

Implication of peculiar internal fracturing in fossil nautiloids

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Extinct Miocene nautiloid *Aturia cubaensis* from Uchiura Group (Fukui Prefecture) shows internal septa fragmentation though the outer wall is intact. Similar broken nautiloids fossils with intact outer walls and fragmented septa have been reported since 1980s and were interpreted as 'implosion', the fragmentation by increasing ambient water pressure during a dead shell sinks. In these *A. cubaensis*, however, siphuncles are filled with mud and mangled. This indicates this fragmentation occurred after a burial of the empty shell.

Septal fragmentation occurs at adapically half from a last septum. Intact air chambers are filled with grayish white mudstone though a fossil matrix is dark gray mudstone. Former is composed of matrix-supported and high porosity (about 25 - 35 %) and latter is grain-supported and low porosity (below 20 %). On the other hand, porosity of mudstone infilling of the siphuncle has usually high (more than 40 %). Especially it is highest at the collapse boundary between intact air chambers and fragmented septa (up to 70 %). In addition, clay minerals concentrates in the siphuncle near the collapse boundary. These lines suggest that the siphuncle-infilling soaks up the water in air chambers in diagenesis. This depressurizes insides of air chambers and thus makes considerable pressure difference between inside and outside of a buried nautilus shell, and finally septa collapse.

This internal fragmentation has not been found from ammonoids. Deformation of ammonoids occurs in outer walls mainly and can be explained by simple compactional process except for dissolution. This suggests difference of strength of structure between shells of nautiloids and ammonoids. Detailed taphonomic analysis could be a clue to structural mechanics of cephalopods shells.

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