ANGLER HARVEST IN HEATED FISHING DOCKS ON AN OKLAHOMA RESERVOIR[1]

Dennis P. Lingenfelter and Robert C. Summerfelt
Oklahoma Cooperative Fishery Unit
Oklahoma State University
Stillwater, Oklahoma 74074

ABSTRACT

In 1969-70 there were 50 active commercial, heated fishing docks on Grand Lake, a 18,818 hectare reservoir in northeastern Oklahoma. During the winter-spring of 1969-70, fishermen interviews were made to determine fishermen catch statistics. Docks were sampled Friday through Monday during the period 28 January through 30 April 1970. A total of 1365 interviewed fishermen caught 3963 fish in 4462 hours of fishing (0.89 fish/man-hour). One carp (*Cyprinus* carpio) was captured, with the balance of 3962 fish in the sample represented by white crappie (*Pomoxis annularis*) of 239 mm mean total length and 194 g mean weight. Age composition of 234 fishermen caught fish was 94% age group III and IV, with age IV comprising 67.1% of the catch.

The total population of fishermen using 41 of the 50 commercial docks was obtained from records kept by the dock operators. Using creel interviews at 50 docks, the winter-spring harvest of white crappie and man-days of fishing in the heated docks was estimated. Fishing pressure was determined by extrapolating total man-days from 41 to all 50 docks and harvest was obtained by multiplying sample catch rates by total man-hours. Extrapolated total man-days of fishing in heated docks in 93 days from 28 January through 30 April 1970 was 31,494 man-days. The average trip length for sample data was 4.9 hours/trip and the total man-hours was 153,562 hours. Applying 28 January through 28 February 1970 catch rate and fishing pressure, stratified by weekend-weekday, as an estimate of the same parameters for 1 November 1969 through 27 January 1970, the estimate of the winter-spring 1969-70 (1 November through 30 April) fishing pressure was 60,016 man-days (3.19 man-days/ha) or 293,656 man-hours (15.60 man-hours/ha). Estimated total harvest was 255,024 fish (13.534 fish/ha) or 48,962 kilograms (2.60 kg/ha).

Compared with kg/ha values for crappie from nine southern reservoirs, the heated fishing dock harvest on Grand Lake was greater than three and would comprise at least 30% of four others. Furthermore, the Grand Lake heated dock harvest of crappie approximated 19% of the unweighted mean angler harvest of crappie (9.0 kg/ha) from 79 U.S. reservoirs.

Rotenone samples in the summer of 1970 indicated a total standing crop of white crappie to be 24.43 kg/ha. The total harvest from heated dock fishing, those fish not usually harvested by fishermen, 18.3% of the biomass of catchable-sized crappie were harvested by winter anglers fishing indoors in heated docks.

INTRODUCTION

Houser and Heard (1958) estimated that 37.1% of the total annual (1955-56) fishing effort (592,671 man-days) on Fort Gibson Lake, a 7,692 hectare Oklahoma reservoir, were indoor dock fishermen. The indoor fishermen comprised 91.3% of the December-January fishing pressure, and 33.6% of the March-May fishing pressure. The authors, however, did not delineate the

[1]Presented at the Southern Division, American Fisheries Society, Knoxville, Tennessee, October 1972 (26th Annual Conference, S. E. Assoc. Game & Fish Comm.).

significance of indoor fishermen to the seasonal or total annual harvest, nor did they characterize the difference in composition or catch rates of indoor and outdoor fishermen. Gasaway (1967) reported 96,908 man-hours of fishing in 7 heated docks in one year on Tenkiller Ferry Reservoir, Oklahoma. This pressure comprised 22% of the total angler use for this reservoir. Although popularity of indoor heated fishing docks in southern impoundments is obvious from data of Houser, Heard and Gasaway, which illustrate relative importance of heated dock fishing to total fishing pressure, yet catch composition, catch rates, and contribution of indoor fishing to total harvest are largely undescribed. The purpose of this study was to characterize, in Grand Lake, the angler harvest in heated dock fishing, and to relate this harvest to the standing crop of white crappie.

The white-crappie is the most popular game fish in Grand Lake, with intensive fishing pressure occuring for it during the winter months in heated docks of the type illustrated by Bennett (1971, Figure 9.7). It appeared that a large percentage of the annual harvest of white crappie in this reservoir would be taken during winter fishing in heated docks. Fifty-four commercial, heated fishing docks were present on Grand Lake during the winter-spring of 1969-70, of which 50 were in operation. A creel survey of dock fishing was conducted on 54 of 93 possible days, 28 January through 30 April 1970, to yield estimates of winter-spring fishing pressure, harvest, and fishing success. Using cove rotenone samples taken in the summer of 1970, the winter-spring yield in heated docks was related to the standing crop of white crappie. Age and back-calculation of growth was made on 234 of the crappie obtained during interviews.

DESCRIPTION OF STUDY AREA

Lake O' The Cherokees, commonly referred to as Grand Lake, was formed in 1940 by the construction of Pensacola Dam across the Grand (Neosho) River in northeastern Oklahoma (Okla. Water Res. Bd., 1971). The lake lies in the transitional zone between the Ozark Mountains and tall grass prairie. Grand River Dam Authority (GRDA) created the lake initially for flood control and hydroelectric power (OWRB, 1965 and GRDA, N.D.), with recreation and fish and wildlife later added as a purpose for impoundment (OWRB, 1971). Grand Lake differs from the majority of other large reservoirs in Oklahoma as private ownership of shoreline property is condoned, making the lake "one of the most popular with resort and weekend vacationers in northeastern Oklahoma" (OWRB, 1971).

The morphometry of Grand Lake is given in Table 1 from OWRB (1970) and Jenkins (1953, 1913). At conservation pool, the lake extends 96.5 kilometers upstream from the dam. The shoreline has several tributary arms and has many bays and coves. Rocky, clear, relatively deep coves are typical of the lower portion of the lake, while shallow inlets with mud and silt bottoms exemplify the upper section. Generally, water level fluctuation is about 3.0 to 4.6 meters annually (Thompson, 1950).

Table 1. Morphometric data on Grand Lake ("Lake O' The Cherokees") standing crop of all fish and crappies from summer (1970) rotenone samples.

	Metric	English
Conservation pool elevation (msl)	227.1 m	744.9 ft.
Surface area (c.p.)*	18,818 hectares	46,510 acres
Storage capacity	$2.06X10^9m^3$	$1.67X10^6$ acre-ft.
Shoreline length	2,092 km	1,300 miles
Maximum depth	36.6 m	120.0 ft.
Average depth	9.1 m	29.8 ft.
Shoreline development index	43.0	43.0
Morphoedaphic index	6.0	6.0
Standing crop of all fish	449.8 kg/ha	401.3 lbs/acre
Standing crop of crappies	24.43 kg	21.8 lbs
Crappie as % total standing crop	5.4%	5.4%

*c.p. = conservation pool elevation of 227.1 meters.

CREEL SURVEY DESIGN

A basic and often difficult aspect of creel surveys on large reservoirs is the problem of determining fishing pressure (Lambou, 1961). This problem was greatly alleviated in this survey through the cooperation of dock operators. Forty-one of the 50 operators provided information on the total number of fishermen using their enterprises. An estimate of total fishing pressure was made by extrapolating total man-days from 41 to all 50 docks. Expansion was done by using the data from 41 docks to calculate the man-days per dock per day for each size strata of docks ($<$ or $>$ 20 man capacity), and then multiplying these factors by the number of docks lacking information in these strata and the days in the survey. Since fishing pressure differed greatly between weekends and weekdays, expansion was enacted separately for both time periods on a monthly basis. Total man-hours were also calculated for weekends and weekdays within each month by multiplying total man-days for each time interval by the average fisherman trip length for that interval. Average trip lengths were calculated from information obtained from fishermen with completed trips. Monthly totals were achieved by summing weekend and weekday totals within each month.

Total harvest in numbers and pounds was calculated by multiplying weekend and weekday catch rates within each month by the respective total fishing pressure (man-hours) within these intervals and summing the products to achieve monthly and overall totals. There was no significant correlation ($P > 0.05$) in catch per man-hour verses time spent fishing for both weekend and weekday fishermen. Thus, incomplete trips were unbiased estimates of catch rates since catch rate was not a function of the time spent fishing. Harvest per hectare was computed using lake area at conservation pool elevation.

Harvest calculated for dock fishing 28 January through 30 April 1970 underestimates the total harvest attributable to such fishing for the complete winter season, generally from November 1 through April. Therefore, to obtain an estimate of "typical" winter heated dock fishing, a direct proportion expansion was made of the estimates for that part of the survey period which seemed most representative of the November 1 through January 27 interval. Expansion was done for weekdays and weekends spearately. The fishing pressure and catch statistics for 28 January through 28 February were used as the best estimate of the same statistics for the 88-day period from 1 November 1969 through 27

January 1970. The validity of the extrapolations was supported by reports of dock operators, that angler pressure and catch rate are about the same November through February, and by observations of Houser and Heard (1958) on Fort Gibson Reservoir, Oklahoma. Houser and Heard observed 5.0 and 4.0% of total annual pressure in November and December, respectively, compared with 3.2 and 3.6% for January and February, respectively. It can be inferred from data given by Houser and Heard (1958) that 28 January through 28 February data would also closely approximate or slightly underestimate catch rate for 1 November through 27 January.

On each day of the survey 5 of the 50 floating docks were randomly chosen by assigning numbers from a table of random numbers (Snedecor and Cochran, 1967) to each of the docks every survey day, and selecting the 5 docks with the largest numbers for survey. Selection was done without replacement, as there was no reason to sample the same dock more than once on a given day. In a few cases when docks contained no fishermen, the dock in closest proximity to the originally selected dock was sampled in an effort to reduce travel expenses. Dock visitation was almost exclusively by automobile. The survey began at approximately 0930-1000 hours each day and was concluded near 1700 hours. The time spent at each dock varied according to number of fishermen present and their catch.

Since the docks varied significantly in the number of fishermen they could accomodate, the sampling was stratified according to dock size. Forty-two docks with seating capacities > 20 fishermen were assigned two random numbers as proposedto one for the 8 smaller capacity docks. This arbitrary stratification was based on pre-survey observations on fishermen usage, and was an attempt to maximize the number of fisherman contacts throughout the study. In retrospect, this stratification appears valid, in that fishing pressure was notably less in docks with seating capacities < 20 fishermen; whereas, no distinct pattern in fishing pressure was apparent in higher capacity docks.

During interviews, fishermen were asked to confer total time they had been fishing and length and weight and scale samples were obtained of their catch. Johnson and Wroblewski (1962) and Grosslein (1961) found that although individual fishermen were often greatly in error concerning their fishing time, their individual errors tended to compensate.

The catch rates of crappie were computed as the number and weight of fish caught per man-hour of fishing. These indices to fishing quality are commonplace (e.g., Brown, 1971; Barkley, 1960; Carter, 1957; Churchill, 1957; Cole and Finkelstein, 1959; Davis and Hughes, 1965 and 1967; Houser and Heard, 1958; Jackson, 1966; Lambou and Stern, 1959). Weight per unit of effort is probably a better index of fishing success in making comparisons between different bodies of water because it is a function of both the number and size of the fish (Shetter, 1944). Catch per hour is a more valid index than catch per fisherman trip because most of the survey data was collected from incomplete fishermen trips and the lengths of fishermen trips varied considerably. Grosslein (1961) and Lambou (1966) concur that catch per hour is more desirable than catch per trip, as the yield may be more accurately calculated from the former. As recommended by Lambou, weight and number per man-hour, and average weight of the fish caught were reported as indices of fishing quality in this paper.

Catch rates in terms of number of crappie per man-hour were calculated, as recommended by Lambou (1966) and Carlander *et al.* (1958), as the ratio of total catch to total hours fished (Table 2). Kilograms per man-hour were computed by multiplying number per man-hour for each time interval by the average weight of fish captured within that interval. Catch rates were computed separately for weekdays and weekends by month.

RESULTS AND DISCUSSION

A total of 1365 fishermen were interviewed in 54 interview days between 28 January and 30 April 1970 (Table 2). The interviewed fishermen creeled 3962 white crappie in 4462 hours of fishing (0.89 fish/man-hour). Only one other fish, a carp (*Cyprinus carpio*), was removed by an interviewed fisherman, illustrating the dominance and importance of the crappie in the heated dock fishery during the winter and early spring months. Houser and Heard (1958) observed that crappie comprised 84.9% of the total winter harvest, of which 91.3% was in heated docks, on Fort Gibson Reservoir, Oklahoma, 1955-56. Grand Lake dock operators reported increased catches of carp and channel catfish in their docks during the summer months and an attendant decline in fishing success for crappie.

With the exception of February and March weekend catch rates, catch rates were at their minimum in February followed by an increase in monthly catch rates in April the latter apparently influenced by the increase in shoreward movement of crappie as their spawning time neared. The overall catch rates of 0.89 fish/hour and 171 g/hr. were generally better than those reported for other reservoirs (e.g., Carter, 1957; Gasaway, 1967; Houser and Heard, 1958; and Jackson, 1966.).

Weekday catch rates (g/hour) were higher than those for weekends for all months except January. Weekend catch rates were undoubtedly lowered due to the influx of inexperienced fishermen to resorts on the weekends.

Most crappie (67.1%) appearing in the creel, as indicated by samples from the creel between 28 January and 30 April 1970, were of the 1966 year class (Table 3), i.e., they had completed four summers of life. Together, the age group III and IV fish comprised 94.0% of the catch. The minimum size fish in the creel, as indicated by the sample taken for age analysis, was 158 mm. Basically, few crappie enter the creel until near the end of their second year of life. As suggested by the catch curve data for year classes 1966 and 1965 (assuming uniform recruitment), the annual mortality rate of Grand Lake crappie between age group IV and V, i.e., once fully vulnerable to fishing, is extremely high (ca. 95%).

Fishing pressure typically increased from winter to spring with weekends expectantly receiving a disproportionate share (Table 4). April contributed 11,499 man-days or 56,563 man-hours, representing approximately 36% of the 93-day total of 31,494 man-days or 153,563 man-hours. Harvest reflected the trends in catch rate and angler pressure with a catch of 6,940 fish (1,288 kg) in four days in 65,770 fish (13,592 kg) inApril. The overall harvest was 144,867 fish weighing 28,659 kg. Fishermen caught 7,568 fish or 1.503 kg per hectare during the study period.

The estimated total fishing pressure for the commercial heated docks for the interval 1 November 1969 through 30 April 1970 was 60,016 man-days (3.19 man-days/ha). Total man-hours was 293,656 or 15.6 man-hours/ha. The total harvest of white crappie for this period was 255,024 fish weighing 48,962 kg (13.5 fish/ha or 2.60 kg/ha).

Compared with kilogram per hectare figures reported for nine other southern reservoirs (Table 5), the winter harvest in Grand Lake's heated docks is greater than three of these values and would comprise at least 30% of four others. The 2.60 kg/ha harvest in heated dock harvest on Grand Lake is ca. 29% of the unweighted mean angler harvest (9.0 kg/ha) from 79 U.S. reservoirs (Table 4).

The estimated angler harvest 1 November 1969 through 30 April 1970 (2.6 kg/ha) was 10.6% of the standing crop of white crappie (24.43 kg/ha) captured in five rotenone cove samples in August and September, 1970 (Table 1). Deleting biomass of white crappie smaller than 165 mm total length, because they were seldom creeled by fishermen, indicates the dock harvest comprised 18.3% of the

standing crop of harvestable size crappie. If it is true that many warm water fisheries could accept additional fishing pressure with little danger to fishermen success (BSFW, 1962), then heated dock fishing should be considered as a means of increasing sport fish (i.e., crappie) harvest as suggested by Jenkins (1960) and Hall (N.D.).

ACKNOWLEDGEMENTS

The authors wish to express their appreciation to Dr. Bradford E. Brown for aiding in the design of the creel survey, and to Jack Orr, graduate student in Zoology Department, for his assistance with fish collections in the cove rotenone samples. We are grateful to the Grand Lake Association, especially Mr. Barney Barnhart, for some financial assistance and manpower during the study. The Oklahoma Department of Wildlife Conservation provided other financial support. Fishery Unit cooperators are the Oklahoma Department of Wildlife Conservation, Oklahoma State University Research Foundation, and the Bureau of Sport Fisheries and Wildlife (USDI).

Table 2. Angling success for white crappie in commercial, heated fishing docks on Grand Lake, Oklahoma, on 54 of 93 days between 28 January through 30 April 1970.

Interval	Number of interviews	Number of man-hours	Catch		Catch/man-hour	
			No.	Avg. wt.(g)	No.	g
January	103	450	400	184	0.88	162
Weekdays	77	320	285	179	0.89	159
Weekends	26	130	115	192	0.88	169
February	417	1348	1025	184	0.76	140
Weekdays	177	578	475	184	0.79	145
Weekends	240	770	568	184	0.74	136
March	441	1485	1204	199	0.81	161
Weekdays	170	575	548	191	0.95	181
Weekends	271	910	656	206	0.72	148
April	404	1179	1333	209	1.13	236
Weekdays	174	498	613	198	1.23	244
Weekends	230	681	720	222	1.06	235
Weekdays	598	1971	1903	190	0.96	183
Weekends	767	2491	2059	203	0.83	168
Totals	1365	4462	3962	194	0.89	171

Table 3. Mean calculated total lengths in millimeters and, in ( ), accompanying 95% confidence intervals for 234 white crappie obtained from fisherman's creel, on Grand Lake, Oklahoma, January-April, 1970.

Year Class	Age Group	Number of fish	% Total N	Length at Annulus 1	2	3	4	5	6	Mean length* at capture
1964	VI	4	1.7	73.8	149.0	227.3	279.0	324.0	247.8	347.8
				(3.5)	(+28.0)	(+48.0)	(+33.7)	(+22.2)	(+26.1)	(325-364)
1965	V	8	3.4	74.6	154.5	206.1	249.0	287.9		287.3
				(+4.3)	(+10.4)	(+11.6)	(+16.3)	(+15.8)		(262-320)
1966	IV	157	67.1	74.8	149.4	204.8	248.0			248.0
				(+0.8)	(+1.6)	(+1.8)	(+2.2)			(222-284)
1967	III	63	2k.9	73.8	143.1	206.0				206.0
				(+1.2)	(+3.0)	(+4.0)				(162-245)
1968	II	2	0.9	82.0	160.5					160.5
		234	100.0	(+12.7)	(+31.8)					(158-163)
Weighted overall means				75.3	150.1	208.6	254.5	302.0	347.8	
Number of fish				234	234	232	169	12	4	

*Ranges in parentheses.

Table 4. Fishing effort and harvest of white crappie in commercial, heated fishing docks on Grand Lake, Oklahoma, 28 January through 30 April 1970, extrapolated totals from 54 sampling days within the 93 day period.

	Fishing effort		Avg. duration of man-day (hrs.)	Total harvest		Harvest/hectare	
	Man-days	Man-hours		No.	Kg.	No.	Kg.
January	1,324	7,843	5.8	6,940	1,288	0.346	.064
Weekdays	750	3,825	5.1	3,404	609	0.180	.032
Weekends	574	4,018	7.0	3,536	679	0.166	.032
February	9,139	42,553	4.7	32,719	6,020	1.336	.246
Weekdays	5,233	24,595	4.7	19,430	3,575	0.815	.150
Weekends	3,904	17,958	4.6	13,289	2,445	0.521	.096
March	9,534	46.604	4.9	39,438	7,759	1.804	.353
Weekdays	5,329	25,579	4.8	24,300	4,641	1.226	.234
Weekends	4,205	21,025	5.0	15,138	3,118	0.578	.119
April	11,499	56,563	4.8	65,770	13,592	4.082	.840
Weekdays	6,839	34,195	5.0	42,060	8,328	2.748	.544
Weekends	4,660	22,368	4.8	23,710	5,264	1.334	.296
Weekday	18,151	88,194	4.8	89,194	17,153	4.969	0.960
Weekend	13,343	65,369	4.9	55,673	11,506	2.599	0.543
Totals	31,494	153,563	4.9	144,867	28,659	7.568	1.503

Table 5. Comparison of estimated winter-spring (1 November 1969 through 30 April 1970) angler harvest of white crappie from commercial, heated fishing docks on Grand Lake, Oklahoma with harvest of crappie (black and white) from other artificial impoundments. Reservoirs listed by rank on basis of harvest (kg/ha).

Lake	Lake size hectares	Survey interval	Angerl harvest No.	Angerl harvest Kg	Harvest/hectare No.	Harvest/hectare Kg
Fort Gibson Res., Okla. (Houser and Heard, 1958)	7,692	9/1/55- 8/31/56	1,667,150	244,422	216.9	31.78*
Lake Eucha, Okla. (Jackson, 1966)	1,166	9/1/54- 8/31/68 (10-year avg.)	66,967	15,552	57.4	13.34
Mean annual harvest from 79 reservoirs (Jenkins and Morais, 1971)	-	-	-	-	-	9.0**
Lake Pawhuska, Okla. (Thompson and Hutson, 1951)	38	1/1/43-12/31/48 (5-year avg.)	1,817	298	47.8	7.85
Tenkiller Ferry Res., Okla. (Gasaway, 1967)	5,054	5/1/64- 6/30/65	168,355	35,158	33.3	6.96
Spavinaw Lake, Okla. (Jackson, 1966)	662	9/1/54- 8/31/64 (10-year avg.)	15,324	3,650	23.2	5.52
Brussey Brake Res., La. (Davis nd Hughes, 1965)	890	4/1/60- 4/31/63 (3-year avg.)	24,355	3,456	27.4	3.89
rafid Lake (Present study)	18,818	11/1/69- 4/30/70	255,024	48,962	13.6	2.61
Dewey Lake, Ky. (Carter, 1957)	445	3/20- 9/28/55	7,917	467	17.8	1.05
Lake For Smith, Ark. (Cole, 1969)	212	8/1/57- 6/30/61	1,023	153	4.8	0.73
Santee-Cooper Res., S. Car. (Stevens, 1958)	64,954	9/1/54- 8/31/58	45,057	17,687	0.7	0.28

*Heated dock fishiag contributed approximately 37% of the total annual fishing presuure.

**Simple mean; weighted by area it was 5.9 kg/ha.

Barkley, H. 1960. Two years of creel census on three north Mississippi flood control reservoirs. Proc. S.E. Assoc. Game and Fish Comm. 14:148-173.

Bennett, G. W. 1971. Management of lakes and ponds. Van Nostrand Reinholt Company, New York. 375 p.

Brown, B. E. 1971. Implications from the Oklahoma State lake creel survey to improve creel survey design. Proc. S.E. Assoc. Game & Fish Comm. 24:577-590.

Bureau of Sport Fisheries and Wildlife. 1962. Sport fishing-today and tomorrow. Outdoor Recreation Resources Review Commission Study Report 7, U.S. Government Printing Office, Washington, DC. 127 p.

Carlander, K. D., C. J. Di Costanzo and R. J. Jessen. 1958. Sampling problems in creel census. Prog. Fish-Cult. 29(2):73-81.

Carter, E. R. 1957. Investigations and management of the Dewey Lake fishery. Proc. S.E. Assoc. Game & Fish Comm. 10:254-270.

Churchill, W. 1957. Conclusions from a ten-year creel census on a lake with no angling restrictions. J. Wildl. Mgmt. 21(2):182-188.

Cole, C. F. 1969. The 1957-61 sport fishery in an Arkansas water supply reservoir. Proc. S.E. Assoc. Game & Fish Comm. 22283-289.

Cole, C.F. and S. Finkelstein. 1959. A preliminary report of standing crop and rates of harvest in Lake Fort Smith, Arkansas: 1957 through 1958. Proc. Ark. Acad. Sci. 13:50-65.

Davis, J. T. and J. S. Hughes. 1965. Creel census on Bussey Brake Reservoir for the first three years. Proc. S.E. Assoc. Game & Fish Comm. 17:284-290.

Davis, J. T. and J. S. Hughes. 1967. Results of creel census on four north Louisiana lakes. Proc. S.E. Assoc. Game & Fish Comm. 18:495-506.

Gasaway, C. R. 1967. The sport fishery of Tenkiller Ferry Reservoir, Oklahoma. Okla. Fish. Res. Lab., Bull. No. 7. 21 p.

Grand River Dam Authority. No date. Pensacola Dam. Unpublished leaflet. 3 p.

Grosslein, M. D. 1961. Estimation of angler harvest on Oneida Lake, New York. Ph.D. Thesis, Cornell Univ., Ithaca. 296 p.

Hall, G. E. No date. Report on heated fishing docks: Their adaptability to South Atlantic division reservoirs. U. S. Army Corps of Engineers Report. Unpublished. 9 p.

Houser, A. and W. R. Heard. 1958. A one-year creel census on Fort Gibson Reservoir. Proc. Okla. Acad. Sci. 38:137-146.

Jackson, S. W. 1966. Summary of fishery management activities on Lakes Eucha and Spavinaw, Oklahoma. Proc. S.E. Assoc. Game & Fish Comm. 19:315-343.

Jenkins, R. M. 1953. Growth histories of the principle fishes in Grand Lake (O' The Cherokees), Oklahoma, through thirteen years of impoundment. Okla. Fish. Res. Lab. Report. 86 p.

_____. 1955. An eleven-year growth history of white crappie in Grand Lake, Oklahoma. Proc. Okla. Acad. Sci. 34:40-47.

_____. 1960. Reservoir fish management-progress and challenge. Sport Fishing Inst. Report. Presented, in part, at the 90th Annual Meeting of the Amer. Fish. Soc., Denver, Colo., Sept. 12, 1960. 19 p.

_____and D. I. Morais. 1971. Reservoir sport fishing effort and harvest in relation to environmental variables. *In* G. E. Hall (ed.), Reservoir fisheries and limnology. Spec. Publ. No. 8, Amer. Fish. Soc., pp. 371-384.

Johnson, M. W. and L. Wroblewski. 1962. Errors associated with a systematic sampling creel census. Trans. Amer. Fish. Soc. 91(2):201-207.

Lambou, V. W. 961. Determination of fishing pressure from fishermen or party counts with a discussion of sampling problems. Proc. S.E. Assoc. Game & Fish Comm. 15:380-401.

_____. 1966. Recommended method of reporting creel survey data for reservoirs. Okla. Fish. Res. Lab., Bull. No. 4. 40 p.

and H. Stern, Jr. 1959. Preliminary report on the effects of the removal of rough fishes on the Clear Lake sport fishery. Proc. S.E. Assoc. Game & Fish Comm. 12:36-56.

Oklahoma Water Resources Board 1965. Oklahoma's water resources. Publ. No. 10, Okla. Water Res. Bd. 51 p.

_____. 1970. Oklahoma's water resources. Publ No. 30, Okla. Water Res. Bd. 68 p.

. 1971. Appraisal of the water and related land resources of Oklahoma: Region nine. Publ. No. 36, Okla. Water Res. Bd. 149 p.

Snedecor, G. W. and W. G. Cochran. 1967. Statistical Methods. Iowa State Univ. Press, Ames. 593 p.

Shetter, D. S. 1944. Angler catches from portions of certain Michigan trout streams in 1939 and 1940, with a discussion of angling quality. Paper Mich. Acad. Sci., Arts, and Lett. 29:305-312.

Stevens, R. E. 1958. The black and white crappies of Santee-Cooper Reservoir. Proc. S.E. Assoc. Game & Fish Comm. 12:158-169.

Thompson, W. H. 1950. Investigations of the fisheries resources of Grand Lake. Coop. Fish. Exp. Sta. 45 p.

_____ and D. Hutson. 1951. A ten-year creel census on Lake Pawhuska, Oklahoma. Trans. Amer. Fish. Soc. 80:11-27.

CATCH OF COMMERCIAL AND GAME FISH WITH FOUR-FOOT TRAP NETS OF VARIOUS MESH SIZES[1] [2]

Bobby G. Grinstead and Ricardo Gomez
Oklahoma Fishery Research Laboratory
Norman, Oklahoma

ABSTRACT

The catch of commercial and game fish with 4-foot trap nets having minimum mesh sizes of 0.5, 2, and 3-inch, square measure, were compared. A small trap net having 0.5-inch webbing in the crib has been used for many years to sample fish from Oklahoma reservoirs. Various investigators have indicated that this gear has potential as a commercial fishing device. However, large catches of game fish, especially white crappie, was a serious detriment to this potential. Two designs of large mesh trap nets were therefore developed to determine if by enlarging the mesh size of the standard design, the catch rate of game fish would decline while the catch rate of commercial fish would remain constant.

An investigation was conducted on Keystone Reservoir during 1971 and 1972. The results indicated that the large mesh trap nets did take significantly fewer game fish. The catch of commercial fish was also reduced, but to a lesser extent, as the mesh size increased. However, this reduction was not deemed significant when considering the advantages of a smaller game fish catch.

[1]Contribution number 184 of the Oklahoma Fishery Research Laboratory, a cooperative unit of the Oklahoma Department of Wildlife Conservation and the University of Oklahoma Biological Survey. Funds for this investigation were obtained from PL 88-309 project 2-154-R I.

[2]Prepared for presentation at the Southern Division, American Fisheries Society, Knoxville, Tennessee, October 1972; the 26th Annual Conference of the Southeastern Association of Game and Fish Commissioners.