

Lehigh River

Northampton County

American Shad Passage through the Easton Dam (RM 0.0) Fishway

The staff from Fisheries Management Area 5 (Bushkill) has completed monitoring of shad passage through the Easton Dam (RM 0.0) fishway for the 2012 spawning migration. Monitoring was discontinued at the Chain Dam (RM 3.0) fishway due to its inability to successfully pass shad. At Easton, surveillance equipment was started 23 March 2012 and terminated 29 June 2012. The early start was due to the unusual warming trend during the spring, which was thought to have jump started shad passage earlier than traditional runs.

A minimum of 2,096 adult American shad passed the Easton Dam fishway in 2012 (Table 1). The passage of the first recorded American shad was on 23 March with shad being recorded through 28 June. Multiple peaks in passage were observed 16 April through 22 April ($n = 453$ shad), 1 May through 15 May ($n = 507$ shad), 17 May through 1 June ($n = 934$ shad), and 8 June through 14 June (Figure 1). Generally passage was very low and sporadic prior to 16 May, with less than 10 individuals observed passing. Throughout May and June, passage of shad occurred daily although no passage of shad was observed 27 March through 13 May. Passage was recorded throughout the 24-hour period with the greatest movement (98.6%, $n = 2,067$ shad) occurring from 0500 through 2100 hours

The 2012 passage of shad through the Easton Dam fishway is suggestive of an above average spawning run directed into the Lehigh River. Comparatively, the total passage for 2012 ($n = 2,096$ shad) was above the long-term (1995-2012) monitoring average (avg. = 1,662 shad), ranking the 5th highest over the time-series (1995 – 2012; Table 2). Those circumstances contributing to above average return or passage remains unknown. Most likely multiple confounding factors contribute to the successful passage of shad. The returning spawning run in the Delaware River continues to improve as observed from Smithfield Beach (RM 218) shad collections. Thus, any influential density-dependence function could have potentially directed more shad through the Easton Dam fishway, given that there were more shad available in the Delaware River to pass into the Lehigh River.

The exceptionally low flow period experienced throughout April and into early May, may have inadvertently enhanced successful shad passage into the Lehigh River. Water depths immediately below the majority of the Easton Dam, particularly on the side opposite of the fishway entrance, tended to be too shallow for shad to successfully swim. This condition concentrated the shad to the deeper waters next to the fishway attraction flow, potentially increasing the likelihood of shad successfully finding the fishway entrance chamber. Forty-seven percent (47.5%) of the total shad passage through the Easton Dam fishway occurred during these low flow conditions (23 March-16 May). In contrast, river flows during the remainder of May and June tended to remain above the long-term average. Peaks in flow discharge were generally attributable to climatic cold frontal activity, yet the passage of shad appeared to improve as the flow declined from the peak. Following the peak flow on 16 May and subsequent decline in flow, approximately 28.4% ($n = 596$) successfully passed the Easton Dam fishway over a 7 day period (17 May – 23 May). Similarly, following a peak in flow 2 June, shad passage tended to increase over the subsequent 9 days, passing 5.5% ($n = 117$) of the

total for the season. The increased passage during declining flows is most likely a behavioral response of shad. Theoretically shad would have a relatively lower energetic expenditure migrating upriver under low flow conditions relative to swimming against higher flow events.

In addition to passage of American shad, a variety of other fishes were observed successfully passing the Easton fishway (Table 1).

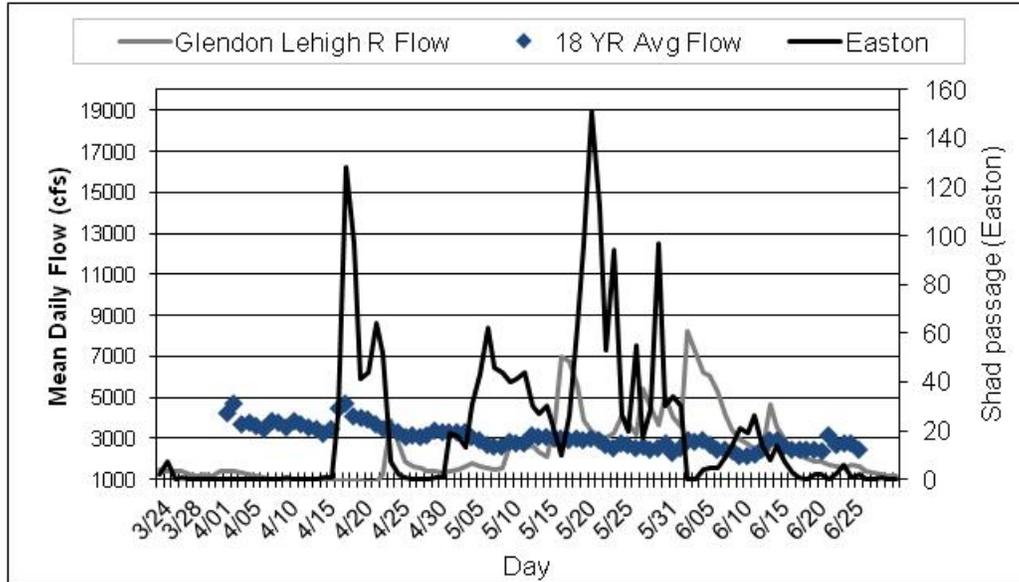
Table 1. Fishes observed migrating through the Easton (RM 0.0) and Chain (RM 3.0) fishways.

Fish	Total
American shad	2096
River herring	0
Gizzard shad	422
Strip bass	4
American eel	0
Sea lamprey	316
Trout spp.	208
Muskellunge	14
Walleye	15
Yellow perch	0
Black bass	431
Sunfishes/Crappie	387
Common carp	419
Quillback	33
Catfish spp.	805
Flathead catfish	2
Fallfish/Minnows	3
Sucker spp.	1521
Unknown	144
Total	6820

Table 2. Total shad passage through Easton Dam (RM 0.0) fishway for the entire time-series passage has been recorded. Rank denotes the order of greatest passage to lowest passage, 1995 – 2012.

Year	Passage	Rank
	N	
1995	873	12
1996	1141	11
1997	1428	9
1998	3293	3
1999	2346	4
2000	2094	6
2001	4740	1
2002	3314	2
2003	422	17
2004	754	13
2005	675	14
2006	2023	7
2007	1397	10
2008	408	18
2009	425	16
2010	1935	8
2011	558	15
2012	2096	5

Figure 1. Recorded daily totals of American shad passage at the Easton Dam (RM 0.0) fishway from 23 March through 29 June 2012 overlaid with daily river flow (cfs) at Glendon USGS gage station data.



Daryl Pierce
Delaware River Biologist