The Herpetological Bulletin 168, 2024: 45–46
NATURAL HISTORY NOTE

https://doi.org/10.33256/hb168.4546

Congenital bilateral pseudobuphthalmos in the dice snake *Natrix tessellata*

ANASTASIIA A. KLENINA[1,2] & EVGENIY SIMONOV[1*]

[1]Mahambet Utemisov West Kazakhstan University, N. Nazarbayev Avenue, 162, Uralsk, 090000, Kazakhstan
[2]Samara Federal Research Scientific Center of RAS, Institute of Ecology of the Volga River basin of RAS, Komzin str. 10, Tolyatti, 445003, Russia

Author e-mail: ev.simonov@gmail.com

The dice snake *Natrix tessellata* (Laurneti, 1768) has a wide distribution from central and southern Europe eastward to China, across countries of the Middle East, Iran, Russia, and Central Asia. On 4 July 2023, in relation to research on snake reproductive biology, we caught ten gravid female *N. tessellata* from the northern-most population of the species (53° 21'51.5" N, 49° 12'59.0" E, WGS84; Samara Region, Russia). The individuals were temporarily kept in the laboratory until the eggs were laid. Between 7 July and 13 July, a total of 139 eggs were laid by the snakes, after which the snakes were returned to their capture sites. The eggs were then incubated following an established protocol (Eplanova & Klenina, 2013) at an average temperature of 29.5 ± 0.5 °C. Hatching occurred between 10–16 August, with an incubation period ranging from 25 to 34 days. Out of the 139 newborns hatched, one neonate (0.7%) was born with abnormally enlarged eyes (Fig. 1). The diameter of the spectacle of the right and left eyes was 4.91 mm and 4.90 mm respectively. The eye size of one of the siblings without the anomaly was 2.10 mm. Its upper jaw was deformed due to severe distention of the sub-spectacular space and was not completely covered by the lower jaw at the edges (Fig. 1B). The remaining individuals had no congenital deviations, except for a few cases of scale abnormalities.

The possible cause of this eye malformation may be a congenital blockage of the lacrimal duct resulting in development of pseudobuphthalmos, also known as bullous spectaculopathy (Millichamp, 2022; Hellebuyck & Vilanova, 2023). This condition is usually observed in neonates (Hellebuyck & Vilanova, 2023). In snakes, the sub-spectacular space contains secretion produced by the Harderian gland inside the eye orbit. The fluid in the sub-spectacular space is drained into the mouth through the lacrimal ducts. In case of the lacrimal drainage obstruction the fluid from the gland will accumulate in the sub-spectacular space, causing the spectacle to bulge and distend away from the eye (Millichamp, 2022). The spectacle is shed at regular intervals during normal ecdysis and in some cases pseudobuphthalmos resolves at the time of ecdysis (Millichamp, 2022).

The reported neonate specimen shed its skin three times: shortly after hatching, and then again at three and five months old. After the second ecdysis the pseudobuphthalmos was resolved on the left side but developed again in five days. With the third ecdysis the condition resolved bilaterally,

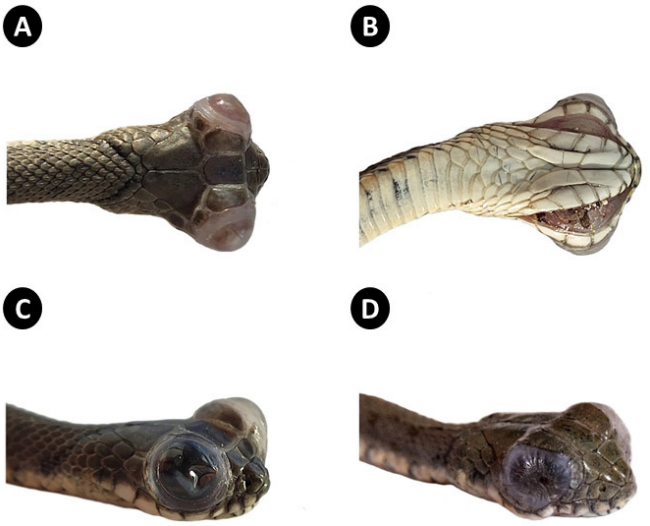

Figure 1. Neonate dice snake *Natrix tessellata* with congenital bilateral pseudobuphthalmos possibly associated with developmental abnormalities in the lacrimal duct **A.** Dorsal view, **B.** Ventral view, **C.** Lateral view, **D.** Later view after ecdysis

but spectacles were left dented (Fig. 1D) along with the facial deformations and recurrent accumulation of fluid with time. The eyes under spectacles were of normal size. Recurrence in the development of pseudobuphthalmos is a sign of permanent obstruction of lacrimal duct drainage (Millichamp, 2022).

There are reports of up to 60% of newborns from a single clutch being affected by pseudobuphthalmos, for example in the Malayan pit viper *Calloselasma rhodostoma* (Hellebuyck & Vilanova, 2023). Cases of congenital pseudobuphthalmos have also been reported in Dumeril's boa *Acrantophis dumerili*, *Boa constrictor*, corn snake *Pantherophis guttatus* and Mexican black milksnake *Lampropeltis nigritus*. In oviparous species, such as *N. tessellata*, the completion of embryonic development depends, in part, on the interplay between genetic factors and environmental conditions, which could lead to congenital malformations that are mostly incompatible with life (Martín-del-Campo et al., 2021). The clutch from which the discussed individual hatched was laid by the female after being maintained in a terrarium for six days. The egg laying date fits within published limits for the species in this area (Klenina, 2015). The temperature

was the same for all ten clutches obtained (or for all 139 eggs), and a such pronounced deviation appeared in only a single individual (0.7%). Thus, we argue that the incubation temperature is very unlikely to have led to the development of this defect.

The spectacle covering the eye plays a crucial role in the quality of snake vision (Millichamp, 2022) implying that the vision of the specimen was heavily disturbed. The neonate was also unable to dive underwater and could not feed itself. It is obvious that this individual would not have survived in the wild and would instead require captive care and artificial feeding.

ACKNOWLEDGEMENTS

The study was partially supported by state assignment of Institute of Ecology of the Volga River Basin (Theme No. 1023062000002-6-1.6.20; 1.6.19).

REFERENCES

Ensley, P.K., Anderson, M.P. & Bacon, J.P. (1978). Ophthalmic disorders in three snakes. *Journal of Zoo and Wildlife Medicine* 9: 57–59.

Eplanova, G.V. & Klenina, A.A. (2013). To the method of reptile egg incubation. *Current Studies in Herpetology* 13: 160–163.

Hellebuyck, T. & Vilanova, F.S. (2023). Anatomy, physiology, and disorders of the spectacle, subspectacular space, and its lacrimal drainage system in squamates. *Animals* 13: 1108.

Klenina, A.A. (2015). *Colubridae snakes of the Volga River basin: feeding, reproduction, state of protection*. Tolyatti, Kassandra. 158 pp. (In Russian).

Klenina, A.A. (2019). Preliminary data on the influence of incubation temperature on the morphological characteristics of snakes of the genus *Natrix*. *Ecological collection* 7: 225–226.

Martín-del-Campo, R., Calderón-Campuzano, M.F., Rojas-Lleonart, I., Briseño-Dueñas, R. & García-Gasca, A. (2021). Congenital malformations in sea turtles: puzzling interplay between genes and environment. *Animals* 11: 444.

Millichamp, N.J. (2022). Ophthalmology of Serpentes: Snakes. In *Wild and Exotic Animal Ophthalmology*. 231–269 pp. Montiani-Ferreira, F., Moore, B.A. & Ben-Shlomo, G. (Eds.). Springer, Cham.

Accepted: 8 February 2024