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PART II

(The lab data archive report)

#169

A NATIONAL COMPENDIUM OF FRESHWATER FISH
AND WATER TEMPERATURE DATA

Volume II

Temperature Requirement Data
for Thirty Fishes

by

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PREFACE

Compilation of the temperature requirements of freshwater fishes began as part of our field validation research activity. My literature search covered the basic data used in development of temperature criteria for freshwater aquatic life (NAS/NAE 1973; U.S. EPA 1976; Brungs and Jones 1977) up through 1978. In the first 30 tables, I summarize the lethal temperatures, lower and upper zero net growth and optimum temperature values, final preferendum and avoidance temperatures, lower and upper embryo tolerance limits, lowest and highest spawning temperatures and earliest and latest spawning times for thirty fish species. Pertinent test conditions are listed for each experiment. Responses are described by footnotes to Tables 1-30. References are cited for each stated value. Variation in the measured thermal response values is given for each species that has 2 or more measurements. Variation of 2-5°C or more is common among species and thermal responses. Tables 32-42 summarize the basic response data among thirty species for use in subsequent synthesis reports.

I summarize the sources of variation in the measurement of temperature requirements of freshwater fishes in an unpublished book manuscript (Hokanson 1990). Thermal responses used in this review are described more fully in this manuscript. This book drafts the best available thermal criteria for various activities including survival, growth, and reproduction of thirty freshwater fishes adapted to the temperate climate. Standard test conditions are defined for producing the best available thermal requirement data; limitations of test results are described by footnotes for each value for thirty fish species. The best available thermal requirement data are simply the highest reported value in tests meeting stated minimum specifications. This book addresses the measurement problems in bioassay. Uncontrolled experimental errors unbeknown to the investigator, poor culture techniques for seldom reared species, and lack of validated test protocols were factors contributing to variation in test results. Confounding experimental errors that interact with the main treatment (i.e., temperature) are the cause of lower performance levels in

many laboratory experiments. Factors influencing growth and survival of white suckers in laboratory tests were investigated for a single species by Koenst and Smith (1982); field validation activities can be used to sort out experimental errors in temperature tests on fishes (Hokanson and Koenst 1986).

Data collection began in 1978 as part of our Agency's program for field validation of thermal criteria based on laboratory data. Our efforts were diminished in the 1980's as thermal pollution problems were largely resolved, and has lately been revived in relation to our assessment of potential global climate warming effects. We are evaluating field and laboratory derived fish thermal requirements for global climate warming impact assessments (Hokanson et al. 1990, 1991). This report provides an independent laboratory database for global climate warming impact assessments as well as basic data for thermal criteria development and 316a demonstrations. This document provides an archival record of this database for these synthesis efforts.

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