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The palaeoneurology of a new specimen of the Middle Triassic dicynodont synapsid Kombuisia frerensis

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The pineal eye is a photoreceptive organ, sometimes called the “third eye”, housed within the parietal foramen of some ectothermic vertebrates (Eakin 1973; Quay 1979). It is amongst the most enigmatic organs, and accordingly, concerns relating to its origin and evolution have long fascinated palaeontologists (Eakin 1973; Roth and Roth 1980; Benoit et al. 2016). In dicynodont synapsids, a parietal foramen is almost always present, with a few noticeable exceptions that have, so far, eluded explanations (Benoit et al. 2016; Kammerer 2019). *Kombuisia frerensis* is one such exception. There are two recognised species of *Kombuisia: K. frerensis*, from South Africa, and *K. antarctica*, from Antarctica. The two species are virtually undistinguishable except for the absence of a parietal foramen in the former, whereas the latter retains a slit-like opening on the skull roof (Fröbisch et al. 2010). While describing *K. frerensis*, Hotton (1974) refrained from including the absence of a parietal foramen in the diagnosis of the species as very little was known about the intraspecific variability of this character. Intraspecific variation of the parietal foramen has since been documented in modern reptiles (e.g., Gundy and Wurst 1976; Roth and Roth 1980) and other synapsids (Benoit et al. 2016). As a result, the absence of a parietal foramen in *K. frerensis* has been treated with caution by subsequent authors (e.g., Kammerer 2019). In 2023, our research team found a new specimen referrable to *K. frerensis*: an almost undeformed skull with articulated lower jaw and associated postcrania (Fig. 1A). This new specimen confirms that the absence of a parietal foramen is diagnostic for *K. frerensis*. We here explore the physiological implications of this condition and propose that it may be the result of latitudinal gradient separating the two species of *Kombuisia*.

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