

CHAPTER 4. CONCLUSIONS TO DISSERTATION

The two populations of *Gammarus minus* differed in features of life history and in secondary production during the year studied. There also appear to be some differences in foregut morphology. Immature and mature *G. minus* differed in frequency of feeding behaviors in a laboratory experiment and in details of mouthpart morphology. There appears to be some relationship between habitat, particularly organic (or vegetational) features, and these differences.

The differences in secondary production are consistent with findings of other studies of freshwater gammarids. These studies and mine provide evidence that stream habitats characterized by finer substrates, such as gravel, and by aquatic macrophytes support higher levels of production than do coarser substrates. Exactly what factors are responsible for this difference are unknown. Possibilities for further study include determining 1) the role of the following items as food sources for stream invertebrates: biofilms on gravels, wood and bark; organic detritus trapped in interstices of gravel and sand substrates; and aquatic macrophytes (including studies of possible seasonality of chemical defense systems by these plants) and 2) determination of the relative importance of the advantages of interstices among gravel and sand substrates to survival: interstices as refugia from currents and predators and as stores of usable detritus.

Differences in feeding behavior and allometry of mouthparts in this study provide indirect evidence in support of the hypothesis that young amphipods make use of different potential food resources in their habitats than more mature amphipods. These differences may need to be considered in modeling of resource partitioning within stream communities. Finally, the relationship of life history relationships and annual production to the annual cycling of food resources in streams in temperate climates warrants further study. Repeating this study in the same streams over a period of years to determine whether the relationships between condition of leaf detritus and release of young from brood pouches or between annual regrowth of watercress and increased release of young is part of a regular cycle of reproduction. Laboratory studies of effects of availability of different food resources to reproductive cueing and survival of young are also needed.

VITA

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EDUCATION:

PhD Aquatic Ecology. Virginia Polytechnic Institute and State University. Blacksburg, VA.
May 1997. (Dissertation: Comparisons of Secondary Production, Life History, and
Mouthpart Functional Morphology Between Two Populations of the Amphipod *Gammarus
minus*)

MS Biology. Old Dominion University. Norfolk, VA. 1980.

BA Biology. Randolph-Macon Woman's College. Lynchburg, VA. 1971.

PROFESSIONAL EMPLOYMENT:

Environmental Scientist

*Environmental Sciences Staff
Center for Veterinary Medicine
U. S. Food and Drug Administration
Rockville, MD (May 1990-present)*

Major responsibilities:

- Environmental regulatory activities concerning aquaculture drugs. Activities include:
 - Reviewing environmental components of new animal drug applications and investigational new animal drug applications for aquaculture uses.
 - Coordinating CVM activities with other regulatory agencies that have jurisdiction over aquaculture facilities.

For example,

Co-chair of “United States Sponsored Workshop On Jurisdiction Of Sea Lice Treatment And Control” to be held in September 1996. This workshop is an effort to encourage harmonization among the many state, provincial, Canadian, and U.S. agencies that regulate the use of chemicals in salmon net pens.

— Guiding the aquaculture industry through the drug approval process by teaching courses, presenting lectures at scientific meetings, writing guidance documents.

— Serving as the Environmental Sciences Staff representative to the Center’s Aquaculture Coordinating Committee and the Office of New Animal Drug Evaluation Aquaculture Working Group.

- Other activities:

— Reviewing environmental components of other new animal drug applications, investigational animal drug applications, and food additive petitions.

— Writing environmental assessments for Center actions.

Research Assistant

*Virginia Water Resources Research Center
Virginia Polytechnic Institute and State University (VPI&SU)
Blacksburg, VA (Fall 1987 to May 1990)*

Researched scientific, legal, economic, and social aspects of issues concerning Virginia's waters, including water supply management, nonpoint source pollution, boat pollution, non-tidal wetlands preservation, wastewater treatment, and institutional influences on water policy. Provided this information to the Center director and, with him, used this information to write reports, papers, and grant proposals.

Research Assistant

Department of Biology . VPI&SU .

Summer 1987. Performed standard chemical analyses and heavy metal analysis using atomic absorption spectrophotometry for Roanoke Electric Steel Company, Roanoke, VA.

Summer 1986. Performed *Daphnia* bioassays of sediment for a private consultant.

Summer 1985. Performed aquatic macroinvertebrate survey for Roanoke Electric Steel Company, Roanoke, VA.

TEACHING EXPERIENCE:

*Virginia Polytechnic Institute and State University
Blacksburg, VA*

Teaching Associate (*Fall 1985 to Fall 1987*). Coordinator of General Biology Teaching Assistants. Supervised 30 Teaching Assistants and two technicians.

Lecturer (*1986 to 1987*) Substitute lecturer for regular faculty in General Biology and Principles of Biology classes.

Teaching Assistant (*Summer 1986*) Revised General Biology laboratory exercises.

Teaching Assistant. (*1983-1985*) Taught General Biology, Principles of Biology, Freshman Honors Biology, and Human Anatomy Laboratories.

PUBLICATIONS:

Haley, Carol J., John C. Matheson, III, and Charles Eirkson, III. 1993. FDA requirements for the environmental assessment of animal health products. *Journal of Hazardous Materials* 35(2): 217-228. (Text of talk given at Annual Meeting of the American Chemical Society in Washington, DC. 1992).

Walker, W.R., Margaret S. Hrezo, and Carol J. Haley. 1992. Management of Water Resources for Drought Conditions. pp 147-156 IN: National Water Summary 1988-1989 - Floods and Droughts. U.S. Geological Survey Water-Supply Paper 2375.

Walker, W.R., C.J. Haley, P. Bridgeman, and S.H. Goldstein. 1991. Effects of deodorants on treatment of boat holding-tank waste. *Environmental Management* 15: 441-449.

SELECTED PRESENTATIONS:

Haley, Carol J. November 1995. Harmonization of Approaches for Environmental Toxicology. Talk given at 16th Annual Meeting of the American College of Toxicology. Vienna VA.

- Haley, Carol J. April 1995. Environmental Concerns in Aquaculture INADs. Lecturer at Fish and Wildlife Service Course #FIS1133: Use of Drugs & Chemicals in Fish Culture. La Crosse, WI.
- Haley, Carol J. October 1994. Environmental Concerns -- Exposure of the Aquatic Environment to Animal Health Products. Talk given at the Environmental Risk Assessment Workshop sponsored by the Animal Health Institute and FDA's Center for Veterinary Medicine, Gaithersburg, MD.
- Haley C.J., C. Eirkson, S. Geil and B. Mahanes. September 1994. Environmental Assessment for Approval of Aquaculture Drugs. NRSP-7 (National Research Support Project Number 7)/FDA Workshop for Minor Use Drugs -- Drugs in Aquaculture: Current Status - Future Goals. Bethesda, MD.
- Haley C.J., C. Eirkson, S. Geil and B. Mahanes. June 1994. U.S. Food and Drug Administration ecological risk assessments for drugs used in aquaculture and in terrestrial animals -- are they different? Talk given at Aquaculture and Water Resource Management Conference at the Institute of Aquaculture at the University of Stirling, Stirling, Scotland.
- Haley, Carol J. November 1993. Environmental Risk Assessment of the Use of Animal Drug Products in Aquaculture. Talk given at Society of Environmental Toxicology and Chemistry Annual Meeting, Houston, Texas.
- Haley, Carol J. and Arthur L. Buikema, Jr. September 1989. The role of the amphipod, *Gammarus minus*, in the food webs of two Virginia streams. Talk given at the VIIth International Colloquium on Amphipods, in Portland, Maine.
- Haley, Carol J. and Arthur L. Buikema, Jr. August 1987. Particle-collecting behavior of the amphipod, *Gammarus minus*. Poster presented at Ecological Society of American Annual Meeting, Columbus, Ohio. Abstr. published in ESA Bulletin 68: 317.
- Haley, Carol J. and Arthur L. Buikema, Jr. May 1987. *Gammarus minus*: collector or shredder: Talk given at Virginia Academy of Science Annual Meeting, Norfolk, VA. Abstr. published in Va. J. Sci. 38:120.
- Haley, Carol J. and Arthur L. Buikema, Jr. May 1986. Feeding ecology of the amphipod, *Gammarus minus*. Talk given at Virginia Academy of Science Annual Meeting, Harrisonburg, VA Abstr. published in Va. J. Sci. 37: 102.
- Haley, Carol J. and Arthur L. Buikema, Jr. May 1986. Mouthparts of the amphipod, *Gammarus minus*. Poster given at the North American Benthological Society Annual Meeting, Lawrence, Kansas. Abstr. published in NABS Bulletin 3: 123.

Stout, Ben M. III and Carol J. Haley. May 1988. Automated measuring of aquatic organisms. Poster presented at the North American Benthological Society Annual Meeting. Abstr. published in NABS Bulletin 5(1): 55.

FDA COMMITTEES

Co-Chair of FDA's Committee for the Advancement of FDA Science (CAFDAS), 1994-1995

Chair, FDA Science Awards Selection Committee 1995-1996

Chair, Center for Veterinary Medicine Performance Management Council (1996)

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:

Association for Women in Science
Ecological Society of America
North American Benthological Society
Sigma Xi

TRAINING (SCIENTIFIC AND LEGAL):

“Mid-America Toxicology Course.” April 21-26, 1996.

“Biology of Amphipoda Workshop.” University of Maine. July 17-21, 1995.

"Using Non-Metric Clustering and Association Analysis as a Pattern Analysis Technique for Hazard Assessment. Short Course at SETAC Annual Meeting in Houston, TX. November, 1993.

“National Environmental Policy Act Executive Overview.” Shipley Associates. Gaithersburg, MD. September 21-23, 1993.

“U.S. Environmental Protection Agency National Pollutant Discharge Elimination System Basic Permit Writers' Course.” Alexandria, VA. July 13-16, 1993.

“GLP Seminar--GLP regulations-industry perspective.” Gaithersburg, MD. March 8, 1993.

“New Animal Drug Studies: Data Quality Assurance.” Animal Health Institute.” Rockville, MD. October 28-29, 1992.

“Structures and Physical Properties of Organic Compounds.” FAES Graduate School at NIH. September 1992-May 1993.

“Basic Food and Drug Law Course.” Rockville, Maryland November 5-9, 1990.

SCHOLARSHIPS AND GRANTS:

Graduate Research Development Project Grant, VPI&SU (1986)

Student Assembly Travel Fund Grant, VPI&SU (1986)

Sigma Xi Grant-in-Aid (1985)

Virginia Academy of Science Grant-in-Aid (1985)

VPI & SU Tuition Scholarship (1983)

National Science Foundation Undergraduate Research Participation Grant (1970)