The Herpetological Bulletin 151, 2020: 37-38
SHORT COMMUNICATION

https://doi.org/10.33256/hb151.37-38

Records of limb abnormalities in three anurans from eastern Amazon - *Atelopus hoogmoedi*, *Allobates femoralis* and *Dendropsophys leucophyllatus*

MARIA MADALENA SALVIANO SANTANA[1], PATRICK RIBEIRO SANCHES[1,*], ALINE EMANUELE OLIVEIRA-SOUZA[1], KURAZO MATEUS OKADA-AGUIAR[2], WIRLEY ALMEIDA-SANTOS[3] & CARLOS EDUARDO COSTA-CAMPOS[1].

[1]Universidade Federal do Amapá, Departamento de Ciências Biológicas e da Saúde, Laboratório de Herpetologia. Rod. JK Km 2, Bairro Jardim Marco Zero, CEP 68902-280, Macapá, Amapá, Brazil
[2]Bio-Ornithos Consultoria Ambiental
[3]Prefeitura Municipal de Serra do Navio, Secretaria Municipal de Turismo, Amapá, Brazil
[*]Corresponding author e-mail: patricksanchs@gmail.com

Isolated reports of amphibians with malformed, extra, missing, or abnormal limbs in natural populations have been in the scientific literature for centuries (Ouellet, 2000). However, the increasing, sporadic appearance of such abnormalities over the last few decades has demonstrated a high susceptibility of this group to this type of abnormality (Ouellet, 2000; Lannoo, 2009; Henle & Dubois, 2017). The causes of deformities and abnormalities in amphibians are believed to be related to several factors, such as ultraviolet radiation, chemical pollution (Blaustein et al., 2003), climate change (Pounds, 2001), and epidemic disease such as chytrid fungus (Pounds et al., 2006). Herein we describe instances of limb abnormalities in three anuran species of the eastern Amazon.

In 2017, during monitoring studies of the herpetofauna of Parque Natural Municipal do Cancão (PNMC) (0.90275°N, 52.00497°W; Datum WGS84/SAD 69), municipality of Serra do Navio, Amapá state, Brazil, we observed three cases of limb abnormalities. These were in *Atelopus hoogmoedi* Lescure, 1974 (Anura, Bufonidae), *Allobates femoralis* (Boulenger, 1884) (Anura, Aromobatidae) and *Dendropsophus leucophyllatus* (Beireis, 1783) (Anura, Hylidae). Single specimens with morphological abnormalities were collected at the margin of a stream near the Amapari River, in the western portion of PNMC. We captured the live anurans under collection permits from ICMBio (48102), using a combination of the visual encounter surveys and audio strip transects. We fixed the voucher specimens in 10 % formalin and preserved them in 70 % ethanol (Heyer et al., 1997) and subsequently identified and classified the abnormalities following the nomenclature proposed by Henle & Dubois (2017). The specimens are now housed in the Herpetological Collection of Federal University of Amapá – CECCAMPOS 2901 – *Atelopus hoogmoedi*; CECCAMPOS 2177 – *Dendropsophus leucophyllatus*; CECCAMPOS 3457 – *Allobates femoralis*).

Two of the anurans, *A. hoogmoedi* and *D. leucophyllatus*, showed ectromely which is characterised by the absence, partial or complete, of a limb (Henle & Dubois, 2017). The abnormality in *A. hoogmoedi* consisted of a partially missing radio-ulna in the right forelimb, where the hand was absent (Fig. 1). *Dendropsophus leucophyllatus* presented ectromely of the radio-ulna in the left forelimb (Fig. 2), with a somewhat shorter radio-ulna than in *A. hoogmoedi*. While, in *A. femoralis* there were three types of malformations in the fingers: brachydactyly, polydactyly and syndactyly (Fig. 3). In the right hand of *A. femoralis*, we observed a fusion in the tissue between the two medial phalanges (syndactyly)

Figure 1. Ectromelia of the radio-ulna in the left limb in a male of *A. hoogmoedi* from the municipality of Pedra Branca do Amapari, Amapá state

Figure 2. Ectromelia of the radio-ulna in the right limb in a male of *D. leucophyllatus* from the municipality of Serra do Navio, Amapá state

Figure 3. Brachydactyly, polydactyly and syndactyly in the right limb in a male of *A. femoralis* from the municipality of Serra do Navio, Amapá state

and in the distal finger two abnormalities a proximal fission duplicating the finger (polydactyly) but with the bones of the fingers reduced in length (brachydactyly) (Lannoo, 2009; Henle & Dubois, 2017).

Concerning the prevalence of these abnormalities, only a single specimen of each of the three species was detected with an abnormality although this accounts for a high proportion of the total number of specimens observed - *A. hoogmoedi* (1 of 22 or 4.5 %), *D. leucophyllatus* (1 of 13 individuals or 7.6 %) and *A. femoralis* (1 of 55 or 1.8 %). The area of the survey is a fully protected conservation unit but is within the Serra Navio municipality where for generations there has been manganese extraction resulting in contamination with chemical residues including arsenic (Queiroz, 2008) which might be an exogenous factor affecting anuran populations.

ACKNOWLEDGEMENTS

We thank L. Forti for the suggestions on an earlier version of this manuscript. We also thank Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), Christoph Jaster (Parque Nacional Montanhas do Tumucumaque) for the permits and the support in fieldwork.

REFERENCES

Blaustein, A.R., Romansic, J.M., Kiesecker, J.M. & Hatch, A.C. (2003). Ultraviolet radiation, toxic chemicals, and amphibian population declines. *Diversity and Distribution* 9: 123–140.

Henle, K. & Dubois, A. (2017). Studies on Anomalies in Natural Populations of Amphibians. *Mertensiella* 25: 185-242.

Heyer, R., Donnelly, M.A., Foster, M. & Mcdiarmid, R. (1994). *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Smithsonian Institution Press: Washington and London. 364 pp.

Lannoo, M.J. (2009). Amphibian malformations. In *Amphibian Biology*, 3089–3111 pp. Heatwole, H. & Wilkinson, J.W. (Eds.). Baulkham Hills Australia: Surrey Beatty & Sons.

Ouellet, M. (2000). Amphibian deformities: current state of knowledge. In *Ecotoxicology of Amphibians and Reptiles*, 617-661 pp. Sparling, D.W., G. Linder & Bishop, C.A. (Eds.). Pensacola, Florida: SETAC Press.

Pounds, J.A. (2001). Climate and amphibian declines. *Nature* 410: 639–640.

Pounds, J.A., Bustamante, M.R., Coloma, L.C., Consuegra, J.A., Michael P.L. Fogden, M.P.L., Foster, P.N., La Marca, E., Masters, K.L., Merino-Viteri, A., Puschendorf, R., Ron, S.R., Sánchez-Azofeita, G.A., Still, C.J. & Young, B.E. (2006). Widespread amphibian extinctions from epidemic disease driven by global warming. *Nature* 439: 161–167.

Queiroz, J.C., Sturaro, J.R., Saraiva, A.C. & Landim, P.M.B. (2008). Geochemical characterization of heavy metal contaminated area using multivariate factorial kriging. *Environmental Geology* 55(1): 95–105.

Ouellet, M. (2000). Amphibian deformities: current state of knowledge. In *Ecotoxicology of Amphibians and Reptiles*, 617-661 pp. Sparling, D.W., G. Linder & Bishop, C.A. (eds.). Pensacola, Florida: SETAC Press.

Accepted: 17 December 2019