

TVA
1993

Draft Proposal

IDENTIFYING THE FOOD REQUIREMENTS OF JUVENILE FRESHWATER MUSSELS

Purpose

This project is being conducted to determine the food requirements of juvenile freshwater mussels from the time they begin independent life until they are approximately one year old.

Background

On September 7, 1990, the U.S. Fish and Wildlife Service issued the latest Biological Opinion on a TVA proposal to widen the navigation channel downstream from Pickwick Landing Dam. One component of the reasonable and prudent measures identified in this Opinion is a requirement that TVA "... reinstitute a mussel propagation program and actively pursue successful propagation and rearing of freshwater mussels." Since the issuance of the Biological Opinion, TVA and the few other laboratories conducting mussel propagation research have demonstrated that several improvements will have to be made in the existing procedure before large numbers of mussels can be produced using artificial means. At present, technique improvements appear to be required in three broad areas: transformation techniques which will work for a variety of species, determining juvenile mussel food requirements, and determining juvenile mussel habitat requirements.

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL

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NO Available information suggests that identifying juvenile food requirements is the most critical need. TVA and some other laboratories can transform some mussel species; however, most species do not grow substantially after transformation and the animals do not survive for more than a few weeks. Unmet habitat requirements could be responsible for these mortalities with some species; however, many types of holding facilities have been tried with a uniform lack of success. Various laboratories (TVA included) have provided a variety of foods to the juvenile mussels and many of these foods have been seen in the digestive tracts. What has not yet been determined is which of these food materials actually are being assimilated by the young mussels.

Scope

A series of short-term experiments will be conducted to identify the nutrient materials ingested and assimilated by various ages of juvenile freshwater mussels, starting with newly-transformed animals. Subsequent longer-term experiments will confirm that juvenile mussels of several species remain active and grow when provided with appropriate concentrations of the right food materials. Results from these experiments also will indicate whether nutrient requirements change as the juveniles grow larger. If changes in nutrient requirements are identified, additional rounds of food preference experiments will be conducted to identify the full sequence of juvenile mussel food requirements until these animals are approximately one year old.

Procedure

Newly-transformed specimens of Anodonta imbecillis and at least one other native mussel species will be produced using artificial culture or by infecting natural fish hosts. These young mussels will be presented with radioactive- (or otherwise) labeled samples of likely food materials such as various algal species, detritus, bacteria, and organic macromolecules. Following appropriate exposure times, the young mussels will be examined to determine which of the labeled materials were ingested and which, if any, were assimilated. Once one or more categories of assimilated materials has been identified, additional experiments will be conducted to identify specific foods which are assimilated in quantity. Subsequent longer-term experiments will be conducted with a variety of mussel species to demonstrate that high activity levels and growth rates can be achieved using appropriate concentrations of the identified food materials. how?

Results of the longer-term feeding experiments also will indicate if nutrient requirements or feeding preferences change as the young mussels become larger and have more mature feeding structures. If such changes in requirements are detected, additional labeled-food experiments will be conducted to determine the new food preferences. These experiments also will be followed by confirmation studies to demonstrate continued activity levels and growth by the maturing mussels.

This project will conclude when appropriate food materials for juvenile mussels have been identified and demonstrated to promote natural activity levels and growth patterns in several species over the first full year of their lives. Depending on the results of the step-wise experiments, such a conclusion could be reached in between two and five years of research effort.

Budget

[Not yet estimated]

Schedule

This project must be approved by the U.S. Fish and Wildlife Service and conducted concurrently with the remainder of the Pickwick Channel Widening Project. Other mussel-related aspects of the Pickwick Project are scheduled to begin in September 1993. If continually funded, construction activities are now scheduled to conclude in FY 1995.

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