

## FINAL REPORT

State: NEW HAMPSHIRE Grant: F-61-R-25/F22AF00514

Grant Title: NEW HAMPSHIRE'S MARINE FISHERIES INVESTIGATIONS

Project III: MULTI-SPECIES EVALUATION

Job 2: COASTAL HARVESTERS PROGRAM

Objective: To collect catch and effort information from coastal harvesters targeting and catching recreationally important finfish species or species not currently being reported to the National Oceanic and Atmospheric Administration Fisheries Service directly from harvesters fishing strictly in state waters.

Period Covered: January 1, 2019 - December 31, 2023

### ABSTRACT

Between January 1, 2019 and December 31, 2023, the NH Fish and Game Department conducted one investigation per year to collect catch and effort information from coastal harvesters targeting and catching recreationally important finfish species from New Hampshire's coastal and estuarine waters. Individuals who obtain a Harvest Permit to take marine species in New Hampshire coastal and estuarine waters are required to complete and submit trip-level logbooks on a monthly basis detailing harvest and effort. The majority of those who obtain this permit are seeking bait for other recreational and commercial fisheries. The harvest of these baitfish is not captured or quantified by any other harvest and effort reporting programs.

The total annual harvest of marine species from New Hampshire coastal and estuarine waters during 2019 to 2023 ranged from 64,881 pounds in 2021, to 809,998 pounds in 2022. Atlantic Menhaden *Brevoortia tyrannus*, American Eel *Anguilla rostrata*, and Killifish *Fundulus spp.* were consistently harvested throughout the reporting period as bait for recreational fisheries. Other coastal finfish, such as Atlantic Mackerel *Scomber scombrus* and Atlantic Tomcod *Microgadus tomcod* were harvested periodically as bait. In response to low river herring spawning returns, the NH Fish and Game Department closed the river herring (Alewife *Alosa pseudoharengus* and Blueback Herring *Alosa aestivalis*) fishery to all harvest in

2021. Participation in the coastal harvester program shifted interest in species harvested from river herring to Atlantic Menhaden.

Harvesters used 10 different gear types to capture various marine species from New Hampshire waters between 2019 and 2023. Atlantic Menhaden represented the most sought after and harvested species of baitfish. Cast nets and minnow traps were used to harvest the widest variety of species. Three different gear types were used to harvest Atlantic Menhaden; seine nets harvested the majority each year. Four different gear types were used to harvest river herring in 2019 and 2020; cast nets harvested the majority each year. American Eels were primarily harvested using eel pots and Killifish were harvested solely by minnow traps.

## INTRODUCTION

In New Hampshire (NH), persons harvesting horseshoe crabs *Limulus polyphemus* by any method, American Eels *Anguilla rostrata* by any method other than angling, or marine finfish by seine, net, weir, pot, or trap from coastal and estuarine waters are required to obtain a Harvest Permit from the NH Fish and Game Department. A Harvest Permit is also required to take any species, except American lobster *Homarus americanus* and crabs, for commercial purposes from state waters, unless reported through another method (e.g., National Oceanic and Atmospheric Administration's (NOAA) Vessel Trip Reporting Program). The permittees are required to complete monthly logbooks on their harvest and effort. Collection of this information fills a gap in the fishery-dependent data collection program. Most of these harvesters either harvest exclusively in state waters or retain the marine species they catch for personal use (e.g., food, bait, etc.); thus, the information is not captured by NOAA's Fisheries Service commercial reporting program. Due to certain gear restrictions (i.e., no mobile gear in state waters) few traditional commercial finfish operations in NH obtain this permit. The majority of people obtaining the permit are individuals seeking bait for various fisheries such as the recreational Striped Bass *Morone saxatilis* fishery and NH's commercial lobster fishery.

Many of the fish targeted and retained by these harvesters, such as river herring (Alewife *Alosa pseudoharengus* and Blueback Herring *Alosa aestivalis*), Atlantic Menhaden *Brevoortia tyrannus*, and American Eel, are forage for important recreationally harvested finfish species.

Information from the coastal harvester's mandatory logbooks provides annual harvest and effort information useful for improving the quality of stock assessments and fisheries management.

## PROCEDURES

Mandatory trip-level logbooks are required to be submitted on a monthly basis for those months an individual holds a permit to harvest marine species within the coastal or estuarine waters of NH. The required elements to be reported are in accordance with the Atlantic Coastal Cooperative Statistics Program's standards which include date fished, trip number, species sought, quantity of species retained, disposition of the harvest, area fished, gear type, number and size of gear, effort (in hours), number of sets, and quantity of bycatch by species. If the individual used a boat or sold their catch, the following elements are also required: port, county, and state harvest was landed, hours at sea, number of crew, dealer license number, and unload date. The reports are required to be submitted by the tenth day of the following month for those months the individual is permitted to harvest whether or not effort occurred. Permits for subsequent years are not issued to an individual until the previous years' reporting requirements have been met.

The harvest information is reported in either weight or quantity. All quantitative data are converted to weight using the conversions in Table 3.2-1. Harvest weight, effort, and CPUE data are compiled by species. Effort measurements for each gear are presented in Table 3.2-2. If the number of harvesters reporting a single species is less than three, harvest, effort, and location data are not published to protect the confidentiality of an individual's data.

## RESULTS

Between January 1, 2019 and December 31, 2023, the NH Fish and Game Department conducted one investigation per year to collect catch and effort information from coastal harvesters targeting and catching recreationally important finfish species from New Hampshire's coastal and estuarine waters. The lowest number of permits issued and lowest reported effort by permittees during the reporting period occurred in 2023. Of the 63 individuals that obtained a harvest permit in 2023, only 11 actively fished and reported catch and effort information (Table 3.2-3). The largest total annual harvest in the reporting period for all marine species was 809,998 pounds in 2022 (Table 3.2-4). A complete summarization of each year's harvest by month and species is presented in Appendix Tables 3.2-1 through 3.2-5. Ten different gear types were used to harvest 12 different taxa (Tables 3.2-4 and Appendix Tables 3.2-6 through 3.2-10). Gear types used to target marine species during the reporting period had the greatest diversity in 2020 (10) and 2023 had the lowest variety of gear types used (5) (Appendix Tables 3.2-6 through 3.2-10). Minnow traps were used to harvest the widest variety of species, and river herring were harvested by

the widest variety of gear types in 2019 and 2020 prior to the fishery closure in 2021, then Atlantic Menhaden from 2021 through 2023.

Atlantic Menhaden made up most of the reported harvest during the reporting period. The highest reported catch of Atlantic Menhaden occurred in 2022 with a total of 341,041 pounds (Table 3.2-4) and 99% of the total harvest occurred during the months of June, July, and August (Table 3.2-5). Seventy-two percent of the total river herring harvest occurred in the Squamscott River (Table 3.2-6). Cast nets were the most commonly used gear type to target river herring, between 61% and 77% of the total annual harvest during the two years of the reporting period the fishery was open (Appendix Tables 3.2-6 through 3.2-10). Cast net CPUE ranged from 65.23 fish/hour in 2019 to 103.32 fish/hour in 2020 (Table 3.2-7).

Killifish (*Fundulus spp.*) were harvested solely using minnow traps through all the months of the year during the reporting period (Appendix Tables 3.2-6 through 3.2-10). Killifish harvest was highest in 2020 with 79 pounds, representing less than one percent of the total annual harvest each year (Table 3.2-5).

American Eel harvest was the highest in 2020 with 12 pounds and lowest in 2021, less than one percent of the total annual harvest (Table 3.2-5 and Appendix Tables 3.2-1 through 3.2-5). All American eels were harvested between May and October. Eel pots were the primary gear used to target eels (Appendix Tables 3.2-6 through 3.2-10).

During the reporting period, harvest of Atlantic Menhaden occurred between May and October (Table 3.2-5). Atlantic Menhaden annual harvest has been increasing in recent years with the highest catch of 341,041 pounds in 2022 (Table 3.2-4). Gill net effort ranged from 4,212.50 fish/net area/hours fished in 2020 to 12,009.70 fish/net area/hours fished in 2019 (Table 3.2-7).

A summary of the harvested weight by species, month, and area of selected marine species from 2019 through 2023 is presented in Appendix Tables 3.2-11 through 3.2-15. A complete summary of effort and CPUE for each year by gear, month, and area for selected marine species is presented in Appendix Tables 3.2-16 through 3.2-25.

Various species of finfish were targeted and harvested over the reporting period by coastal harvesters for use as bait. American Eel, Atlantic Menhaden, and Killifish were the only bait species harvested across all five years. Some species-specific harvest and effort was not published individually in order to protect the confidentiality of data that is not reflective of at least three individuals.

## DISCUSSION

Mandatory reporting of harvest activities on various marine species in NH coastal and estuarine waters closes a data reporting gap between harvesting in federal waters, which is reported to NOAA Fisheries Service, and state waters. Species-specific harvest and effort data from this program are utilized in fisheries management for some species as well as address compliancy requirements for various Atlantic States Marine Fisheries Commission's fishery management plans. Some of the harvested finfish species are not only important as a forage base for recreationally important fish, but also used widely as bait in recreational fisheries (i.e., Striped Bass, Bluefish *Pomatomus saltatrix*, and American lobster).

The anadromous river herring is a prime example of this; they are an important forage fish in both freshwater as young-of-the-year and the marine environment as juveniles and adults. River herring are used as bait by both recreational anglers and the lobster fishery, therefore have been one of the most sought after baitfish of permittees in NH waters over the last ten years (Table 3.2-4). However, in recent years New Hampshire has experienced a decline in river herring spawning returns (see F-61-R-PI-1), combined with continued harvest (Table 3.2-4). As a result, the NHFG closed the fishery to all harvest of river herring in 2021. The decrease in coastal harvester permits issued in 2021 (Table 3.2-3) was largely from the closure of the river herring fishery. The largest harvest and effort of river herring occurs during the spawning run into coastal rivers in the spring (Tables 3.2-5, and 3.2-8).

Historically, the Squamscott River has been the focus for river herring harvest due to a bridge constriction that concentrates the migrating fish allowing for ease of harvest. In reaction to the decline of river herring returns to the Exeter River fishway (freshwater section of the Squamscott River) in 2004 (see F-61-R-PI-1), a more restrictive administrative rule was instituted to reduce harvest pressure. The rule limited the days of the week a harvester could take river herring in the Squamscott River to Saturdays and Mondays in April, May, and June. In addition, a daily harvest limit of one tote per person was implemented. Before implementation in 2005, the total harvested weight of river herring coming from the Squamscott River had begun to decrease drastically. The harvest of river herring from the Squamscott River has been highly variable throughout the last ten years since 2009, with a low of 1,647 lb in 2012 and a high of 8,756 lb in 2019 (Table 3.2-8). Although variable, the Squamscott River continues to be the location of the highest percentage of total harvested river herring annually.

Similarly, the Oyster River has been experiencing declining river herring spawning returns since 1999 (see F-61-R-PI-1). As a result of the drastic

decline in the spawning runs of river herring in the Oyster River, the NHFG closed the Oyster River and its tributaries to the taking of river herring in 2012.

Atlantic Menhaden is a highly desirable and regularly harvested baitfish when abundant in state waters, even more so since the closure of river herring harvest and declining Atlantic Herring *Clupea harengus* population. This species accounted for the majority of the total landed harvest in 2022 with 341,041 pounds (Table 3.2-4). Twenty-five individuals reported fishing effort for Atlantic Menhaden in 2022, a large increase from previous years. The increase in permits issued since 2018, was largely from individuals seeking Atlantic Menhaden for use as bait in the lobster fishery in addition to river herring harvesters (Table 3.2-3).

In 2011, a new recreational saltwater license was implemented. The Harvest Permit is a free permit, but now a recreational saltwater license needs to be purchased when taking, possessing, or transporting finfish for personal use from NH coastal and estuarine waters. This extra license requirement may deter some people from obtaining a Harvest Permit.

Over the past 10 years American Eels, Killifish, river herring, and Atlantic Menhaden consistently have been targeted and harvested as bait (Table 3.2-4). Harvest of American Eels, river herring, and Atlantic Menhaden in NH's waters is used almost exclusively as bait in various marine fisheries. Killifish are used primarily for bait by freshwater anglers during winter and summer fishing seasons.

In summary, some species harvested in NH's coastal and estuarine waters continue to be an important resource as bait in recreational and commercial fisheries. This demand for bait has likely maintained the American Eel, Killifish, Atlantic Menhaden, and river herring fisheries. During the reporting period, most permittees obtained permits to harvest menhaden and river herring. Ten different gear types were used to harvest 12 different taxa. Atlantic Menhaden continue to be an important bait species and represent one of the most sought after and harvested species by permittees in the past ten years. Species harvested for use as bait in New Hampshire's recreational and commercial fisheries continue to be an important commodity.

Table 3.2-1. Conversion factors used to adjust harvest reported in numbers of marine species by persons with Harvest Permits for New Hampshire coastal and estuarine waters, 2019-2023

Species	Conversions
American Eel	4 fish = 1 lb
Atlantic Mackerel	4 fish = 1.125 lb
Atlantic Menhaden	1 fish = 1 lb
Atlantic Silverside	10 fish = 1 lb
Atlantic surf clam	1 bushel = 89.08 lb
Horseshoe crab	1 male = 0.56 lb
	1 female = 1.77 lb
Killifish	1 liquid quart = 1.125 lb
	1 liquid quart = 275 fish
Rainbow Smelt	10 fish = 1 lb
River Herring	1 fish = 0.5 lb

Table 3.2-2. Effort measurements for each gear type reported by persons with Harvest Permits for New Hampshire coastal and estuarine waters, 2019–2023.

Gear	Effort
Bait trap	Trap haul set over days
Bow net	Hours fished
Cast net	Hours fished
Clam dredge	Hours fished
Dip net	Hours fished
Eel pot	Trap haul set over days
Gill net	(Net area/100) * Hours fished
Hand	Hours fished
Hand line	Hours fished
Minnow trap	Trap haul set over days
Scallop dredge	Hours fished
Seine	(Net area/100) * Hours fished
Tub trawl	Hours fished
Weir	Hours fished
Wire basket	Hours fished

Table 3.2-3. Number of Coastal Harvest permittees that reported fishing effort for each marine species by year and total number of Harvest Permits that were issued for New Hampshire coastal and estuarine waters, 2014–2023.

Species	Number of permittees									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
American Eel	6	<3	8	3	4	<3	3	<3	4	3
Atlantic Cod	-	-	-	-	-	-	-	-	<3	-
Atlantic Herring	-	-	-	-	<3	-	-	-	-	-
Atlantic Mackerel	-	-	<3	<3	-	<3	-	<3	<3	<3
Atlantic Menhaden	-	-	-	3	18	20	20	5	25	3
Atlantic sea scallop	-	-	-	<3	<3	<3	<3	<3	<3	<3
Atlantic Silverside	-	-	-	-	<3	-	-	-	-	-
Atlantic surf clam	-	-	-	-	-	-	<3	-	<3	<3
Atlantic Tomcod	-	-	-	-	-	-	-	<3	<3	<3
Green crab	-	-	-	-	-	-	-	-	-	<3
Horseshoe crab	3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Killifish	<3	3	4	3	4	5	5	4	<3	<3
Rainbow Smelt	-	<3	<3	-	-	-	-	-	-	-
River Herring <sup>a</sup>	29	21	23	14	16	21	19	-	-	-
Stickleback Spp.	-	-	<3	<3	<3	-	-	-	-	-
Tautog	-	-	-	-	-	-	-	-	<3	-
# Permits issued	83	74	76	71	95	105	98	73	77	63
# Permittees reported effort	34	29	36	24	40	46	46	13	36	11

<sup>a</sup> River herring fishery closure starting in 2021.



Table 3.2-4. Coastal Harvest permittees reported total weight (lb) of harvested marine species by year for New Hampshire coastal and estuarine waters, 2014–2023.

Species	Weight of harvest									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
American Eel	35	a	44	19	19	a	12	a	8	10
Atlantic Cod	-	-	-	-	-	-	-	-	b	-
Atlantic Herring	-	-	-	-	a	-	-	-	-	-
Atlantic Mackerel	-	-	a	a	-	a	-	a	a	a
Atlantic Menhaden	-	-	-	8,364	79,401	262,705	310,361	60,900	341,041	1,040
Atlantic sea scallop	-	-	-	a	a	a	a	a	a	a
Atlantic Silverside	-	-	-	-	a	-	-	-	-	-
Atlantic surf clam	-	-	-	-	-	-	a	-	a	a
Atlantic Tomcod	-	-	-	-	-	-	-	a	a	a
Green crab	-	-	-	-	-	-	-	-	-	b
Horseshoe crab	91	a	a	a	a	a	a	a	a	a
Killifish	a	12	11	6	12	16	79	34	a	a
Rainbow Smelt	-	-	a	-	-	-	-	-	-	-
River herring <sup>e</sup>	5,737	7,566	4,354	4,016	4,398	11,326	7,964	-	-	-
Stickleback spp. <sup>b</sup>	-	-	a	a	a	-	-	-	-	-
Tautog	-	-	-	-	-	-	-	-	b	-
Confidential Harvest <sup>d</sup>	a	138	102	1,325	1,479	805	13,299	3,947	468,949	576,395
Yearly Total	5,877	7,715	4,511 <sup>c</sup>	13,729 <sup>c</sup>	85,308 <sup>c</sup>	274,852	331,701	64,881	809,998 <sup>c</sup>	577,446 <sup>c</sup>

<sup>a</sup> Weight of harvest not shown due to confidentiality restrictions of the data.

<sup>b</sup> Catch reported in numbers, no conversion factor available for the appropriate size fish.

<sup>c</sup> Yearly total reflects missing lb from species with no conversion factors.

<sup>d</sup> Confidential harvest is the combined weight of all species of fish that were harvested by less than three harvesters for that year.

<sup>e</sup> River herring fishery closure starting in 2021.

Table 3.2-5. Reported harvested weight (lb) of selected marine species by persons with Harvest Permits in New Hampshire coastal and estuarine waters, by species, year and month, 2019–2023.

Species	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
American Eel	2019					a	a	a						a
	2020					a	3.25	a	a	a				12
	2021					a	a	a						a
	2022					a	3	2	a	a				8
	2023					a	5	a	a	a	a			10
Atlantic Menhaden	2019						9,430	133,444	119,531	a				262,705
	2020						51,993	173,571	84,797	a				310,361
	2021						18,300	42,600						60,900
	2022					a	90,665	115,823	132,775	a	a			341,041
	2023						a	a						1,040
Killifish	2019			a	a	a	a	a	a	a	a	a	a	16
	2020	a	a	a	a	a	a	a	a	a	a		a	79
	2021	a	a	a	a	a	a	a	a	a	a	a	a	34
	2022		a	a	a	a	a	a	a	a	a	a	a	a
	2023			a	a	a	a	a	a	a	a	a		a
River Herring <sup>b</sup>	2019					8,646	2,681							11,326
	2020					6,063	1,901							7,964
	2021													
	2022													
	2023													

<sup>a</sup> Weight of harvest not shown due to confidentiality restrictions of the data.

<sup>b</sup> River herring fishery closure starting in 2021.

Table 3.2-6. Reported harvested weight (lb) of selected marine species by Harvest Permittees in New Hampshire coastal and estuarine waters, by year and area, 2019–2023.

Species	Area	2019	2020	2021	2022	2023
American Eel	Cochecho R.		a			
	Great Bay	a	a	a		a
	Hampton R.				a	
	Little Bay				a	a
	Squamscott R.		a	a	a	
	Tide Mill Creek				a	a
Atlantic Menhaden	Cochecho R.		a			
	Gulf of Maine				a	
	Hampton Coast	22,629	7,850	18,350	6,156	a
	Little Harbor				11,725	
	New Castle				6,045	
	Oyster R.	a				
	Portsmouth Harbor	a			106,175	
	Rye Coast	219,118	212,598		7,028	
	Seabrook Coast	20,100	87,874	42,550	203,887	a
	Seabrook Harbor					a
Killifish	Bellamy R.	a				
	Great Bay			a		
	Hampton Coast		a			
	Hampton Harbor		a	a		
	Rye Coast	a	a			a
	Rye Estuaries	a	a			
	Seabrook		a			
	Squamscott R.	a	a	a	a	
	Tide Mill Creek	a	a	a	a	a
River herring <sup>b</sup>	Bellamy R.	a	146			
	Lamprey R.	a	a			
	Squamscott R.	8,756	5,118			

<sup>a</sup> Weight of harvest not shown due to confidentiality restrictions of the data.

<sup>b</sup> River herring fishery closure starting in 2021.

Table 3.2-7. Reported effort and CPUE of marine species by persons with Harvest Permits for New Hampshire coastal and estuarine waters, by species and gear type, for each year, 2019–2023.

		Effort and CPUE									
		2019		2020		2021		2022		2023	
Species	Gear	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE
American Eel	Eel pot	a	a	a	a	3.50	0.50	501.42	0.46	16.67	0.41
	Minnow trap			a	a	3.00	0.08	77.00	0.05	77	0.5
Atlantic Menhaden	Cast net			a	a	a	a	30.50	112.28		
	Dip net										
	Gill net	12,009.70	10.14	4,212.50	31.93	a	a	10159.90	7.03	a	a
	Seine	a	a	a	a	a	a	219	2,222.07	a	a
Killifish	Cast net										
	Dip net										
	Eel pot										
	Minnow trap	299.13	0.50	226.07	2.57	348.00	1.97	a	a	a	a
	Seine										
River herring <sup>b</sup>	Cast net	133.50	210.37	48.75	103.32						
	Dip net										
	Gill net			a	a						
	Seine										
	Weir	a	a	a	a						
	Wire basket	34.00	12.42	a	a						

<sup>a</sup> Weight of harvest not shown due to confidentiality restrictions of the data.

<sup>b</sup> River herring fishery closure starting in 2021.

Table 3.2-8. Reported harvest of river herring by persons with Harvest Permits and percentage of total herring harvested at all locations in New Hampshire coastal and estuarine waters, 2014–2023.

Year	Bellamy R.		Cocheco R.		Great Bay		Lamprey R.		Oyster R.	
	lb	%	lb	%	lb	%	lb	%	lb	%
2014	a	a	a	a	a	a	a	a		
2015	a	a					a	a		
2016	a	a					a	a		
2017	a	a					a	a		
2018	a	a					a	a		
2019	a	a					a	a		
2020	146	2%					a	a		
2021 <sup>b</sup>										
2022 <sup>b</sup>										
2023 <sup>b</sup>										

Year	Piscataqua R.		Little Bay		Salmon Falls R.		Squamscott R.		Winnicut R.		Total harvest (lb)
	lb	%	lb	%	lb	%	lb	%	lb	%	
2014			a	a			4,380	76%			5,737
2015							6,446	85%			7,566
2016							4,206	97%	a	a	4,354
2017							2,629	65%			4,016
2018							2,439	55%			4,398
2019							8,756	77%			11,326
2020							5,118	64%			7,964
2021 <sup>b</sup>											0
2022 <sup>b</sup>											0
2023 <sup>b</sup>											0

<sup>a</sup> Weight of harvest not shown due to confidentiality restrictions of the data.

<sup>b</sup> River herring fishery closure.