Investigation Into The Feasibility of Stocking Artificially Propagated Red Drum In Georgia

John M. Pafford
Nick Nicholson and Arnold G. Woodward

Georgia Department of Natural Resources
Coastal Resources Division
1 Conservation Way
Brunswick, Georgia 31523

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ABSTRACT

Investigations were conducted to assess the feasibility of stocking artificially spawned and reared red drum, Sciaenops ocellatus, in Georgia's coastal waters. This involved literature review, providing red drum to the U. S. Fish and Wildlife Service hatcheries, observing red drum research activities at hatcheries, and gathering information on the latest developments in induced spawning and other red drum mariculture techniques. Methods for propagating and rearing fry and fingerling red drum have been refined and much effort has been expended into stocking of these red drum into estuarine and freshwater systems. However, there is a paucity of documentation concerning increased red drum abundance and possible enhanced angling opportunities derived from such costly investments. Therefore, until the benefits of stocking red drum can be verified, Georgia will concentrate efforts toward conserving the native red drum stock(s) while continuing to identify and protect red drum spawning and nursery habitat.

INTRODUCTION

The red drum, Sciaenops ocellatus, distributed from Laguna Madre, Mexico to New York (Fischer, 1978), is a valuable recreational and commercial species throughout its range. The popularity of this species with marine recreational anglers in the southeastern United States has increased during the past decade (Schmeid and Burgess 1987). In Georgia, the number of saltwater fishing trips taken annually has doubled in the past 10 years with red drum remaining one of the top marine sportfish targeted by recreational fishermen. Persistent harvest of immature juveniles and sub-adults by anglers combined with increasing coastal development make it necessary for resource managers to explore all possible management alternatives for maintaining adequate spawning stocks and protecting vital nursery habitat. Stock enhancement using artificially propagated red drum is viewed by many fishery managers as an opportunity to ameliorate the effects of overexploitation and loss of habitat.

The need for research and management to ensure Georgia will have viable red drum populations became evident when, apparently as a result of severe winters in the late 1970's, abundance of juvenile and sub-adult red drum declined severely. The Georgia Department of Natural Resources (GADNR) immediately initiated fishery-dependent and -independent investigations to gather harvest and life history data on red drum. These early investigations (Music and Pafford 1984,

Pafford and Nicholson 1989) documented the high exploitation of juvenile red drum and suggested the need for length and creel limits on this species. In addition to regulations to modify harvest, protection of red drum habitat was afforded through increased enforcement of the Georgia "Coastal Marshlands Protection Act of 1970" which limits development or alteration of the vast saltmarsh estuarine system which serves as a nursery for many recreationally important finfish, shellfish, and crustaceans. Considering the increasing angling effort on Georgia's coast, the feasibility of propagated red drum as a management tool in coastal fishery management must be addressed.

METHODS

Investigations were conducted to determine the feasibility of stocking cultured red drum in Georgia's coastal waters. An extensive review of scientific literature was conducted to establish a database of existing information on red drum mariculture and stock enhancement methodologies.

To augment efforts in refining red drum culture methodology for the South Atlantic region, juvenile and adult red drum collected in Georgia were provided to the United States Fish and Wildlife Service (USFWS). GADNR personnel visited the USFWS Orangeburg Fish Hatchery, Waddell Mariculture Center, hatchery facilities at the South Carolina Department of Wildlife and Marine Resources Center in Charleston, and the

Redfish Hatchery (a commercial facility in Pass Christian, Mississippi) to observe hatchery operation and research pertaining to red drum mariculture. In addition, personnel investigated design and operational cost for converting rice field impoundments into a red drum put-grow-take facility on Champney Island at the Altamaha Waterfowl Refuge.

RESULTS

In the past 20 years, most research concerning culture techniques and stocking of red drum was conducted in the Gulf of Mexico, primarily in Texas. Much of the scientific literature available from the earlier stocking activities is limited to information concerning the numbers of red drum eggs, fry, and fingerlings produced and released (Matlock 1984,1986; Matlock, McCarty, and Vega 1986; Daily 1988, 1989). Few investigations have been conducted to evaluate the benefits of stocking hatchery-reared red drum into estuaries to augment native populations.

Two methods have been used to evaluate survival of red drum introduced into natural populations: marked fish and length-frequencies of sampled red drum. Matlock, Hysmith, and Colura (1984) investigated the survival of red drum fingerlings tagged with individually numbered monel jaw tags attached to the opercula and released in Matagorda Bay, Texas. Of the 5,942 marked red drum released, 10 (0.2%) were recaptured. Daily and McEachron (1986) investigated the survival

of unmarked red drum stocked into two Texas bays by releasing 13,060,992 reared fingerlings at a time when no small red drum would occur in natural populations. Bag seining produced 132 unmarked red drum, which were considered to have been stocked. Matlock, Kemp, and Heffernan (1986) investigated the survival of an unspecified number of unmarked red drum fingerlings and 38,000 fingerlings tagged with magnetic nose tags released in Texas bays. They reported many of the unmarked red drum stocked survived, but the percent survival was unstated. Only 3 of the 38,000 nose tagged fish were recaptured. The low recovery rate of marked fish was attributed to rapid tag loss. Hammerschmidt (1986) studied the initial 24 hr survival rate of red drum fingerlings stocked in three Texas bays. Findings indicated >85% of stocked fingerlings survived the first 24 hrs following release. Matlock (1988) investigated the survival of 4.8 million red drum fry released into Christmas Bay, Texas. He reported no stocked red drum were recaptured during three months of bag seining following introduction.

In addition to investigations on survival of released propagated red drum, research was conducted to evaluate differences in growth and temperature tolerances among fingerling red drum reared from both Texas and South Carolina broodstock (Procarione 1989; Procarione and Matlock 1990). Their findings indicated no consistent differences in growth rates during rearing or survival when subjected to low water temperatures. Therefore, there is no apparent advantage to utilizing non-native red drum for stock enhancement in Georgia.

To assist in the development of mariculture techniques for Atlantic coast red drum, program personnel provided the USFWS Orangeburg Hatchery with six adult-size red drum (882-1,035 mm). Due to the difficulty in "transporting and handling" these large red drum, USFWS requested juvenile-size red drum. Therefore, 22 juveniles (305-436 mm) were provided to hatchery personnel. Unfortunately, all of the red drum provided to USFWS by Georgia DNR were reported to have died due to equipment failure at the Orangeburg Hatchery.

Based on research conducted at hatcheries in South Carolina, adequate quantities of Atlantic stock red drum larvae, fry, and fingerlings can be provided for stocking into natural populations. Hopkins et al. (1988) reported recent progress in the development of culture techniques for red drum at the Waddell Mariculture Center in South Carolina. Research indicates there is potential for red drum propagation, both for commercial and stock enhancement purposes, in the coastal areas of the southeastern United States.

Investigations into converting rice field impoundments on Champney Island, Altamaha Waterfowl Refuge included natural and artificial red drum stocking approaches. Construction and operation costs necessary to complete the extensive alterations and repairs required to refurbish deteriorated dikes and modify existing rice field designs for constructing holding ponds, as well as a red drum hatchery facility were determined.

DISCUSSION

Mariculture operations in the Gulf of Mexico and South Atlantic regions have provided the methodology for induced spawning and pond rearing of red drum. A few published studies suggest that stocking of hatchery-reared fry and/or fingerlings may enhance red drum abundance in estuarine waters. However, research on survival of stocked fish has not yet provided sufficient information to fully determine the cost/benefits associated with utilizing cultured red drum to supplement wild populations. Additional research documenting survival rates and optimal environmental conditions for stocking to ensure highest survival must be conducted before the validity of stock enhancement can be determined.

Due to the high cost of construction and operation of a fish hatchery and the limited documentation of survival of stock released in the wild, coastal fishery managers in Georgia determined the best approach could be stocking red drum in impoundments such as those at the Altamaha Waterfowl Refuge near Darien, Georgia. Originally, these impoundments were managed as put-grow-take fishing ponds for freshwater species such as Centrachid sunfish and channel catfish. However, survival of stocked freshwater species was poor due to frequent flooding of impoundments with saline waters during astronomical high tides. Juvenile red drum are tolerant of such changes in salinity, therefore this area was considered as a potential put-grow-take facilility for this species.

Various alternatives for construction of red drum fishing ponds were evaluated including: (1) a weir system designed to limit undesirables and allow access of red drum larvae and (2) a completely closed system requiring stocking of propagated fry and/or fingerling red drum. The latter alternative would require the purchase of red drum from culture facilities outside of Georgia. The former scenario would depend on natural stocking of impoundments by immigration of native red drum larvae.

Juvenile red drum occur naturally in coastal Georgia rice field impoundments. The potential exists to enhance numbers of red drum in rice field impoundments by installing water control devices which allow immigration of desired species during peak abundance and optimal environmental conditions. With the proper design, this system would limit immigration of undesirable species and egress of desirable species such as red drum. However, natural recruitment may be too low to maintain the level of abundance necessary to provide real benefits to coastal anglers.

Regardless of the method selected for stocking red drum in fishing impoundments, it would take in excess of $225,000 to repair and modify 40 acres of existing impoundments. This estimate does not include costs associated with the operation of such a facility. Initial cost for construction and operation of a red drum hatchery, with modest production capabilities, could easily exceed $500,000. Therefore, the most cost-effective alternative available at the present time is to obtain red drum for stocking from private or governmental

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