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Research

Crocodilians Evolved Scattered Multi-Sensory Micro-Organs

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Supersense: it's a snap for crocs

Previously misunderstood/unknown multi-sensory organs in the skin of crocodilians are sensitive to touch, heat, cold, and the chemicals in their environment, finds research in BioMed Central's open access journal *EvoDevo*. These sensors have no equivalent in any other vertebrate.

Crocodilians, the group that includes crocodiles, gharials, alligators and caimans, have particularly tough epidermal scales consisting of keratin and bony plates for added protection. On the head, these scales are unusual because they result from cracking of the hardened skin, rather than their shape being genetically determined.

The scales have sensors known as dome pressure receptors (DPR) or Integumentary Sensory organs (ISO) with fingertip sensitivity. Researchers from the University of Geneva investigated ISO in Nile crocodiles (*Crocodylus niloticus*) and the spectacled caiman (*Caiman crocodilus*) to find out exactly what these micro-organs can 'see'.

ISO appear on the head of the developing caiman and crocodile embryos before the skin starts to crack and form scales. Nile crocodiles additionally develop ISO all over their body. In both animals the ISO contain mechano-, thermo, and chemo-sensory receptor-channels giving them the combined ability to detect touch, heat/cold and chemical stimuli, but not salinity. Nile crocodiles have separate salt glands on their tongues which help regulate osmolarity in hyper-saline environments.

This means that they can detect surface pressure waves allowing them to quickly find prey even in the dark. The thermal sensitivity help them to maintain body temperature by moving between basking in the sun and cooling in the water, and the chemical sensors may help them to detect suitable habitats.

Prof Michel Milinkovitch, who led this study explained, "ISO sensors are remarkable because not only are they able to detect many different types of physical and chemical stimuli, but because there is no equivalent in any other vertebrates. It is this transformation of a diffuse sensory system, such as we have in our own skin, into ISO which has allowed crocodilians to evolve a highly armoured yet very sensitive skin."