

# NORTHEAST FISHERIES OBSERVER PROGRAM BIOLOGICAL SAMPLING MANUAL



U.S. Department of Commerce/NOAA  
Fisheries Service  
National Marine Fisheries Service  
Northeast Fisheries Science Center  
Fisheries Sampling Branch  
166 Water Street  
Woods Hole MA 02543

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## INTRODUCTION

The Northeast Fisheries Observer Program (NEFOP) collects, maintains and distributes data for scientific and management purposes in the northwest Atlantic Ocean. The Program is a component of the Northeast Fisheries Science Center (NEFSC) of the National Marine Fisheries Service (NMFS). For the year of 2007, NEFOP trained and deployed approximately 50 observers and provided coverage on a variety of fisheries averaging to about 7000 days at sea.

This guide is intended to serve as a general at-sea biological sampling reference for NEFSC fisheries observers. It contains summaries and tables designed to enable observers to quickly determine the correct biological sampling protocols and methods while at sea. While this manual provides identification criteria for selected species that have proved troublesome in the past, observers should mainly rely on the field guides issued in training for species identification.

Biological sampling is one of the most important functions of a fisheries observer. Information and samples collected by observers are often unobtainable by any other method. These data are used in scientific studies and can influence management regulations. It is therefore very important that observers have a thorough understanding of biological sampling principles and practices. Prior to deployment, especially in a new fishery, observers should review all biological sampling protocols and resolve any uncertainty with their supervisor or NEFOP staff.

In addition to this manual, the [NEFSC Fisheries Observer Program Manual](#) provides a detailed description of each data field collected. The [NEFSC Fisheries Observer Program Training Manual](#) is a textbook for observer trainees as well as a reference for experienced observers containing in-depth instruction on procedures and protocols relating to biological data collection as well as other aspects of the job, such as safety at sea.

This manual represents a revision of the biological sampling protocols described in the [1996 NEFSC Observer Program Manual](#). All figures contained in this version are from the 1996 edition unless otherwise noted. For documentation of other changes see [Documentation of changes made to the NEFSC Biological Sampling Protocols, 2008](#).

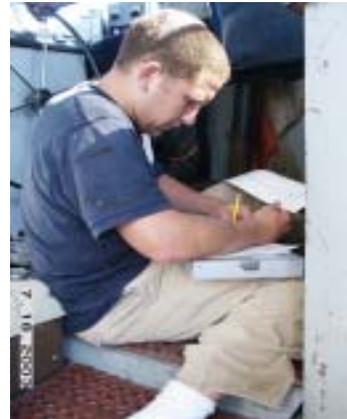
## OBSERVERS AT WORK



Observer measuring monkfish.



Observer's in safety training.



Observer recording data.



Observer's sorting through catch.

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Cover photos (left to right): Observer sorting skates. An observer measuring flounder. An Observer discarding sampled catch. All photos from NEFSC Observer Program photo files.

## **BIOLOGICAL SAMPLING PROTOCOLS: overview**

### **Definitions**

Observed Haul: A haul for which the observer collects weights for all species both kept and discarded. Collection of discard information includes everything brought up in the gear; plants, vertebrate and invertebrate animals, rocks and debris.

Sampled Haul: A haul for which the observer collects detailed biological information, such as length measurements and age structures, from certain species or portion of the catch.

### **Summary**

Biological sampling involves collecting data on the species caught in order to aid in determining the effect of fishing effort on catch size and species distribution. These data are also useful in establishing length-weight relationships, aging, migration patterns, food habits, and other valuable biological information.

Biological sampling consists of the collection of the following information from both the kept and discarded catch:

- ↔ Actual weights
- ↔ Length frequencies
- ↔ Age structures
- ↔ Tissue and/or other samples, which may include specialty sampling requests

Biological sampling should generally occur after or during every or every other observed haul, as the instructions for each fishery specify. Sampling after every other observed haul is requested in order to allow adequate time to **thoroughly** sample hauls.

## **BIOLOGICAL SAMPLING: overview**

## **BIOLOGICAL SAMPLING: overview**

The tables and summaries included in this manual are designed to give the observer enough information to make decisions about which species to sample, and in what priority, on a per haul basis.

- ➔ Tables 1a-h. Length Frequency and Age Structure Sampling Priorities are organized by fishery (excluding the pelagic fisheries) and area, with species listed alphabetically. Each list includes fish, shellfish and squid species most likely to be encountered in the fishery, and gives a priority rating (1 = high, 2 = medium, 3 = low) to guide in choosing the order in which to sample species on a per haul basis.
- ➔ Table 2. Fish and Shellfish Sampling Requirements by Species for Domestic Fisheries lists the number of lengths, and the type and number of age structures to collect for each fish, shellfish and squid species which may be sampled from the non-pelagic fisheries.
- ➔ Table 3. Pelagic Species Sampling Requirements for Domestic Fisheries summarizes the sampling priorities and protocols for pelagic species.
- ➔ Table 4. Marine Mammal Biological Sampling Priorities summarizes the sampling priorities and protocols for incidentally taken marine mammals.
- ➔ The Sea Turtle and Sea Bird Biological Sampling Protocols section summarizes the sampling priorities and protocols for incidentally taken sea turtles and sea birds.

These tables are guidelines, and not absolute instructions. Every fishery, every trip, and every haul may be different. Thus, sampling procedures must be adapted by the observer to each unique situation.

Generally, only those species listed in Tables 2 & 3 should have length measurements and, where applicable, age samples collected, as these species are considered the commercially important (marketable) species taken by the specific gear in the designated area. However, significant quantities (catches) of targeted species or bycatch of

commercially important species which may not be listed in these tables may also be sampled. In general, the observer should attempt to obtain a large variety of kept and discard samples of the requested size (see [Tables 2 and 3](#)) from species in the same haul or statistical area. Sampling larger numbers of animals than requested produces data of little additional value.

When deployed in a pelagic fishery (*i.e.* pelagic drift gillnet, pelagic pair trawl, pelagic longline, etc.), the sampling priorities for pelagic species should be followed, as outlined in [Table 3](#). This table should also be consulted regardless of the fishery, whenever pelagic species are caught.

Specialty sampling requests should also be accommodated whenever time and circumstances permit.

#### **INCIDENTAL TAKE SAMPLING PRIORITIES FOR ALL FISHERIES**

**Marine mammals** and **sea turtles** are high sampling priority species. However, additional work-up beyond minimum requirements, should occur only after the sampling of priority species listed in [Tables 1a-h](#) and/or [Table 3](#) (*i.e.* cod, pollock, tunas, etc...) is completed. Once these data are collected, and if time permits, additional sampling should occur as outlined in the [Marine Mammal Sampling Protocols](#) and the [Sea Turtle Sampling Protocols](#) sections of this manual.

Incidentally taken dead **sea birds** are also high sampling priority species and should be identified, photographed, and checked for the presence of bands (tags). If present, the band number must be recorded. The band should be removed if possible. Once these data are collected, and if time permits, additional sampling should occur as outlined in the [Sea Bird Sampling Protocols](#) section of this manual. Any incidentally taken birds which are still alive need only be identified, recorded, checked for the presence of bands, photographed, and released as soon as possible.

#### **BIOLOGICAL SAMPLING: overview**

## GILLNET AND BEACH SEINE SAMPLING PRIORITIES

### GILLNET

#### Limited fish sampling trips:

- ➔ A protected species haul watch is conducted during **every** haul.
- ➔ Kept catch weights will be recorded after each haul.
- ➔ Discarded catch is NOT recorded or sampled, except for animals that are recorded on an Individual Animal Log or incidental takes of marine mammals, sea turtles, or sea birds.
- ➔ Biological sampling of the **kept catch** should occur for the last haul of the trip (day trips) during the steam back to port or the last haul of the day (multi-day trips).

#### Complete fish sampling trips:

- ➔ **Every** haul is observed, *i.e.* complete catch information for both kept and discarded species is recorded.
- ➔ No protected species haul watches are conducted.
- ➔ The kept and discarded catch of all hauls should be biologically sampled, with **priority given to the discarded species**.

### BEACH SEINE

- ➔ If gear is hauled onto the beach **all** hauls will be observed; kept and discarded catch should be biologically sampled with **priority given to the discarded species**.
- ➔ If gear is "fished-over" (a dory is used to check the gear while it is in the water), the observer will record and biologically sample the **kept catch** only.
- ➔ In **both** situations the observer will conduct a marine mammal, sea turtle, and debris haul watch.

If it is not possible to biologically sample a particular haul according to these instructions, the reason(s) should be noted in the comments section of the corresponding Haul Log.

**Table 1a.** Length frequency and age structure sampling priorities in gillnet and beach seine fisheries.

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Gulf of Maine (Statistical areas 511 - 515)</b>					Wolffish	2	2	-	-
Bass, Striped	2	2	-	-	<b>George's Bank (Stat areas 522, 525, 526, 561, 562)</b>				
Bluefish	3	3	3	3	Bluefish	3	3	3	3
Cod, Atlantic	1	1	1	1	Cod, Atlantic	1	1	1	1
Cusk	3	3	3	3	Cusk	3	3	3	3
Dogfish, Spiny	2	2	-	-	Dogfish, Spiny	2	2	-	-
Flounder, Am. Plaice	2	2	2	2	Flounder, Am. Plaice	2	2	2	1
Flounder, Winter	1	1	1	1	Flounder, Witch	2	2	2	2
Flounder, Witch	1	1	2	3	Haddock	1	1	1	1
Flounder, Yellowtail	2	2	2	2	Hake, Red	3	3	-	-
Haddock	1	1	1	1	Hake, Silver	3	3	-	-
Hake, Red	3	3	-	-	Hake, White	1	1	1	1
Hake, Silver	3	3	-	-	Monkfish	1	1	1	1
Hake, White	1	1	1	1	Pollock	1	1	1	1
Mackerel, Atlantic	3	3	3	3	Redfish	2	2	2	2
Monkfish	1	1	1	1	Skate, Barndoor	3	3	-	-
Pollock	1	1	1	1	Skate, Little	2	2	-	-
Redfish	2	2	2	2	Skate, Rosette	3	3	-	-
Skate, Barndoor	-	2	-	-	Skate, Smooth	2	2	-	-
Skate, Little	2	2	-	-	Skate, Thorny	-	2	-	-
Skate, Smooth	-	3	-	-	Skate, Winter	2	2	-	-
Skate, Thorny	-	2	-	-	Wolffish	2	2	-	-
Skate, Winter	2	2	-	-					

**GILLNET AND BEACH SEINE SAMPLING PRIORITIES**

## GILLNET AND BEACH SEINE SAMPLING PRIORITIES

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**Table 1a.** (Con't) Length frequency and age structure sampling priorities in gillnet and beach seine fisheries.

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Cape Cod (Statistical area 521)</b>					<b>Southern New England (Statistical areas 537-539)</b>				
Bass, Striped	3	3	-	-	Bass, Striped	3	3	-	-
Bluefish	3	3	3	3	Bluefish	3	3	3	3
Cod, Atlantic	1	1	1	1	Cod, Atlantic	2	2	2	2
Cusk	3	3	3	3	Dogfish, Spiny	2	2	-	-
Flounder, Winter	2	2	2	2	Flounder, Winter	3	3	3	3
Haddock	2	2	1	1	Mackerel, Atlantic	3	3	3	3
Hake, Red	3	3	-	-	Monkfish	1	1	1	1
Hake, Silver	3	3	-	-	Skate, Barndoor	-	2	-	-
Hake, White	1	1	1	1	Skate, Clearnose	3	3	-	-
Mackerel, Atlantic	3	3	3	3	Skate, Little	2	2	-	-
Monkfish	1	1	1	1	Skate, Rosette	3	3	-	-
Pollock	1	1	1	1	Skate, Smooth	2	2	-	-
Redfish	2	2	2	2	Skate, Thorny	-	2	-	-
Skate, Barndoor	-	2	-	-	Skate, Winter	2	2	-	-
Skate, Little	2	2	-	-	Tautog	3	3	-	-
Skate, Smooth	-	2	-	-					
Skate, Thorny	-	2	-	-					
Skate, Winter	2	2	-	-					
Tautog	3	3	-	-					
Wolffish	2	2	-	-					

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Mid-Atlantic (Stat areas 201, 393, 401, 611-616, 621, 622, 625, 626, 631, 632, 635, 636, 700-702, 707, 708)</b>									
Alewife	3	3	-	-	Herring, Blueback	2	2	-	-
Bass, Striped	1	1	-	-	Lobster, American	2	1	-	-
Bonito	3	3	-	-	Mackerel, Atlantic	2	2	2	2
Bluefish	1	1	1	1	Mackerel, Spanish	2	2	-	-
Croaker, Atlantic	2	2	-	-	Menhaden, Atlantic	2	2	-	-
Dogfish, Spiny	1	1	-	-	Monkfish	1	1	1	1
Drum, Black	3	3	-	-	Scup	2	2	2	2
Drum, Red	2	2	-	-	Sea Bass, Black	2	2	2	2
Flounder Sand Dab	3	2	3	3	Shad, American	3	3	-	-
Flounder, Summer	1	1	1	1	Spot	3	3	-	-
Flounder, Winter	1	1	1	1	Sturgeon, Atlantic	1	1	-	-
Flounder, Yellowtail	1	1	1	1	Tautog	3	3	-	-
Herring, Atlantic	2	2	-	-	Weakfish	1	1	-	-

## GILLNET AND BEACH SEINE SAMPLING PRIORITIES

## OTTER and SHRIMP TRAWL SAMPLING PRIORITIES

- ➔ **At a minimum 75% of the hauls** should be observed, *i.e.* complete catch information for both kept and discarded species is recorded. The number of hauls observed will be affected by trip and tow duration.
- ➔ Collection of length frequencies and age structures should occur **at least** after every other observed haul.
- ➔ If catches are light and time permits, the observer should sample every haul.
- ➔ Otter trawl fishery: obtain actual weights for as many species as possible.
- ➔ Shrimp trawl fishery: obtain actual weights for all discarded species.

If it is not possible to biologically sample a particular haul according to protocol, the reason(s) should be noted in the comments section of the corresponding [Haul Log](#).

**Table 1b.** Length frequency and age structure sampling priorities in the otter trawl fisheries.

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Gulf of Maine (Statistical areas 511-515)</b>					<b>George's Bank (Statistical areas 522, 525, 526, 561, 562)</b>				
Bluefish	3	3	3	3	Bluefish	3	3	3	3
Cod, Atlantic	1	1	1	1	Butterfish	2	2	2	2
Cusk	2	2	1	1	Cod, Atlantic	1	1	1	1
Dogfish, Spiny	2	2	-	-	Cusk	2	2	1	1
Flounder, Am. Plaice	1	1	1	1	Dogfish, Spiny	2	2	-	-
Flounder, Winter	1	1	1	1	Flounder, Am. Plaice	2	2	2	2
Flounder, Witch	1	1	1	2	Flounder, Sand Dab	2	2	2	2
Flounder, Yellowtail	1	1	1	1	Flounder, Summer	2	2	2	2
Haddock	1	1	1	1	Flounder, Winter	1	1	1	1

Hake, Red	3	3	-	-
Hake, Silver	3	3	-	-
Hake, White	1	1	1	1
Herring, Atlantic	2	2	-	-
Monkfish	1	1	1	1
Pollock	1	1	1	1
Redfish	2	2	2	2
Skate, Barndoor	-	2	-	-
Skate, Little	2	2	-	-
Skate, Smooth	-	3	-	-
Skate, Thorny	-	2	-	-
Skate, Winter	2	2	-	-
Wolfish	2	2	-	-

Flounder, Witch	2	2	2	2
Flounder, Yellowtail	1	1	2	2
Haddock	1	1	1	1
Hake, Red	3	3	-	-
Hake, Silver	3	3	-	-
Hake, White	1	1	1	1
Herring, Atlantic	2	2	-	-
Lobster, American	2	2	-	-
Monkfish	1	1	1	1
Ocean Pout	2	2	-	-
Pollock	1	1	1	1
Redfish	2	2	2	2
Skate, Barndoor	-	2	-	-
Skate, Little	2	2	-	-
Skate, Smooth	-	2	-	-
Skate, Thorny	-	2	-	-
Skate, Winter	2	2	-	-
Squid, Atl. Long-fin	3	3	-	-
Squid, Short-fin	3	3	-	-
Wolfish	2	2	-	-

## OTTER and SHRIMP TRAWL SAMPLING PRIORITIES

## OTTER and SHRIMP TRAWL SAMPLING PRIORITIES

**Table 1b.** (Con't) Length frequency and age structure sampling priorities in the otter trawl fisheries.

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Cape Cod (Statistical area 521)</b>					<b>Southern New England offshore (Statistical area 537)</b>				
Bluefish	3	3	3	3	Bluefish	3	3	3	3
Butterfish	3	3	3	3	Bonito	3	3	-	-
Cod, Atlantic	1	1	1	1	Butterfish	1	1	1	1
Cusk	2	2	1	1	Cod, Atlantic	2	2	2	2
Flounder, Am. Plaice	3	3	3	3	Dogfish, Spiny	2	2	-	-
Flounder, Sand Dab	2	2	2	2	Flounder, Sand Dab	2	2	2	2
Flounder, Summer	1	1	1	1	Flounder, Summer	1	1	1	1
Flounder, Winter	1	1	1	1	Flounder, Winter	1	1	1	1
Flounder, Witch	2	2	2	2	Flounder, Yellowtail	1	1	1	1
Flounder, Yellowtail	1	1	1	1	Hake, Red	3	3	-	-
Haddock	2	2	1	1	Hake, Silver	2	2	-	-
Hake, Red	3	3	-	-	Herring, Atlantic	2	2	-	-
Hake, Silver	3	3	-	-	Mackerel, Atlantic	2	2	2	2
Hake, White	1	1	1	1	Monkfish	1	1	1	1
Herring, Atlantic	2	2	-	-	Ocean Pout	2	2	-	-
Mackerel, Atlantic	3	3	3	3	Scup	1	1	1	1
Monkfish	1	1	1	1	Sea Bass, Black	1	1	1	1

Pollock	1	1	1	1
Redfish	2	2	2	2
Skate, Barndoor	-	2	-	-
Skate, Little	2	2	-	-
Skate, Smooth	2	2	-	-
Skate, Thorny	-	2	-	-
Skate, Winter	2	2	-	-
Squid, Atl. Long-fin	2	2	-	-
Squid, Short-fin	2	2	-	-
Tautog	3	3	-	-
Wolfish	2	2	-	-

Skate, Barndoor	-	2	-	-
Skate, Clearnose	3	3	-	-
Skate, Rosette	3	3	-	-
Skate, Little	2	2	-	-
Skate, Smooth	3	3	-	-
Skate, Thorny	-	2	-	-
Skate, Winter	2	2	-	-
Squid, Atl. Long-fin	1	1	-	-
Squid, Short-fin	2	2	-	-
Tautog	3	3	-	-

## OTTER and SHRIMP TRAWL SAMPLING PRIORITIES

## OTTER and SHRIMP TRAWL SAMPLING PRIORITIES

**Table 1b.** (Con't) Length frequency and age structure sampling priorities in the otter trawl fisheries.

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Mid-Atlantic offshore</b> (Statistical areas 616, 622, 623, 626, 627, 632, 636)					<b>Mid-Atlantic inshore</b> (Statistical areas 538, 539, 611-615, 621, 625, 631, 635)				
Alewife	3	3	-	-	Alewife	3	3	-	-
Bluefish	3	3	3	3	Bass, Striped	1	1	-	-
Butterfish	2	2	2	2	Bluefish	1	1	1	1
Dogfish, Spiny	2	2	-	-	Butterfish	2	2	2	2
Flounder, Sand Dab	2	2	2	2	Croaker, Atlantic	3	3	-	-
Flounder, Summer	1	1	1	1	Dogfish, Spiny	1	1	-	-
Hake, Red	3	3	-	-	Drum, Black	3	3	-	-
Hake, Silver	2	2	-	-	Drum, Red	3	3	-	-
Herring, Atlantic	1	1	-	-	Flounder Sand Dab	1	1	1	1
Herring, Blueback	3	3	-	-	Flounder, Summer	1	1	1	1
Mackerel, Atlantic	2	2	2	2	Flounder, Winter	1	1	1	1
Monkfish	1	1	1	1	Flounder, Yellowtail	1	1	1	1
Scallop, Sea	3	3	3	3	Herring, Atlantic	2	2	-	-
Scup	1	1	1	1	Herring, Blueback	2	2	-	-
Sea Bass, Black	1	1	1	1	Lobster, American	2	1	-	-
Shad, American	3	3	-	-	Mackerel, Atlantic	2	2	2	2
Skate, Barndoor	-	2	-	-	Mackerel, Spanish	3	3	-	-

Skate, Clearnose	2	2	-	-
Skate, Little	2	2	-	-
Skate, Rosette	2	2	-	-
Skate, Smooth	3	2	-	-
Skate, Thorny	-	2	-	-
Skate, Winter	3	3	-	-
Squid, Atl. Long-fin	1	1	-	-
Squid, Short-fin	1	1	-	-
Weakfish	3	3	-	-

Menhaden, Atlantic	3	3	-	-
Monkfish	1	1	1	1
Ocean Pout	2	2	-	-
Scup	2	2	2	2
Sea Bass, Black	1	1	1	1
Shad, American	3	3	-	-
Skate, Clearnose	2	2	-	-
Skate, Little	2	2	-	-
Spot	3	3	-	-
Squid, Atl. Long-fin	1	1	-	-
Squid, Short-fin	1	1	-	-
Tautog	3	3	-	-
Weakfish	1	1	-	-

**OTTER and SHRIMP TRAWL SAMPLING PRIORITIES**

## OTTER and SHRIMP TRAWL SAMPLING PRIORITIES

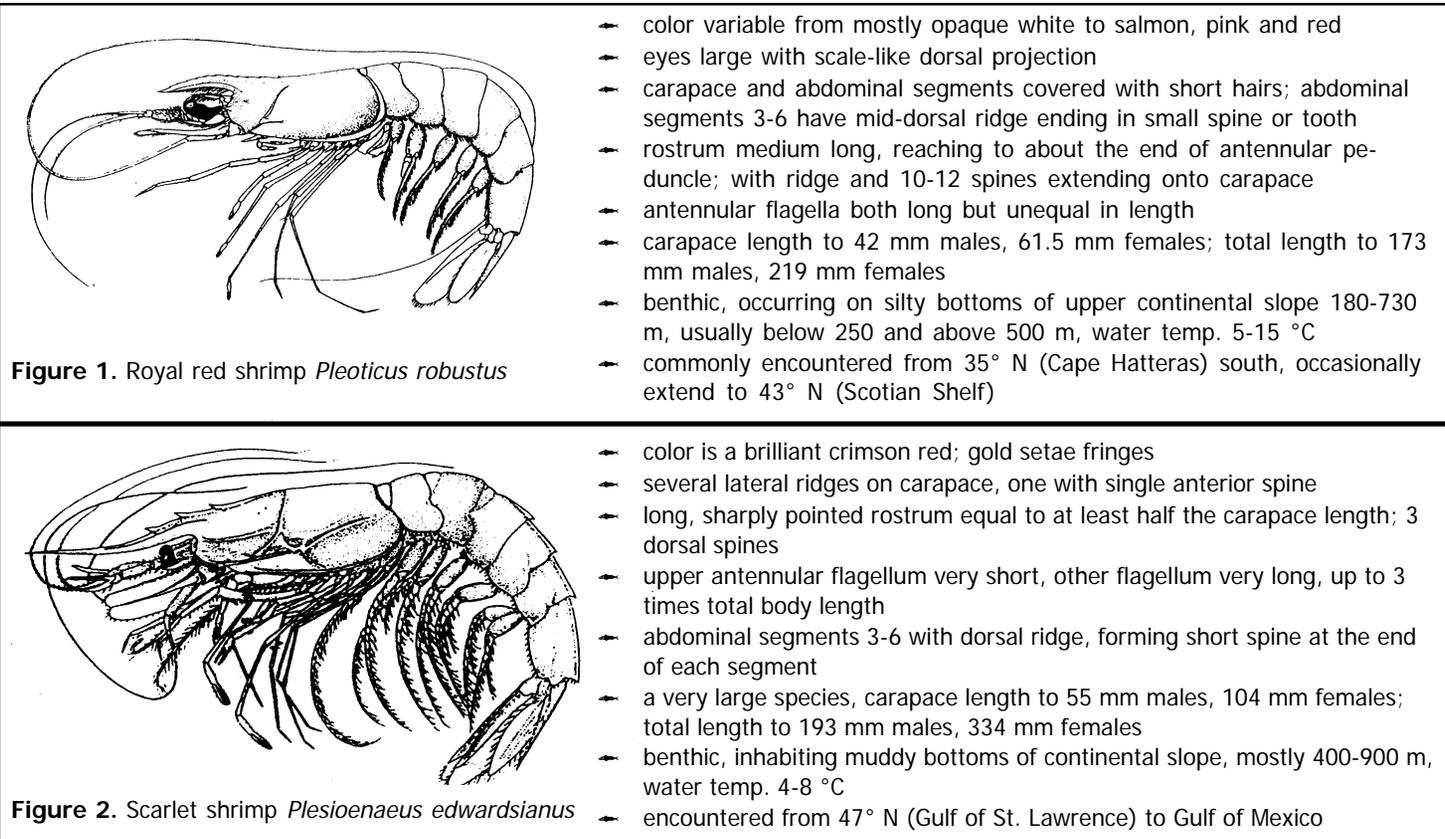
**Table 1c.** Length frequency and age structure sampling priorities in the shrimp trawl fishery\*\*.

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Massachusetts, New Hampshire and Maine</b>									
Cod, Atlantic	*	1	*	1	Monkfish	1	1	1	1
Flounder, Am. Plaice	*	1	*	1	Ocean Pout	*	1	*	1
Flounder, Sand Dab	*	2	*	2	Pollock	*	1	*	1
Flounder, Winter	*	1	*	1	Redfish	*	1	*	1
Flounder, Witch	*	1	*	1	Skate, Barndoor	-	2	-	-
Flounder, Yellowtail	*	1	*	1	Skate, Little	2	2	-	-
Haddock	*	1	*	1	Skate, Smooth	-	3	-	-
Hake, Red	*	3	*	-	Skate, Thorny	-	2	-	-
Hake, Silver	*	2	*	-	Skate, Winter	2	2	-	-
Hake, White	*	2	*	2	Wolfish	3	3	-	-
Herring, Atlantic	2	2	-	-					
Lobster, American	2	1	-	-					

\* As of 1 January 1994, regulations mandate the use of a Nordmore Grate in all Shrimp Trawl gear which reduces finfish bycatch. Since none of these species may currently be kept, measurement of **all** discards should occur when time permits.

\*\* All weight measurements for discarded species should be actual in this fishery.

The following two shrimp species, which are not contained in *Atlantic Coast Fishes* (Peterson, 1986) issued to observers in training, may be encountered in the shrimp trawl fishery.



## OTTER and SHRIMP TRAWL SAMPLING PRIORITIES

## SCALLOP TRAWL and SCALLOP DREDGE FISHERY SAMPLING PRIORITIES

### Scallop Trawl Fishery

- ➔ **Every haul** should be observed, *i.e.* complete catch information for both kept and discarded species is recorded, during on-watch periods.
- ➔ Collection of length frequencies should occur at least after **every other observed haul**.
- ➔ At minimum, **half** of the hauls should be observed and **one quarter** of the hauls should be biological sampled during a trip.
- ➔ At approximately the midpoint of the trip, the observer should switch watches in order to ensure collection of data most representative of the entire trip.

### SCALLOP SHELL HEIGHT FREQUENCIES

- ➔ A random sample of at least 100 scallops should be collected and measured **from each disposition** (*i.e.* kept and discarded).
- ➔ Collect shell height frequencies from **only one net** per haul.
- ➔ Sample alternate nets (*i.e.* port and starboard) each time biological sampling of scallops is conducted.
- ➔ Generally, scallop shell height frequency sampling should be the first priority for all hauls, with finfish sampling being second priority.
- ➔ For **at least** one haul per watch, finfish sampling should be first priority.

### FINFISH SAMPLING

- ➔ Collect finfish length frequencies and age structures as a first priority for at least one haul per watch, and on additional hauls, as time permits.
- ➔ If a haul has an exceptionally large amount of finfish bycatch, finfish sampling should become first priority for that haul.
- ➔ Collect finfish length frequencies and age structures from **both nets** per haul.
- ➔ When sampling finfish, refer to Otter and Shrimp Trawl Sampling Priorities (pages 8-15) for priority status for length frequencies and age structures per stat area.

### **Scallop Dredge Fishery**

- ➔ **Every haul** should be observed, *i.e.* complete catch information for both kept and discarded species is recorded, during on-watch periods.
- ➔ Collection of length frequencies should occur at least after **every other observed haul**.
- ➔ At minimum, **half** of the hauls should be observed and **one quarter** of the hauls should be biological sampled during a trip.
- ➔ At approximately the midpoint of the trip, the observer should switch watches in order to ensure collection of data most representative of the entire trip.

### **SCALLOP SHELL HEIGHT FREQUENCIES**

- ➔ A random sample of at least 100 scallops should be collected and measured **from each disposition** (*i.e.* kept and discarded).
- ➔ Collect shell height frequencies from **only one dredge** per haul.
- ➔ Sample alternate dredges (*i.e.* port and starboard) each time biological sampling of scallops is conducted.
- ➔ Generally, scallop shell height frequency sampling should be the first priority for all hauls, with finfish sampling being second priority.
- ➔ For **at least** one haul per watch, finfish sampling should be first priority.

### **FINFISH SAMPLING**

- ➔ Collect finfish length frequencies and age structures as a first priority for at least one haul per watch, and on additional hauls, as time permits.
- ➔ If a haul has an exceptionally large amount of finfish bycatch, finfish sampling should become first priority for that haul.
- ➔ Collect finfish length frequencies and age structures from **both dredges** per haul.

### **SCALLOP TRAWL and SCALLOP DREDGE FISHERY SAMPLING PRIORITIES**

## SCALLOP TRAWL and SCALLOP DREDGE FISHERY SAMPLING PRIORITIES

### Both Scallop Trawl and Scallop Dredge Fishery

#### VOLUMETRIC MEASURES OF SCALLOP MEATS

- ➔ **On the first haul of each watch only**, the volume of meats corresponding to the length frequency sample from the **kept** portion of the catch (whole scallops) should be measured.
- ➔ The volume of this sample must represent the meats of **all kept and measured** animals.
- ➔ The weight of the sample for which the volumetric measurement was collected, should be obtained.

If it is not possible to biologically sample a particular haul in the manner outlined above, the alternate sampling method followed should be recorded in the comments section of the corresponding Haul Log.

**Table 1d.** Length frequency and age structure sampling priorities in the scallop trawl and scallop dredge fishery.

Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard
Flounder, NK	3	3	2	2
Flounder, Summer	2	2	1	1
Flounder, Yellowtail	1	1	1	1
Monkfish	2	2	1	1
Scallop, Sea	1	1	-	-
Skate, Barndoor	-	2	-	-
Skate, nk	3	3	-	-

\*\*Skate, nk = single skate species

\*\*Flounder, nk = single flounder species

## TWIN TRAWL FISHERY SAMPLING PRIORITIES

- ➔ **At a minimum 75% of the hauls** should be observed, *i.e.* complete catch information for both kept and discarded species is recorded. The number of hauls observed will be affected by trip and tow duration.
- ➔ Collection of length frequencies should occur at least after **every other observed haul**.
- ➔ If catches are light and time permits, the observer should sample every haul.
- ➔ Collect finfish length frequencies and age structures from **both nets** per haul.
- ➔ Obtain actual weights for as many species as possible.
- ➔ For length frequency and age structure sampling guidelines per stat area refer to Otter and Shrimp Trawl Sampling Priorities (pages 8-15) for priority status.

If it is not possible to biologically sample a particular haul according to protocol, the reason(s) should be noted in the comments section of the corresponding Haul Log.

## LOBSTER, CRAB and FISH POT FISHERY SAMPLING PRIORITIES

- ➔ **Every haul** should be **both** observed, *i.e.* complete catch information for both kept and discarded species is recorded, and biologically sampled.
- ➔ Conduct sampling for **each pot**, when possible.
- ➔ Lobster pot fishery: **every individual lobster** caught should be biologically sampled when possible.

If it is not possible to biologically sample a particular haul according to protocol, the reason(s) should be noted in the comments section of the corresponding [Haul Log](#).

### CRAB CATCH ESTIMATION AND SUB-SAMPLING

Following are some suggested methods to collect **crab counts and weights** in the lobster, crab and fish pot fishery. These suggested methods are listed in order of preference. While the observer may choose to use a method other than those listed below, or make another judgement on what to sample due to time or other constraints, any sub-sampling or catch estimation method used must be recorded in the comments section of the corresponding [Haul Log](#) or [Crustacean Sample Log](#). These methods may be applied to both the kept and discarded catch.

Crab sampling of the species listed in [Table 1e](#) should occur **following lobster sampling**, as time/conditions permit. However, when the captain targets crabs with (a) particular trawl(s), crab sampling becomes equal in priority to lobster sampling.

#### Per Trawl Methods

- 1 The crew sorts all crabs to be kept into totes to be weighed (total kept weight) by the observer. The crew sorts crabs to be discarded into totes to be weighed (total discard weight) by the observer. The observer randomly fills a tote, each, from both the kept and discarded catch to be sampled.
- 2 The crew places crabs into the hold while randomly selecting some to fill a tote for the observer to weigh and sample.

The observer, using a clicker, counts the number of crabs placed in the hold. The total number of crabs caught (which includes those in the subsample tote) are divided by the number of crabs in the subsample tote. The quotient is multiplied by the weight of the tote to yield an estimated total kept weight. The observer also samples the crabs in the tote. Follow these procedures for weight determination and length frequency sampling of discards.

Example: 300 crabs are placed in the hold, and 50 crabs are counted in the tote. The actual sample weight of the tote is 100 lbs:  
 $[(300 + 50) \div 50] * 100 = 700$  lbs total kept catch

- 3 The crew places crabs into the hold while randomly selecting some to fill a tote for the observer to sample. The observer estimates the pounds of crabs placed in the hold. This estimated weight is added to the actual tote weight (sample weight) to yield an estimated total kept weight. The observer also samples the crabs in the tote. Follow these procedures for weight estimation and length frequency sampling of discards.

**Per Day Methods**

- 1 Following one haul selected randomly each day (this haul should not routinely be the last haul of the day),

the crew places all of the kept crabs into totes to be weighed and sampled by the observer. Follow these procedures for weight determination and biological sampling of discards. For the remaining hauls of each day, the observer estimates the kept and discarded crab catch weights, but does not conduct any sampling.

- 2 Follow the methods of number 2 or 3, above, for one haul per day.

**Table 1e.** Length frequency and age structure sampling priorities in the lobster, crab and fish pot fishery.

Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard
<b>Gulf of Maine (Statistical area 515)</b>				
Crab, Jonah	2	2	-	-
Crab, Red	2	2	-	-
Crab, Rock	2	2	-	-
Hagfish	1	1	-	-
Lobster, American	1	1	-	-
Wolfish	3	3	-	-

NOTE: When crabs are the target of (a) particular trawl(s), the crab priority will be the same as lobster.

**LOBSTER, CRAB and FISH POT FISHERY SAMPLING PRIORITIES**

## BOTTOM LONGLINE FISHERY SAMPLING PRIORITIES

- ➔ **Every haul** should be observed, *i.e.* complete catch information for both kept and discarded species is recorded.
- ➔ Collection of length frequencies and age structures should occur **at least** during/after every other observed haul.
- ➔ If catches are light and time permits, the observer should sample every haul.
- ➔ If commercially important bycatch is caught in significant quantities, yet the species are not listed in Table 1f, refer to Table 2. Fish and Shellfish Sampling Requirements By Species For Domestic Fisheries.

If it is not possible to biological sample on a particular haul, the reason(s) should be noted in the comments section of the corresponding Haul Log.

For biological sampling priorities in the pelagic longline fishery see Table 3. Pelagic Species Length Frequency Sampling Requirements for Domestic Fisheries.

**Table 1f.** Length frequency and age structure sampling priorities in the bottom longline fishery.

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Gulf of Maine (Statistical areas 464, 465, 467, 511-515) and Georges Bank (Statistical areas 521, 522, 525, 526, 541-543, 561, 562)</b>									
Cod, Atlantic	1	1	3	2	Hake, White	1	1	1	1
Cusk	1	1	2	2	Monkfish	1	1	1	1
Haddock	1	1	3	2	Pollock	1	1	3	2
Hake, Red	2	2	-	-	Wolffish	2	2	-	-
Hake, Silver	2	2	-	-	Skate, nk	2	2	-	-
Skate, Barndoor	-	1	-	-					
Skate, Thorny	-	1	-	-					

\*\*Skate, nk = single skate species

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Southern New England (Statistical areas 533, 534, 537-539)</b>					<b>Mid-Atlantic (Statistical areas 611-616, 621-629, 631-639)</b>				
Cod, Atlantic	1	1	3	2	Flounder, Summer	1	1	1	1
Flounder, Summer	1	1	1	1	Hake, Red	2	2	-	-
Hake, Red	2	2	-	-	Monkfish	1	1	1	1
Monkfish	1	1	1	1	Tilefish	1	1	1	1
Skate, Barndoor	-	1	-	-	Skate, nk	2	2	-	-
Skate, nk	2	2	-	-					

\*\*Skate, nk = single skate species

## BOTTOM LONGLINE FISHERY SAMPLING PRIORITIES

**MID-WATER OTTER TRAWL, PURSE SEINE and PAIR TRAWL SAMPLING PRIORITIES** 24

- ➔ **Every haul** should be observed, *i.e.* complete catch information for both kept and discarded species is recorded.
- ➔ Collection of length frequencies and age structures should occur after every observed haul.
- ➔ Collect 10 baskets of fish, obtain actual weights and calculate percent composition's for both the kept and discard species on every haul.

**PAIR TRAWL**

- ➔ If only one of the two vessels has an observer onboard, the observer should be recording the catch for both vessels (Disposition 110 should be used for the part of the catch that is pumped/transferred to other vessel).
- ➔ If both vessels have an observer onboard, the observer onboard the vessel where the catch is pumped onto should be observing and recording all of the catch. The observer onboard the other vessel should comment that "catch was loaded onto the other vessel" and leave the species section BLANK.
- ➔ If catch is dumped before coming onboard, the haul should be marked as unobserved and all visually observed discards should be noted in the species section of the haul log. Be sure to **clearly** document the situation in the comments section.

If it is not possible to biologically sample a particular haul according to protocol, the reason(s) should be noted in the comments section of the corresponding Haul Log.

**Table 1g.** Length frequency and age structure sampling priorities in the mid-water otter trawl, purse seine and pair trawl fisheries.

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Gulf of Maine (Statistical areas 511-515)</b>					<b>George's Bank (Statistical areas 522, 525, 526, 561, 562)</b>				
Bluefish	3	3	3	3	Bluefish	3	3	3	3
Cod, Atlantic	1	1	1	1	Cod, Atlantic	1	1	1	1
Cusk	2	2	1	1	Cusk	2	2	1	1
Dogfish, Spiny	2	2	-	-	Dogfish, Spiny	2	2	-	-
Flounder, Am. Plaice	1	1	1	1	Flounder, Am. Plaice	2	2	2	2
Flounder, Winter	1	1	1	1	Flounder, Sand Dab	2	2	2	2

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Gulf of Maine (Statistical areas 511-515) cont.....</b>					<b>Georges Bank (Stat areas 522, 525, 526, 561, 562) cont.....</b>				
Flounder, Witch	1	1	2	2	Flounder, Summer	2	2	2	2
Flounder, Yellowtail	1	1	2	2	Flounder, Winter	1	1	1	1
Haddock	1	1	1	1	Flounder, Witch	2	2	2	2
Hake, Red	3	3	-	-	Flounder, Yellowtail	1	1	2	2
Hake, Silver	2	2	-	-	Haddock	1	1	1	1
Hake, White	2	2	1	1	Hake, Red	3	3	-	-
Herring, Atlantic	1	1	-	-	Hake, Silver	2	2	-	-
Monkfish	1	1	1	1	Hake, White	2	2	1	1
Pollock	1	1	1	1	Herring, Atlantic	1	1	-	-
Redfish	2	2	2	2	Lobster, American	2	2	-	-
Skate, Barndoor	-	2	-	-	Monkfish	1	1	1	1
Skate, Little	2	2	-	-	Ocean Pout	2	2	-	-
Skate, Smooth	-	3	-	-	Pollock	1	1	1	1
Skate, Thorny	-	2	-	-	Redfish	2	2	2	2
Skate, Winter	2	2	-	-	Skate, Barndoor	-	2	-	-
Wolffish	2	2	-	-	Skate, Little	2	2	-	-
					Skate, Smooth	-	2	-	-
					Skate, Thorny	-	2	-	-
					Skate, Winter	2	2	-	-
					Squid, Atl. Long-fin	3	3	-	-
					Squid, Short-fin	3	3	-	-
					Wolffish	2	2	-	-

**MID-WATER OTTER TRAWL, PURSE SEINE and PAIR TRAWL SAMPLING PRIORITIES**

## MID-WATER OTTER TRAWL, PURSE SEINE and PAIR TRAWL SAMPLING PRIORITIES

**Table 1g.** (Con't) Length frequency and age structure sampling priorities in the mid-water otter trawl, purse seine and pair trawl fisheries.

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Cape Cod (Statistical area 521)</b>					<b>Southern New England offshore (Statistical area 537)</b>				
Bluefish	3	3	3	3	Bluefish	3	3	3	3
Butterfish	3	3	3	3	Bonito	3	3	-	-
Cod, Atlantic	1	1	1	1	Butterfish	3	3	3	3
Cusk	2	2	1	1	Cod, Atlantic	2	2	2	2
Flounder, Sand Dab	2	2	2	2	Dogfish, Spiny	2	2	-	-
Flounder, Summer	1	1	1	1	Flounder, Sand Dab	2	2	2	2
Flounder, Winter	1	1	1	1	Flounder, Summer	1	1	1	1
Flounder, Yellowtail	1	1	1	1	Flounder, Winter	1	1	1	1
Haddock	2	2	1	1	Flounder, Yellowtail	1	1	2	2
Hake, Red	3	3	-	-	Hake, Red	3	3	-	-
Hake, Silver	3	3	-	-	Hake, Silver	2	2	-	-
Hake, White	1	1	1	1	Herring, Atlantic	1	1	-	-
Herring, Atlantic	1	1	-	-	Mackerel, Atlantic	1	1	2	2
Mackerel, Atlantic	1	1	3	3	Monkfish	1	1	1	1
Monkfish	1	1	1	1	Ocean Pout	3	3	-	-
Pollock	1	1	1	1	Scup	1	1	1	1
Redfish	2	2	2	2	Sea Bass, Black	1	1	1	1

Skate, Barndoor	-	2	-	-	Skate, Barndoor	-	2	-	-
Skate, Little	2	2	-	-	Skate, Clearnose	3	3	-	-
Skate, Smooth	2	2	-	-	Skate, Rosette	3	3	-	-
Skate, Thorny	-	2	-	-	Skate, Little	2	2	-	-
Skate, Winter	2	2	-	-	Skate, Smooth	3	3	-	-
Squid, Atl. Long-fin	2	2	-	-	Skate, Thorny	-	2	-	-
Squid, Short-fin	2	2	-	-	Skate, Winter	2	2	-	-
Tautog	3	3	-	-	Squid, Atl. Long-fin	1	1	-	-
Wolffish	2	2	-	-	Squid, Short-fin	2	2	-	-
					Tautog	3	3	-	-

## MID-WATER OTTER TRAWL, PURSE SEINE and PAIR TRAWL SAMPLING PRIORITIES

## MID-WATER OTTER TRAWL, PURSE SEINE and PAIR TRAWL SAMPLING PRIORITIES

**Table 1g.** (Con't) Length frequency and age structure sampling priorities in the mid-water otter trawl purse seine and pair trawl fisheries.

Species	Length Frequencies		Age Structures		Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard		Kept	Discard	Kept	Discard
<b>Mid-Atlantic offshore</b> (Statistical areas 616, 622, 623, 626, 627, 632, 636)					<b>Mid-Atlantic inshore</b> (Statistical areas 538, 539, 611-615, 621, 625, 631, 635)				
Alewife	3	3	-	-	Alewife	3	3	-	-
Bluefish	3	3	3	3	Bass, Striped	1	1	-	-
Butterfish	3	3	3	3	Bluefish	1	1	1	1
Dogfish, Spiny	2	2	-	-	Croaker, Atlantic	3	3	-	-
Flounder, Sand Dab	2	2	2	2	Dogfish, Spiny	1	1	-	-
Flounder, Summer	1	1	1	1	Drum, Black	3	3	-	-
Hake, Red	3	3	-	-	Drum, Red	3	3	-	-
Hake, Silver	2	2	-	-	Flounder Sand Dab	1	1	1	1
Herring, Atlantic	1	1	-	-	Flounder, Summer	1	1	1	1
Herring, Blueback	1	1	-	-	Flounder, Winter	1	1	1	1
Mackerel, Atlantic	1	1	2	2	Flounder, Yellowtail	1	1	1	1
Monkfish	1	1	1	1	Herring, Atlantic	1	1	-	-
Scallop, Sea	3	3	3	3	Herring, Blueback	1	1	-	-
Scup	1	1	1	1	Lobster, American	2	1	-	-
Sea Bass, Black	1	1	1	1	Mackerel, Atlantic	1	1	2	2
Shad, American	3	3	-	-	Mackerel, Spanish	3	3	-	-
Skate, Barndoor	-	2	-	-	Menhaden, Atlantic	3	3	-	-

Skate, Clearnose	2	2	-	-
Skate, Little	2	2	-	-
Skate, Rosette	2	2	-	-
Skate, Smooth	3	2	-	-
Skate, Thorny	-	2	-	-
Skate, Winter	3	3	-	-
Squid, Atl. Long-fin	1	1	-	-
Squid, Short-fin	2	2	-	-
Weakfish	3	3	-	-

Monkfish	1	1	1	1
Scup	2	2	2	2
Sea Bass, Black	1	1	1	1
Shad, American	3	3	-	-
Skate, Clearnose	2	2	-	-
Skate, Little	2	2	-	-
Spot	3	3	-	-
Tautog	3	3	-	-
Weakfish	1	1	-	-

**MID-WATER OTTER TRAWL, PURSE SEINE and PAIR TRAWL SAMPLING PRIORITIES**

## CLAM/QUAHOG FISHERY SAMPLING PRIORITIES

- ➔ **Every haul** should be observed, *i.e.* complete catch information for both kept and discarded species is recorded, during on-watch periods.
- ➔ Collection of length frequencies should occur at least after **every other observed haul**.
- ➔ At minimum, **half** of the hauls should be observed and **one quarter** of the hauls should be biological sampled during a trip.

## CLAM/QUAHOG SHELL HEIGHT FREQUENCIES

- ➔ A random sample of at least 30 clams/quahogs should be collected and measured **from each disposition** (*i.e.* kept and discarded).
- ➔ Generally, clam/quahog shell height frequency sampling should be the first priority for all hauls, with finfish sampling being second priority.
- ➔ For **at least** one haul per watch, finfish sampling should be first priority.

## FINFISH SAMPLING

- ➔ Collect finfish length frequencies and age structures as a first priority for at least one haul per watch, and on additional hauls, as time permits.
- ➔ If a haul has an exceptionally large amount of finfish bycatch, finfish sampling should become first priority for that haul.

**Table 1h.** Length frequency and age structures sampling for the clam/quahog fisheries

Species	Length Frequencies		Age Structures	
	Kept	Discard	Kept	Discard
Clam, Surf	1	1	-	-
Flounder, nk	3	3	2	2
Flounder, Summer	2	2	1	1
Flounder, Yellowtail	2	2	1	1
Monkfish	2	2	1	1
Quahog, Ocean	1	1	-	-
Scallop, Sea	1	1	-	-
Skate, Barndoor	-	2	-	-
Skate, nk	3	3	-	-

\*\*Skate, nk = single skate species

\*\*Flounder, nk = single flounder

## CLAM/QUAHOG FISHERY SAMPLING PRIORITIES

**TABLE 2. FISH & SHELLFISH SAMPLING REQUIREMENTS BY SPECIES PER STATISTICAL AREA  
(For Kept and Discard Separately)**

SPECIES NAME	LENGTH TARGET	LENGTH TYPE	SEXING NECESSARY?	SCALE TARGET	OTOLITH TARGET
Alewife	100	FL	-	-	-
Bass, Striped	100	FL	-	-	-
Bluefish	100	FL	-	25	-
Butterfish	100	FL	-	-	20****
Cod, Atlantic	100	FL	-	-	20
Clams, Surf	30*	S	-	-	-
Crabs	100	C	YES	-	-
Croaker, Atlantic	50	TL	-	-	-
Cusk	100	TL	-	-	20
Dogfish, Spiny	100	TL	YES	-	-
Drum, Black	50	FL	-	-	-
Drum, Red	50	FL	-	-	-
Flounder, Am. Plaice	100	TL	-	-	20
Flounder, Sand Dab	100	TL	-	20	-
Flounder, Summer	100	TL	-	25	-
Flounder, Winter	100	TL	-	-	20
Flounder, Witch	100	TL	-	-	20
Flounder, Yellowtail	100	TL	YES	10/SEX	-
Haddock, Large (>56 cm)	100	FL	-	50	50
Haddock, Scrod (45-56 cm)	50	FL	-	25	25
Haddock, Small (<48 cm)	50	FL	-	25	25
Hagfish	100	TL	-	-	-
Hake, Red	100	TL	-	-	-
Hake, Silver	100	FL	-	-	-
Hake, White	100	TL	-	-	20

Herring, Atlantic	50	FL	-	-	-
Herring, Blueback	100	FL	-	-	-
Lobster, American	100	C	YES	-	-
Mackerel, Atlantic	100	FL	-	-	20****
Mackerel, Spanish	100	FL	-	-	-
Menhaden	50	FL	-	-	-
Monkfish (40 cm and over)	100	O	-	-	15 (vertebrae)
Monkfish (under 40 cm)	100	O	-	-	10 (vertebrae)
Ocean Pout	100	TL	-	-	-
Pollock	100	FL	-	-	20
Quahog, Ocean	30*	S	-	-	-
Redfish	100	FL	YES	-	10/SEX
Scallop, Sea	100	S	-	-	-
Scup	100	FL	-	25	-
Sea Bass, Black	100	TL	-	25	-
Shad, American	100	FL	-	-	-
Spot	100	FL	-	-	-
Skate, nk**	100	TL	-	-	-
Squid, Atl. Long-fin	100	ML	-	-	-
Squid, Short-fin	100	ML	-	-	-
Tautog	100	TL	-	-	-
Tilefish	100	FL	-	-	20****
Weakfish	100	FL	-	-	-
Wolfish	100	TL	-	-	-

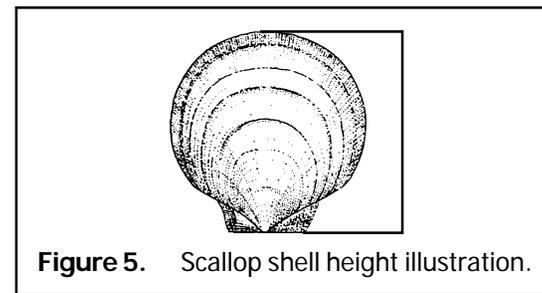
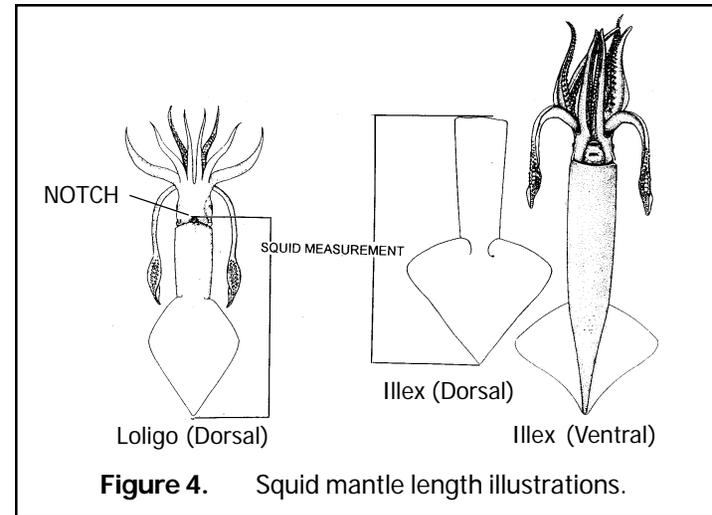
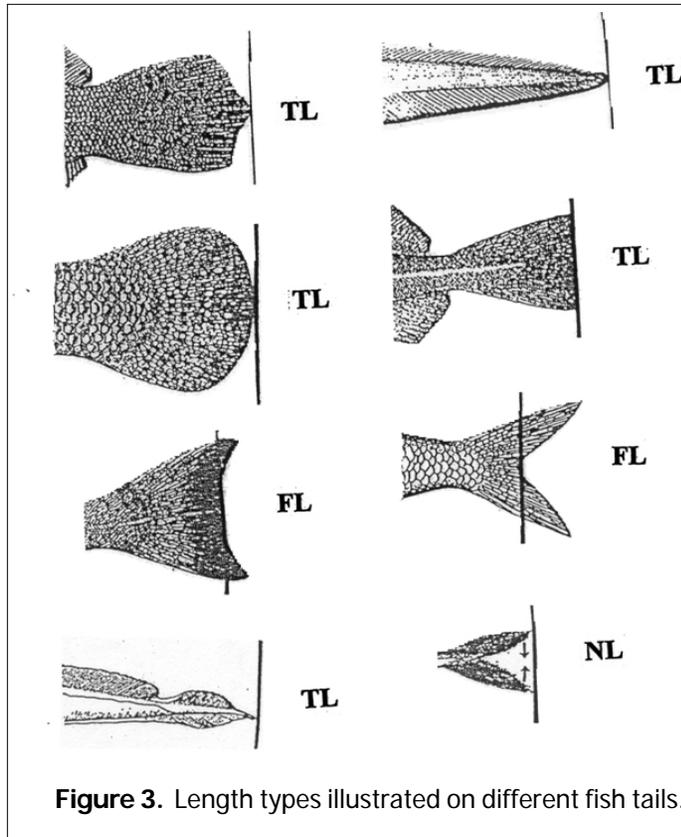
\* If size distribution is variable, length target is 50.  
 \*\* See Tables 1a-h for listing of priority species.  
 \*\*\* Bottom Longline fishery only.  
 \*\*\*\* Heads may be collected in lieu of otoliths.

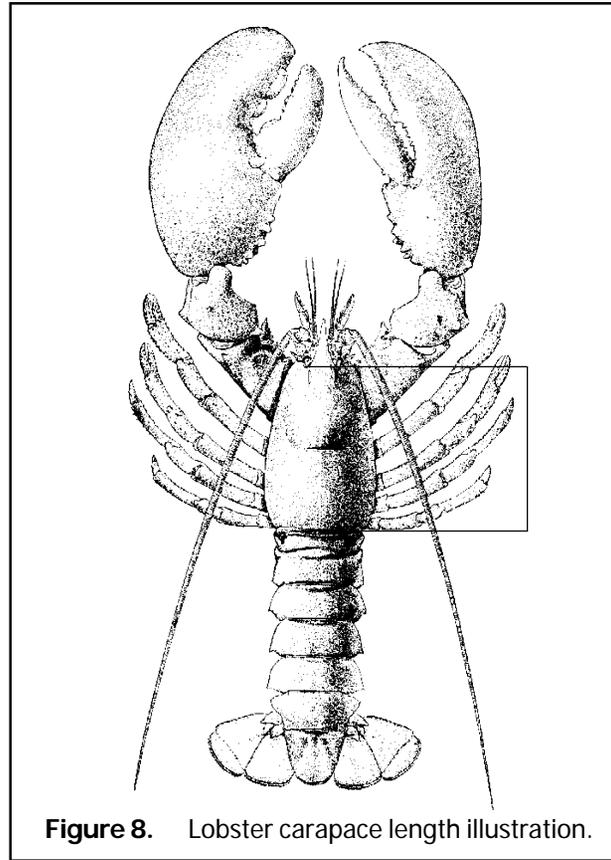
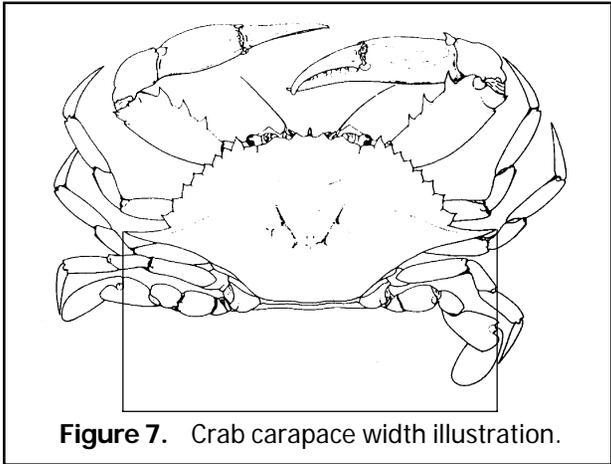
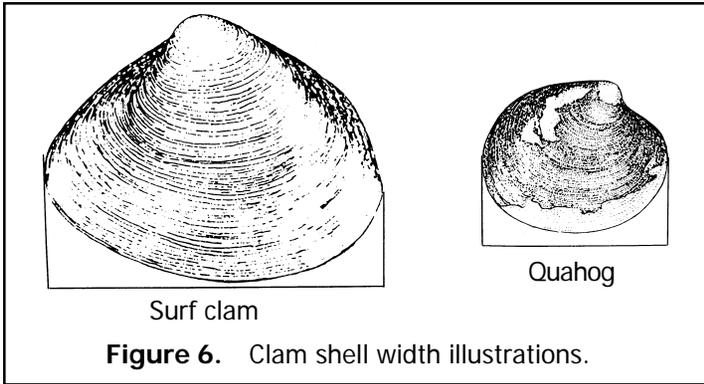
LENGTH TYPE CODES:  
 TL= Total Length      S = Shell, width or height  
 FL = Fork Length      C = Carapace, width or length  
 NL = Natural Length    ML = Mantle Length  
 O = Lower jaw to tip of tail, with jaw pushed down

**TABLE 2. FISH & SHELLFISH SAMPLING REQUIREMENTS BY SPECIES PER STATISTICAL AREA**

## LENGTH MEASUREMENT ILLUSTRATIONS

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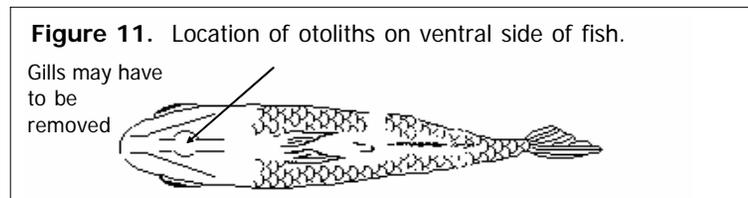
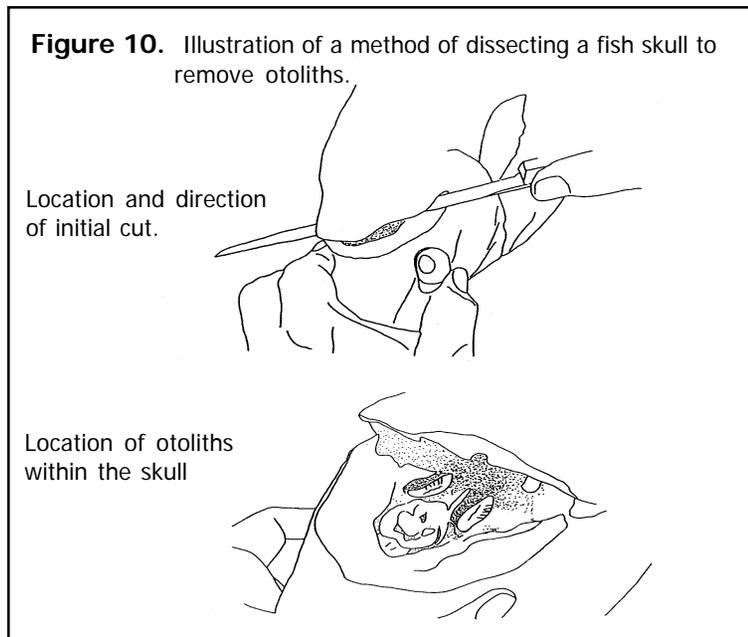
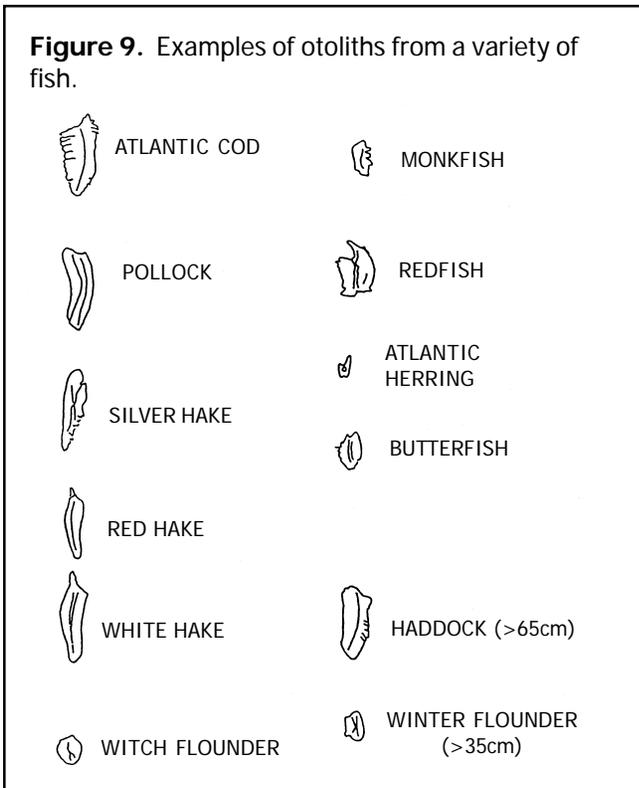




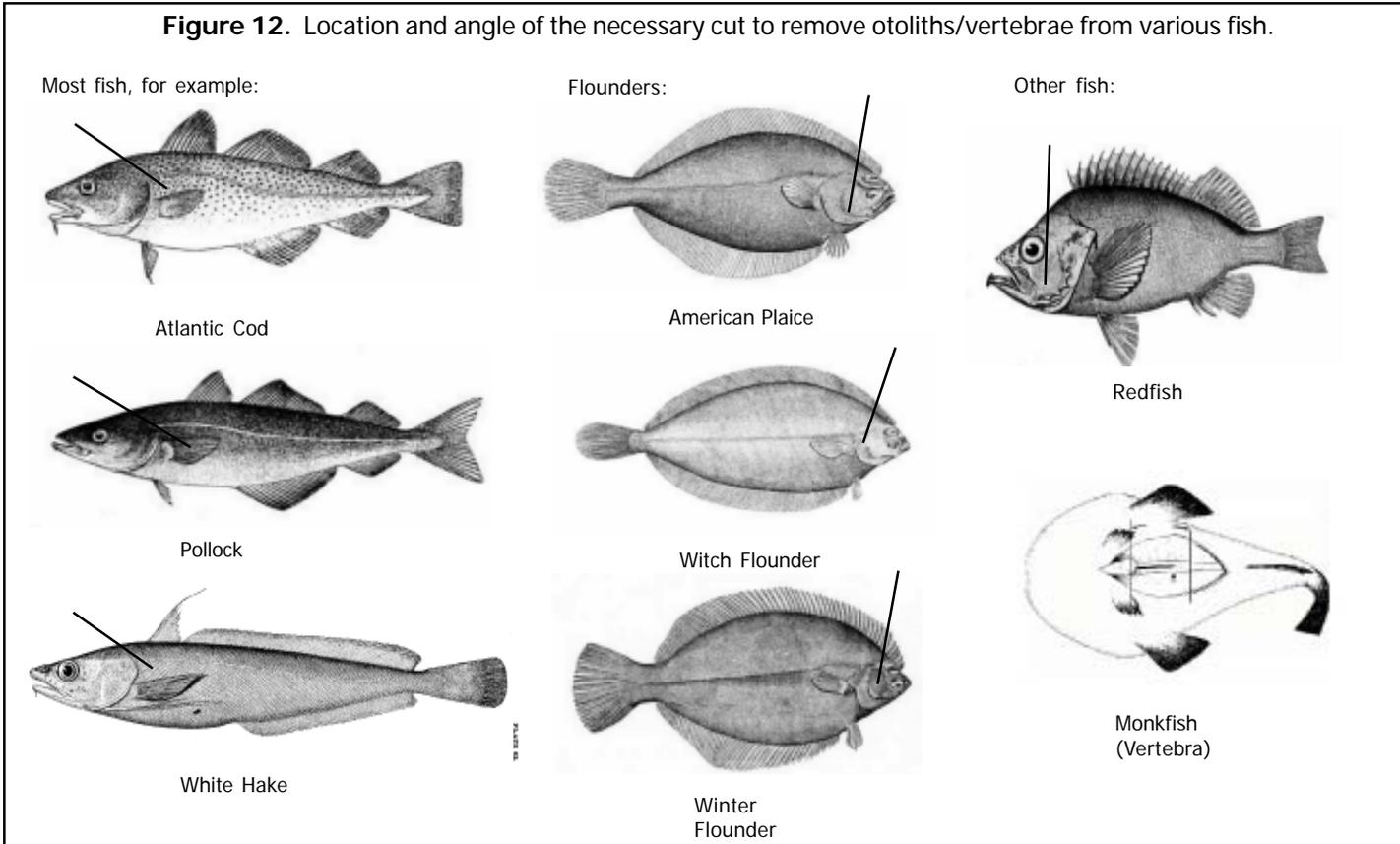
**LENGTH MEASUREMENT ILLUSTRATIONS**

## AGE STRUCTURE SAMPLE COLLECTION

### OTOLITHS



**Figure 12.** Location and angle of the necessary cut to remove otoliths/vertebrae from various fish.

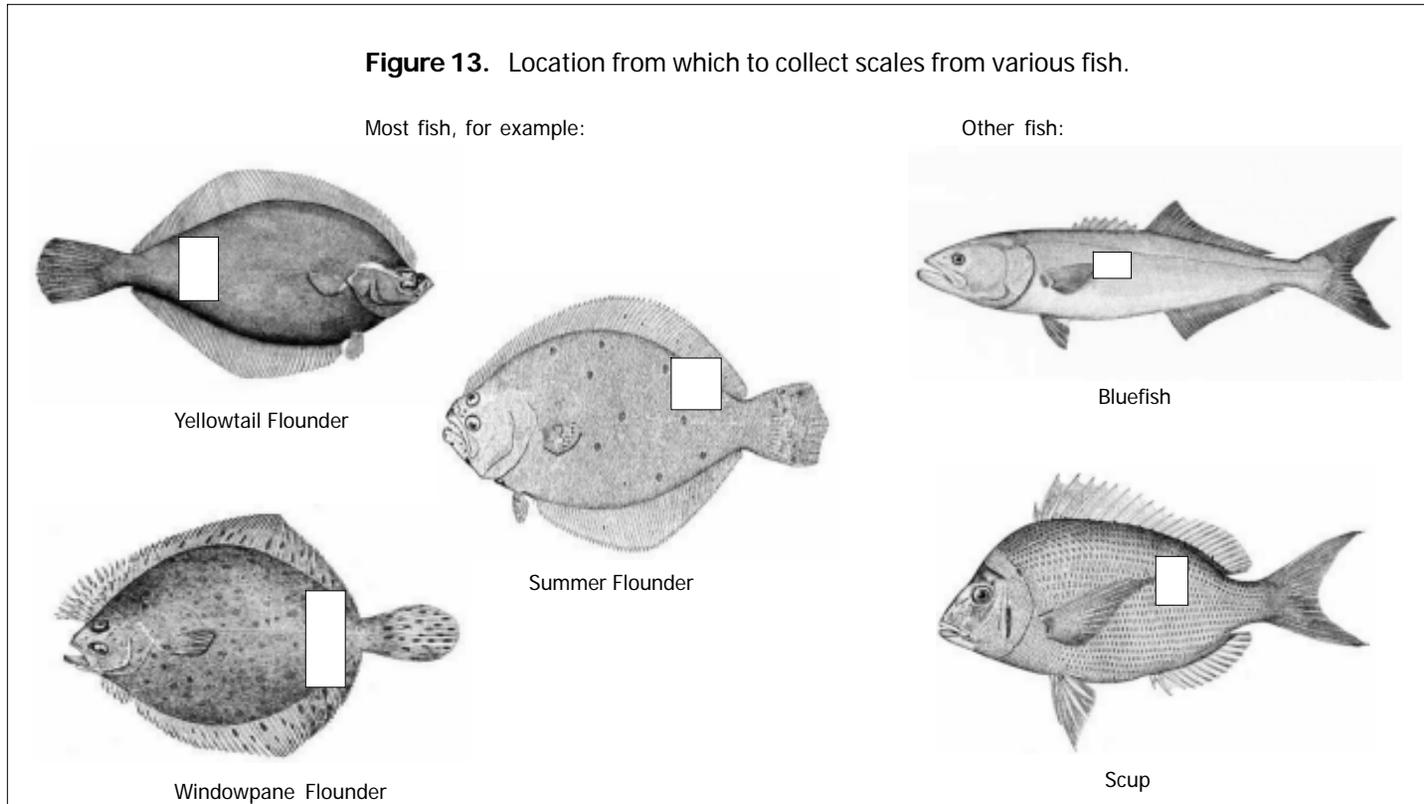


**AGE STRUCTURE SAMPLE COLLECTION**

## AGE STRUCTURE SAMPLE COLLECTION

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### SCALES

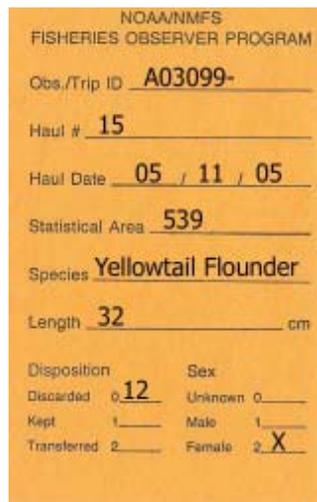


General considerations for age structure sample collection:

Otoliths: Exercise care when cutting the fish to remove the otoliths so as not to shatter them. Shattered otoliths are of little value.

Scales: Do your best to remove mucus, debris and epidermis from the fish before collecting scales. Only scales collected from the proper locations can be used for aging.

**Figure 14.** Age structure envelope.



NOAA/NMFS  
FISHERIES OBSERVER PROGRAM

Obs./Trip ID A03099

Haul # 15

Haul Date 05 / 11 / 05

Statistical Area 539

Species Yellowtail Flounder

Length 32 cm

Disposition      Sex  
Discarded 0 12      Unknown 0  
Kept 1      Male 1  
Transferred 2      Female 2 X

← Every envelope must have a liner.

← Sample envelopes containing age structures from the same species and disposition codes should be grouped together. Each group of envelopes should contain a header envelope. All of the required information should be filled out on the header envelope and each envelope following the header should only contain the length of the species sampled.

Disposition: Record appropriate kept or discarded fish disposition **code** in the space provided. The code must match the fish disposition code as recorded on accompanying length frequency log.

## AGE STRUCTURE SAMPLE COLLECTION

**TABLE 3. PELAGIC FISH SAMPLING REQUIREMENTS BY SPECIES**

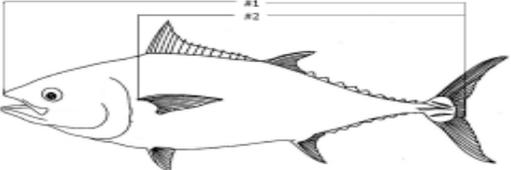
SPECIES NAME	SAMPLE PRIORITY CODE	TARGET SAMPLE SIZE (per haul)	LENGTH TYPE(S) (#1, #2)	LENGTH CODE	SEXING NECESSARY?	AGE STRUCTURE TYPE(S) TO COLLECT
Swordfish	1	100	LJFL, CK	C	Yes	-
Tuna, Bluefin	1	all caught	FL, PFL	S	Yes	-
Bonito	2	50	FL, PFL	S	Yes	-
Marlin, Sailfish, Spearfish, NK	2	50	LJFL, PFL	C	No	-
Shark, NK	2	100	FL, TL	S	Yes	Vertebral Centra
Tuna, Albacore	2	100	FL, PFL	S	Yes	-
Tuna, Bigeye	2	100	FL, PFL	S	Yes	-
Tuna, Blackfin	2	all caught	FL, PFL	S	Yes	-
Tuna, Yellowfin	2	all caught	FL, PFL	S	Yes	-
Dolphinfish (Mahi Mahi)	3	20	FL	S	No	-
Escolar	3	20	FL	S	No	-
Louvar	3	20	LJFL	S	No	-
Mackerel, NK	3	20	FL	S	No	-
Oilfish	3	20	FL	S	No	-
Opah	3	20	TL	S	No	-
Ray, NK	3	20	TL, DW	S	Yes	-
Sturgeon, NK	3	all caught	FL	S	No	-
Tuna, Little (False Albacore)	3	50	FL, PFL	S	Yes	-
Tuna, Skipjack	3	50	FL, PFL	S	Yes	-
Wahoo	3	20	FL	S	No	-

**SAMPLE PRIORITY CODES**  
 1 = HIGH  
 2 = MEDIUM  
 3 = LOW

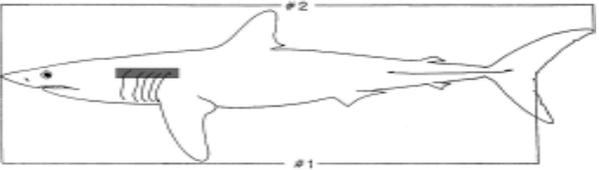
**LENGTH CODES**  
 S = STRAIGHT  
 C = CURVED

**LENGTH TYPE CODES**  
 FL = Fork Length  
 PFL = Pectoral Fin to Fork Length  
 LJFL = Lower Jaw to Fork Length  
 TL = Total Length  
 CK = Cleithrum to Keel Length  
 DW = Disk Width

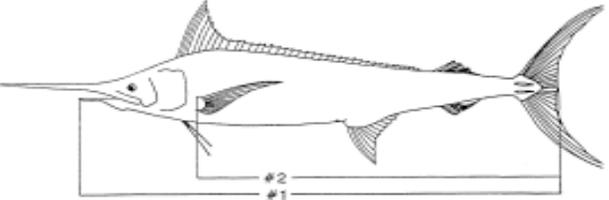
**Length measurement and age sample parts illustrations for pelagic fish. Shaded areas indicate TAG RECAPTURE**



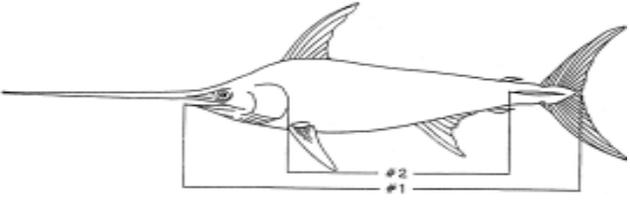
**Figure 15.**  
**TUNA** measurements in order of importance:  
 #1: Tip of upper jaw to fork (straight); #2: Anterior pectoral fin to fork (straight).



**Figure 16.**  
**SHARK** measurements in order of importance:  
 #1: Tip snout to fork (straight); #2: Tip of snout to tip of upper caudal lobe (straight).



**Figure 17.**  
**BILLFISH** measurements in order of importance:  
 #1: Tip of lower jaw to fork (curved); #2: Anterior pectoral fin to fork (curved).



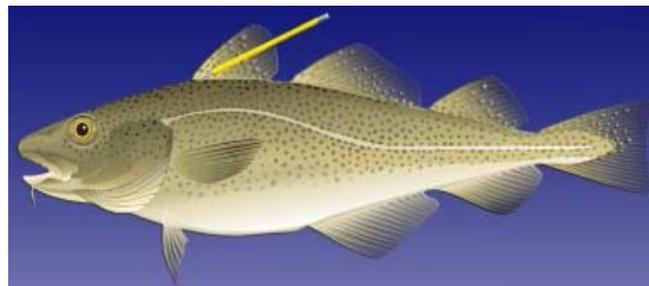
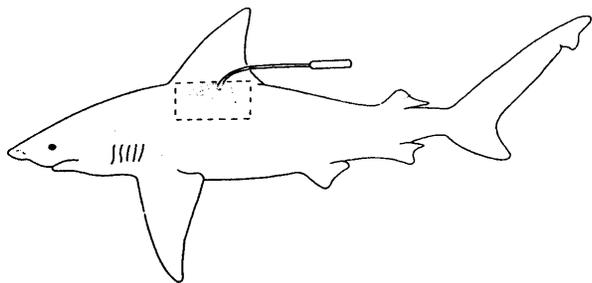
**Figure 18.**  
**SWORDFISH** measurements in order of importance:  
 #1: Tip of lower jaw to fork (curved); #2: Cleithrum to the anterior origin of the caudal keel (curved).

**TABLE 3. PELAGIC FISH SAMPLING REQUIREMENTS BY SPECIES**

## SHARK/FISH TAG RECAPTURE

### Shark and Fish Tag Recapture

- ➔ See [Table 2](#) and [Table 3](#) for samples and length measurement descriptions to collect from tag recapture animals (excluding pelagic species).
- ➔ **All** tag recaptures should be recorded on the [Individual Animal Log](#) and fully sampled if possible (*i.e.* weather permitting and without interfering with the processing of a kept fish).
- ➔ Information to record:
  - Tag #
  - Species
  - Tag program name, address and/or phone number
  - Comments regarding the animal condition at the tag location



**Figure 19.** Examples of tagging locations for sharks/fish.

## BIOLOGICAL SAMPLE TAG

General instructions for filling out biological sample tags:

- ➔ The purpose of biological sample tags is to provide a sturdy label for biological samples collected (*i.e.* vertebrae, finclip, head), excluding otolith and scale age structures.
- ➔ Each sample should be bagged separately, unless otherwise instructed, and have its own tag.
- ➔ If several samples from one animal are collected, or numerous vertebrae from one haul are obtained, each separately bagged sample may be placed in a larger bag for ease in transporting and tracking samples. The larger bag should be tagged as well and all of the appropriate samples indicated.
- ➔ A permanent marker should be used to complete the tag.
- ➔ If an entire marine mammal is retained, a biological sample tag should be completed and attached to the animal's lower jaw or caudal peduncle in addition to the yellow carcass tag.
- ➔ If an entire turtle is retained, a biological sample tag should be completed and attached to the animal's flipper, in addition to tagging the rear flipper with one Inconel tag.
- ➔ All protected species samples must be double bagged and double tagged.

### Biological Sample Tag, front.

NMFS FISHERIES OBSERVER PROGRAM			
Obs/Trip ID	A01099L	Haul #	10
Tag#		PSID	
		Date	02/16/05
Species	Monkfish	Stat Area	514
Fishery	050	Length	45
		Disp	012

### Biological Sample Tag, back.

SAMPLE TYPE:			
BLUBBER	<input type="checkbox"/>	JAW	<input type="checkbox"/>
FETUS	<input type="checkbox"/>	KIDNEY	<input type="checkbox"/>
HEAD	<input type="checkbox"/>	LIVER	<input type="checkbox"/>
HEART	<input type="checkbox"/>	MUSCLE	<input type="checkbox"/>
		REP. ORGAN	<input type="checkbox"/>
		STOMACH	<input type="checkbox"/>
		VERTEBRA	<input checked="" type="checkbox"/>
		WHOLE	<input type="checkbox"/>
OTHER	_____		
		DNA	
		FINCLIP	<input type="checkbox"/>
		FLIPPER	<input type="checkbox"/>
		BIOPSY	<input type="checkbox"/>
		SKIN	<input type="checkbox"/>

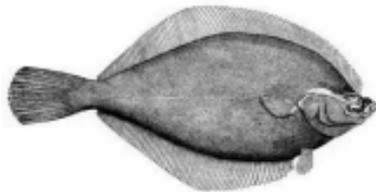
Figure 20. Biological Tag illustration

## SEX DETERMINATION: groundfish

### YELLOWTAIL FLOUNDER *Pleuronectes ferrugineus*

**Female:** The anterior edge of the ovary is rounded, and extends back toward the caudal fin, forming a balloon or sac-like structure. In mature fish the ovary extends back to a minimum of one half of the body cavity. Depending on maturity stage, the ovaries will appear light pink (immature) to bright orange (ripe) in color.

**Male:** The testis is tapered at the anterior edge. It is triangular in shape, and does not extend as far back as the ovary. It extends back toward the caudal fin about twice the distance of the width of the front edge. In mature fish the testis will not extend back any further than the pectoral fins. Depending on maturity stage, the testis will appear clear and transparent (immature) to opaque and white (ripe) in color.

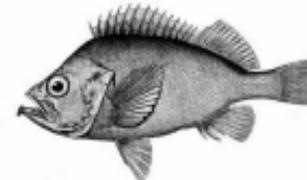


### REDFISH *Sebastes* sp.

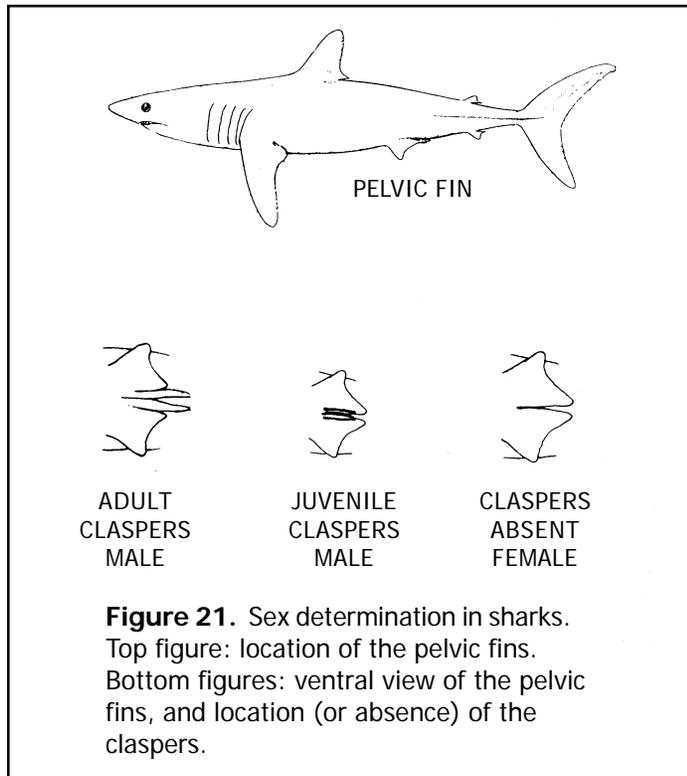
Redfish are live-bearers, so the stage of maturity for females and males are offset. Females will ripen in the winter, when males rest.

**Female:** The ovaries are paired and sac-like, or balloon-like in shape. After the eggs are fertilized, the eyes of the larvae can be seen as black dots. Redfish eggs are green in color.

**Male:** There are greater than two fat bodies present which are sac-like, segmented or lumpy. These may look like the testes, but the testes are paired, consist of smooth tissue and are firmer than the fat bodies. The coloration is light tan when resting and off-white when developing and ripe. Males over 20 cm also have an external copulatory organ, which is located near the vent. If the organ is not seen, it will be necessary to cut open the fish to verify the sex.



**SHARKS Elasmobranchii**



**Figure 21.** Sex determination in sharks.  
 Top figure: location of the pelvic fins.  
 Bottom figures: ventral view of the pelvic fins, and location (or absence) of the claspers.

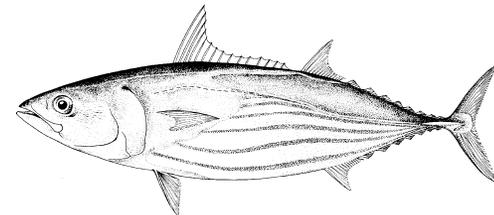
**SEX DETERMINATION: sharks/ tunas**

**TUNAS *Euthynnus, Thunnus* sp.**

See sex determination of **swordfish** section (next page).

**Female:** Same characteristics as swordfish ovaries.

**Male:** The testes are usually elongated and uniform in shape throughout. They are flatter and thinner when compared to the swordfish testes. Generally, there is more fatty or connective tissue associated with the tuna testes than with the swordfish testes.



## SEX DETERMINATION: swordfish

### SWORDFISH *Xiphias gladius*

#### Female:

The most prominent characteristics of female swordfish gonads are:

- oval shape (cigar or sausage shaped)
- rough (striated) external appearance
- in a cross section, the presence of a lumen (opening) near the center

Color: variable, ranges from gray (indicating immature egg production) to orange (indicating near spawning)

Generally, swordfish and tuna over 250 pounds are female.



**Figure 22.** Cross section (left) and whole (right) views of female swordfish gonads. Courtesy of U.S. National Marine Fisheries Service, Southeast Fisheries Science Center.

**Male:**

The most prominent characteristics of male swordfish gonads are:

- triangular in shape (cross section), solid
- thin, elongated, and slightly compressed (smooth and flat)
- a raised center ridge

Color: white to pink



**Figure 23.** Cross section (left) and whole (right) views of male swordfish gonads. Courtesy of U.S. National Marine Fisheries Service, Southeast Fisheries Science Center.

**SEX DETERMINATION: swordfish**

## SEX DETERMINATION: crustaceans

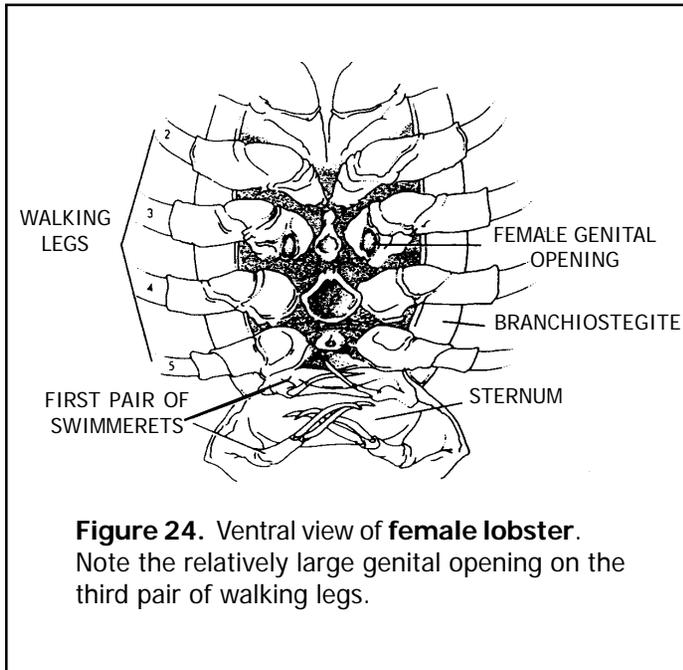
48

### AMERICAN LOBSTER *Homarus americanus*

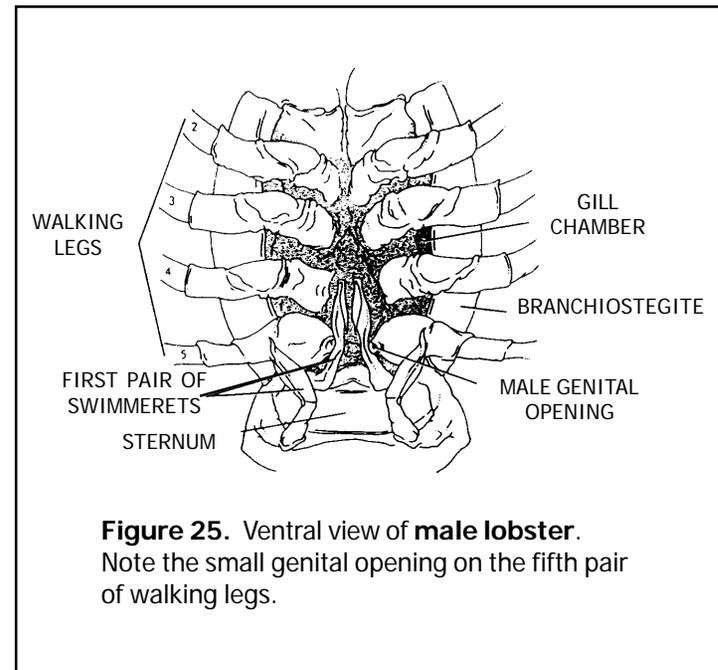


**Female:** The first pair of swimmerets are thin and filament-like.

**Male:** The first pair of swimmerets are thick in shape and firm in texture.

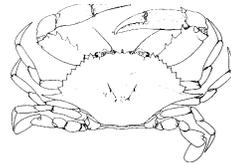


**Figure 24.** Ventral view of **female lobster**. Note the relatively large genital opening on the third pair of walking legs.



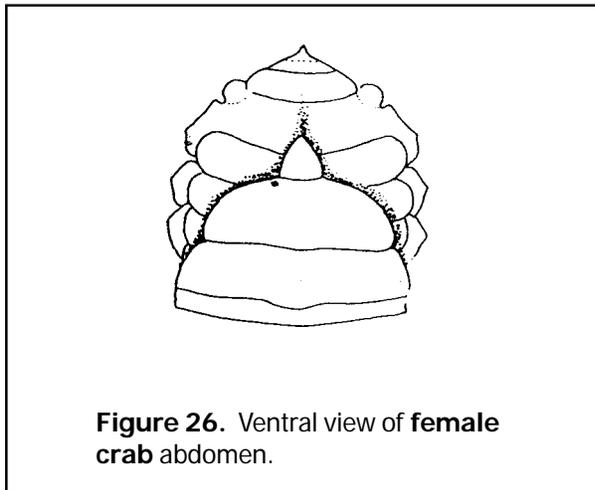
**Figure 25.** Ventral view of **male lobster**. Note the small genital opening on the fifth pair of walking legs.

**CRABS Brachyura**

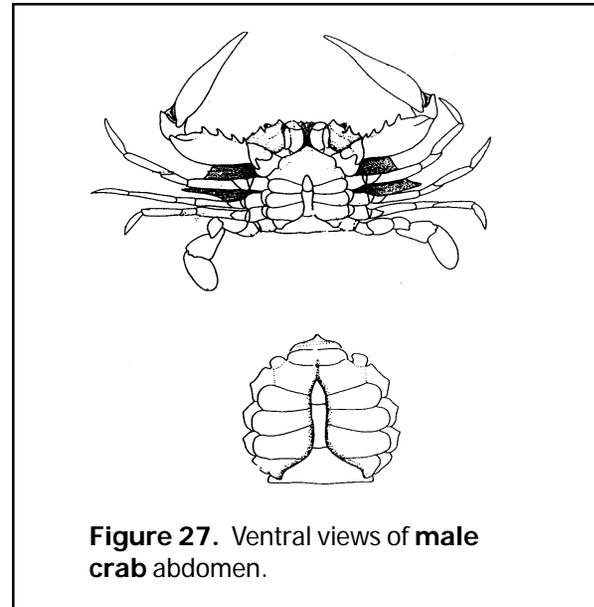


**Female:** The abdomen is "U" shaped.

**Male:** The abdomen is "V" shaped.



**Figure 26.** Ventral view of **female crab** abdomen.



**Figure 27.** Ventral views of **male crab** abdomen.

**SEX DETERMINATION: crustaceans**

**TABLE 4. MARINE MAMMAL SAMPLING REQUIREMENTS BY SPECIES**

SPECIES	WHOLE +	DNA SAMP (FINCLIP/ SKIN)	STD MEAS	HEAD/ JAW	STOM	BLUB	MUSC	REPR TRACT	FETUS	LIVER	HEART	KIDNY	ADD MEAS
Porpoise, Harbor	1	1	1	1	1	1	1	1	1	2	-	-	-
Dolphin, Bottlenose	1	1	1	1	1	1	1	1	1	1	1	3	1
Dolphin, White-sided	1	1	1	1	1	1	-	-	-	-	-	-	-
Dolphin, Common	1	1	1	1	1	1	1	1	1	-	-	-	-
Whale, Pilot, NK	1	1	1	1	1	1	1	1	-	1	2	2	-
Dolphin, Spotted, NK	1	1	1	1	1	1	1	-	1	-	-	-	-
Dolphin, Striped	-	1	1	1	1	1	-	-	-	-	-	-	-
Dolphin, Risso's (Grampus)	-	1	1	1	1	1	2	3	-	-	-	-	-
Seal, Gray	1	1	1	1	1	1	1	-	-	-	-	-	-
Seal, Harbor	1	1	1	1	1	1	1	-	-	-	-	-	-
Seal, Harp	1	1	1	1	1	1	1	-	-	-	-	-	-
Seal, Hooded	1	1	1	1	1	1	1	-	-	-	-	-	-
Whale, Beaked, NK	1	1	1	1	1	1	1	1	1	1	1	-	-

\*\* Please note that species are in order of priority from top to bottom and samples are in order of priority from left to right.

+ If whole animals cannot be retained, collect head after performing minimum sampling requirements.

+ If whole animal is retained, minimum sampling requirements should still be completed.

## MINIMUM REQUIREMENTS

Live animals: Photograph and return to the water.

- Dead animals:
- 1 DNA sample
  - 2 Tag
  - 3 Identify, noting immediate observable characteristics
  - 4 Photograph
  - 5 Body Measurements: 7 for cetaceans, 4 for pinnipeds
  - 6 Body Temperature
  - 7 Sex Determination
  - 8 Describe any new and/or healed wounds



Figure 28. Marine mammal carcass tag

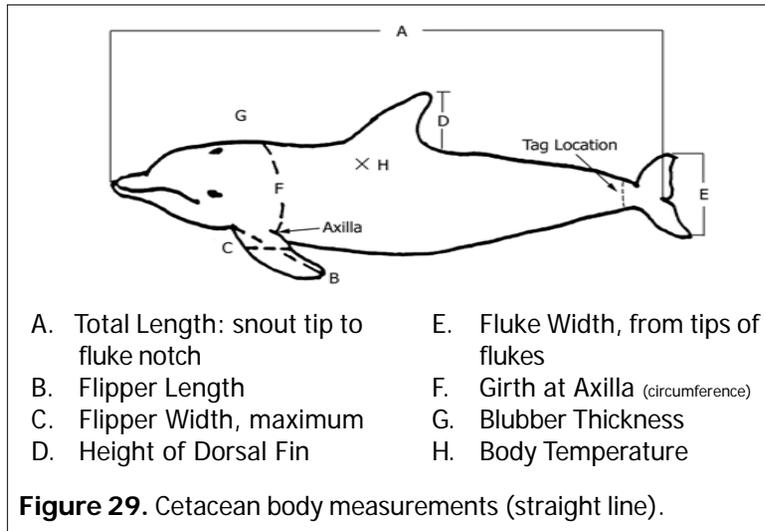


Figure 29. Cetacean body measurements (straight line).

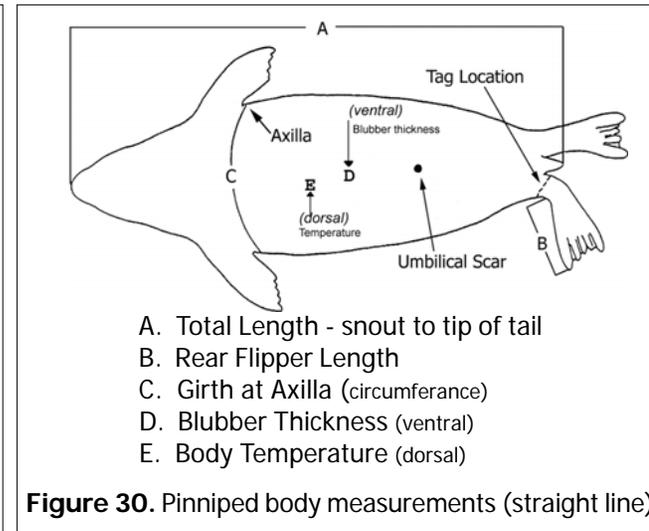
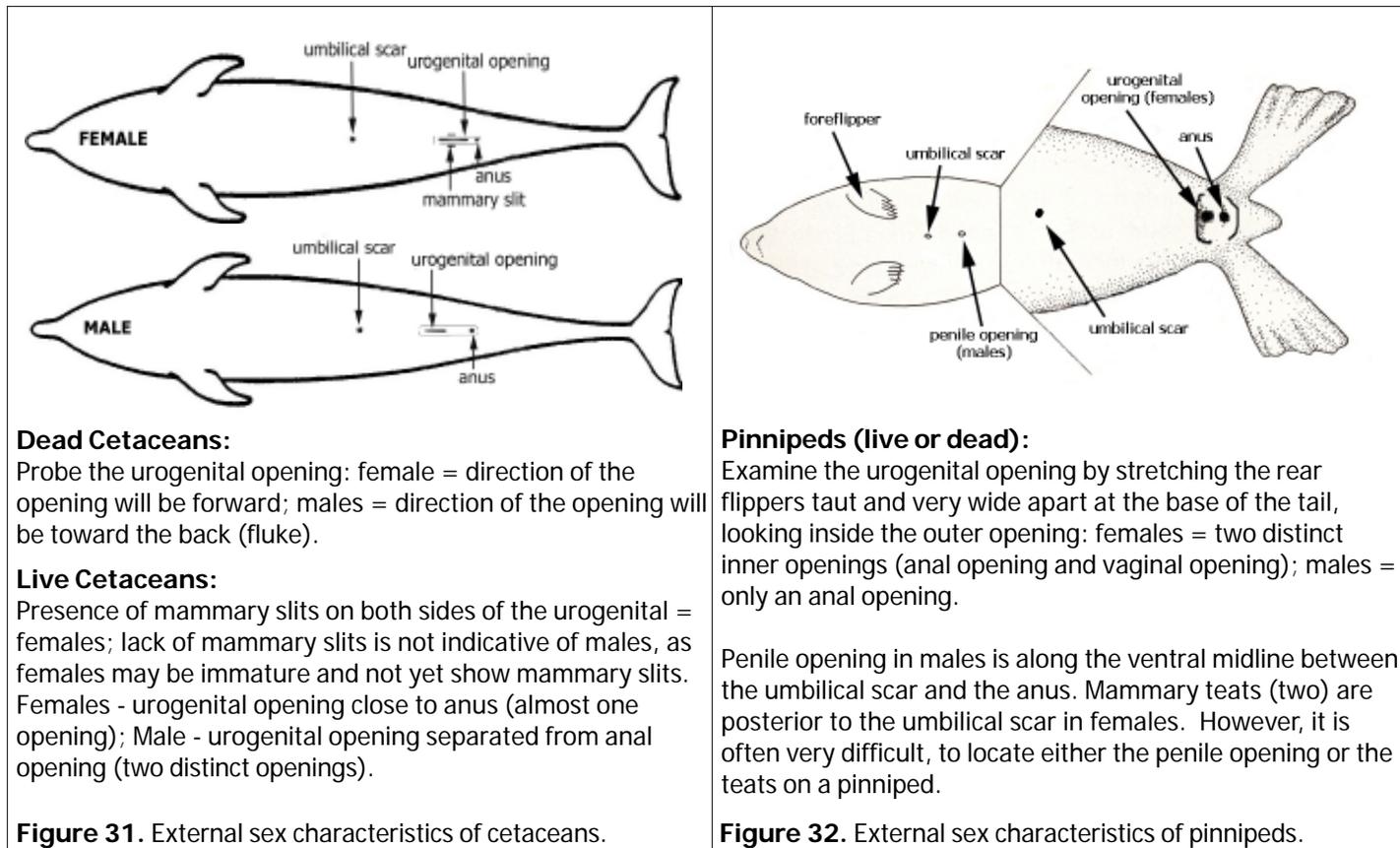


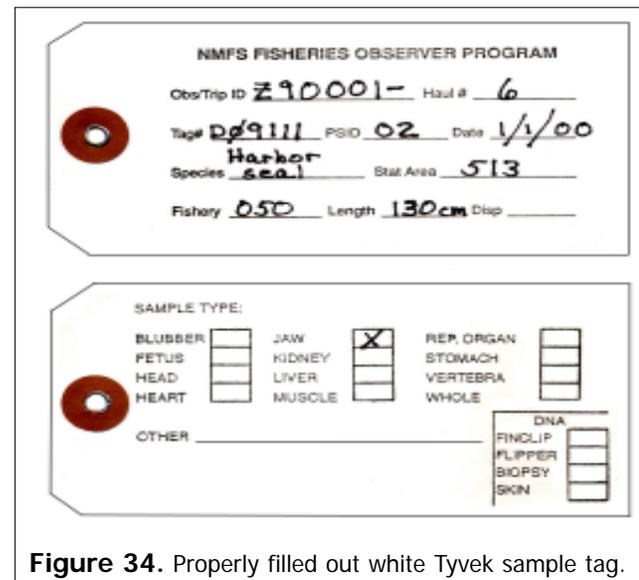
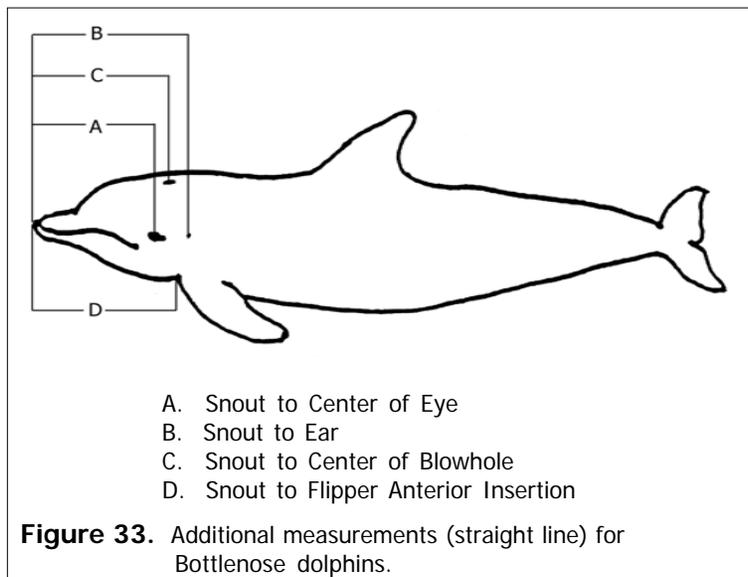
Figure 30. Pinniped body measurements (straight line).

## MARINE MAMMAL MINIMUM SAMPLING PROTOCOLS



**Marine Mammal Additional Sampling Protocols**

After sampling of the catch according to Tables 1a-h and Table 3 is completed, additional marine mammal measurements (Bottlenose dolphins only) and sampling should occur as outlined in Table 4. Be sure to fill out separate tags for each sample collected (Figure 34).



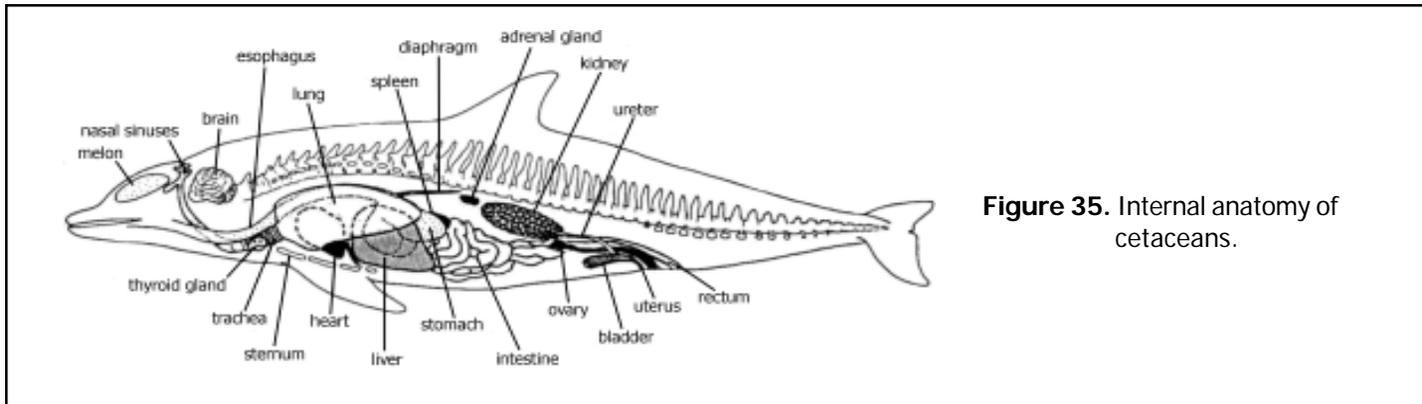


Figure 35. Internal anatomy of cetaceans.

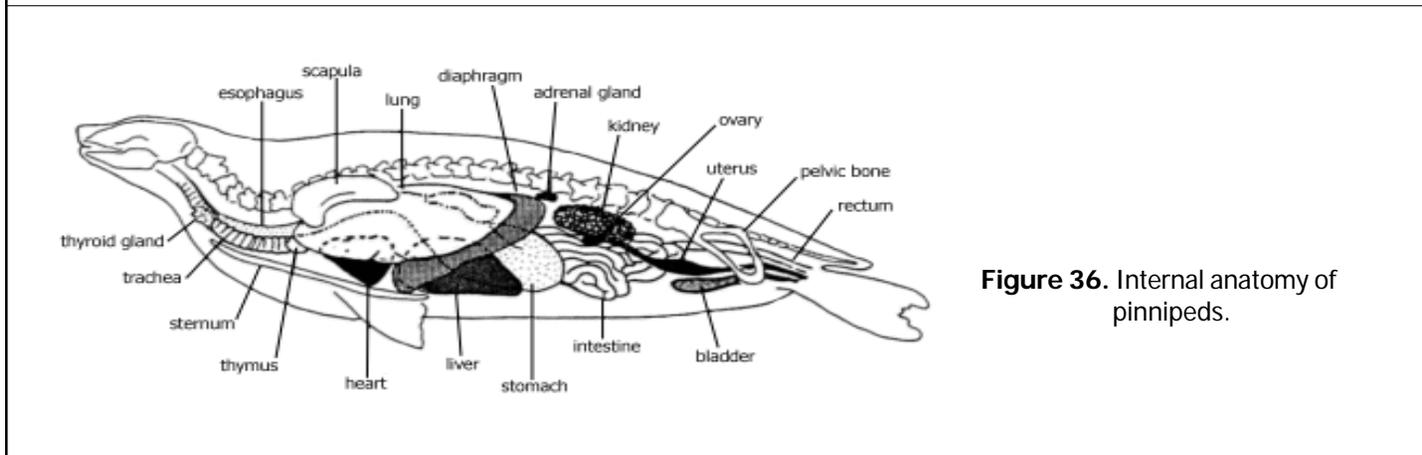


Figure 36. Internal anatomy of pinnipeds.

## SEA BIRD SAMPLING REQUIREMENTS

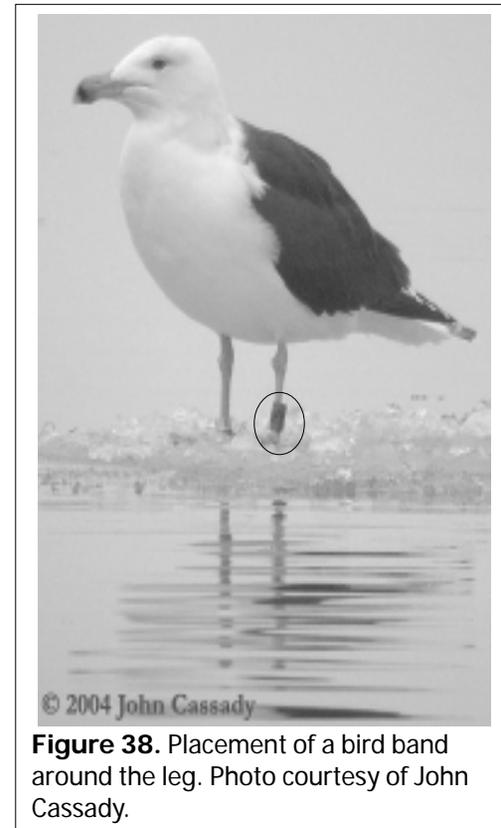
- Live animals:
- 1 Identify, noting immediate observable characteristics
  - 2 Photograph
  - 3 Check for the presence of bands
  - 4 Release

- Dead animals:
- 1 Identify, noting immediate observable characteristics
  - 2 Photograph
  - 3 Check for the presence of bands
  - 4 Retain whole seabird or feathers\*

\***NOTE:** For seabirds (fresh dead only) caught in the area between Maine and North Carolina, all attempts should be made to retain whole specimens. However, if unable, 20-30 breast feathers should be collected. Samples should be bagged and labeled with Tyvek tags, filled out as shown in Figure 34.



## SEA BIRD SAMPLING PROTOCOLS



## SEA TURTLE SAMPLING PROTOCOLS

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### SAMPLING REQUIREMENTS (all turtles)

- 1 Identify, noting immediate observable characteristics
- 2 Photograph
- 3 Describe any new and/or healed wounds
- 4 Body Measurements (3, curvilinear)
- 5 Identification Criteria (6)
- 6 Biopsy/tissue (genetic) sample
  - Live Animals: Turtle must be > 25 cm notch to tip carapace length
  - Dead Animals: Retain animals whole. If not possible then obtain biopsy/tissue sample
- 7 Tag with inconel tag(s) on rear flipper(s): 1 for dead sea turtles, 2 for live sea turtles > 26 cm notch to tip carapace length
- 8 Scan for PIT tags on flippers and all soft tissues

Inconel Tag Location: Proximal to the first scale (closest to the body) on the trailing edge of each rear flipper for all turtles except Leatherback. For Leatherback turtles, tag along the trailing edge of the rear flipper approximately 5 cm (~2 inches) out from the base of the tail (they do not have flipper scales). Position the tag so there will be adequate overhang (approx. 1/3 length of tag) after it is attached. See Figures 39 and 40.

Biopsy Location: Posterior trailing edge of the rear flipper and out (away from the body) from the Inconel tag location. **One crescent shape biopsy per rear flipper.** See Figure 40.

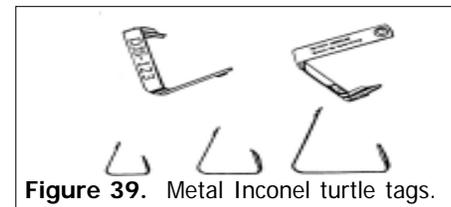


Figure 39. Metal Inconel turtle tags.

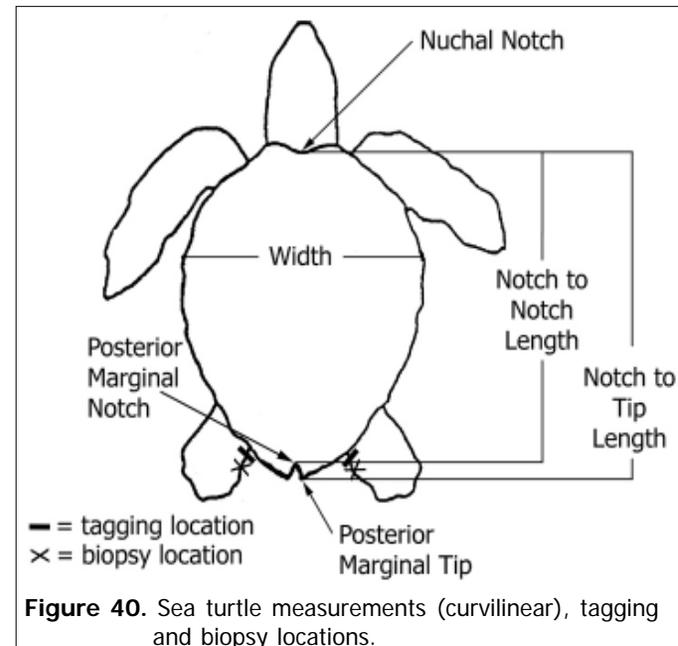


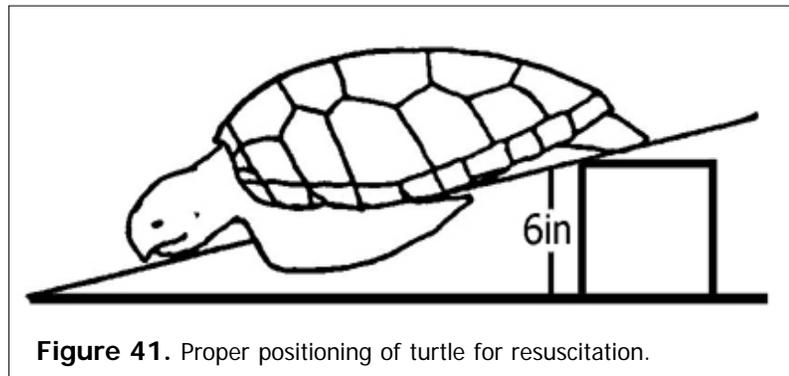
Figure 40. Sea turtle measurements (curvilinear), tagging and biopsy locations.

Resuscitation must be attempted on sea turtles that are comatose or inactive, but not dead. **Do not assume that an inactive turtle is dead.** The onset of rigor mortis is often the only definitive indication that a turtle is dead.

**RESUSCITATION:**

- 1 Place the turtle right side up (on the bottom shell or plastron).
- 2 Elevate the hindquarter 6 inches for a period of 4 up to 24 hours.
- 3 Protect from environmental conditions.
- 4 Periodically rock the turtle from side to side by holding the outer edge of the carapace and lifting one side about 3 inches.
- 5 Touch the upper eyelid and pinch the tail (reflex test) periodically to see if there is a response.

Those that revive and become active must be released over the stern of the boat when fishing gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by fishing gear or vessels. Sea turtles that fail to respond to the reflex test or fail to move within several hours (up to 24, if possible) should be returned to the water in the same manner.

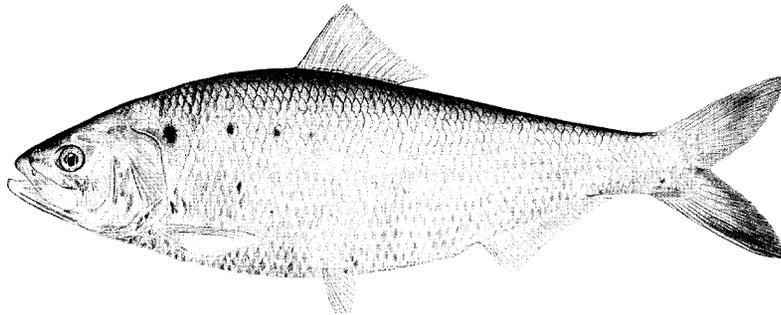


**Figure 41.** Proper positioning of turtle for resuscitation.

## SELECTED SPECIES ID'S: shad

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The following selected species identification section contains descriptions of some of the more commonly misidentified Atlantic species. It should be used as a supplement to the field guides distributed in training.

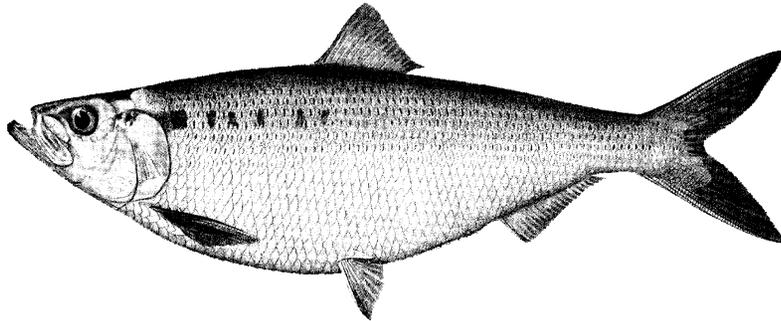


### **AMERICAN SHAD *Alosa sapidissima***

#### Key characteristics

- tip of the lower jaw is entirely enclosed within the tip of the upper mouth when closed
- longer mouth than hickory shad
- upper jaw reaches below the rear edge of the eye
- spots are circular shaped

VS.

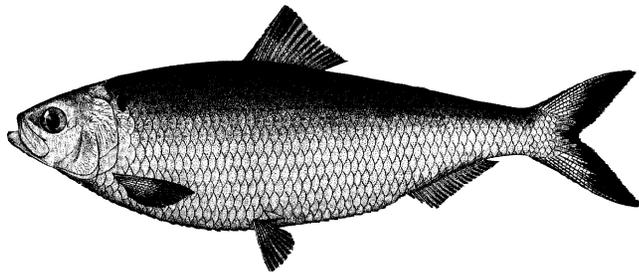


### **HICKORY SHAD *Alosa mediocris***

#### Key characteristics

- tip of the lower jaw projects beyond the upper jaw when mouth is closed
- shorter mouth than American shad
- upper jaw reaches the middle of the eye
- spots are oval shaped

**Figure 42.** American shad (top) and hickory shad (bottom). Source: *Fishes of Chesapeake Bay* by E. O. Murdy et al., published by Smithsonian Institution Press.

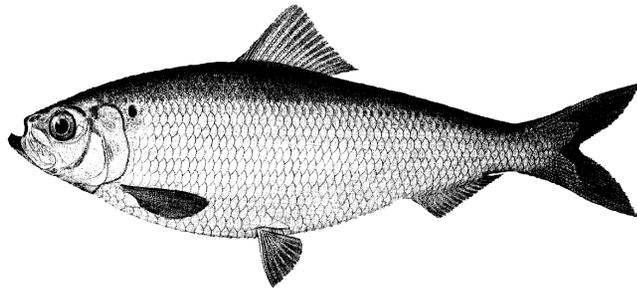


**BLUEBACK HERRING *Alosa aestivalis***

Key characteristics:

- peritoneum (belly lining) is black or sooty colored
- back is blue-green in color
- eye width = distance between the front of the eye to the tip of the snout
- body shape is slightly more slender than the alewife

VS.



**ALEWIFE *Alosa pseudoharengus***

Key characteristics:

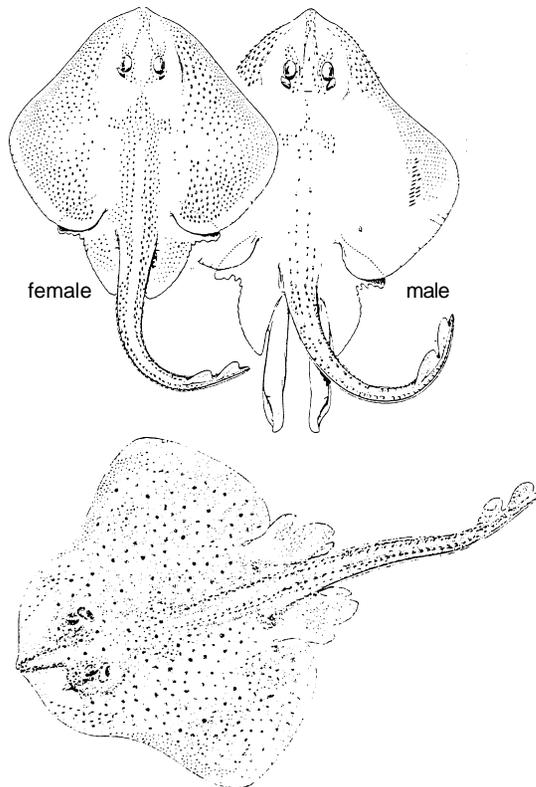
- peritoneum (belly lining) is pale gray or pink
- back is gray-green in color
- eye width > distance between the front of the eye to the tip of the snout
- body shape is slightly deeper than the blueback

**Figure 43.** Blueback herring (top) and alewife (bottom). Source: *Fishes of Chesapeake Bay* by E. O. Murdy et al., published by Smithsonian Institution Press.

**SELECTED SPECIES ID'S: herring**

## SELECTED SPECIES ID'S: skates

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### **LITTLE SKATE *Leucoraja erinacea***

Key characteristics:

- maximum length 54 cm
- matures at a smaller size than winter skates
- animals 35 cm and over will be sexually mature, males will have large claspers that extend well beyond the posterior edge of the disk, females will have a granular patch on the bottom of the animal, in front of the tail

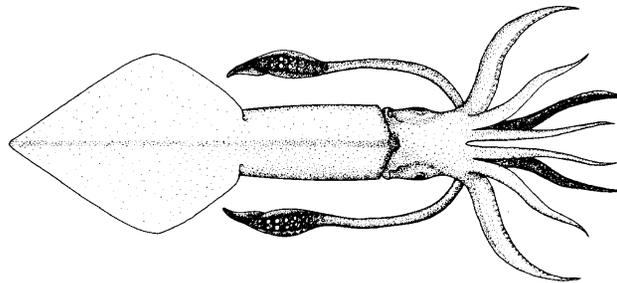
VS.

### **WINTER SKATE *Leucoraja ocellata* (Big skate)**

Key characteristics:

- maximum length 109 cm
- matures at a larger size than little skates
- animals < 54 cm will be sexually immature, males will have small claspers that rarely extend beyond the posterior edge of the disk, females do not have a granular patch on the bottom of the animal

**Figure 44.** Little skate (top) and winter skate (bottom). Source: *Fishes of the Gulf of Maine* by H.B. Biegelow & W.C. Schroder, U.S. Fish and Wildlife Service.



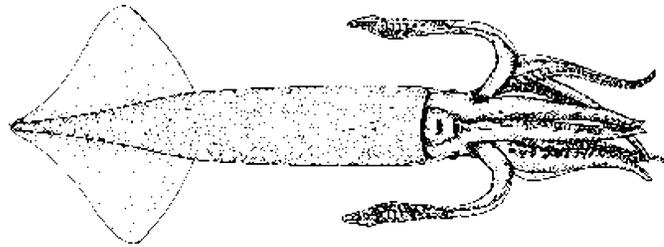
dorsal view

**LOLIGO SQUID *Loligo pealei***  
**(Long-finned squid)**

Key characteristics:

- fins elongated, about 1/2 of mantle length
- color: white to purple, occasionally some reddish-brown, darker on dorsal side

VS.



ventral view

**ILLEX SQUID *Illex illecebrosus***  
**(Short-finned or Boreal squid)**

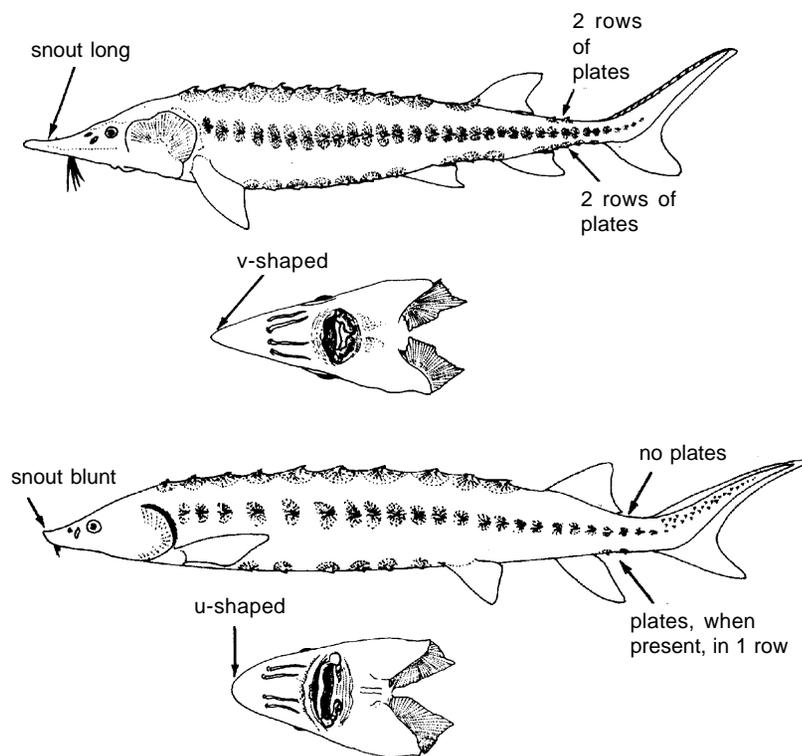
Key characteristics:

- fins shortened, about 1/3 of mantle length
- color: reddish-brown, darker on dorsal side

**Figure 45.** Loligo squid (top) and illex squid (bottom). Source: *FAO Species Identification Sheets for fishery purposes. Western Central Atlantic (fishing area 31). Vol. 6*, UNFAO.

**SELECTED SPECIES ID'S: squid**

## SELECTED SPECIES ID'S: sturgeon



### ATLANTIC STURGEON *Acipenser oxyrinchus*

#### Key characteristics:

- snout v-shaped from underside view (upturned profile in juveniles)
- barbel length > 1/2 width of mouth
- width inside lips < 55% of bony interorbital width
- male average length 198 cm, female average length 244 cm

VS.

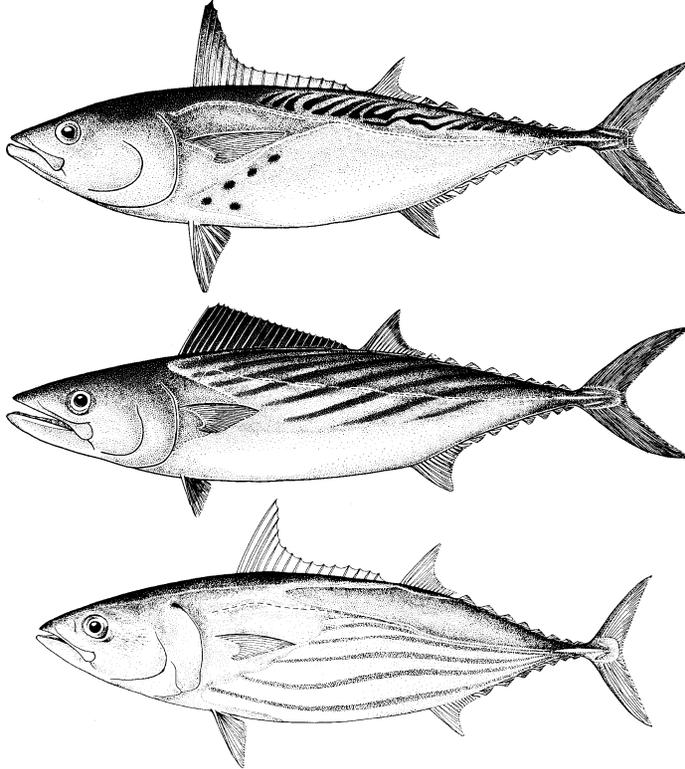
### SHORTNOSE STURGEON *Acipenser brevirostrum*

#### Key characteristics:

- snout u-shaped from underside view
- barbel length < 1/2 width of mouth
- width of inside lips > 62% of bony interorbital width
- post-dorsal plates usually absent
- post-anal plates, when present, in 1 row
- average max. length 102 cm (can be 6 ft. or more)

**Figure 46.** Atlantic sturgeon (top 2) and shortnose sturgeon (bottom 2). Source: *FAO Species Identification Sheets for fishery purposes. Western Central Atlantic (fishing area 31). Vol. 1*, UNFAO.

The key characteristics for distinguishing these 3 species are the body markings.



**LITTLE TUNNY\* *Euthynnus alletteratus*  
(False albacore)**

- markings: a series of dark, wavy lines above the lateral line
- 4-5 dark spots below pectoral fin

\*note that the name 'little tuna' may also be used by fishermen to refer to other Euthynnus species

VS.

**ATLANTIC BONITO *Sarda sarda***

- markings: a series of dark, longitudinal stripes on the upper half of the fish

VS.

**SKIPJACK TUNA *Euthynnus pelamis***

- markings: a series of dark, longitudinal stripes on the lower half of the fish

**Figure 47.** Little tunny (top), Atlantic bonito (middle) and skipjack tuna (bottom). Source: *FAO species catalogue. Vol. 2. Scombrids of the World. An annotated and illustrated catalogue of tunas, mackerels, bonitos and related species know to date* by B.B. Collette & C.E. Nauen, UNFAO.

**SELECTED SPECIES ID'S: tuna**

## SUBSAMPLING AND RANDOM SAMPLING GUIDELINES

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The keys to successful subsampling are:

- ➔ **A sufficiently sized sample.** Collect as large a sample as possible, but at least 20% of the entire catch amount.
- ➔ **A randomly selected sample.** Each fish from the entire catch should have an equal chance of being selected for the subsample. No “favoritism” is given to “exceptional” fish (*i.e.* particularly large or small fish), as it must be equally likely that these, as well as the “typical” members, will be chosen.

Some other basic guidelines:

- ➔ Collect subsamples from **at least three different parts of a large pile**. The greater the range of fish sizes, and the greater the diversity in species composition, the greater the number of subsamples to collect, as time and conditions permit.
- ➔ Instead of a few, large subsamples, **collect more, smaller subsamples from different areas of a pile** or different times during the crew’s sorting procedures.
- ➔ Ensure collection of fish from the **bottom, middle, and top layers** of a pile. Scoop a basket to be filled from the top of a mixed pile of fish, down to the deck, and back to the top.

In every subsampling situation, the methods used should be recorded in the Comments section of the corresponding [Catch Estimation Worksheet](#).

**Example:** A large otter trawl catch, which consists mainly of the target species, loligo squid, is brought aboard the vessel and dumped on deck into a rectangular holding area confined by 4 peg boards. The crew sorts the catch in the following manner: the pile is picked through and all species other than squid are removed. Species to be kept are sorted into totes by species. Species to be discarded are thrown into a separate tote, as requested by the observer. Because of the large volume, the observer must sample the squid differently from the rest of the catch.

- 1 The observer weighs all totes of the kept species other than squid to obtain actual weights for these species.
- 2 The observer then identifies the priority\* species requiring further sampling (length measurement and age structure collection) and begins measuring fish, randomly chosen from the tote(s). While conducting length frequencies, the first one to three fish (depending on the sample size and time available) at each unique length are sampled for age structures, as appropriate.
- 3 The observer takes a subsample of the squid catch by filling 5 totes of squid from the total catch, making sure to collect animals from different parts of the pile. The observer estimates the total catch weight of squid based on tote counts (method A on the next page).
- 4 The observer then obtains a complete sample, 100 lengths\*, of squid randomly chosen from the totes.
- 5 After sampling of the kept catch is completed, the observer sorts the tote of **discarded catch** by species. All animals are weighed to obtain actual weights for all species.
- 6 Appropriate numbers of length frequency and age structures are collected from all of the required\* (priority) species of the discarded catch, as described in #2.

\* See [Tables 1a-h. Length Frequency & Age Structure Sampling Priorities by Fishery](#), & [Table 2. Fish & Shellfish Sampling Priorities by Species](#).

## SUBSAMPLING AND RANDOM SAMPLING GUIDELINES

## CATCH ESTIMATION GUIDELINES

Accurate weights are extremely important. It will be possible to obtain actual weights in most situations. In rare cases, *i.e.* extremely large catches, rough weather, etc., it may be necessary to estimate the catch or a portion of the catch.

- ➔ Dressed vs. Round weights: Get round weights unless they are landing parts of a particular species, for example: monkfish livers, monkfish tails, skate wings, shark fins.
- ➔ Kept vs. Discarded catch: The following techniques can be used to estimate weights for both the kept and discarded portions of the catch. However, usually weight estimation will only be necessary for a kept species. If you are recording discards, ask the crew to throw the discards aside in totes or baskets for you to weigh at the end of the haul.
- ➔ Remember to subtract the weight of the basket or tote, *i.e.* the subsampling unit, from all weight calculations.
- ➔ Obtain a catch estimate from the captain if there is no other way of estimating a weight.

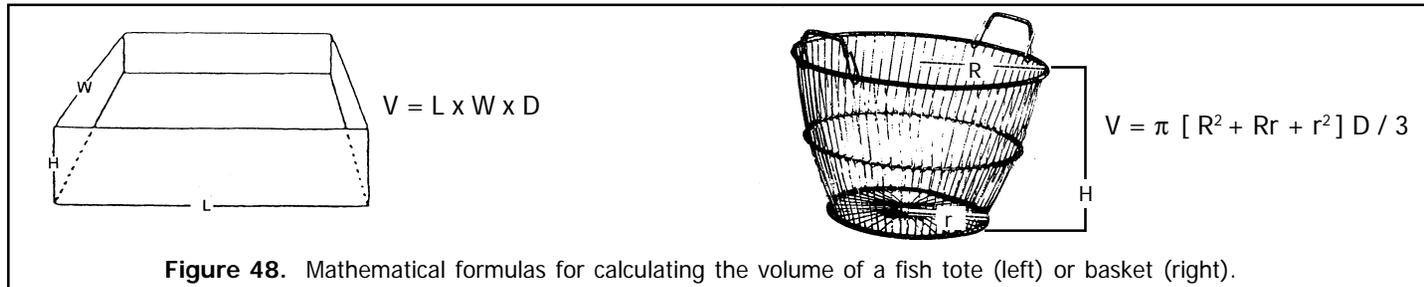
### A Estimation Based on Basket or Tote Counts

- 1 The catch is separated into totes by species. For each species:
- 2 Get an average weight per tote by actually weighing some totes (A).
- 3 Count the total number of totes; make sure that all of the totes are filled to approximately the same level (B).
- 4 If the last tote is not full, weight it (C).
- 5 To calculate the total catch, multiply the number of totes by the average weight of a tote and add the remainder (A x B + C).

### B Estimating Large Catches and Total Species Weights Using Volume to Volume Method

- 1 Calculate the volume of the catch within the fish bin or hold. Take care that your volume measurements accurately represents the entire catch.  
**Example:** Rectangular bin/hold: Volume A (V cubic feet) = depth of catch (D feet) x width (W feet) x length (L feet).\*\*
- 2 Calculate/determine the volume of the catch within a basket or tote (the subsampling unit) by multiplying the number

\*\* Examples of calculating the volume for odd shaped containers can be found in the [NEFOP Observer Program Training Manual](#).



of subsampling containers by the volume of the subsampling container.

➔ Volume of a standard fish tote = 2.65 ft<sup>3</sup>

➔ Volume of an orange basket = 1.47 ft<sup>3</sup>

Example: 8 orange baskets were used to collect a subsample of the entire catch. The subsample volume would be 8 (number of baskets) x 1.47 ft<sup>3</sup> (volume of an orange basket) = 11.76 ft<sup>3</sup> (subsample volume).

- 3 Calculate the Sample Weight Multiplier by dividing the total catch volume (Step 1) by the total subsample volume (Step 3).

Example: 40 ft<sup>3</sup> (total volume of catch) ÷ 4 ft<sup>3</sup> (total subsample volume) = 10 (sample weight multiplier).

- 4 Extrapolate the total of each of each species from the subsample by multiplying the weight of each individual species by the sample weight multiplier.

Example: The total subsample weights consist of 12 lbs Monkfish, 20 lbs Atlantic Cod and 30 lbs Summer Flounder.  
 12 lbs (Monkfish) x 10 (sample weight multiplier) = 120 lbs (estimated total Monkfish weight on haul log)  
 20 lbs (Atlantic Cod) x 10 (sample weight multiplier) = 200 lbs (estimated total Cod weight on haul log)  
 30 lbs (Summer Flounder) x 10 (sample weight multiplier) = 300 lbs (estimated Summer Flounder weight on haul log).

## CATCH ESTIMATION GUIDELINES

## SUBSAMPLING GUIDELINES FOR THE SCALLOP FISHERY

Listed below are comprehensive notes on subsampling scenarios which might occur while observing a scallop trip. The standard subsampling method is the Volume to Volume Ratio. Some general guidelines to keep in mind are:

- ➔ Actual weights are the priority, especially for Access Area Scallop trips. Subsampling is used only for large volume catches where estimated weights are expected.
- ➔ Kept vs. Discarded catch: The following techniques can be used to estimate weights for both the kept and discarded portions of the catch. However, usually weight estimation will only be necessary for kept species. If you are recording discards, ask the crew to throw the discards aside in totes or baskets for you to weigh at the end of the haul.
- ➔ Remember to subtract the weight of the basket or tote (*i.e.* the subsampling unit) from all weight calculations.
- ➔ Obtain a catch estimate from the captain if there is no other way of estimating a weight.

**A** **Sampling for a Standard Haul** (*i.e.*, each haul is sorted individually. The haul is dumped on a clean deck and sorted before the next haul back)

*-Collect Weights of discarded species.*

- 1 When a haul is dumped on deck, collect (actual) weights for all discarded species during and after the sorting process. If time becomes an issue, you may choose to collect a subsample of the discard pile. Use the Volume to Volume Ratio Method (refer to pages 66-67). If a subsample of the remaining discards is not an option, use approved estimation methods (*i.e.*, tally or Basket Count Method) to obtain accurate estimates of all discards.

*-Determine weight of kept scallops for the haul using the Basket Count Method.*

- 2 Count the number of baskets of kept scallops collected for that haul. This value will be entered in the Number of Bushels field under kept scallops on the Scallop Dredge Haul Log.
- 3 Obtain an average weight of a basket of kept scallops (calculated once per watch at a minimum). In Open Areas, an average weight will be calculated from three or more full baskets of whole kept scallops (filled by

crew). In Scallop Access Areas, an average weight will consist of the meat weight from 1 full basket of whole scallops (filled and cut by crew).

- 4 Multiply the number of kept scallop baskets by the obtained average weight. This product will equal the total weight of kept scallops for that haul. Enter this value in the Average lb/bushel field on the Scallop Haul Log.

**B Deckloading** (i.e., multiple hauls are dumped on top of each other)

*-Find the Total Catch Volume.*

- 1 Calculate the Total Catch Volume and collect a random subsample from the pile. Ideally, the subsample will be  $\geq$  20% of the Total Catch Volume. Large species or species that are few or uncommon in the pile can skew subsample estimates. Remove all of these species (if possible) prior to calculating the Total Catch Volume. Collect actual weights or Tally/Basket Counts for these larger species.  
Volume of a standard fish tote = 2.65 ft<sup>3</sup>  
Volume of an orange basket = 1.47 ft<sup>3</sup>

*-Collect weights of species.*

- 2 Access Area Trips - Keep a cumulative actual weight of Yellowtail Flounder (kept and discarded) and a cumulative count of baskets of kept scallops over the entire deckloading period. Divide the weight totals equally among participating hauls. (refer back to steps 1-3 under section A to determine the weight of scallops).  
Open Area Trips or Access Area Trips with no Yellowtail Flounder tally requirements - Obtain a cumulative count of kept scallop baskets over the deckloading period. Divide the weight totals equally among participating hauls.

## **SUBSAMPLING GUIDELINES FOR THE SCALLOP FISHERY**

## SUBSAMPLING GUIDELINES FOR THE SCALLOP FISHERY

Use these collective sums for Yellowtail Flounder (kept and discarded) and kept scallops. The actual weights collected will be recorded as estimates on the haul logs due to an even share of the actual weights being assigned for each haul. Disregard the possible subsample estimate weights for Yellowtail Flounder and kept scallops. Comment on this process on the [Catch Estimation Worksheet](#).

- 3 Before the next haul is brought on board, obtain the remainder volume of the catch that remains on deck (refer to step 1 under section B in the Catch Estimation Guidelines section).
- 4 When the next haul is dumped, obtain the volume of the new catch pile on deck then subtract the remainder volume obtained from the haul prior to this. This is the calculated volume of the current haul. If deckloading continues, return to step 2 under section B and continue method until the deck is clear.

If time does not allow for subsamples using the Volume to Volume Ratio Method for the deckloading period, obtain Yellowtail Flounder cumulative actual weights and cumulative basket counts of kept scallops as a priority. Obtain actual weights or use approved methods for accurately estimating other discarded species.

- C Shoveling only** - Volume to Volume Ratio Method (*i.e.*, mixed catch shoveled into baskets. Deck cleared for next haulback)

*-Find the Total Catch Volume.*

- 1 Keep an accurate tally of the # of baskets of mixed catch shoveled for the haul. The total basket count will represent the total volume. **OR** Measure the catch pile dimensions to calculate the Total Catch Volume.

*-Collect weights of species*

- 2 Collect a random subsample of baskets (ideally  $\geq 20\%$  of the total catch volume).

If you are counting the # of baskets filled by shovel, to obtain total volume, you must use baskets filled by the crew. Remember that 1 orange basket = 1.47 ft<sup>3</sup> when flush, but when comparing basket to basket an observer must leave the baskets heaped as the crew filled them.

- 3 Obtain the total number of kept scallop baskets by multiplying the number of baskets of scallops present in the subsample by the Sample Weight Multiplier. Obtain actual weights or used approved methods for accurately estimating other discarded species (refer to Steps 3-4 under section A).

If larger finfish are not shoveled, collect actual weights while the shoveling is occurring.

#### **D Combination of Shoveling and Deckloading**

- 1 Measure the catch pile dimensions to calculate the Total Catch Volume.
- 2 Collect a random subsample of baskets shoveled by the crew (ideally  $\geq$  20% of the total catch volume).
- 3 Use the Volume to Volume Ratio Method to calculate the total weight for each species (refer to pages 66-67). Remember to keep cumulative actual weights of Yellowtail Flounder (kept and discarded) for all hauls on deck for Access Area trips with Yellowtail Flounder tally requirements.
- 4 Obtain total number of kept scallop baskets by multiplying the number of baskets of scallops present in the subsample by the Sample Weight Multiplier (refer to Steps 3-4 under section A).
- 5 Before the next haul is brought onboard, you must obtain the remainder volume of the catch that remains on deck.
- 6 When the next haul is dumped, obtain the volume of the new catch pile on deck, then subtract the remainder

### **SUBSAMPLING GUIDELINES FOR THE SCALLOP FISHERY**

**SUBSAMPLING GUIDELINES FOR THE SCALLOP FISHERY**

volume obtained from the haul prior to this. This is the calculated volume of the current haul. Proceed to step 1 under section D and continue method until the deck is clear.

**NOTE:** If time does not allow subsampling using the Volume to Volume Ratio Method for the deckloading period then obtain Yellowtail Flounder cumulative actual weights and cumulative basket counts of kept scallops only. Obtain actual weights or used approved methods for accurately estimating other discarded species.





revised 01/01/08