Growth and Food Habits of Saugeye (Walleye × Sauger Hybrids) in Thunderbird Reservoir, Oklahoma[1]

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Abstract: Saugeye (*Stizostedion vitreum vitreum* × *S. canadense*) stocked in Thunderbird Reservoir from 1985–1987 were monitored for growth, food habits, and possible diet overlap with largemouth bass (*Micropterus salmoides*) as they progressed from age-1. Age-1 and age-2 saugeye attained mean length of 445 mm and 543 mm, respectively, by October. Food habits revealed saugeye 301–400 mm began converting from inland silversides (*Menidia beryllina*) to shad (*Dorosma* spp.) as their main food item. A predator-prey length relationship showed mean prey length was approximately 30% of predators. Diet overlap between saugeye 301–400 mm and largemouth bass 300–400 mm occurred in the summer season. Saugeye introductions appear to be a desirable management strategy for increasing predation on inland silversides, large shad, and slow-growing white crappie (*Pomoxis annularis*) populations.

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Saugeye (*Stizostedion vitreum vitreum* × *S. canadense*) fingerlings were stocked in Thunderbird Reservoir from 1985–1987 in an attempt to provide an additional sport fishery and also increase predation of inland silversides (*Menidia beryllina*) and shad (*Dorosoma* spp.). A previous study of age-0 saugeye in Thunderbird Reservoir (Leeds and Summers 1987) showed inland silversides were the main item in the diet. The age-0 saugeye had rapid growth rates, no diet overlap with white crappie (*Pomoxis annularis*), and a slight diet overlap with largemouth bass (*Micropterus salmoides*) ≤ 350 mm. Because of the fast growth expressed by the saugeye in Thunderbird Reservoir, requests for stockings in other reservoirs and small impoundments in Oklahoma have been numerous. To effectively determine future stocking sites, it was necessary to evaluate growth rates and food habits of saugeye older than age-0. This study focused on growth, predator-prey relation-

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ships, and possible diet overlap with largemouth bass of age-1 and age-2 saugeye in Thunderbird Reservoir.

Methods

Thunderbird Reservoir was impounded in 1965 to serve as a municipal water supply for Norman, Del City, and Midwest City, Oklahoma. The reservoir covers 2,456 ha with a mean depth of 6 m. It is characterized as slightly turbid and nutrient rich (Gomez and Grinstead 1973), with a low density largemouth bass fishery (RSD_{15} range of 36–62 from 1985–1987; Oklahoma Dep. Wildl. Cons. unpublished data), and a stunted crappie population (Boxrucker 1987). Gizzard shad (*Dorosoma cepedianum*), threadfin shad (*D. petenense*), and inland silversides (*Menidia beryllina*) are the main forage fishes (Summers 1984).

All saugeye were collected by night electrofishing. Monthly samples for saugeye were taken April through October of 1986 and 1987. Lengths (TL) and weights (g) were recorded for all fish. The stomach contents of each fish were evacuated in the field using glass tubes. The contents were preserved immediately in 10% formalin for evaluation in the lab. Food items were identified, enumerated, measured (TL) when possible, and volumetrically measured. Percent frequency, percent volume, and relative abundance by number were calculated for each prey item. The Index of Relative Importance (IRI) of Pinkas et al. (1971) was also determined for each prey item and presented by season (spring: April-May; summer: June-August; fall: September-October). The IRI combines the parameters of frequency of occurrence, number, and volume in the equation IRI = (N + V)F. Food habits were evaluated for saugeye 201–300 mm, 301–400 mm, and ≥ 401 mm. The relationship between predator length and prey length was evaluated by simple linear regression. Age groups were determined using length-frequency distribution analysis. Mean lengths for each age group with 95% confidence intervals were calculated monthly.

Results and Discussion

Saugeye continued to show rapid growth rates through age 1, reaching a mean TL of 445 mm (N = 78) by October (Fig. 1), with a mean monthly growth increment of 24 mm. Age 2 saugeye began to exhibit a decline in growth rates, although mean TL for age 2 saugeye by October was 543 mm (N = 60) with mean monthly growth increments of 16 mm. In comparison to saugeye growth reports from Ohio and Tennessee waters (B. L. Johnson, D. L. Smith, R. F. Carline, unpubl. data), Thunderbird Reservoir had one of the highest (Table 1).

A 3 way analysis of variance showed no significant difference ($P \geq 0.48$) for prey item volume among years and seasons for each length group. Therefore, saugeye food habits data were evaluated collectively by season from 1985–1987 for each length group. IRI values show 201–300 mm saugeye diets are composed almost exclusively of inland silversides through all seasons (Fig. 2). Inland silversides are

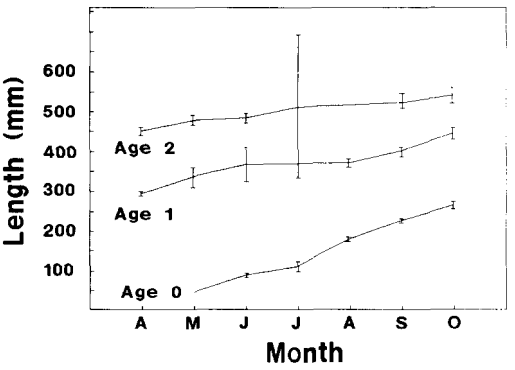

Figure 1. Mean total length by month of 3 saugeye year classes from April through October in Thunderbird Reservoir, Oklahoma. Age-1 year classes from 1986 and 1987, Age-0 year classes from 1985–87.

the major food item in the spring for saugeye 301–400 mm. A transition from inland silversides to a shad diet appeared to occur during the summer months when mean TL of age-1 saugeye was approximately 340–370 mm. The importance of shad in the diet continued to increase through the fall. IRI for saugeye ≥ 400 mm indicate shad as the most important food item for all seasons, with white crappie secondly in the spring and fall.

The linear regression for predator length-prey length relationship was significant (prey length = 14.635 + (0.252) predator length; $r = 0.81$; $P < 0.05$) and was similar to findings by Johnson (1981). The relationship showed that mean prey length was approximately 30% of the predator length. Saugeye ≥400 mm ate shad almost exclusively, but also began to feed on the overpopulated crappie in the reservoir. This predator length-prey length relationship suggests that saugeye ≥401 mm were consistently feeding on shad and crappie ≥120 mm. The majority of the stunted crappie population in Thunderbird are characterized in the 120–150 mm size range (Boxrucker 1987). Therefore, saugeye could be used as a component of a management scheme for controlling crappie and larger shad which are primarily underutilized by other large predators.

Comparison of largemouth bass food habits (Boxrucker 1987) to saugeye food habits by percent volume suggests a slight overlap in diet of largemouth bass 301–

Table 1. Mean lengths (mm), by October, of age-1 and age-2 saugeye from various reservoirs (B. L. Johnson, D. L. Smith, and R. F. Carline, unpubl. data) compared to Thunderbird Reservoir.

Location	Age	
	1	2
Pleasant Hill Reservoir, Ohio	385	392
Charles Mill Reservoir, Ohio	340	439
Deer Creek Lake, Ohio	361	454
Morris Reservoir, Tenn.	389	465
Thunderbird Reservoir, Okla.	445	543

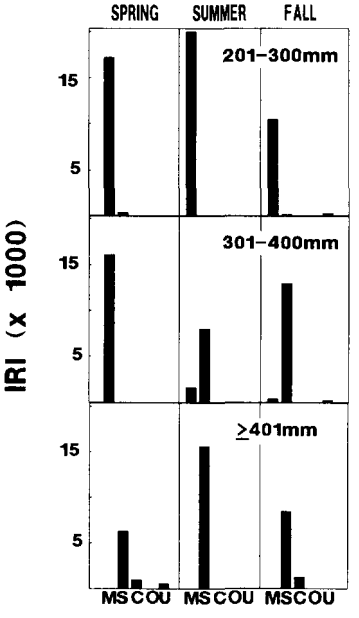

Figure 2. Seasonal Index of Relative Importance (IRI) values for saugeye 201–300 mm, 301–400 mm, and ≥ 400 mm in Thunderbird Reservoir, Oklahoma. M = *Menidia*, S = shad, C = crappie, O = other, U = unidentified fish.

400 mm (Table 2). Food habits data for largemouth bass >400 mm in Thunderbird Reservoir were not available. Largemouth bass exhibit a similar predator length-prey length relationship to saugeye (Stiefvater and Malvestuto 1985). A diet overlap does occur between saugeye and largemouth bass 301–400 mm through the summer months, when shad was the major food source for both. During the remaining seasons, largemouth bass turn to other food items virtually rejected by saugeye of all size groups, thus suggesting a limited diet overlap.

In summary, growth rates of saugeye in Thunderbird Reservoir continue to remain high in comparison to other lakes which have stocked saugeye. Food habits data of saugeye showed a transition from inland silversides to shad at approximately 340 mm, the predominant food item for saugeye ≥400 mm was shad, and that length of prey was directly related to predator length. A notable diet overlap with saugeye 301–400 mm and largemouth bass 301–400 mm occurred during the summer season. Management implications for saugeye are utilization of large shad as a forage base and possible assistance in alleviating an overpopulated crappie situation through predation.

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Table 2. Percent volume of food items for saugeye and largemouth bass[a] in Thunderbird Reservoir.

Type of fish		Food item by % volume				
		Menidia	Shad	Crappie	Other	Unidentified
			Spring			
	201–300 mm	87	13			
Saugeye	301–400 mm	95	5			
	≥401 mm	2	68	25		5
Largemouth bass	201–300 mm	45			55	
	301–400 mm		33		66	
			Summer			
	201–300 mm	98				
	301–400 mm	19	79		2	
Saugeye	≥400 mm		95	3	2	17
Largemouth bass	201–300 mm	25			75	
	301–400 mm	1	77		22	
			Fall			
	201–300 mm	72	22		1	5
Saugeye	301–400 mm	9	89			2
	≥401 mm	2	67	30		1
Largemouth bass	201–300 mm	2	36		62	
	301–400 mm		19		81	

[a]Boxrucker (1987)

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