



## Striped Bass and White Hybrid (x) Striped Bass Management and Fishing in Pennsylvania

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2005 (stocking numbers updated after 2005)

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**Goal:** Maintain or create robust sport fisheries for striped bass through preservation and enhancement of essential habitats, judicious stocking, and through harvest management of wild populations and populations maintained by stocking. Manage wild populations through Cooperative inter-jurisdictional harvest management where appropriate. Maintain robust sport fisheries for white x striped bass through judicious stocking and through harvest management.

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Striped Bass are an anadromous species that are native to Pennsylvania's Atlantic slope rivers occurring within the Delaware River and Susquehanna River drainage. Striped bass typically spawn in spring, primarily in the tidal freshwater segments of the Schuylkill and Delaware Rivers in Pennsylvania. The Delaware River is tidal from the state-line up-river beyond Philadelphia to Morrisville Pennsylvania some 55 miles. The Schuylkill River is tidal to the Fairmont Dam, 9 miles. The Susquehanna River is not subject to tidal influence in Pennsylvania and virtually all spawning takes place outside of Pennsylvania (Susquehanna Flats in Maryland). In the Delaware River juveniles remain in tidal areas for 2 or more years before joining the coastal ocean stock of fish that range from Canada to Florida. Striped bass remain in coastal ocean waters until they mature (males ages 2-3 females age 4-7 ) and return to natal rivers in the fall prior to spawning for over-wintering and then, in spring, continue their ascent to the uppermost tidal freshwater or brackish water to spawn. Some adults move above the tidal front after or during the spawning period, however spawning activity or production of young fish appears very limited above the tidal front in Pennsylvania. Following spawning most adults move down-river and return to the coastal ocean population, some however continue their ascent and very large adults have been caught far above the tidal front, above the confluence with the Lackawaxen River in Pennsylvania which is 198 miles up-river from the state line. There is historical evidence suggesting that striped bass spawned throughout the non-tidal freshwater segment of the Delaware River (Chittenden 1971). Very few spawning size fish are observed in spring and summer in the non-tidal Delaware River nowadays.

In Pennsylvania, "landlocked" populations of striped bass are maintained in reservoirs through juvenile (fingerling) stocking programs within the Atlantic slope drainage, Raystown Lake is the largest lake in Pennsylvania stocked with striped bass fingerling.

Striped bass eggs are semi-buoyant and incubation periods are brief and unique. Spawning and fertilization takes place in a flowing river at temperatures of 59-64°F, eggs develop and hatch as they float down-river within the water column, which typically does not extend past 72 hours (3 days) and can be as short as 48 hours. Some landlocked populations have become self-sustaining above dams on coastal rivers outside of Pennsylvania. Characteristics and water quality of rivers upstream of our large reservoirs in Pennsylvania appears inadequate for spawning and egg incubation. To sustain reservoir populations of striped bass, fingerlings are maintenance-stocked in late spring (Table 1). Fishery biologists insure pelagic forage fish (alewife) are abundant and that summer-time thermal habitat is suitable in reservoirs into which striped bass are stocked. These characteristics typically limit stocking to Pennsylvania's larger reservoirs.

<b>Table 1. Striped bass and white bass x striped bass (hybrid stripers) stocking by the Pennsylvania Fish and Boat Commission</b>					
<b>Year</b>	<b>Striped bass</b>			<b>White x striped bass</b>	
	<i>Adult</i>	<i>Fingerling</i>	<i>Fry</i>	<i>Fingerling</i>	<i>Fry</i>
1975	0	43,000	0	0	0
1976	0	117,525	0	0	0
1977	0	75,250	0	51,410	50,000
1978	0	53,202	0	48,700	0
1979	0	60,000	0	41,170	0
1980	0	30,200	0	0	0
1981	0	100,675	0	12,325	0
1982	0	95,000	0	20,180	0
1983	0	133,790	0	132,750	0
1984	0	31,450	0	213,317	0
1985	0	136,551	0	27,500	0
1986	0	134,000	0	132,000	0
1987	0	90,377	200,000	0	0
1988	0	111,335	200,000	109,000	0
1989	0	147,725	200,000	23,000	1,085,000
1990	0	203,255	100,000	131,065	0
1991	0	221,184	100,000	86,575	0
1992	0	152,255	100,000	23,500	0
1993	0	112,000	54,000	7,946	0
1994	0	264,751	3,252,000	0	0
1995	0	89,000	2,103,000	99,306	0
1996	0	82,450	0	121,180	0
1997	230	401,501	0	0	0
1998	0	264,536	0	33,450	0
1999	0	239,087	0	144,350	0
2000	600	270,476	0	11,400	0
2001	0	223,906	0	158,148	0
2002	0	24,081	0	92,336	0
2003	0	446,716	6,650,000	89,295	0

2004	0	37,017	13,690,000	93,125	0
2005	27	301,050	7,499,998	45,492	0
2006	0	352,922	6,880,000	50,670	0

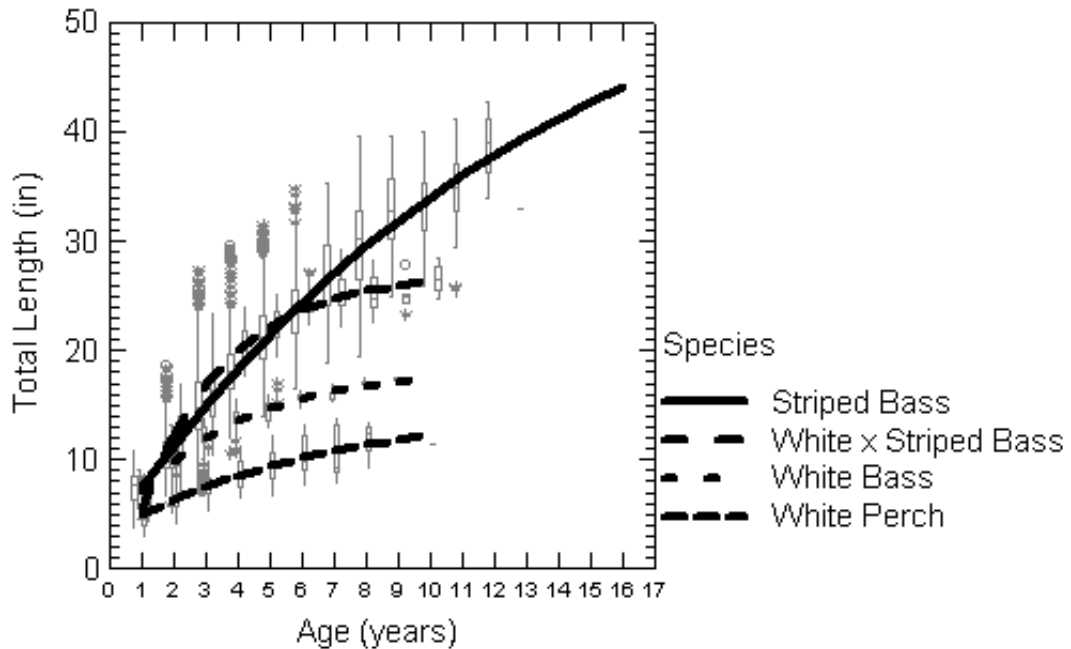
Harvest management and water quality improvements have played a pivotal role in recovery of wild anadromous Atlantic striped bass populations from Maine to Florida. Pennsylvania has played an important role in both the water quality improvement arena and the harvest management arena. In the water quality arena, installation of secondary sewage treatment systems at municipalities along the Delaware River in the 1970's reduced organic loads by more than 75% and improved dissolved oxygen levels in the river in the vicinity of Philadelphia which benefited survival of juvenile fish of all fish species (Weisberg and Burton 1993). In terms of harvest management, Pennsylvania engages in Cooperative management of important anadromous species through participation in the Delaware River Fish and Wildlife Management Cooperative, comprised of states bordering the Delaware River and Federal agencies responsible for anadromous species and habitat management, and the Atlantic State Marine Fisheries Commission, comprised of all Atlantic Coast States engaged in collective harvest and habitat management of coastal fishes. Consistent harvest management is achieved by collective measurement of production of young striped bass, monitoring adult striped bass density, measuring mortality levels, monitoring commercial harvest and monitoring angler harvest using a variety of survey methods. Pennsylvania has monitored adult striped bass abundance in the tidal Delaware since 1995. Harvest levels are adjusted by manipulation of size and creel limits such that harvest rates do not exceed pre-determined levels based upon coast-wide striped bass stock assessments. Abundance, catch, and harvest have improved dramatically since imposition of moratoria in the 1980's and subsequent restrictions on harvest, which serve to maintain relatively high densities. To sustain robust populations, minimum size limits are set relatively high, currently 28 inches with a 2 fish daily limit, and in the tidal Delaware River a closed spawning season in April and May to sustain a robust coastal population. Carefully regulated commercial fisheries for striped bass exist in Delaware Bay outside of Pennsylvania. Striped bass have historically been commercially important in Delaware Bay.

Fisheries for white x striped bass, a fast growing, inter-specific hybrid between striped bass and white bass are sustained through stocking and harvest management. Stocking is necessary to maintain populations of white x striped bass in waters where fisheries exist. White x striped bass are typically cultured by Fish and Wildlife agencies outside of Pennsylvania for stocking within Pennsylvania. Fry or fingerling derived from culture operations are provided to the Pennsylvania Fish and Boat Commission in exchange for fish routinely cultured in Pennsylvania. If white x striped bass hybrids are received as fry they are reared to fingerling size at Pennsylvania Fish and Boat Commission hatcheries. If received as fingerling they are directly stocked into waters as described in management plans. White x striped bass not only exhibit fast growth but also tolerate thermal habitats which are warmer than can be tolerated by striped bass. Reservoir thermal characteristics in summer determine, in part, whether striped bass or white x striped bass are suitable for stocking. In addition, within the Susquehanna River and Delaware River drainages, in Pennsylvania, stocking of white x striped bass only takes place where reservoir escape is limited or prevented, such as flood control reservoirs. Preventing escape insures back crossing with indigenous striped bass does not occur and preserves the genetic integrity of native striped bass. White x striped bass are stocked into both rivers and reservoirs in the Ohio drainage in Pennsylvania where back crossing with indigenous white bass is unknown. Since 1967, on average, in excess of 67,000 white x striped bass fingerling have been annually stocked into rivers and reservoirs across Pennsylvania to sustain populations for angling (Table 1).

With respect to harvest of striped bass and white x striped bass hybrids in inland waters, where stocking sustains populations, a minimum size limit of 20 inches is applied with a daily creel limit of 2 (combined species). In setting the size limit in inland waters, striped bass hybrid maximum size was considered (Fig. 1), since both

striped bass and white x striped bass hybrids are occasionally stocked in the same waters. Setting the size limit the same would avoid any problem associated with mis-identification. A Pennsylvania striped bass attains a length of 20 inches in 4.5 years. It requires approximately 4 years for a white x striped bass hybrid to reach the minimum length limit. White x striped bass hybrids are shorter lived and do not attain the large sizes of striped bass (Fig. 1).

**Figure 1. Average length of striped bass (March-June) and white x striped bass (March-June) collected by Fisheries Biologists in assessment gear in Pennsylvania. Average lengths for white bass (March –June), and white perch (March – October), Pennsylvania’s other “true bass”, are also depicted for comparison.**



Biologists routinely examine growth of striped bass by measuring length, weight, and taking a scale sample to determine age during assessments. In Pennsylvania, a 28 inch striped bass is approximately 9 years old and weights 7.4 pounds. We have tabulated average ages and weights for a variety of lengths of striped bass in Pennsylvania (Table 2). Anglers find these tables useful in approximating the weight and age of their catch.

**Table 2. Average weight and average age of striped bass and white x striped bass (hybrid stripers) at a given length (March-June).**

Inches	Striped bass		White x striped bass	
	Pounds	Years	Pounds	Years
4	0.1	0.2	0.1	0.8
4.5	0.1	0.3	0.1	0.9
5	0.1	0.4	0.1	0.9
5.5	0.1	0.5	0.1	1
6	0.1	0.7	0.1	1.1
6.5	0.1	0.8	0.1	1.1
7	0.1	0.9	0.1	1.2
7.5	0.1	1	0.2	1.3

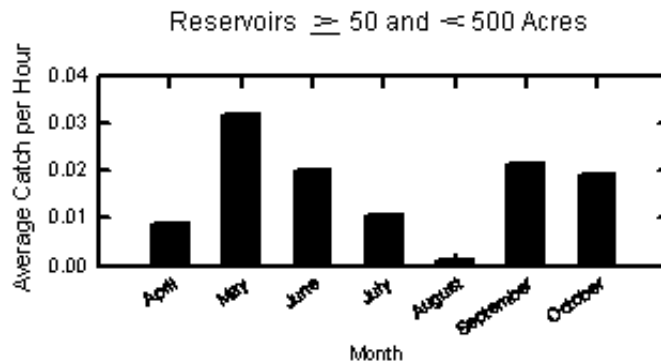
8	0.2	1.1	0.2	1.3
8.5	0.2	1.3	0.2	1.4
9	0.2	1.4	0.3	1.5
9.5	0.3	1.5	0.4	1.5
10	0.3	1.7	0.4	1.6
10.5	0.4	1.8	0.5	1.7
11	0.5	1.9	0.6	1.8
11.5	0.5	2	0.7	1.9
12	0.6	2.2	0.8	2
12.5	0.7	2.3	0.9	2
13	0.8	2.5	1	2.1
13.5	0.9	2.6	1.2	2.2
14	1	2.7	1.3	2.3
14.5	1.1	2.9	1.5	2.4
15	1.3	3	1.6	2.6
15.5	1.4	3.2	1.8	2.7
16	1.5	3.3	2	2.8
16.5	1.7	3.5	2.3	2.9
17	1.9	3.6	2.5	3
17.5	2.1	3.8	2.8	3.2
18	2.3	3.9	3	3.3
18.5	2.5	4.1	3.3	3.5
19	2.7	4.2	3.7	3.6
19.5	2.9	4.4	4	3.8
20	3.2	4.5	4.4	4
20.5	3.4	4.7	4.7	4.2
21	3.7	4.9	5.1	4.4
21.5	4	5	5.6	4.6
22	4.3	5.2	6	4.9
22.5	4.6	5.4	6.5	5.2
23	4.9	5.5	7	5.5
23.5	5.3	5.7	7.5	5.8
24	5.7	5.9	8.1	6.2
24.5	6	6.1	8.6	6.7
25	6.4	6.2	9.2	7.3
25.5	6.9	6.4	...	...
26	7.3	6.6	...	...
26.5	7.8	6.8	...	...
27	8.2	7	...	...
27.5	8.7	7.2	...	...
28	9.3	7.4	...	...
28.5	9.8	7.6	...	...

29	10.3	7.8	...	...
29.5	10.9	8	...	...
30	11.5	8.2	...	...
30.5	12.2	8.4	...	...
31	12.8	8.6	...	...
31.5	13.5	8.8	...	...
32	14.2	9.1	...	...
32.5	14.9	9.3	...	...
33	15.6	9.5	...	...
33.5	16.4	9.8	...	...
34	17.2	10	...	...
34.5	18	10.2	...	...
35	18.9	10.5	...	...
35.5	19.8	10.7	...	...
36	20.7	11	...	...
36.5	21.6	11.3	...	...
37	22.5	11.5	...	...
37.5	23.5	11.8	...	...
38	24.6	12.1	...	...
38.5	25.6	12.3	...	...
39	26.7	12.6	...	...
39.5	27.8	12.9	...	...
40	28.9	13.2	...	...
40.5	30.1	13.5	...	...
41	31.3	13.9	...	...
41.5	32.5	14.2	...	...
42	33.8	14.5	...	...
42.5	35.1	14.8	...	...
43	36.5	15.2	...	...
43.5	37.8	15.5	...	...
44	39.2	15.9	...	...
44.5	40.7	16.3	...	...
45	42.2	16.7	...	...
45.5	43.7	17.1	...	...
46	45.2	17.5	...	...
46.5	46.8	17.9	...	...
47	48.4	18.3	...	...
47.5	50.1	18.8	...	...
48	51.8	19.3	...	...
48.5	53.6	19.7	...	...

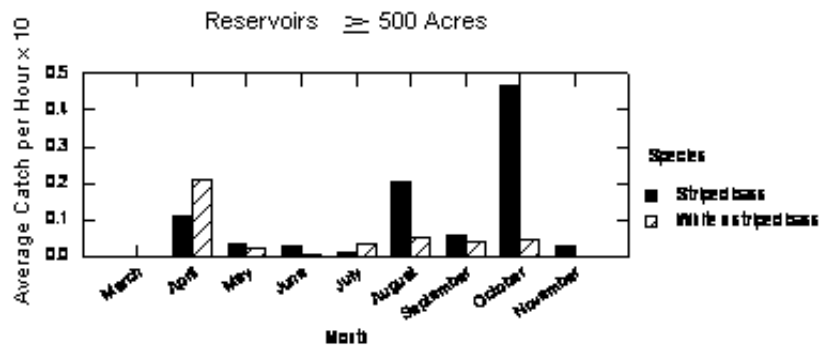
Catching striped bass and white x striped bass can be accomplished from the shoreline

of a river or reservoir or from the deck of a boat. Both casting and trolling are popular methods. Both live baits and artificial baits are effective. Popular baits in inland waters include large live baits (live trout and alewife) as well as a variety of minnow shaped crank baits and jigs. Popular baits on the Delaware River include bloodworms, live herring, chicken liver and artificial baits such as minnow shaped crank baits and jigs. Whatever your bait choice, locations depicted on our GIS maps will enhance your success. Striped bass can be caught almost any time of year from many waters, however on the Delaware River and tributaries, adults of this anadromous species are more available in Pennsylvania in spring, when they migrate from lower Delaware Bay and the ocean for spawning. Biologists conduct creel surveys to estimate angler catch or catch per hour for various fish species in association with harvest evaluation. Creel surveys show that catch rates are highest in rivers (Fig. 4) and medium size reservoirs (Fig. 2) in spring. Large reservoirs (Fig. 3) yield highest catch rates in fall. White x striped bass hybrids can be caught most any time, as well, generally though, highest catch per hour occurs in spring and summer in large reservoirs and rivers (Fig. 3 and 4).

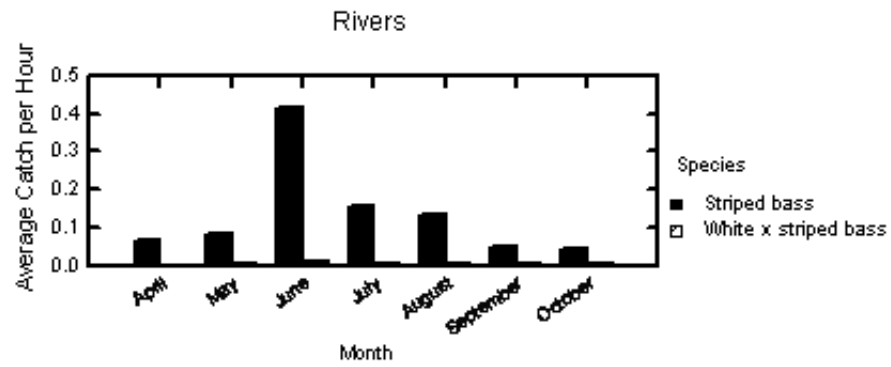
**Figure 2. Average catch per angler hour of striped bass from medium size Pennsylvania reservoirs. Surveys detailing white x striped bass catch rate were not available.**



**Figure 3. Average catch per angler hour of striped bass and white x striped bass, from large size Pennsylvania reservoirs.**



**Figure 4. Average catch per angler hour of striped bass and white x striped bass, from Pennsylvania rivers.**



### References

- Chittenden, M. E. 1971. Status of the striped bass, *Morone saxatilis*, in the Delaware River. *Chesapeake Science* 17:93-100
- Weisberg, S. B. and W. H. Burton. 1993. Spring distribution and abundance of ichthyoplankton in the tidal Delaware River. *Fishery Bulletin* 91:788-797.