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The impact of algal biofilms on skin-friction in a turbulent channel flow[1] MICHAEL SCHULTZ, KAREN FLACK, CECILY STEPPE, U.S. Naval Academy, JESSICA WALKER, University of Tasmania — Experiments were carried out in a fully-developed, turbulent channel flow facility over a wide Reynolds number range. The wall shear stress was determined using the bulk flow rate and the streamwise pressure gradient in the downstream section of the channel. A biofilm dominated by three species of diatoms developed on acrylic test surfaces exposed for four days in a brackish tidal environment at the United States Naval Academy. The resulting biofilm had an average thickness of 200 μm. This biofilm had a significant effect on the flow showing a doubling of the skin-friction compared to the hydraulically-smooth condition at the highest Reynolds number. Scale up of the present results to ship scale indicates that this biofilm would generate an 18% powering penalty for a mid-sized naval ship at cruising speed.

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