

Advanced stereopsis and predatory adaptation in a Cretaceous mantis

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Visual systems have been crucial for animals to detect light signals. Binocular stereopsis has affected prey-predator relationships throughout animal evolution by providing depth perception, among others. However, it has been difficult to reconstruct extinct binocular functions due to a lack of suitable fossil material. Here, we show, based on morphological analysis of well-preserved eyes, that an extinct mantis (*Ambermantis wozniaki* Grimaldi, 2003) in the Cretaceous New Jersey amber developed an advanced visual system as a predator. We found that *A. wozniaki* possesses large compound eyes with numerous, ca. 12 000 ommatidia. The interocular distance is narrower than the eyes, and the estimated binocular visual field is broader than in the typical extant basal and derived taxa. The large number of ommatidia indicates that the compound eyes of *A. wozniaki* achieved high spatial resolution to capture objects visually. The broad binocular field supports that *A. wozniaki* increased the stereoscopic area and developed an advanced prey-recognition system. These findings suggest that the Cretaceous basal mantises were highly adaptive visual predators, implying the ecological domination of mantises as visual specialists for 90 million years.

Key words: Insecta, Mantodea, palaeobiology, predatory behaviour, visual system, binocular vision, New Jersey amber.

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