Increase of the Wave-Tidal Power Generator Efficiency by Copying Litopenaeus vannameis' Swimming

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Currently, it's common to use fixing cables to prevent wave power generators being swept away. These fixing cables are not only ten times more expensive than wave power generators themselves, but also they have limitations regarding locations for installation. This study aims to solve these problems and to enhance efficiency of a power generator that imitates in-place swimming of litopenaeus vannamei(Hereinafter L.V.), using wave and tidal power. The study takes three phases: mathematization of physical patterns of the L.V.'s in-place swimming, simulation of new wave-tidal power generator model based on biomimetics of the L.V.s, and efficiency comparison with existing power generators. After centers of gravity on each segment of the L.V. were measured, changes of centers of gravity captured while they were swimming in different current speed. New formula of curvature variation of center of gravity according to flow rate was derived and a generator model based on the formula suggested following after that. This new generator model can be kept in its place changing curvature of its body in flowing water and has higher efficiency in power generation by combining wave and tidal power generator. It showed better efficiency in comparison with existing power generators, especially in current speed of more than 3m/s. The new generator model can prevent huge energy loses by eliminating fixed cable costs and the location of them is not restricted. This model is meaningful because it can contribute in conservation of marine ecosystem and in that it applies the biomimetics to the power generation.

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