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Correspondence

New records of *Pantherophis guttatus* (Squamata: Colubridae) in the state of Bahia, an alien species to Brazil

Érica Fonseca[1,2], Ricardo Marques[1,2] & Moacir Santos Tinôco[1,3]

[1)] Universidade Católica do Salvador, SPPG-MPPA – Centro de Ecologia e Conservação Animal – ECOA. Avenida Prof. Pinto de Aguiar, 2589. CEP 41740-090. Pituaçu, Salvador, BA, Brazil

[2)] Universidade Estadual de Santa Cruz, Programa de Pós-Graduação em Zoologia. Rodovia Ilhéus–Itabuna, km 16, CP 110. CEP 45662-900. Ilhéus, BA, Brazil

[3)] University of Kent at Canterbury; DICE – Durrell Institute of Conservation and Ecology; School of Anthropology and Conservation. Marlowe Building, Kent, CT2 7NZ, UK

Corresponding author: Érica Fonseca, e-mail: erica.fonsecae@gmail.com

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Introducing alien species to other habitats can lead to deleterious effects on economy, human health and local wildlife (Vasconcellos 2001, Sax et al. 2007, Dechoum 2009). However, the impacts of alien snake species are poorly known. Some native species suffer due to the introduction of the Burmese pythons (*Python bivittatus*) to Florida (Krysko et al. 2007, Engeman et al. 2011) and the introduction of the brown tree snake (*Boiga irregularis*) that has long been affecting the populations of birds, mammals, and lizards on the island of Guam (Pimentel et al. 2000) is another example of how deleterious the invasion by alien herpetofaunal species can become.

The colubrid genus *Pantherophis* originates from North America (Burbrink & Lawson 2007). The species *P. guttatus* is widely known for its different colour morphs, for which reason it has been classified in several subspecies that are distributed over the southeastern United States, western Colorado, eastern Utah, southern Texas and Mexico (Burbrink 2002, Fisher & Csurhes 2009).

Pantherophis guttatus is found in a wide range of habitats, including pine forests, semi-deserts, grassland habitats, and urban environments (Burbrink 2002, Fisher & Csurhes 2009). It is mainly arboreal, but also found on the ground (Conant & Collins 1998, Kraus & Cravalho 2001), foraging for small mammals, birds, amphibians and lizards (Fisher & Csurhes 2009). This species makes for a popular pet in many countries, and this hobby is believed to have led to the introduction of several alien species to countries all over the globe (Kraus & Cravalho 2001, Eterovic & Duarte 2002, Gisp 2005, Fisher & Csurhes 2009, Leão et al. 2011, Magalhães & São-Pedro 2012). Herein we report on the detection of *P. guttatus* at different localities in the Brazilian state of Bahia.

We recorded two specimens of *Pantherophis guttatus* in the state of Bahia. The first record was obtained during a survey in the municipality of Camaçari (-12.766809° S, -38.187198° W) in 2001. The specimen was captured in a local grassland within the borders of a local protected area, known as APA do Rio Capivara, at Arembepe, which lies within an area of very high diversity in coastal Brazil – the north coast of Bahia (Tinôco 2011). It was an adult female, 32.1 mm HL, 1,035 mm SVL, 196 mm TL (voucher: CHECOA 142). The second record was made at Boca do Rio, a residential neighbourhood in Salvador (-12.977431° S, -38.427449° W) (Fig. 1). Salvador is the third largest city in Brazil, and the area where the record was made still holds remnants of native Atlantic forest vegetation. The animal was a very young juvenile, probably a week old considering the egg marks on its belly, suggesting that it had hatched in the wild, and a female, measuring 14.4 mm HL, 251 mm SVL, 51.8 mm TL. It had been captured in 2012 and was donated to us (voucher: CHECOA 2855). The two voucher specimens are deposited in the herpetological collection at the Centro de Ecologia e Conservação Animal – ECOA (Fig. 2).

The importation of exotic animals into Brazil is regulated by ordinance 93/1998, and according to this law, the commercialisation of some species is forbidden, including reptiles and amphibians except *Lithobates catesbeianus*. Nowadays, illegal trade in alien amphibian and reptile species on the Internet is widespread in Brazil, though, involving a large variety of websites, social networking and shopping

portals, and Magalhães & São-Pedro (2012) sourced 49 species that were for sale as pets. Among them, *P. guttatus* is the most frequently traded alien species, which according to Brazilian legislation, constitutes an offence.

The records of corn snakes herein reported may have originated from the illegal pet trade, and are likely to have been intentionally released or may have escaped. Due to the fascination these species have on people, most of these animals are obtained as young that are easy to handle. However, when they grow, people may not be able to take care of them and release them into the wild. Most of these owners do not appear to understand how their actions may be deleterious to native fauna (Alves et al. 2011, Destro et al. 2012).

The species was also recorded from Queensland in Australia, Durban in South Africa, Spain, Hawaii, the Bahamas, and has established itself on many Caribbean islands (Kraus & Cravalho 2001, Burbrink 2002, Pleguezuelos 2002, Hayes et al. 2004, Van Wilgen et al. 2008, Fisher & Csurhes 2009, Knapp et al. 2011, Powell et al. 2011), which reinforces its status as invasive fauna. Although the impacts of introducing *P. guttatus* are poorly documented, the unnatural presence of the species is known to be a threat to the local bird fauna (Kraus & Cravalho 2001, Hayes et al. 2004), and other snake species may be threatened by the parasite *Cryptosporidium* that is often carried by *P. guttatus* (Xiao et al. 2004).

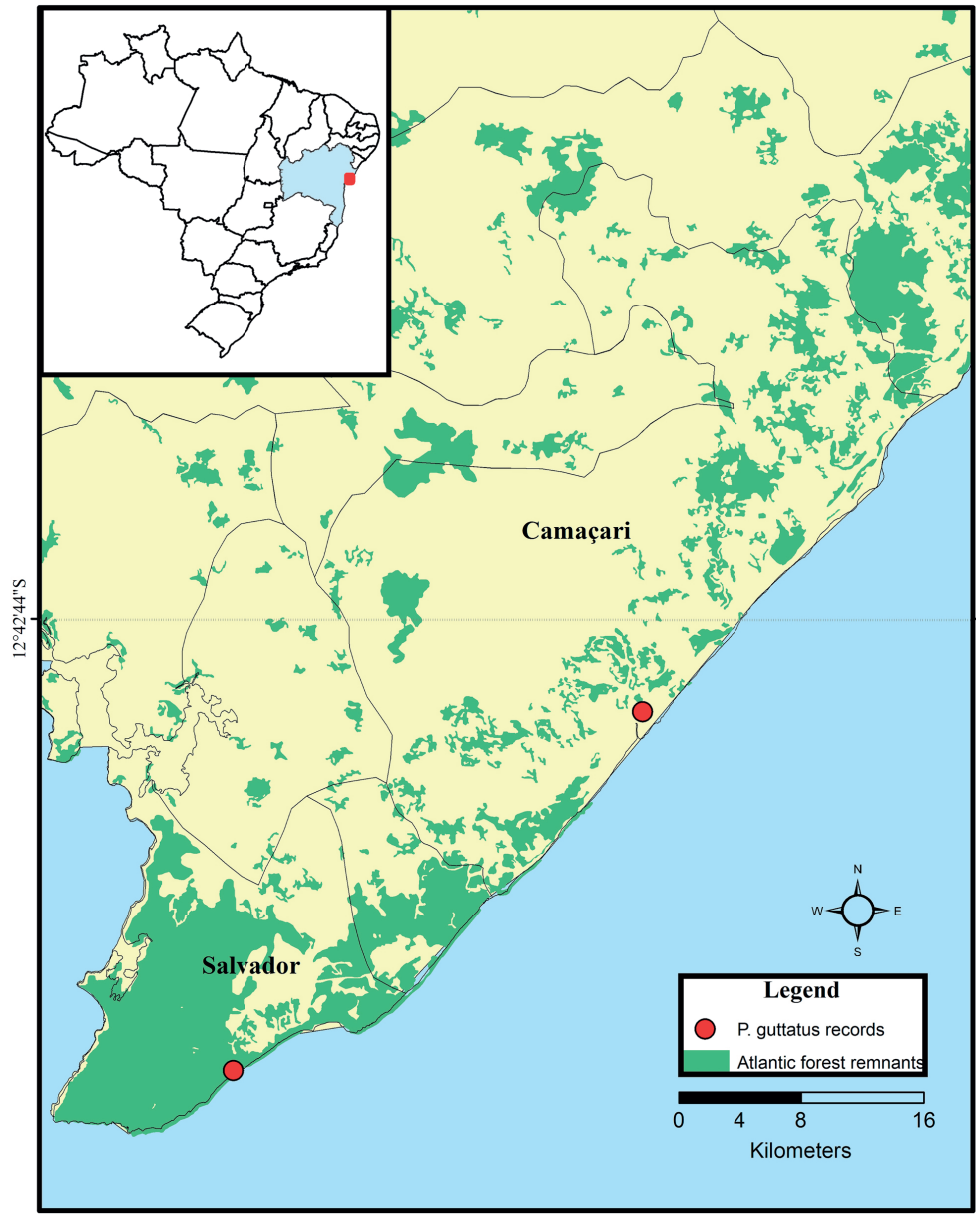

Figure 1. Species records from the municipalities of Salvador and Camaçari.

In Brazil, between 1995 and 2000, 66 snakes of 17 species were found in São Paulo and sent to the Butantan Museum. Amongst these, three were identified as *P. guttatus* (Eterovic & Duarte 2002). The introduction of this species to Brazil is a result of inefficient controls by border control agencies, especially at airports, and also highlights the need for more effective and stricter laws.

A recently approved CONAMA (Brazilian Environment Council) resolution, number 457, tries to put an end to the illegal pet trade, but it is still, in our opinion, ineffective. It stipulates that, if a person wishes to keep a wild animal (of an exotic or native species), he or she may apply for a permit to keep it as a legal pet. Up to ten specimens may be legally kept as pets thus, provided the keeper signs a responsibility agreement. As long as the species is not listed as threatened or endemic to a specific biome, does not exhibit invasive potential, or keeping it in captivity is expected to compromise its welfare, the owner will be allowed to keep it for an indefinite period of time.

We believe this resolution might further the illegal pet trade, as it might facilitate the legalisation of originally illegal animals. Amongst its risky aspects is that any registered person may keep up to 10 animals without limitation to only males or females. The resolution also stipulates that in a case of captive breeding, the keeper should communicate such events to the authorities, but no one can assure that such communication will occur and that the offspring will not be illegally sold. As was mentioned above, a permit

Figure 2. A) An adult specimen that was collected in Camaçari; B) a juvenile that was obtained in Salvador.

holder is classified as a keeper and not a breeder, and no provision is made in the resolution for passing on possible offspring. As a result it might in fact facilitate new introductions to different ecosystems within the country.

Even without the proper knowledge about the effects of alien snake species in urban and natural environments, we believe *P. guttattus* is a potential invader due its generalist diet and adaptability to different habitats, both of which are attributes that show why the species managed to successfully establish itself in other regions. Furthermore, its ecological aspects are similar to most native species (Eterovic & Duarte 2002), as it originates from a very similar ecoregion and therefore finds in Bahia an ideal environment to establish itself and become a high risk to the local fauna.

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References

Alves, R. R. N., K. S. Vieira, G. G. Santana, W. L. S. Vieira, W. O. Almeida, W. M. S. Souto, P. F. G. P. Montenegro & J. C. B. Pezzuti (2011): A review on human attitudes towards reptiles in Brazil. – Environmental Monitoring and Assessment, **184**: 6877–6901.

Burbrink, F. T. (2002): Phylogeographic analysis of the corn snake (*Elaphe guttata*) complex as inferred from maximum likelihood and Bayesian analyses. – Molecular Phylogenetics and Evolution, **25**: 465–476.

Burbrink, F. T. & R. Lawson (2007): How and when did Old World rat snakes disperse into the New World? – Molecular Phylogenetics and Evolution, **43**: 173–189.

Conant, R. & J. T. Collins (1998): Peterson Field Guide to Reptiles and Amphibians, Eastern and Central North America. – Houghton Mifflin Company, Boston Massachusetts.

Dechoum, M. S. (2009): Espécies exóticas invasoras: o contexto internacional e a construção de políticas públicas e de estratégias nacionais. – pp. 4–11 in: Kuntschik, D. P. & M. Eduarte (eds): Cadernos da Mata Ciliar. – São Paulo: Secretaria de Estado do Meio Ambiente.

Destro, G. F. G., T. L. Pimentel, R. M. Sabaini, R. C. Borges & R. Barreto (2012): Efforts to combat wild animals trafficking in Brazil. – pp. 421–436 in: Lameed, G. A. (ed.): Biodiversity enrichment in a diverse world. – InTech Brazil.

Engeman, R., E. Jacobson, M. L. Avery & W. E. Meshaka jr. (2011): The aggressive invasion of exotic reptiles in Florida with a focus on prominent species: A review. – Current Zoology, **57**: 599–612.

Eterovic, A. & M. R. Duarte (2002): Exotic snakes in São Paulo City, southeaster Brazil: why xenophobia? – Biodiversity and Conservation, **11**: 327–339.

Fisher, P. L. & S. Csurhes (2009): Pest animal risk assessment American corn snake *Elaphe guttata*. – Queensland: Primary Industries and Fisheries.

GISP (2005): Programa Global de Espécies Invasoras. América do Sul invadida: A crescente ameaça das espécies exóticas invasoras. – Cape Town: GISP.

Hayes, W. K., R. X. Barry, Z. McKenzie & P. Barry (2004): Grand Bahama's brown-headed nuthatch: a distinct and endangered species. – Bahamas Journal of Science, **12**: 21–28.

Knapp, C. R., J. B. Iverson, S. D. Buckner & S. V. Cant (2011): Conservation of amphibians and reptiles in The Bahamas. – pp. 53–87 in: Hailey, A., B. S. Wilson & J. Horrocks (eds): Conservation of Caribbean island herpetofaunas. Volume 2: Regional Accounts of the West Indies. – Brill Academic Publishers, Leiden.

Kraus, F. & D. Cravalho (2001): The risk to Hawai'i from snakes. – Pacific Science, **55**: 409–417.

Krysko, K. L., K. M. Enge, E. M. Donlan, J. C. Seitz & E. A. Golden (2007): Distribution, natural history, and impacts of the introduced Green Iguana (*Iguana iguana*) in Florida. – Iguana, **14**: 143–151.

Leão, T. C. C., W. R. Almeida, M. S. Dechoum & S. R. Ziller (2011): Espécies exóticas invasoras no nordeste do Brasil: Contextualização, Manejo e Políticas Públicas. – Recife: Cepan.

Magalhães, A. L. B. & V.A. São-Pedro (2012): Illegal trade on non-native amphibians and reptiles in southeast Brazil: the status of e-commerce. – Phyllomedusa, **11**: 155–160.

Pimentel, D., L. Lach, R. Zuniga & D. Morrison (2000): Environmental and economic costs of non-indigenous species in the United States. – BioScience, **50**: 53–65.

Pleguezuelos, J. M (2002): Las especies introducidas de anfibios y reptiles. – pp. 501–532 in: Pleguezuelos, J. M., R. Márquez & M. Lizana (eds): Atlas y Libro Rojo de los Anfibios y Reptiles de España. – Dirección General de Conservación de la Naturaleza-Asociación Herpetológica Española.

Powell, R., R. W. Henderson, M. C. Farmer, M. Breuil, A. C. Echternacht, G. van Buurt, C. M. Romagosa & G. Perry (2011): Introduced amphibians and reptiles in the Greater Caribbean: patterns and conservation implications. – pp. 63–143 in: Hailey, A., B. S. Wilson & J. A. Horrocks (eds): Conservation of Caribbean island herpetofaunas. Volume 1: Conservation biology and the wider Caribbean. – Brill, Leiden.

Sax, D. F., J. J. Stachowicz, J. H. Brown, J. F. Bruno, M. N. Dawson, S. D. Gaines, R. K. Grosberg, A. Hastings, R. D. Holt, M. M. Mayfield, M. I. O'Connor & W. R. Rice (2007): Ecological and evolutionary insights from species invasions. – Trends in Ecology and Evolution, **22**: 465–471.

Tinôco, M. S. (2011): Herpetofauna conservation in the Atlantic forest of Bahia, Brazil. – Solitaire, **22**: 24–25.

Van Wilgen, N. J., D. M. Richardson & E. H. W. Baard (2008): Alien reptiles and amphibians in South Africa: towards a pragmatic management strategy. – South African Journal of Science, **104**: 13–20.

Vasconcellos, S. A. (2001): Zoonoses e Saúde Pública: Riscos causados por animais exóticos. – O Biológico, São Paulo, **63**: 63–65.

Xiao L., U. M. Ryan, T. K. Graczyk, J. Limor, L. Li, M. Kombert, R. Junge, I. M. Sulaiman, L. Zhou, M. J. Arrowood, B. Koudela, D. Modry & A. A. Lal (2004): Genetic diversity of *Cryptosporidium* spp. in captive reptiles. – Applied and Environmental Microbiology, **70**: 891.