Technical Report

Massachusetts Division of Marine Fisheries
Technical Report TR-47

Recommended Time of Year Restrictions (TOYs) for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts

N. T. Evans, K. H. Ford, B. C. Chase, and J. J. Sheppard

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Department of Fish and Game
Massachusetts Division of Marine Fisheries

April 2011

SDMS Doc ID 548591

Massachusetts Division of Marine Fisheries Technical Report Series

Managing Editor: Michael P. Armstrong
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Recommended Time of Year Restrictions (TOYs) for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts

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April, 2011

Commonwealth of Massachusetts
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Department of Fish and Game
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Executive Summary

This report defines the Massachusetts Division of Marine Fisheries' recommendations for seasonal or "time of year" restrictions (TOYs) on in-water construction work. The TOY date ranges were established to provide protection to marine resources in Massachusetts during times when there is a higher risk of known or anticipated significant lethal, sublethal, or behavioral impacts. This report is based on the best available life history information on marine fisheries resources in Massachusetts and provides a clear record of how the TOYs are determined. The TOY recommendations forare:

Diadromous	**Spring TOY**	**Fall TOY**
Alewife	April 1 - June 15	Sept. 1 - Nov. 15
Blueback herring	April 1 - June 30	Sept. 1 - Nov. 15
American shad	May 1 - July 15	Sept. 30 - Oct. 31
Rainbow smelt	March 1 - May 31	none
American eel	March 15 - June 30	Sept. 15 - Oct. 31
White perch	April 1 - June 15	none
Atlantic tomcod	Feb. 15 - April 30	none
Atlantic salmon	April 1 - July 15	Sept. 15 - Oct. 31
Atlantic sturgeon	April 1 - Nov. 1	none
Shortnose sturgeon	April 1 - Nov. 1	none
Other finfish	**Spring TOY**	**Fall TOY**
Winter flounder	*Southern Massachusetts* Jan. 15 - May 31	none
	Cape Cod Bay Feb. 1 - June 30	none
	North Coast Feb. 15 - June 30	none
Atlantic cod	April 1 - June 30	Dec. 1 - Jan. 31
Mollusks and Arthropods	**TOY**	
Bay scallop	June 1 - Sept. 30	
Blue mussel	May 15 - August 31	
American oyster	June 15 - Sept. 15	
Northern quahog	June 15 - Sept. 15	
Sea scallop	Sept. 1 - Nov. 15	
Soft-shell clam	*Southern Mass., Cape Cod Bay, and North Coast* April 15 - Sept. 15	
	Cape Cod Bay and North Coast May 1 - Sept. 30	
Surf clam	June 15 - Oct. 15	
Short-finned squid	June 15 - Oct. 15	
Long-finned squid	April 15 - June 15	

Mollusks and Arthropods (cont.)	**TOY**
American lobster	*Southern Massachusetts* May 15 - July 1
	East of Cape Cod June 15 - August 15
	Cape Cod Bay and North Coast May 31 - July 31
Atlantic horseshoe crab	*in -water* May 1 - June 30
	Beach May 1 - July 31
Marine Mammals and Reptiles	**TOY**
North Atlantic right whale	Jan. 1 - May 15
Humpback whale and Fin whale	April 1 - Oct. 31
Sea turtles	June 1 - Nov. 30

The location of marine fisheries resources, organized by town, watershed, and waterbody, is presented in the Appendix with the associated TOY date ranges. A TOY may or may not be recommended depending upon the location of a project within a waterbody and the type of impact. Whether or not a TOY will pertain to a specific construction project depends on the type of work proposed, the location of the project relative to the resource area and the timing and duration of the activity. It is beyond the scope of this document to describe the decision process whereby a TOY is recommended, but it is anticipated that such guidance will be forthcoming.

Introduction

The Commonwealth of Massachusetts through the Division of Marine Fisheries (*MarineFisheries*) has the authority and responsibility under MGL c. 130 § 17 for the development and stewardship of marine fisheries resources, habitats, and harvest. *MarineFisheries* is involved with fisheries management at multiple levels of government (state, interstate, and federal). Managed species include finfish (e.g., cod, winter flounder, sharks), invertebrates (e.g., shellfish, lobsters), and protected species (e.g., whales, turtles) (Table 1). *MarineFisheries'* biologists study the populations and life history of these animals for better harvest management and resource protection. *MarineFisheries* works to identify, manage, protect and restore vulnerable habitat areas necessary for managed species' passage, spawning, juvenile development, forage, and shelter.

Many managed marine fisheries resources (including specific life stages and habitats) are vulnerable to coastal alteration projects such as dredging, pipeline construction, and beach fill, depending on their life history and specific habitat requirements. *MarineFisheries'* personnel review coastal alteration permit applications and provide technical comment to regulatory agencies regarding means to avoid, minimize, and/or mitigate for lethal, sublethal, behavioral, permanent or temporary impacts to marine fisheries resources. Species are considered vulnerable to anthropogenic coastal alteration if their habitat is spatially limited within a particular system, if a vulnerable life stage (e.g., spawning or aggregated passage) occurs in an area proposed to be impacted, and/or if their population abundance is particularly low.

Adverse impacts to marine fisheries resources can result from suspension of fine grain sediments, lowered dissolved oxygen levels, impediments to migration, direct removal of important shelter, forage or spawning habitat, and direct mortality. In order to avoid or minimize some of these impacts, several actions can be taken, including:

- Siting the project footprint to avoid resources.
- Designing the project to minimize the footprint or size needed (e.g., minimizing the number of necessary piles on a dock).
- Using a particular construction technique (e.g., an environmental dredge bucket).
- Real-time monitoring of the extent of turbidity plumes with permitted thresholds and contingency plans.
- Use of project sequencing (scheduling portions of a project at different times in different areas of the waterbody in order to minimize impacts to time and spatially sensitive resources).
- Use of time of year restrictions on in-water work (seasons when in-water work should not be conducted to protect critical life stages).

This report is focused on defining the date ranges for times of year during which there is a higher risk of known or anticipated significant lethal, sub-lethal, or behavioral impacts to marine fisheries resources as a result of construction activities. We have consolidated the best available life history information on marine fisheries resources in Massachusetts as a clear record of how the date ranges for time of year restrictions (TOYs)[1] on in-water construction work are determined. Further, this report presents resources by waterbody and identifies the entire date range that may apply to that waterbody. However, whether or not TOYs pertain to a given project depends on the type of work proposed, the location of the project relative to the resource area and the timing and duration of the activity within the waterbody. During the permit review process these variables are examined along with any site specific information and a TOY recommendation decision is made. It is beyond the scope of this document to describe the decision process whereby a TOY is recommended, but it is anticipated that such guidance will be forthcoming.

[1]The corollaries to TOYs are recommendations defining when work *can* be conducted; these are known as environmental windows.

Table 1. Marine fisheries species managed in Massachusetts and adjacent federal waters.*

Common name	Scientific name	Common name	Scientific name
Finfish		**Shellfish**	
Alewife/river herring	*Alosa pseudoharengus*	Bay scallop	*Argopecten irradians*
American eel	*Anguilla rostrata*	Blue mussel	*Mytilus edulis*
American plaice	*Hippoglossoides platessoides*	Channeled whelk	*Busycotypus canalictulatus*
American shad	*Alosa sapidissima*	Eastern oyster	*Crassostrea virginica*
Atlantic bluefin tuna	*Thunnus thynnus*	Knobbed whelk	*Busycon carica*
Atlantic cod	*Gadus morhua*	Northern quahog	*Mercenaria mercenaria*
Atlantic croaker	*Micropogonias undulatus*	Ocean quahog	*Arctica islandica*
Atlantic halibut	*Hippoglossus hippoglossus*	Razor clam	*Ensis directus*
Atlantic herring	*Clupea harengus*	Sea scallop	*Placopecten magellanicus*
Atlantic mackerel	*Scomber scombrus*	Soft shell clam	*Mya arenaria*
Atlantic menhaden	*Brevoortia tyrannus*	Surf clam	*Spisula solidissima*
Atlantic salmon	*Salmo salar*	**Other invertebrates**	
Atlantic sturgeon	*Acipenser oxyrinchus*	American lobster	*Homarus americanus*
Atlantic tomcod	*Microgadus tomcod*	Blue crab	*Callinectes sapidus*
Black sea bass	*Centropristis striata*	Horseshoe crab	*Limulus polyphemus*
Blue marlin	*Makaira nigricans*	Red crab	*Chaceon quiquedens*
Blueback herring/river herring	*Alosa aestivalis*	Long-finned squid	*Loligo pealei*
Bluefish	*Pomatomus saltatrix*	Short-finned squid	*Illex illecebrosus*
Butterfish	*Peprilus triacanthus*	Northern shrimp	*Pandalus borealis*
Fluke/summer flounder	*Paralichthys dentatus*	Green sea urchin	*Strongylocentrotus droebachiensis*
Haddock	*Melanogrammus aeglefinus*	**Sharks**	
Monkfish	*Lophius americanus*	Basking shark	*Cetorhinus maximus*
Ocean pout	*Macrozoarces americanus*	Blue shark	*Prionace glauca*
Offshore hake/blackeye whiting	*Merluccius albidus*	Dusky shark	*Carcharhinus obscurus*
Pollock	*Pollachius virens*	Shortfinned mako shark	*Isurus oxyrinchus*
Rainbow smelt	*Osmerus mordax*	Porbeagle shark	*Lamna nasus*
Red drum	*Sciaenops ocellatus*	Sand tiger shark	*Carcharias taurus*
Red hake/ling	*Urophycis chuss*	Sandbar shark	*Carcharhinus plumbeus*
Redfish	*Sebastes fasciatus*	Spiny dogfish	*Squalus acanthias*
Sailfish	*Istiophorus albicans*	Thresher shark	*Alopias vulpinus*
Scup	*Stenotomus chrysops*	White shark	*Carcharodon carcharias*
Shortnose sturgeon	*Acipenser brevirostrum*	**Skates**	
Silver hake/whiting	*Merluccius bilinearis*	Barndoor skate	*Dipturus laevis*
Spanish mackerel	*Scomberomorus maculatus*	Little skate	*Raja (Leucoraja) erinacea*
Spot	*Leiostomus xanthurus*	Smooth skate	*Malacoraja senta*
Spotted seatrout	*Cynoscion nebulosus*	Thorny skate	*Amblyraja radiata*
Striped bass	*Morone saxatilis*	Winter skate	*Leucoraja ocellata*
Swordfish	*Xiphias gladius*	**Marine mammals**	
Tautog	*Tautoga onitis*	Atlantic white-sided dolphin	*Lagenorhynchus acutus*
Tilefish	*Lopholatilus chamaeleonticeps*	Blue whale	*Balaenoptera musculus*
Weakfish	*Cynoscion regalis*	Common dolphin	*Delphinus delphis*
White hake	*Urophycis tenuis*	Fin whale	*Balaenoptera physalus*
White marlin	*Tetrapturus albidus*	Harbor porpoise	*Phocoena phocoena*
White perch	*Morone americana*	Humpback whale	*Megaptera novaeangliae*
Windowpane flounder	*Scophthalmus aquosus*	Long finned pilot whale	*Globicephala melas*
Winter flounder	*Pseudopleuronectes americanus*	Minke whale	*Balaenoptera acutorostrata*
Witch flounder/grey sole	*Glyptocephalus cynoglossus*	North Atlantic right whale	*Eubalaena glacialis*
Yellowtail flounder	*Limanda ferruginea*	Risso's dolphin	*Grampus griseus*
		Sei whale	*Balaenoptera borealis*
		Short finned pilot whale	*Globicephala macrorhynchus*
		Turtles	
		Green sea turtle	*Chelonia mydas*
		Hawksbill sea turtle	*Eretmochelys imbricata*
		Kemp's Ridley sea turtle	*Lepidochelys kempii*
		Leatherback sea turtle	*Dermochelys coriacea*
		Loggerhead sea turtle	*Caretta caretta*

*Sources include: Diodati (2007); SAFIS (2009); and Massachusetts Commercial Finfish Regulation list provided on *MarineFisheries* website (http://www.mass.gov/dfwele/dmf/commercialfishing/regulations.htm#abstracts) accessed 12/9/10.

Background

Impacts of coastal construction on marine fisheries resources. Dredge, fill, coastal construction and other coastal alteration projects can result in deleterious impacts to marine fisheries resources and habitats (Wilber and Clarke 2001; Erftemeijer and Lewis 2006; Wilber et al. 2006; Hanson et al. 2003). Impacts include lethal, sub-lethal, behavioral, permanent or temporary, resulting directly or indirectly from coastal construction activities (primary impacts) and associated use activities (secondary impacts). Within these impact categories, construction activities are linked to a broad range of potential effects, including, benthic habitat loss and alteration, sedimentation, water quality impacts such as changes to turbidity and total suspended solid loading, changes to water flow, electromagnetic field generation, noise and shock, impediments to passage, entrainment and impingement, and direct mortality. The common construction activities reviewed in the Massachusetts coastal and marine environments along with their associated potential impacts are summarized in Table 2. For a more comprehensive review of non-fishing impacts to marine fisheries see Johnson et al. (2008).

In the case of many development projects, a TOY may minimize the temporary construction impacts, though the project may also cause permanent degradation and habitat loss necessitating other mitigation actions. Although we discuss many project impacts here, the focus of this document is on minimization of temporary impacts through time of year restrictions. Many demersal species, including estuarine fish and shellfish, are vulnerable to construction activities that involve excavation of the seafloor. Such activities can result in temporary or long-lasting habitat degradation, depending on the sediment type, depth or changes in human use patterns. Fine grain silts, debris, and contaminants including excess nutrients, metals, and organic compounds can both temporarily and permanently degrade spawning habitat, smothering eggs and altering substrata needed for egg attachment (Farnworth et al. 1979; Chase 2006). Activities requiring blasting may also cause elevated sound pressure that may result in fish kills (Keevin and Hempen 1997).

Based on the life history characteristics, the response to temporary impacts varies widely. For example, the effect of sedimentation depends on the specific egg form, migratory behavior and foraging patterns of the species. A demersal, adhesive egg (e.g., tomcod, smelt, winter flounder) may be exposed to a sediment plume for several days while semi-buoyant eggs (e.g., American shad) and larvae could experience a shorter exposure to a sediment plume and therefore experience less of an impact. Similarly, migrating species undeterred by turbidity or other environmental changes (e.g., American eel) are less vulnerable to temporary alterations than more easily stressed species (e.g., American shad).

Although attention has been paid in the literature to impacts of coastal alteration projects on marine fisheries species, many questions remain. Because site-specific life history information, with attention to high resolution spatial and temporal distribution, is typically lacking, resource protection recommendations are often broad-based and precautionary. The goal is to avoid and minimize impact to a variety of species in an area with a focus on the most vulnerable. We recommend that all proposed coastal alteration work be reviewed on a case-specific basis as a means to minimize resource impact by considering alternative materials, methods, timing, and siting. Site specific life history information, when available, is used to tailor resource recommendations to the specific project impacts and features of the site.

MarineFisheries' jurisdiction for environmental review. The Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, through its appropriate departments and divisions, is charged with carrying out state environmental policy including the regulation and management of marine and coastal fisheries and natural resources located in the territorial waters, the economic zone waters and the continental shelf, wetlands, estuaries, shorelines, and interior of the commonwealth (MGL c. 21A § 2). Within that directive

Table 2. Examples of coastal alteration activities and associated impacts to marine fisheries resources.

Coastal Alteration	Potential Effects	Species or Habitat Impacted
Watershed development: Increased impervious surfaces, Non-point source pollution	Increased sedimentation and turbidity Substrate and water quality degradation due to pollutants Egg smothering Impaired respiration and feeding Eutrophication and lower dissolved oxygen (DO) Increased organic content Changes in flow characteristics Impediments to passage	Diadromous fish Other finfish Winter flounder Shellfish Eelgrass habitat
Shoreline protection, beach fill	Increased sedimentation and turbidity Smothering of mud-flat, beach, rocky intertidal or subtidal habitats Egg smothering Changes in flow characteristics Direct mortality Benthic habitat loss and conversion	Winter flounder Horseshoe crabs Lobster Shellfish Benthic habitat (e.g. eelgrass, complex bottom)
Flood control, channel armoring	Changes in flow characteristics Loss of spawning habitat Increased vulnerability of eggs to predation Impediments to passage Benthic habitat alteration	Diadromous fish
Dredging	Changes in flow characteristics Loss of spawning habitat Increased vulnerability of eggs to predation Increased sedimentation and turbidity Substrate and water quality degradation due to pollutants Egg smothering Impaired respiration and feeding Benthic habitat alteration Impediments to passage Direct mortality of vulnerable life stages	Diadromous fish Winter flounder Horseshoe crabs Lobster Shellfish Benthic habitat (e.g. eelgrass, complex bottom)
Pile driving	Changes in flow characteristics Loss of habitat beneath piles Noise impact (shock) Increased sedimentation and turbidity Benthic habitat alteration Impediments to passage Direct mortality	Diadromous fish Other finfish Winter flounder Shellfish Eelgrass habitat
Cables and pipelines	Increased sedimentation and turbidity Substrate and water quality degradation due to pollutants Electromagnetic fields Benthic habitat alteration Impediments to passage	Elasmobranchs (sharks) Lobster Shellfish Benthic habitat (e.g. eelgrass, complex bottom)
Blasting	Noise impact (shock) Increased sedimentation and turbidity Benthic habitat alteration Impediments to passage Direct mortality	Diadromous fish Lobster

MarineFisheries (a division of the Department of Fish and Game) has jurisdiction over marine fisheries resources with the authority to adopt, amend, or repeal all rules and regulations, with approval of the Governor, for the maintenance, preservation and protection of all marine fisheries resources between the mean high water mark of the commonwealth and a straight line extension of the lateral boundaries of the Commonwealth drawn seaward to a distance of 200 miles or to a point where the water depth reaches 100 fathom, whichever is the greatest (MGL c. 130 § 17).

MarineFisheries has the responsibility to participate in the review of coastal projects and prepare guidance documents for the protection of marine resources from coastal construction under the above law as well as other laws and regulations, including MGL c. 130 § 17, 19, 20, 21, 25; 310 CMR 9 and 10 (Waterways and Wetlands Protection); 314 CMR 9.07(3)(d) (Water Quality Certification); and the Federal Fish and Wildlife Coordination Act (16 U.S.C. c. 5A 661-667e). *MarineFisheries* provides technical comment on town, state, and federal permits and actions that could cause impact to fisheries resources or habitats. This includes comments on the following permit applications:

- Notices of Intent to Conservation Commissions;
- 401 Water Quality Certifications and Chapter 91 Wetlands and Waterways reviews by Massachusetts Department of Environmental Protection (DEP);
- General Permit (Category II) and Individual Permit (IP) applications to the Army Corps of Engineers (ACE) under Section 10 of the Rivers and Harbors Act and 404 of the Clean Water Act;
- Massachusetts Environmental Policy Act (MEPA) process.

MarineFisheries provides comment on the significance of land under the ocean to the protection of marine fisheries resources and recommends management practices to avoid and minimize impacts to those resources. State and federal guidelines require projects to first *avoid* any fisheries impacts (considering all alternative solutions that would eliminate any adverse effect on the environment), second *minimize* all unavoidable impacts with the use of best management practices and project siting and sequencing, and finally *mitigate* when necessary (301 CMR 11.00, MEPA Regulations & 33 CFR part 320-330, and 404 (b)(1) guidelines). In many cases, *MarineFisheries* considers TOYs a minimization of impact, since TOYs generally only encompass times of the year when the likelihood of impacting a vulnerable resource is higher than at other times of the year. A project can still impact a vulnerable resource outside of the TOY dates. A project may also impact other vulnerable resources of which we have limited knowledge.

History of TOYs. It is unclear how long TOYs have been used as a minimization technique, although prohibitions on activities that hinder anadromous passage date back to the early 1700's (McPhee 2002; Montgomery 2004). Prior to the passage of the National Environmental Policy Act (NEPA) in 1969, TOYs were informally recommended on at least the town and state levels, particularly to protect spawning runs for anadromous fish. Since NEPA, TOYs have been recommended as a precautionary management measure by state and federal fisheries resource agencies through the permit review process.

TOYs were originally modeled after fishing regulations that protect fish during their spawning season. In the late 1600s the importance of maintaining fish stocks was recognized and fishing regulations were first enacted to prevent the harvest of cod, haddock, pollock and hake during spawning events occurring in the months of December and January (McFarland 1911). In Massachusetts, harvest restrictions to protect the spring spawning runs of river herring date back to the 1700's and rainbow smelt to 1874 (Kendall 1926). In Massachusetts there is currently a year-round moratorium on the harvest, possession and sale of river herring and seasonal restrictions on the harvest of smelt. In

1975, all Massachusetts in-shore embayments, including Boston Harbor and Buzzards Bay, were closed year-round to all nets for the protection of near-shore spawning habitat and larval and juvenile development of demersal finfish, with a focus on winter flounder (322 CMR 4.02). In 1985, an in-shore winter flounder spawning closure that prohibited the use of all mobile gear from February 1 through May 31 was established as part of a set of regulations to limit effort of vessels in state waters in response to a recognized urgent need to address resource declines (322 CMR 8.09; Coates 1990; Figure 1). In addition to state-regulated closed seasons, the Federal Fishery Management Plans (FMP) also have seasonal closure recommendations in order to rebuild or maintain spawning stocks at or near target levels by reducing pressure on spawning fish. For example, Amendment 1 to the Atlantic States Marine Fisheries Commission (ASMFC) Winter Flounder Fishery Management Plan (FMP) recommended recreational and commercial closures of the Southern New England (SNE)/ Mid Atlantic (MA) winter flounder fishery during the months of March and April to protect spawning fish (ASMFC 2005). Currently, there is a zero possession limit within the federal SNE/MA winter flounder stock area (generally south and east of Cape Cod) and drastic reductions in quota in state waters. Closed seasons, harvest reductions, and harvest prohibitions are commonplace in the management of fisheries and other natural resources (e.g., deer, turkeys, ducks) throughout the United States.

In addition to fishing impacts, habitat degradation and climate change are believed to be contributing factors to increasingly poor recruitment of certain fish stocks (Deegan and Buchsbaum 2005; ASMFC 2005; Hanson et al. 2003). In order to

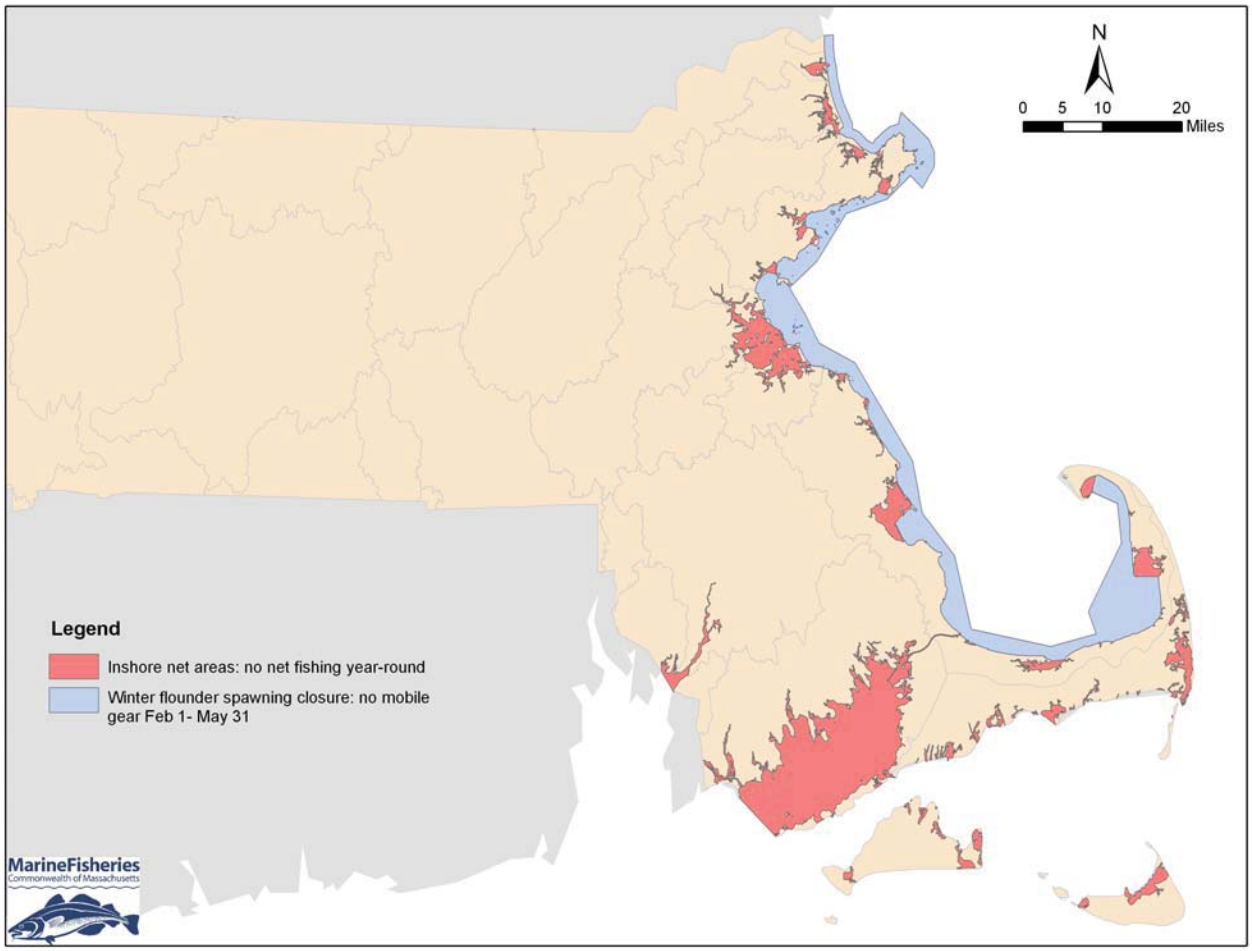

Figure 1. Inshore fisheries closures to protect vulnerable resources; Winter flounder spawning closure and inshore net closure areas pursuant to 322 CMR 4.02 and 8.09.

maintain fish stocks at or near target levels, there is a recognized need for increased habitat protection in addition to the reductions in allowed catch imposed by fisheries regulations (ASMFC 2005). Marine fisheries resources and habitats are subject to many non-fishing impacts, including habitat loss and degradation due to coastal alteration such as development and dredging (Johnson et al. 2008). *MarineFisheries* recognizes the importance of non-fishing impacts to fisheries management, and has participated in the review of coastal alteration projects since at least the 1980's. At the federal level, Essential Fish Habitat (EFH) regulations require the New England Fishery Management Council (NEFMC) to address non-fishing impacts in their fishery management plans (Magnuson-Stevens Act 1996) and the ASMFC recommends that states "establish and enforce strict timeframes when sediment dredge activities should be prohibited or minimized in spawning and nursery areas" (ASMFC 2005). The ASMFC requested all state fishery agencies to actively intervene, within their jurisdiction, to ensure that local, state and federal permitting agencies are fully aware of the impacts of habitat loss and degradation on fishery productivity. Further, Amendment 1 to the ASMFC Interstate Fishery Management Plan for inshore stocks of winter flounder specifically sets as high priority the establishment of "windows and dredge sequencing for minimization of adverse effects" (ASMFC 2005). Non-fishing impacts from coastal alteration projects can be managed in a manner similar to the regulation of fishing impacts. Fishing regulations include license caps (limited entry), quotas, gear restrictions, area restrictions, and temporal restrictions. Commonly used best management practices for coastal alteration projects include specifications for construction equipment, construction methods, materials, temporal restrictions on work (TOYs), and habitat-based area restrictions (avoidance of impact to Special Aquatic Sites such as intertidal mudflat or vegetated shallows).

The practice of federal and state marine fisheries agencies recommending TOYs has been reviewed several times. In 1980, NOAA reviewed and evaluated 10 years of their own resource recommendations on coastal projects nationwide to provide an analysis of past recommendations and available literature, in order to improve the future application of TOYs (NOAA 1980). The NOAA document is the first document that fully separated TOYs from fisheries regulations, and specifically defined TOYs using life history information linked to project impacts. In 2001, the National Research Council held a workshop as part of the National Dredge Team Conference in Jacksonville, Florida in order to review and discuss the ways in which TOYs are established and used. A multi-stakeholder approach was encouraged to direct the process of using TOYs in individual states (NRC 2001). In 2007, a Massachusetts Coastal Zone Management (CZM) report (Normandeau 2007), reviewed the application of TOYs on hydraulic dredging projects on Cape Cod. The CZM report highlights the significant constraints that TOYs place on dredging projects and identifies perceived inconsistencies in the application of TOYs in different environmental permits.

At the state level, *MarineFisheries* first consolidated its TOYs in an internal memo to DEP in 1996, listing the important commercial and recreational species and the seasons during which they are most vulnerable to construction impact. This memo was updated informally over many years of project review through conversations with *MarineFisheries* and NMFS biologists and other reviewers. The revisions of the 1996 memo provide the basis for this report. The TOYs described in this report represent the most current recommendations of *MarineFisheries*; any previously available memos or drafts of TOYs are superseded by this document. Future amendments will be provided on an as-needed basis when additional information is available.

Establishment of TOYs in MA. TOYs are established by examining the life history and habitat requirements for each species. To the maximum extent possible, this is done on a waterbody-specific level. For the purposes of this document, a coastal waterbody is considered the physiographic region encompassing a tidal river, coastal pond or embayment. The sources of data used to support the TOY date ranges include general life history references, peer reviewed studies, NOAA NMFS technical reports (including EFH Source documents), ASMFC

fishery management plans, *MarineFisheries'* technical reports and estuarine monograph series, the *MarineFisheries'* Resource Assessment trawl survey time-series, and the unpublished data and observations of *MarineFisheries'* biologists.

TOYs are designed to reasonably encompass species life stages that are both more vulnerable to impact and more critical to the fitness of a population. These life stages are typically spawning, larval settlement, and early juvenile development. A TOY may also protect a resource that is aggregated while spawning, foraging, or migrating, depending on the specific project impact (e.g., blasting, vibrating steel sheeting). Life history events usually correspond to environmental cues. For example, winter flounder spawning is thought to be triggered when the coldest winter temperatures are reached and warming begins (Collette and Klein-MacPhee 2002). Rainbow smelt and river herring undergo upriver spawning migrations cued by seasonal changes in temperature, photoperiod and water chemistry (Chase 2006). Given that these activities are dependent on seasonal cues, there may be a high degree of variability in the onset and length of the activity. Therefore, TOYs are established based on average conditions with room for annual variation. In any given year, however, there may be spawning before the TOY and larval settlement after the TOY. The specificity with which we can make TOY recommendations is heavily dependent on the resolution of the underlying data. Where data is limited, we apply a precautionary, risk-averse approach and rely on general trends.

It is important to note that the application of TOYs depends on the type of work proposed, the location of the project relative to the resource area, and the timing and the duration of the activity.

TOYs in Other States. Each coastal state has different resource concerns, construction needs and environmental regulations to address, therefore the processes associated with setting and applying TOY recommendations differ across borders (Table 3). Maine, New Hampshire, Rhode Island, New York, and Delaware have "dredge rules" which are defined as a standard environmental window for all in-water, silt-producing work. However, Maine and New Hampshire have tailored TOYs to a project in a case-by-case review as appropriate and when there is sufficient information to do so (B. Swan, ME Department of Marine Resources, 2009, pers. comm.; D. Grout, NH Fish & Game Marine Division, 2009, pers. comm.). Massachusetts, Connecticut and New Jersey recommend TOYs on a case-by-case basis and specify different TOYs depending on the ecoregion or waterbody, the species likely to be impacted, and/or the project methods proposed, and potential impacts. For example, in Connecticut, a small project dredging clean sand may not have any restrictions while a larger project to dredge mud and silt in an adjacent location might have several (G. Wisker, CT Department of Environmental Protection, 2009, pers. comm.).

Life History Information & TOY Date Ranges

This chapter provides a description of the known life history of selected managed species and the resulting TOY date ranges. The inclusion of species in this section is driven by their status as a managed species (under NEFMC, ASMFC, or *MarineFisheries*) and/or their vulnerability to non-fishing impacts. A summary of the life history information is provided in Appendix A. Please also refer to Figure 2 for a map of the watersheds and coastal regions where different TOY date ranges apply. The Annotated Bibliography in Appendix C provides a description of the supporting references by species.

The spatial distribution of marine fisheries resources is critical to the review of coastal alteration projects and the resulting resource recommendations. Due to the well-defined biogeographic boundary formed by Cape Cod, some species in Massachusetts have regionally-specific TOYs. The warmer waters and sandier coastline of Southeastern Massachusetts and the south side of Cape Cod are a part of the Virginian Province. The cooler, rocky shores north of Cape Cod to Cape Ann are part of the Gulf of Maine Province. These two provinces are defined by their different biological

Table 3. Recommended TOYs in some East Coast states.

State	TOY date ranges		Description	Reference
Maine	4/1 to 11/30		A standard dredge TOY is designed to protect winter flounder, anadromous and shellfish species.	B. Swan, ME DMR, 2009, pers. comm.
New Hampshire	3/15 to 11/15		A standard dredge TOY is designed to protect winter flounder, anadromous and shellfish species.	D. Grout, NH Fish & Game, 2009, pers. comm.
Rhode Island	1/31 to 10/31		A standard dredge TOY is designed to protect winter flounder, anadromous, shellfish, and other species.	D. Goulet, RI CRMC, 2009, pers. comm.
Connecticut	Winter flounder	2/1 to 5/31	Separate TOYs depending on species impacted.	G. Wisker, CT Office of Long Island Sound Programs, 2009, pers. comm.; CT Species Seasonal Restriction List.
	Anadromous	4/1 to 6/30		
	Shellfish	6/1 to 9/30		
New York	12/15 to 9/15		A standard dredge TOY is designed to protect winter flounder, anadromous, shellfish, and other species.	L. Chiarella, NMFS, 2009, pers. comm.; D. McReynolds. NY DEC, 2009, pers. comm.
New Jersey	Blue crab	12/1 to 3/31	Separate TOYs depending on ecoregion, dredge method and species impacted. For example, mouth of river and all shoreline to 1000' offshore has a TOY for blue crab and horseshoe crab, while channels and anchorages have TOYs for Atlantic sturgeon, striped bass, river herring and American shad.	R. Allen, NJ DEP Div. of Fish & Wildlife 2009, pers. comm.; NJ Sea Restriction Chart 10 Oct. 06
	Horseshoe crab	4/15 to 9/15		
	Striped bass River herring Amer. shad Atl. sturgeon	3/15 to 6/30		
Delaware	12/31 to 9/1		A standard dredge TOY is designed primarily for the protection of summer and winter flounders.	J. Tinsman, DE DFW 2009, pers. comm.
Pennsylvania	Anadromous	3/16 to 5/31	Separate TOYs depending on species impacted.	S. Carney, PFBC, 2009, pers. comm.
	Winter flounder	1/1 to 5/31		

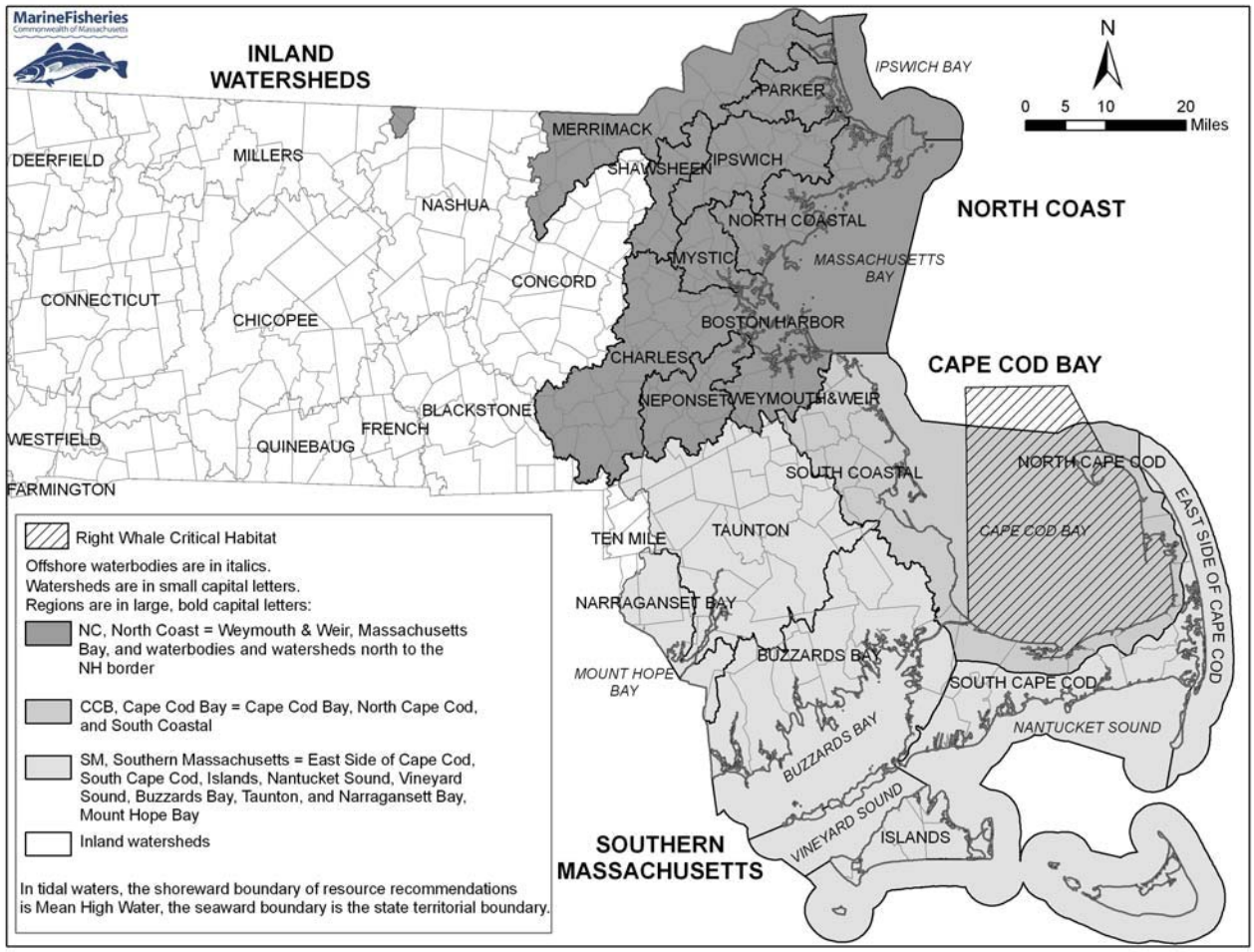

Figure 2. Watersheds and coastal regions of Massachusetts used for TOY delineations.

assemblages, including distinct stocks of species such as winter flounder and lobster. Therefore, different TOYs can apply in different regions of the state (Figure 2). In order to make watershed-level assessments, watersheds were defined using the Major Drainage Basins layer available on MassGIS (2003). This layer was refined in two ways to draw boundaries more relevant for our purposes: 1) Cape Cod was divided into north and south to reflect differing resource use north and south of Cape Cod. The north-south boundary was defined using the Drainage Sub-basins layer. 2) The Boston Harbor Major Basin was divided into its component sub-basins of the Neponset, Weir, and Mystic Rivers using the Major Watersheds (2000) layer. All layers used are available from MassGIS. Within watersheds, waterbodies include ponds, rivers, embayments and coastal areas with known finfish resources that *MarineFisheries* may comment on in our project review. The general known presence of marine fisheries resources in a watershed, waterbody, and city or town is provided in Appendix B. Shellfish are listed as a general category. However, for a more specific map of the location of particular shellfish species in each waterbody please refer to Shellfish Habitat Suitability layers on MassGIS (Mass GIS 2008). Appendix B is not an exhaustive list and it will be expanded and updated as our understanding of fisheries resource distributions evolves. It is anticipated that companion GIS data-layers will be forthcoming.

Diadromous Fish. Diadromous fish include species that spend part of their life history in estuaries, rivers and freshwater ponds and part in marine waters. Anadromous fish spawn in fresh water rivers and ponds, migrate out to sea as juveniles, and spend most of their adult life in marine waters;

catadromous fish spawn in marine waters, migrate to coastal river systems, and spend most of their adult lives in estuaries and freshwater habitats. Diadromous fish migrate through inlet channels, embayments, harbors, and tidal rivers en route to their spawning grounds. In coastal Massachusetts, diadromous fish habitats are often in close proximity to urbanized areas, which are subject to pollution, eutrophication, hydrologic alteration, and other anthropogenic impacts.

Stocks of diadromous fish in the western North Atlantic have declined compared to historic levels (Moring 2005; Limburg and Waldman 2009). While overfishing may have played a role in the declining status of striped bass, Atlantic salmon and Atlantic sturgeon populations (Moring 2005), for most diadromous fish, their long-term decline appears to be mainly due to migration impediments (e.g., dams and other obstructions), habitat alterations and impaired water quality (ASMFC 2009a). The above factors have resulted in a measurable reduction in the available freshwater habitat, thereby lowering the reproductive and nursery carrying capacity which is thought to be a major reason for the decline and extirpation of anadromous stocks. For example, fish stressed by crowding, changes in dissolved oxygen, salinity, temperature, poor nutrition or obstructed passage have been found to reabsorb their eggs and return to the sea without spawning or spawn fewer batches (Rideout et al. 2005; Dadswell 1996; Rottmann et al. 1991).

MarineFisheries is actively involved in monitoring diadromous fish and has been working towards restoring diadromous habitat and populations for over 70 years. Recent and ongoing efforts include projects on river herring, American shad, American eel, and rainbow smelt. Much of this information is available in a series of technical reports accessible on the *MarineFisherie*s website (Chase 2006, Chase 2008, Chase et al. 2009, Reback et al. 2004a, 2004b, 2005a, 2005b). Data on fish ladders and obstructions which were assessed for spawning run locations was last updated in 1997 and is available on the MassGIS website as ANADFISH_PT (MassGIS 1997). The information contained in Appendix B supersedes the ANADFISH_PT layer. *MarineFisheries* is currently in the process of updating the information on diadromous fish spawning run locations for the MassGIS data layer.

Life history information and the recommended TOYs specific to individual diadromous species are detailed in the following sections. The recommended TOYs below will, in most cases, be the most appropriate TOY for any year. However, there may be cases when monitoring data indicate that a spawning run has begun early or juvenile emigration was delayed in a given year. In these cases, with sufficient monitoring data or anecdotal evidence, *MarineFisheries* may recommend a different TOY date on a case-by-case basis.

River herring. Alewives (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*) are clupeid fish (family Clupeidae) that are together known as river herring. They are also referred to as alosids and alosine species. There is considerable overlap in their geographic distribution; alewives range from Labrador to South Carolina and blueback herring range from Nova Scotia to Florida. Alewives are the dominant (≥ 90%) river herring species in New England, except in the upper Connecticut River (DiCarlo 1981; Gibson 1982; Greenwood 1982; Flagg and Squires 1983). The maximum age of river herring increases northerly from seven and eight years in Florida and South Carolina (Rulifson and Huish 1982), to nine in North Carolina (Street et al. 1975; Johnson et al. 1977), and 10 in Nova Scotia (O'Neill 1980).

River herring reach spawning age at about three to eight years old with a modal spawning age of four or five (Loesch 1987). Blueback herring typically spawn in shallow riverine environments while alewives migrate further upstream to ponds, lakes and other impoundments (Loesch and Lund 1977; and Loesch 1987). Alewives generally spawn three to four weeks earlier than bluebacks in the same system (Reback et al. 2004a). The onset of spawning is related to water temperature and is delayed with increasing latitude in Massachusetts. Generally, alewives begin spawning when temperatures

reach 51° F (10.5° C) and bluebacks wait until the water warms to approximately 57° F (14° C). In Massachusetts, temperatures are generally warming and spawning runs begin in April, although some river systems on Cape Cod may have an earlier spawning run beginning in late March. Eggs are demersal to pelagic and slightly adhesive (Klauda et al. 1991). For both species, the spawning period occurs from March through June, with most activity in April and May (Belding 1921; Bigelow and Schroeder 1953) (Appendix A). High dissolved oxygen, temperature and current velocity were the strongest predictors of alewife egg presence (O'Connell and Angermeier 1999). Reduced dissolved oxygen levels (less than 5.0 mgL^{-1}) and elevated total suspended solids (TSS) concentrations (500 mgL^{-1}) may impact developing river herring larvae (Funderburk et al. 1991). A vegetated riparian zone may help to maintain stable temperatures and dissolved oxygen as well as appropriate habitat structure for egg and juvenile cover (O'Connell and Angermeier 1997). Once the appropriate habitat is reached and the eggs are spawned, egg incubation and hatching often takes only three to four days (Klauda et al. 1991). The hatched larvae develop quickly, schooling within two weeks post-hatch (Cooper 1961) and are considered juveniles when they reach 20-45 mm total length (Norden 1967). Juveniles typically remain in the freshwater nursery areas through spring and early summer and the first migrants depart during late June/early July (Kosa and Mather 2001). Emigration can continue through the fall and is dependent on location and a variety of seasonal-specific influences (Kosa and Mather 2001; Yako et al. 2002).

In Massachusetts, spawning and nursery habitats are found along the entire coastline, within both large rivers, such as the Merrimack and Taunton Rivers, and smaller tributaries and streams. River herring historically supported important recreational and commercial fisheries in Massachusetts (Belding 1921). Recreational harvest data are scarce and most information on harvest is derived from the commercial industry. Commercial landings for these species declined dramatically from historic highs (Munger et al. 2004), especially during the 1960's when foreign fleets began fishing for river herring off the mid-Atlantic coast. Statistics compiled by Kocik (2000) indicated U.S. landings averaged 25,000 mt annually during the 1960's, declining to an average of 4,000 to 5,000 mt in the mid-1980's, then further declining to an average of 500 mt from 1994 to 1998.

In response to the decline in alosine stocks, in 1985 the ASMFC developed a cooperative Interstate Fishery Management Plan (FMP) for American shad and river herring, providing management guidance to states. In 1998, the ASMFC adopted Amendment I to the FMP for shad and river herring, requiring states to conduct surveys to characterize alosine stocks, including adult spawning stock surveys. In 1989, *MarineFisheries* enacted regulations that prohibited directed harvest of river herring by any means other than a dipnet within the territorial waters of the Commonwealth. In 2005, Massachusetts river herring populations had continued to decline to alarmingly low levels. This prompted *MarineFisheries* to ban all harvest of river herring throughout the state as of January 1, 2006. The ban is in effect through 2011 when it will be reassessed and likely extended (322 CMR 6.17 and 6.19). In order to gauge the status of river herring populations in Massachusetts, *MarineFisheries* conducts an intensive monitoring program utilizing a variety of counting techniques. *MarineFisheries* conducts assessments of river herring spawning and nursery habitats (Chase 2010) and also relies on town officials, watershed associations and private groups to conduct counts and procure data on run size, timing of the run, water quality and other habitat information.

In conjunction with high exploitation, vast areas of historic spawning habitat have been lost or remain inaccessible to river herring. The construction of dams inhibiting upstream migration and land-use alterations damaging spawning and nursery habitat have contributed to a long-term reduction in their stocks (Moring 2005). In addition to obstructions, changes in water discharge may also influence river herring migration (Kosa and Mather 2001). Suspended solids resulting from coastal alteration pro-

jects, such as dredging, may impact river herring eggs and larvae by increasing infection and reducing hatching success (Funderburk et al. 1991).

Recommended TOYs for river herring. *MarineFisheries* recommends a TOY for river herring during the spring spawning migration from **April 1 to June 15** for alewife and **April 1 to June 30** for blueback herring. The spring TOY encompasses the adult migration, spawning, egg incubation and juvenile development within nursery habitats. A TOY may also be recommended for the juvenile emigration from **September 1 to November 15**[2]. Whether or not these TOYs will pertain to a given project is dependent on the nature and location of the proposed work and the most current data on the system in question. In general, in-water, silt producing work should be avoided or fully contained when conducted in a known river herring run during these periods.

American shad. American shad (*Alosa sapidissima*) are found along the entire east coast of the U.S. from Canada to Florida. Shad are river-specific, returning to their natal rivers to spawn, and each major river along the Atlantic supports a discrete spawning stock (Rounsefell and Stringer 1943; Carscadden and Leggett 1975; Messieh 1977; Melvin et al. 1986). Spawning occurs as early as mid-November in Florida and as late as August in some Canadian rivers (Collette and Klein-MacPhee 2002). In Massachusetts, adult shad are known to spawn in the fresh water main stem of several major rivers from late April to July.

The age of maturity is generally from three to five years for males and four to six years for females (Reback et al. 2004a). Most American shad native to rivers south of Cape Fear, North Carolina, die after spawning (Carscadden and Leggett 1975). However, the incidence of repeat spawning increases with latitude (ASMFC 1999) and in the northern extent of their range shad may survive to make several spawning runs throughout their lifetime. The oldest reported shad in the United States was 11 years old and 584 mm long (Scott and Crossman 1973). Shad spawn at night in shallow water and in areas of moderate current. Eggs are fertilized in the upper water column. Shad eggs are semi-buoyant and non-adhesive, floating with the current and hatching after about ten days. Larvae remain in the river and metamorphose to the juvenile stage after three weeks. Young of the year (YOY) spend the first summer in the freshwater river. In the fall, as water temperatures drop, the YOY move downstream to the estuary and brackish water and eventually out to sea. Peak downstream movement is in September and October. After spawning, spent adult fish migrate back downstream in schools in the mid to upper water column.

Coastal runs of American shad in Massachusetts are relatively small compared to other New England systems and mid and southern Atlantic regions. The Commonwealth has five river systems supporting natal American shad recreational fisheries; the Merrimack River, the North and South Rivers of Pembroke and Marshfield, the Palmer River of Rehoboth and the Connecticut River. Smaller populations are known to exist in other Massachusetts coastal rivers.

American shad populations in Massachusetts have been in rapid decline for almost two decades due to pollution, habitat loss, upland development and overfishing (ASMFC 2009a). Elevated levels of turbidity caused by dredging, construction projects, stormwater run-off and other inputs may cause significant stress to migrating, spawning, and developing eggs and larvae. Adult shad may be tolerant of turbidity levels up to 1000 mgL^{-1} total suspended solids (TSS) and hatching success of

[2]The *MarineFisheries'* TOY dates for river herring may differ from the Federal Energy Regulatory Commission (FERC) Fish Passage Protocols at specific fishways associated with hydropower facilities. FERC recommendations are solely intended to ensure passage of Atlantic salmon and clupeid species through a fishway and are therefore more precautionary than a TOY for coastal alteration projects. FERC approved fish passage protocol dates for the Essex Dam (FERC project No. 2800-MA) on the Merrimack River include: upstream passage from May 1 to July 15 and September 15 to October 15; downstream passage from April 1 to July 15 and September 1 to November 15 (FERC 2000).

eggs was not significantly impacted at levels below 1000 mgL^{-1} (ASMFC 2009a). However, concentrations greater than 100mgL^{-1} TSS were found to significantly reduce larval survival (Funderburk et al 1991) and TSS equal to 500 mgL^{-1} for four days resulted in high larval mortality (Wilber and Clark 2001). In addition, if passage of adults is obstructed, physically or due to increased stress, resulting in a spawning delay of more than a few days, adult shad may reabsorb their eggs and return to the sea without spawning (Dadswell 1996). To address impacts from over-fishing, American shad may only be taken recreationally by hook and line (MGL 130 § 100C; 322 CMR 8.06). The landing of net-caught shad is prohibited, even when taken outside of Massachusetts waters in the EEZ (Exclusive Economic Zone) or in the territorial seas of another state (322 CMR 4.12).

MarineFisheries has been involved in anadromous restoration efforts in the Charles River for decades including a shad fry stocking program collaboratively run by *MarineFisheries* and U.S. Fish and Wildlife Service (USFWS) since 2006. The Connecticut and Merrimack River systems are also in an ongoing process of shad stock restoration. Both systems have governmental, multi-state, and multi-agency anadromous fish management and restoration plans in effect. In the future, restoration of shad may be extended to other Massachusetts river systems where they once existed.

Recommended TOYs for American shad. MarineFisheries recommends a TOY for shad during the spring spawning season from **May 1 to July 15** and the autumn juvenile emigration from **September 30 to October 31**[3]. Whether or not these TOYs will pertain to a given project is dependent on the nature and location of the proposed work and the most current data on the system in question. In general, work that may impede migratory passage should be prohibited in a known shad run throughout the spring migration and juvenile emigration and in-water, silt producing work should not be conducted near known shad spawning habitats in Massachusetts.

Rainbow smelt. The historic range of anadromous rainbow smelt (*Osmerus mordax*) extended from Labrador to Delaware Bay in the western North Atlantic. They mature in coastal waters and estuaries, and migrate into freshwater drainages during spring spawning runs. Spawning habitat is typically found at gravel and cobble riffles upstream of the tidal interface (Clayton 1976; Murawski et al. 1980; Chase 2006). Spawning occurs at night during flood tides and most fish exit the freshwater zone before daylight. Smelt deposit a demersal, adhesive egg that incubates at the spawning riffles for one to three weeks, depending on water temperature. Deposited eggs are approximately 1 mm in diameter and transparent. After hatching, larvae are passively transported downstream into the tidal zone where they feed on zooplankton. The onset of spawning in Massachusetts is typically early March when water temperatures reach 4-6 ºC. March-May is the period when viable smelt eggs have been documented on the Gulf of Maine coast of Massachusetts (Clayton 1976; Murawski et al. 1980; Lawton et al. 1990; and Chase 2006).

Rainbow smelt are an important forage fish for many species of wildlife and have supported traditional commercial and recreational fisheries in New England that have declined in recent decades. Bans on fishing during the spawning season were in place as early as 1874 (Kendall 1926). The threat of overfishing during spring net fisheries prompted regulations to limit smelt fishing to hook-and-line methods only. *MarineFisheries* regulates the smelt fishery with a closed season from March 15th – June 15th and a daily bag limit of 50 smelt per angler was

[3]The *MarineFisheries'* TOY dates for shad may differ from the FERC Fish Passage Protocols at specific fishways associated with hydropower facilities. FERC recommendations are solely intended to ensure passage of Atlantic salmon and clupeid species through a fishway and are therefore more precautionary than a TOY for coastal alteration projects. FERC approved fish passage protocol dates for the Essex Dam (FERC project No. 2800-MA) on the Merrimack River include: upstream passage from May 1 to July 15 and September 15 to October 15th ; downstream passage from April 1 to July 15 and September 1 to November 15 (FERC 2000).

enacted in 2009. Concern over declining smelt populations throughout much of their range has increased since the 1980s. Rainbow smelt were recently designated a Species of Concern by the National Marine Fisheries Service due to a large reduction in commercial catches and truncation of their distribution (NOAA 2004).

The location of smelt spawning runs in Massachusetts was mapped by *MarineFisheries* and is available in a *MarineFisheries* technical report (Chase 2006). Monitoring of freshwater drainages along the Gulf of Maine coast of Massachusetts found 45 specific locations where smelt spawn within 30 coastal river systems (Chase 2006). This project documented the spatial and temporal use of spawning habitat in this region and recorded GPS locations of the spawning habitat to assist resource management efforts, such as environmental permit review. The monitoring also documented watershed alterations that caused negative impacts to smelt spawning habitat, of which eutrophication and sedimentation were nearly ubiquitous and passage impediments were common in coastal Massachusetts. In addition to this mapping effort, *MarineFisheries* has conducted monitoring and restoration projects on smelt spawning habitat and populations in recent years (Chase et al. 2008 and 2009).

For successful spawning, smelt require clean substrate and good water quality so that eggs may adhere to substrate in spawning riffles throughout a relatively long incubation period. The smelt's reproductive strategy is challenged in urban areas where watershed alterations have left streams vulnerable to impacts from nutrient enrichment, reduced shading and riparian buffer, increased water withdrawal, and non-point source pollutants.

Recommended TOY for rainbow smelt. MarineFisheries recommends a TOY for smelt during the spring spawning migration from **March 1 through May 31**. The spring TOY encompasses the adult migration, spawning, egg incubation and juvenile emigration to nursery habitats. Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work and the most current data on the system in question. In general, in-water, silt-producing work should be avoided or fully contained when conducted in a known rainbow smelt run during the spring TOY.

American eel. The American eel (*Anguilla rostrata*) is the only catadromous fish found in Massachusetts. Mature American eels (silver eels) depart rivers along the eastern coast of North America in the fall to migrate to their only known spawning grounds in the Sargasso Sea (Facey and Van Den Avyle 1987; Collette and Klein-MacPhee 2002). The migration of mature eels to the ocean in Massachusetts has received little attention, but is known to occur at night during rain events between September and November (K.Oliviera, University of Massachusetts, Dartmouth, 2009, pers. comm.). During their first year, juvenile eels (glass eels) enter virtually all coastal drainages on the Atlantic coast of North America during well-defined spring glass eel runs. Eels will remain in estuaries and freshwater habitats until maturity occurs in 5-20 years. Eels are one of the largest predators in freshwater habitats. Historically, eels accounted for the largest percentage of fish biomass among freshwater fish in most coastal river systems on the east coast. Eels were very important to New England communities as subsistence and commercial fisheries up until the 20th century (ASMFC 2009a).

Although not well-documented, eel population abundance and fisheries in Massachusetts have declined in the last two to three decades. Currently a small commercial fishery for eels continues in Massachusetts. *MarineFisheries* monitors the commercial eel fishery and glass eel runs in accordance with mandates from the ASMFC. *MarineFisheries* has glass eel trap stations at four rivers in Massachusetts that provide temporal and relative index of abundance data on the glass eels runs (Chase 2008). Monitoring since 2001 has documented the glass eel run as occurring during the months of March through June.

While the abundance of eels in Massachusetts is likely at historic low levels, their presence is still widespread. Concern for declining eel abundance

led to the declaration of the American eel as a Candidate Species by the USFWS under the Endangered Species Act (ESA) in 2006. A status review concluded that an ESA listing of American eel was not warranted, while recognizing that present abundance throughout North America is likely well below historic levels (USFWS 2007). Eels have been found by *MassWildlife* and *MarineFisheries* biologists in most coastal drainages where nets, traps, and electrofishing were used to monitor diadromous or freshwater fish. At this time, the reasons for the continent-wide decline are unknown and could be due to fewer glass eels migrating from the ocean or fewer eels surviving in coastal watersheds. Ongoing investigations have indicated that passage barriers, habitat alteration, overfishing, hydropower mortality and oceanic condition changes are likely contributors (Haro et al. 2000).

Because eels do not spawn in estuaries and juveniles are routinely found in highly turbid waters, they are not as vulnerable to silt-producing work as some fish species. However, turbidity levels above natural concentrations for the particular system can cause physiological stress and migration delays. In addition, some in-stream activities may result in direct mortality or delay migrations, and work that alters riverine gravel and cobble substrate may remove important crevices and pools used by eels for resting during migration.

Recommended TOYs for American eel. *MarineFisheries* recommends a TOY for the spring glass eel immigration from **March 15 through June 30** and during the silver eel emigration from **September 15 to October 31**. Larger projects with direct impacts may warrant protection into November. Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work. In general, no in-water work should be conducted that would permanently impact resting habitat at the head of tide within a known eel run.

White perch. White perch (*Morone americana*) have a native range from Canada to South Carolina. They are abundant in the Chesapeake Bay and Hudson River, but they are not as common in Massachusetts, particularly along the Gulf of Maine coast (Bath and O'Connor 1982; Bigelow and Schroeder 1953; Scott and Scott 1988; and Collette and Klein-MacPhee 2002).

White perch are year-round residents of estuaries and coastal embayments in Massachusetts that make spring spawning runs into coastal rivers, migrating from higher salinities to lower salinities and fresh water within the same estuary. White perch spawn from early April to mid-June in Massachusetts near the tidal interface. They deposit a demersal, adhesive egg that hatches quickly (two to six days) depending on water temperature (Bigelow and Schroeder 1953; Mansuiti 1961). Newly hatched larvae soon enter the estuary and forage in brackish waters for their first year. White perch are considered an adaptable species that is tolerant of osmotic transitions (i.e., changes in salinity). White perch spawning runs in Massachusetts begin in early April, peaking in May with declining movements to spawning locations through June. Beyond their presence and absence, little has been documented on white perch in Massachusetts coastal rivers (Bigelow and Schroeder 1953; and Collette and Klein-MacPhee 2002).

In Massachusetts, small-scale commercial and recreational fisheries have typically targeted white perch during spawning run migrations, with a majority of effort occurring in coastal rivers of Cape Cod and Buzzards Bay. White perch have been caught since 2005 at all eight smelt fyke net stations maintained by *MarineFisheries* to monitor smelt populations, with higher catch rates found at the southernmost stations. Despite the sparse documentation of population status, concern has increased over the health of white perch runs in Massachusetts. Their presence on the Gulf of Maine coast has diminished in recent decades with little effort occurring in once-popular recreational fisheries. Causes of declining populations are not known, although the negative influence of watershed alterations on a reproductive strategy of depositing a demersal egg near the tidal influence could be a common threat to white perch and other anadromous species.

Recommended TOY for white perch. MarineFisheries recommends a TOY for white perch from **April 1 to June 15** to protect the spawning period and post-hatch emigration. Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work. In general, in-water, silt producing work should be avoided or fully contained when conducted near white perch spawning habitat during the spring TOY.

Atlantic tomcod. Atlantic tomcod (*Microgadus tomcod*) ranges from Canada to Virginia. They are small, short-lived fish that spend most of their lives in the estuaries and embayments near their natal rivers. Tomcod mature at the end of their first year and begin spawning as early as December in the Gulf of Maine with most spawning occurring in January and February. Tomcod deposit demersal, adhesive eggs close to the upper extent of the salt wedge (Peterson et al. 1979). The incubation period is the longest among diadromous species due to the influence of winter water temperature. Depending on water temperature, eggs typically hatch between four and six weeks. Ichthyoplankton sampling in the Weweantic River in Wareham found tomcod larvae present in the upper estuary from late-February to mid-April with a March peak (Lebida 1966; and Howe 1971). Larvae abundance in Massachusetts is highest in the upper estuary in March (Lebida 1966; Howe 1971; Chase 2006). Larval settlement and juvenile development occurs in April and May (Howe 1971; and Lazzari et al. 1999). Juvenile tomcod move from shallow waters as water temperature increases during the summer months, to deeper locations, often occupying eelgrass beds (Howe 1971).

Tomcod have received little attention in Massachusetts, in part due to their life history and low abundance. Among diadromous fish in Massachusetts, tomcod are the earliest spawners and have the shortest migrations into coastal rivers. These movements tend to escape detection other than from traditional subsistence and late-winter recreational fisheries, which have largely disappeared in most coastal rivers. Little information is available on the status of tomcod populations in New England. Fried and Schultz (2006) provide evidence of a significant decline in tomcod populations in the Long Island Sound region in the last decade. The causes for this decline are uncertain. One driver may be tomcod's life history strategy; selection for a long incubation time and a demersal adhesive egg. In today's developed watersheds, this strategy results in the egg's prolonged exposure to degraded water and substrate quality. The juveniles and adults may also be vulnerable to stressors in urban estuaries as year-round residents. There are no *MarineFisheries* regulations for tomcod.

Recommended TOY for Atlantic tomcod. MarineFisheries recommends a TOY for Atlantic tomcod from **February 15 to April 30** to protect the spawning period and post-hatch emigration. Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work. In general, in-water, silt producing work should be avoided or fully contained when conducted within a known Atlantic tomcod run during this period. Acquisition of more information on tomcod spawning is needed to determine if there are differences in timing of spawning between the southern Massachusetts and Gulf of Maine populations.

Atlantic salmon. In North America, Atlantic salmon (*Salmo salar*) have a native range from Labrador to Long Island Sound (Collett and Klein-MacPhee 2002). However, in the 1700s wild Atlantic salmon (*Salmo salar*) were disappearing from most New England Rivers and by the 1800s the last indigenous Atlantic salmon runs were extirpated in Massachusetts likely due to pollution, overfishing, loss of habitat and impediments to migration (Kocik and Sheehan 2006). The presence of wild Atlantic salmon in New England is now limited to some rivers in Maine. Wild Atlantic salmon is listed as an endangered species under the Federal Endangered Species Act (ESA) and on the American Fisheries Society list of Stocks at Risk of Extinction (Musick et al. 2000) due to their low numbers in New England. Because all Atlantic salmon in Massachusetts rivers are hatchery raised, they are not eligible for

listing under the Massachusetts Endangered Species Act (MESA).

As part of an active salmon restoration program managed by *MassWildlife* and the *USFWS,* hatchery -spawned fry are released into receiving waters of the Merrimack and Connecticut Rivers where they are present for a few years until they develop into smolts and emigrate to marine waters. This emigration occurs in the spring. Because these juvenile fish are critical to the restoration program, protecting their emigration is a priority. FERC fish passage protocols ensure emigrating smolt passage through hydroelectric dams from April 1 to July 15 (FERC 2000). Smolts mature in marine waters and return to their natal grounds as adults. The adult spawning migration in the Merrimack and Connecticut Rivers generally occurs from April through July each year. As returning adults migrate through fishways, *MassWildlife* captures them for transport to either the Nashua National Fish Hatchery (Merrimack River fish) or the Richard Cronin National Salmon Station (Connecticut River fish) where they are held until spawning in the fall (C. Slater, *MassWildlife,* 2009, pers. comm.). In addition to hatchery-raised smolts and juveniles, adult broodstock, retired and released from the hatcheries, are also present in the Merrimack River system and in selected lakes and ponds throughout the state.

MarineFisheries recommends protection of salmon at all stages of migration in all portions of the river system. Therefore, depending on the location of a project, a site-specific TOY may be recommended as salmon are more or less vulnerable in different portions of the river system at different stages of the spawning run. For example, migrating salmon are likely to be found in estuaries in early April through early July and are more prevalent in the mainstem of river systems from early May through mid-July. In addition, as mentioned above, emigrating smolts in the Merrimack River are most vulnerable at the fishway (Essex Dam) and in the mainstem from the beginning of April to mid-July.

Due to their federally endangered status, the National Marine Fisheries Service and the USFWS are jointly responsible for Atlantic salmon management. The Massachusetts Division of Fish and Wildlife (*MassWildlife*) is responsible for managing Atlantic salmon in Massachusetts and is involved in restoration efforts. The harvest of Atlantic salmon (including broodstock salmon) is allowed in landlocked waterbodies subject to *MassWildlife* fisheries regulations (321 CMR 4.01), but is prohibited in the Connecticut River and all its tributaries, and the Merrimack River and all its tributaries downstream of the Essex Dam (321 CMR 4.01).

Recommended TOYs for Atlantic salmon. MarineFisheries recommends a TOY for Atlantic salmon in know salmon runs from **April 1 to July 15** to protect the upstream migration of adults and the emigration of smolts and from **September 15 to October 31** to protect the fall adult migration[4]. In general, work that will obstruct passage or alter river hydrology should be prohibited in known salmon runs during these periods. Because of the unique nature of these at-risk populations and their very limited distribution, TOYs may be determined on a case by case basis, depending on the nature and location of the project. Our recommended TOYs are consistent with *MassWildlife* recommendations and with FERC approved fish passage protocols (FERC 2000; C. Slater, *MassWildlife,* 2009, pers. comm.). Projects planned in areas that may have Atlantic salmon should also consult with *MassWildlife* for recommendations.

Shortnose and Atlantic sturgeon. There are two sturgeon species in Massachusetts: the shortnose

[4]The *MarineFisheries'* TOY dates for salmon may differ from the FERC Fish Passage Protocols at specific fishways associated with hydropower facilities. FERC recommendations are solely intended to ensure passage of Atlantic salmon and clupeid species through a fishway and are therefore more precautionary than a TOY for coastal alteration projects. FERC approved fish passage protocol dates for the Essex Dam (FERC Project No. 2800-MA) on the Merrimack River include: upstream passage from May 1 to July 15 and September 15 to October 15 ; downstream passage from April 1 to July 15 and September 1 to November 15 (FERC 2000).

sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*Acipenser oxyrinchus*). Both have ranges in temperate waters of the northern hemisphere from the coast of Labrador to northern Florida (ASSRT 2007).

Shortnose sturgeon is listed as an Endangered species under the Federal and Massachusetts Endangered Species Acts (ESA/MESA) and on the American Fisheries Society list of Stocks at Risk of Extinction (Musick et al. 2000). Shortnose sturgeon inhabit the main stems of their natal rivers, migrating between the mesohaline estuary and freshwater river reaches. Spawning occurs in upper, freshwater areas in the spring, while feeding and overwintering activities may occur in both fresh and saline habitats (NMFS 1998). Spawning male shortnose sturgeon were captured in the upper Connecticut River and in the Merrimack River, in Haverhill, in the late 1980s and early 1990's (NMFS 1998).

The Atlantic sturgeon is listed as a Species of Concern and as a Candidate species for Threatened or Endangered listing under the ESA and is listed as an Endangered species under MESA. Atlantic Sturgeon are also on the American Fisheries Society list of Stocks at Risk of Extinction (Musick et al. 2000). Atlantic sturgeon are highly migratory. Adults migrate from the open ocean to spawn in their natal rivers in the spring and early summer. In the Gulf of Maine, Atlantic sturgeon were historically found in most larger rivers and in the open sea (ASSRT 2007). These anadromous fish likely spawned in numerous systems along the Massachusetts coast. However, Atlantic sturgeon are vulnerable to anthropogenic impacts, and the Gulf of Maine population has been severely depressed for hundreds of years. Currently, spawning populations in New England exist only in the Penobscott and Kennebec Rivers, ME (ASMFC 2009a). Juvenile Atlantic sturgeon make seasonal forays into the Merrimack and possibly the Taunton River estuaries utilizing the estuary as nursery and forage habitat (ASSRT 2007). Telemetry studies conducted in the Merrimack River showed that Atlantic sturgeon juveniles enter the river typically in May or when river water warms to 14.8-19ºC and emigrate in fall when water temperature drops to 13-18.4ºC (Kieffer and Kynard 1993; Kynard et al. 2000). Based on their size (70-156 cm total length), these fish were considered juveniles, so it is unlikely that they were spawning (Kieffer and Kynard 1993; Kynard et al. 2000). In July 2007 and 2008, incidental hook and line catches of Atlantic sturgeon were reported by recreational striped bass anglers near the southern breakwater jetty at the mouth of the Merrimack River (Ferry 2007, 2008). Atlantic Sturgeon were again reported in the 1990's in the Taunton River (K. Ferry, *MarineFisheries*, Oct. 2008, pers. comm.). Atlantic sturgeon are consistently intercepted as bycatch in gillnets in Massachusetts Bay (ASMFC 2007a). Bycatch studies illustrate that they are caught in similar locations over many years (ASMFC 2007) and it is thought that they may form feeding aggregations in shelf and coastal waters (ASSRT 2007).

The ASMFC has a Sturgeon Management Board that covers assessments and management recommendations for both sturgeon species. The National Marine Fisheries Service is responsible for shortnose sturgeon management and the administration of their recovery plan (NMFS 1998). In Massachusetts, *MassWildlife* is responsible for managing shortnose sturgeon and there is a prohibition on their take (321 CMR 4.01).

ASMFC initiated a coast-wide moratorium on the harvest of Atlantic sturgeon in 1998 which *MarineFisheries*' instituted as a moratorium on landing and possession (322 CMR 6.16). NMFS established a similar moratorium for federal waters in 1999. *MassWildlife* is also responsible for managing Atlantic sturgeon and maintains a prohibition on their take (321 CMR 4.01). The ASMFC and NMFS moratoria are in place until specific stock rebuilding goals are met which are anticipated to take up to 40 years.

Recommended TOY for shortnose and Atlantic sturgeon. *MarineFisheries* recommends a TOY for sturgeon of **April 1 to November 1** for projects that could impact sturgeon or inhibit their movements when they are likely present in the estuarine and

riverine habitats of the Merrimack and Taunton Rivers. Other restrictions may apply in certain coastal marine locations, particularly Massachusetts Bay. *MarineFisheries* has not previously recommended a TOY for shortnose or Atlantic sturgeon due to their management by *MassWildlife*. Projects planned in areas that may have shortnose or Atlantic sturgeon should consult with *MassWildlife* for recommendations.

Other Finfish. *Shore-zone fishes.* Numerous species of finfish occupy and use the nearshore waters (intertidal to 5 meters) for forage, spawning, shelter, and juvenile development from late spring through early fall (Bigelow and Schroeder 1953; Derickson and Price 1973). In addition to species such as Atlantic silverside (*Menidia menidia*), pipefish (*Syngnathus fuscus*), mummichog (*Fundulus heteroclitus*), and sand lance (*Ammodytes americanus*), the shore zone also supports juvenile life stages of commercially important species such as winter flounder (*Pseudopleuronectes americanus*), blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), Atlantic herring (*Clupea harengus*), and tautog (*Tautoga onitis*). Many of these species and life stages also constitute forage for other species including bluefish (*Pomatomas saltatrix*), striped bass (*Morone saxatilis*), and summer flounder (*Paralichthys dentatus*). Shore-zone fishes may be found within embayments or along coastal beaches and occupy a variety of habitat types including sand and mud bottom, areas of low relief such as cobble and small boulder, and areas of vegetation such as eelgrass (*Zostera marina*) and algae (e.g., *Ulva lactuca, Codium fragile*) (Lazzari 2002). These species move into the shore zone in mid-spring (May) as water temperatures begin to rise and leave the area in the fall (October) as temperatures decline (Collette and Klein-MacPhee 2002). Occurrence and relative abundance vary with the reproductive life history of each species as well as water temperature, but both generally peak during July and August.

Shore-zone fishes may be adversely impacted by dredging, mining, beach nourishment, pipeline or cable projects and other work that will disturb the shore zone.

Recommended TOY for shore-zone fishes. *MarineFisheries* recommends a TOY for shore-zone and juvenile fishes from **May 1 to November 1**. Whether or not this TOY will pertain to a particular project is limited to projects that have been determined to have impacts to shore-zone fishes and is dependent on the location and extent of the proposed work.

Winter flounder. Winter flounder (*Pseudopleuronectes americanus*) is an important commercial and recreational species throughout its range, from Maine to Delaware, and is the most common shoal-water flounder in the Gulf of Maine. Winter flounder are found in a variety of habitats from brackish riverine waters to saline coastal environments and have been documented from depths of less than 1 meter in coastal embayments to 27 meters in Cape Cod Bay and Stellwagen Bank and to 82 meters on George's Bank (Collette and Klein-MacPhee 2002). Inshore stocks of winter flounder move to shallow, protected waters in late fall/early winter, and spawn in early spring, often over sandy or muddy substrates (Collette and Klein-MacPhee 2002; Pereira et al. 1999). Tagging studies have suggested that winter flounder show site fidelity with general seasonal movements, particularly in the Southern New England stock (Howe and Coates 1975). Spawning adults were found in higher densities in water less than 5 meters (Pereira et al. 1999) and as shallow as 1 meter (Manderson et al. 2004). Spawning is thought to begin around the minimal seasonal water temperature, just before temperatures begin to rise, approximately 0-2.8°C near Gloucester and 0-1.7°C in Woods Hole (Collette and Klein-MacPhee 2002). Spawning activity occurs at night and both males and females spawn in batches several times over the length of the spawning period (Pereira et al. 1999). Once released, eggs, approximately 0.74 – 0.85 mm in diameter, sink to the bottom and adhere together in clumps on the substrate.

Surveys conducted in Mount Hope Bay as part of the Dominion Brayton Point biological monitor-

ing program from 1993 to 2007 found both eggs and larval winter flounder present during the entire sampling period from February through May (Dominion Energy 2008). The survey also showed a bell curve trend of increasing larval winter flounder densities from the end of February to a peak in mid-April and then a gradual decrease in densities throughout the month of May (Dominion Energy 2008). Surveys conducted in Plymouth, MA at the Pilgrim Nuclear Power Station found egg and larval winter flounder during the months of April and May and larval winter flounder throughout the month of June (Pilgrim Nuclear Power Station 2008). It is anticipated that the SNE/MA stock begins spawning earlier than the GOM stock since water temperatures warm earlier south of Cape Cod.

Nursery habitats are usually in or near spawning and settlement areas. The habitat of inshore winter flounder is varied from muddy sand, patchy eelgrass, clay or gravel (Collette and Klein-MacPhee 2002). Studies indicate that winter flounder do exhibit habitat selectivity, with the highest densities of juveniles associated with sand and muddy habitats (Fairchild et al. 2009; Fairchild et al. 2005; Collette and Klein-MacPhee 2002). It has been posited that this selectivity is related to food availability, but this has not been expressly studied (Fairchild et al. 2009). Winter flounder are mature at 2-3 years and can reach a maximum age of about 15 years.

Massachusetts has three distinct stocks: the Southern New England/ Mid-Atlantic stock (SNE/MA) and the Gulf of Maine Stock (GOM) are inshore stocks and the George's Bank Stock (GB) is an offshore stock. Tagging studies have indicated little mixing between stocks (Howe and Coates 1975). Each of the three stocks are currently in decline as indicated by state and federal assessments (NMFS 2008a; ASMFC 2005). In Massachusetts, *MarineFisheries* conducts a trawl survey throughout state waters and a seine survey in 6 coastal embayments along the south coast of Cape Cod. Both surveys report data on distribution, relative abundance and size composition of fish over a multi-year time-series. Results from the surveys indicate that winter flounder are declining; seine survey catches are now one quarter the size that they were in the 1970s (King et al. 2008). The 2008 NMFS winter flounder stock assessment indicated that the SNE/MA stock is depleted and the GOM stock is experiencing over-fishing (NMFS 2008a). This led to a zero possession limit in the SNE/MA stock unit on federally permitted vessels for the 2009 season and ASMFC recommended increased restrictions on recreational and commercial harvest on inshore stocks of winter flounder (ASMFC 2009b). The population remains low despite regulation of the state commercial fishery. These regulations have included a year-round prohibition of net fishing in embayments, a seasonal closure in coastal waters, and a spawning season closure on inshore areas for more than 20 years (Figure 1).

It has been suggested that habitat degradation has contributed to the decline of winter flounder populations (ASMFC 2005). There are concerns that activities that result in sedimentation could lead to burial and reduced hatching success of demersal eggs. Winter flounder eggs suffer reduced hatching success if buried to only one half an egg diameter (D. Nelson, NMFS, unpub. data as cited in Berry et al. 2003). More recent studies on the effects of burial are less conclusive regarding the amount of sedimentation necessary to significantly affect survival (Klein-MacPhee et al. 2004; Berry et al. 2005). Protection of winter flounder habitat may play a role in improving recruitment (i.e., the survival of eggs, larvae and juveniles) thereby contributing to the rebuilding of winter flounder stocks. To address habitat degradation, the ASMFC has recommended management measures targeting habitat alterations of near-shore waters, including the release of suspended sediments through dredging and other activities, and the establishment and enforcement of strict timeframes when sediment dredge activities should be prohibited or minimized in spawning or nursery areas (i.e., TOYs) (ASMFC 2005).

Recommended TOYs for winter flounder. Two distinct coastal stocks of winter flounder are divided into three regions in Massachusetts for the purpose of TOY recommendations. The SNE/MA stock is found in the southern Massachusetts region. The

Gulf of Maine stock is found in both the Cape Cod Bay and North Coast regions (Figure 2). The regions have progressively later TOY dates based on decreasing water temperature with increasing latitude. The TOY ranges were designed to protect the spawning period, larval settlement and juvenile development:

Southern Massachusetts	**January 15 to May 31**
Cape Cod Bay	**February 1 to June 30**
North Coast	**February 15 to June 30**

Because of the wide extent of potential winter flounder habitat, the declining population status, and a lack of highly site-specific winter flounder data, this TOY applies in all embayments and some nearshore areas. Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work.

Atlantic cod. Atlantic cod (*Gadus morhua*) range from North Carolina through Canada. They are found throughout Massachusetts waters in shallow embayments and off-shore to depths greater than 450 meters (Collette and Klein-MacPhee 2002). Cod are groundfish and generally remain within 2 meters of the bottom. Cod spawn at approximately age 4 and increase in fecundity with size. It has been shown that cod aggregations exhibit unique behaviors during spawning (Rose 1993). Cod peak spawning period has been documented to occur in the winter and spring. *MarineFisheries* surveys and landings data have identified several areas important to aggregations of spawning cod within Massachusetts waters (Hoffman et al. 2007; Howe et al. 2002). Hatching occurs after 8 to 60 days in varying temperatures (Hardy 1978; Fahay et al. 1999) and averages 2-3 weeks in average spring conditions (Lough et al. 1989; Fahay et al 1999). Larvae are planktonic until about 20 mm at which point they move deeper in the water column and settle on the seafloor as juveniles between 2.5 and 6 cm (Hardy 1978; Fahay et al 1999). Early, post-settlement cod are dependent on certain habitat types and remain localized for several weeks to enhance forage success and protection from predators (Grant and Brown 1998) making them particularly vulnerable to anthropogenic impacts. Typical bottom types preferred by cod include gravel, cobble, sand, and clay with broken shells, biogenetic-covered rock reefs and seagrass beds, as well as rock outcrops and ledges (i.e., complex habitats) (Collette and Klein-MacPhee 2002). Early juvenile (age 0 and 1) cod have been found to occupy shallower depths (<90ft), particularly during winter and spring, moving into deeper waters with increasing age and length (Howe et al. 2002; Grant and Brown 1998).

MarineFisheries monitors cod and other groundfish in the Gulf of Maine through several surveys including the Resource Assessment trawl survey, specific tagging studies of cod, and the Industry-Based Survey (IBS). The IBS was designed to study cod distribution, monitor in-shore cod stocks, identify important spawning grounds and provide data to be used for future management decisions (Hoffman et al. 2007). The IBS results indicate a higher relative abundance of juvenile cod in Massachusetts Bay compared to other regions in the Gulf of Maine (Hoffman et al. 2007). Additional high concentrations of cod in the Gulf of Maine are found on Stellwagen Bank and Jeffrey's Bank. Complex habitats are abundant in shallow water in many Massachusetts embayments and cod may be found associated with these habitats at the mouths of estuaries, particularly Ipswich Bay and Plymouth Bay, considered historic Gulf of Maine cod spawning grounds still annually occupied by breeding adults (Howe et al. 2002) Ichthyoplankton surveys conducted from 1977 to 1987 found the highest densities of cod eggs in Massachusetts waters from November to June (Berrien and Sibunka 1999) and the highest larval densities from May to July (Morse et al. 1987). Juvenile cod are caught in low numbers year round in many Massachusetts embayments including the shallow waters of Plymouth and Salem Sound (Chase et al. 2002).

There are likely four major groups of cod in New England waters including George's and Brown's Banks, Gulf of Maine, southern New England and mid-Atlantic coast cod populations. New England commercial and recreational cod fisheries are managed under the New England Fishery Management Council's Northeast Multispecies Fishery Management Plan (FMP). Under this FMP, cod are included in a complex of 15 groundfish species and are managed by seasonal area closures, gear restrictions, minimum size limits and days-at-sea restrictions. Since a 1994 crash, biomass of Gulf of Maine cod has been slowly increasing in part due to the implementation of measures to reduce fishing effort. The stock has a status of not overfished, but with overfishing continuing to occur (NMFS 2008a).

Historically, cod were abundant in Massachusetts and made up a large and important part of the commercial catch throughout colonial times. Because cod aggregate during spawning seasons and their population is low, they are vulnerable to activities that would disturb the spawning behavior as well as habitats in which they aggregate. To protect spawning aggregations, the most productive grounds in Massachusetts Bay have been closed to fishing seasonally from December 1 to January 31st and designated as a Cod Conservation Zone (33 CMR 8.15) since 2005. More recently, a very distinct aggregation was closed in the late spring. In addition, in southern Gulf of Maine spring and fall rolling closures are in effect for commercial fishing.

Recommended TOY for Atlantic cod. MarineFisheries recommends a TOY for Atlantic cod of **December 1 to January 31** and **April 1 to June 30** to protect spawning aggregations of fish. These TOYs have not been proposed to date and may vary based on project-specific issues. Any project planned in the Gulf of Maine (Cape Cod Bay, Massachusetts Bay, and Ipswich Bay) should consult with *MarineFisheries* for technical review of potential impacts to aggregations of spawning, larval and juvenile cod.

Mollusks. Shellfishing is important both recreationally and commercially in Massachusetts. Sea scallop, soft-shell clam and quahog fisheries are among the highest valued fisheries in the Commonwealth (Standard Atlantic Fisheries Information System (SAFIS) 2009). The *MarineFisheries'* Shellfish Program has two primary missions: public health protection and both direct and indirect management of the Commonwealth's molluscan shellfish resources. More than 300 waterbodies and portions of waterbodies, known as designated shellfish growing areas, are monitored regularly for bacterial concentrations to ensure that shellfish are safe to eat. Much of the information about status and trends is produced in a series of shellfish sanitation reports which are available upon request. Shellfish habitat in Massachusetts has been mapped by *MarineFisheries* with assistance from local Shellfish Constables, input from commercial fishermen, and information contained in maps and studies of shellfish in Massachusetts. The datalayer is available on the MassGIS website as SHELLFISHSUIT_POLY (MassGIS 2008). Mapped areas include observed and potential habitat based on field notes and best professional judgment since the mid-1970s to present. These data are intended as an initial guide. Site-specific evaluations may be necessary to establish the current distribution and abundance of shellfish resources at both mapped and unmapped sites. Appendix B does not identify individual shellfish species by waterbody, but instead indicates the general presence of shellfish in the specific waterbody, with a catch-all TOY of **May 1 to November 15**. Species distribution information is available through the GIS layers referenced above. Higher resolution, site-specific data is also often available upon request to *MarineFisheries* biologists and the local municipal shellfish departments. Species specific TOY recommendation are explained in the following sections.

There is a wide variety in shellfish vulnerability to impact. Some shellfish species are known for their hardiness (e.g., northern quahogs) and others are sensitive to environmental change (e.g., bay scallops, oysters). None of the shellfish species have threatened populations; however, all species have vulnerable life stages, in particular the larval

stages, and local success of seed sets may vary dramatically due to a variety of environmental factors (e.g., temperature, salinity, current; Belding 1909a). Impacts to shellfish resource and habitats are a concern because of their importance as a commercial and recreational fisheries resource and, of equal importance, their role in ecosystem dynamics as a forage species. Therefore, regardless of whether or not shellfish can be harvested in an area based on water quality conditions, project impacts to shellfish resource and habitat are considered and TOYs may be recommended.

Squid is also a mollusk and thereby listed in this section. However, it is managed as a finfish. It is not subject to the same sanitation regulations as molluscan shellfish.

American oyster. The American or Eastern oyster (*Crassostrea virginica*) is an estuarine species, growing in shallow subtidal and intertidal waters throughout most of its range along the East Coast of North America and south to the West Indies and the Yucatan Peninsula in Mexico. American oysters live to be over four years old. The American oyster is unisexual and begins to spawn in Massachusetts at age two with increasing spawning activity into the fourth and fifth years (Belding 1909a). Temperature and food availability dictate spawning times of year which generally occur from June through August (Belding 1909a) or when water temperatures reach around 15-20ºC. Following fertilization, the larval free-swimming period lasts up to three weeks, depending on temperature, after which spat settle out onto hard benthic surfaces, preferably existing oyster shell (Belding 1909a).

Although their range includes the entire Massachusetts coast, with mapped habitat in small creeks and estuaries, wild populations of oysters have suffered dramatic declines in natural populations since the turn of the 20th century and now only remnant populations are found in limited areas of the Massachusetts coast. Population declines are likely due to water quality degradation, habitat loss, overfishing, natural and introduced predators, and diseases (Coen and Gizzle 2007). Oyster reefs provide important complex habitat for fish, crustaceans, other shellfish and birds (Coen et al. 1999; Sanders et al. 2004) and filter the water column improving water quality (Coen et al. 1999). Because of their significance as both a marine fisheries resource and important habitat, there are several established restoration efforts along the Atlantic Coast. The mid-Atlantic has dominated oyster restoration, however, small-scale oyster projects are underway in New England including one in Wellfleet Harbor and several restoration sites in the Great Bay estuarine system in New Hampshire (The Nature Conservancy 2010; University of New Hampshire 2007; ASMFC 2007b).

Recommended TOY for American oyster. MarineFisheries recommends a TOY for oysters from **June 15 to September 15** to adequately protect the majority of the spawning period. This TOY has not been proposed to date. Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work.

Bay scallop. The bay scallop (*Argopecten irradians*) is found in the waters of the South Coast, Cape Cod Bay, Buzzards Bay, Nantucket and Martha's Vineyard. Bay scallops are hermaphroditic and sexually mature at age one. Most individuals live 12 to 26 months, and some individuals may reach 36 months. Scallops spawn once in their lifetime (Belding 1910a). Food availability and temperature are important in determining spawning time and success (Barber and Blake 2006; Sastry 1966). Most spawning occurs in June and July, but can continue into August as it is temperature-dependent with an optimum temperature of 20ºC (Belding 1910a). A second, usually smaller, spawning event can occur in the fall, generally in September (MacKenzie 2008). Spatfall occurs approximately 14 days after spawning and larvae settle and attach to substrates such as eelgrass, pebbles or shell debris (MacKenzie 2008). Aggregations of scallops vary from year to year in any given embayment due to varied survival of vulnerable life stages. Survival is thought to be linked to food availability (plankton), water temperatures, and predation (MacKenzie 2008).

In Massachusetts, bay scallops occur commercially only in the waters south of Boston with large pockets in Buzzards Bay, Cape Cod and around the Islands of Martha's Vineyard and Nantucket. Usually bay scallops are found in waters from 5 to 30 feet deep, but they can occur to 60 feet. Shallow areas with eelgrass often receive the heaviest sets and the best substrates are either sandy or mud with patchy eelgrass growth (Belding 1910a).

Recommended TOY for bay scallop. Marine-Fisheries recommends a TOY for bay scallops from **June 1 to September 30**. This time period encompasses both spawning events, the larval stage, and the newly settled spat stage (roughly two weeks) of the spring spawn. Temporal and spatial variability necessitates up to date resource monitoring to assess potential project impacts. As such, recommendations regarding protections for bay scallops may vary over time more so than for other species.

Blue mussel. Blue mussels (*Mytilus edulis*) occur in shallow estuarine environments where they attach to hard substrate and are often part of the marine fouling community on lines and pilings. There is spatial variability in the spawning period for different regions. Mussels grown in New Jersey were found to have two spawning peaks, one in May and a lesser one in August (Sunila et al. 2004) whereas mussels in Newfoundland have only one spawning peak in late July (Thomson 1984). Newell et. al (1982) sampled sites from Maine to Delaware and found that spawning peaks occurred generally from May to June. In the Bay of Fundy, high larval abundance has been noted in August (Newell 1989). The larval period in wild blue mussels lasts about three to five weeks before settlement occurs (Seed 1969). Mussels provide structural habitat, important for shelter and forage of juvenile species of fish and invertebrates. Mussels have grown in commercial importance since the 1970s and 80s when aquaculture of these species developed in New England, mostly in Maine (Coen and Grizzle 2007). Massachusetts currently has limited experimental mussel aquaculture grants on open long lines (vertical lines suspended beneath the surface for mussel culture). Wild mussel beds are found along the entire coastline of Massachusetts. The largest mapped area of blue mussels is in Cape Cod Bay.

Recommended TOY for blue mussels. Marine-Fisheries may recommend a TOY for mussels of **May 15 to August 31** in specific cases to protect spawning and settlement in areas very important to natural or cultured mussels. This TOY has not been proposed to date. Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work.

Northern quahog. The Northern quahog (*Mercenaria mercenaria*), also called the hard clam, is predominantly found south of Boston, although pockets have been noted near Boston and on the North Shore, particularly in Quincy Bay and Plum Island Sound. Quahogs are sexually mature by age two and when the individual reaches approximately 2.5 to 3 inches in size (Belding 1909a). Quahogs can live over 10 years and age estimates of some individuals have reached 40 to 60 years. In New England, spawning occurs from June through mid-August (Landers 1955; Belding 1909a) at temperatures between 21-25°C. Larval settlement can take one week to one month depending on the temperature. Quahogs prefer sandy substrate to mud and are found in subtidal waters in estuaries and coastal habitats.

Experiments showed that buried adults can escape up to 50 cm of sediment overburden as long as the new sediment layer is the same grain size as surrounding sediments (Kranz 1974). Quahogs can withstand changes in dissolved oxygen to a greater degree than temperature and salinity changes (Savage 1976). Hard clams are referred to by different names depending on their size class. Quahog is a commonly used name for this species but it can also refer to the largest size class (>70 mm length) known also as chowders. Cherrystones are the next size down (61-70 mm) and littlenecks are the smallest (51-60 mm) and are 1" thick at the thickest point, which is the legal size limit.

Recommended TOY for northern quahog. MarineFisheries recommends a TOY for quahogs from **June 15 to September 15** to adequately protect the majority of the vulnerable spawning, larval, and settlement period. Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work.

Sea scallop. The sea scallop (*Placopecten magellanicus*) is found in abundant patches off-shore, predominantly along Cape Ann, Hull Bay, outer Boston Harbor, Cape Cod Bay, along the outer Cape and in the Atlantic Ocean south of Martha's Vineyard. Sea scallops are sexually mature at one year of age. Individuals live about 10 years. Spawning on George's Bank typically occurs between late September and early October when temperatures reach 9-11ºC (MacKenzie et al. 1978). Two spawning seasons have been reported in Newfoundland, a small event in the early summer and a larger, longer event in the fall (Mackenzie et al. 1978). Spatfall occurs one month after spawning.

Recommended TOY for sea scallop. MarineFisheries recommends a TOY for sea scallops of **September 1 to November 15** to protect the spawning period. This TOY has not been proposed to date. Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work.

Soft-shell clam. Soft-shell clams (*Mya arenaria*) are the most commercially and recreationally important in-shore shellfishery in Massachusetts (Standard Atlantic Fisheries Information System (SAFIS) 2009) and are ubiquitous along the entire coast of Massachusetts. Soft-shells are sexually mature by age two, at about 1.5 inches, and may live 10-12 years (Belding 1909b). Spawning occurs in two events from March-April and from June-August (Brousseau 1978; Belding 1909b) or when temperatures are approximately 15-18ºC which may extend the period to the end of August on the North Coast of Massachusetts (*MarineFisheries*' shellfish plant, unpub. data). Veliger larvae are found in the water column generally from mid-June to September; later on the North Coast (Belding 1909b). Larval settlement takes approximately two to six weeks depending on temperature (Belding 1909b).

Soft-shell clams are found in the shallow waters of bays and estuaries up to the limit of salt water intrusion, in sediment types ranging from rocky gravel to soft mud (Belding 1909b). They are most abundant in silty mud and sand environments. Although the most harvest-abundant clam flats are found in the inter-tidal zone between extreme low and extreme high waters, the most productive beds are thought to be in shallow subtidal areas where food availability is not tidally dependent (Belding 1909b).

Recommended TOYs for soft-shell clam. MarineFisheries recommends the following TOYs for soft-shell clams defined by the following regions (Figure 2):

Southern Massachusetts	**April 15 to September 15**
Cape Cod Bay & North Coast	**May 1 to September 30**

Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work.

Surf clam. The surf clam (*Spisula solidissima*) inhabits coastal subtidal regions to depths of 60 meters from the Gulf of Maine to Cape Hatteras, South Carolina (Fay et al. 1983). In Massachusetts, surf clams, also known as sea clams, are found on the north and south coasts, Cape Cod Bay, the outer Cape, and in the Atlantic Ocean south of the Islands. Surf clam settlement and recruitment is episodic and may be affected by temperature and hydrodynamic effects on larval supply (Chintala and Grassle 2001). Surf clams are sexually mature at age one or two and can live to be over 10 years old. Adults are found in course sand and gravel substrates and may be buried below the sediment surface to a depth equal to their length (Fay et al. 1983). Spawning was documented in New Jersey from mid-July to mid-August and from mid-

October to early November (Fay et al. 1983). Belding studied surf clams on Cape Cod from 1905 to 1910 and documented the peak spawning at Monomoy Point in the last week of June and the first week of July (Belding 1910b). The spawning season varies with latitude as colder temperatures produce a later spawn. Spatfall occurs 18 days after spawning at 21.7ºC (Fay et al. 1983).

Recommended TOY for surf clam. MarineFisheries recommends a TOY for surf clams from **June 15 to October 15** to protect the majority of the vulnerable spawning, larval and settlement period. Whether or not this TOY will pertain to a given project is dependent on the nature and location of the proposed work

Squid. There are two species of squid common in Massachusetts waters, the short-finned squid (*Illex illecebrosus*) and the long-finned squid (*Loligo pealei*). Short-finned squid range from Florida to Newfoundland, while long-finned squid have a larger range from the Gulf of Venezuela to Newfoundland (Jacobson 2005; Hendrickson and Holmes 2004). In both species spawning occurs year-round both inshore and off-shore with distinct seasonal and geographic peaks (Jacobson 2005; Hendrickson and Holmes 2004). In Massachusetts, both squid species are found in Nantucket and Vineyard Sounds and in Massachusetts Bay (McKiernan and Pierce 1995; Jacobson 2005). In the spring, squid migrate into Massachusetts waters to lay egg capsules, containing thousands of eggs, in 50-60 cm wide clusters. Egg clusters are found attached to rocks and vegetation on sandy and muddy bottoms at depths generally <50 meters (Jacobson 2005). In spring, the inshore spawning peak is in May (Jacobson 2005; McKiernan and Pierce 1995). Eggs hatch in about 18-27 days depending on temperature (Jacobson 2005). Juvenile squid are commonly observed in Nantucket and Vineyard Sounds and Buzzards Bay during *MarineFisheries'* September Resource Assessment trawl survey (King et al. 2010; Jacobson 2005). Young-of-the-year squid develop from juveniles to subadults and migrate offshore in November to overwinter on the continental shelf and slope waters. Adults return to inshore waters in March and April as water temperatures warm. Both squid species live only about one year (Jacobson 2005; Hendrickson and Holmes 2004).

In Massachusetts the squid fishery is focused almost exclusively on Nantucket and Vineyard Sounds (McKiernan and Pierce 1995). Based on the *MarineFisheries'* trawl survey, at sea observations, and landings of commercial catches, there is the suggestion of an important spawning aggregation of long-finned squid in western Nantucket Sound (McKiernan and Pierce 1995). Due to the mobility of these animals, juveniles and adults are not particularly vulnerable to most construction projects. However, incubating eggs may be highly vulnerable to impacts, and projects in areas where egg clusters may be located should avoid disturbance of the bottom during the critical peak spawning time of year.

Recommended TOY for squid. MarineFisheries recommends a TOY of **April 15 to June 15** to protect spawning aggregations and incubating eggs of squid in Nantucket and Vineyard Sounds. This TOY has not been recommended to date and may vary based on project-specific issues. Any project planned in Nantucket and Vineyard Sounds should consult with *MarineFisheries* for technical review of potential impacts to aggregations of spawning squid.

Arthropods.

American lobster. The American lobster (*Homarus americanus*) is an arthropod species of the sub-phylum Crustacea that ranges from Canada to North Carolina. From December to May the adults are largely offshore, and move inshore in migratory waves for spawning between May and August. During this time egg-bearing females are present inshore and are particularly vulnerable to project impacts. Adult lobsters remain in highest abundance in nearshore areas, supporting significant lobster fisheries, from May to December. The early benthic phase lobsters (carapace length of 5-40 mm, Incze and Wahle 1991) are newly settled post-larvae and juveniles. Early benthic phase lob-

sters are shelter-dependent until about 35-40 mm (MacKenzie and Moring 1985), which can take up to three years. The preferred habitat for protection from predators is complex substrate, particularly cobble, but eelgrass and peat reefs have also been noted (Palma et al. 1998). Lobsters exhibit strong habitat-selection behavior, and this shelter-dependency suggests that availability of complex substrate may limit population size (Wahle and Steneck 1991). Field experiments have demonstrated that complex substrate habitat is a bottleneck for American lobsters (Phillips 2006) other cryptic, crevice-dwelling crustaceans (Factor 1995). Other factors, such as cold years and olfactory cues, are also involved with recruitment, but availability of coastal cobble substrate has been described as the primary demographic bottleneck for the American lobster (Phillips 2006).

In Massachusetts, studies identifying geographic variation in morphology, size-frequency, migratory behavior, growth rate, fecundity, and maturity have led to the definition of three major population groups: southern Gulf of Maine, outer Cape Cod, and Buzzards Bay/Southern Cape Cod. These areas are fished both recreationally and commercially. Lobster may not be taken at night, and it is illegal to possess egg-bearing females and V-notch lobsters to protect spawning females (brooders). These three groups are managed with size and gear restrictions for the commercial fishery and size and daily trip limits for the recreational fishery.

Egg-bearing females are important to protect for recruitment; they are vulnerable to disturbance and mortality during the spawning season. Lobster juveniles are vulnerable to impacts to heterogeneous seafloor habitat because of their strong shelter-dependence.

Recommended TOY for American lobster. MarineFisheries recommends minimization of work that may impact adult lobsters during the high inshore abundance period from **May 1 to December 1**. Within this time period, the likelihood of removal or impact to egg-bearing females is increased during the spawning periods below; work that may impact or remove adult lobsters should be avoided during these times in the following coastal regions (Figure 2):

Southern Massachusetts	**May 15 to July 1**
East Side of Cape Cod	**June 15 to August 15**
Cape Cod)	
Cape Cod Bay & North Coast	**May 31 to July 31**

Early benthic phase lobsters exhibit low mobility and shelter-dependence on complex bottom for several years. Therefore, there is no appropriate TOY to protect this life stage. Permanent impacts to complex bottom, including nearshore disposal, should be avoided at all times. Complex bottom includes eelgrass and seafloor with >15% cover of >4mm sized sediment (Glenn 2007).

*Atlantic horseshoe crab***.** The Atlantic horseshoe crab (*Limulus polyphemus*) is an arthropod species of the sub-phylum Chelicerata. Similar forms to this species have been found in deposits over 400 million years old (Rudkin et al. 2008), therefore horseshoe crabs are considered "living fossils." Atlantic horseshoe crabs range from Bar Harbor, Maine to the Gulf of Mexico and migrate on and offshore at different stages in their life history from intertidal beaches to off-shore depths of 75 feet (23 meters) (Gosner 1978). Adults nest on sandy beaches during May and June (e.g., Loveland and Botton 1992; Avissar 2006). Females deposit their eggs in the sand in the upper intertidal zone on a moon high tide. Horseshoe crab nests must meet specific physical requirements (dissolved oxygen, sediment grain size, sand temperature, sand moisture, wave energy, and salinity) for egg success (Avissar 2006). The eggs hatch between 15 and 28 days later into trilobite larvae, which can remain in nearshore plankton through mid-August (Botton and Loveland 2003). After the trilobites molt they are known as instar juveniles and they settle and spend the first several years in intertidal and subtidal shallows, undergoing multiple molts (Botton

and Loveland 2003). By age three or four, they molt once a year during July and August (Sekiguchi et al. 1988). Recently it has been suggested that between spawning periods the adults burrow in deeper channels to rest. This limited mobility may make them more susceptible to dredging activities (S. Michels, DE DFW, 2009, pers. comm.).

The blood of horseshoe crabs contains amebocytes which have a clotting factor known as coagulogen. Coagulogen is released outside the cell when bacterial endotoxin is encountered. This clotting reaction is used in the Limulus Amebocyte Lysate (LAL) test to detect bacterial endotoxins in pharmaceuticals and to test for several bacterial diseases. Horseshoe crabs are returned to the ocean after bleeding, although between 15% and 30% die during the process (Rudloe 1983; Walls and Berkson 2003; Hurton and Berkson 2006; Kurz and James-Pirri 2002; Leschen and Correia 2010). Horseshoe crabs are also harvested for bait primarily for the eel and whelk (*Busycon* spp.) fisheries. Studies have documented a declining horseshoe crab population due to over harvest and habitat degradation (Widener and Barlow 1999; ASMFC 1998). Concern over the importance of horseshoe crab eggs to the endangered migratory shorebird, the red knot, has led to significant fisheries restrictions, including some harvest bans, in Virginia, Delaware, Maryland, New Jersey, and New York (Botton et al. 1994; Karpanty et al. 2006; Atkinson et al. 2007). Massachusetts reduced the allowable harvest by 50% in 2008 to 165,000 animals with a daily limit of 400. Further harvest was restricted on beaches during and around the full and new moons during mating season. New entry into the fishery is not permitted in Massachusetts.

Coastal and nearshore projects that change sediment composition may have a deleterious effect on managed arthropod species including horseshoe crabs. Dredging and beach nourishment projects may change the physical conditions of a beach resulting in unsuccessful horseshoe crab egg development. Specifically, beach nourishment was found to raise sand temperature and moisture and reduce dissolved oxygen in the nourished beach (Avissar 2006). While beach nourishment can enhance dwindling horseshoe crab spawning habitat if done at the right time of year, disposal during and for several months after spawning can have negative consequences for horseshoe crab populations and should be avoided. Because horseshoe crab nests in the intertidal zone are not easily identified, they cannot be marked and avoided by beach nourishment activities as is done for some shorebirds.

Recommended TOYs for horseshoe crabs. *MarineFisheries* recommends a TOY for horseshoe crabs from **May 1 to June 30** to protect burrowing animals from dredging or other in-water work that may entrain, remove or bury horseshoe crabs in known horseshoe crab migratory channels. *MarineFisheries* recommends a TOY for horseshoe crabs from **May 1 to July 31** to protect eggs, larvae, and newly settled juveniles from beach disposal on known spawning beaches.

Marine Mammals and Reptiles. The dominant large whale species that inhabit Massachusetts waters are the humpback (*Megaptera novaeangliae*), fin (*Balaenoptera physalus*), minke (*Balaenoptera acutorostrata*), and North Atlantic right (*Eubalaena glacialis*) whales. They occur seasonally in Massachusetts state waters and their known distributions have been mapped using aerial survey, vessel survey, and opportunistic sightings (E. Burke, MA *MarineFisheries*, 2009, pers. comm.). In addition, acoustic arrays listen for whales throughout Cape Cod Bay and Massachusetts Bay. The North Atlantic right whale migrates from winter calving and nursery areas in the Southeast United States to summer feeding grounds in New England and Atlantic Canada (NMFS 2005). North Atlantic right whales are most abundant in Cape Cod Bay between February and April (Hamilton and Mayo 1990). Right whales are also found on Jeffrey's Ledge and Stellwagen Bank during the spring and summer (EEA 2009; NMFS 2008b). Due to its importance as a foraging site, Cape Cod Bay was designated a Critical Habitat Area for the North Atlantic right whale by NMFS in 1994 (Figure 2). Other baleen whales including the humpback, fin and minke are most abundant in Cape Cod Bay, Massachusetts Bay,

Jeffrey's Ledge, Stellwagen Bank and the outer Cape from April through October (EEA 2009). Whales are protected under the Federal Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), as well as the Massachusetts Endangered Species Act (MESA).

Harbor porpoise (*Phocoenoides phocoena*) and Atlantic white-sided dolphins (*Lagenorhynchus acutus*) are also known to occur in Massachusetts state waters and are most abundant from November to June (EEA 2009) but their distributions are not mapped. Gray seals (*Halichoerus grypus*) and harbor seals (*Phoca vitulina*) are found throughout state waters and seal haul-out locations are present along the entire Massachusetts coast. Seals, dolphins, and harbor porpoises are protected under the MMPA.

Five marine sea turtle species, all protected under the MESA and ESA, are found seasonally from June through November in state waters: the loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), Kemp's Ridley (*Lepidochelys kempii*), green (*Chelonia mydas*), and hawksbill (*Eretmochelys imbricata*) sea turtles. The seasonal distribution of the species varies depending on the species of turtle, the time of year, and the availability of prey. The leatherback, the most abundant sea turtle in Massachusetts, has a broader thermal tolerance and therefore may be present in MA waters for a longer time period than other sea turtles (C. Upite, NOAA, 2009, pers. comm.). Aerial surveys of the mid and north Atlantic noted the presence of leatherback turtles from April to November in the Gulf of Maine (NMFS 1992). The leatherback is known to feed in Massachusetts waters, and groups of hundreds of individuals have been observed in August and September south of Cape Cod and in Cape Cod Bay (NMFS 1992). NMFS often uses a June through November TOY in their comments on construction or dredging projects that may impact turtles (C. Upite, NOAA, 2009, pers. comm.). The Endangered Species Act Section 7 Biological Opinion prepared for the Cape Wind energy project in Nantucket Sound noted that sea turtles are likely to be found in Nantucket Sound from June through November (NMFS 2008b).

The diamond-backed terrapin (*Malaclemys terrapin)* inhabits marshes and shallow, brackish bays and harbors. It requires adjacent sandy upland (including beaches) for nesting during the summer and overwinters in shallow, muddy waters. The diamond-backed terrapin is found in the southeastern part of the state. It is protected under MESA.

Because all marine mammals and reptiles are covered under MESA, *MassWildlife* is responsible for their management.

Recommended TOYs for marine mammals & reptiles. *MarineFisheries* recommends a TOY of **January 1 to May 15** for right whales to protect feeding aggregations in the right whale critical habitat area in Cape Cod Bay (Figure 2). A TOY of **April 1 to October 31** may be recommended to protect other whale species. The recommended TOY to protect sea turtles is **June 1 to November 30**. Whether or not these TOYs will pertain to a given project is dependent on the nature and location of the proposed work. Projects planned in areas that may have marine mammals or reptiles should consult with *MassWildlife* and National Marine Fisheries Service for TOY restrictions.

Amendments & Consistency

This document will be amended when necessary and the most current version will be available on the *MarineFisheries* website. We endeavor to use the best available information to make our recommendations. Should you identify any errors or omissions or have any other suggestions or comments, please contact the first author at: tay.evans@state.ma.us.

The recommendations made by *MarineFisheries* and presented in this technical report are consistent to the maximum extent practicable with those of other resource agencies, except where noted. If inconsistencies arise, they will be handled on a project-specific basis.

Acknowledgements

The authors would like to thank all biologists at *MarineFisheries* for providing their knowledge and input both through scientific references and their institutional knowledge of the species that they study. Their contributions laid the groundwork for this report. We particularly thank Phillips Brady, Erin Burke, Steve Correia, Bruce Estrella, Kristen Ferry, Frank Germano, Bob Glenn, Jeff Kennedy, Vin Malkoski, Vincent Manfredi, and David Whittaker. We extend a special thanks to Katelyn Ostrikis for her work compiling information and editing the document. Thanks to Eileen Feeney for assisting with formatting the document and to Bruce Estrella for editing and final formatting for publication. We thank U.S. Army Corps of Engineers Regulatory staff, particularly Gregory Penta for his work integrating this report with the ACOE GP regulations, members of the New England Regional Dredge Team, Massachusetts State Dredge Team, the National Marine Fisheries Service Habitat Conservation staff, and EPA, who were all instrumental through their review and comments on drafts of this document. This report was funded, in part, by the USFWS through the Sportfish Restoration Act.

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Appendix A. Life history information for selected managed marine fisheries species. Note: Please see Appendix C for the annotated bibliography.

Species	Spawning Period	Spawning Period Peak	Spring TOY Restriction	Fall TOY Restriction	Spawning Habitat	Spawning Locations	Spawning Site Fidelity	Egg Type
Anadromous								
Alewife (*Alosa pseudoharengus*)	late-March - mid-June	May	April 1 - June 15	Sept. 1 - Nov. 15	freshwater lentic (can be found in lotic habitat)	system specific	variable to high	semi-demersal
Blueback herring (*Alosa aestivalis*)	April - June	May	April 1 - June 30	Sept. 1 - Nov. 15	freshwater lotic (can be found in lentic habitat)	system specific	variable to high	semi-buoyant/ adhesive
American shad (*Alosa sapidissima*)	late-April - July	May/June	May 1 - July 15	Sept. 30 - Oct. 31	freshwater lotic	system specific	variable to high	semi-buoyant/ semi-adhesive
Rainbow smelt (*Osmerus mordax*)	March - May	April	March 1 - May 31	none	freshwater riffle at or above tidal interface	Gulf of Maine coast of MA	not known	demersal/ adhesive
White perch (*Morone americana*)	April - June	not known	April 1 - June 15	none	unspecified substrata near tidal interface	not known	not known	demersal/ adhesive
Atlantic tomcod (*Microgadus tomcod*)	late-Nov. - Feb.	Jan.	Feb. 15 - April 30	none	unspecified substrata at tidal interface	not known	not known	demersal/ adhesive
Atlantic salmon (*Salmo salar*)	April - July & Sept. - Oct.	May/June	April 1 - July 15	Sept. 15 - Oct. 31	currently no access to spawning habitat in MA	present in ocean waters and the Connecticut and Merrimack River systems; removed at Essex Dam and transported to hatchery	not applicable in MA	not applicable in MA
Sturgeon: Atlantic sturgeon (*Acipenser oxyrinchus*)	May - June	not known	April 1 - Nov. 1	none	historically, solid substrata in oligohaline and tidal freshwater zones near tidal interface	presently no evidence of spawning in MA but may use Merrimack as nursery	not known	benthic/ adhesive
Sturgeon: Shortnose sturgeon (*Acipenser brevirostrum*)	April - Nov.	not known	April 1 - Nov. 1	none	evidence of spawning in the Merrimack in Haverhill in the late 1980s	upper Merrimack River	not known	benthic/ adhesive

Species	Spring Glass Eel Run	Spring Glass Eel Run Peak	Spring TOY Restriction	Fall TOY Restriction	Adult Silver Eel Spawning Emigration	Spawning Habitat	Spawning Locations	Spawning Site Fidelity
Catadromous								
American eel (*Anguilla rostrata*)	March - June	May	March 15 - June 30	Sept. 15 - Oct. 31	Sept. - Nov.	marine pelagic	Sargasso Sea	high degree of spawning site fidelity

Species	Spawning Period	Spawning Period Peak	Spring TOY Restriction	Fall TOY Restriction	Spawning Habitat	Spawning Locations	Spawning Site Fidelity	Egg Type
Other Finfish								
Winter flounder (*Pseudopleuronectes americanus*)	Jan. - May/June	*GOM stock* mid-Feb. - mid-May; *SNE* stock mid-Jan. - mid-April	*Southern MA* Jan. 15 - May 31; *Cape Cod Bay* Feb. 1 - June 30; *North Coast* Feb. 15 - June 30	none	shallow subtidal waters, to approx. 5-8 meters deep, in sheltered bays, estuaries and harbors, as well as open nearshore coastal waters	present in nearly all harbors, bays and coastal waters of MA	limited seasonal movements and high degree of spawning site fidelity	demersal/ adhesive
Atlantic cod (*Gadus morhua*)	Nov. - Feb. & April - June	varies	*Gulf of Maine (MA Bay, Cape Cod Bay, Ipswich Bay)* April 1 - June 30	*Gulf of Maine (Mass Bay, Cape Cod Bay, Ipswich Bay)* Dec. 1 - Jan. 31	gravel, cobble, sand, and clay with broken shells, biogenetic covered rock reefs and seagrass beds, as well as rock outcrops and ledges	MA Bay, Stellwagen Bank, Jeffrey's Bank, Georges's Bank, Southern New England	can be high, variable	pelagic/ bouyant

Appendix A (Continued). Life history information for selected managed marine fisheries species. Note: Please see Appendix C for the annotated bibliography.

Species	Egg Incubation	Larvae/ Juvenile Emigration - *time period*	Larvae/ Juvenile Emigration Peak	Post-spawning Adult Emigration - *duration*	Juvenile Nursery Habitat	Adult Habitat	Population Status	Federal ESA Status	State MESA Status
Anadromous									
Alewife (*Alosa pseudoharengus*)	brief (2-5 days at 20-22 °C)	July - Nov.	not known	several days-weeks	river-estuaries	coastal marine	in decline-moratorium	Species and Habitats of Special Concern - 2006	not listed
Blueback herring (*Alosa aestivalis*)	brief (3-4 days at 20-21 °C)	July - Nov.	not known	several days-weeks	river-estuaries	coastal marine	in decline-moratorium	Species and Habitats of Special Concern - 2006	not listed
American shad (*Alosa sapidissima*)	brief (6-8 days at 17 °C)	July - Nov.	not known	several days	river-estuaries	coastal marine	population in decline	Species and Habitats of Special Concern - 2006	not listed
Rainbow smelt (*Osmerus mordax*)	7-21 days	immediate passive movement to estuary	April 15 - May 30	one-several days	estuaries and embayments	coastal marine	not assessed	Species and Habitats of Special Concern - 2004	not listed
White perch (*Morone americana*)	2 days at 18.3 °C; 6 days at 11.1 °C	approx. 2 weeks post-hatch	June	not known	estuaries and embayments	coastal marine	not assessed	not listed	not listed
Atlantic tomcod (*Microgadus tomcod*)	24-30 days at 4-6 °C; 52 days at 2-4 °C	mid-Feb. - April	March	one-several days	estuaries and embayments	estuaries and coastal marine	not assessed	not listed	not listed
Atlantic salmon (*Salmo salar*)	not applicable in MA	smolts - April 1 - July 15	April/May	presently N/A in MA; adults held in hatchery; adult broodstock may be released into MA and NH waters with tags	historical habitat and habitat of the currently stocked fry is in NH tributaries; smolts stocked in MA downriver of Essex Dam	oceanic and riverine	population in decline	wild stock in ME - Endangered species; not listed in MA	not listed
Sturgeon: Atlantic sturgeon (*Acipenser oxyrinchus*)	brief (4-7 days at 20-17.8 °C)	not known	not known	not known	riverine (May - Nov.) and oceanic	coastal marine: MA Bay and Cape Cod	population in decline	Species of Concern and Candidate Species for Threatened or Endangered	Endangered
Sturgeon: Shortnose sturgeon (*Acipenser brevirostrum*)	13 days at 10°C	after approx. 9 days larvae move downstream	not known	late April - early May move downriver to forage habitat	riverine freshwater	freshwater and estuaries	endangered	Endangered	Endangered

Species	Egg Type	Egg Incubation	Post-spawning Adult Emigration	Juvenile Nursery Habitat	Population Status	Federal ESA Status	State MESA Status		
Catadromous									
American eel (*Anguilla rostrata*)	not applicable	not applicable	not applicable	freshwater and estuaries; glass eels rest in complex substratas near tidal interface	not assessed	Candidate Species - 2006	conservation concern		

Species	Egg Incubation	Larvae/ Juvenile Migration	Post-spawning Adult Migration	Juvenile Nursery Habitat	Adult Summer Habitat	Population Status	Federal ESA Status	State MESA Status	
Other Finfish									
Winter flounder (*Pseudopleuronectes americanus*)	15-18 days at between 2.8-3.3 °C	not known	SNE - leave coastal embayments when waters warm before June; GOM - present inshore year-round with a migration below the thermocline during summer if temperatures become very warm (more than 18-19 °C)	SNE - estuaries, various substrates, shallow subtidal to intertidal, adjacent to eelgrass beds and other SAV; GOM - estuaries, various substrates, shallow subtidal to lower intertidal, adjacent to eelgrass beds and other SAV	SNE - ocean, Nantucket Shoals and shelf waters south of The Islands; GOM - ocean/ deeper channels and inlets in estuaries, bays and harbors where cooler waters mix with warm shallows	population in decline	not listed	not listed	
Atlantic cod (*Gadus morhua*)	8-60 days dependant on temperature	fall juvenile inshore (<100m) migration	not known	gravel, cobble, sand, and clay with broken shells, biogenetic covered rock reefs and seagrass beds, as well as rock outcrops and ledges; early juvenile (age 0 and 1) cod have been found to occupy shallower depths (<90ft), particularly during winter and spring, moving into deeper waters with increasing age and length	oceanic state wide, throughout Gulf of Maine, mostly north of Cape but some also south of Cape	population concerns	not listed	not listed	

Appendix A (Continued). Life history information for selected managed marine fisheries species. Note: Please see Appendix C for the annotated bibliography.

Species	Spawning Period	Spawning Period Peak	TOY Restriction	Habitat	Spawning Locations	Larval Settlement	Egg Type
Mollusks and Arthropods							
Bay scallop (*Argopecten irradians*)	June - July & Sept.	varies	June 1 - Sept. 30	sandy, muddy subtidal areas often associated with eelgrass beds	bay scallops are found on Cape Cod, Buzzards Bay, and the Islands	larval settlement 14 days after spawn; larvae attach to substrates such as eelgrass, pebbles or shells	pelagic
Blue mussel (*Mytilus edulis*)	May - June	varies	May 15 - Aug. 31	attached to hard substrate including rocks and pilings		larval settlement 3-5 weeks after spawn	pelagic
American oyster (*Crassostrea virginica*)	June - Aug.	varies	June 15 - Sept. 15	reef forming		larval settlement onto hard substrates including pepples and shells, 3 weeks after spawned	pelagic
Northern quahog (*Mercenaria mercenaria*)	June - Aug.	varies	June 15 - Sept. 15	sandy shallow subtidal areas within estuaries and coastal embayments	hard clams are primarily found south of Boston except for pockets in Quincy and Plum Island	larval settlement 1-4 weeks after spawned	pelagic
Sea scallop (*Placopecten magellanicus*)	Sept. - Nov.	varies	Sept. 1 - Nov. 15	adults found offshore generally on firm sand, gravel	sea scallops are found off-shore on the outer Cape and the North Coast	settlement occurs in 4-6 weeks on gravelly sand, shell fragments, hydroids and sponges	demersal
Soft-shell clam (*Mya arenaria*)	March - April & June - Aug.	varies	*Cape Cod Bay and North Coast* May 1 - Sept. 30; *Southern MA* April 15 - Sept. 15	gravel to soft mud in subtidal and intertidal areas within estuaries and coastal emabayments	all of MA	larval settlement 2-6 weeks after spawn	pelagic
Surf clam (*Spisula solidissima*)	June - Aug. & Oct. - Nov.	varies	June 15 - Oct. 15	subtidal sandy substrate	offshore, mainly north of Cape Cod, some pockets south	larval settlment 18 days after spawn	pelagic
Squid short-finned squid (*Illex illecebrosus*) long-finned squid (*Loligo pealei*)	year-round both inshore and off-shore with distinct seasonal and geographic peaks	May	April 15 - June 15	mud and sand substrate, migrate diurnally and seasonally in water column from 6-400 meters	western Nantucket Sound	planktonic paralarvae recruits found in 1-50 meters depth range	benthic/ adhesive
American lobster (*Homarus americanus*)	May - Aug.	varies	*Cape Cod Bay and North Coast* May 31 - July 31; *East of Cape Cod* June 15 - Aug. 15; *Southern MA* May 15 - July 1	EBP on cobble substrate; adults on complex substrate and mud burrows	present in all MA waters	newly settled larvae are shelter dependant for several years	adhesive/ attached to adult
Atlantic horseshoe crab (*Limulus polyphemus*)	May - July	mid-May - mid-June	*in channels* May 1 - June 30; *on spawning beaches* May 1 - July 31	upper intertidal zone of sandy beaches; adults move into estuaries to spawn and feed in the summer and move to deeper waters in winter	present along entire coast of MA; more abundant in South Coast, Cape Cod and the Islands	stay local with repeat spawing within a season; most believed to return to same area interannually	benthic/ adhesive; laid in clumps buried in sand for 2-4 weeks

Species	Presence in Massachusetts Waters	TOY Restriction	Habitat	Food	Population Status	Federal ESA Status
Marine Mammals and Reptiles						
North Atlantic right whale (*Eubalaena glacialis*)	Jan. - May	Jan. 1 - May 15	abundant in Cape Cod Bay in winter and spring (Feb.-May); occasionally present in other areas of state waters outside this time period	zooplankton	approx. 400 whales; some females bring calves to Cape Cod Bay	Endangered; Marine Mammal Protection Act
Humpback whale (*Megaptera novaeangliae*) and Fin whale (*Balaenoptera physalus*)	April - Oct.	April 1 - Oct. 31	Stellwagon Bank, Great South Channel, Cape Cod Bay, MA Bay, off Gloucester, off Race Point Provincetown	herring, sand lance, and other small fishes	approx. 900 whales in Gulf of Maine feeding stock	Endangered; Marine Mammal Protection Act
Leatherback sea turtle (*Dermochelys coriacea*)	June - Nov.	June 1 - Nov. 30	abundant in Cape Cod Bay and south of Cape Cod in summer and fall	jellyfish	endangered	Endangered
Loggerhead sea turtle (*Caretta caretta*); Kemp's Ridley sea turtle (*Lepidochelys kempii*)	June - Nov.	June 1 - Nov. 30	frequent visitors to Cape Cod Bay and south of Cape Cod in summer and fall	crabs and mussels	endangered	Endangered
Green sea turtle (*Chelonia mydas*); Hawksbill sea turtle (*Eretmochelys imbricata*)	June - Nov.	June 1 - Nov. 30	infrequent visitors to area	green turtles feed on submerged aquatic vegetation and hawksbill turtles feed on sea anemones and invertebrates	endangered	Endangered

Appendix A (Continued). Life history information for selected managed marine fisheries species. Note: Please see Appendix C for the annotated bibliography.

Species	Population Status	Federal ESA Status	State MESA Status
Mollusks and Arthropods			
Bay scallop (*Argopecten irradians*)	not assessed	not listed	not listed
Blue mussel (*Mytilus edulis*)	not assessed	not listed	not listed
American oyster (*Crassostrea virginica*)	population in decline	not listed	not listed
Northern quahog (*Mercenaria mercenaria*)	not assessed	not listed	not listed
Sea scallop (*Placopecten magellanicus*)	not assessed	not listed	not listed
Soft-shell clam (*Mya arenaria*)	not assessed	not listed	not listed
Surf clam (*Spisula solidissima*)	not assessed	not listed	not listed
Squid short-finned squid (*Illex illecebrosus*) long-finned squid (*Loligo pealei*).	not assessed	not listed	not listed
American lobster (*Homarus americanus*)	population concerns	not listed	not listed
Atlantic horseshoe crab (*Limulus polyphemus*)	population concerns	not listed	not listed

Species	State MESA Status		
Marine Mammals and Reptiles			
North Atlantic right whale (*Eubalaena glacialis*)	Endangered		
Humpback whale (*Megaptera novaeangliae*) and Fin whale (*Balaenoptera physalus*)	Endangered		
Sea turtles: Leatherback (*Dermochelys coriacea*);	Endangered		
Loggerhead (*Caretta caretta*); Kemp's Ridley sea turtle (*Lepidochelys kempii*)	Endangered		
Green sea turtle (*Chelonia mydas*); Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered		

Appendix B: Presence of selected marine fisheries species in Massachusetts coastal waterbodies.

NOTES:

1. The term "present" and the need to comply with the TOY restrictions for present species are specified in the U.S. Army Corps of Engineers Massachusetts General Permit (MA GP), General Conditions 11, 21(j), 24 (b) and Appendix A (pages 2 & 5).
2. This table is a guide. These data are based on existing professional knowledge and represent confirmed presence of species in a waterbody according to the accompanying key.
3. References for recent and historic documentation can be found in Appendix C.

KEY:

1 and color : Spawning run/ habitat present based upon recent (<10 years) documentation.
2 and color : Spawning run/ habitat present based upon historical (>10 years) documentation.
3 and color : Spawning run/ habitat present based upon Best Professional Judgment (BPJ).
4 and color : Present, not spawning.
5 and color : Not present based upon BPJ.
ND: No data or not assessed

Offshore Waters

Town	Waterbody Name	Watershed	Region	Spring TOY Restriction	Fall TOY Restriction	River herring: Alewife	River herring: Blueback	American shad	Rainbow Smelt	American eel	White Perch	Atlantic tomcod	Atlantic salmon	Sturgeon spp.	Winter flounder	Atlantic cod	Horseshoe crab	Shellfish
n/a	Buzzards Bay	Offshore	SM	15-Jan to 15-Nov		4	4	4	4	4	4	4	5	5	1	4	1	1,2,3
n/a	Cape Cod Bay	Offshore	CCB	01-Feb to 31-Jan		4	4	4	4	4	4	4	4	4	3	1	1	1,2,3
n/a	Ipswich Bay	Offshore	NC	15-Feb to 31-Jan		4	4	4	4	4	4	4	4	4	2	1	1	1,2,3
n/a	Massaschusetts Bay	Offshore	NC	15-Feb to 31-Jan		4	4	4	4	4	4	4	4	4	2	1	4	1,2,3
n/a	Nantucket Sound	Offshore	SM	15-Jan to 15-Nov		4	4	4	4	4	4	4	5	5	1	4	1	1,2,3
n/a	Vineyard Sound	Offshore	SM	15-Jan to 15-Nov		4	4	4	4	4	4	4	5	5	1	4	1	1,2,3

Coastal Waters, Embayments, and Rivers

Town	Waterbody Name	Watershed	Region	Spring TOY Restriction	Fall TOY Restriction	River herring: Alewife	River herring: Blueback	American shad	Rainbow Smelt	American eel	White Perch	Atlantic tomcod	Atlantic salmon	Sturgeon spp.	Winter flounder	Atlantic cod	Horseshoe crab	Shellfish
Acushnet	Acushnet River	Buzzards Bay	SM	15-Jan to 30-Jun	01-Sep to 15-Nov	1	1	5	1	1	3	ND	5	5	3	5	ND	5
Acushnet	New Bedford Reservoir	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	2	2	5	5	3	ND	5	5	5	5	5	5	5
Agawam	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Agawam	Westfield River	Connecticut River	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	5	1	1	5	3	5	5	1	5	5	5	5	5
Amesbury	Back River	Merrimack River	NC	15-Mar to 15-Nov		1	1	1	5	3	5	5	1	1	5	5	5	5
Amesbury	Merrimack River	Merrimack River	NC	01-Mar to 15-Nov		1	1	1	1	1	1	4	1	1	5	5	5	5
Amesbury	Powow River	Merrimack River	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	ND	5	1	2	5	ND	ND	5	5	5	5
Andover	Merrimack River	Merrimack River	NC	01-Apr to 15-Nov		1	1	1	5	5	5	5	1	1	5	5	5	5
Andover	Shawsheen River	Merrimack-Shawsheen	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Aquinnah	Gay Head Herring Creek	Islands	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	1	5	5	1	1	1	5	5	5	5	5	5
Aquinnah	Menemsha Pond	Islands	SM	15-Jan to 15-Nov		1	1	5	5	3	1	3	5	5	1	5	1	1,2,3
Arlington	Mystic River	Mystic River	NC	15-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	5	1	1	2	5	5	3	5	ND	5
Arlington	Upper & Lower Mystic Lakes (via Mystic River)	Mystic River	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	3	5	5	5	5	5	5	5
Athol	Millers River	Connecticut River	SM	15-Mar to 15-Jul	15-Sep to 31-Oct	5	5	5	5	3	5	5	1	5	5	5	5	5
Attleboro	Ten Mile River	Narragansett Bay	SM	15-Jan to 15-Jul	01-Sep to 15-Nov	3	3	1	5	3	1	3	5	5	3	5	ND	5
Barnstable	Barnstable Harbor	North Cape Cod	CCB	01-Feb to 15-Nov		4	4	5	4	3	4	4	5	5	1	5	1	1,2,3
Barnstable	Centerville Harbor	South Cape Cod	SM	15-Jan to 15-Nov		4	4	5	5	3	4	3	5	5	1	4	1	1,2,3
Barnstable	Centerville River	South Cape Cod	SM	15-Jan to 15-Nov		1	5	5	5	3	5	ND	5	5	1	5	1	1,2,3
Barnstable	Cotuit Bay	South Cape Cod	SM	15-Jan to 15-Nov		4	4	ND	ND	ND	ND	ND	ND	ND	1	5	1	1,2,3
Barnstable	East Bay	South Cape Cod	SM	15-Jan to 15-Nov		1	5	5	5	3	5	ND	5	5	3	5	1	1,2,3
Barnstable	Hyannis Harbor	South Cape Cod	SM	15-Jan to 15-Nov		4	4	5	5	3	4	4	5	5	3	5	1	1,2,3
Barnstable	Hyannis Port	South Cape Cod	SM	15-Jan to 15-Nov		4	ND	ND	ND	ND	ND	ND	ND	ND	3	5	ND	1,2,3
Barnstable	Lake Elizabeth/ Red Lily Pond	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	3	5	5	5	5	5	5	5
Barnstable	Lewis Bay	South Cape Cod	SM	15-Jan to 15-Nov		4	4	5	5	3	4	4	5	5	1	5	ND	1,2,3
Barnstable	Long Pond (drains to Centerville River and Vineyard Sound)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	2	5	5	5	1	5	5	5	5	5	5	5	5
Barnstable	Long Pond (via Centerville River)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	3	5	5	5	5	5	5	5
Barnstable	Marston Mills River	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	3	ND	5	5	5	5	5	5
Barnstable	Middle Pond (via Marstons Mills River)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	2	2	5	5	3	2	5	5	5	5	5	5	5
Barnstable	Mill Pond (via Boat Cove Creek)	North Cape Cod	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	3	5	5	5	5	5	5	5
Barnstable	Mystic Lake (via Marstons Mills River)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	2	ND	5	5	3	ND	5	5	5	5	5	5	5
Barnstable	Rushy Marsh Pond	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Barnstable	Santuit River	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	5	5	5	5	5	5	5
Barnstable	Seapuit River	South Cape Cod	SM	15-Jan to 15-Nov		4	4	5	5	5	4	3	5	5	3	5	1	1,2,3
Barnstable	Shoestring Bay	South Cape Cod	SM	15-Jan to 15-Nov		1	1	5	5	3	1	3	5	5	3	5	5	1,2,3
Barnstable	Skunknett River	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	3	5	5	5	5	5	5	5
Barnstable	Wequaquet Lake (drains to Centerville River and Vineyard Sound)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	2	5	5	5	3	5	5	5	5	5	5	5	5
Barnstable	West Bay	South Cape Cod	SM	15-Jan to 15-Nov		4	4	5	5	ND	4	3	5	5	1	5	4	1,2,3

Appendix B (Continued). Presence of selected marine fisheries species in Massachusetts coastal waterbodies.

Coastal Waters, Embayments and Rivers

Town	Waterbody Name	Watershed	Region	Spring TOY Restriction	Fall TOY Restriction	River herring: Alewife	River herring: Blueback	American shad	Rainbow Smelt	American eel	White Perch	Atlantic tomcod	Atlantic salmon	Sturgeon spp.	Winter flounder	Atlantic cod	Horseshoe crab	Shellfish
Bedford	Concord River	North Coastal	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Bedford	Shawsheen River	Merrimack-Shawsheen	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Berkley	Assonet River	Taunton	SM	15-Jan to 15-Nov		1	1	5	1	3	1	5	5	5	2	5	ND	1,2,3
Beverly	Beverly Harbor	North Coastal	NC	15-Feb to 15-Nov		4	4	5	4	4	4	4	5	5	1	4	ND	1,2,3
Beverly	Chubb Creek	North Coastal	NC	15-Feb to 30-Jun	15-Sep to 31-Oct	5	5	5	1	1	5	3	5	5	5	5	5	5
Billerica	Concord River	North Coastal	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Billerica	Merrimack River	Merrimack River	NC	none		5	5	5	5	5	5	5	5	5	5	5	5	5
Billerica	Shawsheen River	Merrimack-Shawsheen	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Boston	Boston Harbor	Charles and Mystic Rivers	NC	15-Feb to 15-Nov		4	4	4	4	4	4	4	5	5	1	4	1	1,2,3
Boston	Charles River	Charles River	NC	15-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	1	1	1	1	5	5	5	5	5	5
Boston	Dorchester Bay	Neponset and Charles Rivers	NC	15-Feb to 15-Nov		4	4	5	4	4	4	4	5	5	1	4	ND	1,2,3
Boston	Fort Point Channel	Charles River	NC	15-Feb to 30-Jun		4	4	4	4	4	4	5	5	5	1	5	ND	5
Boston	Muddy River	Charles and Mystic Rivers	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	1	4	5	5	5	5	5	5	5
Boston	Mystic River	Mystic River	NC	15-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	5	1	1	2	5	5	3	5	ND	5
Boston	Winthrop Harbor	Mystic River	NC	15-Feb to 15-Nov		4	4	5	4	3	4	4	5	5	3	4	ND	1,2,3
Bourne	Beal's Pond (via Monument River)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Bourne	Benoit's Pond (via Monument River)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Bourne	Bourne Pond / Brook	Buzzards Bay	SM	15-Jan to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	5	5	5	5	3	5	ND	5
Bourne	Cape Cod Canal	Buzzards Bay	SM	15-Apr to 15-Nov		4	4	5	5	4	4	5	5	5	4	5	4	1,2,3
Bourne	Great Herring Pond (via Monument River)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Bourne	Megansett/Squeteague Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		4	ND	5	5	4	ND	ND	ND	ND	3	4	4	1,2,3
Bourne	Monument River	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	5	5	5	5	5	5	5
Bourne	Phinneys Harbor/Monument Beach	Buzzards Bay	SM	15-Jan to 15-Nov		4	ND	5	5	4	ND	4	5	5	3	4	1	1,2,3
Bourne	Red Brook	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	5	5	5	5	5	5	5	5
Bourne	Red Brook Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		4	4	5	5	3	5	3	5	5	1	5	1	1,2,3
Bourne	Red Brook Pond	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	5	5	5	5	5	5	5	5
Bourne	Tobys Island and Pocasset River	Buzzards Bay	SM	15-Jan to 15-Nov		ND	ND	5	5	3	ND	ND	5	5	3	5	1	1,2,3
Bourne	White Island Pond (via Red Brook)	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Braintree	Fore River / Monataquot	Weymouth and Weir Rivers	NC	15-Feb to 15-Nov		1	1	5	1	1	1	1	5	5	1	5	ND	1,2,3
Braintree	Smelt Brook	Weymouth and Weir Rivers	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	3	5	5	5	5	5	5	5	5
Brewster	Long Pond	North Cape Cod	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	5	5	5	5	5	5	5
Brewster	Lower Mill Pond (via Stoney Brook)	North Cape Cod	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	2	5	5	3	ND	5	5	5	5	5	5	5
Brewster	Namskaket Creek	North Cape Cod	CCB	01-Feb to 15-Nov		ND	ND	5	5	ND	ND	ND	5	5	3	5	1	1,2,3
Brewster	Quivett Creek	North Cape Cod	CCB	01-Feb to 15-Nov		1	5	5	5	3	ND	3	5	5	3	5	ND	1,2,3
Brewster	Seymour Pond (drains into Hinckleys Pond)	North Cape Cod	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	2	5	5	5	3	ND	5	5	5	5	5	5	5
Brewster	Stony Brook	North Cape Cod	CCB	01-Feb to 15-Nov		1	1	5	5	3	4	3	5	5	3	5	1	1,2,3
Brewster	Upper Mill Pond (via Stoney Brook)	North Cape Cod	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	2	5	5	3	ND	5	5	5	5	5	5	5
Brewster	Walker Pond (via Stoney Brook)	North Cape Cod	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	2	2	5	5	3	ND	5	5	5	5	5	5	5
Bridgewater	Lake Nippenicket (via Town River)	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	2	3	5	5	3	ND	5	5	5	5	5	5	5
Buckland	Deerfield River	Connecticut River	SM	15-Mar to 15-Jul	15-Sep to 31-Oct	5	5	5	5	3	5	5	1	5	5	5	5	5
Cambridge	Alewife Brook	Charles River	NC	15-Mar to 30-Jun	15-Sep to 31-Oct	ND	ND	ND	5	3	5	5	5	5	5	5	5	5
Cambridge	Charles River	Charles River	NC	15-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	1	1	1	1	5	5	5	5	5	5
Carlisle	Concord River	North Coastal	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Chatham	Bucks Channel	South Cape Cod	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	1	1,2,3
Chatham	Bucks Creek	South Cape Cod	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	1	1,2,3
Chatham	Chatham Harbor	South Cape Cod	SM	15-Mar to 15-Nov		4	4	5	5	3	4	4	5	5	3	5	1	1,2,3
Chatham	Frost Fish Creek	South Cape Cod	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	3	3	5	5	5	5	5	5
Chatham	Mill Creek	South Cape Cod	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	1	1,2,3
Chatham	Muddy Creek	South Cape Cod	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	5	5	5	1	4	3	5	5	5	5	5	5
Chatham	Ryders Cove	South Cape Cod	SM	15-Jan to 15-Nov		1	5	5	5	4	4	4	5	5	3	5	ND	1,2,3
Chatham	Stage Harbor	South Cape Cod	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	1	1,2,3
Chelmsford	Merrimack River	Merrimack River	NC	none		5	5	5	5	5	5	5	5	5	5	5	5	5
Chelsea	Chelsea River	Mystic River	NC	15-Feb to 30-Jun	15-Sep to 31-Oct	4	4	ND	1	1	5	4	5	5	3	5	ND	5
Chelsea	Mystic River	Mystic River	NC	15-Feb to 15-Nov		1	1	1	5	1	1	2	5	5	3	5	ND	1,2,3
Chesterfield	Westfield River	Connecticut River	SM	15-Mar to 15-Jul	15-Sep to 31-Oct	5	5	5	5	3	5	5	1	5	5	5	5	5
Chicopee	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Chilmark	Menemsha Pond	Islands	SM	15-Jan to 15-Nov		1	1	5	5	3	1	3	5	5	1	5	1	1,2,3
Chilmark	Tiasquam River	Islands	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	1	ND	ND	5	5	5	5	5	5
Chilmark	Tisbury Great Pond	Islands	SM	15-Jan to 15-Nov		1	5	5	5	1	1	1	5	5	3	5	ND	1,2,3
Chilmark	Black Point Pond	Islands	SM	15-Feb to 15-Nov		1	5	5	5	1	2	1	5	5	5	5	ND	1,2,3

Appendix B (Continued). Presence of selected marine fisheries species in Massachusetts coastal waterbodies.

Coastal Waters, Embayments and Rivers

Town	Waterbody Name	Watershed	Region	Spring TOY Restriction	Fall TOY Restriction	River herring: Alewife	River herring: Blueback	American shad	Rainbow Smelt	American eel	White Perch	Atlantic tomcod	Atlantic salmon	Sturgeon spp.	Winter flounder	Atlantic cod	Horseshoe crab	Shellfish
Cohasset	Bound Brook	South Coastal	CCB	15-Feb to 30-Jun	01-Sep to 15-Nov	1	5	5	1	1	ND	3	5	5	5	5	5	5
Cohasset	Cohasset Harbor	South Coastal	CCB	01-Feb to 15-Nov		4	4	5	4	4	4	4	5	5	1	5	1	1,2,3
Cohasset	Little Harbor	South Coastal	CCB	01-Feb to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	4	1,2,3
Cohasset	Straits Pond	Weymouth and Weir Rivers	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	4	3	5	4	5	5	5	5	5	5
Concord	Concord River	North Coastal	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Conway	Deerfield River	Connecticut River	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	5	1	1	5	3	5	5	1	5	5	5	5	5
Cummington	Westfield River	Connecticut River	SM	15-Mar to 15-Jul	15-Sep to 31-Oct	5	5	5	5	3	5	5	1	5	5	5	5	5
Danvers	Crane River	North Coastal	NC	15-Feb to 15-Nov		3	3	5	1	3	3	3	5	5	2	5	ND	1,2,3
Danvers	Danvers River	North Coastal	NC	15-Feb to 15-Nov		3	3	5	4	1	4	4	5	5	2	5	ND	1,2,3
Danvers	Porter River	North Coastal	NC	15-Feb to 15-Nov		5	5	5	1	3	5	3	5	5	2	5	ND	1,2,3
Dartmouth	Allens Pond	Buzzards Bay	SM	15-Jan to 15-Nov		5	5	5	5	5	5	5	5	5	3	5	1	1,2,3
Dartmouth	Padanaram Harbor (Apponagansett)	Buzzards Bay	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	ND	ND	3	5	1	1,2,3
Dartmouth	Paskamansett River	Buzzards Bay	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	1	5	1	1	5	3	5	5	5	5	5	5
Dartmouth	Russells Mill Pond	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	2	2	5	5	3	5	5	5	5	5	5	5	5
Dartmouth	Slocums River	Buzzards Bay	SM	15-Jan to 15-Nov		1	1	5	2	1	3	2	5	5	3	5	1	1,2,3
Deerfield	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Deerfield	Deerfield River	Connecticut River	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	5	1	1	5	3	5	5	1	5	5	5	5	5
Dennis	Bass River	South Cape Cod	SM	15-Jan to 15-Nov		1	2	5	5	1	1	2	5	5	1	5	1	1,2,3
Dennis	Quivett Creek	North Cape Cod	CCB	01-Feb to 15-Nov		1	5	5	5	3	ND	3	5	5	3	5	ND	1,2,3
Dennis	Scargo Lake (via Sesuit Creek)	North Cape Cod	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Dennis	Sesuit Creek	North Cape Cod	CCB	01-Feb to 15-Nov		1	5	5	1	3	5	5	5	5	3	5	ND	1,2,3
Dennis	Sesuit Harbor	North Cape Cod	CCB	01-Feb to 15-Nov		1	5	5	1	3	5	5	5	5	3	5	1	1,2,3
Dennis	Swan Pond River	South Cape Cod	SM	15-Jan to 15-Nov		1	ND	5	5	ND	ND	ND	5	5	3	5	5	1,2,3
Dighton	Cole River	Narragansett Bay	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	1	5	1	3	1	3	5	5	5	5	5	5
Dighton	Muddy Cove Brook	Taunton	SM	15-Jan to 30-Jun	01-Sep to 15-Nov	1	1	5	5	2	2	5	5	5	2	5	ND	5
Dighton	Segreganset River	Taunton	SM	01-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	1	3	ND	5	5	5	5	5	5	5
Dighton	Taunton River	Taunton	SM	15-Feb to 15-Nov		1	1	1	1	2	1	1	5	1	2	5	ND	1,2,3
Dighton	Three Mile River	Taunton	SM	01-Apr to 30-Jun	01-Sep to 15-Nov	1	1	5	5	5	3	5	5	5	5	5	5	5
Dorchester	Dorchester Bay	Neponset and Charles Rivers	NC	15-Feb to 15-Nov		4	4	5	4	4	4	4	5	5	1	4	ND	1,2,3
Dracut	Merrimack River	Merrimack River	NC	01-Apr to 15-Nov		1	1	1	5	5	5	5	1	1	5	5	5	5
Duxbury	Bluefish River	South Coastal	CCB	01-Feb to 15-Nov		1	1	5	5	3	ND	5	5	5	2	5	ND	1,2,3
Duxbury	Duxbury Bay	South Coastal	CCB	01-Feb to 15-Nov		4	4	4	4	4	4	4	5	5	2	4	1	1,2,3
Duxbury	Island Creek	South Coastal	CCB	01-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	1	1	5	5	5	5	5	5	5	5
E. Bridgewater	Forge Pond (via Meadow Brook)	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	ND	5	5	5	5	5	5	5
E. Bridgewater	Meadow Brook	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
E. Bridgewater	Satucket River	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	5	5	5	5	5	5	5	5
East Hampton	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Eastham	Boat Meadow River	North Cape Cod	CCB	01-Feb to 15-Nov		4	ND	ND	ND	ND	4	ND	5	5	3	5	ND	1,2,3
Eastham	Herring Pond (via Herring River)	North Cape Cod	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	2	2	5	5	5	5	5	5	5
Eastham	Herring River	North Cape Cod	CCB	01-Feb to 15-Nov		1	5	5	5	3	4	3	5	5	3	5	ND	1,2,3
Eastham	Rock Harbor Creek	North Cape Cod	CCB	01-Feb to 15-Nov		1	5	5	5	4	1	4	5	5	3	5	1	1,2,3
Edgartown	Caleb Pond	Islands	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	ND	ND	3	5	1	1,2,3
Edgartown	Cape Pogue Bay	Islands	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	ND	ND	3	5	1	1,2,3
Edgartown	Edgartown Great Pond	Islands	SM	15-Jan to 15-Nov		1	5	1	5	1	1	1	5	5	1	5	ND	1,2,3
Edgartown	Edgartown Harbor	Islands	SM	15-Jan to 15-Nov		4	4	5	5	1	1	1	5	5	1	4	1	1,2,3
Edgartown	Eel Pond	Islands	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	ND	ND	1	4	4	1,2,3
Edgartown	Katama Bay	Islands	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	ND	ND	3	5	1	1,2,3
Edgartown	Mattakeset Herring Creek	Islands	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	1	1	ND	5	5	5	5	5	5
Edgartown	Oyster Pond	Islands	SM	15-Jan to 15-Nov		1	5	5	5	3	3	3	5	5	3	5	4	1,2,3
Edgartown	Sengekontacket Pond	Islands	SM	15-Jan to 15-Nov		1	5	5	5	3	3	ND	5	5	3	5	1	1,2,3
Edgartown	Trapps Pond	Islands	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	ND	5	5	5	5	5	5
Erving	Millers River	Connecticut River	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	5	1	1	5	3	5	5	1	5	5	5	5	5
Essex	Chebacco Lake (via Essex River/Alewife Brook)	North Coastal	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	1	3	5	5	3	ND	5	5	5	5	5	5	5
Essex	Essex Bay	North Coastal	NC	15-Feb to 15-Nov		1	1	5	4	2	4	4	5	5	1	4	ND	1,2,3
Essex	Essex River/Alewife Brook	North Coastal	NC	15-Feb to 15-Nov		1	3	5	1	1	3	3	5	5	2	5	ND	1,2,3
Everett	Mystic River	Mystic River	NC	15-Feb to 15-Nov		1	1	1	5	1	1	2	5	5	3	5	ND	1,2,3
Fairhaven	Acushnet River	Buzzards Bay	SM	15-Jan to 15-Nov		1	1	5	1	1	3	ND	5	5	3	5	1	1,2,3
Fairhaven	Brandt Island Cove	Buzzards Bay	SM	15-Jan to 15-Nov		5	5	5	5	5	5	5	5	5	3	5	1	1,2,3
Fairhaven	Nasketucket Bay	Buzzards Bay	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	4	1	1,2,3
Fairhaven	New Bedford/Fairhaven Inner Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		1	1	5	1	1	3	ND	5	5	2	5	1	1,2,3
Fairhaven	New Bedford/Fairhaven Outer Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		4	4	5	4	4	ND	ND	5	5	3	5	1	1,2,3
Fairhaven	West Island South	Buzzards Bay	SM	15-Jan to 15-Nov		4	4	ND	4	4	4	4	5	5	3	4	1	1,2,3
Fall River	Mount Hope Bay	Narragansett Bay	SM	15-Jan to 15-Nov		2	2	ND	ND	2	2	2	5	5	1	5	1	1,2,3

Appendix B (Continued). Presence of selected marine fisheries species in Massachusetts coastal waterbodies.

Coastal Waters, Embayments and Rivers

Town	Waterbody Name	Watershed	Region	Spring TOY Restriction	Fall TOY Restriction	River herring: Alewife	River herring: Blueback	American shad	Rainbow Smelt	American eel	White Perch	Atlantic tomcod	Atlantic salmon	Sturgeon spp.	Winter flounder	Atlantic cod	Horseshoe crab	Shellfish
Falmouth	Cedar Lake	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	5	5	5	5	5	5	5	5
Falmouth	Childs River	South Cape Cod	SM	15-Jan to 15-Nov		1	5	5	5	2	1	2	5	5	2	5	ND	1,2,3
Falmouth	Coonamessett Pond (via Coonamessett River)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	5	5	5	5	5	5	5
Falmouth	Coonamessett River	South Cape Cod	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	3	5	5	5	5	5	5
Falmouth	Eel Pond, Woods Hole	South Cape Cod	SM	15-Jan to 15-Nov		ND	ND	5	5	4	4	4	5	5	3	5	ND	1,2,3
Falmouth	Eel Pond/Eel River	South Cape Cod	SM	15-Jan to 15-Nov		ND	ND	5	4	2	3	2	5	5	1	4	1	1,2,3
Falmouth	Falmouth Inner Harbor	South Cape Cod	SM	15-Jan to 15-Nov		5	5	5	5	5	ND	ND	5	5	3	5	4	1,2,3
Falmouth	Flax Pond	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Falmouth	Fresh River Flows from Siders Pond (DMF surveys)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Falmouth	Great Harbor	South Cape Cod	SM	15-Jan to 15-Nov		5	5	5	5	4	4	4	5	5	3	5	4	1,2,3
Falmouth	Great Pond	South Cape Cod	SM	15-Jan to 15-Nov		4	4	ND	ND	ND	ND	ND	ND	ND	1	5	1	1,2,3
Falmouth	Green Pond	South Cape Cod	SM	15-Jan to 15-Nov		1	5	5	5	3	1	5	5	5	3	5	1	1,2,3
Falmouth	Herring Brook	Buzzards Bay	SM	15-Mar to 15-Nov		1	5	5	5	3	3	5	5	5	5	5	5	1,2,3
Falmouth	Little Harbor	South Cape Cod	SM	15-Jan to 15-Nov		ND	ND	5	5	4	4	4	5	5	3	5	4	1,2,3
Falmouth	Little Pond	South Cape Cod	SM	15-Jan to 15-Nov		5	5	5	5	5	5	5	5	5	3	5	ND	1,2,3
Falmouth	Mill Pond (via Green Pond)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	1	5	5	5	5	5	5	5
Falmouth	Oyster Pond (via Trunk River)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	1	4	5	5	5	5	5	5
Falmouth	Perch Pond	South Cape Cod	SM	15-Jan to 15-Nov		ND	ND	5	5	ND	ND	1	5	5	1	5	1	1,2,3
Falmouth	Quashnet River	South Cape Cod	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	2	5	5	5	5	5	5
Falmouth	Quissett Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		5	5	5	5	5	5	ND	5	5	3	5	4	1,2,3
Falmouth	Salt Pond	South Cape Cod	SM	15-Mar to 15-Nov		1	5	5	5	3	3	5	5	5	4	5	5	1,2,3
Falmouth	Shivericks Pond (via Fresh River)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Falmouth	Siders Pond	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	5	5	5	5	5	5	5	5
Falmouth	Trunk River	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	3	5	5	5	5	5	5	5
Falmouth	Waquoit Bay	South Cape Cod	SM	15-Jan to 15-Nov		4	4	5	5	2	4	4	5	5	1	5	1	1,2,3
Falmouth	West Falmouth Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		4	4	5	5	3	4	4	5	5	1	5	4	1,2,3
Falmouth	Wild Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		4	5	5	5	4	5	5	5	5	1	4	1	1,2,3
Falmouth	Wild Harbor River	Buzzards Bay	SM	15-Mar to 15-Nov		1	5	5	5	3	5	5	5	5	3	5	5	1,2,3
Falmouth	Wings Pond (via Herring Brook)	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Freetown	Assonet River	Taunton	SM	15-Jan to 15-Nov		1	1	5	1	3	1	5	5	5	2	5	ND	1,2,3
Freetown	Bleachery Reservoir (via Rattlesnake Brook)	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	ND	5	5	5	5	5	5	5
Freetown	Forge Pond (via Assonet River)	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	ND	5	5	5	5	5	5	5
Freetown	Rattlesnake Brook	Taunton	SM	01-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	1	3	1	5	5	5	5	5	5	5
Freetown	Taunton River	Taunton	SM	15-Jan to 15-Nov		1	1	1	1	2	1	1	5	1	2	5	ND	1,2,3
Georgetown	Pentucket Pond (via Parker River)	Parker	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	1	ND	5	5	3	ND	5	5	5	5	5	5	5
Georgetown	Rock Pond (via Parker River)	Parker	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	2	ND	5	5	3	ND	5	5	5	5	5	5	5
Gill	Connecticut River	Connecticut River	SM	01-Apr to 15-Jul	01-Sep to 15-Nov	5	1	1	5	5	5	5	1	5	5	5	5	5
Gloucester	Alewife Brook	North Coastal	NC	15-Mar to 30-Jun	15-Sep to 31-Oct	ND	ND	5	5	3	5	5	5	5	5	5	5	5
Gloucester	Annisquam River	North Coastal	NC	15-Feb to 15-Nov		ND	2	5	4	4	4	4	5	5	1	4	ND	1,2,3
Gloucester	Essex Bay	North Coastal	NC	15-Mar to 15-Nov		1	1	5	4	2	4	4	5	5	1	4	ND	1,2,3
Gloucester	Gloucester Harbor	North Coastal	NC	15-Feb to 15-Nov		1	1	5	4	1	4	4	5	5	1	4	ND	1,2,3
Gloucester	Lily Pond (via Little River)	North Coastal	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Gloucester	Little River	North Coastal	NC	15-Feb to 15-Nov		1	1	5	1	1	5	5	5	5	2	5	ND	1,2,3
Gosnold	Cuttyhunk Pond	Islands	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	1	1,2,3
Gosnold	Tarpaulin Cove	Islands	SM	15-Jan to 15-Nov		ND	ND	5	5	4	5	4	5	5	3	4	1	1,2,3
Greenfield	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Greenfield	Deerfield River	Connecticut River	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	5	1	1	5	3	5	5	1	5	5	5	5	5
Groveland	Merrimack River	Merrimack River	NC	01-Mar to 15-Nov		1	1	1	1	1	1	4	1	1	5	5	5	5
Hadley	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Hamilton	Chebacco Lake (via Essex River/Alewife Brook)	North Coastal	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	1	3	5	5	3	5	5	5	5	5	5	5	5
Hamilton	Essex River/Alewife Brook	North Coastal	NC	15-Feb to 30-Jun	01-Sep to 15-Nov	1	3	5	1	1	3	3	5	5	2	5	ND	5
Hanover	Indian Head River	South Coastal	CCB	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	1	1	5	5	5	5	5	5	5
Hanover	North River	South Coastal	CCB	01-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	4	1	1	1	5	5	1	5	ND	5
Hanover	Third Herring Brook	South Coastal	CCB	01-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	1	3	5	5	5	5	5	5	5	5
Hanson	Herring Brook	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	5	5	5	5	5	5	5	5
Hanson	Oldham Pond (via Herring Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Harwich	Allen Harbor	South Cape Cod	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	4	1,2,3
Harwich	Andrews River	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	5	5	5	5	5	5	5	5
Harwich	Herring River	South Cape Cod	SM	15-Jan to 15-Nov		1	1	5	5	1	1	3	5	5	1	5	4	1,2,3
Harwich	Hinkleys Pond	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Harwich	Long Pond	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	5	5	5	5	5	5	5
Harwich	Muddy Creek	South Cape Cod	SM	15-Jan to 15-Nov		1	5	5	5	1	4	3	5	5	3	5	ND	1,2,3
Harwich	Red River	South Cape Cod	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	5	5	5	1	ND	3	5	5	5	5	5	5
Harwich	Saquatucket Harbor	South Cape Cod	SM	15-Jan to 15-Nov		4	ND	ND	ND	ND	ND	ND	5	5	3	5	4	1,2,3
Harwich	Skinequit Pond (via Red River)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	1	ND	5	5	5	5	5	5	5
Harwich	Wychmere Harbor	South Cape Cod	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	4	1,2,3

Appendix B (Continued). Presence of selected marine fisheries species in Massachusetts coastal waterbodies.

Coastal Waters, Embayments and Rivers

Town	Waterbody Name	Watershed	Region	Spring TOY Restriction	Fall TOY Restriction	River herring: Alewife	River herring: Blueback	American shad	Rainbow Smelt	American eel	White Perch	Atlantic tomcod	Atlantic salmon	Sturgeon spp.	Winter flounder	Atlantic cod	Horseshoe crab	Shellfish
Hatfield	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Haverhill	Merrimack River	Merrimack River	NC	01-Mar to 15-Nov		1	1	1	1	1	1	4	1	1	5	5	5	5
Hingham	Accord Brook	Weymouth and Weir Rivers	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	5	5	5	5	5	5	5	5
Hingham	Broad Cove	Weymouth and Weir Rivers	NC	15-Mar to 30-Jun	15-Sep to 31-Oct	ND	ND	5	4	3	5	5	5	5	4	5	ND	5
Hingham	Foundry Pond (via Weir River)	Weymouth and Weir Rivers	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Hingham	Fresh River	Weymouth and Weir Rivers	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	ND	ND	5	1	1	5	5	5	5	5	5	5	5
Hingham	Fulling Mill Brook	Weymouth and Weir Rivers	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	5	5	5	5	5	5	5	5
Hingham	Hingham Bay	Weymouth and Weir Rivers	NC	15-Feb to 15-Nov		4	4	4	4	4	4	4	5	5	1	4	ND	1,2,3
Hingham	Hingham Harbor	Weymouth and Weir Rivers	NC	15-Feb to 15-Nov		4	4	4	4	4	4	4	5	5	3	5	1	1,2,3
Hingham	Triphammer Pond (via Accord Brook)	Weymouth and Weir Rivers	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Hingham	Turkey Hill Run	Weymouth and Weir Rivers	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	3	5	5	5	5	5	5	5	5
Hingham	Weir River	Weymouth and Weir Rivers	NC	15-Feb to 15-Nov		1	1	5	1	1	3	1	5	5	3	5	5	1,2,3
Holyoke	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Hull	Straits Pond	Weymouth and Weir Rivers	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	4	3	5	4	5	5	5	5	5	5
Hull	Weir River	Weymouth and Weir Rivers	NC	15-Feb to 15-Nov		1	1	5	1	1	3	1	5	5	3	5	5	1,2,3
Huntington	Westfield River	Connecticut River	SM	15-Mar to 15-Jul	15-Sep to 31-Oct	5	5	5	5	3	5	5	1	5	5	5	5	5
Ipswich	Egypt River	Ipswich	NC	01-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	1	1	3	5	5	5	5	5	5	5
Ipswich	Ipswich River	Ipswich	NC	15-Feb to 15-Nov		1	1	5	1	1	3	5	5	5	2	5	ND	1,2,3
Ipswich	Plum Island Sound	Parker	NC	15-Feb to 15-Nov		1	1	5	4	1	4	4	5	5	1	4	1	1,2,3
Kingston	Furnace Brook	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Kingston	Halls Brook	South Coastal	CCB	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	1	5	5	5	5	5	5	5	5
Kingston	Jones River	South Coastal	CCB	01-Feb to 15-Nov		1	1	1	1	1	1	1	5	5	2	5	ND	1,2,3
Kingston	Kingston Bay	South Coastal	CCB	01-Feb to 15-Nov		4	4	4	4	4	4	4	5	5	2	4	1	1,2,3
Kingston	Laundry Brook	South Coastal	CCB	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	3	5	5	5	5	5	5	5	5
Kingston	Russle Pond (via Furnace Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	ND	5	5	3	ND	5	5	5	5	5	5	5
Kingston	Smelt Brook	South Coastal	CCB	01-Feb to 30-Jun	15-Sep to 31-Oct	5	5	5	1	3	5	5	5	5	2	5	ND	5
Kingston	Soules Pond (via Furnace Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	ND	5	5	3	ND	5	5	5	5	5	5	5
Kingston	Sylvia Pond (via Furnace Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	ND	5	5	3	ND	5	5	5	5	5	5	5
Lakeville	Assawompset Pond (via Nemasket River)	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Lakeville	Assonet River	Taunton	SM	15-Jan to 30-Jun	01-Sep to 15-Nov	1	1	5	1	3	1	5	5	5	2	5	ND	5
Lakeville	Long Pond (via Nemasket River)	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	5	5	5	5	5	5	5
Lakeville	Nemasket River	Taunton	SM	15-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	ND	3	ND	ND	5	5	5	5
Lakeville	Poquoy Brook	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	ND	5	5	5	5	5	5	5
Lawrence	Merrimack River	Merrimack River	NC	01-Mar to 15-Nov		1	1	1	1	1	1	4	1	1	5	5	5	5
Lawrence	Spickett River	Merrimack River	NC	15-Mar to 15-Jul	15-Sep to 31-Oct	ND	ND	1	5	3	5	5	ND	ND	5	5	5	5
Longmeadow	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Lowell	Concord River	North Coastal	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Lowell	Merrimack River	Merrimack River	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Manchester	Bennet Brook	North Coastal	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	ND	ND	5	1	1	5	5	5	5	5	5	5	5
Manchester	Chubb Creek	North Coastal	NC	15-Feb to 30-Jun	15-Sep to 31-Oct	5	5	5	1	1	5	3	5	5	5	5	5	5
Manchester	Sawmill Brook	North Coastal	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	1	5	5	5	5	5	5	5	5
Marblehead	Marblehead Harbor	North Coastal	NC	15-Feb to 15-Nov		ND	ND	5	4	4	4	4	5	5	2	4	ND	1,2,3
Marion	Hathaway Pond (via Sippican River)	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	1	ND	5	5	5	5	5	5	5
Marion	Sippican Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	4	1	1,2,3
Marion	Sippican River	Buzzards Bay	SM	15-Jan to 15-Nov		1	5	5	2	3	5	3	5	5	3	5	ND	1,2,3
Marshfield	Green Harbor	South Coastal	CCB	01-Feb to 15-Nov		2	2	ND	ND	ND	ND	ND	5	5	3	5	4	1,2,3
Marshfield	North River	South Coastal	CCB	01-Feb to 15-Nov		1	1	1	4	1	1	1	5	5	1	5	4	1,2,3
Marshfield	South River	South Coastal	CCB	01-Feb to 15-Nov		1	1	1	1	3	5	5	5	5	3	5	ND	1,2,3
Mashpee	Johns Pond (via Quashnet River)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Mashpee	Mashpee River	South Cape Cod	SM	15-Jan to 15-Nov		1	1	5	5	3	1	3	5	5	3	5	ND	1,2,3
Mashpee	Mashpee-Wakeby Pond	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Mashpee	Popponesset Bay	South Cape Cod	SM	15-Jan to 15-Nov		4	4	ND	ND	ND	ND	ND	5	5	3	5	1	1,2,3
Mashpee	Quashnet River	South Cape Cod	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	2	5	5	5	5	5	5
Mashpee	Santuit Pond	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	5	5	5	5	5	5	5
Mashpee	Santuit River	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	5	5	5	5	5	5	5
Mashpee	Shoestring Bay	South Cape Cod	SM	15-Jan to 15-Nov		1	1	5	5	3	1	3	5	5	3	5	5	1,2,3
Mashpee	Waquoit Bay	South Cape Cod	SM	15-Jan to 15-Nov		4	4	5	5	2	4	4	5	5	1	5	1	1,2,3
Mashpee	Washburn Pond (via Quashnet River (DMF surveys))	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Mattapoisett	Mattapoisett Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		4	4	ND	4	4	ND	ND	5	5	3	4	1	1,2,3
Mattapoisett	Mattapoisett River	Buzzards Bay	SM	15-Jan to 15-Nov		1	1	5	4	3	3	ND	5	5	3	5	ND	1,2,3

Appendix B (Continued). Presence of selected marine fisheries species in Massachusetts coastal waterbodies.

Coastal Waters, Embayments and Rivers

Town	Waterbody Name	Watershed	Region	Spring TOY Restriction	Fall TOY Restriction	River herring: Alewife	River herring: Blueback	American shad	Rainbow Smelt	American eel	White Perch	Atlantic tomcod	Atlantic salmon	Sturgeon spp.	Winter flounder	Atlantic cod	Horseshoe crab	Shellfish
Medford	Mystic River	Mystic River	NC	15-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	5	1	1	2	5	5	3	5	ND	5
Medford	Upper & Lower Mystic Lakes (via Mystic River)	Mystic River	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	3	5	5	5	5	5	5	5
Merrimac	Merrimack River	Merrimack River	NC	01-Mar to 15-Nov		1	1	1	1	1	1	4	1	1	5	5	5	5
Methuen	Spickett River	Merrimack River	NC	15-Mar to 15-Jul	15-Sep to 31-Oct	ND	ND	1	5	3	5	5	ND	ND	5	5	5	5
Methuen	Merrimack River	Merrimack River	NC	01-Apr to 15-Nov		1	1	1	5	5	5	5	1	1	5	5	5	5
Middleborough	Fall Brook	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	3	5	5	5	5	5	5	5
Middleborough	Great Quittacas Pond (via Nemasket River)	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Middleborough	Nemasket River	Taunton	SM	15-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	ND	3	5	5	5	5	5	5
Middleborough	Poquoy Brook	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	ND	5	5	5	5	5	5	5
Milton	Gulliver Creek	Neponset River	NC	15-Feb to 15-Nov		4	4	4	1	3	5	5	5	5	2	5	ND	1,2,3
Milton	Neponset River	Neponset River	NC	15-Feb to 15-Nov		1	1	1	1	1	1	3	5	5	3	5	ND	1,2,3
Montague	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Montague	Millers River	Connecticut River	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	5	1	1	5	3	5	5	1	5	5	5	5	5
Montgomery	Westfield River	Connecticut River	SM	15-Mar to 15-Jul	15-Sep to 31-Oct	5	5	1	5	3	5	5	1	5	5	5	5	5
N. Andover	Shawsheen River	Merrimack-Shawsheen	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Nantucket	Folgers Marsh	Islands	SM	15-Feb to 15-Nov		1	5	5	5	3	ND	3	5	5	4	5	5	1,2,3
Nantucket	Hither Creek	Islands	SM	15-Jan to 15-Nov		1	1	5	5	3	ND	ND	5	5	3	5	ND	1,2,3
Nantucket	Hummock Pond	Islands	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	ND	5	5	5	5	5	5
Nantucket	Nantucket Harbor	Islands	SM	15-Jan to 15-Nov		4	ND	ND	ND	ND	ND	ND	5	5	3	4	1	1,2,3
Nantucket	Sesachacha Pond	Islands	SM	15-Feb to 15-Nov		1	1	5	5	3	1	3	5	5	4	5	ND	1,2,3
New Bedford	Acushnet River	Buzzards Bay	SM	15-Jan to 15-Nov		1	1	5	1	1	3	ND	5	5	3	5	1	1,2,3
New Bedford	Clarks Cove	Buzzards Bay	SM	15-Jan to 15-Nov		4	4	5	5	3	4	4	5	5	1	4	1	1,2,3
New Bedford	New Bedford/Faivhaven Inner Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		1	1	5	1	1	3	ND	5	5	2	5	1	1,2,3
New Bedford	New Bedford/Faivhaven Outer Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		4	4	5	4	4	ND	ND	5	5	3	5	1	1,2,3
Newbury	Merrimack River Estuary	Merrimack River	NC	15-Feb to 15-Nov		1	1	1	1	1	1	4	1	1	2	4	ND	1,2,3
Newbury	Parker River ACEC	Parker	NC	01-Mar to 15-Nov		1	1	5	1	1	1	4	5	5	1	4	1	1,2,3
Newbury	Plum Island Sound	Parker	NC	15-Mar to 15-Nov		1	1	5	4	1	4	4	5	5	1	4	1	1,2,3
Newburyport	Merrimack River Estuary	Merrimack River	NC	15-Feb to 15-Nov		1	1	1	1	1	1	4	1	1	2	4	1	1,2,3
North Andover	Merrimack River	Merrimack River	NC	01-Apr to 15-Nov		1	1	1	5	5	5	5	1	1	5	5	5	5
Northampton	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Northfield	Connecticut River	Connecticut River	SM	01-Apr to 15-Jul	01-Sep to 15-Nov	5	1	1	5	5	5	5	1	5	5	5	5	5
Norwell	First Herring Brook	South Coastal	CCB	01-Feb to 30-Jun	01-Sep to 15-Nov	1	5	5	1	1	ND	ND	5	5	1	5	ND	5
Norwell	North River	South Coastal	CCB	01-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	4	1	1	1	5	5	1	5	ND	5
Norwell	Second Herring Brook	South Coastal	CCB	01-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	1	3	5	5	5	5	5	5	5	5
Norwell	Third Herring Brook	South Coastal	CCB	01-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	1	3	5	5	5	5	5	5	5	5
Oak Bluffs	Farm Pond	Islands	SM	15-Jan to 15-Nov		1	5	5	5	1	1	ND	5	5	3	5	ND	1,2,3
Oak Bluffs	Harthaven	Islands	SM	15-Jan to 15-Nov		1	5	5	5	1	1	ND	5	5	3	5	ND	1,2,3
Oak Bluffs	Lagoon Pond	Islands	SM	15-Jan to 15-Nov		1	1	5	5	1	1	ND	5	5	1	5	1	1,2,3
Oak Bluffs	Oak Bluffs Harbor	Islands	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	1	5	4	1,2,3
Oak Bluffs	Sengekontacket Pond	Islands	SM	15-Jan to 15-Nov		1	5	5	5	3	ND	5	5	5	3	5	1	1,2,3
Oak Bluffs	Vineyard Haven Harbor	Islands	SM	15-Jan to 15-Nov		4	ND	ND	ND	ND	ND	ND	5	5	3	4	1	1,2,3
Orange	Millers River	Connecticut River	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	5	1	1	5	3	5	5	1	5	5	5	5	5
Orleans	Little Namskaket Creek	North Cape Cod	CCB	01-Feb to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	ND	1,2,3
Orleans	Pilgrim Lake	North Cape Cod	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	2	5	5	5	1	ND	5	5	5	5	5	5	5
Orleans	Rock Harbor Creek	North Cape Cod	CCB	01-Feb to 15-Nov		1	5	5	5	4	1	4	5	5	3	5	ND	1,2,3
Pembroke	Furnace Pond (via Herring Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Pembroke	Herring Brook	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	5	5	5	5	5	5	5	5
Pembroke	Indian Head River	South Coastal	CCB	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	1	1	5	5	5	5	5	5	5
Pembroke	Mill Ponds (via Herring Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Pembroke	North River	South Coastal	CCB	01-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	4	1	1	1	5	5	1	5	ND	5
Pembroke	Oldham Pond (via Herring Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Plainville	Ten Mile River	Narragansett Bay	SM	15-Jan to 15-Jul	01-Sep to 15-Nov	3	3	1	5	3	1	3	5	5	3	5	ND	5
Plymouth	Billington Sea (via Town Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	ND	5	5	3	ND	5	5	5	5	5	5	5
Plymouth	Eel River	South Coastal	CCB	01-Feb to 30-Jun	01-Sep to 15-Nov	1	1	5	1	1	2	1	5	5	2	5	ND	5
Plymouth	Ellisville Marsh	South Coastal	CCB	01-Feb to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	4	1,2,3
Plymouth	Halfway Pond (via Agawam River)	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	ND	ND	5	3	ND	5	5	5	5	5	5	5
Plymouth	Little Herring Pond (via Monument River)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	2	5	5	3	ND	5	5	5	5	5	5	5
Plymouth	Plymouth Bay	South Coastal	CCB	01-Feb to 31-Jan		4	4	4	4	4	4	4	5	5	2	2	1	1,2,3
Plymouth	Plymouth Beach	South Coastal	CCB	01-May to 15-Nov		4	4	5	5	4	5	5	5	5	5	5	1	1,2,3
Plymouth	Red Brook	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	5	5	5	5	5	5	5	5
Plymouth	Shingle Brook	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	5	5	5	5	5	5	5	5
Plymouth	Standish Mill Pond (via Town Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	ND	5	5	3	ND	5	5	5	5	5	5	5
Plymouth	Town Brook	South Coastal	CCB	01-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	1	1	5	5	5	5	5	5	5	5

Appendix B (Continued). Presence of selected marine fisheries species in Massachusetts coastal waterbodies.

Coastal Waters, Embayments and Rivers

Town	Waterbody Name	Watershed	Region	Spring TOY Restriction	Fall TOY Restriction	River herring: Alewife	River herring: Blueback	American shad	Rainbow Smelt	American eel	White Perch	Atlantic tomcod	Atlantic salmon	Sturgeon spp.	Winter flounder	Atlantic cod	Horseshoe crab	Shellfish
Provincetown	Provincetown Harbor	North Cape Cod	CCB	01-Feb to	15-Nov	ND	ND	ND	ND	ND	ND	ND	5	5	3	4	1	1,2,3
Quincy	Dorchester Bay	Neponset and Charles Rivers	NC	15-Feb to	15-Nov	4	4	5	4	4	4	4	5	5	1	4	ND	1,2,3
Quincy	Furnace Brook	Weymouth and Weir Rivers	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	1	5	5	5	5	5	5	5	5
Quincy	Quincy Bay	Weymouth and Weir Rivers	NC	15-Feb to	15-Nov	4	4	4	4	4	4	4	5	5	1	4	1	1,2,3
Quincy	Town River	Weymouth and Weir Rivers	NC	15-Feb to	15-Nov	5	5	5	1	3	5	5	5	5	1	5	ND	1,2,3
Raynham	Forge River	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	5	5	5	5	5	5	5	5
Raynham	Furnace Brook	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Raynham	Lake Nippenicket (via Town River)	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	2	3	5	5	3	ND	5	5	5	5	5	5	5
Raynham	Poquoy Brook	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	ND	5	5	5	5	5	5	5
Rehoboth	Palmer River	Narragansett Bay	SM	15-Jan to 15-Jul	01-Sep to 15-Nov	3	3	1	3	3	1	3	5	5	3	5	ND	5
Rehoboth	Rocky Run	Narragansett Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	5	5	5	5	5	5	5	5
Rochester	Leonards Pond (via Sippican River)	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Rochester	Sippican River	Buzzards Bay	SM	15-Jan to 30-Jun	01-Sep to 15-Nov	1	5	5	2	3	ND	3	5	5	3	5	ND	5
Rochester	Snipatuit Pond (via Mattapoisett River)	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Rockport	Mill Brook	North Coastal	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	1	5	5	5	5	5	5	5	5
Rockport	Sawmill Brook	North Coastal	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	1	5	5	5	5	5	5	5	5
Rowley	Mill River	Parker	NC	15-Feb to	15-Nov	2	1	1	1	1	3	ND	5	5	2	5	ND	1,2,3
Rowley	Ox Pasture Brook	Parker	NC	01-Mar to	31-May	ND	ND	5	1	5	5	5	5	5	5	5	5	5
Rowley	Plum Island Sound	Parker	NC	15-Feb to	15-Nov	1	1	5	4	1	4	4	5	5	1	4	1	1,2,3
Rowley	Rowley River	Parker	NC	15-Feb to	15-Nov	3	3	5	1	1	3	ND	5	5	2	5	ND	1,2,3
Russell	Westfield River	Connecticut River	SM	15-Mar to 15-Jul	15-Sep to 31-Oct	5	5	1	5	3	5	5	1	5	5	5	5	5
Salem	Beverly Harbor	North Coastal	NC	15-Feb to	15-Nov	4	4	5	4	4	4	4	5	5	1	4	ND	1,2,3
Salem	Forest River	North Coastal	NC	15-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	5	1	5	5	5	5	5	5	5	5
Salem	North River	North Coastal	NC	15-Feb to	15-Nov	3	3	5	1	1	1	5	5	5	2	5	ND	1,2,3
Salem	Salem Harbor	North Coastal	NC	15-Feb to	15-Nov	4	4	5	4	4	4	4	5	5	1	4	ND	1,2,3
Salisbury	Merrimack River Estuary	Merrimack River	NC	15-Feb to	15-Nov	1	1	1	1	1	1	4	1	1	2	4	ND	1,2,3
Sandwich	Cape Cod Canal	Buzzards Bay	SM	none		4	4	5	5	4	4	5	5	5	4	5	4	5
Sandwich	Mill Creek	North Cape Cod	CCB	01-Feb to	15-Nov	1	1	1	5	3	1	5	5	5	3	5	ND	1,2,3
Sandwich	Sandwich Harbor	North Cape Cod	CCB	01-Feb to	15-Nov	4	4	4	ND	ND	ND	ND	5	5	3	5	4	1,2,3
Sandwich	Scorton Harbor	North Cape Cod	CCB	01-Feb to	15-Nov	ND	ND	ND	ND	4	4	4	5	5	3	5	4	1,2,3
Saugus	Saugus River	North Coastal	NC	15-Feb to	15-Nov	1	1	5	1	1	1	1	5	5	2	5	ND	1,2,3
Saugus	Shute Brook	North Coastal	NC	01-Mar to	31-May	5	5	5	1	ND	5	5	5	5	5	5	5	5
Scituate	First Herring Brook	South Coastal	CCB	01-Feb to 30-Jun	01-Sep to 15-Nov	1	5	5	1	1	ND	ND	5	5	1	5	ND	5
Scituate	First Herring Brook Reservoir (via First Herring Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	5	5	5	5	5	5	5	5
Scituate	Musquashcut Brook	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	5	5	5	5	5	5	5	5
Scituate	North River	South Coastal	CCB	01-Feb to	15-Nov	1	1	1	4	1	1	1	5	5	1	5	ND	1,2,3
Scituate	Old Oaken Bucket Pond (via First Herring Brook)	South Coastal	CCB	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Scituate	Satuit Brook	South Coastal	CCB	01-Mar to 30-Jun	15-Sep to 31-Oct	ND	ND	5	1	3	5	5	5	5	5	5	5	5
Scituate	Scituate Harbor	South Coastal	CCB	01-Feb to	15-Nov	ND	ND	ND	ND	ND	ND	ND	5	5	3	5	1	1,2,3
Scituate	South River	South Coastal	CCB	01-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	1	3	5	5	5	5	3	5	ND	5
Seekonk	Runnins River	Narragansett Bay	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	3	3	1	5	3	3	5	5	5	5	5	5	5
Seekonk	Ten Mile River	Narragansett Bay	SM	15-Feb to 15-Jul	01-Sep to 15-Nov	3	3	1	5	3	1	3	5	5	3	5	ND	5
Shelburne	Deerfield River	Connecticut River	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	5	1	1	5	3	5	5	1	5	5	5	5	5
Somerset	Lee River	Narragansett Bay	SM	15-Mar to	15-Nov	2	2	5	5	3	ND	5	5	5	3	5	5	1,2,3
Somerset	Mount Hope Bay	Narragansett Bay	SM	15-Jan to	15-Nov	2	2	ND	ND	2	2	2	5	5	1	5	1	1,2,3
Somerset	Taunton River	Taunton	SM	15-Jan to	15-Nov	1	1	1	1	2	1	1	5	1	2	5	1	1,2,3
Somerville	Mystic River	Mystic River	NC	15-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	5	1	1	2	5	5	3	5	ND	5
South Hadley	Connecticut River	Connecticut River	SM	01-Apr to	15-Nov	5	1	1	5	5	5	5	1	1	5	5	5	5
Springfield	Connecticut River	Connecticut River	SM	01-Apr to	15-Nov	5	1	1	5	5	5	5	1	1	5	5	5	5
Sunderland	Connecticut River	Connecticut River	SM	01-Apr to	15-Nov	5	1	1	5	5	5	5	1	1	5	5	5	5
Swansea	Cole River	Narragansett Bay	SM	15-Jan to	15-Nov	1	1	5	1	3	1	3	5	5	1	5	1	1,2,3
Swansea	Kickamuit River	Narragansett Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	ND	5	5	5	5	5	5	5
Swansea	Lee River	Narragansett Bay	SM	15-Jan to	15-Nov	2	2	5	5	3	ND	5	5	5	3	5	5	1,2,3
Swansea	Mount Hope Bay	Narragansett Bay	SM	15-Jan to	15-Nov	2	2	ND	ND	2	2	2	5	5	1	5	ND	1,2,3
Swansea	Rocky Run	Narragansett Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	5	5	5	5	5	5	5	5
Taunton	Furnace Brook	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Taunton	Lake Rico (via Furnace Brook)	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	5	5	5	5	5	5	5	5
Taunton	Mill River	Taunton	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	3	5	5	5	5	5	5
Taunton	Oakland Mill Ponds	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	ND	5	5	5	5	5	5	5
Taunton	Segreganset River	Taunton	SM	01-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	1	3	ND	5	5	5	5	5	5	5

Appendix B (Continued). Presence of selected marine fisheries species in Massachusetts coastal waterbodies.

Coastal Waters, Embayments and Rivers

Town	Waterbody Name	Watershed	Region	Spring TOY Restriction	Fall TOY Restriction	River herring: Alewife	River herring: Blueback	American shad	Rainbow Smelt	American eel	White Perch	Atlantic tomcod	Atlantic salmon	Sturgeon spp.	Winter flounder	Atlantic cod	Horseshoe crab	Shellfish
Tewksbury	Concord River	North Coastal	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Tewksbury	Merrimack River	Merrimack River	NC	01-Apr to 15-Nov		1	1	1	5	5	5	5	1	1	5	5	5	5
Tisbury	Lake Tashmoo	Islands	SM	15-Jan to 15-Nov		1	5	5	5	3	ND	ND	5	5	1	5	1	1,2,3
Tisbury	Mink Meadows	Islands	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	4	1,2,3
Truro	Pamet Harbor	North Cape Cod	CCB	01-Feb to 15-Nov		1	1	5	5	3	5	ND	5	5	1	5	1	1,2,3
Truro	Pamet River	North Cape Cod	CCB	01-Feb to 15-Nov		1	1	5	5	3	5	ND	5	5	1	5	1	1,2,3
Tyngsborough	Merrimack River	Merrimack River	NC	none		5	5	5	5	5	5	5	5	5	5	5	5	5
W. Bridgewater	Town River	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	5	5	5	5	5	5	5	5
W. Tisbury	James Pond	Islands	SM	15-Mar to 15-Nov		1	5	5	5	3	ND	ND	5	5	4	5	ND	1,2,3
W. Tisbury	Mill Brook	Islands	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	3	ND	5	5	5	5	5	5
W. Tisbury	Tiasquam River	Islands	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	1	ND	ND	5	5	5	5	5	5
W. Tisbury	Tisbury Great Pond	Islands	SM	15-Jan to 15-Nov		1	5	5	5	1	1	1	5	5	3	5	ND	1,2,3
Wareham	Agawam River	Buzzards Bay	SM	15-Jan to 15-Nov		1	1	1	1	3	1	3	5	5	3	5	ND	1,2,3
Wareham	Bournes Cove	Buzzards Bay	SM	15-Jan to 15-Nov		5	5	5	5	5	5	5	5	5	3	5	4	1,2,3
Wareham	Dicks Pond (via Gibbs Brook)	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	ND	5	5	5	5	5	5	5
Wareham	Gibbs Brook	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Wareham	Little Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		ND	ND	ND	ND	ND	ND	ND	5	5	3	5	1	1,2,3
Wareham	Red Brook	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	5	5	5	5	5	5	5	5
Wareham	Sippican River	Buzzards Bay	SM	15-Jan to 15-Nov		1	5	5	2	3	ND	3	5	5	3	5	ND	1,2,3
Wareham	Wankinco River	Buzzards Bay	SM	15-Feb to 30-Jun	01-Sep to 15-Nov	1	1	5	5	1	3	3	5	5	5	5	5	5
Wareham	Wareham River	Buzzards Bay	SM	15-Jan to 15-Nov		4	4	4	4	4	ND	ND	5	5	3	5	1	1,2,3
Wareham	Weweantic River	Buzzards Bay	SM	15-Jan to 15-Nov		1	1	5	1	1	1	1	5	5	3	5	5	1,2,3
Wareham	Glen Charlie Pond (via Agawam River)	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	ND	ND	5	3	ND	5	5	5	5	5	5	5
Wareham	Tihonet Pond (via Wankinco River)	Buzzards Bay	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Watertown	Charles River	Charles River	NC	15-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	1	1	1	1	5	5	5	5	5	5
Wellfleet	Herring River	North Cape Cod	CCB	1-Feb to 15-Nov		1	1	5	5	3	1	ND	5	5	1	5	ND	1,2,3
Wellfleet	Wellfleet Harbor	North Cape Cod	CCB	1-Feb to 15-Nov		4	4	5	5	4	4	4	5	5	1	5	1	1,2,3
Wendell	Millers River	Connecticut River	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	5	1	1	5	3	5	5	1	5	5	5	5	5
West Newbury	Merrimack River	Merrimack River	NC	01-Mar to 15-Nov		1	1	1	1	1	1	4	1	1	5	5	5	5
West Springfield	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
West Springfield	Westfield River	Connecticut River	SM	15-Mar to 15-Jul	01-Sep to 15-Nov	5	1	1	5	3	5	5	1	5	5	5	5	5
Westfield	Westfield River	Connecticut River	SM	15-Mar to 15-Jul	15-Sep to 31-Oct	5	5	1	5	3	5	5	1	5	5	5	5	5
Westport	Cockeast Pond	Buzzards Bay	SM	15-Jan to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	1	ND	5	5	2	5	ND	5
Westport	Richmond Pond	Buzzards Bay	SM	15-Mar to 15-Nov		1	1	5	5	3	5	5	5	5	4	5	5	1,2,3
Westport	Westport Harbor	Buzzards Bay	SM	15-Jan to 15-Nov		2	2	ND	4	4	ND	4	5	5	2	5	1	1,2,3
Westport	Westport River E. Branch	Buzzards Bay	SM	15-Jan to 15-Nov		1	1	5	2	1	1	2	5	5	2	5	ND	1,2,3
Westport	Westport River W. Branch	Buzzards Bay	SM	15-Jan to 15-Nov		1	1	5	2	3	1	2	5	5	2	5	ND	1,2,3
Weymouth	Back River	Weymouth and Weir Rivers	NC	15-Feb to 15-Nov		1	1	5	1	1	1	3	5	5	2	5	ND	1,2,3
Weymouth	Dump Creek	Weymouth and Weir Rivers	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	3	5	5	5	5	5	5	5	5
Weymouth	Mill Cove Creek	Weymouth and Weir Rivers	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	3	5	5	5	5	5	5	5	5
Weymouth	Smelt Brook	Weymouth and Weir Rivers	NC	01-Mar to 30-Jun	15-Sep to 31-Oct	5	5	5	1	3	5	5	5	5	5	5	5	5
Weymouth	Weymouth Back River ACEC	Weymouth and Weir Rivers	NC	15-Feb to 15-Nov		1	1	5	4	1	1	4	5	5	1	5	ND	1,2,3
Weymouth	Weymouth Fore River	Weymouth and Weir Rivers	NC	15-Feb to 15-Nov		1	1	5	1	1	1	1	5	5	1	5	ND	1,2,3
Weymouth	Whitman's Pond (via Weymouth Back River)	Weymouth and Weir Rivers	NC	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	3	5	5	5	5	5	5	5
Whately	Connecticut River	Connecticut River	SM	01-Apr to 15-Nov		5	1	1	5	5	5	5	1	1	5	5	5	5
Whitman	Forge Pond (via Meadow Brook)	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	3	3	5	5	3	ND	5	5	5	5	5	5	5
Whitman	Meadow Brook	Taunton	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	1	5	5	3	ND	5	5	5	5	5	5	5
Wilmington	Shawsheen River	Merrimack-Shawsheen	NC	15-Mar to 15-Jul	01-Sep to 15-Nov	1	1	1	5	3	5	5	5	5	5	5	5	5
Winchester	Mystic River	Mystic River	NC	15-Feb to 15-Jul	01-Sep to 15-Nov	1	1	1	5	1	1	2	5	5	3	5	ND	5
Windsor	Westfield River	Connecticut River	SM	15-Mar to 15-Jul	15-Sep to 31-Oct	5	5	5	5	3	5	5	1	5	5	5	5	5
Yarmouth	Bass River	South Cape Cod	SM	15-Jan to 15-Nov		1	2	5	5	1	1	2	5	5	1	5	1	1,2,3
Yarmouth	Chase Garden Creek	North Cape Cod	CCB	01-May to 15-Nov		4	ND	ND	ND	ND	ND	ND	5	5	5	5	1	1,2,3
Yarmouth	Hyannis Harbor	South Cape Cod	SM	15-Jan to 15-Nov		4	4	5	5	3	4	4	5	5	3	5	1	1,2,3
Yarmouth	Lewis Bay	South Cape Cod	SM	15-Jan to 15-Nov		4	4	5	5	3	4	4	5	5	1	5	ND	1,2,3
Yarmouth	Long Pond (via Parkers River)	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	ND	5	5	5	5	5	5	5
Yarmouth	Mill Creek	South Cape Cod	SM	15-Jan to 15-Nov		1	5	5	5	3	3	5	5	5	3	5	ND	1,2,3
Yarmouth	Parkers River	South Cape Cod	SM	15-Jan to 15-Nov		1	5	5	5	1	1	3	5	5	1	5	1	1,2,3
Yarmouth	Whites Brook	South Cape Cod	SM	15-Mar to 30-Jun	01-Sep to 15-Nov	1	5	5	5	3	5	5	5	5	5	5	5	5

Appendix C. Annotated Bibliography

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River herring

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List of Massachusetts Division of Marine Fisheries Technical Reports (continued from inside front cover)

TR-34 Nelson, G. A. 2008. **2007 Massachusetts striped bass monitoring report**.
TR-35 Barber, J. S., K. A. Whitmore, M. Rousseau, D. M. Chosid, and R. P. Glenn. 2009. **Boston Harbor artificial reef site selection and monitoring program.**
TR-36 Nelson, G. A. 2009. **Massachusetts striped bass monitoring report for 2008**.
TR-37 Leschen, A. S., R. K. Kessler, and B. T. Estrella. 2009. **Eelgrass restoration used as construction impact mitigation in Boston Harbor, Massachusetts.**
TR-38 King, J. R., M. J. Camisa, V. M. Manfredi. 2010. **Massachusetts Division of Marine Fisheries trawl survey effort, list of species recorded, and bottom temperature trends, 1978-2007.**
TR-39 Dean, M. J. 2010. **Massachusetts lobster fishery statistics for 2006**.
TR-40 Pol, M., P. He, and P. Winger. 2010. **Proceedings of the international technical workshop on gadoid capture by pots (GACAPOT).**
TR-41 Nelson, G. A. 2010. **Massachusetts striped bass monitoring report for 2009.**
TR-42 Chase, B. C. 2010. **Quality assurance program plan (QAPP) for water quality measurements for diadromous fish monitoring 2008-2012, version 1.0.**
TR-43 Evans, N. T., and A. S. Leschen. 2010. **Technical guidelines for the delineation, restoration, and monitoring of eelgrass (*Zostera marina*) in Massachusetts coastal waters.**
TR-44 Chase, B. C., T. Callaghan, M. B. Dechant, P. Patel. 2010. **River herring spawning and nursery habitat assessment: Upper Mystic Lake, 2007-2008.**
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