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A unique late Eocene coleoid cephalopod *Mississaepia* from Mississippi, USA: New data on cuttlebone structure, and their phylogenetic implications

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A new family, Mississaepiidae, from the *Sepia–Spirula* branch of decabrachian coleoids (Cephalopoda), is erected on the basis of the following, recently revealed, morphological, ultrastructural and chemical traits of the cuttlebone in the late Eocene *Mississaepia*, formerly referred to Belosaepiidae: (i) septa are semi−transparent, largely chitinous (as opposed to all other recorded cephalopods having non−transparent aragonitic septa); (ii) septa have a thin lamello−fibrillar nacreous covering (*Sepia* lacks nacre altogether, *Spirula* has fully lamello−fibrillar nacreous septa, ectochochleate cephalopods have columnar nacre in septa); (iii) a siphonal tube is present in early ontogeny (similar to siphonal tube development of the Danian *Ceratisepia*, and as opposed to complete lack of siphonal tube in *Sepia* and siphonal tube development through its entire ontogeny in *Spirula*); (iv) the lamello−fibrillar nacreous ultrastructure of septal necks (similar to septal necks in *Spirula*); (v) a sub−hemispherical protoconch (as opposed to the spherical protoconchs of the Danian *Ceratisepia* and Recent *Spirula*); (vi) conotheca has ventro−lateral extension in early ontogenetic stages (as opposed to *Sepia* that has no ventro−lateral extention of the conotheca and to *Spirula* that retains fully−developed phragmocone throughout its entire ontogeny). Chitinous composition of septa in *Mississaepia* is deduced from (i) their visual similarity to the chitinous semi−transparent flange of *Sepia*, (ii) angular and rounded outlines and straight compressive failures of the partial septa and mural parts of septa similar to mechanically−damaged dry rigid chitinous flange of *Sepia* or a gladius of squid, and (iii) organics consistent with −chitin preserved in the shell. The family Mississaepiidae may represent a unknown lineage of the *Sepia–Spirula* branch of coleoids, a conotheca lacking a nacreous layer being a common trait of the shell of this branch. However, Mississaepiidae is placed with reservation in Sepiida because of similarities between their gross shell morphology (a cuttlebone type of shell) and inorganic−organic composition. In *Mississaepia*, as in *Sepia*, the shell contains up to 6% of nitrogen by weight; phosphatised sheets within the dorsal shield may have been originally organic, like similar structures in *Sepia*; accumulations of pyrite in peripheral zones of aragonitic spherulites and in−between the spherulites of the dorsal shield may also indicate additional locations of organics in the shell of living animal.

Key words: Cephalopoda, Coleoidea, cuttlebone, lamello-fibrillar nacre, chitin septa, fossilization, Eocene, Mississippi, USA.

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