



Influences of Environmental Factors, Point Source Pollution, and Pathogen Distribution on Fish Health Issues In Chesapeake Bay—Mycobacterial Lesions in Striped Bass

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Statement of Problem: A number of fish health issues in the Chesapeake Bay and its tributaries have attracted the attention of the public, resource managers and scientists in recent years. These include 1) the ulcerative skin lesions of juvenile menhaden that have been linked to *Pfiesteria* by some investigators; 2) raised, and sometimes ulcerated lesions in young-of-the-year (YOY) menhaden in spring and early summer and 3) skin lesions in striped bass, a popular commercial and sports fishery in the Bay. To address these issues, the NFHRL began a number of studies to determine the cause(s) of the various menhaden lesions and the striped bass lesions and evaluate if and how they may relate to environmental stressors. This study specifically addresses the striped bass lesions, the etiology of the underlying disease, and its potential impacts to the recreational and commercial fisheries in Chesapeake Bay.

Objectives:

- 1) Verify, characterize, and obtain additional mycobacterial isolates from striped bass in Chesapeake Bay.
- 2) Determine infectivity of mycobacterial isolates for striped bass and other selected major species from Chesapeake Bay.

- 3) Evaluate in the laboratory and the wild, predetermined environmental factors that may enhance fish susceptibility.
- 4) Determine mechanisms of pathogenesis that play a role in manifestation of lesions in the striped bass.

Approach: Striped Bass were sampled from commercial pound nets located in the York, Rappahannock, Potomac, and Nanticoke Rivers during November 2003 using standardized methods. Significant differences in gross and histopathology, conditions factor, mycobacterial infection incidence and mycobacterial infection intensity were observed between sample sites.

A yearlong laboratory study evaluating the impact of temperature on mycobacterial growth, and associated pathology in striped bass was completed in FY 2003. The results of the study indicate that water temperature has a major impact on the observed pathology and associated mortality in the striped bass injected with the mycobacteria and that there is significant variation that is dependent on the species of mycobacteria injected.

Sample processing and analysis will continue into the summer of 2004. This work replicates and continues a pilot assessment and methods evaluation study initiated in 2002 and includes some method improvements. The results obtained from the 2002 and 2003 samples will also be used to plan an expanded assessment of mycobacteriosis in Chesapeake Bay striped bass currently planned for FY 2005.

The data from the laboratory study evaluating the impact of temperature on mycobacteria species-specific pathogenesis in striped bass completed in FY 2003 will also be submitted for publication by the end of FY 2004. The results from this study combined with those from other completed field and laboratory projects will be used to plan additional laboratory studies scheduled to begin in FY 2005.

Additional studies on mycobacteriosis in striped bass will be initiated in FY2004 in other east coast bay systems. We will initiate a study with USFWS-Region 5, the Delaware River Fish and Wildlife Management Cooperative, and the State of Delaware and State of New Jersey to investigate the incidence of mycobacteriosis in Delaware Bay stripers. The results of this work will provide direct comparisons to those from Chesapeake Bay and may provide insight to the etiology of the disease.

Selected Reports and Other Products:

Other, Delivered: Ottinger, C.A., 2002, Mycobacteriosis in Striped Bass. Fact Sheet FHB 2002-01: U.S. Geological Survey, Leetown Science Center, USGS, Fact Sheets. The Fact Sheet is located at <http://www.lsc.usgs.gov/FactSheets/Mycobacteria2002.pdf>.

Presentations, Delivered: Densmore, C.L., Mycobacteriosis in striped bass—comparative analysis in four Chesapeake Bay tributaries: 28th Annual Eastern Fish Health Workshop, April 21-25 2003, Gettysburg, PA.

Presentations, Delivered: Ottinger, C.A., C. Densmore, V. Blazer, F. Panek, W. Vogelbein, M. Rhodes, D. Gauthier, H. Kator, M. Mangold, G. Swihart, C. Driscoll, M. Matsche, L.

- Pieper, and A. Baya, Mycobacteriosis in striped bass from Chesapeake Bay tributaries: 34th Annual Conference of the International Association for Aquatic Animal Medicine, May 9-14 2003, Waikoloa, HI.
- Presentations, Delivered: Kaattari, I.M., M.W. Rhodes, H. Kator, S. Kotob, W. Vogelbein, S.L. Kaattari, Ottinger, C.A., & E. Shotts, PCR/RFLP analysis—Rapid identification of mycobacterial isolates from striped bass, *Morone saxatilis*, in the Chesapeake Bay: American Society for Microbiology 101st General Meeting, Orlando, FL. May 21 - 25, 2001.
- Presentations, Delivered: Ottinger C.A. Mycobacteriosis and Chesapeake Bay striped bass—An integrated cooperative research program: 28th Annual Eastern Fish Health Workshop, Gettysburg, PA. April 21-23, 2003.
- Presentations, Delivered: Ottinger, C.A. Mycobacteriosis and Striped Bass. Natural Science and Public Health – Prescription for a Better Environment: Reston, VA. April 1 – 3, 2003
- Presentations, Delivered: Ottinger, C.A. Mycobacteriosis in Chesapeake Bay Striped Bass. USGS Chesapeake Bay Overview – Scientist Meeting Scientists, Fish and Wildlife Service Chesapeake Bay-Susquehanna Ecosystem Team Meeting. Lancaster, PA, March 26, 2003. INVITED
- Presentations, Delivered: Rhodes, M., H. Kator, D. T. Gauthier, W.K. Vogelbein and Ottinger, C.A., Experimental mycobacteriosis in striped bass (*Morone saxatilis*): microbiological results: Fourth International Symposium on Aquatic Animal Health, New Orleans, LA, September 1 – 5, 2002.
- Presentations, Delivered: Blazer, V.S., Ottinger, C.A., C.L. Densmore, and W.B. Schill, 2001, Chesapeake Bay—Emerging pathogens (?) and fish health: Eastern Region Workshop on Emerging Issues in Water Quality, Orlando, FL, November 26 – 30, 2001.
- Presentations, Delivered: Rhodes, M.W., H. Kator, I. Kaattari, S. Katob, P. van Berkum, W. Vogelbein, and C. Ottinger, 2001, Characterization of *Mycobacterium* spp. isolated from striped bass, *Morone saxatilis*, from Chesapeake Bay: 26th Annual Eastern Fish Health Workshop, Shepherdstown, WV, April 23 – 26, 2001.
- Presentations, Delivered: Burge, E.J., D. T. Gauthier, C.A. Ottinger, and P.A. Van Veld, 2003, Increases in short term *in vivo* expression of natural resistance-associated macrophage protein, Nramp, in striped bass (*Morone saxatilis*) following mycobacterial challenge, USGS
- Presentations, Delivered: Ottinger C.A., 2003, Mycobacteriosis and Chesapeake Bay striped bass: An integrated cooperative research program: American Fisheries Society, Fish Health Section 2003 Annual Meeting & 44th Western Fish Disease Workshop, Seattle, WA, July 15 – 17, 2003, American Fisheries Society Fish Health Section
- Presentations, Delivered: Vogelbein, W., D. Gauthier, C. Densmore, M. Rhodes, V. Blazer, H. Kator, A. Baya, and Ottinger, C.A., 2003, Mycobacteriosis in striped bass (*Morone*

saxatilis) from Chesapeake Bay—Fall 2002 survey results: American Fisheries Society, Fish Health Section 2003 Annual Meeting & 44th Western Fish Disease Workshop, Seattle, WA, July 15 – 17, 2003, American Fisheries Society Fish Health Section

Report, Delivered: Burge, E.J., Gauthier, D.T., Ottinger, C.A., and P. A. Van Veld, 2004, *Mycobacterium*-Inducible Nrnmp in striped bass (*Morone saxatilis*): Infection and Immunity 72 (3), 1626-1636.

Report, Delivered: Gauthier, D.T., M.W. Rhodes. W.K. Vogelbein, H. Kator, C.A. Ottinger, 2003, Experimental mycobacteriosis in striped bass *Morone saxatilis*: Diseases of Aquatic Organisms 54: 105-117.

Report, Delivered: Rhodes, M. W., H. Kator, S. Kotob, P. van Berkum, I. Kaattari, W. Vogelbein, M. M. Floyd, W. Ray Butler, F. D. Quinn, Ottinger, C.A., and E. Shotts, 2001, A unique *Mycobacterium* species isolated from an epizootic of striped bass (*Morone saxatilis*) related to *Mycobacterium marinum* and *Mycobacterium ulcerans*: Emerging Infectious Diseases 7: 896-899.

Report, Delivered: Rhodes, M.W., H. Kator, S. Kotob, P. van Berkum, I. Kaattari, W. Vogelbein, F. Quinn, M.M. Floyd, W.R. Butler, and Ottinger, C.A., 2003, *Mycobacterium shottsii* sp. nov., a slowly growing species isolated from Chesapeake Bay striped bass (*Morone saxatilis*): International Journal of Systematic and Evolutionary Microbiology 53: 421-424.

Relevance and Benefits: This task addresses the Fisheries and Aquatic Resources Program's Goal to foster aquatic animal health.