Early Opening of Black Bass Fishing Seasons in New York State: A Review of Issues and Available Data

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Introduction

Freshwater fishing opportunities in New York State attract over one million participants and generate over 19 million days of angling effort (USDOI 2001). Expenditures by freshwater anglers in New York State exceeded 700 million dollars in 2001. The black basses (in New York State the largemouth bass *Micropterus salmoides* and smallmouth bass *M. dolomieu*), are arguably the most valuable of the State's recreational fisheries resources, accounting for more days of fishing by both resident and nonresident anglers than any other species group. Exclusive of angling in the Great Lakes, black bass were sought by 387,000 anglers and accounted for over five million days of fishing effort in 2001, 48% more effort than was expended on trout, the second most popular species group. Angling effort seeking black basses in the Great Lakes waters of New York State totaled 1.8 million days, 71% higher than the effort spent fishing for lake trout, the second most popular species, and only 16% below that spent for all trout combined. All told, almost 28% of all angling (including saltwater) in New York State waters is directed at black basses.

Given their importance, both as a natural and an economic resource, management of black basses in New York State must consider not only opportunities for present day anglers but also include protective measures directed at sustainability that will ensure the quality of the resource for the future. Similarly, predation by bass populations can be an important ecological force in shaping fish communities, and management measures should be designed to avoid dramatic impacts on bass abundance that might cause shifts in food web dynamics (Carpenter et al. 1987). Protective measures typically take the form of regulations, but regulations must be formulated on sound scientific data, and restriction of access to angling resources should take place only when necessary to protect or fairly allocate them. Current black bass regulations in most New York State waters include a closed season during the spring spawning period, designed to protect males from angling during the nesting and guarding stages of reproduction. Nationwide, black bass regulations have become more restrictive in recent decades (Noble 2002). But the use of closed seasons to protect spawning bass has been de-emphasized relative to size and creel limits designed to improve the quality of fishing. Use of closed seasons is currently restricted primarily to northern states and certain areas of Canada, and recent trends are towards opening these fisheries to catch-and-release fishing during the spawning season (Quinn 2002). Consideration of changes in the current regulations in New York State in response to interest expressed by angling groups (Olson et al. 1999) has led to the development of the present review of the issues and available data.

Current Regulations and the Rationale Behind Closed Seasons

Currently, the black bass season in most New York State waters runs from the third Saturday in June through November 30th. Regulations during the open season include a statewide 12" minimum length and a daily limit of 5 fish. Exceptions include Lake Erie and its tributary waters, where the black bass season opens the first Saturday of May with a 15" minimum and one fish daily limit until statewide regulations take effect the third Saturday of June, and the Finger Lakes, which are opened for catch and release fishing only from the first Saturday of May through the opening of the statewide season (Cayuga, Otisco, Owasco, and Skaneateles Lakes are not open to preseason angling for black bass). Black bass fishing in Lake Champlain opens the second Saturday of June with a 10" minimum length regulation, and in most waters of Long Island the black bass season opens the first Saturday in June.

The use of closed seasons in black bass management is typically designed to protect spawning and ensure that reproduction and thus recruitment is not jeopardized by removal or disturbance of males guarding nests or fry (Noble and Jones 1999). In general, recent trends in North America have been away from the use of closed seasons in black bass management (Quinn 2002). As of 2000, five northeastern and Great Lakes states (including New York State) and Ontario still maintained closed seasons during some part of the black bass spawning season while six states, most in the northeast, allowed only catch and release fishing for bass during the spawning season. Among states with spring catch and release fishing, New Hampshire and Vermont do not allow the use of live bait and Pennsylvania does not allow targeting of bass on nests. Some additional states employ seasonal restrictions in specific waters, but most of the remaining states and provinces do not use closed seasons for black bass management. Since the time of Quinn's review, Ohio and Illinois have restricted black bass fisheries to catch and release only during the spawning season in Lake Erie and selected rivers, respectively, and Michigan is currently considering a catch and immediate release spring season for black basses (Bremigan and Towns 2004).

The rationale for regulations designed to protect spawning bass is based primarily on two factors: 1) high vulnerability of guarding males to angling; and 2) reduced survival of eggs and fry when guarding males are removed or temporarily displaced from nests. After spawning, males of both black bass species remain with nests to guard eggs from predators and continue to provide protection to post-hatched fry through the fingerling stage. Depending on water temperature and developmental rates of the early life stages, the guarding phase can last from several weeks to over a month for both largemouth bass and smallmouth bass (Heidinger 1975; Coble 1975). During the egg and fry stages, males and their broods remain near nest sites, which are often easily identified and targeted by anglers. The aggressiveness of guarding males can result in higher vulnerability to angling, and vulnerability of eggs and fry to predation can be quite high in the absence of the guarding male.

Factors affecting the vulnerability of black basses to angling have received much attention, often as a result of efforts to increase angler catch rates, and results indicate

that angling vulnerability is variable among individuals and populations, and may be a heritable trait (e.g., Garrett 2002). However, few studies have specifically addressed angling vulnerability of male bass actively guarding eggs or young. Allan and Romero (1975), in a study of largemouth bass nesting behavior in Lake Mead, had seven anglers target a cove containing 50 well-marked active nests (the presence of schools of fry suggests that the experiment may have taken place after the egg guarding stage for many nests). Anglers fished from afternoon until dark and captured only five male bass. Suski and Philipp (2004), in a study of several southeastern Ontario lakes during the egg guarding stage, concluded that nest guarding males of both species of bass were highly vulnerable to angling, with 70% of smallmouth bass and 54% of largemouth bass hooked when subjected to directed angling efforts comprised of only two casts each of three different lure types. Suski and Philipp further concluded that guarding aggressiveness of males, and hence vulnerability to angling, was positively correlated with the number of eggs in the nest, so that those fish most vulnerable to angling were also those with the greatest potential to contribute to recruitment.

Increased mortality of early life stages of the black basses when guarding males are removed from nests is well established in the literature. Neves (1975) found a 75% reduction in the number of fry produced in smallmouth bass nests when males were excluded from nests by enclosures. Kieffer et al. (1995), in a study of guarding smallmouth bass captured and released, found that physiological stress and time taken to return to nests increased as the amount of time fish were played increased. They observed predation in only 35% of smallmouth nests when playing time was brief, but mean return time to nests more than tripled when fish were played to exhaustion and predation risk for progeny increased by a factor of more than 8. Similarly, Philipp et al. (1997) in a study of both largemouth bass and smallmouth bass, found that time for angled males to return to nests increased steadily as handling time, distance of release site from nest and number of captures increased. They found that the number of predators per nest more than tripled as length of absence of the guarding male increased from 2 minutes to more than 10 minutes, and that nest abandonment rates exceeded 50% in cases where males were removed from nests for more than 5 minutes. They observed no evidence of survival of eggs or fry when abandoned nests were revisited one day later. Suski et al. (2003) found that abandonment of nests by male smallmouth bass returned to nests following removal increased when brood size was reduced prior to return of the bass, suggesting that nests subjected to significant predation when males are captured and released may be abandoned even if some young remain.

While the potential impacts of angling on the success of individual nests are well established, population level impacts of angling on year class strength and recruitment are not well understood. One line of reasoning would be to assume all nests have roughly equal potential to contribute to ultimate year class strength. In this scenario, disruption of any nests would theoretically reduce year class potential, and as the percentage of nests disrupted by angling increased, year class potential would decrease accordingly. An individual-based model of smallmouth bass production predicted that the number of young produced declined as the likelihood of capture of guarding males increased, regardless of whether angling was catch and release or catch and keep (Ridgway and

Shuter 1997). This logic implies that there is a relationship between the number of nests and year class strength, in other words that a stock-recruitment relationship exists. Reynolds and Babb (1978) reported a correlation between the number of spawning adults and recruitment in small impoundments. However, no evidence of a stock-recruitment relationship for black basses in larger systems has been found for northern or southern populations (Minnesota: Kramer and Smith 1960; Oklahoma: Summerfelt 1975; North Carolina: Jackson and Noble 2000). These findings have led to the widespread belief that there is typically a surplus production of eggs and young in black bass populations and that variability in year class success and recruitment to the fishery is controlled by ecological conditions encountered by young fish after the guarding stage, such as food availability and winter conditions (Ludsin and DeVries 1997). Under this scenario, impacts of angling during the guarding stage might be limited unless angling pressure was high enough to affect a large percentage of active nests.

More recently, some researchers have argued that annual recruitment is not a function of the entire spawning population, but instead dependent upon a relatively small subset of all potential spawners, typically those that are the largest and most fit, that produce a disproportionately large percentage of the successful progeny that ultimately determine year class strength. Studies of smallmouth bass have indicated that not all mature adults spawn every year and that decisions to spawn will generally optimize the reproductive success of individual fish (e.g., faster growing fish spawning at younger ages than slower growing individuals; Raffetto et al. 1990). Research by Gross and Kapuscinski (1997) has indicated that as few as 5% of nests guarded by spawning male smallmouth bass in Lake Opeongo, Ontario produced over 50% of the age-0 fish that survived through their first fall. These results suggest that potential impacts of angling of male black bass during the guarding period are more than a simple function of the percentage of fish that are captured, but are rather a lottery, with disproportionate impacts if the most important spawners are captured. Suski and Phillip (2004) found that larger males tended to guard progeny more aggressively, and therefore were more vulnerable to angling. If the largest males are also those that tend to contribute disproportionately to year class strength, then the potential impacts of angling could be focused on those fish who's reproductive potential is greatest and impacts of angling on year class strength could be large even with low levels of angling pressure. However, Gross and Kapuscinski (1997) were unable to predict which males would contribute the most to year class strength based on size, age or spawning date. Nonetheless, these findings suggest that potential impacts of angling on nest guarding males depends on a more complex suite of variables than simply the number of spawners, and that disruption of certain nests may have a disproportionately large impact on recruitment.

Due to the inherent variability in annual year class strength in black bass populations, evaluations of the effects of regulation changes are difficult. However, Quinn's review (2002) indicated that most agencies did not feel that bass fisheries were negatively impacted when protection of spawners was relaxed or removed. Studies in Wisconsin, Minnesota and Michigan did not indicate that fisheries declined as a result of opening of spring catch and release seasons. A study in Michigan further found that catch rates during spawning were not higher than those observed later in the season,

suggesting that anglers were not more successful during the nest guarding stage. An Oregon study found that a no harvest regulation enacted during spring did not improve bass recruitment and removed the regulation. In Florida, implementation of protected spawning areas likewise did not improve recruitment relative to reference areas where fishing was allowed. Opening of the New York State waters of Lake Erie to spring angling has not negatively impacted the quality of that fishery (Einhouse et al. 2002).

Black Bass Populations in New York State Under Current Regulations

In an effort to evaluate potential impacts of a change in black bass regulations in New York State from the current closed season until the third Saturday of June to a spring catch and release only season, we queried the Modern Fisheries Statewide Database. In addition, we reviewed select creel data to determine if early season black bass catch rates, or preseason catch rates where catch and release regulations are in place in New York State, supported arguments that bass are more vulnerable to angling early in the spring when males are involved in guarding behaviors. Specifically, our approach included three broad questions:

1) Given annual variability in spring water temperatures, do the current regulations provide protection to guarding males in most years in most waters?

2) Do survey catch rates of young and/or adult bass indicate that recruitment failure is more likely in waters that are not consistently protected under current regulations (e.g., in colder waters where current regulations may not protect males throughout the spawning season, is there evidence of reduced or more variable recruitment)?

3) Do seasonal trends in black bass catch rates suggest that males are more vulnerable to angling during the guarding stage?

Spring Water Temperatures, Black Bass Spawning and Current Regulations

Approach

To evaluate potential variability in the level of protection provided to spawning and guarding males under the current closed season through the third Saturday in June, we began by querying the Modern Fisheries Statewide Database for spring water temperatures. We restricted or search to data collected during the period June 15-21 to correspond as closely as possible to conditions on the opening day of bass season. Water bodies for which data were available were subdivided into pond, lake, reservoir, and river categories. For ponds and lakes, where wide variability in spring temperatures was observed, we assessed potential relationships between spring water temperatures and surface area, maximum depth, altitude, and latitude using simple linear regression. Similar analyses were not conducted for rivers given the arbitrary nature of assigning single representative morphologic or geographic positions to a river.

Degree of protection provided guarding males under the current closed season was based on published values for water temperatures at which largemouth bass and smallmouth bass initiate spawning and guard progeny.

Results

Water temperature is an important, often the most important, cue for initiation of spawning activity in black basses. However, reported observations of temperatures at which spawning takes place vary widely throughout the range of the two species. In an attempt to use values most likely to represent those in New York State, which is near the northern extent of the range of both species, we used data from Canadian (primarily southern Ontario) populations as reported by Scott and Crossman (1973).

For smallmouth bass populations in the northern part of their range, nest building commences at temperatures of roughly 55º – 68º F, but egg deposition typically takes place when water temperatures reach 61º – 65º F. Eggs may take 4-10 days to hatch, larvae 17-19 days to absorb yolk and leave the nest and guarding of fry may continue for several days following formation of schools. In total, the guarding stage for male smallmouth bass in northern waters would typically extend for 3-5 weeks.

Nest building by largemouth bass males in northern populations begins when water temperatures approach 60º F, but spawning does not typically take place until water temperatures reach 62º - 65º F. Eggs may take 3-5 days to hatch, yolk absorption an additional 6-7 days, and guarding of schools of fry and fingerlings can continue for as long as 31 days. All told, largemouth bass may remain in the guarding stage for as much as 5-7 weeks.

The Modern Fisheries Statewide Database included 658 water temperature readings for dates approximating the opening of black bass season. Lakes and rivers were the best represented types of waters in the database, but ponds and reservoirs were also well represented (Figure 1). Spring water temperatures were most variable among lakes and rivers in the state. Coldest spring temperatures were observed in rivers and ponds typically exhibited higher spring temperatures than other types of waters.

There was no conspicuous pattern in the geographic distribution of spring water temperatures in the state (Figure 2). The coldest spring water temperatures tended to be from the Finger Lakes and Adirondack waters, but waters representing the mid- and warmer ranges of temperatures observed were distributed across the state with no discernable pattern. No relationships between morphological or geographic characteristics and spring water temperatures were evident for lakes (Figure 3) or ponds (Figure 4). Simple linear regression indicated that no single variable accounted for more than 10% of the observed variability in spring water temperatures in lakes and ponds of New York State.

Based upon the temperatures reported by Scott and Crossman (1973) for spawning activities of smallmouth and largemouth bass, it is likely that males are still

involved in guarding activities in as many as half of the waters in New York State on opening day of the current bass season. In many waters, egg deposition is likely still occurring when the season opens, and males are likely still guarding nests and newly hatched fry in many other waters. While some waters do warm early enough that guarding activity may have ended prior to the opening of the bass season, available data suggest that even under the current regulations, many bass populations are not protected from angling for the duration of the guarding period.

Adult Bass Abundance and Recruitment Variability in New York State Waters

Approach

We queried the Modern Fisheries Statewide Database for black bass survey data from waters for which spring temperatures were available. In order to focus on possible relationships between water temperatures on opening day of bass season and bass abundance we emphasized waters that were in the lower and upper quartiles of the range of temperatures observed to maximize contrast. We also included surveys from waters in the middle of the range of observed temperatures. Data from 30 fall electrofishing surveys on waters with appropriate temperature data were identified and catch rates of adult largemouth and smallmouth bass calculated. We used simple linear regression to evaluate potential relationships between spring water temperatures and adult black bass abundance.

Variability in adult catch rates can serve as only a rough measure of potential impacts on recruitment that might result from differential protection of guarding males from angling. Abundance and population structure of black basses is strongly influenced by a large suite of lake characteristics independent of angling impacts such that annual variations in production will often be masked by other factors that will shape adult bass populations (Garvey et al. 2002). Accurate measurement of recruitment variability requires assessment of young of year bass. In order to directly measure potential angling impacts, such assessments would ideally take place shortly after the break up of guarded schools, as conditions not related to disturbance of guarding males will likely affect fingerling abundance through the remainder of the first growing season and winter. Directed assessments of young of year bass production have not been conducted with the intent of evaluating angling impacts, and in fact, young of year bass catch rate data are not available from most waters. In order to evaluate the nature of black bass recruitment variability in the waters of New York State, we used young of year bass catch rate data from lakes included in the walleye stocking study (Jackson et al. 2003). We also reviewed data on recruitment variability in bass populations presented by Green at al. (1986).

Long term studies on Oneida Lake and Canadarago Lake provided some additional opportunity to assess the relationship between water temperatures on opening day of bass season and annual variability of young of year production. For Oneida Lake, smallmouth bass production is reasonably well reflected in summer bottom trawl catches of young of year bass. Fall electrofishing surveys that included collections of young of

year smallmouth and largemouth bass were available from Canadarago Lake. We used simple linear regression to evaluate the relationship between annual variations in spring temperatures and young of year bass production in these lakes.

Results

Abundance of adult black basses, as reflected in electrofishing catch rates varied widely across the waters for which data were available (Table 1). Adult largemouth bass catch per hour ranged from 0.1 to 69.4, while adult smallmouth catch rates in waters where they were present ranged from 0.1 to 76.1 per hour. On average, adult largemouth bass were most abundant in the warmest waters and least abundant in the coldest. Adult smallmouth bass were most abundant in colder waters and least abundant in waters with spring temperatures in the intermediate range of those observed. There was a significant relationship between adult largemouth bass catch rates and spring water temperatures, but no relationship was detected between spring water temperatures and adult smallmouth bass abundance (Figure 5). The relationship for largemouth bass was driven primarily by very high catch rates in five of the warmest waters for which data were available. Largemouth bass are a warmwater species that does not occur at latitudes much further north than the waters of New York State. While the warmest waters of the state would be those in which current bass regulations offer guarding largemouth bass males the most protection, the relationship we observed is more likely to occur as a result of the biology of the species rather than as a result of differential protection under current angling regulations. Smallmouth bass prefer cooler waters, so it is not surprising that we observed the highest catch rates of adult smallmouth bass in the colder waters included in our survey. As with largemouth bass, differences in abundance of adult smallmouth bass with water temperature likely reflect the biology of the species rather than angling impacts, as those waters where smallmouth bass were most abundant would also be those where some angling during the guarding period would be most likely even with the current closed season.

Fall electrofishing catch rates of young of year largemouth and smallmouth bass in the walleye stocking study waters indicate large annual variations in young of year production (Table 2). Annual variation in largemouth bass year class strength, as measured by fall electrofishing, ranged 3-fold to as much as 100-fold, and annual variability in smallmouth bass year class strength varied at similar magnitudes. Spring water temperature data were only available from four of the walleye stocking lakes, but there was no apparent relationship between water temperature and the magnitude of recruitment variability for either species. Findley Lake and Lake Ronkonkama were among the warmer waters in the statewide database, and Bear Lake and Eaton Brook Reservoir were in the intermediate range. Presumably, current bass regulations would offer more consistent protection to guarding male bass in Findley Lake and Lake Ronkonkama, but there was no tendency for young of year bass catches for either species to be higher or less variable in the warmer waters. The survey of bass populations conducted by Green et al. (1986) produced similar estimates of black bass year class variability in New York State as those observed in the walleye stocking study. They reported that largemouth bass recruitment typically varied 2- to 10-fold annually, with

some lakes exhibiting 50- to 100-fold annual variability, and concluded that extreme annual variability might be exhibited by as much as 30-40% of the largemouth bass populations in New York State. Their study found less dramatic annual variations in smallmouth bass year class strength, similar to the findings from the walleye study lakes. Year class variability in black bass is a well-established phenomenon, and variations in largemouth bass year class production of the same magnitude as seen in New York State waters have been observed in other states where no regulations are in place to protect spawners (North Carolina: Jackson and Noble 2002; Illinois: Kohler et al. 1993; Oklahoma: Fisher and Zale 1992). While it is not possible to rule out angling of guarding males in New York waters where the bass season opens before schools of young disperse as a possible factor contributing to year class variability, there is little evidence to suggest that angling contributes significantly to recruitment variability. If angling was a significant factor in year class variability, we would expect to see greater variability in states where there is no protection for guarding males, but there is no evidence that the current regulations in New York State serve to reduce recruitment variability relative to more southern states where no protective regulations are in place.

Long-term collaborative studies conducted by Cornell University and the New York State DEC on Oneida Lake and Canadarago Lake provide additional data for assessing potential relationships between annual variability in water temperatures on opening day of bass season and year class production of black basses. Temperature data indicate that both lakes exhibit wide annual variations in water temperatures in mid-June (Figure 6). The data series from both lakes include years when bass season opened when both species were likely still early in the spawning and guarding period as well as years when the guarding stage should have been concluded when the season opened.

In Oneida Lake, sampling is primarily directed at walleye, and little reliable information on largemouth bass populations is available. However, juvenile smallmouth bass are commonly captured in summer bottom trawls, and variability in trawl catches does appear to reflect real differences in reproductive success (Brooking et al. 2001). No relationship was evident between water temperatures at the time bass season opened and strength of smallmouth bass year classes as measured by summer trawling (Figure 7). The largest year class occurred the year that the warmest spring water temperature was observed, but most of the largest year classes occurred during years when male bass were likely still in the guarding stage when the season opened.

Fall electrofishing samples in Canadarago include collection of young of year black bass, so provide a direct measure of variability in year class strength. There was no relationship between spring water temperatures and electrofishing catch rate of juvenile smallmouth bass (Figure 8). A weak relationship between spring water temperatures and catch rates of young largemouth bass did exist for Canadarago Lake, but was driven by one large year class, and the trend was for higher catches in years when spring water temperatures were cooler.

Seasonal Trends in Angler Catch Rates of Black Bass

Approach

Creel data providing some seasonal breakdown of catch or catch/effort for black basses was gathered from selected lakes to see if trends were consistent with earlier research suggesting higher angling vulnerability of guarding males. Monthly total catch data for largemouth bass from two Long Island Lakes (Blydenburgh Lake and Lake Ronkonkama) on which bass season opens the first Saturday of June were examined (data provided by C. Guthrie). Seasonal targeted catch rates for both species of black bass were available from Black Lake for 1996, as well as preliminary data from the 2004 season (report and data provided by D. Carlson). Monthly targeted catch rates for both largemouth and smallmouth bass from an ongoing creel survey of Oneida Lake were also used (Data provided by S. Krueger). Seasonal trends in smallmouth bass catch rates from the New York waters of Lake Erie were obtained from Einhouse et al. (2002).

Results

Total catch of largemouth bass in Blydenburgh Lake was higher during June than any other month, but there was no difference in catches between June and July in Lake Ronkonama (Table 3). Available data do not allow assessment of potential differences in catch per effort between June fishing, which may occur during the guarding stage and July catches which likely reflect the post-guarding period. However, based on total catches, the results from the two Long Island lakes do not provide conclusive evidence that catches of bass are consistently higher during the guarding period. While data from Blydenburgh Lake are consistent with increased vulnerability of bass during the spawning season, spring catch in Ronkonkama Lake was not different than those recorded later in the summer. Total harvest rates of largemouth bass in both lakes, as a percent of bass caught, were less than 5%.

Black Lake catch rate data were calculated by season (summer: opening day through Labor Day; Fall – Labor Day through close of season), so assessment of June catch rates was not possible. However, in both years, fall season catch rates were higher for both species than those recorded for the summer season (Table 3). In 1996, 6.4% of largemouth caught were harvested and 24% of smallmouth were kept.

In Oneida Lake, seasonal patterns in black bass catch rates differed among years (Table 3). Catch rates of largemouth bass were similar in June and July of all years, and typically higher than late summer and fall catch rates. For smallmouth bass, peak catch rates were not consistently associated with a particular month, but in no year were the highest catch rates observed in June. Oneida Lake data did not provide evidence that early season fishing, when males were most apt to still be in the guarding stage, produced higher catch rates. Harvest rates of largemouth bass in Oneida Lake were typically well under 10%, while harvest rates of smallmouth bass ranged from 16-27% over three years.

Einhouse et al. (2002) reported higher spring (first Saturday in May – third Saturday in June) catch rates of smallmouth bass than observed for the remainder of the season. Based on 95% confidence intervals, differences were significant in four of the seven years since early season fishing was initiated. Despite high catch rates during the male guarding period, they were not able to detect a population level recruitment effect. Harvest rates of smallmouth bass in Lake Erie ranged between 10-20%.

Harvest rate data from Green et al. (1986) generally agree with the more recent creel data above. Weighted average for largemouth bass harvest rate in the waters covered was 8% and for smallmouth 21%.

Seasonal trends in bass catches in both Blydenburgh Lake and Lake Erie were consistent with expectations under the assumption of increased vulnerability of bass to angling during the spring guarding period. However, no such trends were evident from Black Lake, Oneida Lake or Lake Ronkonkama. The lack of clear patterns in Black Lake and Oneida Lake may reflect that fishing in those systems did not encompass the entire spawning season, so it is difficult to draw strong conclusions about increased vulnerability of guarding bass to angling based on data from these lakes. Nonetheless, Lake Erie data provides strong evidence that even with angling pressure during the spawning season, annual recruitment did not decline relative to years prior to the opening of the spring fishing season, even in the face of increased overall angling effort.

Compliance with Closed Seasons

An additional complication in assessing the benefits of closed seasons to black bass fisheries is that level of compliance by anglers is unknown. Growing evidence indicates that even in waters where bass are protected from angling during the spawning season significant levels of illegal targeted fishing takes place. In Michigan, a study of six southern lakes revealed that as many as 44% of general anglers and 69% of bass anglers regularly targeted bass during the closed season (Bremigan and Towns 2004). Philipp et al. (1997) reported noncompliance rates in Ontario waters as high as 63%, and concluded that the level of illegal fishing pressure likely undermined the effectiveness of protective regulations. Kubacki et al. (2002) concluded in further studies of the same waters studied by Philipp et al. (1997) that on average, 32% of anglers fishing prior to the opening of bass season were targeting bass on nests. No effort to estimate noncompliance to the current closed season for black bass has been conducted in New York State, but open seasons for walleye, panfish and esocids prior to the opening of bass season complicates protection of bass nests from angling, and many biologists in the state feel that significant levels of illegal targeting of bass takes place in the state (D. Stang, personal communication).

Conclusions

➢ Based on published data of water temperatures at which black basses initiate spawning and the duration of the guarding period, the current closed season in New York State likely does not protect guarding male bass from angling pressure

in all waters of the state or in all years in others. The current bass season may open in as many as half the waters of the state prior to completion of the male guarding period.

➤ No clear geographic pattern in spring water temperatures is evident across the state, so it is unlikely that regional regulations could be developed that would increase the effectiveness of protective regulations.

➤ Abundances of black bass populations in the state vary widely, but there is little evidence that differential protection from angling during the spawning season contributes to these differences.

➤ Annual year class production of black basses in New York State varies dramatically, but on the same order as observed in states with no closed season. There is no strong evidence that year class production in New York State is less variable as a result of the current protective regulations, nor that variability is higher in waters where the season opens prior to completion of the guarding period.

➤ Data concerning potential increased vulnerability of male bass to angling during the guarding period is inconclusive.

➤ In Lake Erie, where the best data are available, year class strength of smallmouth bass does not appear to have decreased as a result of increased angling during the spawning season.

➤ Noncompliance with closed seasons in other management jurisdictions that utilize closed seasons for black bass suggest that significant levels of preseason angling already takes place.

➤ Harvest rates of largemouth bass in the state are low, so periodic large year classes may be adequate to maintain quality fisheries. Regulation changes to reduce creel limits to offset potential impacts of opening spring fishing (as being considered in Michigan – see Bremigan and Towns 2004), would likely not be effective.

➤ Harvest rates of smallmouth bass can be up to 30% in some waters of the state. If opening of the current closed season does impact year class strength, smallmouth populations in unproductive waters might be negatively impacted. Reduced creel limits may offer some additional protection, but enforcement of differential regulations for largemouth and smallmouth bass may be problematic.

➤ Available data suggest that in most waters of New York State, opening of a spring catch and immediate release season will create additional fishing opportunities without obviously jeopardizing sustainability of bass populations.

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Table 1. Fall electrofishing catch rates of adult largemouth and smallmouth bass as reported in the Modern Fisheries Statewide Database. Lakes are partitioned based on water temperatures on the opening day of bass season into cold (least protection of guarding males from angling pressure), warm (most protection), and intermediate categories.

Temp	Lake	Date	survey	LMB>yoy	SMB>yoy	time	LMB CPUE	SMB CPUE	Avg lake temp
cold	Lake Abanakee	8/26/1992	592070	6	3	3.25	1.8	0.9	54
cold	Blake Falls Res	6/22/1993	693112	0	22	0.88	not present	25.0	68
cold	St. Lawrence River	7/20/1994	694402	11	6	0.88	12.5	6.8	56
cold	Stark Falls Res	6/15/1993	693109	1	39	1.01	1.0	38.6	64
cold	Otsego Lake	Oct-01	SUNY Oneonta	135	58	9.5	14.2	6.1	65.2
cold	Schoharie Res	10/10/1995	495038	36	284	5.25	6.9	54.1	65.12
cold	Higley Falls Res	6/21/1993	693111	2	42	0.83	2.4	50.6	66.02
cold	Pepacton Res	9/11/1991	491029	1	177	3.75	0.3	47.2	70.07
cold	Chautauqua Lake	10/6/2003	903019	137	43	7.42	18.5	5.8	66.05
				cold lake average			7.2	26.1	63.82888889
warm	Massapequa Lake	5/17/2002	102007	41	0	1.68	24.4	not present	80.06
warm	Duck Lake	6/10/1998	798009	149	0	2.25	66.2	not present	77
warm	Rushford Lake	5/31/2000	900302	0	56	1	not present	56.0	73.4
warm	Swan Lake	6/15/1994	394009	25	0	0.36	69.4	not present	87.08
warm	Findley Lake	5 yr avg	Cornell	5 yr avg	5 yr avg	5 yr avg	18.2	6.4	72.73
warm	Lake Ronkonkoma	5 yr avg	Cornell	5 yr avg	5 yr avg	5 yr avg	7.0	1.5	74.69
warm	Lower Cassadaga Lake	6/4/2003	903004	75	22	1.23	61.0	17.9	74
warm	Grant Pond	8/21/1991	191006	135	0	6	22.5	not present	82.04
warm	Stissing Pond	388997	388997	140	0	2.7	51.9	not present	77
				warm lake average average			40.1	20.4	77.55555556
medium	Oneida Lake	2003	Cornell	3	9	4	0.8	2.3	67.4
medium	Canadarago Lake	1990-2003	Cornell	9 yr avg	9 yr avg	9 yr avg	10.5	5.7	70
medium	Snyders Lake	10/17/1988	488051	33	4	3.25	8.3	1.2	75.05
medium	Conesus Lake	10/8/2002	802017	121	2	2.25	60.5	0.9	72.5
medium	Butterfield Lake	10/8/2002	602105	62	5	2.74	12.4	1.8	70.83
medium	Cranberry lake	6/17/1999	699170	13	105	1.38	0.1	76.1	70
medium	Copake Lake	9/25/2000	400059	33	5	1.16	6.6	4.3	72.8
medium	Eaton Brook Res	5 yr avg	Cornell	5 yr avg	5 yr avg	5 yr avg	25.6	3.1	68.23
medium	Otisco Lake	10/16/2003	703015	42	96	3.92	0.4	24.5	70.7
medium	Bear Lake	5 yr avg	Cornell/DEC	5 yr avg	5 yr avg	5 yr avg	31.9	10.9	71.6
medium	Cazenovia Lake	5/28/1997	Cornell	179	112	2	1.6	56.0	72
medium	Kayuta Lake	8/29/2001	601213	1	13	1.47	0.1	8.8	69.8
				medium lake avg			13.2	16.3	70.90916667

Table 2. Fall electrofishing catch rates of young of year largemouth and smallmouth bass in the walleye stocking study lakes.

Largemouth Bass	Min	Max	Mean	Stdev	Count
Bear Lake	3.8	30.0	10.9	10.93	5
Cayuta Lake	1.1	16.2	8.6	5.86	7
Clear Lake	0.7	3.7	1.7	1.22	5
Dyken Pond	3.8	14.1	9.6	4.03	5
Eaton Brook Res	1.6	4.6	2.9	1.36	6
Findley Lake	2.5	57.1	20.0	21.69	5
Fort Pond	1.0	3.2	2.1	0.79	5
Grass Lake	2.9	7.3	4.5	2.02	5
Hyde Lake	1.2	17.8	7.6	7.31	4
Lake Ronkonkoma	1.9	6.6	3.6	1.85	5
Sixtown Pond	3.2	323.9	71.2	127.81	5
Swingng Bridge	0.0	5.3	1.9	2.28	5
Trout Lake	2.8	12.7	6.4	4.38	5
Smallmouth Bass	Min	Max	Mean	Stdev	Count
Bear Lake	0.4	2.9	1.3	1.08	5
Cayuta Lake	-	-	-	-	not present
Clear Lake	0.0	1.2	0.5	0.46	5
Dyken Pond	-	-	-	-	none caught
Eaton Brook Res	1.1	4.8	2.5	1.31	6
Findley Lake	0.0	2.1	1.1	1.00	5
Fort Pond	0.9	20.4	6.3	8.23	5
Grass Lake	0.0	1.4	0.6	0.57	5
Hyde Lake	0.0	0.2	0.1	0.11	4
Lake Ronkonkoma	0.0	3.4	1.0	1.62	5
Sixtown Pond	0.0	0.3	0.1	0.14	5
Swingng Bridge	1.2	168.0	40.8	71.48	5
Trout Lake	1.1	7.4	4.9	2.56	5

Table 3. Total catch and catch rate data for black bass in select waters of New York State.

	Preseason	June	July	Aug	Sept	Oct
Blydenburgh Lake 2000, Total Number Caught, Largemouth Bass Only						
Interview	152	208	93	28	64	
Survey Card	167	311	172	67	42	
Lake Ronkonkama 2000, Total Number Caught, Largemouth Bass Only						
Interview	15	39	69	33	19	18
Survey Card	23	46	38	32	23	16
Black Lake, Targeted Catch Rates (Number/Hour) – Summer and Fall Seasons						
1996						
Largemouth			0.18		0.32	
Smallmouth			0.09		0.48	
2004 (Preliminary)						
Largemouth			0.13		0.20	
Smallmouth			0.06		0.22	
Oneida Lake, Targeted Catch Rates (Number/Hour)						
2002						
Largemouth		0.12	0.14	0.09	0.04	0.01
Smallmouth		0.60	0.47	0.33	0.32	0.91
2003						
Largemouth		0.10	0.09	0.05	0.09	0.03
Smallmouth		0.99	0.68	1.04	0.83	0.56
2004						
Largemouth		0.19	0.12	0.09	0.09	0.02
Smallmouth		0.53	0.84	0.47	0.82	0.25

Figure 1. Range of water temperatures reported in the Modern Fisheries Statewide Database near the opening day of bass season in ponds, lakes, reservoirs and rivers.

Water temperature on opening day of bass season (June 15-21) by type of water, all years
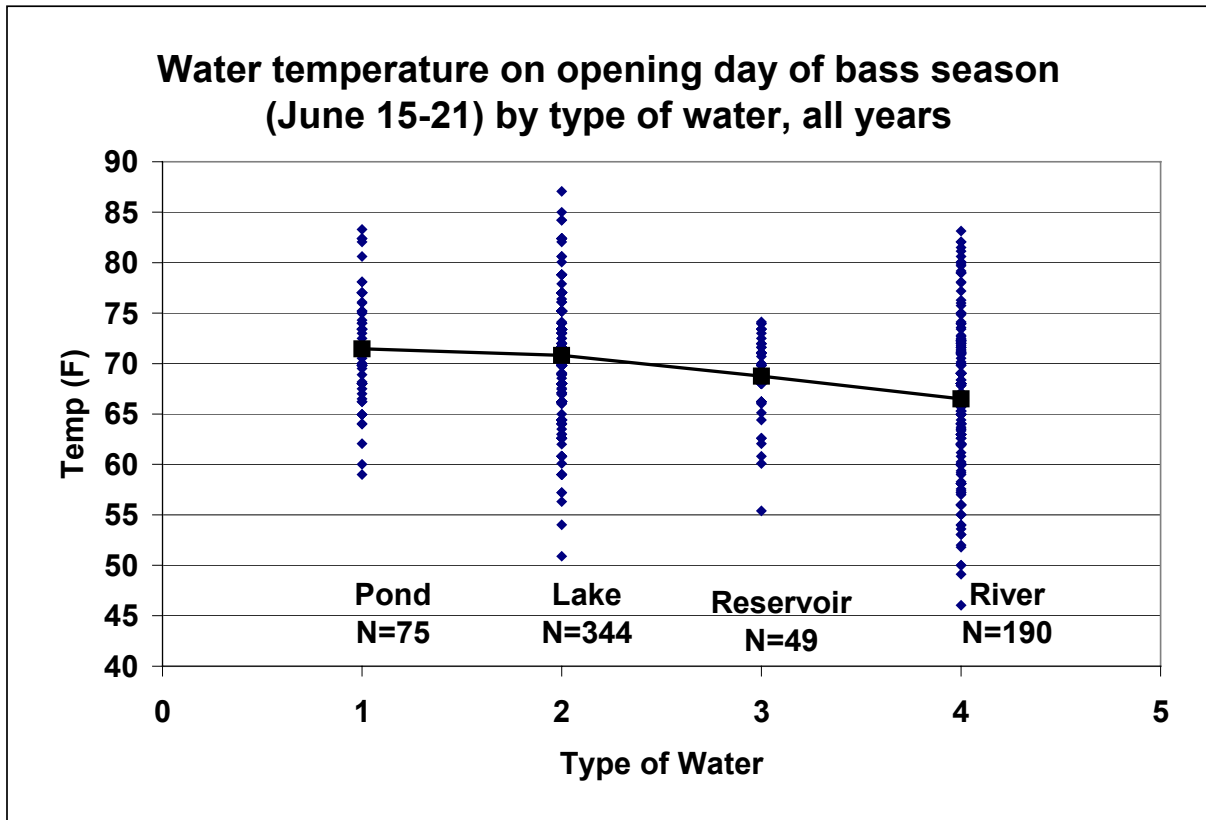
Figure 2. Distribution of observed water temperatures in ponds, lakes and reservoirs in New York State reported in the Modern Fisheries Statewide Database on the opening day of bass season.
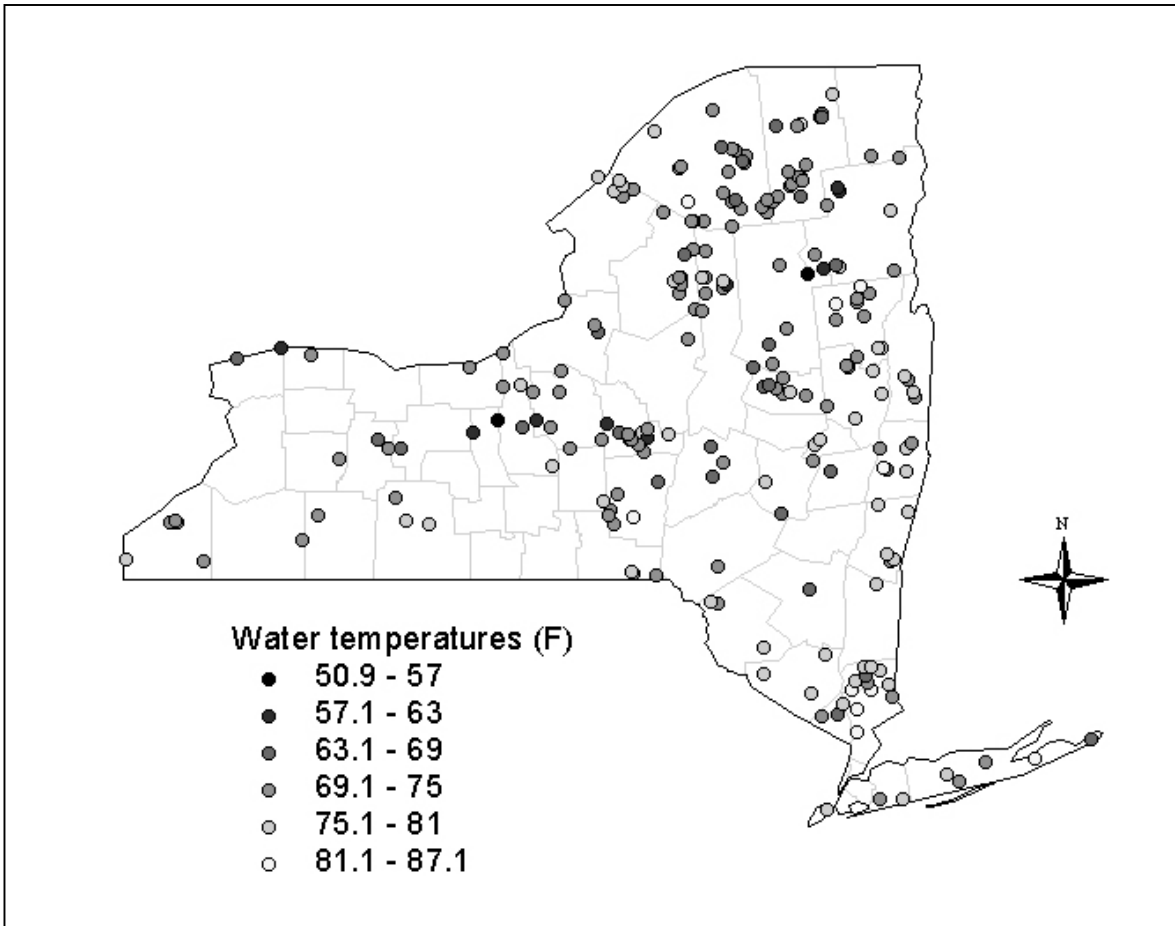
Figure 3. Relationships between spring water temperatures and surface area, maximum depth, altitude, and latitude for lakes in New York State reported in the Modern Fisheries Statewide Database.
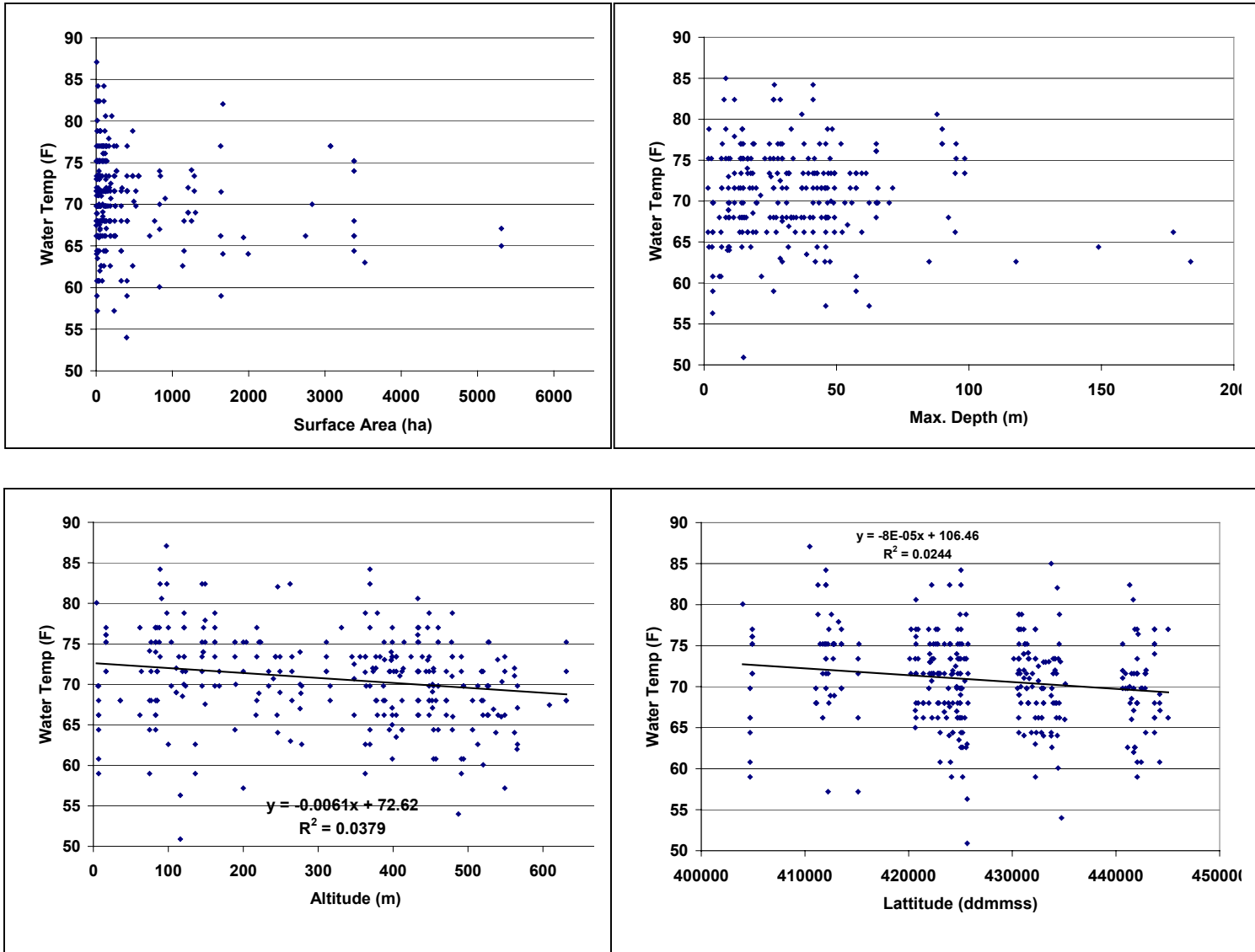
Figure 4. Relationships between spring water temperatures and surface area, maximum
depth, altitude, and latitude for ponds in New York State reported in the Modern
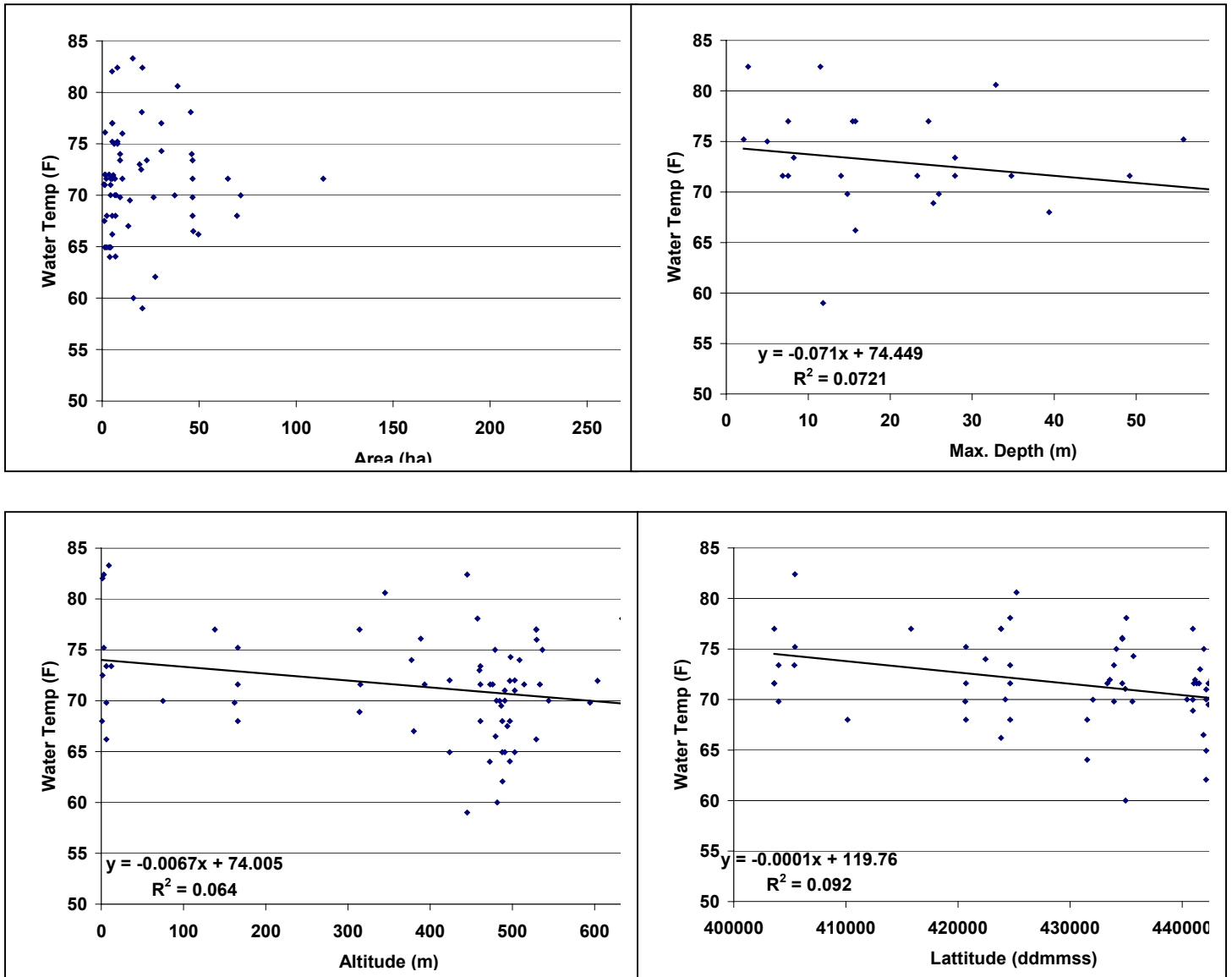Fisheries Statewide Database.

Figure 5. Relationships between spring water temperatures and adult electrofishing catch rates of largemouth and smallmouth bass from the Modern Fisheries Statewide Database.
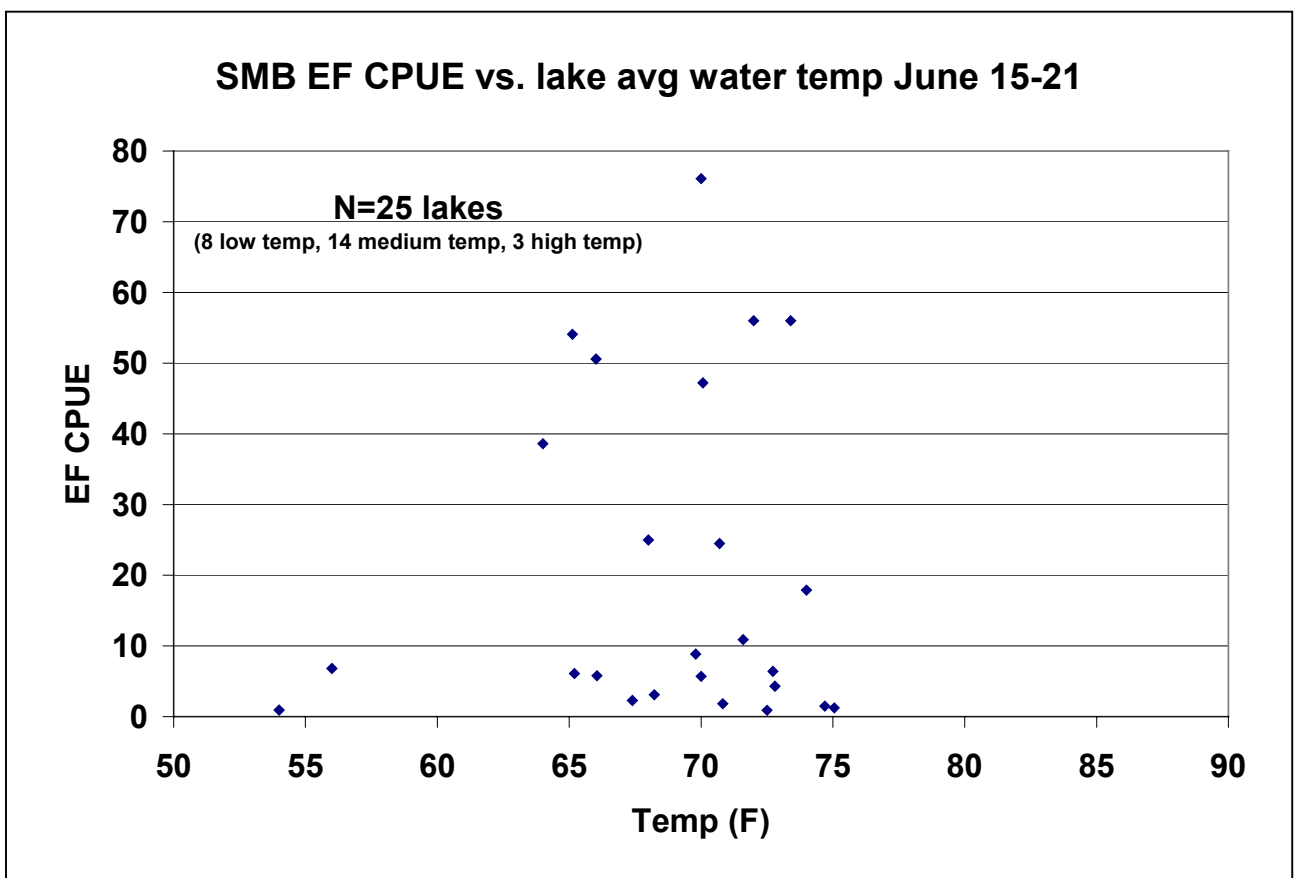

LMB EF CPUE vs. lake avg water temp June 15-21

N=28 lakes
(7 low temp, 14 medium temp, 7 high temp)

$y = 1.7616x - 105.52$
$R^2 = 0.3011$

SMB EF CPUE vs. lake avg water temp June 15-21

N=25 lakes
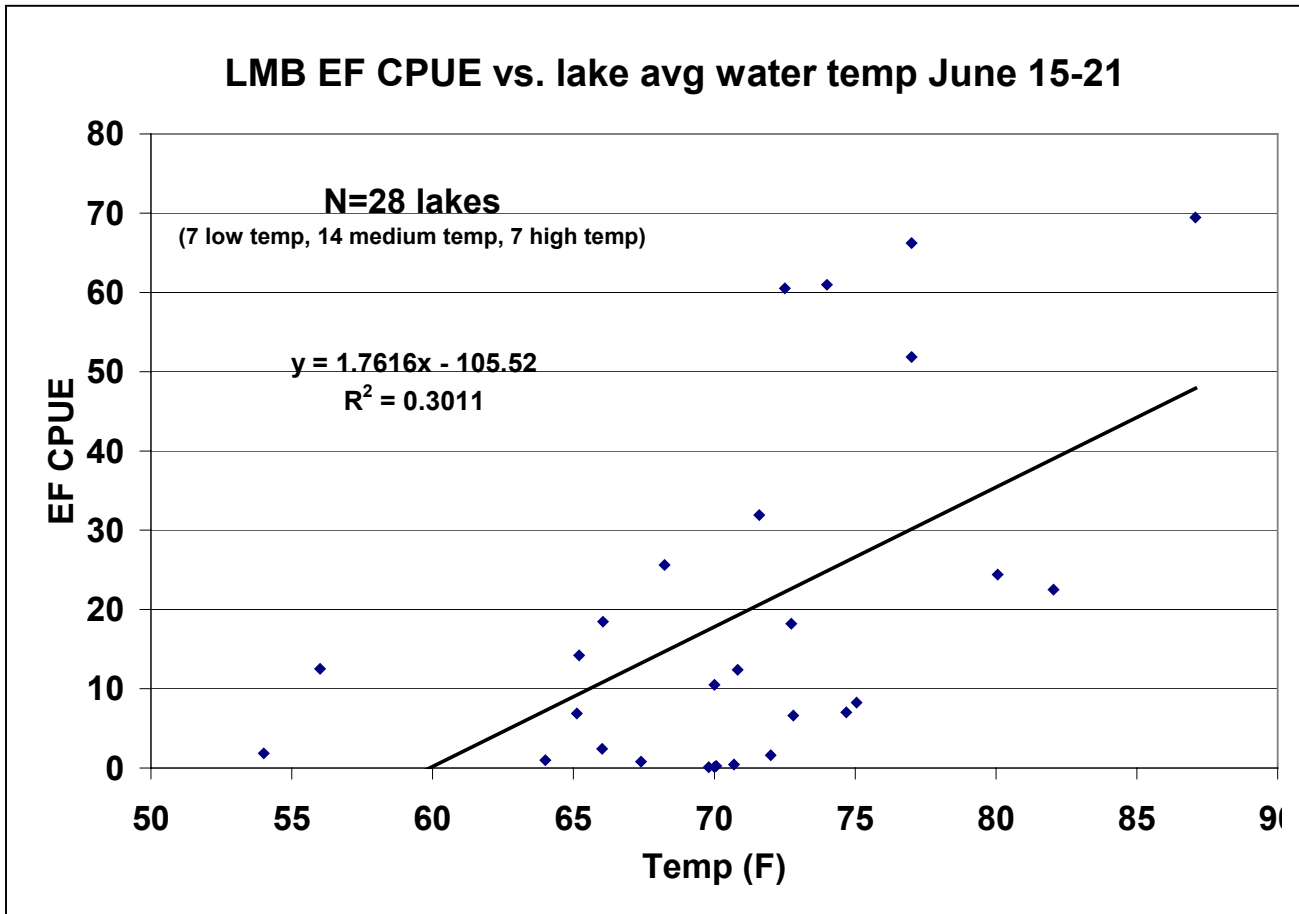(8 low temp, 14 medium temp, 3 high temp)

Figure 6. Annual trends in water temperatures in Oneida Lake and Canadarago Lake at the time black bass season opens.
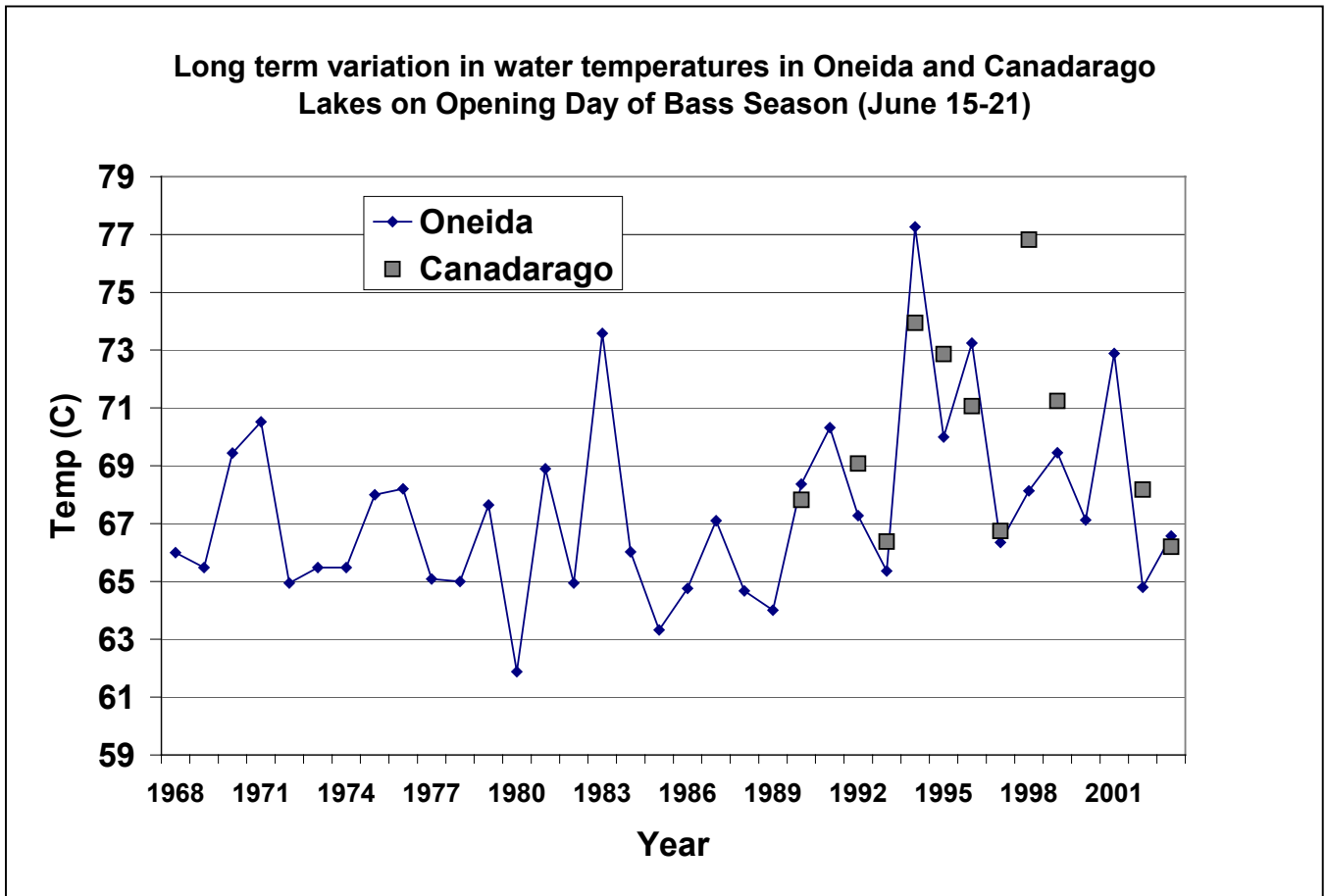
Figure 7. Relationship between water temperatures at time of opening of bass season and summer trawl index of smallmouth bass year class strength in Oneida Lake.

Oneida Lake YOY SMB trawl CPUE vs. temp June 15-21 that year
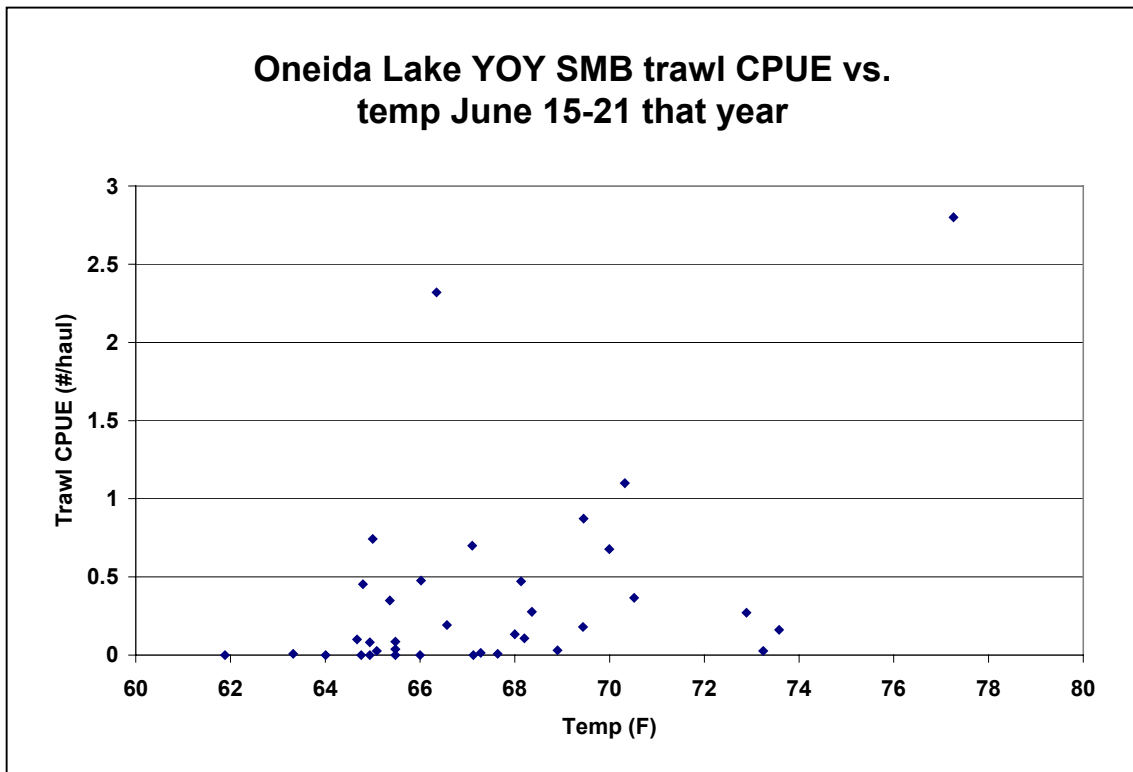
Figure 8. Relationships between water temperatures at time bass season opens and fall electrofishing index of year class strength of largemouth and smallmouth bass in Canadarago Lake.

Canadarago Lake EF CPUE of YOY bass vs. water temps June 15-21 that year

LMB
y = -1.9528x + 141.37
R2 = 0.1926

SMB
y = 0.1362x - 6.1375
R2 = 0.005