



Susquehanna River Walleye Fishery

2008

The Susquehanna River is the largest tributary to the Atlantic Ocean lying completely within the United States. It originates from the outlet of Otsego Lake in Cooperstown, New York, and flows 444 miles to the Chesapeake Bay at Havre de Grace, Maryland. Much of the river (354 miles) travels across Pennsylvania, where it drains half of the state's land area. The Pennsylvania portion of the river provides major fisheries for popular gamefish including smallmouth bass, walleye, catfish, and muskellunge. Recently, some anglers have expressed concerns about harvest of walleye from the Susquehanna River. The objectives of this paper are to review our knowledge of the Susquehanna River walleye population and to determine if angler harvest is having negative impacts on walleye abundance and size structure. For purposes of this paper, the term Susquehanna River refers to the entire length of the river in Pennsylvania. This includes the stretch of river commonly known as the "North Branch", which extends from the New York Border downstream to Sunbury. It does not include the West Branch of the Susquehanna River.

Walleye are not native to the Susquehanna River drainage. Widespread stocking programs introduced the species throughout the basin and the river now supports a naturalized, reproducing walleye population. The Pennsylvania Fish and Boat Commission (PFBC) formerly supplemented this population with walleye fry stockings in the stretch of river from Sunbury, Pennsylvania to York Haven, but terminated this stocking program beginning in 2008. Fisheries management personnel did not believe the stockings made significant contributions to the fishery. Additionally, anecdotal reports suggested that the walleye fishery in the portion of the Susquehanna River from York Haven Dam to the Juniata River improved substantially after the York Haven Dam fishway opened. Significant numbers of walleye pass through this fishway each spring. PFBC biologists will evaluate the results of terminating walleye fry stockings in upcoming years.

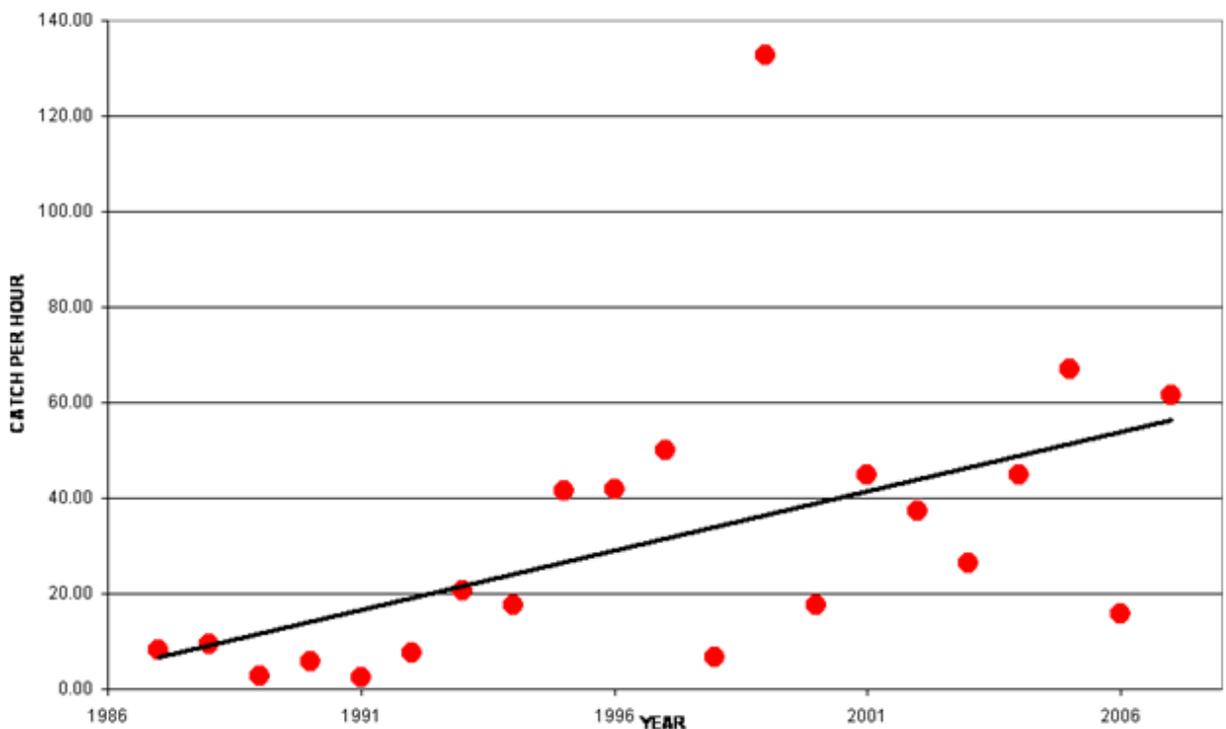
Current walleye regulations for the Susquehanna River include a 15 inch minimum length limit and a six fish daily creel limit. Harvest regulations permit anglers to keep walleye from January 1 to mid-March and again from early May to December 31. The only exception to these regulations applies to Conowingo Pool, where the creel limit is five fish per day and harvest is open year-round. This exception is to maintain consistency in regulations between the Pennsylvania and Maryland portions of the impoundment.

Currently, we do not have an estimate of annual walleye harvest from the Susquehanna River. The PFBC conducted an angler use and harvest study of the Susquehanna River from Sunbury, Pennsylvania to Conowingo Pool and the Juniata River from Port Royal, Pennsylvania to the mouth in 2007. We will generate harvest estimates from this study as data analysis progresses. For now, however, we can use raw data from the study to show that walleye anglers practiced a high level of catch and release on these rivers. Interviewed anglers reported catching 963 walleye during the 2007 survey, including 442 (46%) of legal length. Of the 442 legal walleye caught, anglers reported releasing 336 (76%). Survey clerks only observed 106 walleye (24% of total reported legal catch) in anglers' creels. We should note that this study took place from April to October, and did not include the months when the walleye fishery was at its peak.

The Susquehanna River walleye fishery is at its best during the colder months. Fisheries Management observations, Waterways Conservation Officer reports, angler and bait shop contacts, and a review of angling message boards all suggest that walleye catch and harvest peak from late October through November and once again just before the season closes in mid-March. Additionally, these anecdotal observations suggest that much of the walleye catch during the winters of 2007 and 2008 consisted of sub-legal fish. This has led some anglers to conclude that angler harvest has cropped walleye size structure down to the legal length limit.

There are several ways to determine the impact of angler harvest on fish population abundance and size structure. One method is to look at an index of population size through time. The index we will use here is the catch per hour of walleye collected during annual fall electrofishing samples on the Susquehanna River from 1987 through 2007 (Figure 1). This index doesn't provide a measure of how many walleye are in the river but it does show the trend in population size. If angler harvest were having negative impacts on walleye abundance, we would expect the index to trend downward. In fact, the opposite is true. The trend for the index is positive, indicating that walleye abundance in the Susquehanna River has increased over the last 21 years.

Figure 1. Catch per hour of all walleye captured during fall electrofishing samples on the Susquehanna River from 1987 through 2007.



We can do the same type of analysis to determine if angler harvest negatively impacts the size structure of the walleye population. Figure 2 is an index of the number of legal length (≥ 15 inch) walleye captured during fall electrofishing samples on the river. The trend for this index is even more strongly positive than the trend for total population size. Similarly, the trend for the index of walleye 20 inches and larger (Figure 3) is strongly positive.

Figure 2. Catch per hour of legal size (≥ 15 inch) walleye captured during fall electrofishing samples on the Susquehanna River from 1987 through 2007.

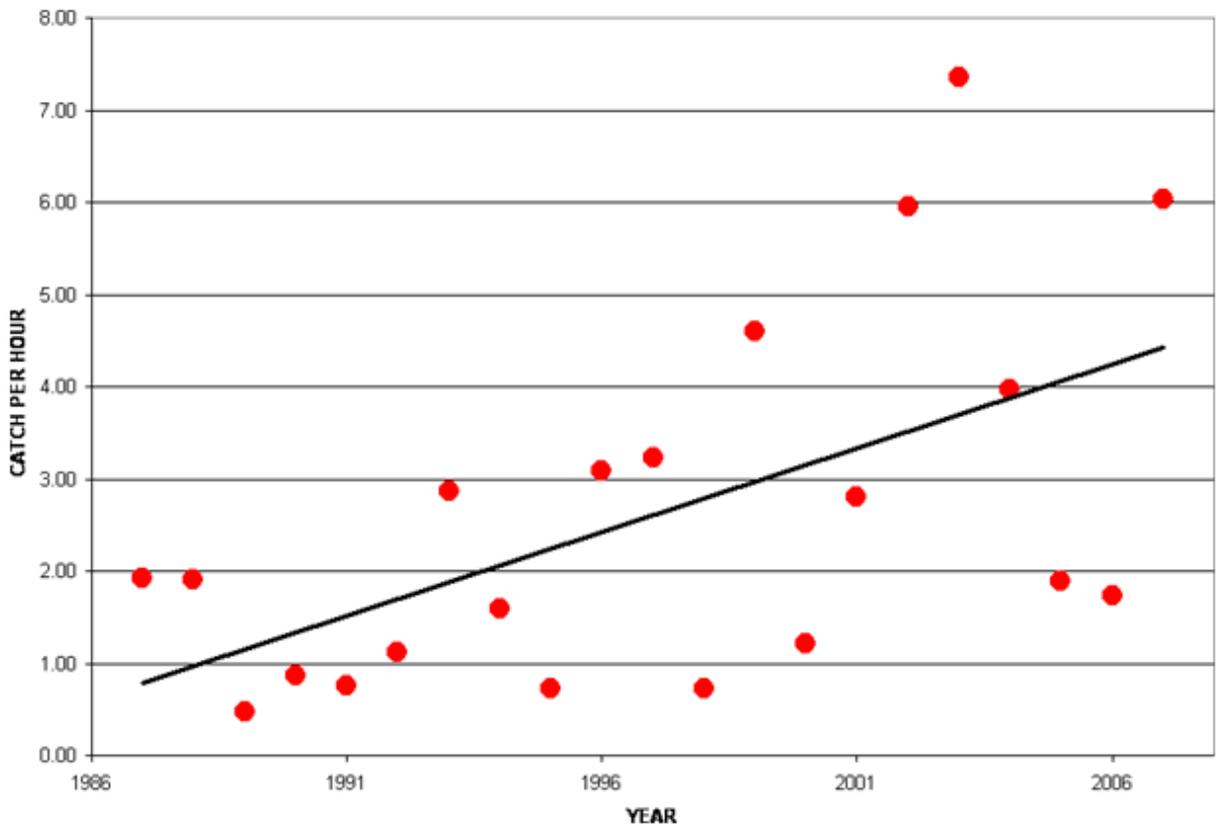
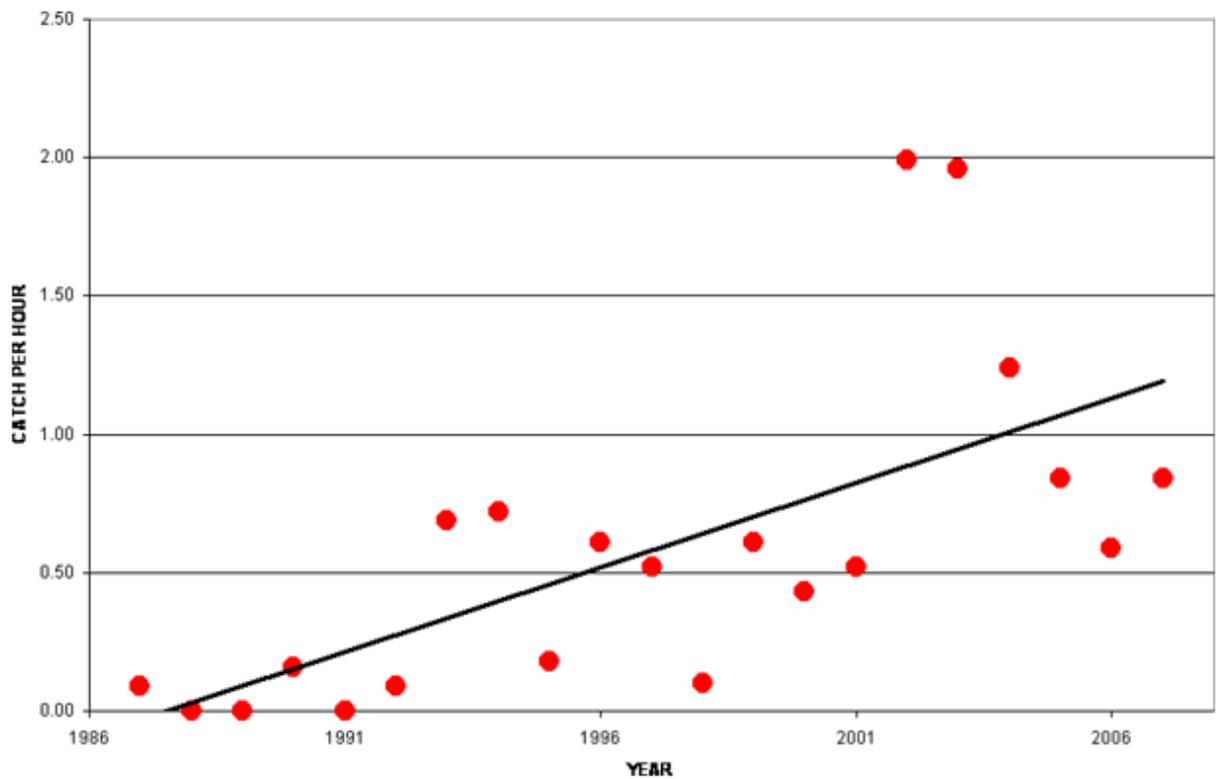


Figure 3. Catch per hour of larger (≥ 20 inch) walleye captured during fall electrofishing samples on the Susquehanna River from 1987 through 2007.



The length-frequency distribution of Age 1 and older fish in a sample provides another way to measure the effect of angler harvest on the size structure of a fish population. When angler harvest results in cropping, the length-frequency distribution shows high numbers of fish just

under the length limit and few fish exceeding it. Looking at the length-frequency distribution of Age 1 and older (≥ 12 inch) walleye from the Susquehanna River in 2007 (Figure 4), we see that 59% of these fish exceeded legal length. In 2006, 36% of Age 1 and older walleye exceeded legal length (Figure 5), and in 2005, 72% of Age 1 and older walleye exceeded legal length (Figure 6). We can also look at walleye length-frequency distribution by decade. In samples from the 1980's (Figure 7), 32% of Age 1 and older walleye exceeded legal length and 1% exceeded 20 inches. In samples from the 1990's (figure 8), 40% of Age 1 and older walleye exceeded legal length and 6% exceeded 20 inches. Finally, in samples from the 2000's (Figure 9), 46% of Age 1 and older walleye exceeded legal length and 11% exceeded 20 inches.

Figure 4. Length-frequency distribution of Age 1 and older walleye captured during fall electrofishing samples on the Susquehanna River in 2007.

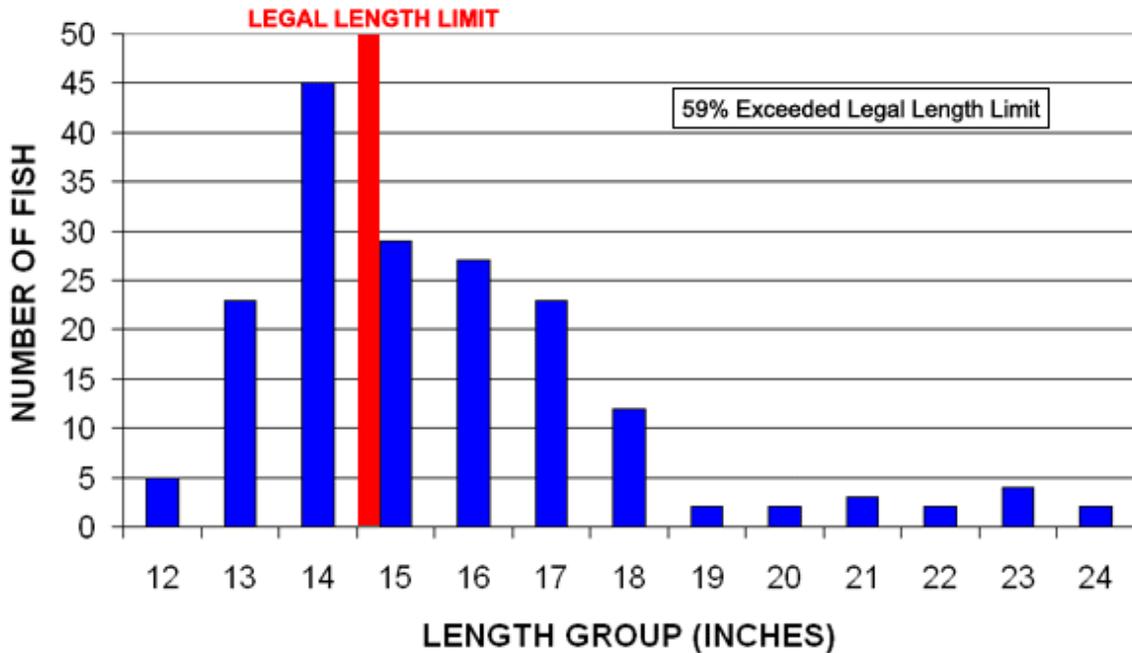


Figure 5. Length-frequency distribution of Age 1 and older walleye captured during fall electrofishing samples on the Susquehanna River in 2006.

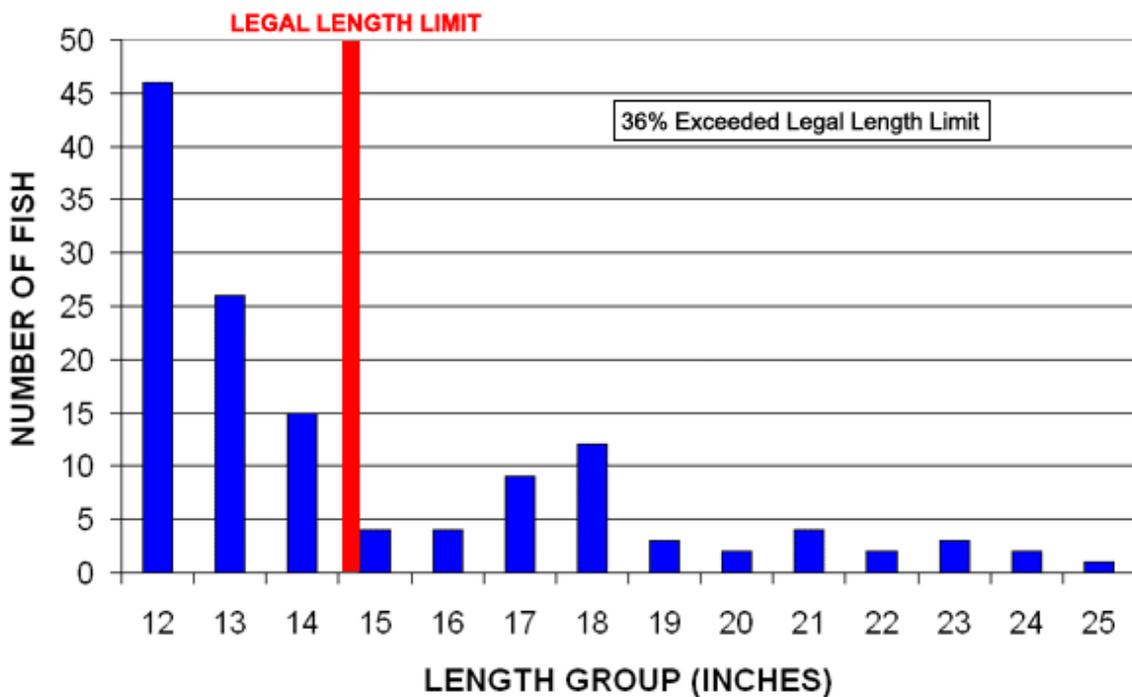


Figure 6. Length-frequency distribution of Age 1 and older walleye captured during fall electrofishing samples on the Susquehanna River in 2005.

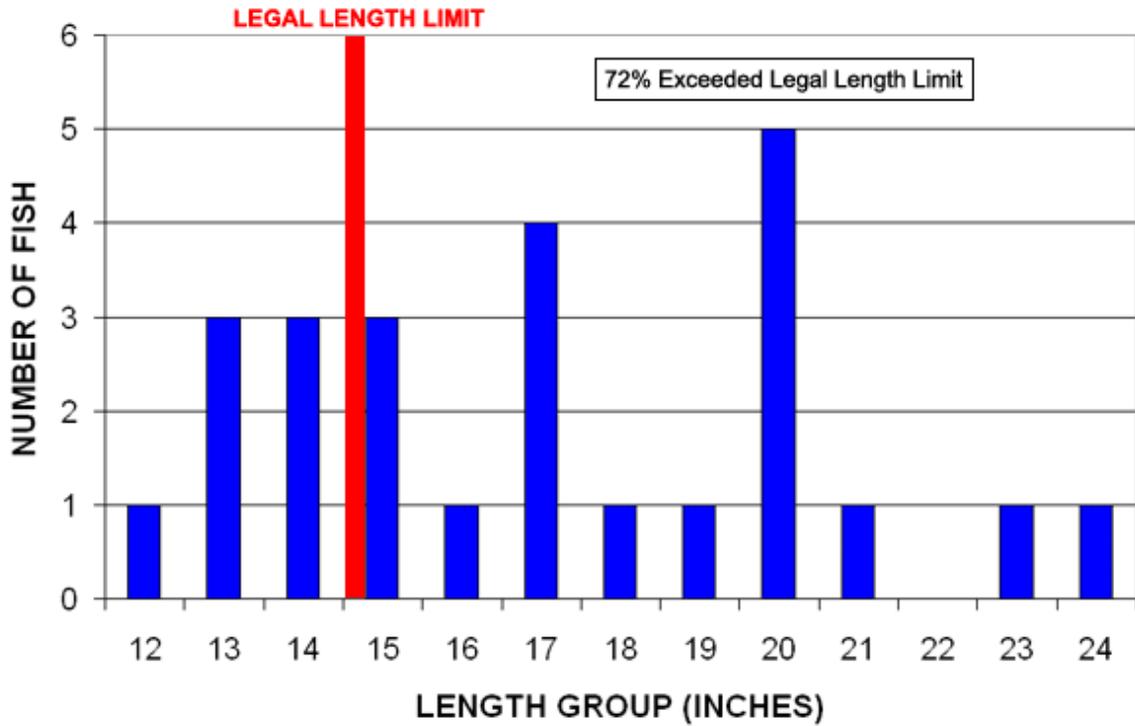
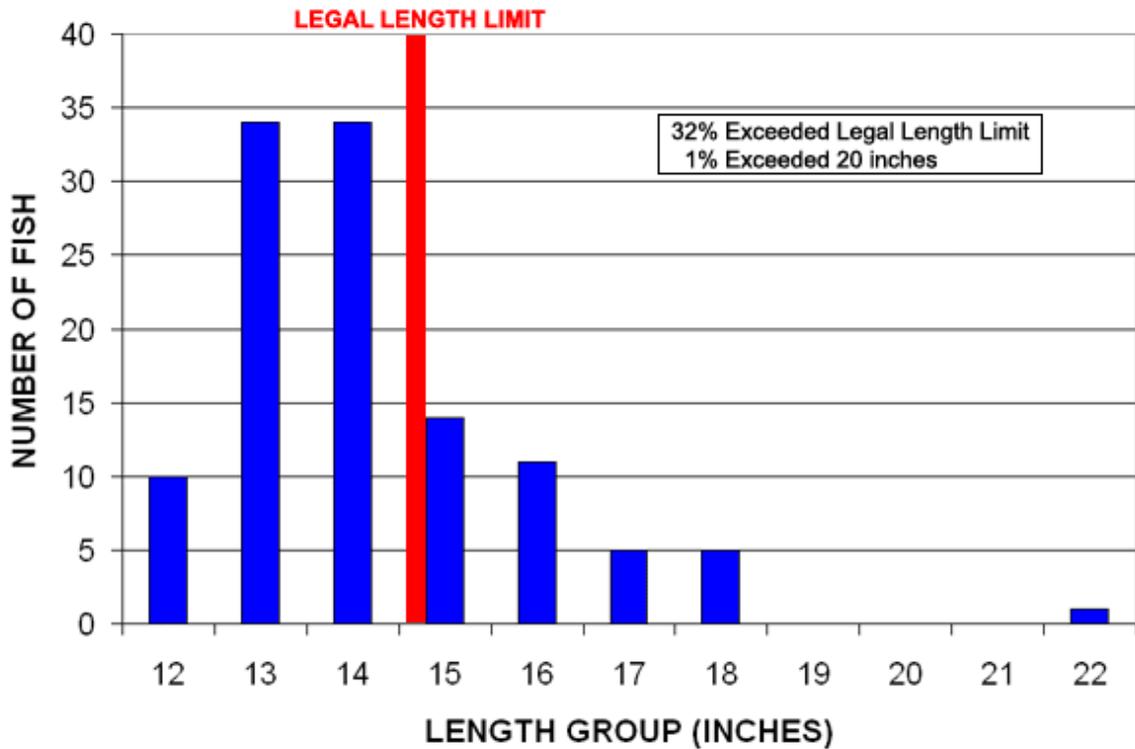


Figure 7. Length-frequency distribution of Age 1 and older walleye captured during fall electrofishing samples on the Susquehanna River during the 1980's.



LEGAL LENGTH LIMIT

Figure 8. Length-frequency distribution of Age 1 and older walleye captured during fall electrofishing samples on the Susquehanna River during the 1990's.

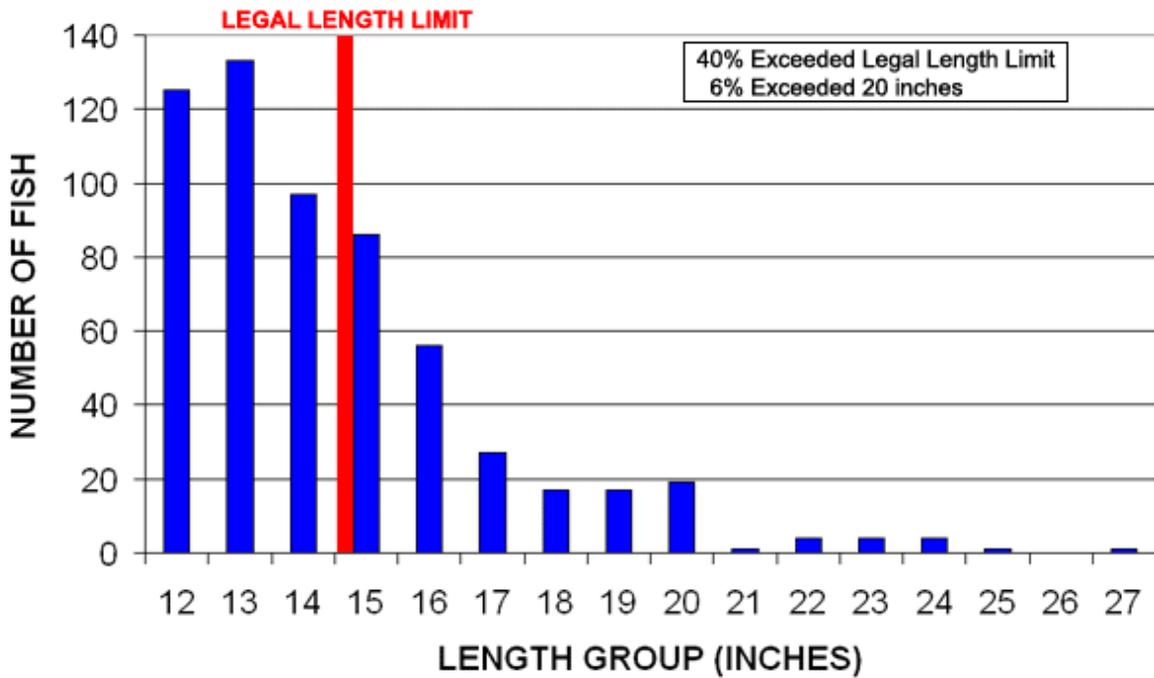
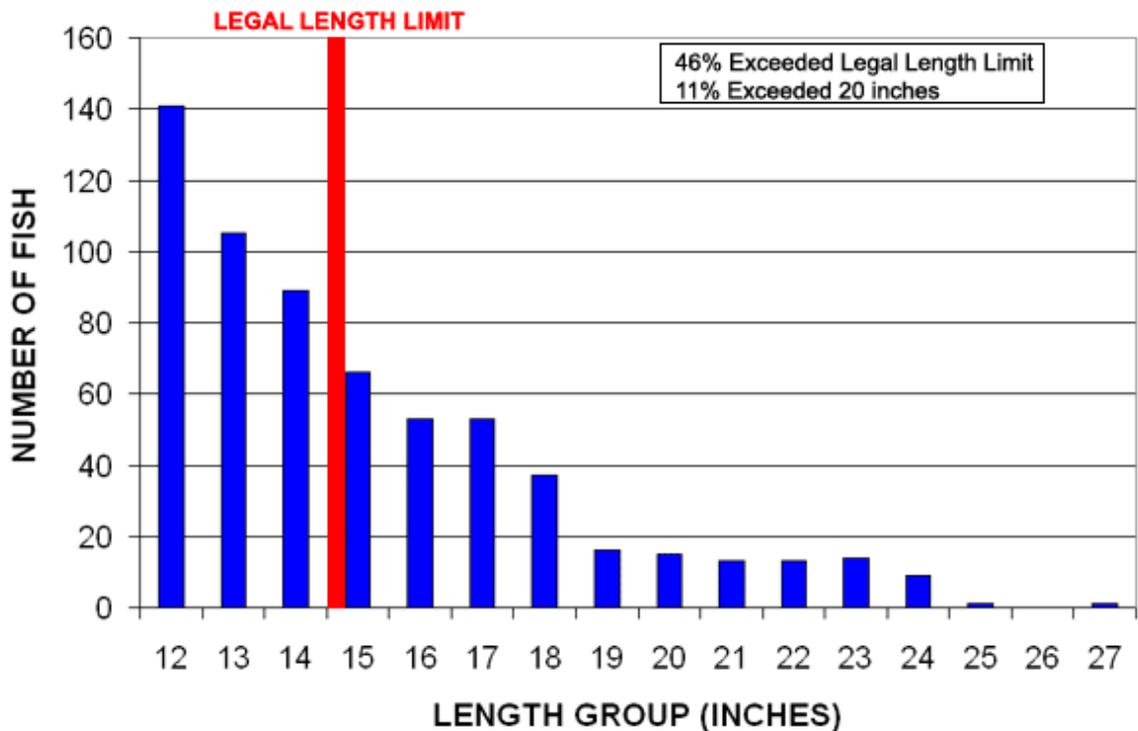
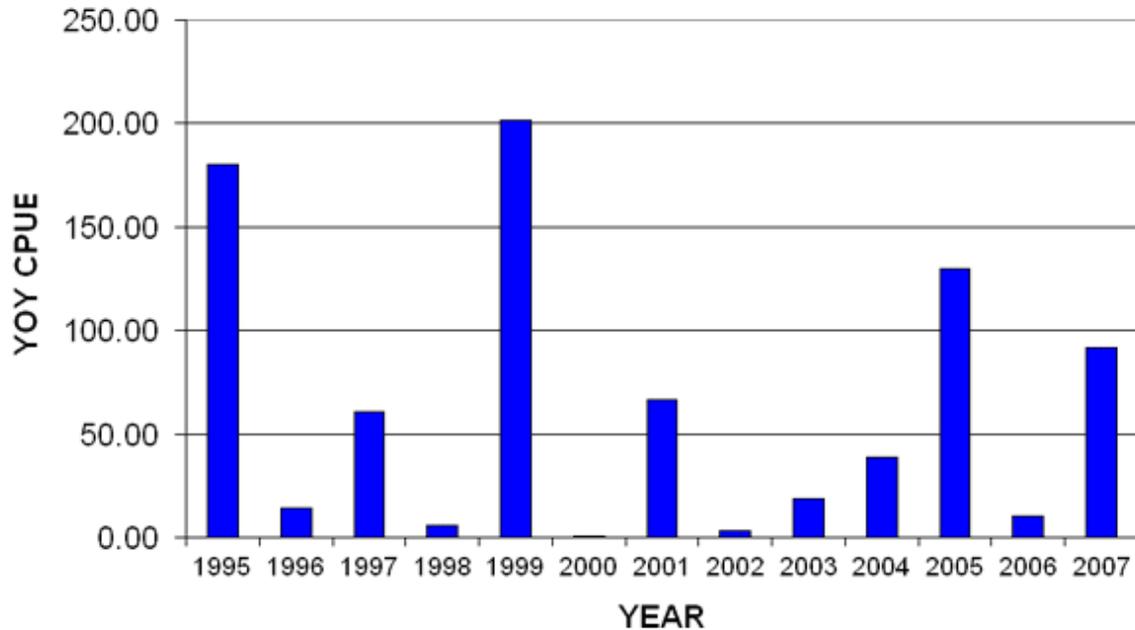


Figure 9. Length-frequency distribution of Age 1 and older walleye captured during fall electrofishing samples on the Susquehanna River during the 2000's.



Trends in abundance indices and length-frequency analyses demonstrate that walleye numbers and size structure in the Susquehanna River have greatly improved since 1987. So, why have anglers been catching such a high percentage of sub-legal fish recently? The answer lies in year class strength, or how many young walleye the river produces each year. Typically, annual walleye reproduction in natural populations is highly variable (Isermann 2007). Many factors can contribute to this variability but the primary cause seems to be spring water temperature (Schupp 2002; Isermann 2007). Annual monitoring of walleye reproduction in the “North Branch” Susquehanna River from 1995 through 2007 shows this variation in a naturalized population (Figure 10). It also shows that Susquehanna River walleyes produced very strong year classes in 2005 and 2007.

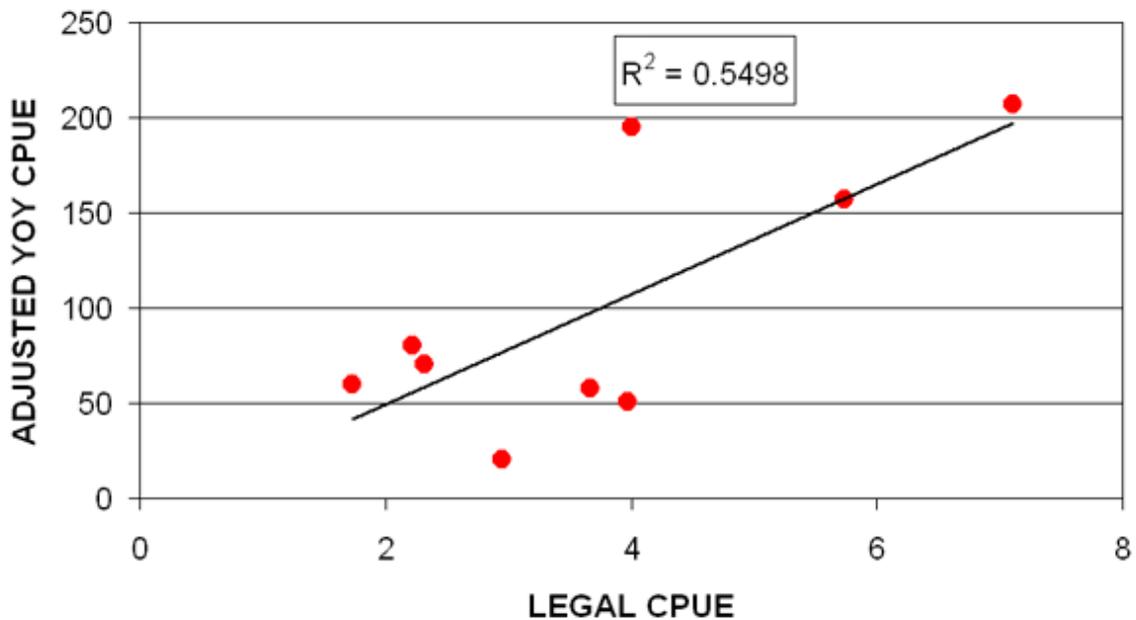
Figure 10. Catch per hour of young-of-the-year walleye (YOY CPUE) in the North Branch Susquehanna River from 1995 through 2007.



Walleye growth rate is variable along the length of the Susquehanna River. Growth is slowest in the upriver portions near New York and fastest in the downriver portions near Conowingo Pool. Additionally, walleye growth can be density dependent and will vary with annual weather patterns. On average, however, 8% of a given walleye year class in the Susquehanna River will reach legal length at Age 2, 75% will reach legal length at Age 3, and 100% will reach legal length at Age 4. Thus, we would predict that the majority of the large walleye year class produced in 2005 would be just under legal length during the winter of 2008, which is exactly what anglers are experiencing in their catches. This isn't surprising given that researchers have found a strong relationship between biologists' estimates of walleye abundance and angler catch rates (Beard et al. 1997). The strong 2005 year class should reach legal length during the summer of 2008 resulting in increased angler catch rates of legal length walleye. Catch rates of sub-legal walleye should remain high for the next few years, however, because of the strong 2007 year class.

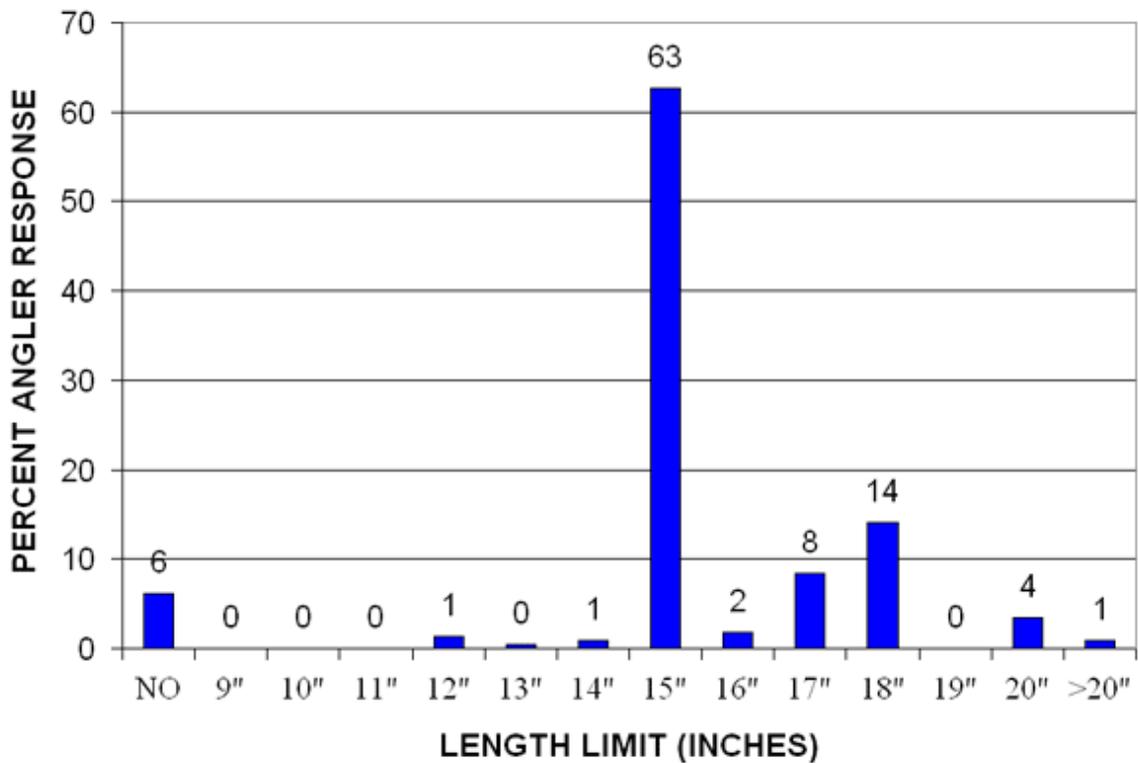
The importance of year class strength in determining the number of legal length walleye available to anglers four years later in the Susquehanna River can't be over-emphasized. Figure 11 is a regression analysis of this relationship taken from the North Branch Susquehanna River dataset. It demonstrates that year class strength accounts for 55% of the variation in electrofishing catch per hour of legal length walleye. This indicates a strong correlation between the two factors. The correlation would be even stronger if we could account for natural mortality of the young walleye before they reached legal length.

Figure 11. The relationship between year class strength (ADJUSTED YOY CPUE) and the abundance of legal walleye (LEGAL CPUE) four years later in the North Branch Susquehanna River.



A number of anglers have recently contacted the PFBC regarding the Susquehanna River walleye fishery. Some are pleased with the increase in the number of walleye available while others are calling for regulation changes because they are catching numerous sub-legal length fish. It's difficult to gauge overall angler opinion from a biased sample of anglers who were motivated to contact the agency. We do, however, have some data available from a less biased sample. Fisheries Management Areas 6 and 7 interviewed 228 anglers fishing the Susquehanna River between Sunbury, Pennsylvania and the tailrace of Safe Harbor Dam in June 2006. When asked the question "What should the minimum length for walleye be on the Susquehanna River", 63% of these anglers preferred the current length limit of 15 inches and only 29% preferred a longer minimum length limit (Figure 12). While this survey did not specifically target walleye anglers, it documented support for the current regulations among general Susquehanna River anglers.

Figure 12. Response of 228 Susquehanna River anglers to the question: "What should the minimum length for walleye be on the Susquehanna River?". NO = No Opinion.



In summary, we have found that total walleye abundance and the abundance of legal length and larger walleye in the Susquehanna River have shown substantial increases over the last 21 years. Given the increasing walleye population, the high level of catch and release fishing among walleye anglers, and support for current regulations among general Susquehanna River anglers, we do not believe that more restrictive regulations for the Susquehanna River walleye fishery are currently necessary.

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