

***Applied***  
***Environmental***  
***Physiology of Fishes***  
***Symposium Proceedings***



**Christina Swanson**  
**Paciencia Young**  
**Don MacKinlay**

*International Congress on the Biology of Fishes*  
San Francisco State University July 14-18, 1996.

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**Christina Swanson  
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*Physiology Section*



**American Fisheries**

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## **PREFACE**

In our interactions with resource managers, aquaculturists and environmentalists, we frequently have to explain and justify the value of physiological research, particularly laboratory studies, for providing information which can have direct, useful applications for their respective fields. The idea for this symposium was born from these sometimes frustrating experiences, nurtured by our conviction that this approach is productive, and has blossomed in this collection of papers.

This symposium brings together fish physiologists who conduct research that provides information applicable to improved aquatic resource management and aquaculture. It continues the overall theme of the first International Fish Physiology Symposium (High Performance Fish, 1994), but with a sharper focus on the direct and indirect applications of physiological research. We have arranged the papers to reflect a frequently used research progression: first, studies that seek to define the environmental envelope in which fish can function; second, studies that examine the physiological responses of fish to sublethal changes or levels of various environmental factors; and finally, papers that directly apply various aspects of environmental physiology to the management and culture of fishes.

Many people contributed to the development of this symposium. We thank our fearless leader, Joseph J. Cech, Jr., and all the members of the physiology lab at UC Davis for their many contributions to this symposium. And finally, our thanks to all of the participants.

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Don MacKinlay

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## **Environmental Tolerances**

**Physiological Responses:  
Sublethal Environmental Conditions**

**Physiological Responses:**

**Stress**

## **Management and Culture Examples**