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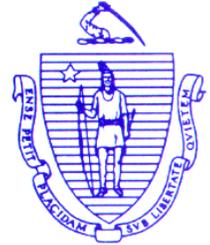
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***Marine Fisheries* River Herring Stocking Protocols**

Date: March 2013

Purpose: The Massachusetts Division of Marine Fisheries (*Marine Fisheries*) has transferred river herring between river systems in stocking trucks to supplement restoration efforts since the 1940s. In 2012, *Marine Fisheries* reviewed their river herring stocking methodologies to develop guidelines to aid our decisions on stocking. From this review, the following protocols were adopted to provide guidance to *Marine Fisheries* when evaluating town requests and new restoration initiatives that seek to transfer river herring from one river system to another.

Restoration Objectives: It is important to highlight that our primary objective in restoring river herring populations is to create natural habitat conditions that support sustainable runs in coastal rivers. The restoration of native herring runs includes the improvement of spawning, nursery, and migratory habitat. Stocking herring can assist this process, but will not be a primary response or done in isolation from habitat improvement, and decisions will be carefully weighed to avoid unintended consequences.

Population status: Due to low population levels, river herring are currently under a moratorium in Massachusetts in which harvest, possession, and sale are prohibited. Population declines are evident in several river systems that have been traditionally used for donor stock. Therefore, careful consideration, based on professional experience and protocols, will be used when selecting donor stocks and introducing herring to new habitats.

1. **Within-basin transfers (WBT):** The transfer of river herring between locations within the same river system can be conducted under circumstances where a site has a temporary downstream obstruction or conditions that severely delay migrations. Requests for WBT stocking will not have the same genetic or habitat considerations as stocking from out-of-basin transfers (OBT). Therefore, WBT requests will be treated differently from OBT requests and reviewed on a case-by-case basis.
2. **Out-of-basin transfers (OBT):** Out-of-basin transfer (transfer of fish from one river system to another) is a practice used historically to establish a new herring run, restore an extirpated run, or to augment an existing run. Decades of stocking efforts between systems within or between neighboring watersheds have provided observational evidence that these goals have been met in numerous cases. However, few formal evaluations of OBT stocking have been conducted to resolve concerns over stocking efficiency and genetic stock interactions. Frank et al. (2009) recently documented that pre-spawning adult alewives transferred from the Nemasket River (Narragansett drainage) to the Ipswich River (Ipswich Bay drainage) exhibited short residence time with the majority of individuals migrating downstream and likely leaving the river immediately after release. Given the current reduced status of river herring populations state-wide, *Marine Fisheries* will use the following guidelines to make case-by-case decisions on OBT stocking efforts including the selection of donor and recipient runs:

1. Recipient system currently/historically has a river herring population: Information on the historical presence or absence of river herring in a targeted river system is required. Stocking in river systems and lakes and ponds that formerly had native river herring runs will be prioritized over river systems with no evidence of having supported a native run. For systems without a current run or evidence of a historical river herring population, careful evaluation of habitat conditions must be undertaken before approving river herring introductions.
2. Size of Spawning and Nursery Habitats: The amount of habitat available for spawning and nursery needs will be considered when evaluating stocking requests. The traditional threshold of only stocking in Great Ponds in Massachusetts (≥ 10 acres) will continue as a general criterion for separating small ponds with limited potential. In addition, *Marine Fisheries* is evaluating production estimates to determine potential population targets and minimum stocking densities (the number of herring required to colonize/re-colonize or augment an existing run). It is expected that production estimates will be developed to provide further guidance on the stocking benefits.
3. Suitability of Spawning and Nursery Habitat: A site evaluation and habitat assessment should be conducted to determine if the water quality at spawning and nursery habitats is suitable for river herring and if stream flow and passageways are adequate to support both the adult spawning run and the juvenile emigration. These assessments should provide estimates of available spawning habitat, and if necessary, provide recommendations on improving existing spawning, nursery and migratory habitat.
 - a. The *Marine Fisheries* river herring habitat assessment QAPP (Chase 2010; http://www.mass.gov/dfwele/dmf/publications/tr_42.pdf) provides specific guidelines for habitat assessments. In some cases, existing water quality monitoring data may have sufficient detail to provide the necessary information to assess habitat suitability.
 - b. The *Marine Fisheries* river herring surveys in coastal rivers are a useful information source for considering the feasibility of stocking requests (Reback et al. 2004, 2005; <http://www.mass.gov/dfwele/dmf/publications/technical.htm>). The surveys identify obstructions, the presence of fishways, and their condition and functionality. A recipient river system may receive fish provided there is currently suitable access to/from spawning habitat or plans are in place to provide access to spawning habitat within three years. After reviewing the *Marine Fisheries* surveys, inspections will still be necessary in order to obtain up-to-date condition of the fishways.
4. Documentation of Existing Herring Run: the presence or absence of river herring in a river proposed to receive stocking must be documented. This can be done through consultation with *Marine Fisheries* staff and local herring wardens on existing conditions. If river herring are present below the first obstruction in a coastal river system, the preferred approach is to encourage improvements to spawning, nursery, and migratory habitats and allow the existing run to colonize upstream locations.
5. Landlocked Populations: *Marine Fisheries* in a Memorandum of Agreement (MOA) with the Massachusetts Division of Fisheries & Wildlife (*MassWildlife*) and the Massachusetts Division of Environmental Law Enforcement (ELE) established pursuant to M.G.L. c. 21 A, s. 1, (2003) was granted jurisdiction of anadromous river herring populations within the coastal and inland waters of the Commonwealth. This jurisdiction does not include existing landlocked herring populations nor does it grant *Marine Fisheries* the authority to create new landlocked populations. The existing literature provides conflicting results concerning the introduction of alewives to inland systems with no historical evidence of previous populations

or access to the marine environment. Mower (1978) noted that the use of alewives as a biological control was an effective alternative to certain chemical treatments used to control taste and color of water supplies. However, other studies (Good and Cargnelli 2004) have shown that creating landlocked alewife populations can have negative impacts to native freshwater species (i.e. MI, VT, and Great Lakes) due to increased competition for food resources and reduced water clarity due to depletion of zooplankton abundance. Based on the results of these studies, the practice of creating landlocked populations is not recommended.

6. **Availability of a Suitable Donor System:** An OBT should be conducted using a donor system located within the same coastal drainage area (e.g. an OBT can occur between two systems that drain into Cape Cod Bay) or an adjacent coastal drainage area (e.g. an OBT can occur between the Taunton River and Narragansett Bay watersheds). Stocking will not be approved from populations separated by more than one coastal drainage area.
 7. **Status of Suitable Donor System:** Removals from a donor system should not constitute more than 1% of the annual population size of that system. This proportion should be estimated from existing run count or population size estimates based upon a minimum of five years of annual run data.
 8. **Spawning Run Monitoring:** In order to receive OBT stocking, an agreement must be in place between the Town and *Marine Fisheries* to monitor spawning run size for a minimum of three years pre-stocking, for the duration of stocking, and for three years post-stocking to document changes in population size for both the stocking and post-stocking periods. Monitoring results must be sent to *Marine Fisheries* at the conclusion of each spawning season.
 9. **Stocking Duration:** OBT stocking at approved donor and recipient systems will occur for a minimum of four years to encompass at least one generation of offspring to return to the newly imprinted natal site.
3. **Documentation of Stocking:** All stocking requests will be reviewed by *Marine Fisheries* staff with the final determination being made by the *Marine Fisheries* Diadromous Fisheries Project Leader. All stocking events should be documented in an annual file maintained by *Marine Fisheries*. The numbers of herring transferred should be recorded with each trip along with counts of transfer mortalities and water chemistry data collected from donor rivers, recipient rivers, and tank water.
 4. **Genetic Stock Identification:** Ideally, genetic stock information would be available for the donor stock and, in cases of run augmentation, on the recipient stock. Approvals of run augmentation through OBT will be uncommon and may require genetic stock information to meet a high threshold of acceptance. Genetic information would assist the evaluation of compatibility of donor stocks and target river systems. Stocking evaluations should review available genetic information for the coastal region and document the status of stock information.
 5. **Transfer and Quarantine Procedures:** *Marine Fisheries* staff will develop procedures to ensure the safe handling of river herring from collection to transport and release in order to minimize mortalities. In addition, *Marine Fisheries* staff will investigate and develop appropriate quarantine procedures, including sanitation of vehicles, holding tanks, and equipment as well as sterilization of water in order to prevent the acquisition, transport, and introduction of invasive flora or fauna (i.e. parasites) from one system to another. Until these procedures are fully developed *Marine Fisheries* staff should take precautions to avoid transporting any materials besides river herring between sites.

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