Ohio Department of Natural Resources
Division of Wildlife

AGE AND GROWTH OF OHIO RIVER SPORT FISH*

Scott A. Schell

Wildlife District Four
360 East State Street
Athens, Ohio 45701
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ABSTRACT

Scales were collected from harvested white bass *Morone chrysops*, hybrid striped bass *Morone saxatalis*, sauger *Stizostedion canadense*, walleye *S. vitreum vitreum*, and smallmouth bass *Micropterus dolomieui* by tailwater clerks during the Ohio river Recreational Use Survey. Eight tailwaters were surveyed starting at New Cumberland (RM 54.4) down river to Greenup (RM 341). Age at harvest analysis for five Ohio River sport fish species revealed that age one (60%) and age two (24%) fish dominated the total sample across species (n=1,168), representing scales collected in April and May. Sauger had the highest proportion of age one (71%) and age two (25%) fish of any species group, suggesting that small sauger are acceptable to anglers. The smallmouth bass sample was comprised of age two (25%) and age three (69%) fish, suggesting that anglers were more likely to harvest slightly older individuals of this species. Fish greater than age four were uncommon in our data suggesting that large, older individuals were an uncommon component of the sport fish harvest.

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BACKGROUND

Age and growth data on upper Ohio River sport fish is sparse and does not represent a significant portion of the resource bordering Ohio. Much Ohio River age and growth work conducted by West Virginia has not been summarized (S. Morrison, personal communication).

The Ohio River Recreational Use Survey provided an opportunity to acquire age and growth information for eight of the nine pools bordering Ohio, simultaneously. This data provides the first comprehensive review of age at harvest information for several species. Sample sizes from the 1993 survey were too small to warrant analysis, therefore only data from the 1992 survey are reported here.

STUDY OBJECTIVE

To determine age and growth of selected Ohio River sport fish populations. To communicate results to enhance interstate management of the Ohio River.

STUDY AREA

The upper 301 miles of the Ohio River bordering Ohio, totalling approximately 47,520 mainstem surface acres, were surveyed in 1992. This reach of river is divided into eight distinct pools formed by dams designed to maintain a 12 foot minimum navigational channel. Many fish species congregate in the tailwaters of these high lift dams and are vulnerable to angling. Scale samples from harvested fish were collected from New Cumberland, Pike Island, Hannibal, Willow Island, Belleville, Racine, Gallipolis, and Greenup tailwaters (Figure 1).

PROCEDURES

Scales were collected from harvested white bass *Morone chrysops*, hybrid striped bass *Morone saxatilis x M. chrysops*, sauger *Stizostedion canadense*, walleye *S. vitreum vitreum*, and smallmouth bass *Micropterus dolomieui* by tailwater survey clerks during the Ohio River Recreational Use Survey in 1992 (for survey procedures see Schell et al. 1994). Scale

samples were randomly collected on an "as time permitted" basis. This extra effort was conducted in a manner that did not violate the objectives or procedures of the angler survey, thus sample sizes were limited. All scales were taken from an area below the lateral line just posterially from the pectoral fin.

Six to ten scales from each fish were mounted on acetate slides and pressed on a Carver Laboratory Press (Model C) with heated templates. Scale impressions were examined on an Eberbach Model 2700 microprojector at a magnification of 40x. All scales were aged by a seasonal employee with approximately 2-5% of each pool sample randomly checked by a biologist. Sample sizes less than 20 for a given sport fish were not analyzed.

Standard $\underline{A}$ values were used for smallmouth bass ($\underline{A}$=35) and walleye ($\underline{A}$=55). Mean $\underline{A}$ values were calculated for the remaining species by using the y-intercept after regressing scale length to fish length. These calculated $\underline{A}$ values include white bass ($\underline{A}$=30), hybrid striped bass ($\underline{A}$=45), and sauger ($\underline{A}$=35).

Twenty two batches of scales from eight pools were analyzed. Mean lengths at age reported in the pool summaries were not weighted by the sample length frequencies. Only scales collected in April and May, prior to suspected annulus formation, were used for back calculations.

FINDINGS

Age at harvest analysis for five Ohio River sport fish species revealed that fast growing age one (60%) and age two (24%) fish dominated our total sample (n=1,168), representing scales collected in April and May (Table 1 and Figure 3). Mean lengths at age one for harvested white bass, hybrid striped bass, sauger, walleye and smallmouth bass were 245, 282, 274, 302, and 235mm; respectively (Tables 2-6). Sample sizes were not large enough for meaningful size at age analysis or pool by pool growth comparisons.

New growth was apparent on some scales from fish sampled in May. Such

scales were not always read to the last complete annulus.

Sauger and walleye had the highest proportion of immature individuals of any of the species groups (all pools combined). Our sauger sample was comprised of 71% age one and 25% age two fish (Figure 2). Our walleye sample from Pike Island pool was comprised of 64% age one and 18% age two individuals (Figure 3). This suggests that small sauger and walleye are acceptable to anglers. Sauger and walleye ranked first and fifth, respectively, on the list of preferred fish species consumed during the Ohio River Recreational Use Survey (Schell et al. 1994).

The total sample of Ohio River white bass was comprised of 64% age one, 22% age two and 12% age three individuals (Figure 2). White bass ranked second on the list of preferred fish species consumed by Ohio River anglers (Schell et al. 1994).

Our hybrid striped bass sample (all pools combined) was comprised of 46% age one, 25% age two, and 24% age three fish; suggesting that a wide range of sizes are accepted by anglers (Figure 2). Hybrid striped bass ranked fourth on the preferred list of fish species consumed during the Ohio River Recreational Use Survey (Schell et al. 1994).

The smallmouth bass sample from Pike Island pool suggests that anglers were more likely to harvest older fish and release the small individuals. Age 2 and age 3 fish represented 25% and 69% of our sample; respectively (Figure 3).

Fish greater than age four were uncommon in our data set for all species. This suggests that large, older individuals were not commonly harvested by anglers.

ANALYSIS

Mean lengths described in our age at harvest data sets appear to be greater than in standard age/growth data sets collected by other gear. This is likely due to the tendency of anglers to select the larger individuals representing the upper end of the growth curve for each age

class. This seems to be especially true of the younger age classes represented in our data (Tables 2-6). Mean lengths at age one for white bass, sauger, walleye, and smallmouth bass collected from the lower Ohio River by electrofishing, gill nets and rotenone (Henley, 1995) were reported as 157, 188, 216 and 135mm; respectively.

In recent years fish consumption advisories and advice for preparing and eating fish have been widely distributed. This information often points out that the smaller, younger fish are safer to consume since the larger, older fish are more likely to have bioaccumulated contaminants over time. Our data may be reflecting the affects of this education effort which helps explain the large proportion of harvested fish that were age one and age two.

Interpreting scales from Ohio River fish was complicated by several factors common to large rivers. Continual flows and the instability of stratification affect annual temperature patterns in large rivers (Wahl 1982). Fish growth and metabolism is impacted by water temperatures (Kitchell et al. 1977a, Kitchell et al. 1977b) and flow rates (Allen 1969). Fish activity patterns can be affected by high turbidity levels causing nocturnal predators to become more active during the daylight hours (Ryder 1977). These combined reasons could conceivably have impacted the time of annulus formation causing us to underestimate the fishes age.

The cause and time of annulus formation varies across age classes of many fish. Low water temperature is the most important factor influencing growth of immature individuals, while a combination of low water temperature, gamete development, and spawning cause annulus formation in mature individuals (Casselman 1987).

Age at maturity varies among the fish species represented in our study. In the Mississippi River male walleyes are reported to reach sexual maturity at age 3 to 4 and females at age 4 to 7 (Gebken and Wright 1968). Mississippi River sauger males are reported to reach maturity at age 2 to 3

and females at ages 3 to 4 (Gebken and Wright 1972). Smallmouth bass age at maturity is reported to range from 3 to 4 for males and 4 to 7 for females (Nord 1967). Age at maturity for white bass is reported to range from 2 to 3 for males and 3 to 4 for females (Horrall 1962). Age at sexual maturity has not been reported for hybrid striped bass.

The majority of the fish in our data sets were immature individuals. Additionally, winters at this latitude can often be mild with no ice formation suggesting that many Ohio River fish species may be exhibiting winter growth. Warm water discharges are also present on every Ohio River pool and are known to concentrate large numbers of predators and prey fish. These combined effects complicate age and growth interpretations on Ohio River fish.

We also theorize that, at least in some years, prey availability in the Ohio River may be quite high during the winter months. Gizzard shad are seasonally abundant in the Ohio River (Sanders 1994), utilized by most predators and become disoriented and vulnerable to predation at water temperatures below 9C (Adams et al. 1982). This vulnerability is compounded in lotic systems.

The significant winter sauger fishery on the Ohio River suggests that food consumption and growth are occurring during the winter months. Wahl (1982) documented that most growth in length and weight for Ohio River saugers occurred from August through March; maximum rate occurred during October and November. He demonstrated that growth of saugers of all age classes was negligible from April through July. Wahl also theorized that reduced light intensity during the winter months may allow continuous feeding by Ohio River saugers.

RECOMMENDATIONS

Otoliths may provide better age information for Ohio River fish. Age estimates are usually higher from otoliths than from scales (Casselman 1987).

Sampling biases inherent to angling data suggest that Ohio River fish populations would be more adequately sampled by other gear. Larger sample sizes across all age classes would permit a more complete description and analysis of the age structure of Ohio River fish populations.

Due to the complicated nature of interpreting large river age and growth information, future aging of Ohio River fish should be done by a biologist.

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Table 1.

OHIO RIVER SPORT FISH AGE/GROWTH SAMPLES

POOL	SPECIES	SAMPLE SIZE
Pike Island	White Bass	31
	Hybrid Striped Bass	61
	Sauger	39
	Walleye	22
	Smallmouth Bass	81
Hannibal	White Bass	76
	Sauger	23
Willow Island	White Bass	26
	Hybrid Striped Bass	58
	Sauger	50
Belleville	White Bass	24
	Hybrid Striped Bass	29
	Sauger	59
Racine	Sauger	79
Gallipolis	White Bass	38
	Hybrid Striped Bass	43
	Sauger	109
Greenup	Hybrid Striped Bass	39
	Sauger	67
Meldahl	White Bass	72
	Hybrid Striped Bass	42
	Sauger	99

Table 2.

SAUGER AGE/GROWTH SUMMARY
OHIO RIVER HARVESTED FISH 1992
MEAN LENGTHS AT AGE BY POOL

PIKE ISLAND POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	12	267	267				
2	16	354	204	354			
3	9	397	210	278	397		
4	2	449	241	325	378	449	

HANNIBAL POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	15	261	259				
2	8	351	216	351			

WILLOW ISLAND POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	42	267	267				
2	6	346	220	346			
3	2	422	235	321	422		

BELLEVILLE POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	44	284	284				
2	15	379	220	378			

RACINE POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	49	293	293				
2	29	354	210	353			
3	1	385	188	307	385		

GALLIPOLIS POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	77	294	294				
2	31	375	210	375			
3	1	470	284	381	470		

GREENUP POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	55	261	261				
2	12	371	196	360			

MELDAHL POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	82	267	265				
2	16	355	198	355			
3	1	365	126	262	365		

Table 3.

WHITE BASS AGE/GROWTH SUMMARY
OHIO RIVER HARVESTED FISH 1992
MEAN LENGTHS AT AGE BY POOL

PIKE ISLAND POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	21	243	241				
2	2	249	199	249			
3	7	349	178	264	349		
4	1	340	140	208	259	340	

HANNIBAL POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	73	228	224				
2	1	252	161	252			
3	2	366	179	279	366		

WILLOW ISLAND POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	21	260	260				
2	1	320	162	320			
3	5	390	182	289	390		

BELLEVILLE POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	21	239	239				
2	1	290	146	290			
3	2	341	186	262	341		

GALLIPOLIS POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	19	242	240				
2	10	306	147	306			
3	8	359	175	292	357		
4	1	350	149	187	291	350	

MELDAHL POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	16	259	259				
2	45	293	148	293			
3	7	297	119	210	297		
4	4	352	156	200	270	352	

Table 4

HYBRID STRIPED BASS AGE/GROWTH SUMMARY
OHIO RIVER HARVESTED FISH 1992
MEAN LENGTHS AT AGE BY POOL

PIKE ISLAND POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	46	285	285				
2	5	406	247	401			
3	10	393	220	302	394		

WILLOW ISLAND POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	41	317	314				
2	5	396	207	396			
3	12	424	234	312	425		

BELLEVILLE POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	21	286	283				
2	2	359	199	381			
3	6	487	275	364	476		

GALLIPOLIS POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	2	275	277				
2	15	383	198	380			
3	17	487	249	346	469		
4	9	523	260	344	417	525	

GREENUP POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	11	260	260				
2	18	354	189	377			
3	10	451	237	348	447		

MELDAHL POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	5	268	267				
2	23	369	191	353			
3	11	452	207	345	452		
4	2	472	221	315	386	472	
5	1	364	170	204	231	280	364

Tablel 5.

SMALLMOUTH BASS AGE/GROWTH SUMMARY
OHIO RIVER HARVESTED FISH 1992
MEAN LENGTHS AT AGE BY POOL

PIKE ISLAND POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	2	235	217				
2	20	356	178	347			
3	56	367	145	232	355		
4	3	411	134	244	305	402	

Table 6.

WALLEYE AGE/GROWTH SUMMARY
OHIO RIVER HARVESTED FISH 1992
MEAN LENTHS AT AGE BY POOL

PIKE ISLAND POOL

AGE	NO. OBS	LENGTH	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5
1	14	302	301				
2	4	360	207	344			
3	2	441	223	353	480		
4	2	538	240	308	463	538	

Figure 1. Map of Study Area

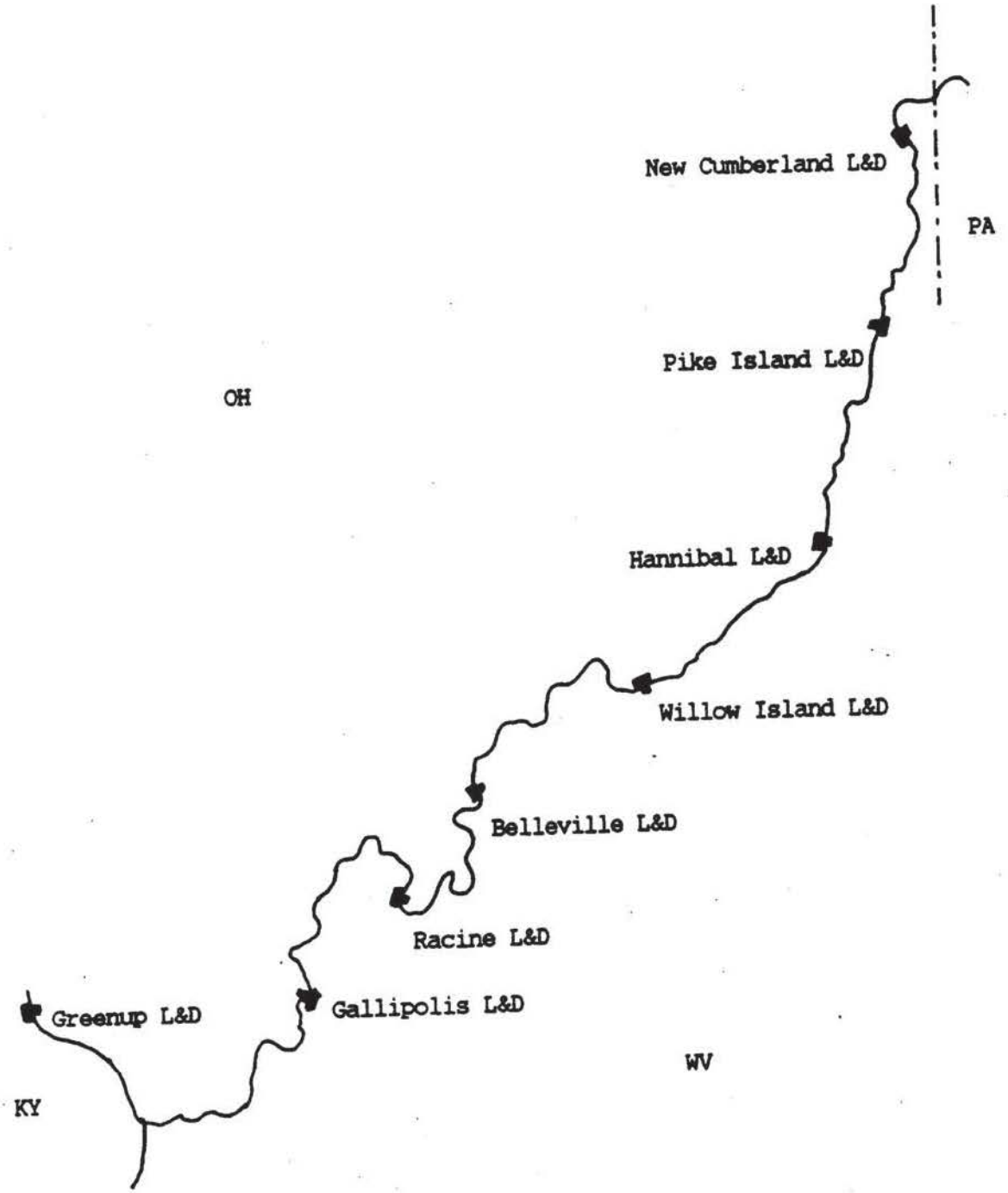


Figure 2.

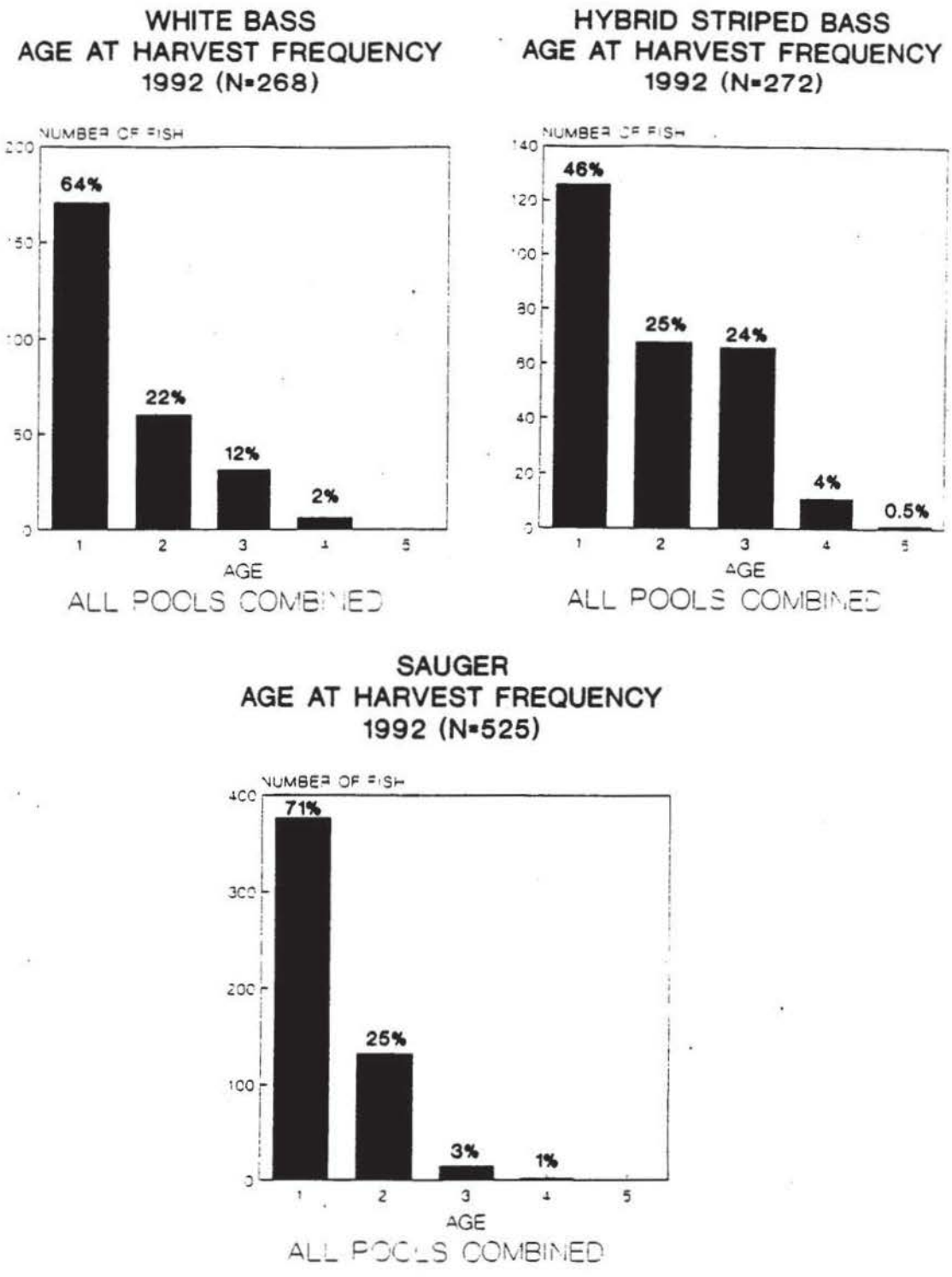
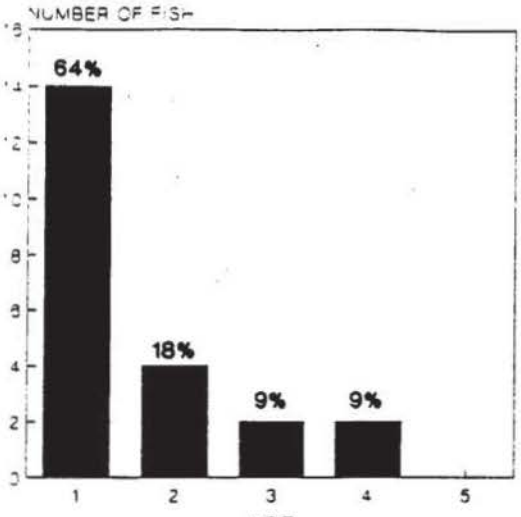

WHITE BASS
AGE AT HARVEST FREQUENCY
1992 (N=268)
NUMBER OF FISH
64%
22%
12%
2%
AGE
ALL POOLS COMBINED
HYBRID STRIPED BASS
AGE AT HARVEST FREQUENCY
1992 (N=272)
NUMBER OF FISH
46%
25%
24%
4%
0.5%
AGE
ALL POOLS COMBINED
SAUGER
AGE AT HARVEST FREQUENCY
1992 (N=525)
NUMBER OF FISH
71%
25%
3%
1%
AGE
ALL POOLS COMBINED

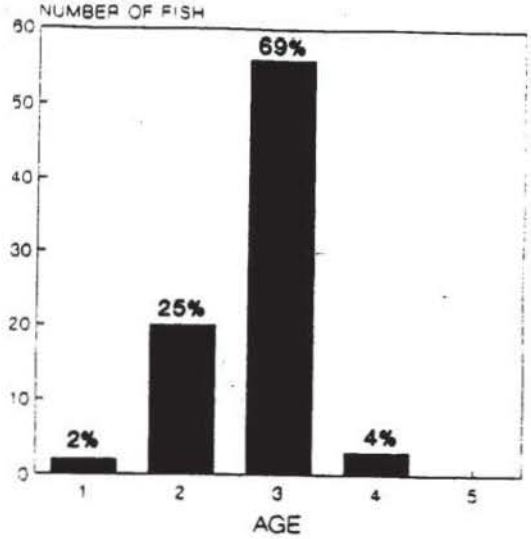
Figure 3.

WALLEYE
AGE AT HARVEST FREQUENCY
1992 (N=22)



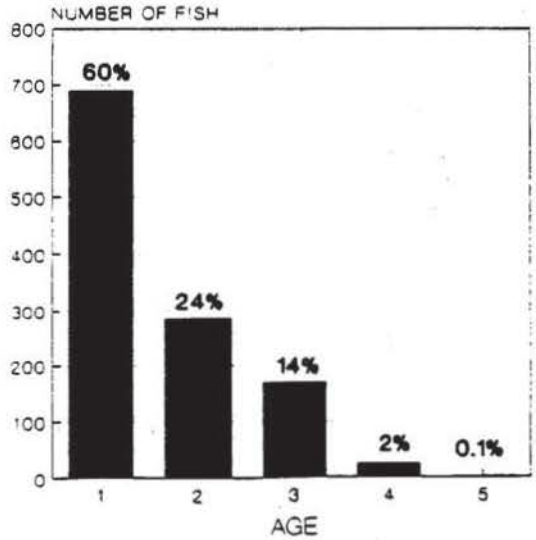
PIKE ISLAND POOL

SMALLMOUTH BASS
AGE AT HARVEST FREQUENCY
1992 (N=81)



PIKE ISLAND POOL

ALL SPECIES
AGE AT HARVEST FREQUENCY
1992 (N=1,168)



ALL POOLS COMBINED

Prepared By: Scott A. Schell — Research Biologist — Date: 10-30-95

Approved By: Gary L. Schell — Administrator, Fish Management and Research — Date: 11/1/95

Approved By: Randy Hullinger — Project Leader — Date: 11/1/95

Approved By: [signature] — Federal Aid Coordinator — Date: 11/1/95