

## Abstract

Most previous studies of brown trout Salmo trutta ecology and behavior have focused on smaller fish, or fish in lakes or under controlled conditions. Very little work has been done in investigating the ecology of large, free-ranging, stream-resident brown trout. The present study was undertaken to monitor the movement, habitat use, and daily activity patterns of these fish.

Radio transmitters were implanted in eight brown trout between 437 mm and 635 mm from the South Branch of the Au Sable River, Michigan over a two year period. Daily tracking during summer (May - August), and tracking at two-week intervals during fall and winter (September - April) was used to determine movement, habitat use, and activity patterns of these fish. Range of movement and home site use was defined, and measured for each fish tracked. I evaluated habitat use by comparing habitat in stream quadrats used by fish to that available in quadrats chosen at random from throughout the river. Two measures of brown trout activity were defined; local activity and long-range activity. Local activity was measured by counting fluctuations in radio signal strength over a 24-h period, and long-range activity was measured as the linear distance covered by a fish between consecutive daytime resting locations.

Range of movement for eight fish tracked varied from 370 m to 33.4 km. The average range of movement in summer was approximately 5,000 m, while the average range of

movement in winter was approximately 12 km. Movement appeared to be nonrandom; that is, fish used a few locations often and were seen to return to these sites after movement to other areas of the river. Fish tracked during summer periods used as many as four home sites; the average separation between these sites was 386 m.

Brown trout chose deep, slow areas with heavy log cover. Significant positive electivity was seen for mean and bottom water velocities less than 10 cm/sec, depths between 46 and 60 cm, areas of cover including overhanging branches, vegetation, and logs, and areas with silt substrate.

Distinct peaks in local activity were observed during two summer months. A major activity peak in June occurred at 2200 h, but in July this major peak shifted to 0500 h. No distinct activity peaks were apparent in August. Light intensity accounted for almost 29% of the variance in local activity levels. Seasonal differences in local activity may also have been related to changes in food availability or temperature.

Long-range activity observed in summer was significantly less than that seen during winter. Average summer long-range activity was less than 300 m, while average winter activity was greater than 3000 m. However, extensive nighttime "foraging" activity in summer was much greater than any reported in previous studies. No significant upstream or downstream trends in long-range activity were observed once fish took up residence in an area; however, many of the fish tracked made a long movement to upstream areas in fall, then

remained in these upstream areas over winter. Significant positive correlations were seen for long-range activity with volume discharge and average daily air temperature. Significant negative correlation was seen between long-range activity and groundwater levels.

During the present study, six of eight fish tracked moved out of a catch-and-release section of the South Branch, making them vulnerable to harvest in sections of the river not covered by special regulations. However, four of five fish tracked during the period of peak fishing pressure (May-August) remained in this catch-and-release section. Possibly, increased harvest of trophy fish in areas adjacent to regulated areas could be counted as an additional benefit of these quality fishing regulations.