Adaptability and Current Status of Introductions of Sacramento Perch, *Archoplites interruptus*, in North America[1]

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ABSTRACT

The Sacramento perch, *Archoplites interruptus* (Girard), is a relict centrarchid, historically found west of the Rocky Mountains. Since 1960, this species has been introduced into waters east of the Rocky Mountains. Sacramento perch are euryhaline and adaptable to inland mineral waters whose high salt content precludes the establishment of other game fishes. The species has survived and reproduced in chloride-sulfate waters with salinities near 17,000 ppm. Survival of Sacramento perch has not been recorded in sodium-potassium carbonate waters exceeding 800 ppm in total alkalinity.

Recent introductions have been made in Arizona, Colorado, Nebraska, New Mexico, South Dakota, and Texas. The annual growth rate of Sacramento perch is good in the larger alkaline and saline lakes where interspecific competition is limited to a few species. Natural propagation is not difficult and can be obtained in small rearing ponds.

Aside from releases into mineral waters devoid of game fishes and hatchery pond propagation, fisheries agencies have shown little concern for the management of Sacramento perch in North America.

INTRODUCTION AND ORIGINAL DISTRIBUTION

Documented reports indicate that the Sacramento perch is native to the Sacramento-San Joaquin drainage and the Pajaro and Salinas river systems of California. The species, first described and named by Girard (1854), also occurred in other river systems of California prior to the settlement of the area. Miller (1946) suggested that *A. interruptus* is a survivor of an ancient (Miocene) fauna which probably antedated the Rocky Mountains. The occurrence of *Archoplites* in Plio-Pleistocene Lake Idaho and in the Great Valley of California, provides evidence of a former connection between the Snake River or its antecedent and the Sacramento-San Joaquin drainage system (Miller and Smith, 1967).

Sacramento perch were first transplanted from California to western Nevada about 1877. Mills spoke of the Indians selling the perch from Pyramid and Walker Lakes, Nevada, in 1897 (La Rivers, 1962).

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RECENT INTRODUCTIONS

More recent Sacramento perch introductions have been made in Utah, Texas, Arizona, New Mexico, Colorado, South Dakota, North Dakota, and Nebraska. The earliest of these releases was in Garrison Reservoir, Utah (Sigler and Miller, 1963) and represented the only stocking of the species in that state. Since then, there have been additional releases in Utah, (R. Sumner, pers. comm., 1969).

In 1961 the Nebraska Game and Parks Commission released adult perch from the Pyramid Lake stock into five Nebraska sandhill lakes and ponds. Following these successful introductions, and consequent natural reproduction, fingerling fish (Figure 1) were introduced into several North Dakota mineral waters during the fall of 1963.

In 1964, the first Colorado perch release was made in Nee Granda Reservoir. In 1965, the first of several perch releases was made in Newall Lake, Colorado. New Mexico and Texas received their first introductions of Sacramento perch in 1966 while Arizona releases were completed during June of 1967. Except in Colorado, their survival has not been encouraging; however, adequate post-release evaluation of the survival, growth and

FIGURE 1.—Close-up photograph of a Sacramento perch fingerling.

natural reproduction has not been reported. Netting surveys of Hamlin Lake in Texas have failed to locate survival or reproduction from the original release of 1966 (D. W. Dillon, pers. comm., 1968).

The Nee Granda introductions in Colorado were followed by only one netting survey. No perch were found and additional surveys have been suspended since the lake is presently almost dry. The release of 130 adult perch in 1965 and 2,000 fingerling perch in 1966 into Newall Lake has been followed by numerous surveys in subsequent years. In March 1969, 198 Sacramento perch fingerlings were captured in trap nets from Newall Lake indicating that a spawning population has been established.

Recent introduction of the fish into experimental ponds and reservoirs in California has met with insignificant success. Only a minor population of Sacramento perch remains in Clear Lake, California, where during the 1930's and early 1940's the species was considered common. In 1964 *Archoplites* was stocked in Lake Almanor and Virginia Ranch Reservoir, California. These plants were made to determine how this species will do in the various environments.

Limited creel census work at Lake Almanor during the past several years has not recorded any perch. The population at Virginia Ranch Reservoir has apparently spawned but electrofishing and angling turn up only a few. The species has recently been discovered in Cowley Lake, California, but it is not known how or when they were introduced there (A. Calhoun, pers. comm., 1969).

LIFE HISTORY

Spawning

The most pronounced characteristic of the perch, unlike other centrarchids, is the almost complete avoidance of nest building activity. This unique spawning behavior has been previously documented by Breder (1936), Neal (1931), Murphy (1948), and more recently by Mathews (1965). Failure of the adults to guard the eggs was not considered a problem in aboriginal times; however, during more

TABLE 1.—*Spawning information for Sacramento perch from Nebraska lakes and ponds*

Estimated spawning date	Spawning age of fish present		Water temperature (F)	Fry-fingerling size (mm) on sampling date
	I	Above age I		
7- 7-64	X		79–81	8–12
7- 5-62		X	80–82	15–20
7-31-63		X	–	22–70
11-15-63	X		–	28–45
6-20-62		X	72–76	eggs
7- 5-62		X	82	15–20
8-17-62		X	82	18–28
8-17-64	X		78–80	15–25
8-14-64	X		8–82	10–15
9-24-62	X		80–81	15–18

recent times such introduced species as the bluegill have made the eggs vulnerable to predation (Miller, 1961).

Sacramento perch select a variety of spawning sites. In Clear Lake, California, Murphy (1948) found eggs adhering to algae on boulders in about 2 feet of water. The spawning sites at Lake Anza and Kingfish Lake, California, were at depths of 8 to 18 inches (Mathews, 1965). All were situated in 8- to 12-inch wide pockets in bottom rooted vegetation. Adjacent bottom areas, presumably unused, consisted of unvegetated gravel and mud. In a 20-gallon aquarium study, Mathews (1965) reported that eggs were deposited over vegetation and small rocks.

In White Lake, South Dakota, spawning perch were observed utilizing patches of sago pondweed (*Potamogeton pectinatus*) growing in 12–20 inches of water. The bottom deposits were mainly sand and sandstone shale. Also, for the first time in this water, eggs were collected from windblown tumbleweeds submerged in 1–3 feet of water.

Although no direct observations have been made on the spawning sites in Round Lake, North Dakota, the abundant distribution of wigeon grass, *Ruppia maritima*, sago pondweed, and *Chara* sp. throughout the limnetic zone of the lake provides adequate habitat for spawning. The bottom type is mostly glacial drift boulders, sand and gravel, (D. B. McCarraher, mimeo. rept., 1963).

The dense growth of *P. pectinatus* and *Chara* sp. in Newall Lake, Colorado provides ample spawning habitat. Evidence of successful spawning here was first presented by Gregory (1968).

Spawning Temperatures

Sacramento perch have an extended spawning period, with age II and older females spawning earlier than the age I group. The earliest recorded spawning date in Nebraska lakes was on 2nd May when the surface water temperature was 73 F. Other temperature-spawning relationship data are presented in Table 1. These spawning dates resemble findings reported by Mathews (1965) when he recorded temperatures between 71–75 F in natural and aquarium situations. The major spawning season in Pyramid Lake appears to extend from mid-May through June when surface temperatures reach 72–75 F. Murphy (1948) observed spawning fish in Clear Lake, California, on 15th of June in 1 to 2 feet of water when the surface temperature was 75.5 F. The spawning area substrate consisted of boulders covered with algae and scattered stands of *Potamogeton* sp. He examined the substrate following spawning activity and found adhesive eggs attached to algae on the boulders and on the *Potamogeton.* During the period 19th May–June 26 the water temperature at 2 feet varied from 84 F to 62 F. Coleman (1930) recorded perch abundant in shallow coves where the young appeared the last of March and first week of April.

Growth Rates

Although growth rate undoubtedly reflects abundance and availability of food organisms, Sacramento perch appear to grow well in most regions (Table 2).

In 1849, Sacramento perch were reported to reach 15–20 inches in lakes of the San Joaquin and Tulare valleys (Harris, 1960). In Pyramid Lake, Nevada, anglers have reported catches of 13 to 16 inch perch with weights ranging from 1 to 3 pounds (Tharratt and McKechnie, 1966).

Food Habits

Recent studies of the feeding habits in the sandhill lakes of Nebraska indicate that fingerling to Age I fish preyed almost entirely on available invertebrate life. Within the less alkaline sites, i.e. Clear Lake, perch fed almost entirely on zooplankters and *Hyalella azteca.* Upon attaining a length of 5.0 inches and

TABLE 2.—*Growth rate of Sacramento perch in North America*

Locality	Total length in inches								
	Age I	II	III	IV	V	VI	VII	VIII	IX
California									
Clear Lake	3.5	7.0	8.0	9.0	–	–	–	–	–
Colorado									
Newall Lake	3.8	7.6	9.3	–	–	–	–	–	–
Nebraska									
Big Alkali Lake	4.3	7.4	–	–	–	–	–	–	–
Clear Lake	5.2	7.6	9.6	11.2	12.8	13.3	–	–	–
Hudson Lake	4.7	7.1	8.6	9.5	10.1	–	–	–	–
North Twin Lake	5.8	7.5	8.8	9.8	–	–	–	–	–
Walgren Lake	5.1	7.6	9.0	11.2	–	–	–	–	–
Nevada									
Indian Lakes	2.8	5.0	7.1	8.7	10.5	12.2	–	–	–
Lahontan Reservoir	2.7	4.9	6.7	8.5	10.2	11.5	12.8	13.5	14.3
Pyramid Lake	3.8	6.5	8.5	10.5	12.0	12.8	13.8	14.5	15.5
Walker Lake	4.0	6.8	8.2	10.2	11.8	12.5	–	–	–
Washoe Lake	2.7	4.0	5.1	6.2	8.5	10.3	11.2	12.3	–
North Dakota									
Round Lake	3.2	–	–	–	–	–	–	–	–
South Dakota									
White Lake	2.8	4.6	–	–	–	–	–	–	–

over the proportion of invertebrate and fish forage remains in stomachs examined was about equal. The abundance of fathead minnows, *Pimephales promelas* (Rafinesque), in Hudson Lake, as well as in other lakes, presents a forage species readily available to the adult perch. Only minor evidence of cannibalism was encountered in those lakes where fathead minnow populations occurred.

Several specimens of perch were examined by La Rivers (1962) from Washoe Lake, Nevada, and were found to be feeding on insects, Dytiscidae and Corixidae.

Turner and Kelley (1966) reported food habits of the perch in the San Joaquin Delta of California as being similar to that for other areas, except that mysid shrimp and amphipods rather than aquatic insects were major items.

Parasites

La Rivers (1962) noted that the Sacramento perch is heavily infested with internal and external parasites on certain occasions in Pyramid Lake. Relating to the sedentary nature of the species, he observed fish containing leeches during certain periods of the year.

Relationships with Other Species

The decline of Sacramento perch populations in the Sacramento-San Joaquin river systems of California has been directly attributed to the introduction of exotic species in these waters. Rutter (1907) reported that the perch were already becoming scarce in this river system in 1896. According to Murphy (1951) the perch decline in Clear Lake, California, was also directly attributed to competition from introduced species. Clear Lake contained ten species of native fish in 1925 (Coleman, 1930). Of these, only *A. interruptus* and the squawfish, *Ptychocheilus grandis* (Ayres), could be considered predator species. The introduced predatory largemouth bass, *Micropterus salmoides* (Lacépède); black crappie, *Pomoxis nigromaculatus* (Lesueur) and several species of catfish were, by the late 1920's, becoming increasingly abundant in the lake. Jordan and Gilbert (1894) wrote of the perch becoming increasingly scarce because of spawning grounds destroyed by carp.

Thurston Lake, California, at one time contained a balanced population of *A. interruptus*, brown bullhead, *Ictalurus nebulosus* (Lesueur) and largemouth bass. Following the introduction of white catfish, *Ictalurus catus* (Linnaeus), in 1933, *A. interruptus* disappeared.

The interspecific competition in Nebraska lakes, although the product of only recent introductions, reveals certain species relationship patterns. The most successful introductions have been made into natural lakes

TABLE 3.—*Water quality (in ppm) of lakes where Sacramento perch have survived for 12 months or more*

Lake	pH	Carbonate	Bicarbonate	Total alkalinity	Sulfate	Chloride	Calcium	Magnesium	Sodium	Potassium	Total solids
Colorado											
Banner	7.8	0.0	108	108	3,125	8.5	425	39.03	–	14	6,024
Newall	7.8	40	215	255	10,000	1,350	940	1,200	1,400	18	19,862
Nebraska											
Big Alkali	9.0	76	712	788	18	20	22	–	189	–	1,114
Clear	8.4	320	50	370	4	8	–	–	200	300	620
Hudson	9.3	212	658	870	50	41	42	22	350	300	1,215
McKeel Pond	9.1	248	1,410	1,658	56	85	42	7	430	310	2,160
North Twin	8.6	105	664	769	6	16	60	62	–	–	370
Rodgers	9.2	332	632	964	14	34	16	–	300	215	1,193
Walgreen	8.5	110	325	435	4	8	–	–	–	–	380
Nevada											
Little Soda	9.2	105	540	645	2,021	1,207	33	–	4,791	–	5,310
Pyramid	9.3	236	1,020	1,256	266	2,080	9	121	1,770	120	5,220
Stillwater	8.6	40	455	495	275	400	82	37	983	–	1,380
Twin	10.6	252	79	331	839	538	21	–	2,490	–	2,544
Walker	9.7	505	1,550	2,055	1,820	1,950	6	123	2,830	157	8,440
North Dakota											
Round	9.5	630	900	1,530	388	185	64	10	900	65	2,680
South Dakota											
White	9.3	466	903	1,368	562	100	33	0.0	435	187	1,880

previously renovated to remove existing fish populations, i.e. Clear Lake, Cherry Co.; Walgren Lake, Sheridan Co.; or in alkaline lakes where the fathead minnow is the only species present, i.e. Hudson Lake, Cherry Co. Releases of *A. interruptus* in lakes following partial fish winterkill has also been satisfactory, i.e. North Twin Lake, Rock Co.

Two years following the release of fingerling perch into Clear Lake, largemouth bass and rock bass, and walleye, *Stizostedion vitreum vitreum*, (Mitchill), entered the lake by overflow drainage from nearby Dewey Lake. By 1966 largemouth bass was the dominant species although annual reproduction of *A. interruptus* continues to be adequate with four year classes now common in the lake. Clear Lake appears to contain the best fishable perch population at present with specimens up to 11.2 inches (1.4 lbs) available for angler harvest (R. Peckham, pers. comm., 1968).

In North Twin Lake three year classes of perch are currently competing well with expanding populations of yellow perch, *Perca flavescens* (Mitchill), and black bullhead, *Ictalurus melas* (Rafinesque).

A. interruptus was first released into Hudson Lake, Cherry Co., in 1961. At the time of stocking only the fathead minnow resided in the lake. Today, this minnow and the Sacramento perch still comprise the total fish fauna of Hudson Lake although other species of fish have been released into this alkaline lake (McCarraher and Thomas, 1968).

A combination fishery of Sacramento perch and white perch, *Roccus americanus* (Gmelin) in Walgren Lake, Nebraska, should provide interesting association data. Both species have produced strong year classes and appear to be in direct competition throughout the year.

The present fish population in Newall Lake, Colorado, consisted of carp, *Cyprinus carpio* (Linnaeus); pumpkinseed, *Lepomis gibbosus* (Linnaeus); plains killifish, *Fundulus kansae* (Garman); fathead minnow; bluegill, *Lepomis macrochirus* (Rafinesque); green sunfish, *Lepomis cyanellus* (Rafinesque), and the Sacramento perch. Thus far the perch is competing well with these species. None of the centrarchids is abundant as only one specimen of each has been captured. This would also indicate lack of natural reproduction. The centrarchids were reportedly caught in other lakes and released by juvenile fishermen living near the lake. Apparently carp are unable to spawn every year and are not too abundant.

In Round Lake, North Dakota, initial releases of *A. interruptus*, were made in the presence of an abundant population of brook stickleback, *Culaea inconstans* (Kirtland). Survival of the perch in this simple population structure was observed for two years.

The long term continuation of the *Archo-*

plites fishery in Pyramid Lake reflects the ability of the species to compete in a comparatively simple fish community. The Lahontan cutthroat trout, *Salmo clarki henshawi* (Gill and Jordan), and the perch constitute the major sport fishes in the lake. There is little documented evidence to point to direct competition between these two species inasmuch as their "niche" preferences are dissimilar for most of the year.

ECOLOGY

Very little information has been previously recorded concerning the Sacramento perch and its habitat. Since 1961 numerous experiments with the fish have been carried out under natural conditions throughout the Nebraska sandhills region. Major emphasis was directed towards the varying survival success in ponds of different chemical characteristics (D. B. McCarraher, mimeo. rept., 1963).

A summary of chemical data (Tables 3 and 4) reveals variable survival results under predominantly alkaline conditions. Adult Sacramento perch were found during both aquaria and field studies to be more tolerant of mineral water compounds than fingerling perch. An example of individual tolerance was found in Smithy's experimental pond No. 2 where, 38 days after their release, the total alkalinity reading was 4,083 ppm (Table 4). The perch collected were in good body condition and had been feeding on Corixidae. Other experiments with this fish in ponds and lakes showed poor survival when the total alkalinity reached the 2,000 ppm concentration level.

Bicarbonate alkalinity appears to exert less harmful effects than does the concentration of carbonate alkalinity. Potassium carbonate was the single most limiting chemical characteristic found in the majority of sandhill lake sites where Sacramento perch failed to survive and become established (Table 4). In other areas of the United States excessive sulfate and sodium ions in lakes suggested why introduced perch did not survive in these sites. Such lakes as Nee Granda (Colorado), Lake George (North Dakota), and Lazy Lagoon, Mirro and Lea Lakes in New Mexico reflect water chemistry of the sulfate and chloride types.

TABLE 4.—*Water quality (in ppm) of lakes in which Sacramento perch survived less than 12 months*

Lake	pH	Carbonate	Bicarbonate	Total alkalinity	Sulfate	Chloride	Calcium	Magnesium	Sodium	Potassium	Total solids	Known survival period
Colorado												
Nee Granda	8.4	8	182	190	8,800	600	644	775	1,600	–	13,825	Not recorded
Nebraska												
By-Way	9.3	716	1,505	2,221	20	178	52	8	870	500	3,800	60–80 days
Diamond	9.8	922	1,163	2,085	106	68	20	–	1,150	950	4,018	40–60 hours
Goose	9.4	520	1,440	1,960	48	320	45	12	700	510	3,350	65–69 days
Little Alkali	9.8	987	1,951	2,938	101	155	16	140	728	775	3,450	20–26 days
McKeel Pond-2	9.2	610	1,470	2,080	40	140	59	1	1,100	1,200	4,300	70–82 days
Smithys	9.6	680	1,760	2,440	85	182	56	30	743	570	3,350	110–124 days
Smithys Pond-1	9.3	960	1,850	2,810	72	160	22	20	810	600	3,900	52 hours
Smithys Pond-2	9.6	1,140	2,941	4,083	190	240	38	8	2,000	950	5,400	38 days
W. Long Pond-2	9.3	590	1,480	2,070	60	110	–	–	–	–	2,850	240 days—winter kill
New Mexico												
Lazy Lagoon	8.3	0.0	84	84	5,200	11,200	1,300	792	–	–	25,200	7–11 hours
Lea	8.2	0.0	120	120	2,200	3,400	960	180	1,500	–	8,300	4–5 days
Mirror	8.2	0.0	130	130	3,900	4,800	970	390	3,900	–	15,500	5–7 hours
North Dakota												
Lake George	9.4	1,026	776	1,802	12,000	2,600	12	770	5,500	–	15,300	4–10 hours
Texas												
Hamlin	8.1	0.0	40	40	510	1,400	1,400	1,600	610	14	3,800	Not known

TABLE 5.—*Salinity tolerance tests of Sacramento perch*[1]

Date	Temperature (C)	Total solids (ppm)	Remarks
6-29-67	23	7,000	2 (3.5") and 2 (5.5"–6.5") Sacramento perch e.o.d.
7- 1-67	23	8,000	No distress symptoms. Active feeding.
7- 6-67	24.5	10,500	No distress symptoms. Active feeding.
7-11-67	24.0	10,800	No distress symptoms. Active feeding.
7-17-67	22.0	13,000	No distress symptoms. Active feeding.
7-19-67	21.0	14,000	No distress symptoms. Active feeding.
7-23-67	22.0	15,000	No distress symptoms. Active feeding.
7-28-67	21.0	15,000	2 small perch in distress.
7-29-67	20.5	15,000	2 small perch dead—larger fish alive and active.
8- 5-67	22.0	15,000	1 large fish in distress.
8- 6-67	22.0	15,000	1 large fish dead.
8- 7-67	22.0	15,000	Surviving large fish in distress not feeding.
8- 8-67	22.0	13,800	Surviving fish alive.
8-20-67	21.0	12,200	Surviving fish alive and feeding again. Test terminated.

[1] Conducted with an Instant Ocean aquarium at Kearney State College, Kearney, Nebraska.

Recent salinity (sodium-chloride) experiments suggest that *Archoplites* ceases active feeding at about 15,000 ppm total solids, with death occurring shortly thereafter (Table 5). However, the species presently persists in Newall Lake, Colorado (17,000 ppm salinity) and represents the only known resident population surviving in a lake with this salinity. The *Archoplites* population appears to be abundant and natural recruitment stable in Pyramid Lake, Nevada, with total solids attaining about 5,200 ppm. Somewhere between the salinity values of these two lakes appears to be a mortality threshold greatly reducing the survival of fry to maturity. Bio-assay studies in Nebraska mineral water ponds showed no survival of fry and fingerlings up to 40 cm (TL) whereas larger perch in the same tests survived for extended time periods in Smithy's and McKeel ponds (Table 5).

R. Gregory (mimeo. rept., 1968) is currently continuing studies on the survival and growth of the species in Newall Lake, Colorado, where the total solids have increased from 9,300 ppm in 1966 to over 19,000 ppm in 1967. The proportion of sulfates in the lake has also greatly increased. A recent measurement in Newall indicated that the T.D.S. have dropped to 8,700 ppm in 1969. Since the *Archoplites* population continues to reproduce and grow in this salinity range it represents survival under saline conditions heretofore unrecorded.

Many biologists have sought to understand survival of species wholly in terms of the environment. However satisfactory this may be, in the final analysis, the means by which *Archoplites* respond to their milieu should be determined by the peculiarities of their internal mechanisms. The ability of osmoregulatory organs to absorb or discharge water and/or ions as required, determines the type of mineral water in which the fish can live and the range of salinity and alkalinity it can tolerate. During the present studies the components and function of the osmoregulatory mechanisms in *Archoplites* were not investigated. It is intended to study tissue tolerance to fluctuations in blood osmoconcentration in the future. Even if *Archoplites* is able to adjust to the osmotic problem of inland mineral waters, they are faced with an imbalance of ions, lower oxygen concentrations, adverse pH, strange buffer systems and large temperature fluctuations.

MANAGEMENT

Aside from fish stocking very little management activity has been directed towards the species throughout North America. Over 20 years ago, Murphy (1948) considered the fish a zoological rarity and a worthwhile game fish. Following his life history studies in Clear Lake, California, he suggested that steps be taken to preserve and increase the species.

Natural propagation is easily obtained in small rearing ponds and has been a source for fingerling stock in California, Nebraska, and North Dakota. B. Curtis (unpublished, 1946) placed 16 adult Sacramento perch in a one-third acre California pond and five months later harvested 23,000 fingerling fish. At the Valentine Hatchery in Nebraska annual rearing of the species in 1-acre drainable ponds has been practiced since 1961. The ponds are stocked with adult fish by early June and drained by late September. The number of fingerlings harvested from the ponds has ranged from 0 to about 14,000 with a great fluctuation of fingerling numbers in the same ponds over a period of years. Aside from the hatchery ponds, numerous ⅓- to 2-acre natural sandhill depression ponds have been used for experimental brood sites. Natural reproduction occurred in those sites where the total alkalinity did not exceed 2,000 ppm throughout the summer months.

With the establishment of a reproducing population in Newall, fish from this lake will be used as a source of supply for stocking other selected waters in Colorado. Perch are now available for fishermen harvest in Banner Lakes, Colorado. A limit of five Sacramento perch has been set for Banner.

Management of Sacramento perch in Nevada is limited to continued stocking in lakes where they have done well in the past. Perch have been released in Walker Lake, Nevada, from which they disappeared about 10 years ago. Studies will be made to determine if perch can now survive there with the TDS approaching 9,500 ppm. The only significant Sacramento perch fishing in Nevada occurs in Pyramid Lake. Regulations there are currently five fish in the bag and in possession (R. Sumner, pers. comm., 1969).

DISCUSSION

In its native range in California and Nevada, the decline of Sacramento perch during the past 10 years has been of some concern. With the establishment of self-sustaining populations of Sacramento perch in Nebraska and Colorado, the future of this species appears more promising. The greatest advantage of this species lies in its ability to survive and reproduce in saline-alkaline waters, thus providing a sport fishery potential where none previously existed. Their disadvantage is that they commonly do best with fewer numbers of competing species. In addition, they are reportedly difficult to catch in some lakes.

When considering their introduction, workers are strongly urged to adhere to the recent policies of the exotic fishes conference (Sport Fishing Institute, 1969). Although Sacramento perch have not been known to overpopulate, their transplanting into open waters should be given careful study.

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