Standard snake evolution story stymied by spate of fossil discoveries

Philip Bell

Until early 2015, the 'earliest' date reported for a fossil snake was less than 100 Ma old. In January, a team led by University of Alberta (Canada) paleontologist Professor Michael Caldwell described fossils of four new species, in *Nature Communications*, which they claimed extended the snake fossil record backwards by about 70 Ma to the Middle Jurassic.[1]

'Earliest' snake fossils

The new species reported were:

- *Parviraptor estesi* (from Dorset, England)—145–140 Ma
- *Diablophis gilmorei* (from Colorado, USA)—155 Ma
- *Portugalophis lignites* (from Guimarota, Portugal)—157–152 Ma
- *Eophis underwoodi* (from Oxfordshire, England)—167 Ma.

The skull anatomy of all four of these 'ancient' snakes, they say, is similar to that of both modern snakes and other fossil snakes. Of course, this is unexpected. However, the skull structure of previously reported fossil snakes, *Pachyrhachis problematicus* and *Haasiophis terrasanctus*, also surprised evolutionary researchers, resembling that of modern boas and pythons (deemed 'advanced'). Furthermore, the latter two species were preserved with actual fossilized hind limbs (considered a 'primitive' condition).[2] It was anticipated that fossils of earlier snakes would turn out to have more pronounced hind legs as well as front legs. So what of the four species reported by Caldwell's team?

Reuters published artistic renditions of three of the species, picked up by media outlets globally.[3] *Diablophis gilmorei* was pictured with diminutive hind legs *and* forelegs and *Portugalophis lignites* as a colourful tree climber with the suggestion of tiny forefeet.

Unknown to most readers of the popular new reports was that these limbs and feet were sheer artistic licence. No trace of limbs or feet was reported by Caldwell *et al.*, neither was there any trace of pectoral or pelvic girdles! The systematic description of skeletal and dental specimens for *Diablophis gilmorei* included little of the backbone itself—just some precloacal[4] vertebrae and "one possible sacral vertebra".[5] Similarly, *Portugalis lignites* was reconstructed solely from fragmentary jaw remains. In fact, the fossil material of all four species was acknowledged to be so incomplete[6] that "we cannot ascertain the shape, length, form and so on of *any aspect* of the body of the earliest snakes (~167 Myr ago) reported herein [emphasis added]". This did not prevent the researchers speculating that "all four may have had some form of reduced forelimbs and hind limbs".[2]

New insights and a new story?

There have long been two competing ideas for the origins of snakes. Some researchers have held that snakes are descended from monitor lizards which, in turn, descended from mosasaurs (an aquatic origin). The other view (a terrestrial origin), has gained ascendancy, with land lizards being deemed the snake ancestors.[7] Commenting on these oldest fossil snakes, the writer for Reuters exclaimed: "The remarkable fossils ... rewrite the history of snake evolution."[3] Caldwell *et al.* were more cautious but did claim that the new fossils "provide insights on snake evolution".[1]

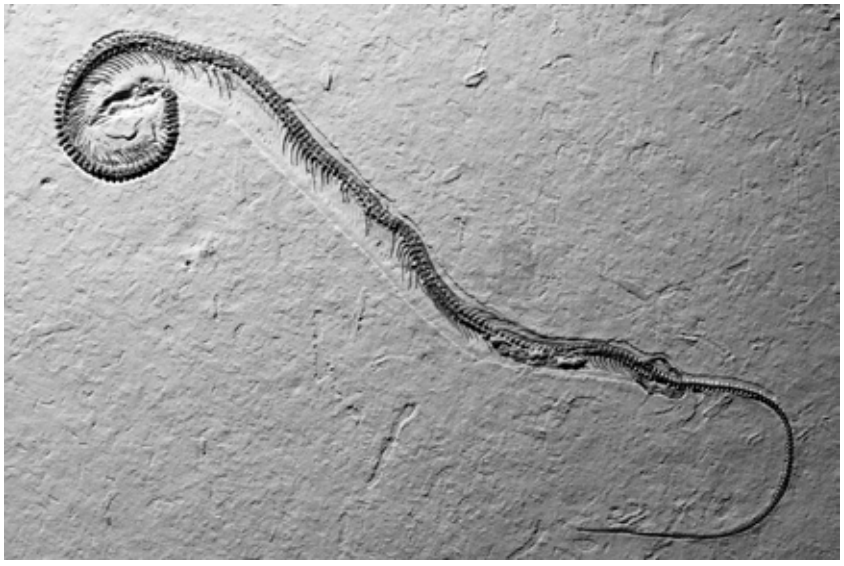

Figure 1. *Tetrapodophis amplectus*—literally 'four footed snake' with an 'embrace'

In fact, the dates assigned to the new fossils posed something of a dilemma, as Caldwell acknowledged: "Importantly, there is now a significant knowledge gap to be bridged by future research, as no fossils [sic] snakes are known from between 140 to 100 Ma ago"[8] (but see later). If mature, biologically diverse snakes (with 'advanced' crania) already existed by 167 Ma ago (the 'age' of the oldest fossil), evolutionary paleontologists now had little option but to argue for an even earlier origin for snakes. One of Caldwell's colleagues, Sebastián Apesteguía (from the National Scientific and Technical Research Council, Argentina), believes snakes must have first appeared about 190 Ma ago.[3]

The evolutionary story was further stymied by the lack of hard evidence for limbs or limb girdles.[9]

Caldwell's team advanced the 'revolutionary' view that the snakes evolved their characteristic skull morphology long *before* losing their legs.[10] They had little choice in taking this step for two reasons: (1) the modern-looking skulls of all four of these 'oldest' snakes; (2) the fact that much 'younger' snakes (such as the 94-Ma-old *Eupodophis*[11]) had small hind limbs. It wouldn't do to argue for an evolutionary reversal having occurred (the loss, then regaining of limbs over millions of years violating Dollo's Law[12]), so although these early snakes *appear* to have been limbless (based on the fossils alone) it is presumed that they possessed legs, front and back. During the 70 Ma of time between *Eophis underwoodi* and the younger hind-limbed snakes, snakes were envisaged to have been diversifying geographically and biologically, principally by virtue of elongation of the body and reduction in size of the legs.

First four-legged snake

In July, a further species of fossil snake was reported in *Science*:[13]

- *Tetrapodophis amplectus* (from Brazil)—113 Ma.

A complete skeleton of the animal is preserved (figure 1), in contrast to the much more fragmentary fossil remains of the four 'older' species. The creature possessed 160 spinal and 112 tail vertebrae and beautifully preserved hind limbs and forelimbs. Ironically, this exquisite fossil has created a quandary for researchers in this field—confusion rather than clarity. Some are even cautious about whether *Teptrapodophis* is actually a true snake, with Michael Caldwell (author of the earlier 2015 paper[1]) even suggesting it may belong to an extinct amphibian group.[14] Nevertheless, the media proclaimed it a four-legged snake. Evolutionary developmental biologist Prof. Martin Cohn claimed: "this could be one of the most important fossils ever found. The combination of snake-like body with complete forelimbs and hindlimbs is like a snake version of *Archaeopteryx*."[15]

Even accepting it as a true snake, *Tetrapodophis* is somewhat problematic for the conventional evolutionary view. Yes, it partially narrows the approx. 40 Ma 'time gap' mentioned earlier. However, *Tetrapodophis* is certainly not morphologically transitional between those 'earliest' (limbless) snakes and the later snake fossils with hind limbs; namely *Pachyrhachis problematicus*, *Haasiophis terrasanctus* and *Eupodophis descouensi*—notwithstanding that evolutionists will have to claim that the 'earliest' fossil snakes also had four limbs—and larger ones at that. Speaking of the limbs of *Tetrapodophis*, one of the authors of the *Science* paper, Dr Nick Longrich (University of Bath, UK), says they were "far from being 'vestigial' evolutionary leftovers, dangling uselessly".[16] Instead, it is believed that *Tetrapodophis* used its long, clawed fingers and toes for grasping onto its prey, conveyed by the species name *amplectus*, meaning 'embrace'. This was portrayed in artistic reconstructions of the creature. Even the preserved remains of its last meal were fossilized, some sort of small vertebrate.

The five 'ancient' snake species reassessed

However the debate on this fascinating little creature pans out, the fact remains that, from an evolutionary perspective, the fossils fail to furnish the evidence for their story. The

'earliest' snake fossils appear mature, 'advanced', and limbless. 54 Ma after their first appearance in *Eophis underwoodi*, *Tetrapodophis amplectus* turns up with four fully functional legs and feet! It is now imperative that evolutionary paleontologists find much 'older' fossil snakes (about 190 Ma) showing *much more* developed hind legs and forelegs (and associated pelvic and pectoral girdles respectively) than observed in *Tetrapodophis amplectus*. In addition, such creatures should show much less body elongation than in 'later' snakes.

Creation affirmed

Evolutionary paleontologists will continue to seek fossils which definitively answer the conundrum of snake origins. The snake fossil record *still* says no to evolution! From a creationist perspective, the four oldest fossils are likely the remains of the types of snakes we would readily recognize in today's world. *Tetrapodophis* is part of the rich antediluvian diversity that is now lost to us; assuming some of its kind passed (via the Ark) into the post-Flood world, they appear to have long since gone extinct. Its limbs exhibit clear evidence of purposeful design. Even if they were diminished in size from an ancestral condition, this would be *de*volution. The *loss* of legs (gradually or quickly) in snakes or lizards no more poses a challenge to biblical biology than does the loss of functional wings in flightless insects[17] or birds.[18]

References

1. Caldwell, M. W. *et al*., The oldest known snakes from the Middle Jurassic-Lower Cretaceous provide insights on snake evolution, *Nature Communications* **6**, (5996), 27 January 2015; doi:10.1038/ncomms6996.
2. Whitehouse, D., Discovery challenges snake origins, news.bbc.co.uk, 17 March 2000; accessed 30 June 2015.
3. Dunham, W., Remarkable fossils push back snake origins by 65 million years, uk.reuters.com, 27 January 2015; accessed 5 February 2015.
4. The cloaca is the shared opening for the expulsion of faecal matter and urine, also used during copulation. Precloacal vertebrae are those back bones which are close to, but in front of, the cloaca.
5. See ref. 1. The sacral part of the backbone is the region where a pelvic girdle would be supported if there was one.
6. The photographs and illustrations appearing in the paper's illustrations are restricted to details of skull and jaw elements (plus teeth) and comparisons of vertebral bones. One can be sure that any pelvic or limb elements would have taken pride of place, had they been found.
7. Bell, P., Of snakes, lizards and mosasaurs—evolutionists puzzle over snake origins, *Creation* **31**(3):15–17, 2009; creation.com/snakes.
8. University of Alberta, The world's oldest known snake fossils: rolling back the clock by nearly 70 million years, www.sciencedaily.com, January, 2015; accessed 5 February 2015.
9. The best they could offer was "one potential sacral vertebra in *Parviraptor estesi*" (in contrast to most other snakes) and "another in the vertebral specimens referred to *Diablophis gilmorei* ...". That these were robust led them to speculate about "the possible presence of robust pelvic girdles and hind limbs".
10. This is the opposite of the conclusion of a recent paper on the fossil snake Coniophis precedens; Longrich, N.R., Bhullar, B.–A.S. and Gauthier, J.A., A transitional snake from the Late Cretaceous period of North America, *Nature* **488**:205-208, 2012.
11. Sarfati, J., Another leggy snake? What should creationists think? 29 April 2008; creation.com/another-leggy-snake.
12. Dollo's Law is named after Belgian biologist Louis Dollo. Another example of a violation of this 'law' relates to the alleged evolutionary loss, reappearance and loss (again) of the wings of stick insects; Bell, P., Evolution revolution, *Creation* **25**(3):31, 2003; creation.com/evo-revo.
13. Marthill, D.M., Tischlinger, H. and Longrich, N.R., A four-legged snake from the Early Cretaceous of Gondwana, *Science* **349**(6243):416–419, 24 July 2015.
14. Perkins, S., Four-legged snake fossil stuns scientists—and ignites controversy, news.sciencemag.org, 23 July 2015.
15. Christakou, A., Four-legged fossil snake is a world first, www.nature.com/news, 23 July 2015.
16. Webb, J., Four-legged snake ancestor 'dug burrows', bbc.co.uk/news, 24 July 2015.
17. Catchpoole, D. and Wieland, C., Researchers: Evolution of insect flight? 19 June 2012; creation.com/insect-flightlessness.
18. Cosner, L. and Sarfati, J., The birds of the Galápagos, *Creation* **31**(3):28–31, 2009; creation.com/galapagos-birds.