

**The first virtual cranial endocast of a porolepiform fish and the evolution of the Dipnomorpha**Struan Henderson<sup>1\*</sup>, Tom Challands<sup>1</sup>, Sam Giles<sup>2</sup> & Jan den Blaauwen<sup>3</sup><sup>1</sup>University of Edinburgh, UK; <sup>2</sup>University of Oxford, UK; <sup>3</sup>University of Amsterdam, the Netherlands.**\*Corresponding author:** struanhenderson@gmail.com

The Dipnomorpha include the extinct Porolepiformes, in addition to *Powichthys* and *Youngolepis* and the extant Dipnii (lungfish). As sister group to the Tetrapodomorpha, the Dipnomorpha hold a valuable place in our understanding of early sarcopterygian evolution. With complete cranial endocasts now known from most other stem sarcopterygian groups including actinistians and tetrapodomorphs (which bracket the Dipnomorpha), a thorough understanding of the porolepiform endocranum remains one of the last pieces in the puzzle towards understanding evolution of the neurocranium in stem sarcopterygians.

We present the first virtual cranial endocast of a porolepiform fish (*Glyptolepis paucidens*) demonstrating that it displays predominantly primitive sarcopterygian endocast characters including: lack of a bifurcation of the olfactory nerves, separate pineal and parapineal recesses, circumvention of the nasal capsule by the profundus nerve, and sessile olfactory bulbs. The union of the orbitonasal canal and the nasal capsule is consistent with that seen in *Powichthys*, *Youngolepis* and other porolepiforms, however circumvention of the nasal capsule by the profundus resembles the dipnoan *Dipterus*, contrasting the state observed in other porolepiforms and *Powichthys*.

Inconsistent with the general primitive nature of the endocast seen in *Glyptolepis* is the large, curved hypophyseal recess, a feature shared with *Powichthys* but unlike *Youngolepis*. Furthermore, *Glyptolepis* displays ventral expansion of the telencephalon - a character thought to be derived within the Dipnii.

This new data enhances our understanding of brain and sensory evolution in sarcopterygians. In particular, it shows conservatism in stem Porolepiformes contrary to the disparate morphology of their sister-group the Dipnii.