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Azhdarchid pterosaurs: water-trawling pelican mimics or "terrestrial stalkers"?

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The lifestyles of all pterosaurs are contentious, but those of the pterodactyloid clade Azhdarchidae are particularly debated. A 2008 review of the functional morphology of azhdarchid pterosaurs concluded that they were probably terrestrial foragers, as evidenced by their long limbs, generalised skull construction, the arthrological limitations of their cervical series, trackway data indicating terrestrial proficiency, a strong continental skew in the depositional context of their fossils, and several additional lines of corroborating evidence. This hypothesis was recently challenged on three counts: (i) azhdarchid fossils routinely occur in aquatic deposits; (ii) terrestrially-foraging pterosaurs were highly vulnerable to predation and (iii), aerial “water trawling”, where the mandible is pulled though water to catch food in a distended throat pouch, is a more likely foraging strategy. Pelican-like jaw mechanics were suggested for azhdarchids because of the asymmetrical jaw joints in these pterosaurs, which permit lateral deflection of the mandibular rami during jaw extension. We evaluate these three claims and conclude that all are flawed. The frequent occurrence of azhdarchid fossils in aquatic sedimentary systems is not significant with regard to ecology or behaviour, since these provide the overwhelming mechanism for the preservation of all fossil terrestrial animals. Likely pterosaur takeoff abilities and the ubiquitous nature of modern, terrestrially-foraging birds indicate that predation risks on ground-foraging pterosaurs are probably overstated. The kinematics of pterosaur jaws are entirely different to those of pelicans, which are highly specialised compared to those of all other tetrapods, and there are no indications from azhdarchid jaw anatomy that azhdarchids indulged in pelican- like foraging behaviour. The estimated amount of jaw expansion present in azhdarchids was minimal compared to that of pelicans, even when the asymmetrical jaw joints of azhdarchids are taken into account. Moreover, the widespread occurrence of asymmetrical jaw joints in other reptiles demonstrates that they are not related to any specific feeding habits. We conclude that terrestrial foraging remains the most parsimonious habit for azhdarchid pterosaurs.

Key words: Azhdarchidae, pterosaur, pelican, foraging methods, palaeoecology.

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