HOW FISHES SWIM

Fish Locomotion. R. W. Blake. Cambridge University Press, New York, 1983. 208 pp., illus. $49.50.

No aspect of fish biology has advanced more rapidly over the last decade than the study of locomotion. Fluid dynamicists and fish biologists have combined their talents to produce a coherent body of theory and experiments that has provided new insights into the mechanisms by which propulsive forces are generated and into the functional significance of different body forms. One consequence of this rapid progress has been the lack of a current summary of the field. Paul Webb's excellent monograph published in 1975 on the hydrodynamics and energetics of fish propulsion has not been superseded by the larger number of review articles and symposium volumes, and it remains the best single source for information in this area.

It is gratifying, then, to have this new overview of fish locomotion by R. W. Blake. Blake provides a good introduction to the recent literature on locomotion and covers many areas that have been the subject of particularly rapid recent research. The book opens with a useful introduction to fluid dynamics and then proceeds to address the energetics of locomotion, drag reduction mechanisms, undulatory and median and paired fin propulsion, stability, and swimming strategy. Blake's treatment of these topics tends to be somewhat mathematical, as he introduces several current hydrodynamical theories and their application to fishes: oscillating airfoils, actuator discs, ground effects, and the important distinction between reactive and resistive theories of propulsion. However, even the nonmathematical reader will be able to follow most of the discussion. These quantitative theories have played such an important role in recent research that this book could hardly have been written without a significant mathematical emphasis. I would have liked a summary chapter to provide a conceptual overview of the field and a sense of where current theory is most inadequate, but otherwise I found the organization of the book clear and concise.

The major areas that Blake has not covered are just those in which there are few convincing data. Two topics of particular importance stand out: (1) evolutionary patterns in the locomotor system of fishes, and (2) the relationship between locomotor demands and internal structural design. Most analyses to date have focused on patterns of movement in relation to hydrodynamical theory. I hope that the next ten years will bring significant advances in our understanding of structural and evolutionary patterns of fish locomotion.

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