Estimating the Effects of a North Florida Reservoir Drawdown Utilizing Creel Data

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Abstract: Lake Talquin was dewatered in September 1983 and a 2-stage refill was completed by mid-July 1984. Spring creel surveys were conducted by the Florida Game and Fresh Water Fish Commission prior to (1978, 1981) and following (1985–88) this drawdown. Harvest estimates have increased 5-fold for largemouth bass (*Micropterus salmoides*) since 1986. Black crappie (*Pomoxis nigromaculatus*) were harvested in record numbers in 1987 but declined appreciably in 1988. Sunfish harvest after 1986 returned to pre-1986 levels and has stabilized. The sharp increase in harvest estimates for all species in 1987 was due to recruitment of their 1984 post-drawdown year class to harvestable size. Benefits to the sport fishery from the drawdown were not immediately realized but became evident to anglers as increased harvest in 1987.

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Lake Talquin water levels have fluctuated little since its construction in the late 1920s. Only 3 major water level fluctuations had been reported prior to the dewatering initiated in 1983 (1957, 1972, and 1974). Stabilized water levels encountered over a period of years resulted in the loss of aquatic habitat and production of a marginal sport fishery (Dobbins and Rousseau 1982). Lake Talquin was drawn down in September 1983 to enhance aquatic habitat and to facilitate dam repairs.

Drawdowns have evolved into a useful management technique for producing strong sportfish year classes (Wegener and Williams 1975, Moyer et al. 1982). The likelihood of success or failure of a drawdown is dependent upon many variables (e.g., season of drawdown and refilling, magnitude of water level fluctuation and vegetation present upon refilling). Literature suggests managers should attempt to: (1) draw down water in late summer and fall, (2) establish herbaceous vegetation by natural colonization or seeding, (3) flood terrestrial vegetation in spring, and (4) maintain high water for as much of the growing season as possible (Ploskey 1986). The drawdown schedule for Lake Talquin followed these guidelines.

The purpose of this paper is to illustrate the effects of a 1983 drawdown on Lake Talquin utilizing creel survey data collected by the Florida Game and Fresh Water Fish Commission. This paper will concentrate on harvest, effort, and fishing success by anglers for largemouth bass, black crappie, bluegill (*Lepomis macrochirus*), redear sunfish (*L. microlophus*), and redbreast sunfish (*L. auritus*) before and after the drawdown. Spring creel survey estimates will provide insight into the positive effects which can be observed in the harvest of sportfish populations following a drawdown.

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Methods

Study Site

Lake Talquin was created by construction of Jackson Bluff Hydroelectric Dam on the Ochlockonee River. The dam is located 106 km upstream from the Gulf of Mexico and approximately 32 km southwest of Tallahassee, Florida. Lake Talquin has a surface area of 4,128 ha (20.9 m MSL), an average depth of 4.5 m and a maximum depth of 15 m immediately upstream of the dam. The reservoir has a gross volume of approximately 18.6 million m^3, a length of 23.2 km, and a drainage basin of approximately 4,453 km^2. Lake Talquin is a eutrophic system with phosphate concentrations averaging in excess of 100 mg/m^3 and chlorophyll *a* levels as high as 29.5 mg/m^3 (Canfield 1981).

Drawdown Design

The Lake Talquin drawdown was implemented in September 1983 as described by Dobbins et al. (1987). A 2-stage refill was used to achieve maximum enhancement of the habitat and sport fishery. The reservoir was lowered 6 m in September 1983. Rye grass was aerially seeded on portions of the lake bottom to provide nursery areas for young fish (Strange et al. 1982) spawned in spring 1984. First stage of refill began February 1984 and raised the water level 4 m, flooding approximately 400 ha of ryegrass. Lake level remained relatively stable at 2 m below full pool until June 1984. Second-stage refilling was implemented at this time at a rate of 0.3 m per week. Normal full pool (20.9 m MSL) was attained in mid-July.

Creel Survey

A roving stratified random creel survey with non uniform probability sampling was utilized for all spring creel surveys (Ware et al. 1972). The use of creel data collected from incomplete trips for success estimates has been of some concern. However, Malvestuto (1983) and Van Den Avyle (1986) suggest such procedures provide reasonable estimates. Spring creel data (April–June) was collected during 1978, 1981, and from 1985 to 1988. The survey of fishermen was conducted 5 days every 2 weeks, 6 hours a day. The reservoir was divided into 3 sections and each section required 2 hours to survey. An instantaneous count (*N* of fishermen/section) was randomly selected at the beginning or end of each 2-hour section and remaining time was spent interviewing fishermen. Creel data collected prior to 1986 included:

resident, non-resident, number in party, species sought, number of fish caught, and hours fished for each species. The species sought category focused on largemouth bass, black crappie, and sunfish (bluegill, redear, and redbreast). Creel data collected from 1986 through 1988 additionally divided the largemouth bass category into those fish < 280 mm total length (TL) that were kept and released, released in the slot limit (280–356 mm), and those kept and released > 356 mm TL. All harvest, effort, and success estimates are illustrated using an 80% confidence interval. Age analysis by use of sectioned otoliths (Hoyer et al. 1985) was also conducted from largemouth bass and black crappie carcasses donated by anglers since 1987.

Results and Discussion

Largemouth bass harvest estimates from spring surveys ranged from a record 21,789 in 1978 to 2,159 in 1986 (Fig. 1a). Harvest estimates from 1981 and 1985 were appreciably lower than harvest estimates in 1978. Harvest estimates in 1978 likely correspond to the production of a strong year class of largemouth bass after a drawdown for dam repairs in November 1974. A further decline in harvest estimates was noted in 1986 and was due to restricting harvest by implementing a 280–356 mm protective slot limit. Harvest estimates from spring 1986 until present cannot be compared directly to prior harvest estimates due to implementation of the slot limit. However, a harvest estimate, if no protective slot limit regulation was in effect, must fall between total catch and actual harvest estimates. The largest increase in harvest was observed from 1987 to 1988 when the majority of the 1984 year class of largemouth bass began exiting the protective slot limit. Harvest estimates generated in 1988 increased 5-fold over 1986 harvest estimates. Age data collected from 206 angler-harvested largemouth bass in spring 1988 indicated 61% of this sample were from the 1984 year class (Long et al. 1988). Thus, if no slot limit regulation was in effect, the 1988 harvest estimate would likely approach total catch. Total catch estimates for spring 1988 are of the same magnitude as harvest estimates reported for spring 1978. Elevated numbers of largemouth bass caught during spring 1978 and 1988 both coincide to the implementation of a drawdown 4–5 years previously. The increase in largemouth bass harvest estimates noted in spring 1987 and 1988 can also be attributed to anglers expending 42,000 and 49,499 hours of effort, respectively (Fig. 1b).

Harvest success estimates (fish/hour) for largemouth bass ranged from a record 0.52 in 1978 to 0.06 in 1985 (Fig. 1c). The harvest success estimates from 1986–1988 would also likely approach the total catch success estimate if no protective slot limit were in effect.

Black crappie harvest estimates ranged from 5,719 in 1978 to 32,393 in 1987 (Fig. 2a). Harvest estimates remained fairly stable during survey years from 1978 through 1986. Anglers in spring 1987 realized a 3-fold increase in the harvest of black crappie (32,393 fish). Age analysis conducted on 127 angler-harvested black crappie in spring 1987 revealed that 95% were from the 1984 year class. Harvest estimates declined sharply in 1988 (14,944 fish) despite relatively high effort and

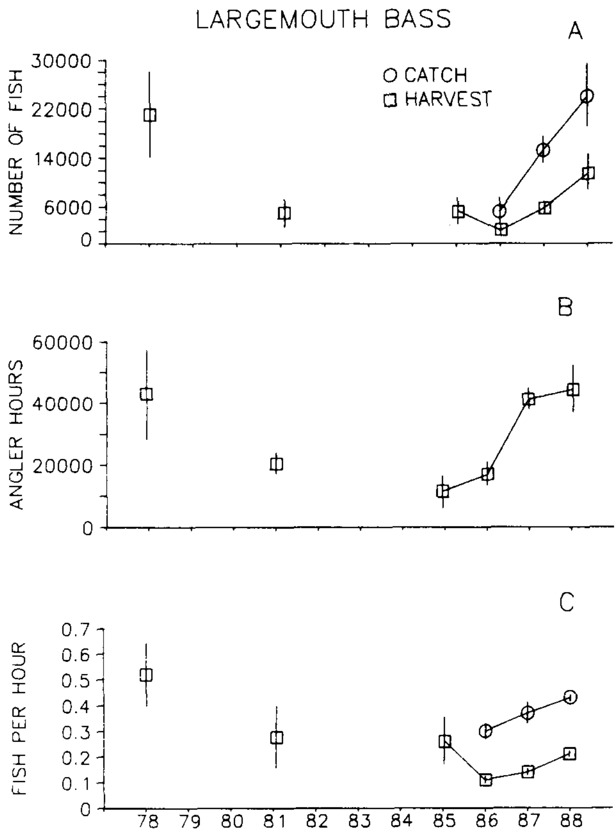

Figure 1. Estimated spring harvest (a), effort (b), and success (c) by anglers for largemouth bass before (1978, 1981) and after (1985–88) the 1983 Lake Talquin drawdown.

success estimates (Figs. 2b, 2c). Age analysis conducted in spring 1988 on 114 angler-harvested black crappie indicated the 1984 year class still represented 89% of the harvest.

Sunfish harvest remained stable for all survey years except for a sharp decline in 1986 (Fig. 3a). This was likely due to the high natural mortality of harvestable-size (>160 mm) sunfish observed by project personnel during January of that year. Low effort and success estimates were also recorded during spring 1986 (Figs. 3b, 3c). However, harvest, effort, and fishing success in 1987 and 1988 returned to levels comparable to those prior to 1986. Natural mortality of harvestable-size sunfish in winter 1986 and the sharp decline in harvest estimates in spring 1986 suggests increased harvests of sunfish in 1987 and 1988 were associated with recruitment of the 1984 and 1985 post-drawdown year classes.

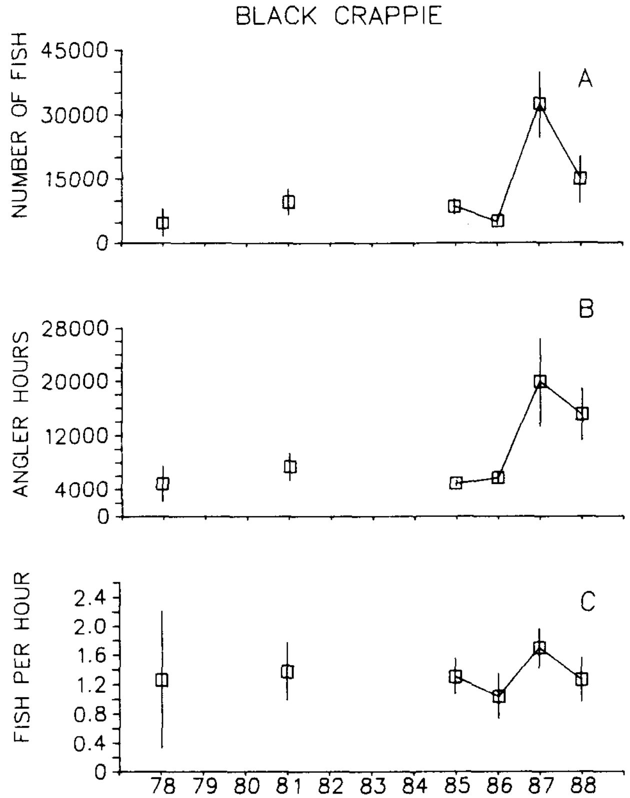

Figure 2. Estimated spring harvest (a), effort (b), and success (c) by anglers for black crappie before (1978, 1981) and after (1985–88) the 1983 Lake Talquin drawdown.

Conclusion

These findings are consistent with those of Wegener and Williams (1975) and Moyer et al. (1982) in documenting substantial increases in sport fish populations following implementation of a drawdown. However, anglers did not receive the benefits of the 1983 Lake Talquin drawdown until 1987 when the 1984 year class for all species attained harvestable size. Confidence intervals for success estimates for largemouth bass since 1986 were also less variable than those of prior survey years. This is indicative of anglers with more consistent catch rates and suggests largemouth bass harvests were influenced by recruitment of the 1984 year class.

Use of a creel survey in conjunction with a sport fishery restoration project allows fishery managers the opportunity to watch the fishery develop through time. The information obtained provides the predictive capability necessary for determining the extent and duration of benefits to sport fish populations produced by a

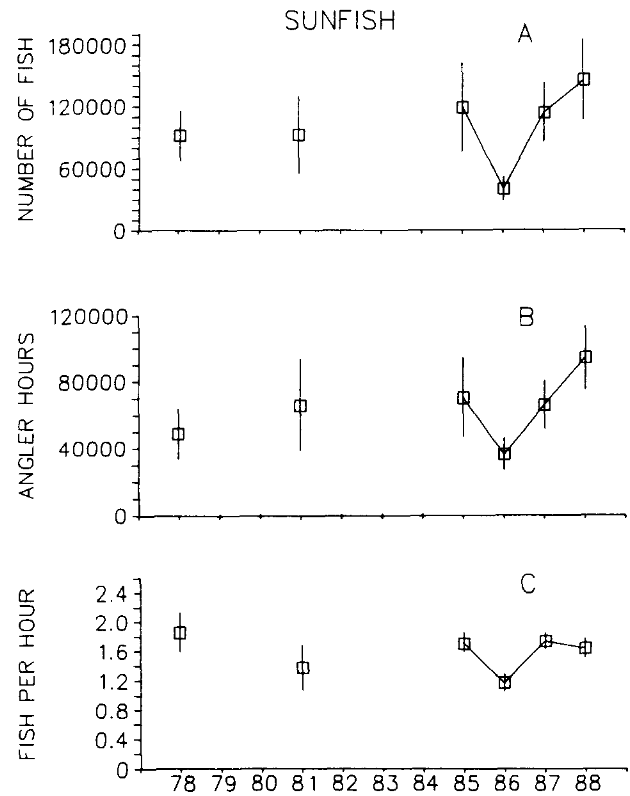

Figure 3. Estimated spring harvest (a), effort (b), and success (c) by anglers for sunfish before (1978, 1981) and after (1985–88) the 1983 Lake Talquin drawdown.

drawdown. This information will assist fishery managers in planning drawdowns accordingly to ensure proper stocks are available in the future.

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