

SHORT COMMUNICATION

## A case of bilateral anophthalmy in an adult *Boana faber* (Anura: Hylidae) from southeastern Brazil

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**Palavras-chave:** ausência de olhos, deformidade, malformação, sapo-ferreiro.

Morphological deformities, commonly osteological malformations of several types, occur in natural populations of amphibians around the world (e.g., Peloso 2016, Silva-Soares and Mônico 2017). Ouellet (2000) and Henle *et al.* (2017) provided comprehensive reviews on amphibian deformities and their possible causes. Anophthalmy, the absence of one or both eyes, has been documented in some anuran species (Henle *et al.* 2017 and references therein, Holer and Koleska 2018). We report here the occurrence of bilateral anophthalmy in an adult Blacksmith Frog, *Boana faber* (Wied-Neuwied, 1821), from a well-preserved forest area of southeastern Brazil.

*Boana faber* is a medium-sized hylid frog widely distributed in eastern to southern Brazil, southeastern Paraguay, and Misiones, Argentina (Frost 2018).

While conducting fieldwork related to the anuran faunas of four types of forest in southeastern Brazil (Bertoluci *et al.* 2007), RAB

collected and adult female *Boana faber* with bilateral anophthalmy in the Estação Ecológica dos Caetetus, Gália Municipality, state of São Paulo, Brazil (22°24'11" S, 49°42'05" W); the station encompasses 2,178.84 ha (Tabanez *et al.* 2005). The animal was collected at about 660 m a.s.l. in an undisturbed area (Site 9 of Brassaloti *et al.* 2010; 22°23'27" S, 49°41'31" W; see this reference for a map). The female is a subadult (SVL 70 mm) and was collected on 13 May 2007 at 21:23 h while perched on vegetation about 1 m above ground along a stream; it died in captivity a few days later (Figure 1). We dissected the eye region for examination; the eye sockets were empty and there was no indication of optic nerves. Ovaries were not developed. The stomach had no prey, but a small quantity of faeces in the rectum revealed three tiny insects had been ingested (2 ants of the genus *Wasmannia* and an Auchenorrhyncha hemipteran) and some minute Acari; we assume that these were consumed accidentally. The specimen is deposited in the herpetological collection of the Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo, with the number VESALQ 495.

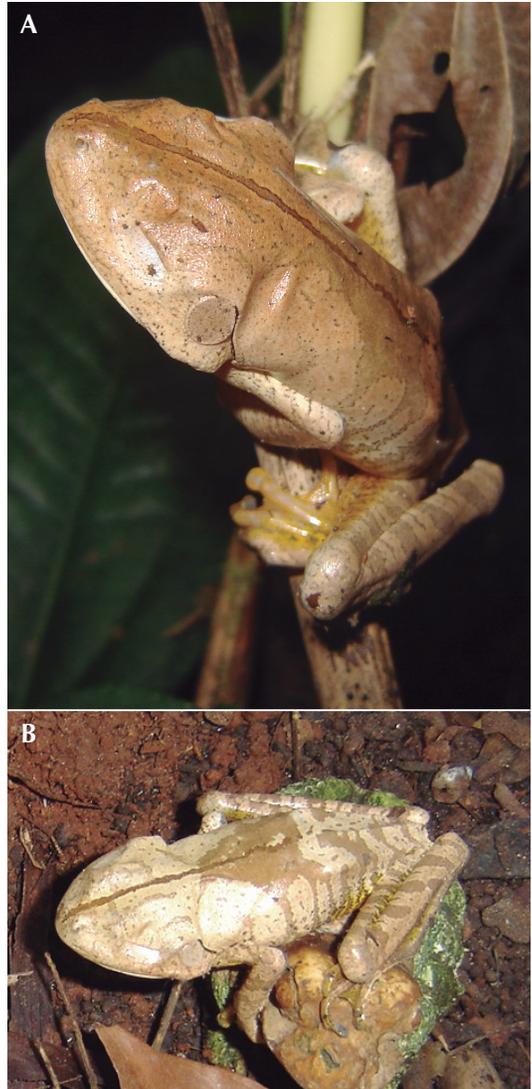
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Cases of bilateral anophthalmia are scarce in the literature. Narayana *et al.* (2017) found an adult bufonid *Duttaphrynus melanostictus* (Schneider, 1799) that lacked both eyes in Borneo. There are a few examples of anophthalmia in Brazilian anurans. Haddad *et al.* (1990) reported unilateral anophthalmia (always the left eye) in natural hybrids of the bufonids *Rhinella icterica* and *R. ornata*, and the hybridization itself was suggested as the probable cause of the abnormalities observed.

The bufonid *Rhinella jimi* is an invasive species of the Archipelago of Fernando de Noronha in northeastern Brazil; in this area, many individuals had deformities of all kind, including partial and total anophthalmia (Toledo and Ribeiro 2009, Tolledo *et al.* 2014, Tolledo and Toledo 2015). It was suggested that the absence of predators on this invasive toad might have allowed deformed individuals to persist in the population until the adult stage (Toledo and Ribeiro 2009).

Dias and Carvalho-e-Silva (2012) reported unilateral anophthalmia and unilateral microphthalmia in two tadpoles of the proceratophryid *Proceratophrys appendiculata* at Parque Nacional da Serra dos Órgãos, state of Rio de Janeiro, Brazil; the cause of this deformity is unknown.

It is surprising the individual *Boana faber* reported here attained adulthood being totally blind. Its survivorship could be related to the fact that *B. faber* preys mainly on adult arboreal frogs, such as the hylids *Aplastodiscus perviridis*, *Scinax granulatus* (Solé *et al.* 2004, 2005), and *Scinax hayii* (pers. obs.); each of these could be encountered in breeding choruses by a predator. Thus a blind frog might locate the breeding site acoustically by relying on both tympanum–columella–papilla basilaris (for air-borne sounds) and opercular muscle–operculum–papilla amphibiorum (for substrate-borne sounds) systems (Duellman and Trueb 1994) to locate individual prey. This would indicate that an individual frog is able to switch its foraging mechanism from visual to acoustic. In fact,



**Figure 1.** The anophthalmic specimen of *Boana faber* in the field (A) and under captivity (B). Photos: RAB and JB.

Tolledo and Toledo (2015) demonstrated such a behavioral switch (and a correlated change in diet composition) from active, nocturnal hunting by eyesight to sit-and-wait predation based on tactile cues in blind *Rhinella jimi* in captivity. Insects and other arthropods are also commonly ingested by *B. faber* (Solé *et al.* 2004, 2005), and

doubtless, the insects ingested by the blind frog may have kept it from starving.

Unfortunately, the cause of deformity in this anuran is unknown. The core area of the site is well preserved, covered by a pristine vegetation, and harbors seemingly healthy anuran populations, as suggested by the report to the site of albino tadpoles of *Rhinella ornata* (Brassaloti and Bertoluci 2008), since in vertebrates albinism is characteristic of healthy populations (Bechtel 1995). Anophthalmia has been reported in anurans from presumably natural areas (e.g., *Lythobates sylvaticus*: Eaton *et al.* 2004). However, the deformed *Boana faber* was collected in an area with varying levels of disturbance because the reserve is located in an agricultural matrix where pesticides can accumulate in bodies of water (Tabanez *et al.* 2005). In fact, pesticides are known to cause deformities in embryos and larvae and to produce high rates of eye anomalies in adults (e.g., *Bufo marinus*; Fort *et al.* 2006).

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## References

- Bechtel, H. B. 1995. *Reptile and amphibian variants: colors, patterns and scales*. Malabar, FL, Krieger Publishing. 224 pp.
- Bertoluci, J., R. A. Brassaloti, J. W. Ribeiro Júnior, V. M. F. N. Vilela, and H. O. Sawakuchi. 2007. Species composition and similarities among anuran assemblages of forest sites in southeastern Brazil. *Scientia Agricola* 64: 364–374.
- Brassaloti, R. A. and J. Bertoluci. 2008. Albinism in tadpoles of *Rhinella ornata* (Anura, Bufonidae) from southeastern Brazil. *Herpetological Bulletin* 106: 31–33.
- Brassaloti, R. A., D. C. Rossa-Feres, and J. Bertoluci. 2010. Anurofauna da Floresta Estacional Semidecidual da Estação Ecológica dos Caetetus, sudeste do Brasil. *Biota Neotropica* 10: <http://www.biotaneotropica.org.br/v10n1/en/abstract?inventory+bn01810012010>.
- Dias, P. H. S. and A. M. P. T. Carvalho-e-Silva. 2012. Records of abnormalities in *Proceratophrys appendiculata* (Günther, 1873) (Anura; Cyclorhynchidae; Alsodinae). *Herpetology Notes* 5: 197–199.
- Duellman, W. E. and L. Trueb. 1994. *Biology of Amphibians*. Johns Hopkins University Press. 670 pp.
- Eaton, B. R., S. Eaves, C. Stevens, A. Puchniak, and C. A. Paszkowski. 2004. Deformity levels in wild populations of the wood frog (*Rana sylvatica*) in three ecoregions of Western Canada. *Journal of Herpetology* 38: 283–287.
- Fort, D. J., R. L. Rogers, B. O. Buzzard, G. D. Anderson, and J. P. Bacon. 2006. Deformities in cane toad (*Bufo marinus*) populations in Bermuda: Part III. Microcosm-based exposure pathway assessment. *Applied Herpetology* 3: 257–277.
- Frost, D. R. 2018. Amphibian Species of the World: an Online Reference. Version 6.0. Electronic Database accessible at <http://research.amnh.org/herpetology/amphibia/index.html>. American Museum of Natural History, New York, USA. Captured on 15 October 2018.
- Haddad, C. F. B., A. J. Cardoso, and L. M. Castanho. 1990. Híbridação natural entre *Bufo ictericus* e *Bufo crucifer* (Amphibia: Anura). *Revista Brasileira de Biologia* 50: 739–744.
- Henle, K., A. Dubois, and V. Vershinin. 2017. A review of anomalies in natural populations of amphibians and their potential causes. *Mertensiella* 25: 57–164.
- Holer, T. and D. Koleska. 2018. A case of unilateral anophthalmia in an adult *Pelophylax kl. esculentus* (Linnaeus, 1758). *Herpetozoa* 31: 103–104.
- Narayana, B. L., B. Nares, and S. Hussain. 2017. A case of anophthalmia in *Duttaphrynus melanostictus* (Schneider, 1799) from Telangana, India. *Sauria* 39: 52–53.
- Ouellet, M. 2000. Amphibian deformities: current state of knowledge. Pp. 617–661 in D. W. Sparling, G. Linder, and C. A. Bishop (eds.), *Ecotoxicology of Amphibians and Reptiles*. Pensacola. SETAC Press.
- Peloso, P. L. V. 2016. Osteological malformation in the tree frog *Hypsiboas geographicus* (Anura: Hylidae). *Phyllomedusa* 15: 91–93.

- Silva-Soares, T. and A. T. Mônico. 2017. Hind limb malformation in the tree frog *Corythomantis greeningi* (Anura: Hylidae). *Phyllomedusa* 16: 117–120.
- Solé, M., B. Pelz, and A. Kwet. 2004. *Hyla faber* (Smith Frog). Diet. *Herpetological Review* 35: 159.
- Solé, M., O. Beckmann, B. Pelz, A. Kwet, and W. Engels. 2005. Stomach-flushing for diet analysis in anurans: an improved protocol evaluated in a case study in Araucaria forests, southern Brazil. *Studies on Neotropical Fauna and Environment* 40: 23–28.
- Tabanez, M.F., G. Durigan, A. Keuroghlian, A. F. Barbosa, C. A. Freitas, C. E. F. Silva, D. A. Silva, D. P. Eaton, G. Brisolla, H. H. Faria, I. F. A. Mattos, I. M. T. Lobo, M. R. Barbosa, M. Rossi, M. G. Souza, R. B. Machado, R. M. Pfeifer, V. S. Ramos, W. J. Andrade, and W. A. Contieri. 2005. Plano de manejo da Estação Ecológica dos Caetetus. *IF Série Registros* 29: 1–103.
- Toledo, L. F. and R. S. Ribeiro. 2009. The archipelago of Fernando de Noronha: an intriguing malformed toad hotspot in South America. *EcoHealth* 6: 351–357.
- Tolledo, J. and L. F. Toledo. 2015. Blind toads in paradise: the cascading effects of vision loss on a tropical archipelago. *Journal of Zoology* 296: 167–176.
- Tolledo, J., E. T. Silva, C. H. L. Nunes-de-Almeida, and L. F. Toledo. 2014. Anomalous tadpoles in a Brazilian oceanic archipelago: implications of oral anomalies on foraging behaviour, food intake and metamorphosis. *Herpetological Journal* 24: 237–243.

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