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1948 MINNOW PROPAGATION EXPERIMENTS

By C. Troy Yoder[1]

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In 1948, six hatchery ponds and four former trout raceways were utilized to determine if it was possible to rear bait minnows profitably. Four species of minnows were tested under a variety of conditions. Some minnows were fed artificial food, several ponds were fertilized, and other ponds were stocked at similar rates for a comparison. In only two of the ten ponds and raceways was a substantial profit realized. Three of the ponds did not produce sufficient bait minnows to cover the cost of food and fertilizer. One raceway stocked with creek chub fry and fed a meat and cereal mixture produced a substantial profit. The largest net profit was obtained by feeding a cereal food and fertilizing a pond stocked with adult fathead minnows.

In view of the inconsistent and usually unpredictable results in these experiments, as well as previous tests, it can only be concluded that considerable risk is involved and the chance of success probably will not warrant a large investment in artificial ponds. One of the main reasons for frequent failure to make a profit is the short growing season in Michigan. It is necessary to hold most of the young until the second summer before they reach a desirable size. This means a salable crop on alternating years only, and the mortality during the winter months and second summer reduces the profit considerably.

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INSTITUTE FOR FISHERIES RESEARCH

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During the summer of 1948, fourteen ponds and four raceways were utilized for minnow production. The ponds were located at the Wolf Lake, Lydell, and Drayton Plains State fish hatcheries, and the Northville Federal Fish Hatchery. The raceways were located at the Wolf Lake Hatchery. Creek chubs (Semotilus atromaculatus), common suckers (Catostomus commersoni), northern fathead minnows (Pimephales promelas), and the western lake chubsucker (Erimyzon sucetta kennerlyi), were employed as test fish in an attempt to learn the maximum production possible under varying pond conditions. Fertilizers and artificial food were added in certain ponds to seek the maximum production in terms of the dollar value of the bait minnows produced.

In addition to the experiments, an attempt was made to produce and sell chub and sucker fry to minnow dealers desiring to grow their own minnows for the bait market.

Production of Chub and Sucker Fry

For several years, common white suckers (Catostomus commersoni) were seined from the shallow waters of Silver Lake, Cannon Township, Kent County, and taken to the Lydell State Fish Hatchery. The adult suckers were easily seined in the shoal area while conducting their spawning activities and transported to the hatchery for stripping. However, in 1948, the abnormally warm

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weather occurring during the month of March caused the spawning activity to commence nearly a month previous to the regular spawning time. A few males and females were taken in March. Following the warm weather there was a prolonged cold period causing the water temperature to drop again, and as a result the suckers did not appear in the shoal areas for approximately three weeks. At this time, large numbers of gravid females were taken, but the males failed to appear. No males were taken and no fertile eggs were found on the spawning grounds. Due to the failure to obtain a sufficient number of adult males, only a few quarts of sucker eggs were produced and all orders for sucker fry were canceled.

During the winter months, a very heavy mortality had occurred in the brood stock of adult northern creek chubs (Semotilus atromaculatus). Instead of the expected 2,000 breeders, only 170 remained when the pond was drained in late March. An attempt to collect a wild brood stock from streams by seining and shocking produced only 61 additional breeders. The breeders were introduced into the pond below the artificial spawning raceway at the Wolf Lake Hatchery. Spawning activities started immediately, and eggs were collected from the gravel and placed in hatchery jars. However, the activities were abruptly halted when the water temperature dropped below 50°F. The water remained cold for several weeks before warmer weather arrived, and as in the case of the suckers, spawning was very light. The majority of the female breeders absorbed their eggs. A check of the females in several streams in July indicated the same condition occurring in the wild chubs, suggesting a very light production of fry in the streams as well as in the artificial raceway.

All the fry produced were retained for experimental purposes, necessitating the cancelation of chub fry orders.

Creek Chub Production by Feeding in Raceways

Two raceways having the same water source and equal dimensions were each stocked on June 11 with 40,000 advanced chub fry. The raceways were 0.04 acre in area, and therefore the stocking rate was 1,000,000 advanced fry per acre. Feeding was started on June 14 and continued until the raceways were drained and the chubs recovered on September 24. Raceway No. 8 was fed a "meal" diet consisting of 20 percent dried milk, 35 percent meat scrap, 30 percent cotton seed meal, 9 percent low-grade wheat flour, and 6 percent salt. Raceway No. 7 was fed a mixture of the same ingredients with ground horse livers added. At the beginning of the experiment, 25 pounds of food were fed weekly to each raceway. The amount was increased weekly to 100 pounds per week at the conclusion, making a total of 880 pounds fed to each raceway during the experiment. Table 1 shows the production and the cost of food.

TABLE 1

Raceway number	Pounds of food	Cost of food	Av. length of chubs (inches)	Number of chubs produced	Pounds of chubs produced	Approx. retail value
7	405.5 (meal) 474.5 (liver)	$91.99	2.35	11,797	47	$354.00
8	880.0 (meal)	$76.05	2.09	4,802	14	$144.00

This experiment with the two types of diet indicates that a greater production of chubs might be realized when fresh meat is added to the diet. If the production of chubs is calculated on an acreage basis, 294,925 chubs valued at $8,850.00 on the retail market could be produced per acre on a diet of meat and

meal combined. In the raceway receiving the meat and meal diet, the survival rate was considerably higher and the minnows were larger at the conclusion of the experiment.

Sucker Production by Feeding in Raceways

Two 0.04-acre raceways, similar to those described previously, were utilized in the production of suckers (Catostomus commersoni). The raceways were each stocked with 32,000 advanced sucker fry on June 2, and feeding was started on June 14, 1948. Raceway No. 6 was fed the same meal diet as described previously, and raceway No. 5 was fed the meal and horse liver diet. This experiment was conducted to seek the maximum production of suckers in a raceway, and also to determine the effect of the fresh meat in the sucker diet. During 1947, suckers fed on a meat and meal diet suffered high mortality, and the gill covers on the dead fish were found to be shortened or deformed. Table 2 shows the results of the 1948 feeding experiment.

TABLE 2

Raceway number	Pounds of food	Cost of food	Av. length of suckers (inches)	Number of suckers produced	Pounds of suckers produced	Percent having deformed gill covers	Approx. retail value
5	624.5 (meal) 255.5 (meat)	$84.65	2.54	3,726	27.0	26	$111.78
6	880.0 (meal)	$76.05	2.81	8,033	59.5	56	$240.99

The suckers responded better to the straight meal diet, as indicated in the above table. The suckers, in the raceway fed meal alone, were larger and they

had a higher survival rate than those fed on the meat and meal mixture. However, the meal diet produced a greater number of suckers with deformed gill covers. This deformity apparently was not harmful and didn't appear to affect the growth rate.

Pond Production of Suckers

At the federal hatchery located near Northville, Michigan, Pond A (0.36 acre in surface area) was stocked in 1946, 1947 and 1948, with 7,500 advanced sucker fry. Table 3 shows the production for each of the three years.

TABLE 3

Year	Number stocked	Number removed	Percent survival	Average length (inches)	Weight (pounds)	Duration of experiment
1946	7,500	4,136	55.1	3.35	47.35	149 days
1947	7,500	7,000	93.3	3.03	70.0	141 days
1948	7,500	7,120	94.9	2.58	64.5	129 days

This production and the rate of survival for the three years are considerably above any other records of sucker production in ponds at the state fish hatcheries.

Northern Fathead Minnow Production

Five similar ponds at the Wolf Lake Hatchery were stocked with adult northern fathead minnows (Pimephales p. promelas). All five ponds were stocked on June 1, 1948, at the rate of 4,000 adult fatheads per acre, and feeding and fertilizing were practiced to determine the maximum production possible under varying conditions. The breeders averaged 1.99 inches in length when introduced into the pond. The results are shown in Table 4.

TABLE 4

(All figures converted to one acre surface area.)

Pond No.	Food and fertilizer (pounds)	Number of fatheads produced	Wgt. of fatheads (pounds)	Av. length, salable minnows 1.5" and over	Number of salable minnows 1.5" and over	Number too small for sale	Retail value of salable minnows
4	400 (inorganic)	69,464	120.6	1.85	3,199	62,265	$ 95.95
5	control	27,356	42.0	1.72	6,032	21,324	180.96
8	5,088 (meal) 2,000 (sheep manure)	380,100	461.0	1.84	224,661	155,439	6,739.83
10	2,000 (sheep manure)	239,090	193.2	1.73	70,783	168,307	2,123.49
11*	449 (meal)	37					

*Feeding stopped July 9, 1948, when adult largemouth bass were observed in the pond.

The meal was the same mixture as that itemized under the production of chubs and suckers.

In both Pond No. 4 and Pond No. 5, 500 of the adults were marked by removal of the dorsal fin at the time of stocking. When the ponds were drained in the fall, 90 marked fatheads were recovered from Pond No. 4 and 8 from Pond No. 5.

Western Lake Chubsucker Production

Two ponds at the Lydell State Fish Hatchery were used to produce the western lake chubsucker (Erimyzon sucetta kennerlyi). The results are shown in Table 5.

TABLE 5

(All figures converted to one acre surface area.)

Pond No.	Number of adults stocked	Number of adults recovered	Number of young recovered	Wgt. of young (pounds)	Average length (inches)	Retail value of salable minnows
6	62	15	3,461	49.9	3.1	$128.44
9	165	11	219	10.8	4.9	17.52

The results of these experiments are in agreement with former experiments which indicated that chubsuckers often do not reproduce in large numbers in small ponds.

Table 6 summarizes the results of the years work in terms of net profit to a retail minnow dealer excluding the cost of building the pond and labor involved in care and handling of the minnows. All figures are in terms of one surface acre of water.

TABLE 6

(All figures converted to one acre surface area.)

Pond or raceway number	Hatchery	Species of fish	Value of original stock	Cost of feed	Cost of fertilizer	Retail value of bait produced	Net profit or loss of non-salable minnows	Small minnows for following year
Raceway 7	Wolf Lake	Creek chub	$2,500	$2,300	$--	$8,850	$4,050	None
Raceway 8	Wolf Lake	Creek chub	2,500	1,901	--	3,600	-801	None
Raceway 5	Wolf Lake	Suckers	1,200	2,116	--	2,794	-521	None
Raceway 6	Wolf Lake	Suckers	1,200	1,910	--	4,024	914	914
Pond 4	Wolf Lake	Fathead	120	---	10	96	-34	62,265
Pond 5	Wolf Lake	Fathead	120	---	--	181	61	21,324
Pond 8	Wolf Lake	Fathead	120	440	55	6,740	6,125	155,439
Pond 10	Wolf Lake	Fathead	120	---	55	2,123	1,948	168,307
Pond 6	Lydell	Chubsucker	5	---	--	128	123	None
Pond 14	Lydell	Chubsucker	13	---	--	18	5	None

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