

## PROGRESS REPORT

State: NEW HAMPSHIRE Grant: F-61-R-22/F19AF00061

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, 2019

### ABSTRACT

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 fisheries. The harvest of these baitfish is not captured or quantified by any other harvest and effort reporting programs.

The reporting compliance rate was approximately 73% in 2019, with 28 individuals out of 105 permittees, not reporting. The total reported annual marine species harvest in New Hampshire's coastal and estuarine waters increased from 85,309 lb in 2018, to 274,001 lb in 2019; the highest reported harvest in the ten-year time series. River herring (*Alosa pseudoharengus* and Blueback Herring *Alosa aestivalis*), American Eel *Anguilla rostrata*, and Killifish *Fundulus* spp. continue to be species consistently harvested as bait for recreational fisheries. Other coastal species such as Atlantic Menhaden *Brevoortia tyrannus* are harvested periodically as bait.

Harvesters used nine different gear types to capture various marine species from New Hampshire waters in 2019. River herring represented the most sought after species of baitfish, while Atlantic Menhaden was the most harvested by weight.

## 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 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

One hundred and five individuals obtained harvest permits in 2019 (Table 3.2-3); the reporting compliance rate was approximately 73% with 28 non-reporters. Forty-five permittees reported harvesting 274,001 lb of marine species in 2019, an increase from 85,309 lb in 2018, and the highest in the time series (Table 3.2-4).

Nine different gear types were used to harvest various species from NH's waters (Table 3.2-5). River herring were harvested with three different gear types; cast net, weir, and wire basket. Atlantic Menhaden were harvested with two gear types, while the remainder of species were each harvested by one gear type. Gill nets were the only gear type used to harvest multiple species.

River herring represented the most sought after species in 2019 with 21 individuals reported fishing effort for river herring, harvesting a total of 11,329 lb in 2019 (Tables 3.2-3 and 3.2-4). Seventy-six percent (8,645.50 lb) of river herring were harvested in May (Table 3.2-6), and 86% (7,442 lb) of those river herring were from the Squamscott River (Tables 3.2-6 and 3.2-7). Seventy-seven percent of all river herring harvested in 2019 were from the Squamscott River (Table 3.2-8). Three gear types were used to take river herring with 77% of the harvest coming from individuals using cast nets (Table 3.2-5). Cast nets had a total CPUE of 210.37 river herring per hour (Table 3.2-9).

Atlantic Menhaden were the most harvested species in 2019 with approximately 96% of the total harvested weight (Table 3.2-4). When targeted, harvest of Atlantic Menhaden occurred between June and September (Table 3.2-6). Atlantic Menhaden annual harvest has been increasing in recent years with the highest catch of 261,855 pounds occurring in 2019 (Table 3.2-4). Gill net CPUE was 9.38 fish/hour in 2019 (Table 3.2-9).

Killifish *Fundulus* spp. were harvested by four individuals using minnow traps in NH's estuarine and coastal waters (Tables 3.2-3 and 3.2-5). A total of 16 lb of Killifish were harvested in 2019, less than one percent of the total annual harvest (Table 3.2-6).

Various species of finfish were targeted and harvested in 2019 including American Eel, Atlantic Mackerel *Scomber scombrus*, Atlantic Menhaden, Killifish, and river herring. A complete summary of effort and CPUE by gear, month, and area for selected marine species is presented in Table 3.2-10. 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 reporting gap between harvesting in federal waters that is reported to NOAA Fisheries Service and those harvesting in 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 for such species as 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 also a highly sought after baitfish as indicated by reported information on the disposition of permittees harvest. River herring are used by both recreational anglers and the lobster fishery and therefore have been one of the most sought after baitfish of permittees in NH waters on an annual basis (Table 3.2-4). The largest harvest and effort of river herring occurs during the spawning run into coastal rivers in the spring (Tables 3.2-6 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 2010, 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 NH Fish and Game Department closed the Oyster River and its tributaries to the taking of river herring in 2012.

Atlantic Menhaden is a desirable baitfish and are occasionally harvested when abundant in state waters. This species accounted for most of the total landed harvest in 2019 with 261,855 pounds (Table 3.2-4). Nineteen individuals reported fishing effort for Atlantic Menhaden in both 2018 and 2019, a large increase from previous years. The increase in permits issued in the recent years was largely from individuals seeking Atlantic Menhaden for use as bait in the lobster fishery (Table 3.2-3).

In summary, species harvested in NH's coastal waters for use as bait in recreational fisheries continue to be an important resource in state waters. This demand for bait has maintained the American Eel, Atlantic Menhaden, Killifish, and river herring fisheries. Forty-five of the 105 permittees reported harvesting 274,001 lb of marine species in 2019. Nine different gear types were used to harvest seven different taxa. River herring 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 fisheries continue to be an important commodity in state waters.

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 from 2019.

Species	Conversions
American Eel	4 fish = 1 lb
Atlantic Mackerel	4 fish = 1.125 lb
Atlantic Menhaden	1 fish = 1 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
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 from 2019.

Gear	Effort
Cast net	Hours fished
Eel pot	Trap haul set over days
Gill net	(Net area/100) * Hours fished
Hand	Hours fished
Minnow trap	Trap haul set over days
Scallop dredge	Hours fished
Seine	(Net area/100) * 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 from 2010-2019.

Species	Number of permittees									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
American Eel	7	11	7	8	6	<3	8	3	4	<3
American Plaice	-	-	<3	-	-	-	-	-	-	-
Atlantic Cod	-	-	<3	-	-	-	-	-	-	-
Atlantic Herring	3	<3	-	-	-	-	-	-	<3	-
Atlantic Mackerel	-	-	-	-	-	-	<3	<3	-	<3
Atlantic Menhaden	3	-	<3	-	-	-	-	3	19	19
Atlantic sea scallop	-	-	-	-	-	-	-	<3	<3	<3
Atlantic Silverside	<3	-	-	-	-	-	-	-	-	-
Bluefish	-	-	<3	-	-	-	-	-	-	-
Cunner	-	-	-	-	-	-	-	-	-	-
Cusk	-	-	<3	-	-	-	-	-	-	-
Goosefish	-	<3	<3	-	-	-	-	-	-	-
Haddock	-	-	<3	-	-	-	-	-	-	-
Horseshoe crab	-	-	-	-	3	<3	<3	<3	<3	<3
Killifish	3	6	3	4	<3	3	4	3	4	4
Pollock	-	-	<3	-	-	-	-	-	-	-
Rainbow Smelt	<3	-	-	-	-	<3	<3	-	-	-
River herring	39	25	20	20	29	21	23	14	16	21
Silver Hake	-	-	<3	-	-	-	-	-	-	-
Spiny Dogfish	3	<3	<3	-	-	-	-	-	-	-
Stickleback Spp.	-	-	-	-	-	-	<3	<3	<3	-
White Hake	-	-	<3	-	-	-	-	-	-	-
Winter Flounder	-	-	<3	-	-	-	-	-	-	-
Witch Flounder	-	-	<3	-	-	-	-	-	-	-
# Permits issued	140	113	108	102	83	74	76	70	95	105
# Permittees reported effort	59	44	35	31	34	28	36	24	40	45

Table 3.2-4. Coastal Harvest permittees reported total weight (lb) of harvested marine species by year for New Hampshire coastal and estuarine waters from 2010–2019.

Species	Weight of harvest									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
American Eel	80	130	167	106	35	a	44	19	19	a
American Plaice	-	-	a	-	-	-	-	-	-	-
Atlantic Cod	-	-	a	-	-	-	-	-	-	-
Atlantic Herring	360	a	-	-	-	-	-	-	a	-
Atlantic Mackerel	-	-	-	-	-	-	a	a	-	a
Atlantic Menhaden	315	-	a	-	-	-	-	8,364	79,401	261,855
Atlantic sea scallop	-	-	-	-	-	-	-	a	a	a
Atlantic Silverside	a	-	-	-	-	-	-	-	a	-
Bluefish	-	-	a	-	-	-	-	-	-	-
Cunner	-	-	-	-	-	-	-	-	-	-
Cusk	-	-	a	-	-	-	-	-	-	-
Goosefish	-	a	a	-	-	-	-	-	-	-
Haddock	-	-	a	-	-	-	-	-	-	-
Horseshoe crab	-	-	-	-	91	a	a	a	a	a
Killifish	10	19	4	12	a	12	11	6	12	16
Pollock	-	-	a	-	-	-	-	-	-	-
Rainbow Smelt	a	-	-	-	-	-	a	-	-	-
River herring	7,466	4,113	2,681	4,481	5,737	7,566	4,354	3,916	4,398	11,329
Silver Hake	-	-	a	-	-	-	-	-	-	-
Spiny Dogfish	128,564	a	a	-	-	-	-	-	-	-
Stickleback spp.	-	-	-	-	-	-	b	b	b	-
White Hake	-	-	a	-	-	-	-	-	-	-
Winter Flounder	-	-	a	-	-	-	-	-	-	-
Witch Flounder	-	-	a	-	-	-	-	-	-	-
Confidential harvest <sup>d</sup>	6	120,762	25,410	-	a	138	102	1325	1,479	801
Yearly total	136,795	125,023	28,262	4,599	5,876	7,717	4,511 <sup>c</sup>	13,630 <sup>c</sup>	85,309 <sup>c</sup>	274,001

<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 that year.

Table 3.2-5. Percent weight composition, by gear type, for harvested marine species by persons with Harvest Permits for New Hampshire coastal and estuarine waters in 2019.

Species	Percent weight composition by gear								
	Cast net	Eel pot	Gill net	Seine	Hand	Minnow trap	Scallop dredge	Weir	Wire basket
American Eel		100%							
Atlantic Mackerel			100%						
Atlantic Menhaden			a	a					
Atlantic sea scallop							100%		
Horseshoe crab					100%				
Killifish						100%			
River herring	77%							a	a

<sup>a</sup> Percent weight composition not shown due to confidentiality restrictions of the data.

Table 3.2-6. Coastal Harvest permittees reported harvested weight (lb) of marine species and percentage of annual harvest, by species and month, for New Hampshire coastal and estuarine waters in 2019.

Species	Weight of harvest						
	Jan	Feb	Mar	Apr	May	Jun	Jul
Atlantic Menhaden						a	133,194.00
Killifish			a	a	a	a	a
River herring					8,645.50	2,680.50	

Species	Aug	Sep	Oct	Nov	Dec	Annual harvest (lb)	% of annual harvest
Atlantic Menhaden	118,931.00	a				261,855.00	96%
Killifish	a	a	a	a	a	16.00	<1%
River herring						11,326.00	4%

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

Table 3.2-7. Reported harvested weight (lb) of select marine species by persons with Harvest Permits for New Hampshire coastal and estuarine waters, by month and area in 2019.

Month/area	Atlantic Menhaden	Killifish	River herring
January			
February			
March			
Rye Coast		a	
Squamscott R.		a	
Tide Mill Creek		a	
April			
Rye Estuaries		a	
Squamscott R.		a	
May			
Bellamy R.			a
Lamprey R.			a
Squamscott R.		a	7,442.00
June			
Bellamy R.			a
Lamprey R.			a
Rye Coast	7,330.00		
Seabrook Coast	a		
Squamscott R.		a	1,313.50
July			
Hampton Coast	12,921.00		
Oyster R.	a		
Rye Coast	116,165.00		
Seabrook Coast	4,100.00		
Squamscott R.		a	
August			
Hampton Coast	9,708.00		
Rye Coast	95,323.00	a	
Seabrook Coast	13,900.00		
Squamscott R.		a	
September			
Rye Coast	a		
Squamscott R.		a	
October			
Squamscott R.		a	
November			
Squamscott R.		a	
December			
Bellamy R.		a	

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

Table 3.2-8. Total reported harvest of river herring by individuals with Harvest Permits, and percentage of total river herring harvested at all locations in New Hampshire from 2010-2019.

Year	Bellamy R.		Cocheco R.		Great Bay		Lamprey R.		Little Bay	
	lb	%	lb	%	lb	%	lb	%	lb	%
2010	a	a	316	4%			1,027	14%	a	a
2011	a	a					a	a		
2012	a	a	a	a	a	a	a	a		
2013	253	6%	a	a			a	a		
2014	a	a	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		

Year	Oyster R.		Piscataqua R.		Salmon Falls R.		Squamscott R.		Winnicut R.		Total harvest (lb)
	lb	%	lb	%	lb	%	lb	%	lb	%	
2010	56	1%	a	a	42	1%	5,877	79%	a	a	7,466
2011	a	a			26	1%	2,165	53%			4,113
2012					a	a	1,647	61%	a	a	2,681
2013							3,942	88%			4,481
2014							4,380	76%			5,737
2015							6,446	85%			7,566
2016							4,206	97%	a	a	4,354
2017							2,529	65%			3,916
2018							2,439	55%			4,398
2019							8,756	77%			11,326

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

Table 3.2-9.

Reported effort and CPUE of marine species by persons with Harvest Permits for New Hampshire coastal and estuarine waters, by gear type, for each month in 2019.

Species	Effort and CPUE											
	Jan		Feb		Mar		Apr		May		Jun	
	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE
Atlantic Menhaden												
Gill net											1,045.00	9.02
Seine												
Killifish												
Minnow trap					a	a	a	a	a	a	a	a
River herring												
Cast net									87.00	82.90	46.50	32.18
Weir									a	a	a	a
Wire basket									a	a	a	a

Species	Effort and CPUE												Total by species & gear	
	Jul		Aug		Sept		Oct		Nov		Dec			
	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE
Atlantic Menhaden														
Gill net	6,308.20	10.72	3,624.50	7.15	a	a							11,085.70	9.38
Seine	a	a	a	a									a	a
Killifish														
Minnow trap	a	a	a	a	a	a	a	a	a	a	a	a	299.13	0.50
River herring														
Cast net													133.50	210.37
Weir													a	a
Wire basket													34.00	12.42

<sup>a</sup> Effort and CPUE for each gear type not shown due to confidentiality restrictions of the data.

Table 3.2-10. Reported fishing effort and CPUE of marine species by persons with Harvest Permits for New Hampshire coastal and estuarine waters by month, area, and gear type in 2019.

Month/area/gear	Atlantic Menhaden		Killifish		River herring	
	Effort	CPUE	Effort	CPUE	Effort	CPUE
January						
February						
March						
Rye Coast						
Minnow trap			a	a		
Squamscott R.						
Minnow trap			a	a		
Tide Mill Creek						
Minnow trap			a	a		
April						
Rye Estuaries						
Minnow trap			a	a		
Squamscott R.						
Minnow trap			a	a		
May						
Bellamy R.						
Cast net					a	a
Lamprey R.						
Cast net					a	a
Weir					a	a
Squamscott R.						
Cast net					83.00	85.40
Minnow trap			a	a		
Wire basket					23.50	15.04
June						
Bellamy R.						
Cast net					a	a
Lamprey R.						
Cast net					a	a
Weir					a	a
Rye Coast						
Gill net	852.00	8.60				
Seabrook Coast						
Gill net	a	a				
Squamscott R.						
Cast net					39.75	31.94
Minnow trap			a	a		
Wire basket					a	a
July						
Hampton Coast						
Gill net	648.00	19.94				
Oyster R.						
Gill net	a	a				
Rye Coast						
Gill net	5,434.20	9.30				
Seine	a	a				
Seabrook Coast						
Gill net	214.00	19.16				
Squamscott R.						
Minnow trap			a	a		

Table 3.2-10. (Continued).

Month/area/gear	Atlantic Menhaden		Killifish		River herring	
	Effort	CPUE	Effort	CPUE	Effort	CPUE
August						
Hampton Coast						
Gill net	1,169.00	8.30				
Oyster R.						
Gill net	a	a				
Rye Coast						
Gill net	2,353.50	6.26				
Minnow trap			a	a		
Seine	a	a				
Seabrook Coast						
Gill net	84.00	17.86				
Seine	a	a				
Squamscott R.						
Minnow trap			a	a		
September						
Rye Coast						
Gill net	a	a				
Squamscott R.						
Minnow trap			a	a		
October						
Squamscott R.						
Minnow trap			a	a		
November						
Squamscott R.						
Minnow trap			a	a		
December						
Squamscott R.						
Minnow trap			a	a		

<sup>a</sup> Effort and CPUE for each gear type is not shown due to confidentiality restriction of the data.