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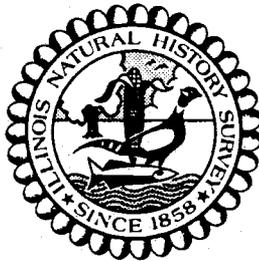
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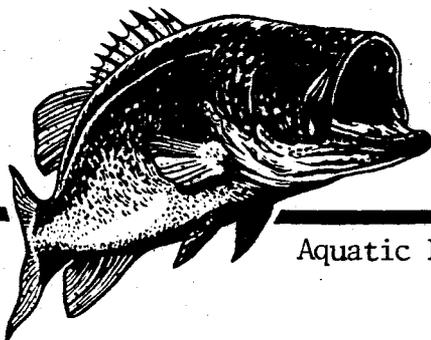
ILLINOIS NATURAL HISTORY SURVEY

EVALUATION OF INDUCED
WHITE CRAPPIE X BLACK CRAPPIE HYBRIDIZATION



Aquatic Biology Section Technical Report

D. Homer Buck and Michael L. Hooe



Annual Performance Report
Federal Aid Project F-42-R

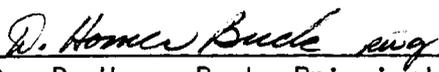
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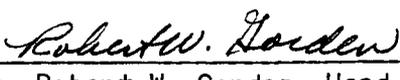
EVALUATION OF INDUCED WHITE CRAPPIE X BLACK CRAPPIE HYBRIDIZATION

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Federal Aid Project F-42-R

D. Homer Buck and Michael L. Hooe



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Project F-42-R, Evaluation of Induced White Crappie x Black Crappie Hybridization, was conducted under a memorandum of understanding between the Illinois Department of Conservation and the Board of Trustees, University of Illinois. The actual research was performed by the Illinois Natural History Survey, a division of the Department of Energy and Natural Resources. The project was supported by Federal-Aid (Dingell-Johnson) funds as prescribed under the Federal Aid in Fish Restoration Act and was performed in compliance with its provisions. The form, content, and data interpretations made in this report are the responsibility of the University of Illinois and the Illinois Natural History Survey, and not that of the Illinois Department of Conservation.

SEGMENT PERFORMANCE REPORT

EVALUATION OF INDUCED WHITE CRAPPIE X BLACK CRAPPIE HYBRIDIZATION

Project No. F-42-R Segment II

D. Homer Buck and Michael L. Hooe

October 1, 1983 to September 30, 1984

STUDY 101: Evaluation of hybrid crappie as a sport fish in farm ponds and small impoundments.

Job 1. Securing brood stock.

Brood stock were collected by electrofishing and frame-nets from April 20 through May 18. "Ripe" white crappie were collected from Rend Lake in Jefferson Co. and Forbes Lake in Marion Co. "Ripe" black crappie were collected from Ridge Lake in Coles Co. and Dawson Lake in McLean Co. All crappie collected were transported to Kinmundy and held in ponds and tanks until needed.

Job 2. Establishment of breeding populations.

To test the potential for the natural production of F1 hybrids, breeding populations were established in 1983 as reported in the Segment I performance report. Species and sex of breeder crappie stocked and total numbers of age-0 crappie recovered are shown in Table 1.

Table 1. Species and sex of breeder size crappie stocked in Spring 1983, and total numbers (N) of age-0 crappie recovered during final census in fall 1983 (ponds 11, 12, 15) or spring 1984 (pond 14).

Pond	Area (ha)	Male	Female	N
11	0.14	White crappie	Black crappie	0
12	0.13	Black crappie	White crappie	2257
14	0.07	White crappie	Black crappie	1869
15	0.14	Black crappie	White crappie	5

Results of isozyme analyses revealed that age-0 crappie recovered from ponds 14 and 15 were F1 hybrids. The age-0 crappie recovered in pond 12 which we presumed to be black male x white female F1 hybrids were morphologically dissimilar to F1 hybrid crappie we had previously examined. For this reason

all the adult breeders and 205 young of the year crappie were examined electrophoretically. These analyses revealed that one of our male breeder crappie was an F1 hybrid, and that ninety-nine percent of the age-0 crappie were the result of backcrossing between this F1 hybrid male and a white female crappie. This F1 hybrid, which we had mistaken for a black crappie, was originally collected in 1982 from either Lake Shelbyville or Schuy-Rush Lake. The age-0 crappie ranged from 62-217 mm in total length.

Mixed breeders for the natural production of hybrids were also stocked in four ponds from April 19-25 in 1984. Total numbers, and types of breeders stocked, are shown in Table 2.

Table 2. Pond surface area and species, sex, and numbers of breeder crappie stocked in ponds 8, 9, 14, and 15 in April 1984.

Pond	Area (ha)	Black Crappie		White Crappie	
		Male	Female	Male	Female
8	0.4	-	20	23	-
9	0.4	21	-	-	23
14	0.07	-	14	11	-
15	0.14	10	-	-	10

To fully assess the young of the year crappie populations, ponds 14 and 15 were drained and censused in August and ponds 8 and 9 in October. Census results are shown in Table 3.

Table 3. Total numbers (N) and sex of breeder crappie and total number of age-0 crappie (N-YOY) recovered during final census 1984.

Pond	Area (ha)	Black Crappie		White Crappie		N-YOY
		N Male	N Female	N Male	N Female	
8	0.4	-	12	22	-	18,783
9	0.4	21	-	-	22	10,460
14	0.07	-	8	9	-	1,877
15	0.14	6	-	-	10	1,205

Electrophoretic examination of age-0 crappie from each of these four ponds showed all crappie tested to be F1 hybrids.

Job 3. Laboratory production of F1 hybrids and their half sibling pure stocks. Over the period May 14-18 we made 21 "crosses", each involving

production of a hybrid and its half-sibling pure stock. Seven of these crosses produced usable fry of both half-sibling stocks.

Eggs stripped from a "ripe" female were divided into two groups of approximately equal numbers. Sperm collected with a micro-pipette from a white crappie was used to fertilize one of the two groups of eggs. Sperm collected in an identical manner from a black crappie was used to fertilize the other group of eggs. Milt and eggs were gently swirled together until homogenous to facilitate fertilization. Water was then added to each group of eggs and the eggs dispersed either over the bottoms of separate glass baking dishes or specially designed spawning trays. Both trays and dishes were placed under continuously flowing water held at a range of 22-24°C until the eggs hatched. Larval fish were then counted and transferred to shallow one-gallon trays. These larvae were nursed to free-swimming fry and stocked.

Job 4. Rearing and stocking of F1 hybrids and half-sibling pure stocks.

To compare first-year growth potentials of the F1 hybrid crappie with their parent stocks, fry of each of the two reciprocal hybrids were stocked separately in ponds with both of their parent stocks. (Table 4).

Table 4. Total numbers and parentage (male x female) of lab-spawned free-swimming crappie fry stocked in 0.4-ha ponds from May 18 through May 23, 1984.

Pond	Half-Sibling		Half-Sibling	
	Black x Black	White x Black	Black x White	White x White
4	600		600	596
7	600	600		600

To compare the growth of lab-spawned and natural spawned hybrids (Job 17), lab-spawned white male x black female fry were stocked in pond 10 and lab-spawned black male x white female fry were stocked in pond 12. Lab-spawned white crappie fry also were stocked in each of ponds 10 and 12 as well as in natural reproduction ponds 8 and 9 (Table 5).

Table 5. Total number and parentage (male x female) of lab-spawned free-swimming crappie fry stocked in ponds 8, 9, 10 and 12 on May 20-21, 1984. Pond surface area is shown in parenthesis.

Parentage	No. Stocked			
	Pond 8 (0.4 ha)	Pond 9 (0.4 ha)	Pond 10 (0.09 ha)	Pond 12 (0.13 ha)
White x White	449	449	449	449
Black x White	-	-	-	600
White x Black	-	-	515	-

Job 5. Production of brood stock of each of the four genetic stocks.

No activities this period.

Job 6. Determination and comparison of sex ratios and first year growths of the four genetic stocks.

Free-swimming lab-spawned crappie fry had been stocked in each of two 0.4-ha ponds in May 1984 (Table 4). Each pond was drained and censused October 11-12. A total of 949 age-0 crappie were recovered from Pond 4 and 1338 from Pond 7. To determine the comparative growth rates of each genetic stock a representative subsample of 200 fish were randomly selected for enzyme analyses. Results from enzyme analysis of the subsample were used to project total numbers, percent survival and percent male and female of each genetic stock in the total population. Data on young of the year crappie from pond 7 are shown in Table 6. Data from pond 4 are not yet available as enzyme analyses are still in progress.

Table 6. Parentage (male x female), total number (N), percent survival, percents male and female, and mean total length (TL), weight (WT) and condition factor (K_{TL}) of age-0 lab spawned crappie from pond 7 censused in October 1984.

	Half-Sibling		
	Black x Black	White x Black	White x White
N	575	569	194
Percent survival	96	95	32
TL (mm)	110	132	119
WT (g)	19.3	30.1	18.1
K_{TL}	1.43	1.30	1.06
Percent Male	49	44	31
Percent Female	51	56	69

The age-0 hybrid crappie in pond 7 were significantly longer and heavier ($P < 0.005$) than the white and black crappie, which confirmed results obtained in Segment 1. Black crappie had a significantly higher condition factor than either the white or hybrid crappie. Black crappie also were significantly heavier than the white crappie ($P < 0.01$); however, the white crappie were significantly longer than the black crappie ($P < 0.005$). Survival rates were good for both the black crappie and F1 hybrids, but white crappie survival was comparatively poor.

Job 7. Determination of second year growth.

In fall 1983 fifty young of the year crappie of each of the four genetic

stocks were given distinctive fin clips and released into 0.4-ha pond 1 and into 0.14-ha pond 11. While total numbers in each were identical (200), the density in the smaller pond was almost three times that in the larger pond. All crappie had been spawned in the lab. Sex and condition when stocked are shown in Table 7. On November 18, 1983 approximately 12 kg of fathead minnows were stocked into each pond to provide forage.

Table 7. Parentage (male x female) and mean total lengths (TL), weights (WT), and condition factors (K_{TL}) of age-0 crappie stocked into 0.4-ha pond 1 and 0.14-ha pond 11 in fall, 1983.

Pond	Parentage	TL (mm)	WT (g)	K_{TL}
1	Black x Black	123	24.1	1.29
	White x Black	92	8.3	1.08
	Black x White	110	14.3	1.06
	White x White	119	18.2	1.09
11	Black x Black	120	21.9	1.25
	White x Black	92	8.5	1.08
	Black x White	108	13.6	1.05
	White x White	118	17.8	1.08

An additional 25 natural-spawned age-1 crappie were stocked in pond 11 on April 19, 1984. These crappie were added to supplement the original stock of white crappie which incurred a post-stocking mortality of 50%. These crappie had a mean total length of 114 mm and a mean weight of 10.4 g. Both second-year growth ponds received an additional 2.7 kg of forage-size fathead minnows on April 26.

Fall censuses of ponds 1 and 11 were conducted October 22-25. A total of 91 age-1 crappie were recovered from pond 1 and 119 from pond 11. All crappie were sorted and identified by fin clips, and each fish was individually weighed and measured. During the sorting process we found several fish in both ponds that looked like F1 hybrid crappie but had the appropriate clip for black crappie. Each of these questionable fish were frozen for enzyme analysis. Analyses are now in progress which will reveal the genetic identity of the fish in question, and will permit comparisons of second-year growths.

Job 8. Securing stocks and establishing advanced, mixed populations of largemouth bass, bluegills and channel catfish.

To supplement the existing forage base established in the fall of

1983, 2.9 kg of fathead minnows were stocked into each of ponds 2, 3, 5 and 6 on April 26, 1984. Immediately following the fall census each pond was restocked with approximately 50 pounds of adult largemouth bass, 112-150 age-0 largemouth, 100 adult bluegill, 500 sub-adult bluegill and 50 channel catfish. Forage-size bluegill < 75 mm in total length were stocked in amounts ranging from 3.6 - 15.5 kg per pond.

Job 9. Introduction of crappie brood stocks into "normal" sportfish populations, monitoring and maintaining populations.

Due to excessive mortality of adult white crappie in Pond 2, a supplemental stocking of 5 pair of white crappie was made on April 19, 1984. These fish were of the same age and origin as the crappie originally stocked, and had a mean total length and weight of 242 mm and 192.1 g.

Intensive seine sampling was conducted in all four ponds in August to determine if young of the year crappie were present. No age-0 crappie were recovered from any pond; however, seining was hampered in three of the four ponds by large amounts of brittle naiad (Najas minor).

A complete assessment of the crappie populations was made during fall census. Limited numbers of age-0 crappie were recovered from two of the four ponds. Adult crappie growth data and total number of age-0 crappie recovered from each pond are shown in Table 8.

A total of 18 age-1 crappie were also recovered from pond 6. These were survivors of a limited spawn in that pond in 1983. The mean total length and weight of these age-1 black crappie was 169 mm and 65.3 g respectively. All crappie surviving the fall 1984 censuses were restocked in the ponds from which they came.

Table 8. Parentage (male x female), total number (N) and mean total lengths (TL), weights (WT) and condition factors (K_{TL}) of adult crappie and the total number of young-of-the-year crappie (N-YOY) recovered during the fall 1984 census.

Pond	Parentage	N	TL(mm)	WT(g)	K _{TL}	N-YOY
2	White x White	13	257	224	1.29	7
3	White x Black	14	263	262	1.44	0
5	Black x White	12	240	191	1.38	13
6	Black x Black	13	231	187	1.49	0

Reproductive success of largemouth bass and bluegill varied from pond to pond. Numbers of age-0 fish recovered from individual ponds ranged from 483 to 6,510 for largemouth bass and from 1547 to 72,780 for bluegill. All age-0 bass and bluegill recovered alive were restocked. Adult bass, bluegill, channel catfish, and sub-adult bluegill were censused and the numbers restocked adjusted to maintain similar numbers of each species in all four ponds (See Job 8).

- Job 10. Spring draining censuses and establishment of experimental populations.

Experimental populations were censused and/or established from February through May as reported under Jobs 2, 4, 7, 8, 9 and 13.

- Job 11. Use of enzyme analyses to determine genetic composition.

Enzyme analyses were conducted on 1984 black and white crappie brood stocks used in the laboratory production of both pure stocks and both reciprocal hybrid crappies. No detectable levels of interspecific hybridization were evident. Electrophoretic analyses were also used to identify age-0 crappie as reported under Jobs 2, 6 and 17. Further analyses of age-0 crappie (Jobs 6 and 17) and age-1 crappie (Job 7) are in progress.

- Job 12. Fall draining censuses and population analyses in 0.4-ha ponds.

Fall censuses were conducted on a total of 14 ponds in 1984 from late August through October. Results of these censuses are given under Jobs 6, 7, 9 and 17.

- Job 13. Draining census and establishment of study population in a 1.4-ha impoundment located on station grounds, monitoring of population.

On February 23, 1984 a total of 456 white male x black female F1 hybrid crappie were stocked in 1.4-ha Marlow Pond. Each of these 1984 year class lab-spawned hybrids was given a left pectoral fin clip. These crappie had a mean total length of 134 mm, a mean weight of 33.2 g, and a mean condition factor (K_{TL}) of 1.38.

- Job 14. Test fishing.

No activities this period.

- Job 15. Final draining census and population analysis of 1.4-ha pond.

No activities this period.

- Job 16. Analysis and reporting of data.

Analysis of fall census data is still in progress.

Job 17. Comparison of growths made by lab-spawned hybrids and pond spawned hybrids.

On May 20-21, lab-spawned white male x black female fry were stocked in pond 10 and lab-spawned black male x white female fry were stocked in pond 12 (Table 5). Lab-spawned white crappie were also stocked in ponds 10 and 12 (Table 5) as well as in natural reproduction ponds 8 and 9. Ponds 8 and 9 had been stocked with breeders of mixed sexes for the natural production of each of the reciprocal hybrids as shown in Table 2.

The comparative growth potentials of the lab-spawned and natural-spawned hybrids (both reciprocal crosses) originally were to be evaluated on the basis of how the growth of each compared to that of the white crappie which shared the same environment. However, when drained and censused in October, 1984, 18,783 young of the year crappie were recovered from pond 8, 10,460 from pond 9, and only 12 from pond 10. Enzyme analyses on a random subsample of 200 crappie from each of ponds 8 and 9 failed to detect any white crappie. With no detectable survival of white crappie in ponds 8 and 9, and with such poor survival in pond 10, no meaningful comparisons of growth were possible. A total of 183 young of the year crappie were recovered from pond 12, for which enzyme analyses are in progress. A different strategy for this job will be developed for 1985.

