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Fish Manoeuvres and Morphology KIRAN SINGH, TIMOTHY PEDLEY, DAMTP, Cambridge — The extraordinary manoeuvrability observed in many fish is attributed to their inherent flexibility, which might be enhanced by the use of appendages like fins. The aim of this work is to understand the role of morphological adaptations, such as body shape and deployment of median fins, on manoeuvrability and internal body dynamics. The 3d vortex lattice numerical method was employed to analyse the hydrodynamics for arbitrary body planforms of infinitesimal thickness. The internal structure of the body due to the combined skeletal system and soft tissue, is represented as an active Euler-Bernoulli beam, in which the time-dependent bending moment distribution is calculated from body inertia and the hydrodynamic pressure difference across the body. C-turns are the manoeuvre of choice for this work and the response for three different species of fish are examined. Angelfish(*Pterophyllum eimekei*), pike (*Esox sp*) and tuna (*Thunnus albacares*) were chosen for their differences in body profile, median fin use and manoeuvrability. Net direction change and bending moment response to prescribed backbone flexure are calculated and used to interpret the influence of body profile on manoeuvrability and muscle work done. Internal stresses may be computed from anatomical data on muscle fibre distribution and recruitment. To the future, it is intended to extend this work to other typical manoeuvres, such as fast starts for which muscle activation patterns have been measured quite widely.

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