Abstract Submitted
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The Impact of Blade Roughness and Biofouling on the Performance of a Horizontal Axis Marine Current Turbine[1] KAREN FLACK, United States Naval Academy, JESSICA WALKER, Australian Maritime College, MICHAEL SCHULTZ, ETHAN LUST, United States Naval Academy — The impact of blade roughness and biofouling on the performance of a two-bladed horizontal axis marine current turbine was investigated experimentally and numerically. A 0.8 m diameter rotor (1/25th scale) with a NACA 63-618 cross section was tested in a towing tank. The torque, thrust and rotational speed were measured in the range $5 < \lambda < 11$ (λ = tip speed ratio). Three different cases were tested: clean blades, artificially fouled blades and roughened blades. The performance of the turbine was predicted using Blade Element Momentum theory and validated using the experimental results. The lift and drag curves necessary for the numerical model were obtained by testing a 2D NACA 63-618 airfoil in a wind tunnel under clean and roughened conditions. The numerical model predicts the trends that were observed in the experimental data for roughened blades. The artificially fouled blades did not adversely affect turbine performance, as the vast majority of the fouling sheared off. For the case of roughened blades, the power coefficient (C_P) versus λ curve was significantly offset below that for the clean case. The maximum C_P for this condition was 0.34, compared to 0.42 for the clean condition.

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Karen Flack
United States Naval Academy

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