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Classification and evolution of the monotremes

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Summary

The higher taxon Monotremata includes the extant platypuses and echidnas as well as their extinct relatives. Living monotremes are highly specialised animals occupying distinct ecological niches, and are known only from Australia and New Guinea. Platypuses are semi-aquatic insectivores/carnivores, and echidnas are spine-covered, terrestrial insectivores. There has been extensive interest in and debate over monotreme origins since their discovery by western science in the late 1800s. Monotremes lay soft-shelled eggs from which the embryonic young hatch, in contrast to marsupial and placental mammals that bear live young. The many 'primitive' (plesiomorphic) features of monotremes occur in concert with unique specialisations, a phenomenon known as 'mosaic evolution'. Monotreme taxonomy and classification have been confounded in part by this mosaic of features, and in part from a dearth of adequate comparative material. However, new discoveries of early mammals and near-mammals and development of cladistic methodologies for determining relationships have shed much-needed light on monotreme origins. Australosphenidans – recently discovered Mesozoic mammals from the Southern Hemisphere with tribosphenic-like teeth – may share a unique relationship with monotremes, and higher level classification schemes have followed based on this presumption, although the debate is far from resolved. Research into unique monotreme attributes – in particular, an electrosensory ability unknown in other mammals – will help science understand the success and longevity of this oldest of mammalian groups.