EFFECTS OF WATER TEMPERATURE ON SWIMMING PERFORMANCE OF FINGERLING SOCKEYE SALMON (SUMMARY)

by

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October 1964

FISH-PASSAGE RESEARCH PROGRAM
U.S. Bureau of Commercial Fisheries
Seattle, Washington

SUMMARY

Relationships between water temperature and fingerling swimming ability may directly influence the effectiveness of diversion or guiding measures that are dependent upon the swimming ability of fish. The purpose of the following experiment was to assess the effects of water temperature on maximal swimming abilities of fingerling sockeye. The tests, conducted in the Behavior Laboratory of the Fish-Passage Research Program, consisted of swimming performance trials of individual fish acclimated to various temperature levels.

The swimming test device was a 50-foot U-shaped metal channel, 3 inches wide and 5 inches deep, through which 2 to 3 inches of water was circulated. Velocity in the channel was adjusted by varying the slope.

Fish tested were fingerling sockeye salmon (Oncorhynchus nerka) from the National Hatchery at Leavenworth, Washington. Their average length was 120 millimeters.

Groups of approximately 100 fish each were acclimated respectively to temperature levels of 35°, 41°, 50°, 59°, and 68° F. When tested, the fish had been acclimated for a minimum of 1 month in excess of the periods prescribed by Brett (1952). During trials, water temperature in the channel was regulated to the level of the acclimated test group. Short term, absolute capacities were assessed in the testing. The basic measure was the total distance that a fish could gain against a water velocity which forced a maximal effort. Performances of individual fish were measured in all instances.

Fifty fish from each acclimation group were tested at the same water velocity. For fish at each thermal level, the average distance gained against a 4-foot-per-second velocity in the channel is shown in figure 1. The curve indicates that temperature incrementally affected swimming performances up to 59° F. Above this level, performances declined. This is in agreement with a similar thermal effect noted by Brett (1958) in measuring cruising speeds of juvenile sockeye salmon.

In terms of distance gained, the largest performance difference shows over the 6 degrees between 35° and 41° F. The difference demonstrated over this interval equalled that shown over the 18 degrees between 41° and 59° F. The smallest performance difference was indicated between 50° and 59° F. To relate this to a louver, for example, the distance a fish guided across the structure could be contingent on the water temperature in relation to the swimming effort required.

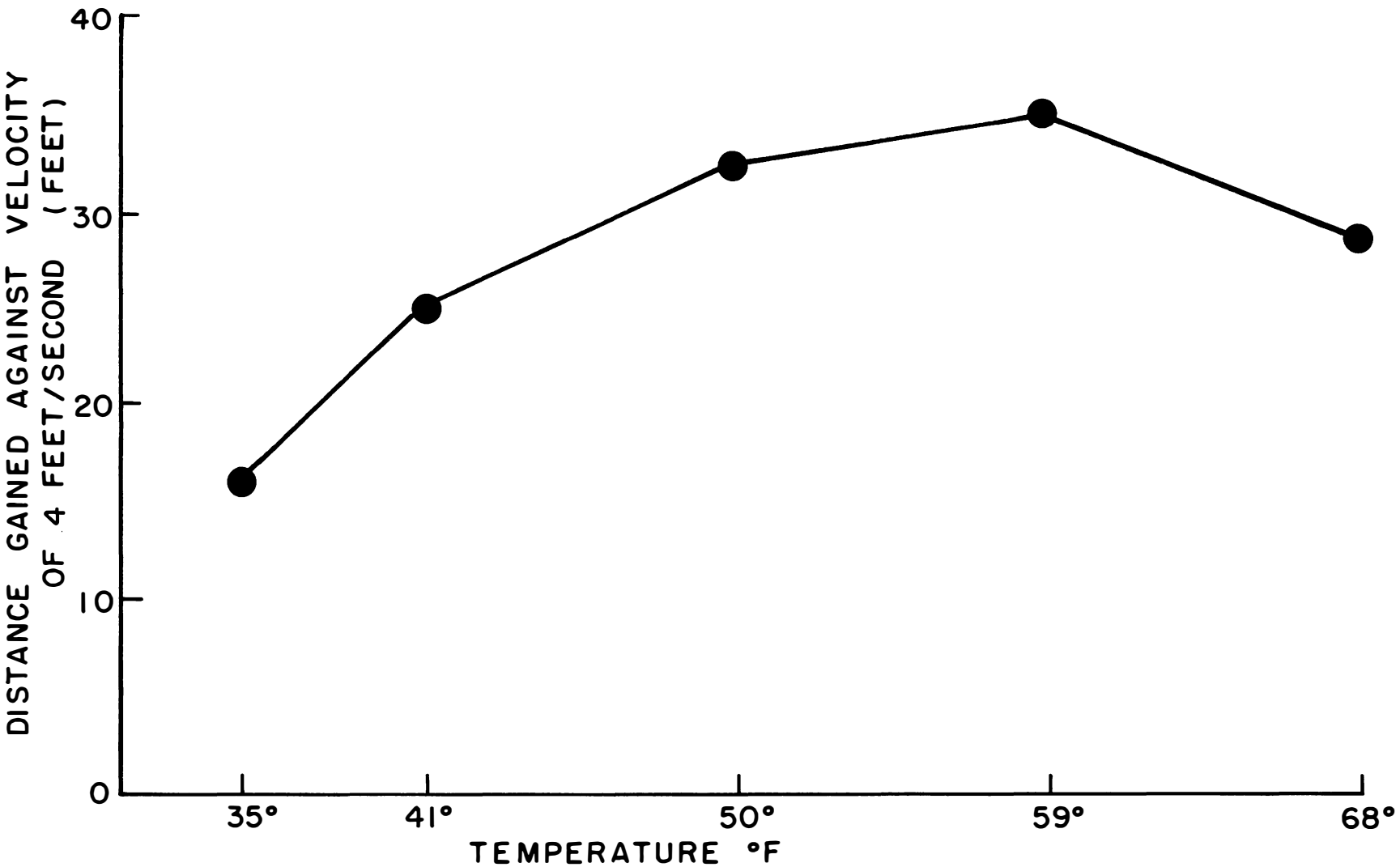

Figure 1.--Effect of water temperature on maximal swimming efforts of fingerling sockeye salmon. Points represent the averages of individual swimming trials of 50 fish acclimated and tested at the indicated temperature levels.

These results, from one species and size range, suggest that the efficiencies of fingerling diversion devices could be appreciably affected by water temperature, especially if the fish must make a strong swimming effort to negotiate a particular distance.

LITERATURE CITED

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