Trihybrid Sunfishes: Their Growth, Catchability, and Reproductive Success Compared to Parentals and Hybrids

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Abstract: Survival, growth, reproductive potential, and catchability of parental, F_1 hybrid, and trihybrid sunfishes were evaluated in hatchery ponds for 28 months. The longear sunfish ♂ x redbreast sunfish ♀ F_1 hybrid, its reciprocal, and these F_1 hybrids outcrossed with the reader sunfish (i.e., trihybrids) were produced artificially, but natural hybridization in ponds was erratic. Survival of all fish types was good, and growth of F_1 hybrids and trihybrids was greater than that of parentals. Only 1 F_1 hybrid (redbreast sunfish ♂ x longear sunfish ♀) exhibited a reduced reproductive potential. F_1 hybrids and trihybrids were more vulnerable to angling than parental types. Generally, trihybrids grew better and were easier to catch than F_1 hybrids.

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The high reproductive potential of sunfishes (*Lepomis* spp.) often results in overabundant, stunted populations which are problematic to both anglers and fishery managers. However, when they attain a large size, sunfish are desirable sport fishes. With increasing management by states of small state-owned and municipal park lakes, there is a demand for large sunfishes with limited or no reproductive capacity.

Numerous researchers have investigated various F_1 (first generation) sunfish hybrids which are capable of attaining large sizes (Ricker 1948, Krumholz 1950, Lagler and Steinmetz 1957, Childers and Bennett 1961, 1967, Childers 1967, Heidinger and Lewis 1972, Henderson and Whiteside 1975, Crandall and Durocher 1979). Most of these hybrids resulted from various crosses using green sunfish (*L. cyanellus*), bluegill (*L. macrochirus*), and redear sunfish (*L. microlophus*); all had limited reproductive potential.

A hybrid sunfish that produces no offspring but displays hybrid vigor has not been developed. A trihybrid sunfish (F_1 hybrid outcrossed with a third

species) has the potential to be sterile and still grow rapidly (Dr. J. Gold, Texas A&M Univ., pers. commun., 1979). Several trihybrids have been artificially produced (Smitherman and Hester 1962, Childers 1967), but only Childers reared any to sexual maturity and they reproduced successfully.

Longear sunfish (*L. megalotis*) and redbreast sunfish (*L. auritus*) have never been hybridized; therefore, survival, growth, reproduction, and catchability of this cross are unknown. Additionally, outcrossing this F_1 hybrid could produce a sterile sunfish exhibiting increased hybrid vigor. This study was initiated to determine if the longear sunfish x redbreast sunfish F_1 hybrids and trihybrid (F_1 hybrid x redear sunfish) could be produced; and, assuming they could, to evaluate their suitability as potential sport fishes in Texas waters.

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Methods

Evaluation of F_1 hybrid and trihybrid sunfishes (Table 1) occurred over a 4-year period (1980–1983). Abbreviations in Table 1 are used in the text to identify fish types; the male species is listed first. During the first year of the study, parental and F_1 hybrids were produced either naturally or artificially. The second year included evaluation of survival, growth, reproductive potential, and catchability of these fish and production of trihybrids. In the third year, evaluation of parentals and F_1 hybrids was completed, and trihybrid evaluation initiated. In the fourth year, the trihybrid evaluation was concluded.

Table 1. Fish types (male listed first) evaluated in the sunfish hybridization study, Texas, 1980–1983.

Common name	Scientific name	Abbreviation
Longear sunfish	*Lepomis megalotis*	LE
Redear sunfish	*L. microlophus*	RE
Redbreast sunfish	*L. auritus*	RB
Redbreast sunfish x longear sunfish	*L. auritus* x *L. megalotis*	RBLE
Longear sunfish x redbreast sunfish	*L. megalotis* x *L. auritus*	LERB
Redear sunfish x (redbreast sunfish x longear sunfish)	*L. microlophus* x (*L. auritus* x *L. megalotis*)	RE x RBLE
Redear sunfish x (longear sunfish x redbreast sunfish)	*L. microlophus* x (*L. megalotis* x *L. auritus*)	RE x LERB
(Redbreast sunfish x longear sunfish) x redear sunfish	(*L. auritus* x *L. megalotis*) x *L. microlophus*	RBLE x RE
(Longear sunfish x redbreast sunfish) x redear sunfish	(*L. megalotis* x *L. auritus*) x *L. microlophus*	LERB x RE

Species Selected for Study

Two isolated populations of exceptionally large specimens of RB and LE were located in central Texas, and fishes were collected for broodstock. Average total length (TL), weight and SE of these male and female RB were 252 ± 2 mm and 363 ± 7 g and 246 ± 4 mm and 348 ± 21 g, respectively. Measurements for male and female LE were 195 ± 3 mm and 220 ± 11 g and 169 ± 3 mm and 143 ± 7 g, respectively. Hatchery RE broodstock were used as required.

Production Procedures

Broodstock of LE, RB, and RE were transported to Heart of the Hills Research Station, Kerr County, Texas, during 1980, prior to their normal spawning seasons. Five pairs each of the 5 crosses LE ♂ x LE ♀, RB ♂ x RB ♀, RE ♂ x RE ♀, LE ♂ x RB ♀, and RB ♂ x LE ♀ were stocked in separate 0.2-ha ponds to produce offspring naturally for evaluation. Natural production of F_1 hybrid offspring was also attempted in the laboratory manipulating photo period and water temperature as described by Banner and Hyatt (1975).

Because natural production of F_1 hybrids was unsuccessful in both ponds and the laboratory, artificial propagation procedures were initiated to produce these fish as the 1980 spawning season progressed using techniques described by Smitherman and Hester (1962). Fertilized eggs were obtained from both crosses and maintained in aquaria. Upon yolk sac absorption, fry were stocked in separate 0.25-ha rearing ponds until the following spring. In 1981, trihybrids were produced using the same technique and fry similarly reared.

Since natural pond production of F_1 hybrids was unsuccessful in 1980, natural reproduction tests were conducted through the remainder of the study (3 years). Each summer, 0.04-ha ponds located on the San Marcos State Fish Hatchery, Comal County, Texas, were stocked with adults necessary to make all hybrid and trihybrid crosses (Table 2). Ponds were drained each fall to determine if reproduction had occurred.

Pond Stocking

Offspring of each fish type produced the previous summer were removed from rearing ponds in April and transported to Lewisville State Fish Hatchery, Denton County, Texas, and stocked in separate 0.2 to 0.3-ha ponds for the 2-year evaluation. Initially ponds were stocked at 1,000 fish/ha; ponds were drained the subsequent October and April, and stocking rates were adjusted to 800 and 650 fish/ha, respectively. When fish were available, replicate ponds were stocked for each fish type.

Survival and Growth

Fifty randomly selected fish from each pond were anesthetized and individually measured and weighed each time ponds were drained. All fish in a

Table 2. Natural reproductive success of 6 fish types stocked in separate 0.04-ha ponds at the San Marcos State Fish Hatchery, Comal County, Texas.

Fish[a] types stocked	1980 Adults stocked ♂	1980 Adults stocked ♀	1980 Adults removed ♂	1980 Adults removed ♀	1980 Offspring produced	1981 Adults stocked ♂	1981 Adults stocked ♀	1981 Adults removed ♂	1981 Adults removed ♀	1981 Offspring produced
RB ♂ and LE ♀	5	5			no	6	3	4	1	yes
LE ♂ and RB ♀	5	5			no	2	3	2	0	no
RE ♂ and RBLE ♀										
RE ♂ and LERB ♀						15	10	12	8	no
RBLE ♂ and RE ♀						15	15	13	14	yes
LERB ♂ and RE ♀						15	15	11	10	no

Fish[a] types stocked	1982 Adults stocked ♂	1982 Adults stocked ♀	1982 Adults removed ♂	1982 Adults removed ♀	1982 Offspring produced	1983 Adults stocked ♂	1983 Adults stocked ♀	1983 Adults removed ♂	1983 Adults removed ♀	1983 Offspring produced
RB ♂ and LE ♀	3	3	1	1	no	3	1	0	0	no
LE ♂ and RB ♀	3	2	1	1	yes	6	4	0	2	no
RE ♂ and RBLE ♀	3	3	1	3	no	3	3	3	3	no
RE ♂ and LERB ♀	3	3	3	2	no	3	1	0	0	no
RBLE ♂ and RE ♀	3	3	2	1	yes	3	3	0	1	yes
LERB ♂ and RE ♀	3	3	2	3	no	3	3	3	2	yes

[a] Abbreviations are defined in Table 1.

pond were counted to determine survival and stocking rate adjustments and then restocked.

Analysis of variance (ANOVA) tests compared differences in growth between fish types. If significant differences were detected, Bonferroni pairwise comparisons were made to determine statistically significant comparisons.

Sex Ratios and Reproductive Potential

At the end of the 2-year evaluation, 50 randomly selected fish from each pond were sacrificed to determine sex ratios (calculated as a percentage). Gonads of these fish were examined for positive determination of sex.

Each fall, offspring produced in each evaluation pond were removed and counted. If a pond contained few offspring, they were individually counted and bulk weighed. For ponds containing larger numbers of offspring, subsamples were taken, counted and weighed prior to extrapolation of fish numbers from the total weight of offspring. Number and total weight of offspring/hectare and number of offspring/adult female were compared. Number of adult females in each pond each fall was based on sex ratios determined at the end of the study.

Catchability

Catchability tests were conducted each fall in evaluation ponds just prior to pond draining. Fishermen used artificial lures (fly rods with popping bugs) or live bait (cane poles with earthworms). Each pond was fished for a 1-hour period during the morning and evening with each fishing method each day. The sequence in which ponds were sampled was chosen at random for the first fishing day and rotated daily so all ponds were fished at similar times. Each pond was fished 6 to 10 hours/fall/fishing method. Catch was recorded as number of fish caught/angling hour.

After each pond was drained to determine number of fish present, catches were converted to percentages [(catch/number present) x 100] and tested for differences between fish types using ANOVA techniques. Arcsin transformations were made on square roots of catchabilities for analyses. Bonferroni pairwise comparisons were made as warranted.

Results and Discussion

Due to pond availability and time constraints, evaluation of trihybrids was 1 year later than that of similar-aged parental and F_1 hybrids. Environmental differences between years could have affected comparisons; and since crosses were evaluated in separate ponds, specific pond conditions could have caused differences in measured parameters. These factors should be considered when interpreting the results.

Natural Reproduction

Natural reproduction occurred in LE, RB, and RE ponds in 1980, but not in hybridization ponds (Table 2). Subsequent yearly hybridization attempts yielded inconsistent results. The RBLE ♂ crossed with RE ♀ produced offspring every year the cross was attempted (3 years), this being the only cross attempted with such success.

Reasons for the erratic spawning success can only be conjectured. In 1981, high broodstock density was used while in 1982, low density was used; both yielded inconsistent results. In 1983, opercular flaps were removed from all broodstock as described by Lewis and Heindinger (1978); however, results were similar to those of previous years. Poor results in some ponds could have been caused by low broodstock survival (Table 2); however, there was also no reproduction in ponds where broodstock survival was high.

Natural reproduction in F_1 hybrid ponds was so inconsistent from year to year that the feasibility of hatchery pond production of these hybrids seems questionable. Natural pond production of RBLE x RE could be routinely accomplished, but would require continued maintenance of F_1 hybrid broodstock. Natural reproduction in sunfish hybrids can occur during a 3- to 4-year

period (Heidinger and Lewis 1972, Lewis and Heidinger 1978, Kurzawski and Heidinger 1982), so artificial propagation of F_1 hybrid broodstock would be required every 3 to 4 years.

Survival and Growth

Survival of all fish types was similar during the study period except for RB; a bacterial outbreak caused heavy RB mortality when they were approximately 16 months old (Table 3). Most observed mortalities for the other fish types were associated with handling stress incurred when ponds were drained each spring and fall.

Growth data show that both F_1 hybrids and trihybrids generally grew faster than parental types throughout the study (Table 3). Trihybrids grew rapidly during most of the study, but growth slowed by the last pond draining. However, F_1 hybrid growth was relatively rapid and weight gain between the last 2 pond drainings was approximately 45 g for both types (Table 3). This suggests these fish had not attained their full size. Bluegill ♂ x green sunfish ♀ F_1 hybrids grown under similar hatchery conditions exhibited a similar growth pattern, while rate of growth for bluegill ♂ x redear sunfish ♀ and green sunfish ♂ x redear sunfish ♀ F_1 hybrids was slower (Crandall and Durocher 1979).

No 1 fish type was significantly larger in length and weight than all others at the end of the 28-month growth period; therefore, they were arbitrarily ranked from greatest to least difference in lengths and weights compared to all others (Tables 4, 5). The RE x RBLE ranked first in both length and weight categories, while RE x LERB ranked second and third in those categories, respectively. The RBLE ranked third overall. The parentals (LE and RE) ranked the lowest and were significantly smaller than all other fish types.

Growth data revealed that crossing the largest F_1 hybrid (RBLE) with the RE paternal produced the largest trihybrid. The RE paternal trihybrids grew larger than either of the hybrid paternal trihybrids. Kurzawski and Heidinger (1982) stated that the size fish attained their first year was instrumental in determining subsequent growth. Ranking the fish types in the present study according to initial lengths and weights at stocking agrees with their observation (Table 3). Initially, fast growing fish types maintained rapid growth until they approached their apparent maximum size.

Except for RE, males were significantly longer and heavier than females for most fish types at 28 months of age (Table 6). Carlander (1977) cited several sources noting no difference in size between sexes in RE. Bluegill ♂ x redear sunfish ♀ and green sunfish ♂ x bluegill ♀ F_1 hybrid males have been reported to grow larger than the females (Ricker 1948, Lewis and Heidinger 1971). Differences in size and coloration of fish made visual determination of sex reasonably accurate when fish were this age. However, coloration could not be used to distinguish between the 2 F_1 hybrids, nor among the 4 trihybrids. Trihybrids differed from F_1 hybrids in coloration; all trihybrids had the characteristic RE red spot on their opercular flaps. The F_1 hybrid males

Table 3. Mean total length (TL in mm) and weight (WT in g) with SE and percent survival (%) for all fish types evaluated in the hybrid sunfish study, Texas, 1980–1983. Length–weight data were collected from 50 of each fish type at each sampling, and fish were the age (months) noted. Fish were initially stocked in evaluation ponds at 10 months of age; R indicates a rank from largest (1) to smallest (9) combined length and weight at stocking.

	10 months			16 months			22 months			28 months		
Fish type[a]	TL	WT	R	TL	WT	%	TL	WT	%	TL	WT	%
LE	120 ± 2	43 ± 2	9	146 ± 1	69 ± 2	70	158 ± 1	108 ± 3	55	167 ± 1	113 ± 3	69
RE	131 ± 2	46 ± 3	8	173 ± 1	97 ± 3	88	187 ± 1	130 ± 4	92	193 ± 1	131 ± 2	88
RB	149 ± 1	62 ± 2	6	176 ± 2	99 ± 4	8						
RBLE	148 ± 1	82 ± 2	3	178 ± 1	127 ± 2	89	193 ± 1	175 ± 3	82	205 ± 1	220 ± 4	85
LERB	141 ± 1	72 ± 2	5	168 ± 1	103 ± 2	83	182 ± 1	138 ± 2	84	195 ± 1	184 ± 3	85
RE x RBLE	156 ± 2	81 ± 4	2	199 ± 1	190 ± 4	95	211 ± 1	223 ± 5	99	217 ± 1	230 ± 5	96
RE x LERB	153 ± 5	89 ± 8	1	187 ± 2	141 ± 5	87	204 ± 2	212 ± 6	97	212 ± 1	212 ± 5	83
RBLE x RE	146 ± 3	79 ± 5	4	175 ± 1	115 ± 3	93	190 ± 2	162 ± 5	96	200 ± 2	167 ± 5	93
LERB x RE	139 ± 2	57 ± 3	7	184 ± 1	136 ± 3	79	200 ± 1	192 ± 3	91	211 ± 1	200 ± 4	89

[a] Abbreviations are defined in Table 1.

Table 4. Mean differences in total length (mm) with significance level[a] for each fish type at 28 months of age when compared to all others evaluated in the hybrid sunfish study, Texas, 1980–1983. Fish types were ranked (R) from greatest (1) to least (8) difference when compared to all others.

Fish type[b]	LE	RE	RBLE	LERB	RE x RBLE	RE x LERB	RBLE x RE	LERB x RE	R
LE		−26.46***	−38.08***	−28.71***	−49.94***	−45.02***	−33.46***	−43.84***	8
RE			−11.62***	−2.25	−23.48***	−18.56***	−7.08*	−17.40***	7
RBLE				9.37***	−11.86***	−6.94**	4.62	−5.78**	4
LERB					−21.23***	−16.31***	−4.75	−15.15***	6
RE x RBLE						4.92	16.48***	6.08*	1
RE x LERB							11.56***	1.16	2
RBLE x RE								−10.40***	5
LERB x RE									3

[a] Asterisks denote significance at $P < 0.05$*, $P < 0.01$**, or $P < 0.001$***.
[b] Abbreviations are defined in Table 1.

Table 5. Mean differences in weight (g) with significance level[a] for each fish type at 28 months of age when compared to all others evaluated in the hybrid sunfish study, Texas, 1980–1983. Fish types were ranked (R) from greatest (1) to least (8) difference when compared to all others.

Fish type[b]	LE	RE	RBLE	LERB	RE x RBLE	RE x LERB	RBLE x RE	LERB x RE	R
LE		−17.28***	−107.05***	−70.92***	−116.24***	−99.04***	−53.52***	−86.68***	8
RE			−89.07***	−53.64***	−98.96***	−81.76***	−36.24***	−69.40***	7
RBLE				36.13***	−9.19	8.01	53.53***	20.37**	2
LERB					−45.32***	−28.12***	17.40	−15.76*	5
RE x RBLE						17.20	62.72***	29.56***	1
RE x LERB							45.52***	12.36	3
RBLE x RE								−33.16***	6
LERB x RE									4

[a] Asterisks denote significance at $P < 0.05$*, $P < 0.01$**, or $P < 0.001$***.
[b] Abbreviations are defined in Table 1.

Table 6. Mean total lengths (TL) and weights (WT) at 28 months of age for all fish types evaluated in the hybrid sunfish study, Texas, 1980–1983.

Fish type[a]	TL (mm)			WT (g)		
	♂	♀		♂	♀	
LE	170 ± 2	162 ± 1	**[b]	127 ± 4	95 ± 2	**
RE	194 ± 1	191 ± 2	NS	133 ± 2	123 ± 5	NS
RBLE	208 ± 1	191 ± 2	**	235 ± 2	153 ± 6	**
LERB	199 ± 1	187 ± 1	**	196 ± 2	150 ± 5	**
RE x RBLE	217 ± 1	211 ± 2	*	234 ± 5	164 ± 4	**
RE x LERB	214 ± 1	206 ± 3	*	225 ± 6	182 ± 7	**
RBLE x RE	203 ± 2	197 ± 2	NS	177 ± 6	151 ± 7	**
LERB x RE	214 ± 1	203 ± 3	**	214 ± 4	164 ± 7	**

[a] Abbreviations are defined in Table 1.
[b] Significance levels are denoted with asterisks at $P < 0.05$* or $P < 0.01$**; NS denotes non-significance.

typically had broader opercular flaps than RB males and longer flaps than LE males. Females of all fish types generally exhibited a drab coloration and their opercular flaps were smaller than those of the males.

Male RBLE and RE x RBLE grew exceptionally large in 28 months (Table 6). Crandall and Durocher (1979) reported bluegill ♂ x green sunfish ♀ F_1 hybrids averaged 250 g after 29 months. Redear ♂ x green sunfish ♀ F_1 hybrids grew to approximately 315 g in 1 pond in 3 years (Heidinger and Lewis 1972) and Ricker (1948) reported bluegill ♂ x redear sunfish ♀ F_1 hybrids achieved 454 g in weight 3 summers after stocking. Crandall and Durocher (1979) evaluated the latter 2 hybrids and found their growth was less than that in the previous investigations or the F_1 hybrids and trihybrids in the present study. This suggests comparisons of growth among sunfishes from other studies should be done with caution.

Sex Ratios and Reproductive Potential

Sex ratios of F_1 hybrid and trihybrid sunfishes (Table 7) showed a propensity toward maleness, but only RE x RBLE were skewed as dramatically as previously reported for other F_1 hybrid crosses (Ricker 1948, Childers 1967, Henderson and Whiteside 1975, Crandall and Durocher 1979). Lewis and Heidinger (1978) noted the source of broodfish can affect sex ratios. The LE exhibited an even sex ratio, while RE showed male predominance. Since the RE broodstock had been reared on state fish hatcheries for years, this skewed sex ratio could be an expression of the hatchery broodstock selection process. Sex ratios could also have been affected by increased mortality in males. Bennett (1970) reported more male sunfish are found in young-of-the-year, while females dominate older year classes in lakes. Wide variation in sex ratios between replicate ponds suggests that caution should be taken in reference to the high sex ratio for RE x RBLE since there was no replicate for this cross. If

Table 7. Sex ratios of adults and offspring production data for each fish type stocked in separate 0.2–0.3-ha ponds during the hybrid sunfish study, Texas, 1980–1983. Production data were collected when ponds were drained in October each year. Number of offspring produced per adult female was based on sex ratios derived when ponds were drained at the end of the second production year.

Fish type[a]	Sex ratio (%)		Offspring							
			Total *N*		*N*/ha		Kg/ha		*N*/adult	
			First year	Second year	First year	Second year	First year	Second year	First year	Second year
LE	56	44	28,060	34,780	138,226	171,330	185.5	271.0	314	693
RE	76	24	140,821	68,150	475,747	230,236	226.5	204.2	1,982	1,456
RB			51,079		172,564		296.9			
RBLE	80	20	11,342	990	38,842	3,390	147.8	35.1	194	89
RBLE	84	16	9,185	210	31,455	719	104.8	7.2	197	7
LERB	76	24	17,760	60,625	60,821	149,486	164.5	291.7	868	3,278
LERB	72	28	14,125	26,875	67,182	92,038	105.8	184.3	822	1,730
RE x RBLE	94	6	475	20,578	2,093	90,652	7.0	93.9	59	2,572
RE x LERB	68	32	3,180	39,477	10,890	173,907	165.4	148.9	92	1,316
RBLE x RE	60	40	10,210	36,225	34,966	124,161	204.1	80.3	95	647
LERB x RE	80	20	36,565	47,888	125,225	164,000	160.7	97.0	655	1,330
LERB x RE	64	36	8,767	40,526	30,024	138,788	230.8	84.8	83	795

[a] Abbreviations are defined in Table 1.

this factor is disregarded, RBLE and RE x RBLE exhibited the most male-dominant sex ratios.

Male predominance is considered a prerequisite for low reproductive potential (Lewis and Heidinger 1978), and other researchers have noted this occurring in some sunfish hybrids (Childers and Bennett 1961, Henderson and Whiteside 1975, Crandall and Durocher 1979, Laarman 1979). In the present study, offspring production by all fish types varied considerably, regardless of sex ratio (Table 7). Generally, more offspring were produced by 2-year-old than 1-year-old fish; however, there was considerable yearly variation among crosses. The RBLE exhibited low offspring production in replicate ponds both years suggesting this hybrid has low reproductive potential. No other differences in offspring production among fish types could be detected because of the variability.

Catchability

Except for LERB x RE being caught significantly easier on worms than RB and RE x RBLE the first fall (Fig. 1), there were no differences in catchabilities between fish types. No other statistical differences were detected probably because of the high variability in the catch data. For example, a fisherman might have caught 10 fish of a particular type in an hour of fishing and the next fisherman on that pond would catch none. This was a typical occurrence. Statistical analyses were not necessary to compare differences in catchability between the 2 fishing methods, because it was obvious that the fish were more vulnerable to worms than popping bugs.

General observations from Fig. 1 suggest more fish were caught on worms the first year than the second; fish may be harder to catch as they age. Yearly live bait catch data were combined for each fish type and ranked from highest (1) to lowest (8). Generally, trihybrids were more easily caught than other fish types. Apparently, crossing the 2 parentals (LE and RB) increased the catchability of the F_1 hybrids. Increased vulnerability of hybrid sunfish to angling has been reported by several researchers (Childers 1967, Childers and Bennett 1967, Henderson and Whiteside 1975, Crandall and Durocher 1979). RE were easier to catch on worms than F_1 hybrids and this characteristic apparently increased trihybrid catchability. So few fish were caught on popping bugs that interpretation of the data was difficult.

Summary and Conclusions

It was determined that F_1 hybrid and trihybrid sunfishes evaluated in this study could be produced artificially but very erratically through natural hybridization. Growth rates and apparent maximum sizes of F_1 hybrids and trihybrids were greater than parental types. Generally, reproductive potential of F_1 hybrids and trihybrids was similar to that of parental types. F_1 hybrids and trihybrids were more easily caught than parentals in catchability tests.

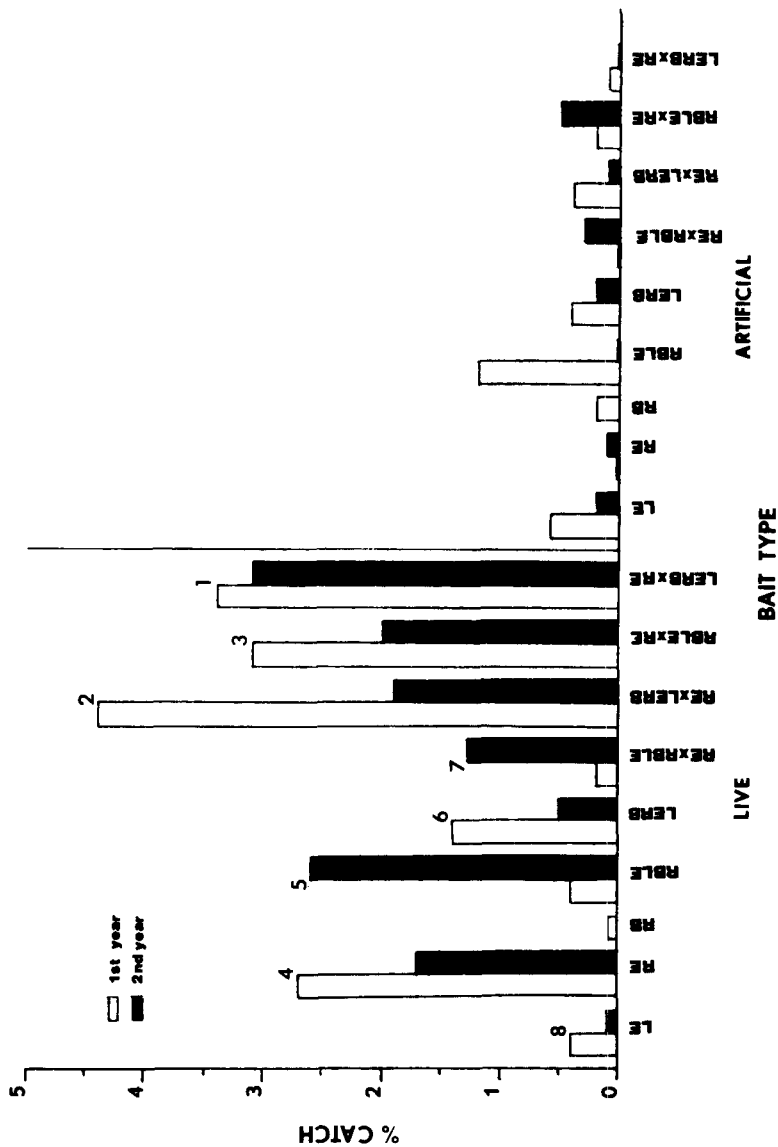

Figure 1. Mean percent catch [(number caught/number present) x 100] for all fish types caught on worms or popping bugs during the hybrid sunfish study, Texas, 1980–1983. Catchability tests were conducted when fish were 16 (first year) and 28 (second year) months old. Fish types were ranked from most (1) to least (8) vulnerable to angling and ranks are included above columns.

No F_1 hybrid or trihybrid excelled in all categories evaluated. The RE x RBLE exhibited the best survival and growth, but ranked low in catchability. The RBLE x RE could be created through natural hybridization and was easy to catch, but grew slower. The LERB trihybrids exhibited good growth and catchability characteristics, but sex ratios showed low male predominance. The RBLE ranked high in growth and exhibited a reduced reproductive potential, but was generally harder to catch than trihybrids.

Data from this study suggests that certain characteristics of the fish types evaluated could be changed through hybridization. Production of hybrid sunfish to increase growth and catchability and reduce reproductive potential is a common practice. Creation of the trihybrid increased growth and catchability even more. This suggests that a hybridization program which continually outcrosses the newly created fish type until the desired characteristics are achieved could possibly produce the "ideal" sunfish for small impoundments.

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