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Nonstandard Gaits in Unsteady Hydrodynamics[1] MICHAEL FAIRCHILD, CLARENCE ROWLEY, Princeton University — Marine biology has long inspired the design and engineering of underwater vehicles. The literature examining the kinematics and dynamics of fishes, ranging from undulatory anguilliform swimmers to oscillatory ostraciiform ones, is vast. Past numerical studies of these organisms have principally focused on gaits characterized by sinusoidal pitching and heaving motions. It is conceivable that more sophisticated gaits could perform better in some respects, for example as measured by thrust generation or by cost of transport. This work uses an unsteady boundary-element method to numerically investigate the hydrodynamics and propulsive efficiency of high-Reynolds-number swimmers whose gaits are encoded by Fourier series or by Jacobi elliptic functions. Numerical results are presented with an emphasis on identifying particular wake structures and modes of motion that are associated with optimal swimming.

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