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Delaware Riverkeeper Network is writing to urge NMFS to list, in whole, alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*) as threatened under the Endangered Species Act and to designate concurrently critical habitat with these listings. NRDC's petition, which incorporates threats and significant downward population trends to river herring in the Delaware River from the Delaware Riverkeeper Network, provides significant scientific data for this listing. The Atlantic States Marine Fisheries Commission has been conducting a stock assessment for river herring since 2008 which shows severe declines in herring populations and landings for both adults and juveniles in the Delaware River. Immediate federal listing is justified and needed based on the massive declines being documented throughout the alewife and blueback herring's ranges by scientific studies and the lack of a coordinated and comprehensive management strategy being implemented for these important species, where states are managing plummeting populations in different ways. For example, Connecticut, Rhode Island, and North Carolina had a fishing moratorium in place as of NRDC petition submission. In the Delaware Watershed, as of Jan 2, 2011 New Jersey has indicated in their January 2012 fishing digest that for the Delaware River "due to serious declines in river herring numbers, the taking of alewife and blueback herring is anticipated to be prohibited beginning January 1, 2012" <http://www.state.nj.us/dep/fgw/pdf/2012/digfsh24-33.pdf>. Pennsylvania Fish and Boat Commission has recently listed all river herring (alewife, blueback) as having a "closed year-round season" with zero daily limit applied to the Lehigh River and tributaries, the Schuylkill River and tributaries, the West Branch Delaware River, the Delaware River, the Delaware estuary, and the Delaware River tributaries upstream to the limit of the tidal influence (<http://fishandboat.com/fishpub/summary/delaware.html>, Jan 2, 2011 and <http://www.fishandboat.com/images/exec/minutes/2011minu/01min.pdf>). River herring need broad based protections at the federal level to ensure the species recover before it is too late and ensure regulations state by state are not lifted prematurely and consistent.

As NMFS' parent agency, the National Oceanic and Atmospheric Administration (NOAA), has stated, "*populations of alewives and blueback herring —have exhibited drastic declines throughout much of their range. Particularly alarmingly, their numbers in more than a few rivers have dropped significantly in just the last decade. Up and down the coast, rivers that once had runs of hundreds of thousands – even millions – of river herring now have just a few thousand or even just a few hundred fish.*" (NRDC Petition, 2011).

In the Delaware River Basin, where the main stem River is undammed, the outlook of river herring is dire and hence have led to recent closures in the fishery at least during their time in the river (ocean fishing and bycatch mortality still a large concern and threat). As of 1990, both species were found in all of the major tributaries of the Basin (though in significant decline from historic 19th century accounts when fish were so

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prevalent they often "flipped onto the creek banks of Delaware River tributaries each spring"). But data from 1990 forward indicate significant declines in landings of both species for the Delaware Watershed. According to ASMFC data, adult populations of both species have had a decline from 2001-2007 and three of the lowest data points occurred from 2005-2009. From 1991 to 2001, commercial landings averaged 19,688 pounds. From 2002 to 2008, commercial landings averaged only 5,270 pounds annually. In 2009, landings dropped to a low 1,453 pounds, a 93% reduction from the 1991-2001 average (DNREC). There is a similar declining trend in New Jersey as well where landings were documented by NJDEP as:

1995-2000 – 3,459 pounds annual average
2001-2006 – 3,066 pounds annual average
2007-2009 – 867 pounds annual average

The numbers for juvenile herring species also show declines. Juvenile blueback herring recruitment for 2009 remained below average for the fourth year in a row, with the juvenile index from 2006-2009 representing the lowest average of any four year period except for 1980 to 1983 – indicating a serious decline in the overall health of blueback herring (NJDEP, 2010). Alewife recruitment for 2009 was also very poor for the third time in four years and in Delaware both alewife and blueback remained low in 2008 and 2009 (DNREC, 2010).

Historic threats are still present in the Delaware Basin with the loss of spawning habitat in every tidal stream of the Delaware River in Delaware due to the construction of low-head dams that formed mill ponds dating to the 1800s or early 1900s (ASMFC 2008). All of these Delaware River tidal streams are relatively short in length (with the longest being approximately 10 to 12 miles from the river or bay to the first dam), which results in a fairly steep salinity gradient (ASMFC 2008). Thus, all spawning in these tidal streams in Delaware is usually restricted to the short distance of freshwater near the dam and immediately downstream (ASMFC 2008).

Dredging operations in the Delaware River also adversely affect the river's populations of alewife and blueback herring. Hydrodynamic alterations from past dredging operations, including in conjunction with water sharing agreements with upstream towns, has caused salt water encroachment, modified water flows, and made certain areas unsuitable spawning habitat for anadromous species, including the alewife and the blueback herring, for periods of time (NRDC Petition, 2011).

The deepening of the Delaware River main channel for navigational purposes and its maintenance dredging has increased the tidal range of the Delaware Estuary. Hydraulic dredging can entrain anadromous fish species, taking them up into the dredge drag-arms and impeller pumps and resulting in death. Consumptive use and water diversions up river have reduced freshwater flows. The combination of increased tidal fluctuation and reduced freshwater flows has caused saltwater to intrude into the freshwater tidal reach of the estuary, depriving anadromous fish species like blueback and alewife, of freshwater habitat important for spawning. Ongoing dredging continues to change salinity, which can affect the behavior of anadromous fish like these species.

A major dredging project, the Delaware River Deepening Project, which has begun in one dredge reach in 2010 despite litigation by DRN, will exacerbate many of the adverse effects of past dredging activities and will further harm the river's alewife and blueback herring populations. The Deepening Project will deepen the river's main shipping channel by 50 feet over 102 miles. Agency comments and technical reports with respect to the dredging project indicate that the dredging operations are expected to result in the resuspension of high levels of PCBs and other contaminants that had been absorbed by the sediment; may result in changes to the salinity and bottom habitat that could negatively impact anadromous fishes that rely

on such habitat for spawning and nursery habitat; and may exacerbate the sediment deficit in the Delaware River system (current maintenance dredging removes more sediment from the estuary than is supplied to the estuary and the new 45 foot channel would likely require increased maintenance dredging) (NMFS 2010).

The Southport Marine Terminal Development project further threatens populations of alewife and blueback herring in the Delaware River. The Southport Development project involves filling in 12.28 acres of open water (0.2 of which is emergent wetlands, 1.08 acres of which is shallow water habitat, and 3.62 of which is deep water habitat), 3.75 acres of non-tidal wetlands, and 0.73 acres of a tidal drainage area; filling in an unspecified amount of floodplain lands with 3 to 4 feet of fill in order to raise the area to above the 100-year floodplain (in fact to raise it to the 200-year floodplain); dredging a 35-acre area within the Delaware River to a 40+2foot depth; impacts to approximately 4,600 linear feet of existing shoreline; and the permanent loss of 1.08 acres of submerged aquatic vegetation.

The Southport project will further degrade water quality and habitat in the Delaware River. The water quality effects from this project include impacts on dissolved oxygen levels through the removal of water celery, an important plant that contributes oxygen to the water, and the introduction of contaminants from both resuspension of sediments and disposal in the Fort Mifflin CDF, a known source of contaminants due to the sediments disposed there. According to the U.S. Fish and Wildlife Service, sediments to be used in the Southport project contain contaminant concentrations high enough to pose unacceptable ecological risk to aquatic organisms. This means that these sediments should only be used in areas where they will not be inundated during high water events and in a way that reduces their potential for leaching from precipitation. However, the spoils from the Southport project are planned for disposal at the Fort Mifflin CDF. Fort Mifflin has been shown to effectively discharge pollution back into the River from sediments disposed there rather than filtering it out prior to discharge. Among the toxics discharged to the River by the CDF are cadmium, lead, copper, zinc and total suspended solids.

The proposed construction and operation of a Liquefied Natural Gas (LNG) import terminal on the Delaware River near Logan, New Jersey, by Crown Landing, LLC will also impact the populations of alewife and of blueback herring in the Delaware River. This proposal was approved by the FERC in 2006. Construction of the LNG terminal will require hydraulic dredging of 1.24 million cubic meters in the first year followed by maintenance dredging of 67-97,000 m³/year. Dredging will occur from August through December and threatens to significantly harm alewife and blueback herring populations in the Delaware, including by impacting migration patterns and distribution. In addition, it is believed the facility will receive up to 150 shipments per year. LNG carriers take on ballast water as they offload in order to maintain stability – an estimated 8 million gallons will be pumped from the River over a 10 hour period while at the berth with an additional 5 to 11 million gallons being taken on after undocking downstream of the berth area. These activities may result in entrainment and impingement of alewife and blueback herring larvae.

The Delaware River alewife and blueback herring populations are also threatened by exceptionally poor water quality. Petroleum pollution and pollution from dye manufacturing is believed to have contributed to the long-term decline of the river's alewife and blueback herring populations (ASMFC 2008). In addition, heavy organic loading near Philadelphia, Pennsylvania during the 1940s and 1950s caused severe declines in DO levels and made parts of the Delaware River uninhabitable for fish during the warmer months of the year (ASMFC 2008). In giving the Northeast region an overall grade of F for water quality and coastal habitat, the EPA's National Coastal Condition Report (2004) noted particular concern about water pollution and fish tissue contaminants in the Delaware River (EPA 2004). EPA's National Coastal Condition Report (2008) rated the water quality in the Delaware River as poor because of high nitrogen and phosphorous levels; several tributaries of Delaware Bay were also given a poor rating (EPA 2008). The Delaware River also has high levels of PCBs, dioxins, mercury, and chlorinated pesticides in its sediments and is subject to

numerous fish consumption advisories. Part of the Roebling-Trenton stretch of the river is a designated EPA Superfund site because of contamination originating from the Roebling Steel plant (NRDC, 2011).

Increased withdrawals from the Delaware River, increasing salt water intrusion and affecting flow patterns, also pose a threat. One of the largest looming threats in the Delaware Basin is an explosion of proposed natural gas extraction activity using unconventional drilling called hydraulic fracturing in the Basin. 36% of the Basin is underlain with Marcellus shale. Each natural gas well, when hydraulically fractured, is estimated to use 1 to 9 million gallons of water, with an average of 4.5 million gallons, from the Delaware River system or groundwater supplies. This water intensive drilling process has already exploded to the west of the Delaware Basin in the Susquehanna Basin, causing conversion from forests to industrial drilling pads and pipelines and increased roads, sediment pollution from erosion and sediment control issues, pollution events and discharge of highly saline brinewater (flowback) that has high levels of contaminants and radioactive materials, and ground water contamination. If drilling is able to proceed in the Basin, pollution and effects to fish species will surely follow.

Impingement and entrainment by power plants (the Connecticut Power Plant at Edgemoor, and the Motiva (now Valero) Refinery at Delaware City) are significant threats. A recent report by Entrix (2008) indicated substantial losses of river herring at the Connecticut Power Plant with the absolute numbers of river herring mortality found to be in excess of 600 million (Entrix (2008), as cited in DNREC 2010). The Salem Nuclear Generating Station kills over 3 billion fish a year including over 59 million blueback herring, 77 million weakfish, 134 million Atlantic Croaker, 412 million White Perch, 448 million Striped Bass, and 2 billion Bay Anchovy (Figures provided are numbers of fish killed. Source: correspondence from US Fish & Wildlife Service to NJDEP, June 30, 2000 relying on PSE&G permit application data). But instead of putting forth a regulatory option for existing facilities that would best protect the greatest number of fish and pounds of fish for our fisheries (closed cycle cooling), the US EPA is putting forth the option that provides the least level of protection of those it studied and considered.

Delaware Riverkeeper Network further corroborates with the petitioner's concerns of climate change on these species as it pertains to Delaware River populations. Looking ahead, climate change poses a grave threat to both species. Warming water temperatures will accelerate the spread and severity of hypoxic zones in spawning and nursery areas such as in the Chesapeake Bay and Delaware River. Changing weather patterns will increase water flow patterns and pollutant loadings to such an extent that these and other water bodies may no longer provide hospitable habitat. Changes to ocean, estuarine, and riverine environments may interfere with migratory cues. As anadromous species that segregate out into river-specific populations, the alewife and the blueback herring have limited capacity to shift range, particularly in the short-term, in response to changing environmental conditions. The highly-depleted status of most of these river populations also means relatively low genetic diversity, which further limits capacity to evolve and spread out in response to changing environmental conditions. Climate scientists predict that global warming will be particularly significant for coastal and riverine environments in the Northeast and mid-Atlantic regions, including the Delaware River. It will exacerbate low dissolved oxygen levels by increasing precipitation and nutrient inputs into water bodies in these regions, including the Delaware (Howarth *et al.* 2006). It can also affect salinity.

Other negative trends include, increased destruction of forests in the watershed, increased stormwater, and continued filling and development of floodplains – all of which negatively affect water quality. Acoustic effects in freshwater, such as pile driving and underwater drilling can deter migrating anadromous fishes such as American shad and river herring (NJ Wildlife Action Plan, 2008).

Economic consequences related to fishing also justify the need to protect these species. For example, a study by PA Fish and Boat Commission on fish passage in the Susquehanna indicates an annual fishery of two million American shad and 12 million herring, would attract more than 500,000 angling trips. The annual economic impact of these angling trips is estimated at more than \$36 million. Specific to the anadromous fish restoration efforts (shad, river herring, etc.), the Commission must continue artificial propagation until wild stocks are restored to self-sustaining levels. The estimated costs of the annual rearing, stocking, monitoring and coordination efforts on the Susquehanna alone are approximately \$500,000 - a significant investment, but one to which the Commission is fully committed. (PA Wildlife Action Plan, September 2005).

This recovery is important to other declining species, such as tuna and shark that rely on river herring for food. And in the Delaware, the alewife floater (*Anodonta implecata*), a freshwater mussel, imperiled in most of the Rivers of the nation, including the Delaware River, continues to hold on and rely on their only known host fish, the alewife, to survive. Populations of alewife have declined 99.9% in several major rivers from Maine to the Chesapeake and bycatch at sea is one contributor to this decline (Limburg and Waldman 2009) (NY Natural Heritage Program, <http://www.acris.nynhp.org/guide.php?id=8381&part=1>). Populations of alewife floaters in New York were likely historically reduced along with their alewife fish hosts with the construction of dams blocking fish migration from large rivers in New York to the Atlantic in the late 19th and early 20th centuries. A survey by the Biological Resources Division of the U.S. Geological Survey in 2001 in the Delaware Water Gap National Recreation Area found eight species of freshwater mussels within Delaware Water Gap National Recreation Area. By far the most common and abundant species of mussel was the eastern elliptio (*Elliptio complanata*), which accounts for nearly 98% of all the mussels in this section of the Delaware River. The next most abundant species, the alewife floater, only accounts for about 2% of the mussels in the river (<http://www.nps.gov/dewa/naturescience/mollusks.htm>, January 2, 2012). In the Summer of 2010, scientists discovered seven freshwater mussel species in the tidal Delaware River between Chester PA and Trenton, NJ, a largely urban section of the River. The alewife floater and tidewater mucket – two species previously thought to no longer exist in NJ and PA – were part of the discovery (Delaware Estuary Program, Dr Danielle Kreeger). Ospreys, bald eagles, cormorants and great blue herons prey heavily on migrating alewives each spring, at a critical time when some of these birds are nesting and rearing their chicks. So protecting the river herring will be important for other critical species threatened by extinction.

For the above reasons, Delaware Riverkeeper Network requests NMFS to list these two important species, on a whole, to protect them at the highest regulatory level to ensure their survival and recovery before it is too late. This action should be taken swiftly to ensure adequate and sustained protection until populations recover and critical habitat listing is an important concurrent action needed.

Thank you for your time and consideration.

Sincerely,

Faith Zerbe
Water Watch Director
Delaware Riverkeeper Network

The Delaware Riverkeeper Network champions the rights of our communities (both human and non-human) to a Delaware River and tributary streams that are free-flowing, clean, and healthy.