

Wild Adult Brown Trout Seasonal Movements, Behavior and Habitat Use in the Batten Kill Watershed

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Background

The long accepted theory proposed by Gerking (1959) was that adult salmonids inhabiting streams are largely sedentary, as well as occupy relatively small home ranges (Bachman 1984, Heggnes 1988, Mense et al. 1975, Shetter 1968, Shuck 1945). While much research conducted in the past has tended to support this theory, more current studies challenge this conclusion (Gowan et al. 1994). Because of inherent biases associated with methods commonly used in the past to study fish movements (e.g., mark and recapture), the results from these studies more recently have been called into question (Gowan et al. 1994, Gowan and Fausch 1996). Radio-tracking has been identified as one method for avoiding the pit falls associated with traditional methods (Winter 1983). Little is known about the seasonal movements and habitat use of brown trout in the Batten Kill. Radio-tagging (telemetry) studies of wild adult brown trout in the Batten Kill were initiated in late August 2003 and concluded in December 2004. Information on their seasonal movements, habitat use, and behavioral interaction with other recreational uses of river will be important to future management of the fishery and addressing other river issues.

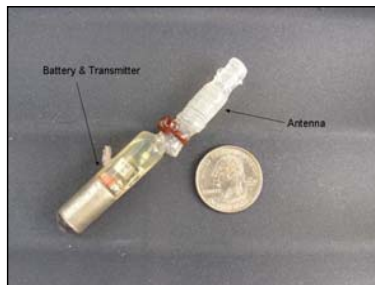
Study Objectives

- Monitor and document the extent and frequency of individual trout seasonal movements.
- Determine habitat use and preferences.
- Observe fish behavior and habitat use in response to water-based recreational activity.

Study Methods

A total of 28 adult brown trout were captured from the Batten Kill and radio-tagged for the two-year study. Total length of fish used in the study ranged from 16.1-21.9 inches. Twelve of the 28 fish were involved in Study 1 (August 25, 2003-June 4, 2004), and Study 2 (June 16, 2004-December 16, 2004) included the remaining 16.

While under anesthesia, a radio transmitter was surgically implanted into the body cavity of each fish. After all fish had recovered from surgery, they were returned to the river at various locations within the lower six miles of the Batten Kill main stem in Vermont. Radio-tracking was conducted from vehicle and on foot. Fish position during any given contact event was marked on an orthophotograph and other pertinent information was recorded, including date, time, type of habitat and cover occupied, and environment conditions. Any river recreation (e.g., angling, swimming, canoeing, and predator (e.g. merganser, heron, otter) presence in proximity of the fish, as well as fish behavioral response, were noted. Observational data were maintained in a computer database and analyzed.



Results

- Sixteen of the 28 radio-tagged fish (Studies 1 and 2 combined) survived and retained tags into the first spawning season following release; 14 of these survived at least to the end of their respective study.
- Twenty fish demonstrated fidelity to home sites even if released at locations removed from the place of original capture.
- Twelve fish either remained in their "summer" home range through the spawning season or returned there following spawning migration to winter.
- Summer or pre-spawning home range size averaged 1,352 river-feet (range 0-4,541 feet).
- Winter post-spawning home range was slightly more limited in size than for summer range (mean 1,157 feet; range 158-3,062 feet).
- Eleven fish migrated into tributaries to spawn (Roaring Branch 5; Green River 4; Warm Brook 1; Camden Creek 1); at least three fish undertook migrations with spawning suspected to have occurred in the Batten Kill main stem.
- Maximum distance traveled from summer home range location to spawning site was 15.2 river-miles. Average distance was 5.8 miles; range 2.4-15.2 miles).

Conclusion

- The size of home ranges and the extent of spawning migrations demonstrate adult Batten Kill brown trout are not sedentary but are dependent upon large areas within the watershed for life activities.
- Tributaries, especially the Roaring Branch and the Green River, are important spawning streams for the main stem brown trout population.
- Adult brown trout show fidelity to their home range, and spawning migrations suggest they may be imprint to natal waters.
- Telemetry observations do not support the contention that recreational activities are a significant disturbance to adult brown trout in the Batten Kill.

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References

- Bachman, R. A. 1984. Foraging behavior of free-ranging wild and hatchery brown trout in a stream. *Transactions of the American Fisheries Society* 113:1-32.
- Gerking, S. D. 1959. The restricted movement of fish populations. *Biology Review* 34:221-242.
- Gowan, C., M. K. Young, K. D. Fausch, and S. C. Riley. 1994. Restricted movement in resident stream salmonids: a paradigm lost? *Canadian Journal of Fisheries and Aquatic Sciences* 74:2626-2637.
- Gowan, C., and K. D. Fausch. 1996. Mobile brook trout in two-elevation Colorado streams: re-evaluating the concept of restricted movement. *Canadian Journal of Fisheries and Aquatic Sciences* 53:1370-1381.
- Heggnes, J. 1988. Effects of experimentally increased interspecific competition of sedentary adult brown trout (*Salmo trutta*) movement and stream habitat choice. *Canadian Journal of Fisheries and Aquatic Sciences* 45:1163-1172.
- Mense, J. B. 1975. Relation of density to brown trout movements in a Michigan stream. *Transactions of the American Fisheries Society* 104:688-695.
- Shetter, D. S. 1968. Observations on movements of wild brown trout in two Michigan stream drainages. *Transactions of the American Fisheries Society* 97:472-480.
- Shuck, H. A. 1945. Survival, population density, growth, and movement of the wild brown trout in Crystal Creek. *Transactions of the American Fisheries Society* 73:209-230.
- Winter, J. D. 1983. Underwater biotelemetry. Pages 371-395 in L. A. Nielsen and D. L. Johnson, editors. *Fisheries techniques*. American Fisheries Society, Bethesda, Maryland.