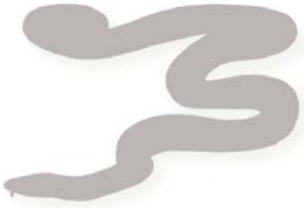
SCOLECOMORPHIDAE

Scolecomorphus vittatus Boulenger, 1895

BANDED CAECILIAN



BEHAVIOUR

Caecilians of the family Scolecomorphidae have vestigial eyes which "are attached to, and move with, the tentacles and may be exposed when the tentacles are extruded" (Nussbaum 1985: 3). This remarkable behaviour was first documented by O'Reilly *et al.* (1996) who showed that the caecilian *Scolecomorphus kirkii* could extrude and retract the entire eye beyond the skull: the only vertebrate with protrusible eyes. Nussbaum's (1985) description of the family and species descriptions (e.g., Nussbaum 1981), clearly indicate that all members of this family should have the ability to move their eyes along the tentacular groove and possibly extrude them from the skull. In scolecomorphids, like some other caecilian families, the orbit is closed (*cf* Sherratt *et al.* 2014), but the bone is translucent so that the eye can be seen moving along the tentacular groove, in an unpigmented area of the skull. Presumably, this allows the animal to sense light whether the tentacle is retracted or extruded. Despite the knowledge that the eye can probably be extruded by all members of the family Scolecomorphidae, there have been no subsequent reports of this behaviour.

On 18 April 2008, I was given access to photograph two *Scolecomorphus vittatus* specimens which were reported to be collected from the West Usamabaras and the base of the Nguru mountains in Tanzania, respectively. During the photographic session, where the specimens were allowed to roam on leaf litter (Fig. 1), I noted that one specimen repeatedly moved its tentacles in and out of the skull, but during the 30 minute session, the eye was seen extruded from the skull only twice (Fig. 2). During most of the observational period, the maximum that the tentacles were protruded from the skull left the eye still protected just inside the skull (Fig. 3). All observations occurred in daylight between 09h30 and 10h00.

The functional explanation of why eyes have become motile, and can even be extruded from the skull is still unknown for scolecomorphids. *Scolecomorphus vittatus* belongs to a group of caecilians which have been described as surface active, indicating that they have been found moving over the ground (Gower *et al.* 2004; Wollenberg & Measey 2009). These caecilians appear to be principally active at night (Mohun *et al.* 2010), although individuals have been found moving over ground during the day (pers. obs.). It is not clear under what conditions it would be advantageous for an individual to extrude the eye out of the skull, although it appears from my observations

that this does not happen frequently above ground, during the day. It is possible that this behaviour may be more frequent when animals are emerging from burrows, perhaps trying to determine whether light levels are low enough to move above ground. It remains to be seen whether members of the genus *Crotaphatrema*, the sister genus to *Scolecomorphus* and the only other genus in the family Scolecomorphidae, can also extrude their eyes from their skulls.

Figure 1. *Scolecomorphus vittatus* moving freely over leaf-litter. The tentacles can be seen to be extended and in touch with the leaf litter substrate.

Figure 2. Detail of the head of a *Scolecomorphus vittatus* showing the eye completely extruded from the skull, one of only two observations in 30 minutes.

Figure 3. Detail of the head of Scolecomorphus vittatus showing the progress of the extrusion of the tentacle and the concurrent movement of the eye along the tentacular groove. In the last image, the eye can be seen partially out of the skull.

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REFERENCES

GOWER, D.J., LOADER, S.P., MONCRIEFF, C.B., & WILKINSON, M. 2004. Niche separation and comparative abundance of *Boulengerula boulengeri* and *Scolecomorphus vittatus* (Amphibia: Gymnophiona) in an East Usambara forest, Tanzania. *African Journal of Herpetology* 53: 183-190.

MOHUN, S.M., DAVIES, W.L., BOWMAKER, J.K., PISANI, D., HIMSTEDT, W., GOWER, D.J., HUNT, D.M. & WILKINSON, M. 2010. Identification and characterization of visual pigments in caecilians (Amphibia: Gymnophiona), an order of limbless vertebrates with rudimentary eyes. *The Journal of Experimental Biology* 213: 3586-3592.

NUSSBAUM, R.A. 1981. *Scolecomorphus lamottei*, a new caecilian from West Africa (Amphibia: Gymnophiona: Scolecomorphidae). *Copeia* 1981: 265-269.

NUSSBAUM, R.A. 1985. Systematics of caecilians (Amphibia: Gymnophiona) of the family Scolecomorphidae. *Occasional Papers of the Museum of Zoology at the University of Michigan* 713: 1-49.

O'REILLY, J.C., NUSSBAUM, R.A. & BOONE, D. 1996. Vertebrate with protrusible eyes. *Nature* 382: 33.

SHERRATT, E., GOWER, D.J., KLINGENBERG, C.P., & WILKINSON, M. 2014. Evolution of Cranial Shape in Caecilians (Amphibia: Gymnophiona). *Evolutionary Biology* 41: 528-545.

WOLLENBERG, K.C., & MEASEY, G.J. 2009. Why colour in subterranean vertebrates? Exploring the evolution of colour patterns in caecilian amphibians. *Journal of Evolutionary Biology* 22: 1046-1056.

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