PARNASSIANA ARCHIVES 10: 27-30 2022

AN EYE-BASED DEFORMITY IN THE FIRE SALAMANDER, *SALAMANDRA SALAMANDRA* (LINNAEUS, 1758) (SALAMANDRIDAE, LISSAMPHIBIA) FROM NAOUSA (NORTHERN MAINLAND GREECE)

Monika Balogová[1], Romana Uhrinová[2], Viktória Vargová[1] & Marcel Uhrin[1]

[1] Department of Zoology, Institute of Biology and Ecology, Faculty of Science, P. J. Šafárik University, Šrobárova 2, 041 80 Košice, Slovakia, e-mail: marcel.uhrin@gmail.com
[2] WWF Slovakia, Medená 101/5, SK–811 02 Bratislava, Slovakia

Published online: September 15, 2022

Anomalies in amphibians, both, morphological and colour-related, are well known and considering current knowledge they could be accounted as an indicator of environmental (various pollution) or ecological (habitat quality, parasitism, predation) pressure on particular populations (Lannoo 2008, Laurentino et al. 2016, Henle et al. 2017a). Among the various skeletal, non-skeletal, abnormal-size- or colour-related malformations, eye-based are relatively rare deformities in wild amphibians, though they have been previously detected especially in some anuran species worldwide (e.g., Harris et al. 2001, de Silva 2011, Guerra & Aráoz 2016, Pardeshi 2017, Ramalho et al. 2017, Brassaloti & Bertoluci 2018, Ashaharraza et al. 2020, Szkudlarek 2020). In urodelans they are even more scarce, and this pattern has been explained by the high regeneration aptitude observed in the Urodela order. These eye-based morphological anomalies in amphibians, first reviewed by Henle et al. (2017a), include deformities such as eyes fused into one single median eye (cyclopia), abnormally large eyes (macrophthalmia), the absence of the eye globe (anophthalmia), and a small globe (microphthalmia; see also Verma & Fitzpatrick 2007, Henle et al. 2017b). Presence of anophthalmia or microphthalmia included genetic (e.g., hybridization or inbreeding), environmental (e.g., chemical pollution, high fluoride levels) or ecological reasons (e.g., viruses or predators; Weis & Weis 1976, Haddad et al. 1990, Burton et al. 2008, Gollmann & Gollmann 2012, Tolledo & Toledo 2015, Guerra & Aráoz 2016, Pollo et al. 2019).

In the family Salamandridae, cases of anophthalmia or microphthalmia have been reported in wild conditions only rarely and hitherto in only three species. In *Salamandra salamandra*, Haensch (1985) and Balicka et al. (2020) recorded an unilateral microphthalmia of an albino larva in Germany and of a subadult male in Slovakia, respectively. The other two cases were reported in newts. In the Urals (Russia), Vershinin & Berzin (2018) observed one case of anophthalmia among almost a thousand examined individuals of *Lissotriton vulgaris*, and recently, two cases of unilateral anophthalmia were reported from Galicia (NW Spain) in *Lissotriton helveticus* (Ayres et al. 2022).

During an opportunistic herpetological surveillance in northern mainland Greece, we found in the town of Naousa (40.61153°N, 22.04649°E, WGS 84, 477 m a.s.l.) on 26 September 2020 an adult

ISSN (print-edition) : 2241-7834
ISSN (on-line edition) : 2241-7842

female fire salamander (*Salamandra salamandra*) with an eye-based abnormality resembling a right (unilateral) microphthalmia (Fig. 1). The observation was made in the Alsos Agiou Nikolaou Park situated on the eastern edge of urbanised area of the city. The park resembles a forest-like and typical fire salamander habitat, with old trees (mostly plane trees, *Platanus* sp.), a shrub floor in some places and large lawn areas crossed by a river (Arapitsa) and a small stream. Although the site also serves as an extensively used recreational area (Athanasiadou 2019), we assume the local population of fire salamanders could be abundant and dense, though no further anomalies were recorded among the further examined individuals (1 female, 1 juvenile). The optical deformity in *S. salamandra* reported here is the first case from Greece (cf. Valakos et al. 2008, Henle et al., 2017a) and only the third in the respective species. However, it is hard to assume if the observed eye-based deformity represents congenital type of microphthalmia or it is just case of posttraumatic *phthisis bulbi* as the result of some previous injury. Nonetheless, the fire salamander was in a good physical condition and we assume that it was able to hunt prey successfully despite its handicap. The aim of this report is thus to provide the basic information on the case as the ground for possible further compilations and an explanation of amphibians' deformity phenomena.

Fig. 1. Female *S. salamandra* with a unilateral microphthalmia, Alsos Agiou Nikolaou Park, Naousa, Greece. **A.** lateral view of the individual's head shows the small right eye globe (photograph by R.U.). **B.** the frontal view shows the clear deformity of the head shape (photograph by R.U.). **C.** The habitat and phenological situation of the record site in autumn aspect (photograph by M.U.).

Acknowledgements

The study was supported by the Scientific Grant Agency VEGA (1/0298/19).

Literature

Ashaharraza, K. & Mahapatra, C. 2020. Anophthalmia in a common Asian toad, *Duttaphrynus melanostictus* (Amphibia: Anura: Bufonidae), from the Eastern Ghats of India. - IRCF Reptiles & Amphibians 27(1): 44-45.

Athanasiadou, E. 2019. Historic gardens and parks worldwide and in Greece: principles of acknowledgement, conservation, restoration and management. - Heritage 2(4): 2678-2690.

Ayres, C., Asensi-Cabirta, M. & Dominguez-Costas, M. 2022. Anophthalmia in palmate
newts (*Lissotriton helveticus*) in Galicia (Northwestern Spain). - Reptiles & Amphibians 29: 113-114.

Balicka, A.A., Lapšanská, M., Uhrin, M., Figurová, M., Trbolová, A. & Balogová, M. 2020. Abnormalities in European fire salamanders (*Salamandra salamandra*, Salamandridae, Amphibia) observed in their wintering roosts. - Russian Journal of Herpetology 27(4): 235-239.

Brassaloti, R.A. & Bertoluci, J. 2018. A case of bilateral anophthalmy in an adult *Boana faber* (Anura: Hylidae) from southeastern Brazil. - Phyllomedusa 17(2): 285-288.

Burton, E.C., Miller, D.L., Styer, E.L. & Gray, M.J. 2008. Amphibian ocular malformation associated with frog virus 3. - The Veterinary Journal 177: 442-444.

de Silva, A. 2011. Some observations of malformation, eye disease, parasitic and viral infection and the effects of agrochemicals on amphibians in Sri Lanka. - Froglog 98: 24-26.

Guerra, C. & Aráoz, E. 2016. Amphibian malformations and body condition across an agricultural landscape of northwest Argentina. - Diseases of Aquatic Organisms 121(2): 105-116.

Gollmann, B. & Gollmann, G. 2012. Die Gelbbauchunke [Beiheft der Zeitschrift für Feldherpetologie 4]. - Laurenti Verlag, Bielefeld.

Haddad, C.F.B., Cardoso, A.J. & Castanho, L.M. 1990. Hibridacao natural entre *Bufo ictericus* e *Bufo crucifer* (Amphibia: Anura). - Brazilian journal of biology 50(3): 739-744.

Haensch, G. 1985. Beobachtungen an einer albinotischen Larve des Feueralamanders. - Elaphe 85(3): 45-47.

Harris, M.L., Bishop, C.A. & McDaniel, T. V. 2001. Assessment of rates of deformity in wild frog populations using in situ cages: a case study of leopard frogs (*Rana pipiens*) in Ontario, Canada. - Biomarkers 6(1): 52-63.

Henle, K., Dubois, A. & Vershinin, V. 2017a. A review of anomalies in natural populations of amphibians and their potential causes. - Mertensiella 25: 57-164.

Henle, K., Dubois, A. & Vershinin, V. 2017b. Commented glossary, terminology and synonymies of anomalies in natural populations of amphibians. - Mertensiella 25: 9-48.

Lannoo, M. 2008. Malformed frogs. The collapse of aquatic ecosystems. - Berkeley, Los Angeles & London: University of California Press. xvi & 270 pp.

Laurentino, T.G., Pais, M.P. & Rosa, G.M. 2016. From a local observation to a European-wide phenomenon: amphibian deformities at Serra da Estrela Natural Park, Portugal. - Basic and Applied Herpetology 30: 7-23.

Pardeshi, A. 2017. Observation of a deformity (anophthalmia) in the critically endangered Amboli toad (*Xanthophryne tigerina*) from the Western Ghats of India. - IRCF Reptiles & Amphibians 24(2): 118-119.

Pollo, F., Bionda, C., Otero, M., Grenat, P., Babini, S., Flores, P., Grisolia, M., Salas, M. & Martino A. 2019. Morphological abnormalities in natural populations of the common South American toad

Rhinella arenarum inhabiting fluoride-rich environments. - Ecotoxicology and Environmental Safety 177: 32-38.

Ramalho, W.P., Maffei, F., Guerra, V., Da Silva, D.P., De Matos, L.R. & Vieira, L.J. 2017. Anophthalmia in adults of two Amazonian treefrogs (Anura: Hylidae). - The Herpetological Bulletin 139: 43-44.

Szkudlarek, M. 2020. Ocular anomalies in four species of European toad. - The Herpetological Bulletin 154: 26-28.

Tolledo, J. & Toledo, L.F. 2015. Blind toads in paradise: the cascading effects of vision loss on a tropical archipelago. - Journal of Zoology 296: 167-176.

Valakos, E.D., Pafilis, P., Sotiropoulos, K., Lymberakis, P., Maragou, P. & Foufopoulos, J. 2008. The amphibians and reptiles of Greece [Frankfurter Beiträge zur Naturkunde / Frankfurt Contributions to Natural History 32. Edition Chimaira]. - Chimaira Frankfurt am Main: Buchhandelsgesellschaft mbH. 463 pp.

Verma, A.S. & Fitzpatrick, D.R. 2007. Anophthalmia and microphthalmia. - Orphanet Journal of Rare Diseases 2(1): 47.

Vershinin, V.L. & Berzin, D.L. 2018. Anomalies of the smooth newt *Lissotriton vulgaris* (Linnaeus, 1758) in European and the East Uralian parts of its distribution area. - Alytes 36(1–4): 45-53.

Weis, J.S. & Weis, P. 1976. Optical malformations induced by insecticides in embryos of the silversides, *Menidia menidia*. - Fishery Bulletin 74: 208-211.