Comparative study of the vision of two psammophilic species: *Scincus scincus* & *Eumeces schneideri* (Scincidae)

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**Abstract**

Sandy substrates, marine or terrestrial, cover a large part of our planet. Numerous species, including the vertebrates, have developed adaptations to live in these environments. One group of vertebrates was here investigated, the Lepidosauria. Among them, two species, *Scincus scincus*, the sandfish, and *Eumeces schneideri*, the Schneider’s Skink, belonging to the same family, were studied. Both species live in hot sandy deserts and have developed many adaptations to cope with, for example, the abrasive properties of the sand (*>). These species have also to deal with an high luminous intensity, so adaptations may have appeared to deal with it but *S. scincus* live most of the time under the surface. Thus, the aim of this study was to highlight plausible adaptations to this feature. To do so, histological and immunohistochemical analyses were performed on those species to investigate the retinal structure of their eyes in relation to their respective lifestyle. We have here shown retinal similarities like a slightly pyramidal visual structure for both species (more pronounced at the peripheral level), but also differences including a thicker bipolar cells layer for *S. scincus*. It is noteworthy that the visual capacities of the sandfish may be better than what would be excepted for such a fossorial species.

**Introduction**

Sandy deserts (a) and sandy oceanic floors cover a large part of our planet. Numerous species of vertebrates have colonized these ecological niches by living in or under these kind of substrates. A large number of morphological adaptations have appeared to sustain life and locomotion in or under the surface of sandy substrates. The sand is a natural granular material. The organisms that live in sandy environments like *Scincus scincus* and *Eumeces schneideri*, both belonging to the Scincidae family (c), and having a similar geographical distribution (d), have to deal with the physical properties of sand. Besides the physio-morphological adaptations impacting for example the skin properties (*†*), indirect adaptations due to the high luminous intensity of the hot sandy desert may have appeared for those species. In this comparative study, we have focused on the structure of the retina (b) of these two psammophilic species to highlight the plausible differences between them, considering that the *S. scincus* lives almost all the time under the sandy surface (*‡*).

**Materials & Methods**

Two species of Lepidosauria (Squamata) were studied. The first one is *Scincus scincus* (g), belonging to Scincidae. Its common name is the "Sandfish". The second one is *Eumeces schneideri* (b), another Scincidae called the "Berber stink". These two species were collected, sacrificed and then were fixed by immersion in Picrosirius-Brazil fluid. The paraffin embedded sections obtained by microtomy were then stained with haematoxylin, Orange G and Fast green to allow histological examination. The number of rods was estimated by immunocytochemistry using an anti-Rhodopsin antibody (Rho 4D2, Abcam®). All the examinations made here were focused on the retina (photoreceptors, bipolar cells & ganglion cells). The thickness of these three regions and the number of cells within them were estimated by using the software ImageJ®.

**Results**

![Diagram](image_url)

**Discussion & Conclusion**

We can see that those two psammophilic species of Scincidae share a common structure of the retina, composed mainly of cone-like photoreceptors and moreover having a mixture of "cones" and "rods" at the central level (median values for both species approximately equal to fifty "cones" for one "rod"). This is an intriguing result considering that fossorial species are excepted to rely on a rod main retina (*†*). Moreover the structure of the retina, concerning the ratio between ganglion cells and photoreceptors (rod illustrated), seems to be similar, with median values of about 0.65 at the central level, and 0.35 at the peripheral level. These values indicate the slightly pyramidal structure of the retina, and may give an hint on the visual acuity of these skinks. All these results add more insights into the knowledge of the Scincidae family visual capacities, which is a little studied topic (*‡*).