



B4. BIOLOGICAL INDICATORS OF AQUATIC ECOSYSTEM STRESS-APPLIED BIOLOGICAL METHODOLOGIES FOR RISK ASSESSMENT IN FARMED AND WILD MARINE ORGANISMS

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Course outline-lectures

- 1. Biological Indicators of aquatic Ecosystem Stress: introduction and Overview**
 - a) Introduction
 - b) Biocriteria, Biomarkers and Bioindicators
- 2. Biomarkers and Bioindicators in Monitoring and Assessment: The State of Art**
 - a) Introduction
 - b) Criteria for Useful Biomarkers and Bioindicators
 - c) Research Needs and Recommendations
- 3. Biochemical Responses as Indicators of Aquatic Ecosystem Health**
 - a) Introduction
 - b) Biochemical Markers of Exposure
 - c) Oxidative Stress
 - d) Case Studies
- 4. Molecular Biomarkers in aquatic organisms: DNA Damage and RNA Expression**
 - a) Introduction
 - b) DNA Damage
 - c) Nonspecific DNA Damage
 - d) Locus-Specific Damage
 - e) Microarray Analysis
 - f) Flow Cytometry
 - g) Gene expression Assays
- 5. Physiological Marine Proteomics and Metabolomics**
 - a) Introduction
 - b) Definitions of Proteomics and Metabolomics and its role in the Assessment of Environmental Stress
 - c) Functional Proteomics and Ecosystem Stress
 - d) Methods Studying the Changes in the Proteomic Profile
 - e) Interpretations of Data
- 6. Physiological and Condition-Related Indicators of Environmental Stress in Farmed Fish and Molluscs**
 - a) Introduction
 - b) Physiological Stress Indicators
 - c) Conditions-Based Stress Indicators
 - d) Measuring and Interpreting Stress responses





7. Genetic Responses as Population-Level Biomarkers of Stress in Aquatic Ecosystems

- a) Introduction
- b) Factors Influencing Genetic Diversity in Populations
- c) Approaches to Quantify Genetic Diversity
- d) Conclusion and Future Directions

8. Reproductive Indicators of Environmental Stress In Fish

- a) Introduction
- b) Reproduction in Fish
- c) Reproductive Indicators of Environmental Stress
- d) Considerations in the Use of Reproductive indicators
- e) Summary and Future Research

Readings:

1. Biomonitoring of Coastal Waters and Estuaries. (ed) Kees J. M. Kramer, CRC, Boca Raton, 1994.
2. Biological Indicators of Aquatic Ecosystem Stress. (ed) S. Marshall Adams, American Fisheries Society Bethesda, Maryland, 2002.