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Deformable micro torque swimmer TAKUJI ISHIKAWA, TOMOYUKI TANAKA, TOSHIHIRO OMORI, YOHSUKE IMAI, Tohoku University — We investigated the deformation of a ciliate swimming freely in a fluid otherwise at rest. The cell body was modeled as a capsule with a hyper elastic membrane enclosing Newtonian fluid. Thrust forces due to the ciliary beat were modeled as torques distributed above the cell body. Effects of the membrane elasticity, the aspect ratio of cell's reference shape and the density difference between the cell and the surrounding fluid were investigated. The results showed that the cell deformed like heart shape when Capillary number (Ca) was sufficiently large, and the swimming velocity decreased as Ca was increased. The gravity effect on the membrane tension suggested that the upwards and downwards swimming velocities of *Paramecium* might be reglated by the calcium ion channels distributed locally around the anterior end. Moreover, the gravity induced deformation made a cell directed vertically downwards, which resulted in a positive geotaxis like behavior with physical origin. These results are important to understand physiology of ciliate's biological responses to mechanical stimuli.

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