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Economics of Rainbow Trout Production in Arkansas

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ECONOMICS OF RAINBOW TROUT PRODUCTION IN ARKANSAS*

The major area of rainbow trout *(Salmo gairdneri)* production in Arkansas is the northwest section of the state. This region is noted for its karst topography with associated underground rivers and springs having ideal water supplies and temperatures for trout production. With increased trout usage for both recreational purposes and personal consumption, northwest Arkansas trout producers presently cannot meet demands. By contrast, the delta areas of Arkansas have copious amounts of shallow, easily obtainable water and readily available production sites that are being used seasonally for producing farm raised channel catfish *(Ictalurus punctatus)*. Collins (1972) and Newton et al. (1977) reported that trout may be reared in cages and ponds in southern Arkansas when water temperatures remain below 21° C. This condition occurs seasonally, usually November through April.

The objectives of this study were to further refine pond production methods and to consider the economic potentials of winter trout rearing in the southern portion of the state.

Fish averaging 119 g each were obtained from a northwest Arkansas commercial producer in November, 1979. Fish were conditioned from raceways to ponds and cages for three weeks before commencing the study. One portion of the experiment consisted of stocking 150 trout in each of three 0.9 cubic meter cages anchored in a 1.6 ha stock pond. The second part consisted of stocking two 0.1 ha ponds each with 500 fish. Both trials were conducted simultaneously at the University of Arkansas at Pine Bluff Research Station from 18 November 1979 through 1 April 1980.

All fish were fed a 36% protein commercial floating trout ration. Caged fish were fed five days a week, while pond fish were fed every day. The caged fish were fed on fewer days than the pond fish because they were set up on a different feeding schedule from the pond fish. Feeding rates were adjusted according to water temperature (Klontz, 1978) and were calculated as a percentage of body weight which was estimated bimonthly (based on an assumed growth rate of 1.7:1 feed conversion efficiency (FCE) or 3.74 kg of food fed for 1 kg of fish produced).

The average total weight harvested per cage was 29.05 kg, a total net gain of 10.64 kg over average initial stocking weight (Table 1). Survival averaged 89% for the caged trout. Fish increased from an average individual size of 122 g to 216 g each during the period, for a 79% average gain. This was similar to growth rates obtained in previous studies in Arkansas (Collins, 1972; Newton et al., 1977). Food conversion efficiency was 1.75:1, higher than that of the previous studies.

The harvest weight of pond-reared trout was 121.36 kg (1213.6 kg/ha), a net gain of 53.8 kg over initial stocking weight (Table 2). Trout survival in ponds averaged 99.5%, which was also similar to that reported earlier by Newton et al. (1977) but higher than survival reported by Kilambi et al. (1977) and Collins (1972). Individual trout increased from 136 g to an average of 245 g in the ponds. The FCE of trout produced in ponds was 1.65:1. There was a noted difference among fish from the two ponds in both total net production and FCE. These differences may be partially explained by variation in water quality between ponds. During the entire period, fish were observed actively feeding in one pond, while only sporadically in the other pond.

Water temperature during the study period averaged 10° C and ranged from 3.8 C - 15.4 C (Fig. 1). Klontz (1978) noted that food conversion efficiency and activity of trout were favorable until water temperature dropped below 10° C. He reported an optimum temperature level of 14.4° C for trout feed consumption. Growth of trout slowed below 8° C and ceased below 5.6° C. During our study, conditions for growth were favorable 75% of the study period and were best for trout production 40% of the time. November, December, March, and April were the best months for trout production.

Winter culture of trout appears quite economically promising. Cages stocked with 150 fish yielded a net profit of $17.10 per cage. Profit would be slightly lower if labor costs were subtracted. Expenses per cage for the growing season were: feed $10.20 ($0.55/kg) and $49.50 for fingerlings ($0.33 ea). Live weight wholesale price was $2.64 per kg. If trout were marketed on a retail market as opposed to wholesale ($4.07/kg), a net profit of $56.70 per cage would be reasonable. Kilambi et al. (1977) found that a stocking rate of 300 fish per cubic meter did not significantly limit growth of caged trout.

Pond-reared trout, at a stocking rate of 5000 per hectare and a harvest weight of 1169 kg, would net $433.96 per hectare based upon a live-weight selling price of $2.64 a kilogram. Expenses (per hectare) were: feed cost $1061.61 ($0.55/kg), and fingerling cost of $1590.60 ($0.33 ea). Profit margins may be increased by higher stocking rates. Jenson (1979) found that a stocking density of 8650 fish per hectare was not limiting to growth of trout in Alabama ponds.

Trout reared along with catfish in ponds during winter, as reported by Reagan and Robinette (1975) and Newton et al. (1977), had a net return on a per hectare per year basis which was higher because the two fish crops could be harvested yearly. Polyculture of trout and catfish also is feasible because nearly 90% of the trout can be captured with only one seine haul without harvesting the catfish. This combination reduces the extra expenses of multiple seinings and sorting common to most polyculture situations. Any remaining trout not captured during the spring harvest would not be totally wasted in catfish production ponds.

Rainbow trout can be successfully and economically reared during the winter season in southern Arkansas. Profits of $44.00 per 0.9 m³ cage and $780.00 per hectare are obtainable. Producers should stock trout weighing at least 113 g to obtain marketable size fish in one growing season. Smaller operations should sell their fish on local markets to both obtain higher prices and take advantage of the maximum length of the growing season. Most trout growth is obtained during November and December and again near the latter part of the season during March and April when water temperatures range between 10-16° C.

Table 1. Net production, food conversion efficiency, percent survival, and average weight gained for rainbow trout reared in cages.

Cage	Stocked weight (kg)	Harvested weight (kg)	Weight gain (kg)	FCE	Percent survival	Individual Averages Stocked (g)	Harvested (g)	Gain (g)
1	18.18	29.45	11.27	1.65	89	122	218	96
2	18.64	29.50	10.86	1.70	87	122	224	102
3	18.45	28.27	9.87	1.89	91	122	207	85
Averages	18.41	29.05	10.64	1.75	89	122	216	95

Table 2. Net production, food conversion efficiency, percent survival, and average weight gain for rainbow trout production in Arkansas ponds.

Pond	Stocked weight (kg)	Harvested weight (kg)	Weight gain (kg)	FCE	Percent survival	Individual Averages Stocked (g)	Harvested (g)	Gain (g)
1	69	113	44	1.93	100	136	227	91
2	68	130	62	1.37	99	136	264	128
Averages	68.5	122	53	1.65	99.5	136	245	109

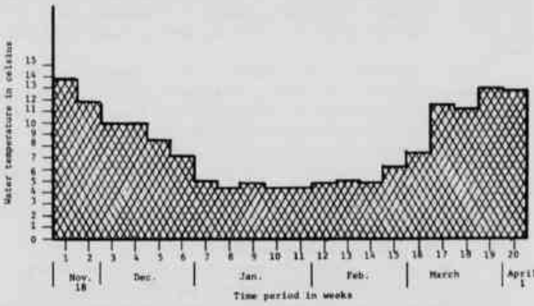

Figure 1. Average weekly water temperature of a 1.6 ha pond at 0.5 meter depth in southeast Arkansas during the winter of 1979-80.

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THE STATE OF CYTIDINE 3', 5' CYCLIC MONOPHOSPHATE (CYCLIC CMP) RESEARCH

The status of cyclic CMP is unclear although the presence of cyclic CMP radioimmunoreactive material (CRIRM) has been demonstrated in a variety of biological tissues and fluids. Furthermore, marked changes in cyclic CMP and CRIRM have occurred at certain times after partial hepatectomy during liver regeneration. In addition, CRIRM is known to increase in cell free systems thought to synthesize the nucleotide from cytidine triphosphate. Several cyclic CMP phosphodiesterases have been demonstrated. Argument about the occurrence of cyclic CMP has arisen because although CRIRM co-chromatographs with both unlabeled authentic cyclic CMP and ³H-cyclic CMP on a number of TLC systems, CRIRM has a different Rf from that of ³H-cyclic CMP or unlabeled cyclic CMP on Dowex-1-formate anion exchange chromatography of acid soluble extracts of biological tissue.

The discovery of cyclic AMP and the development of the second messenger concept constituted a revolution in biological thinking (Sutherland, 1972). In contrast, after almost ten years of research in cyclic CMP, it remains uncertain that this nucleotide is a naturally occurring compound or that it has any biological function at all. For example, in 1980 the only publications in this area were two abstracts on cyclic CM phosphodiesterases (PDE) (Conrad and Bloch, 1980; Helfman et al., 1980), and another communication (Murphy and Stone, 1980) on apparent changes in cyclic CMP concentration during liver regeneration. In 1981, only two communications have appeared so far; (Wikberg and Wingren, 1981) one on non-identity of CRIRM with authentic cyclic CMP and (Scavennec et al., 1981) the other on the occurrence of cyclic CMP in the urine of