Burrowing into the inner world of snake evolution

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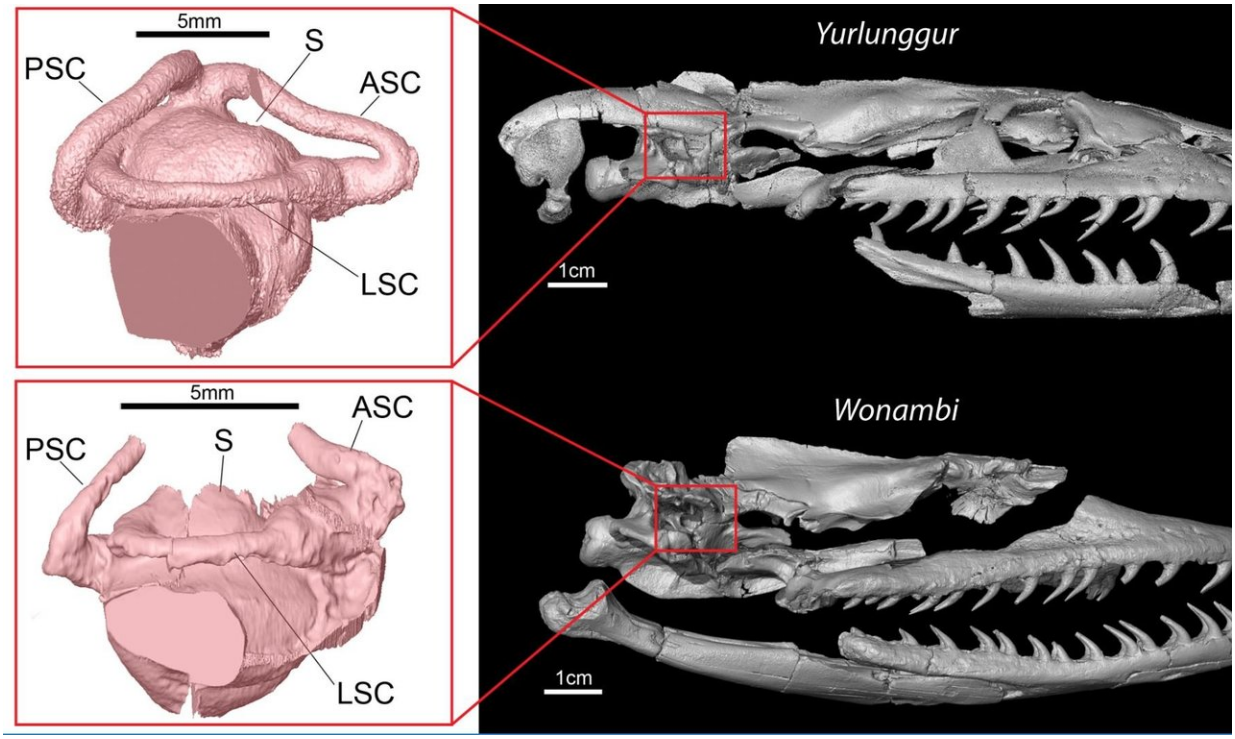

Credit: Flinders University

Looking inside the head of a snake is so much easier when the snake is a fossil.

Flinders University and South Australian Museum postdoctoral researcher Alessandro Palci and other evolutionary palaeontology

experts have used high-resolution computer tomography (CT) to look inside the inner ears of two important Australian fossil snakes – the 23 million-year-old Yurlunggur from northern Australia, and the much younger Wonambi, from southern Australia, which went extinct only about 50,000 years ago.

These snakes are important because they are considered close to the base of the evolutionary tree of snakes, and can thus provide some information on what the earliest snakes looked like and how they lived, says Dr. Palci.

"Ultimately this may also tell us something on how snakes evolved from lizards," he says.

Because the inner ear is responsible for balance and orientation, its shape is correlated with lifestyle, and can therefore be used to infer the life habits of fossil organisms.

"So, we compared the inner ears of Yurlunggur and Wonambi to those of 81 snakes and lizards of known ecological habits," Dr. Palci says.

"We concluded that Yurlunggur was partly adapted to burrow underground, while Wonambi was more of a generalist, likely at ease in more diverse environments."

These interpretations are supported by other features of the skull and skeleton of the two snakes, as well as by palaeoclimate, which implies they had quite different environmental preferences (Wonambi preferred much cooler and drier habitats).

Dr. Palci is specialising in the origin, phylogenetic relationships, and evolutionary history and diversification of major taxonomic groups, with a special focus on living and fossil squamates (a group of reptiles that

includes lizards, amphisbaenians, and snakes).

Squamate reptiles, with over 9,000 known species, represent an ideal study group to investigate evolution.

The research revolves around several projects in collaborations with researchers at the South Australian Museum, Flinders University, the University of Adelaide and University of Alberta.

Digital images (see below) of the fossil snakes Yurlunggur and Wonambi reveal the inner ear mostly consists of a large central portion termed "sacculus" (S), and three tube-like structures, the "semicircular canals" that help the brain keep track of head movements in the three dimensions (ASC, anterior semicircular canal; LSC, lateral semicircular canal; PSC, posterior semicircular canal). Below and behind the sacculus is another structure (not shown), the "lagena" which contains the organ responsible for hearing.

The new paper, "Palaeoecological inferences for the fossil Australian snakes Yurlunggur and Wonambi (Serpentes, Madtsoiidae)," is published online in *Royal Society Open Science*.

More information: Alessandro Palci et al. Palaeoecological inferences for the fossil Australian snakes Yurlunggur and Wonambi (Serpentes, Madtsoiidae), *Royal Society Open Science* (2018). DOI: 10.1098/rsos.172012

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