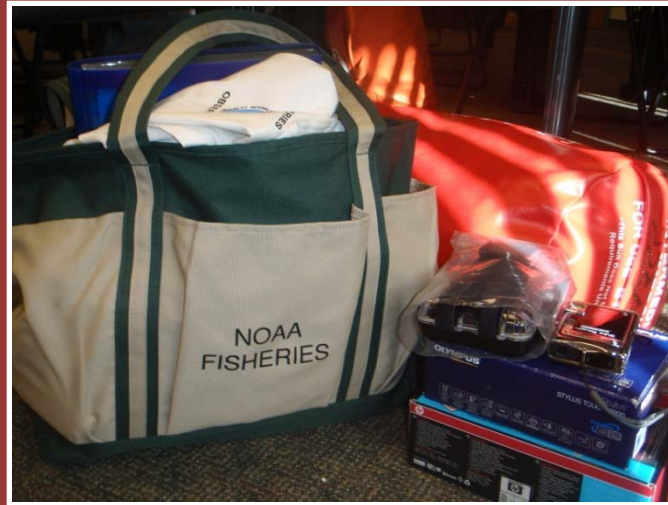
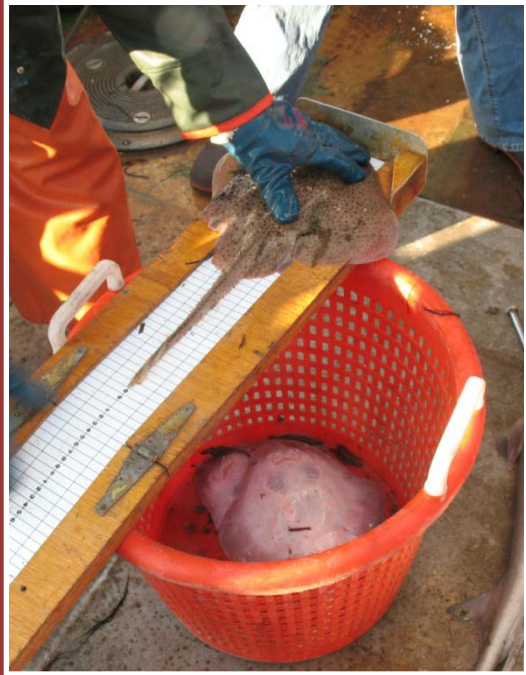


NORTHEAST FISHERIES AT-SEA MONITOR PROGRAM

BIOLOGICAL SAMPLING MANUAL

2010



U.S. Department of Commerce/NOAA
Fisheries Service
National Marine Fisheries Service
Northeast Fisheries Science Center
Fisheries Sampling Branch
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INTRODUCTION

This guide is intended to serve as a general at-sea biological sampling reference for the Northeast Fisheries Science Center (NEFSC) at-sea monitors. It contains summaries and tables designed to enable at-sea monitors 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, at-sea monitors should mainly rely on the field guides issued in training for species identification.

Biological sampling is an important function of an at-sea monitor. These data are used in scientific studies and may influence management regulations. It is therefore very important that at-sea monitors have a thorough understanding of biological sampling principles and practices. Prior to deployment, especially in a new fishery, at-sea monitors should review all biological sampling protocols and resolve any uncertainty with At-Sea Monitor Program staff.

In addition to this manual, the NEFSC At-sea Monitor Program Manual provides a detailed description of each data field collected. The NEFSC At-sea Monitor Program Manual is a textbook for at-sea monitor trainees as well as a reference for experienced at-sea monitors 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.

At-Sea Monitors At Work



Checking Safety Equipment



Sorting Through Catch



Measuring Fish



Weighing Catch

All photos from NEFSC Program photo files.

BIOLOGICAL SAMPLING: An Overview

Definitions

Observed Haul: A haul for which the at-sea monitor 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.

Unobserved Haul: A haul for which the at-sea monitor is not able to collect complete kept and discarded catch information. A haul may be unobserved due to weather, illness, etc. Kept catch only should be recorded on the haul tab/log.

Note: Individual animals and incidental take records should still be recorded during unobserved hauls.

Sampled Haul: A haul for which the at-sea monitor collects detailed biological information, such as length measurements, from certain species 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, 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

At a minimum, biological sampling should occur 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. **Obtaining actual weights is always a priority over biological sampling.**

BIOLOGICAL SAMPLING: An Overview

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

- Tables 1a-c: Length Frequency Sampling Priorities are organized by fishery and area, with species listed alphabetically. Each list includes fish 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 Sampling Requirements by Species lists the number of lengths to collect for each fish species which may be sampled within a Statistical Area.
- Table 3. Pelagic Species Sampling Requirements summarizes the sampling priorities and protocols for pelagic species.
- The Marine Mammal, Sea Turtle, and Sea Bird Biological Protocols section summarizes the sampling priorities and protocols for incidentally taken animals.

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 at-sea monitor to each unique situation.

Generally, only those species listed in Tables 2 & 3 should have length measurements as these species are considered the commercially important (marketable) species taken by the specific gear in the designated area. However, significant quantities of targeted species or bycatch of commercially important species which may not be listed in these tables may also be sampled. In general, the at-sea monitor should attempt to obtain complete sets (i.e. actual weights and target lengths) of kept and discard samples from species in the same haul or statistical area. For example, it is more valuable for at-sea monitors to collect 100 lengths from a single species instead of 20-30 lengths from multiple species.

INCIDENTAL TAKE SAMPLING PRIORITIES FOR ALL FISHERIES

Marine mammals, sea turtles, and sea birds are high priority species.

Incidentally taken marine mammals, sea turtles, and sea birds are high priority species. All incidental takes must be identified, photographed, and checked for the presence of tags or bands. If present, the tag/band number must be recorded. The tag/band should be removed if possible. Any incidentally taken animals which are still alive must be checked for the presence of tags/bands, photographed, identified, and released as soon as possible. All dead marine mammals must be tagged by the at-sea monitor.

GILLNET SAMPLING PRIORITIES

Complete fish sampling trips:

- **Every** haul is observed, i.e. complete catch information for both kept and discarded species is recorded.
- Actual weights should be collected for all discarded species.
- The kept and discarded catch of all hauls should be biologically sampled, with priority given to the discarded species.

If it is not possible to obtain actual weights for discarded species or biologically sample a particular haul according to these instructions, the reason(s) should be noted in the comments section of the corresponding Haul Tab/Log.

Table 1a. Length frequency sampling priorities in the Gillnet Fishery

Gulf of Maine Stat. Areas 511-515, 464, 465

Species	Length Frequencies	
	Kept	Discard
Alewife	1	1
Bass, Striped	2	2
Bluefish	3	3
Cod, Atlantic	1	1
Cusk	1	1
Dogfish, Spiny	2	2
Flounder, Am. Plaice	2	2
Flounder, Winter	1	1
Flounder, Witch	1	1
Flounder, Yellowtail	2	2
Haddock	1	1
Hake, Red	3	3
Hake, Silver	3	3
Hake, White	1	1
Halibut, Atlantic	1	1
Herring, Blueback	1	1
Mackerel, Atlantic	3	3
Monkfish	1	1
Pollock	1	1
Redfish, Nk	2	2
Shad, American	1	1
Skate, Barndoor	-	2
Skate, Little	2	2
Skate, Smooth	-	3
Skate, Thorny	-	2
Skate, Winter	2	2
Wolffish	-	1

George's Bank (Stat. Areas 522, 525, 526, 561, 562)

Species	Length Frequencies	
	Kept	Discard
Bluefish	3	3
Cod, Atlantic	1	1
Cusk	1	1
Dogfish, Spiny	2	2
Flounder, Am. Plaice	2	2
Flounder, Witch	2	2
Haddock	1	1
Hake, Red	3	3
Hake, Silver	3	3
Hake, White	1	1
Halibut, Atlantic	1	1
Monkfish	1	1
Pollock	1	1
Redfish, Nk	2	2
Skate, Barndoor	-	3
Skate, Little	2	2
Skate, Rosette	3	3
Skate, Smooth	-	2
Skate, Thorny	-	2
Skate, Winter	2	2
Wolffish	-	1

Table 1a. Length frequency sampling priorities in the Gillnet Fishery (cont'd)**Cape Cod (Stat. Area 521)**

Species	Length Frequencies	
	Kept	Discard
Alewife	1	1
Bass, Striped	3	3
Bluefish	3	3
Cod, Atlantic	1	1
Cusk	3	3
Flounder, Winter	2	2
Haddock	2	2
Hake, Red	3	3
Hake, Silver	3	3
Hake, White	1	1
Herring, Atlantic	1	1
Herring, Blueback	1	1
Mackerel, Atlantic	3	3
Monkfish	1	1
Pollock	1	1
Redfish, Nk	2	2
Shad, American	1	1
Skate, Barndoor	-	2
Skate, Little	2	2
Skate, Smooth	-	2
Skate, Thorny	-	2
Skate, Winter	2	2
Tautog	3	3
Wolffish	-	1

Southern New England (Stat. Areas 537-539)

Species	Length Frequencies	
	Kept	Discard
Alewife	1	1
Bass, Striped	3	3
Bluefish	3	3
Cod, Atlantic	1	1
Dogfish, Spiny	2	2
Flounder, Winter	1	1
Herring, Blueback	1	1
Mackerel, Atlantic	3	3
Monkfish	1	1
Shad, American	1	1
Skate, Barndoor	-	2
Skate, Clearnose	3	3
Skate, Little	2	2
Skate, Rosette	3	3
Skate, Smooth	2	2
Skate, Thorny	-	2
Skate, Winter	2	2
Tautog	3	3

Table 1a. Length frequency sampling priorities in the Gillnet Fishery (con't)

Mid-Atlantic (Stat areas 201, 393, 401, 611-616, 621, 622, 625, 626, 631, 632, 635, 636, 700-702, 707, 708)

Species	Length Frequencies	
	Kept	Discard
Alewife	1	1
Bass, Striped	1	1
Bonito	3	3
Bluefish	1	1
Croaker, Atlantic	2	2
Dogfish, Spiny	1	1
Drum, Black	3	3
Drum, Red	2	2
Flounder, Sand Dab	3	2
Flounder, Summer	1	1
Flounder, Winter	1	1
Flounder, Yellowtail	1	1
Herring, Atlantic	2	2
Herring, Blueback	1	1
Mackerel, Atlantic	2	2
Mackerel, Spanish	2	2
Menhaden, Atlantic	2	2
Monkfish	1	1
Scup	2	2
Sea Bass, Black	2	2
Shad, American	1	1
Spot	3	3
Sturgeon, Atlantic	1	1
Tautog	3	3
Weakfish	1	1

OTTER TRAWL SAMPLING PRIORITIES

An at-sea monitor's priority is to observe all hauls, i.e. complete catch information for both kept and discarded species is recorded. **At a minimum, 75% of the hauls should be observed.** If a haul is unobserved the at-sea monitor must provide comments describing the reason the haul was unobserved.

- Actual weights for all discarded species should be collected when possible.
- Collection of length frequencies should occur **at least after every other observed haul.**
- If catches are light and time permits, the at-sea monitor should sample every haul.
- Obtain actual weights for as many species as possible.

If it is not possible to obtain actual weights or biologically sample a particular haul according to protocol, the reason(s) should be noted in the COMMENTS section of the corresponding Haul Tab & Haul Log.

Table 1b. Length frequency priorities in the Otter Trawl Fishery

Gulf of Maine Stat. Areas 511-515, 464, 465

Species	Length Frequencies	
	Kept	Discard
Alewife	1	1
Bluefish	3	3
Cod, Atlantic	1	1
Cusk	1	1
Dogfish, Spiny	2	2
Flounder, Am. Plaice	1	1
Flounder, Winter	1	1
Flounder, Witch	1	1
Flounder, Yellowtail	1	1
Haddock	1	1
Hake, Red	3	3
Hake, Silver	3	3
Hake, White	1	1
Halibut, Atlantic	1	1
Herring, Atlantic	2	2
Herring, Blueback	1	1
Monkfish	1	1
Pollock	1	1
Redfish, Nk	2	2
Shad, American	1	1
Skate, Barndoor	-	2
Skate, Little	2	2
Skate, Smooth	-	3
Skate, Thorny	-	2
Skate, Winter	2	2
Wolffish	-	1

George's Bank (Stat. Areas 522, 525, 526, 561, 562)

Species	Length Frequencies	
	Kept	Discard
Bluefish	3	3
Butterfish	2	2
Cod, Atlantic	1	1
Cusk	1	1
Dogfish, Spiny	2	2
Flounder, Am. Plaice	2	2
Flounder, Sand Dab	-	2
Flounder, Summer	2	2
Flounder, Winter	1	1
Flounder, Witch	2	2
Flounder, Yellowtail	1	1
Haddock	1	1
Hake, Red	3	3
Hake, Silver	3	3
Hake, White	1	1
Halibut, Atlantic	1	1
Herring, Atlantic	2	2
Monkfish	1	1
Pout, Ocean	-	2
Pollock	1	1
Redfish, Nk	2	2
Skate, Barndoor	-	2
Skate, Little	2	2
Skate, Smooth	-	2
Skate, Thorny	-	2
Skate, Winter	2	2
Squid, Longfin	3	3
Squid, Shortfin	3	3
Wolffish	-	1

Table 1b. Length frequency priorities in the Otter Trawl Fishery (cont'd)

Cape Cod (Stat. Area 521)

Species	Length Frequencies	
	Kept	Discard
Alewife	1	1
Bass, Striped	2	2
Bluefish	3	3
Cod, Atlantic	1	1
Cusk	1	1
Flounder, Am. Plaice	3	3
Flounder, Sand Dab	-	3
Flounder, Summer	1	1
Flounder, Winter	1	1
Flounder, Witch	2	2
Flounder, Yellowtail	1	1
Haddock	1	2
Hake, Red	3	3
Hake, Silver	3	3
Hake, White	1	1
Herring, Atlantic	2	2
Herring, Blueback	1	1
Scup	1	1
Sea Bass, Black	1	1
Shad, American	1	1
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, Longfin	1	1
Squid, Shortfin	2	2
Tautog	3	3

Southern New England (Stat. Area 533, 534-537-539)

Species	Length Frequencies	
	Kept	Discard
Alewife	1	1
Bass, Striped	2	2
Bluefish	3	3
Butterfish	1	1
Cod, Atlantic	2	2
Dogfish, Spiny	2	2
Flounder, Sand Dab	-	2
Flounder, Summer	1	1
Flounder, Winter	1	1
Flounder, Yellowtail	1	1
Hake, Red	3	3
Hake, Silver	2	2
Herring, Atlantic	2	2
Herring, Blueback	1	1
Mackerel, Atlantic	2	2
Monkfish	1	1
Pout, Ocean	-	2
Scup	1	1
Sea Bass, Black	1	1
Shad, American	1	1
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, Longfin	1	1
Squid, Shortfin	2	2
Tautog	3	3

Table 1b. Length frequency priorities in the Otter Trawl Fishery (cont'd)

Mid-Atlantic (Stat areas 616, 622, 623, 626, 627, 632, 636)

Species	Length Frequencies	
	Kept	Discard
Alewife	1	1
Bluefish	1	1
Butterfish	2	2
Dogfish, Spiny	2	2
Flounder, Sand Dab	2	2
Flounder, Summer	1	1
Hake, Red	3	3
Hake, Silver	2	2
Herring, Atlantic	1	1
Herring, Blueback	1	1
Monkfish	1	1
Scup	1	1
Sea Bass, Black	1	1
Shad, American	1	1
Skate, Barndoor	—	2

Mid-Atlantic (Stat areas 538, 539, 611-615, 621, 625, 631, 635)

Species	Length Frequencies	
	Kept	Discard
Alewife	1	1
Bass, Striped	1	1
Bluefish	1	1
Butterfish	2	2
Croaker, Atlantic	2	2
Dogfish, Spiny	1	1
Drum, Black	3	3
Drum, Red	3	3
Flounder, Sand Dab	1	1
Flounder, Summer	1	1
Flounder, Winter	1	1
Flounder, Yellowtail	1	1
Herring, Atlantic	2	2
Herring, Blueback	1	1
Mackerel, Atlantic	2	2
Mackerel, Spanish	3	3

BOTTOM LONGLINE & HANDLINE FISHERY SAMPLING PRIORITIES

- **Every** haul is observed, i.e. complete catch information for both kept and discarded species is recorded.
- Actual weights should be collected for all discarded species.
- The kept and discarded catch of all hauls should be biologically sampled, with priority given to the discarded species.

If it is not possible to obtain actual weights for discarded species or biologically sample a particular haul according to these instructions, the reason(s) should be noted in the comments section of the corresponding Haul Tab/Log.

Table 1c. Length frequency sampling priorities in the Bottom Longline & Handline Fishery

Gulf of Maine & George's Bank (Stat. Areas 464, 465, 467, 511-515, 521, 522, 525, 526, 541-543, 561, 562)

Species	Length Frequencies	
	Kept	Discard
Cod, Atlantic	1	1
Cusk	1	1
Haddock	1	1
Hake, Red	2	2
Hake, Silver	2	2
Halibut, Atlantic	1	1
Skate, Barndoor	-	1
Skate, Thorny	-	2
Hake, White	1	1
Monkfish	1	1
Pollock	1	1
Wolffish	-	1

Southern New England (Stat. Areas 537-539)

Species	Length Frequencies	
	Kept	Discard
Cod, Atlantic	1	1
Flounder, Summer	1	1
Hake, Red	2	2
Monkfish	1	1
Skate, Barndoor	-	1
Tilefish	1	1

Mid-Atlantic (Stat areas 611-616, 621-629, 631-639)

Species	Length Frequencies	
	Kept	Discard
Flounder, Summer	1	1
Hake, Red	2	2
Monkfish	1	1
Tilefish	1	1
Skate, nk	2	2

**TABLE 2. Fish Sampling Requirements by Species per Statistical Area
(for kept and discard separately)**

SPECIES NAME	LENGTH TARGET	LENGTH TYPE	SPECIES NAME	LENGTH TARGET	LENGTH TYPE
Alewife	100	FL	Halibut, Atlantic	100	FL
Bass, Striped	100	FL	Herring, Atlantic	50	TL
Bluefish	100	FL	Herring, Blueback	100	FL
Butterfish	100	FL	Mackerel, Atlantic	100	FL
Cod, Atlantic	100	FL	Mackerel, Spanish	100	FL
Croaker, Atlantic	50	TL	Menhaden	50	FL
Cusk	100	TL	Monkfish (≥ 40 cm)	100	O
Dogfish, Spiny	100	TL	Monkfish (< 40 cm)	100	O
Drum, Black	50	FL	Ocean Pout	100	TL
Drum, Red	50	FL	Pollock	100	FL
Flounder, Am. Plaice	100	TL	Redfish	100	FL
Flounder, Sand Dab	100	TL	Scup	100	FL
Flounder, Summer	100	TL	Sea Bass, Black	100	TL
Flounder, Winter	100	TL	Shad, American	100	TL
Flounder, Witch	100	TL	Spot	100	FL
Flounder, Yellowtail	100	TL	Squid, Atl. Long-fin	100	ML
Haddock, Large (>56 cm)	100	FL	Squid, Short-fin	100	ML
Haddock, Scrod (48-56 cm)	50	FL	Tautog	100	TL
Haddock, Small (<48 cm)	50	FL	Tilefish	100	TL
Hagfish	100	TL	Weakfish	100	FL
Hake, Red	100	TL	Wolffish	100	TL
Hake, Silver	100	FL			
Hake, White	100	TL			

LENGTH TYPE CODES:

TL = Total Length

FL = Fork Length

ML = Mantle Length

O = Lower jaw to tip of tail, with jaw pushed down

LENGTH MEASUREMENT ILLUSTRATIONS

TL: Total Length
FL: Fork Length
O: Overall Length
ML: Mantle Length

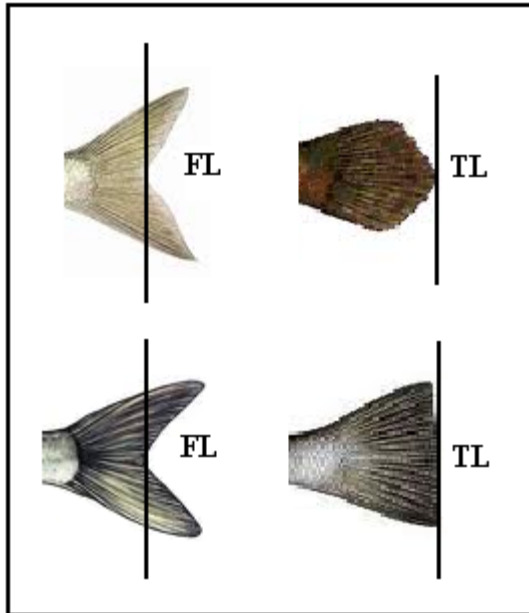


Figure 1. Length types illustrated on different fish tails.

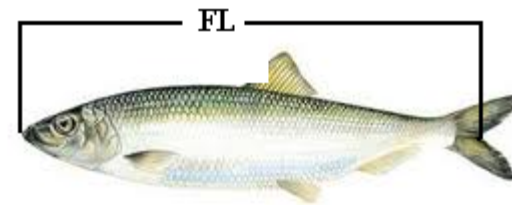
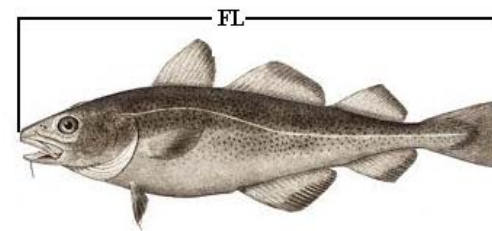
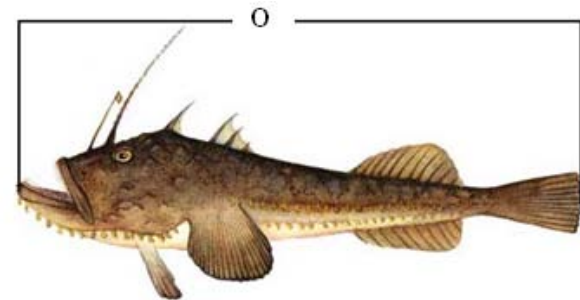
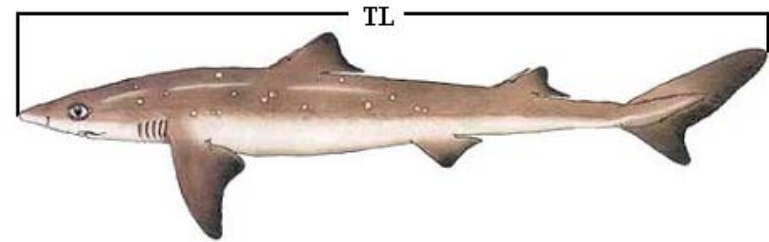
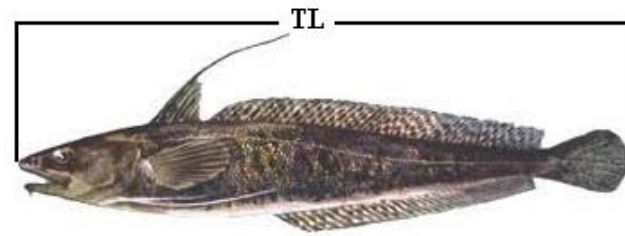
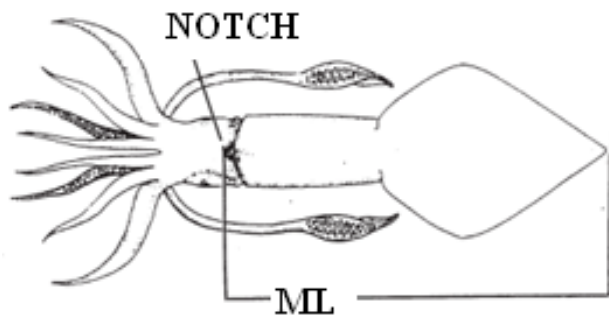
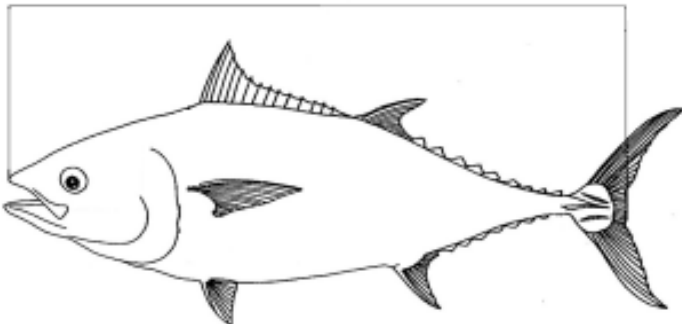


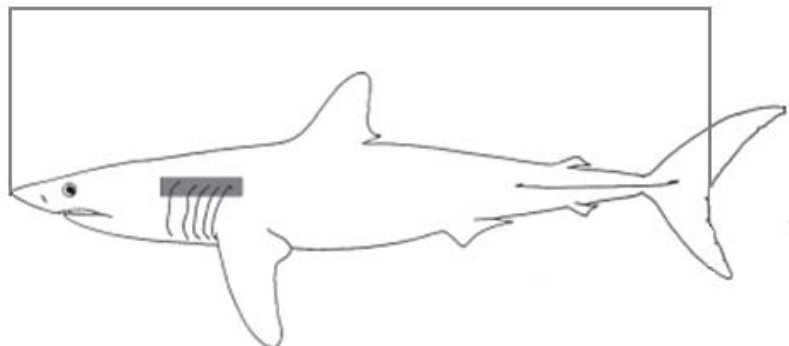
TABLE 3. Pelagic Fish Sampling & Length Measurement Requirements by Species

SPECIES NAME	SAMPLE PRIORITY	TARGET SAMPLE SIZE	LENGTH TYPE
Swordfish	1	100	LJFL
Tuna, Bluefin	1	all caught	FL
Bonito	2	50	FL
Marlin, Sailfish, Spearfish, NK	2	100	LJFL
Shark, NK	2	100	FL
Tuna, Albacore	2	100	FL
Tuna, Bigeye	2	all caught	FL
Tuna, Blackfin	2	all caught	FL
Tuna, Yellowfin	2	20	FL
Dolphinfish (Mahi Mahi)	3	20	FL
Escolar	3	20	FL
Louvar	3	20	LJFL
Mackerel, NK	3	20	FL
Oilfish	3	20	FL
Opah	3	20	TL
Ray, NK	3	20	TL
Sturgeon, NK	3	all caught	FL
Tuna, Little (False Albacore)	3	50	FL
Tuna, Skipjack	3	50	FL
Wahoo	3	20	FL

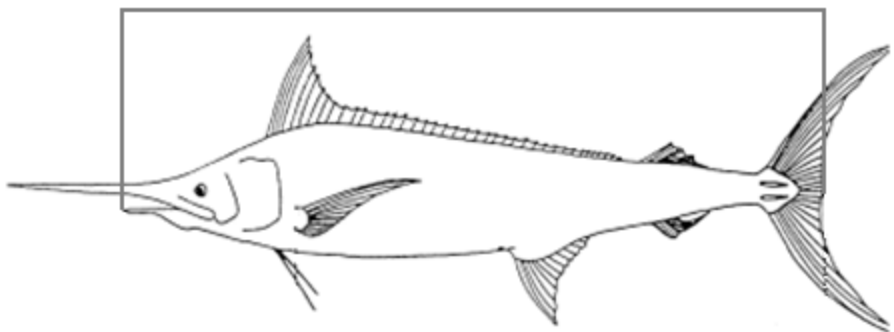
Figure 2. Length measurement illustrations for pelagic fish. Shaded areas indicate TAG RECAPTURE



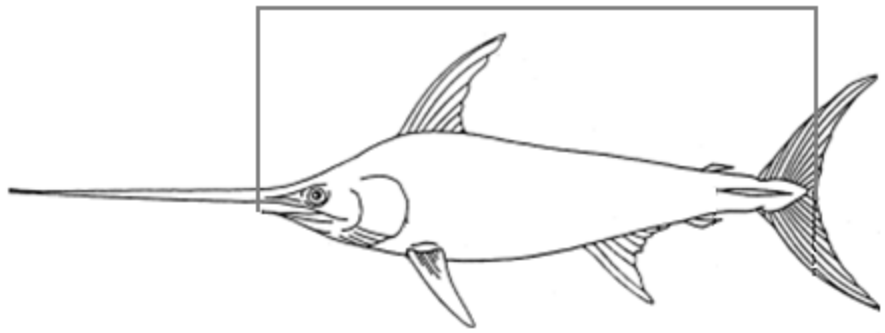
TUNA: Tip of upper jaw to fork (straight): FL



SHARK: Tip of snout to fork (straight): FL



BILLFISH: Tip of lower jaw to fork (curved): LJFL



SWORDFISH: Tip of lower jaw to fork (curved): LJFL

LENGTH TYPE CODES

- FL = Fork Length
- LJFL = Lower Jaw to Fork Length
- TL = Total Length

SAMPLE PRIORITY CODES

- 1 = HIGH
- 2 = MEDIUM
- 3 = LOW

FISH /SHARK TAG & RECAPTURE

- See Table 2 & 3 for length measurement descriptions to collect from tag recapture animals
- All tag recaptures should be recorded on both the IAL Tab & IAL Log
- Information to record:
 - Tag #
 - Species
 - Tag Program name, address or phone number
 - Comments regarding the animal condition, tag location, tag color, and tag shape

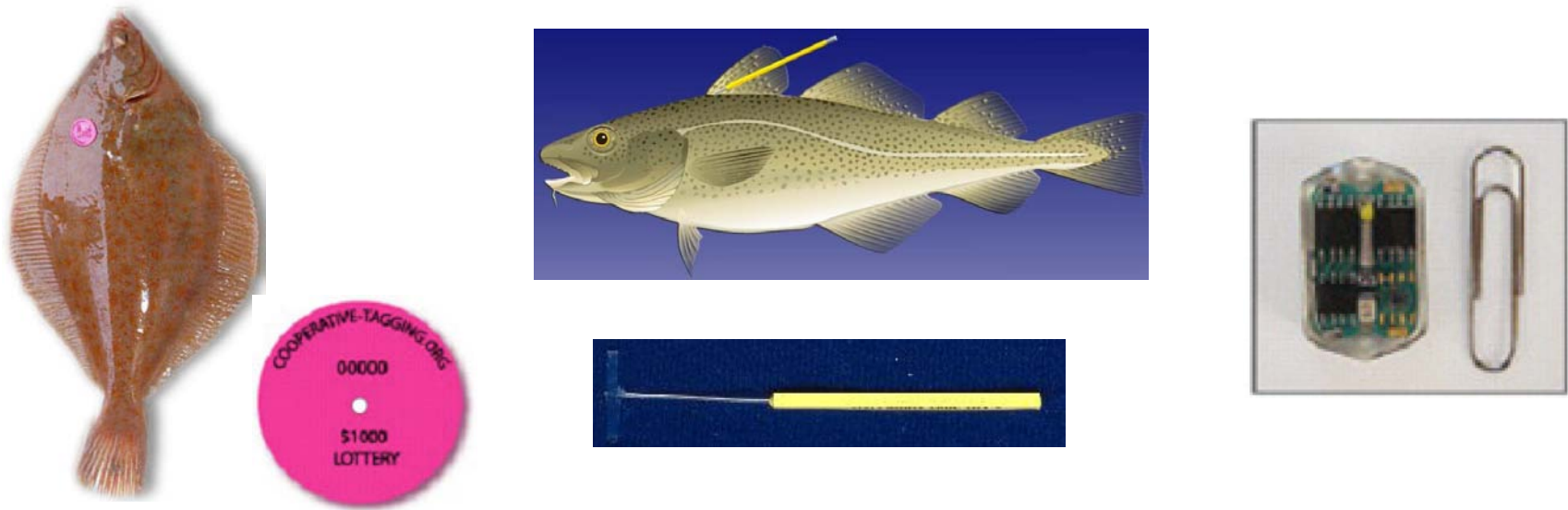
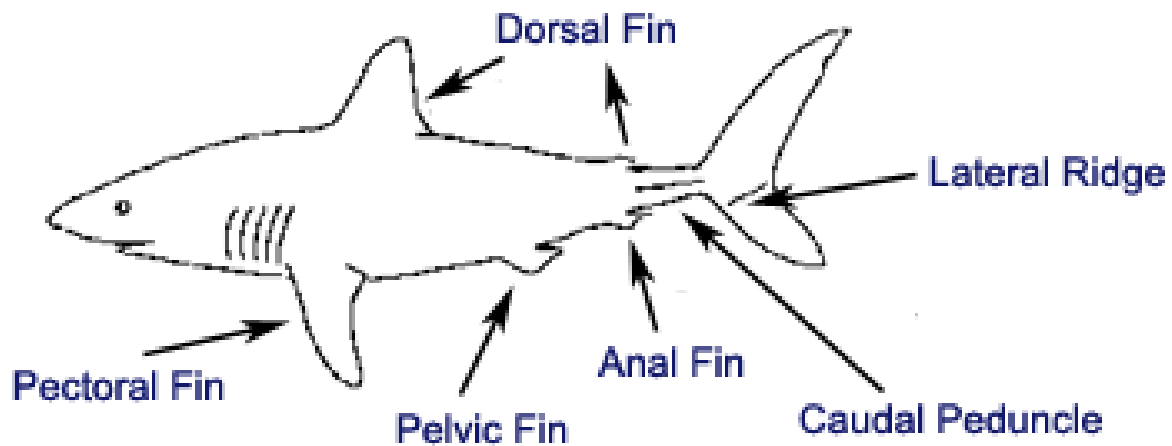
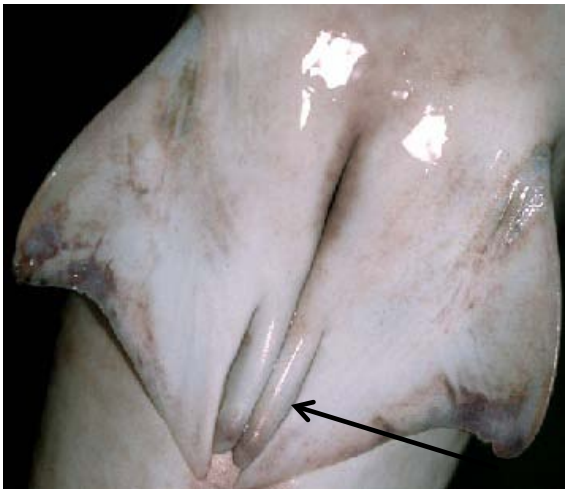


Figure 4. Examples of tags and the tagging locations for fish.

SHARK & RAY SEXING



Claspers absent:
Female



Juvenile claspers:
Male

Adult claspers:
Male

Figure 5. Sex determination in sharks, rays, and skates. Top figure: basic external shark anatomy. Bottom figures: ventral view of the pelvic fins, and location (or absence) of the claspers.

STURGEON IDENTIFICATION & PHOTOGRAPHING

- Photograph (ALL STURGEON)- photos should consist of fish in profile, the underside of the head, post dorsal fin scutes (dorsal view) and post anal scutes (ventral view). Include something in the photo for scale.
- Individual Animal (IAL) Tab instructions (ALL STURGEON)- obtain a length measurement and actual weight. Provide ID characteristics in the COMMENTS section. Record the presence or absence of tag(s), tag # (if present), and tagging program name and contact information.

STURGEON IDENTIFICATION

ATLANTIC STURGEON *Acipenser oxyrinchus*

Key characteristics:

- snout v-shaped from underside view
- barbel length $> \frac{1}{2}$ width of mouth
- width inside lips $< 55\%$ of bony interorbital width
- 2 rows post-dorsal plated
- 2 rows post-anal plates

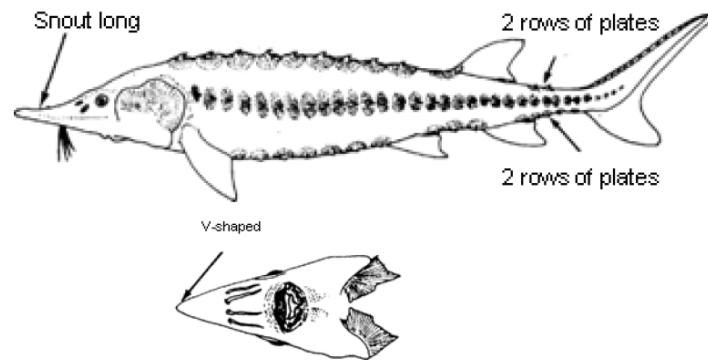


Figure 6. Atlantic Sturgeon.

Source: FAO Species Identification Sheets for fishery purposes. Western Central Atlantic. Vol. 1, UNFAO

STURGEON IDENTIFICATION (con't)

SHORTNOSE STURGEON *Acipenser brevirostrum*

Key characteristics:

- snout u-shaped from underside view
- barbel length $< \frac{1}{2}$ width of mouth
- width inside lips $> 62\%$ of bony interorbital width
- post-dorsal plates usually absent
- post-anal plates, when present, in 1 row

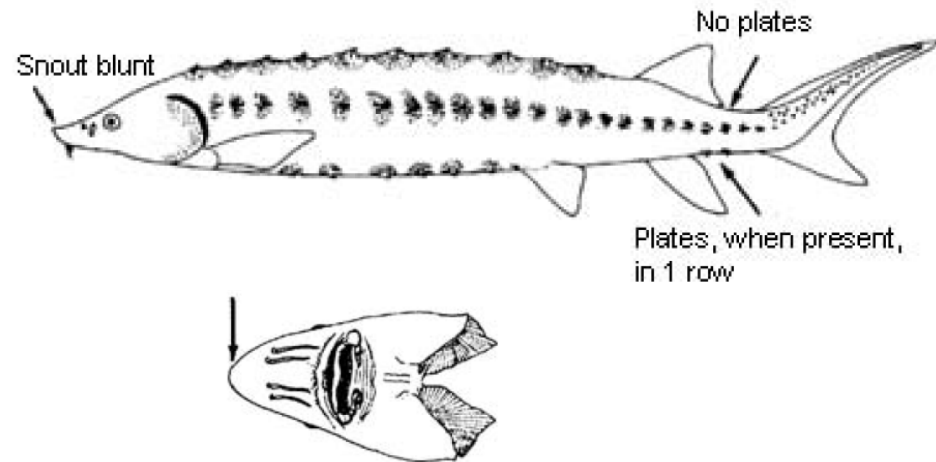


Figure 7. Shortnose Sturgeon.

Source: FAO Species Identification Sheets for fishery purposes. Western Central Atlantic. Vol. 1, UNFAO

Note: In 1994, sturgeon were stocked in the Hudson River, New York. These fish were marked by removing their left pelvic fin. Today these fish would be near 6 ft in length. Should you come across a large sturgeon that is missing its left pelvic, in addition to the above protocols, please photograph the missing fin and comment on the Individual Animal Log and Tab.

MARINE MAMMALS

PRECAUTIONS:

Marine mammals can carry microbes which may cause illness in humans and other animals.

Safety measures to prevent illness and infections

- Use common sense.
- Wear gloves and other protective gear when handling animals.
- Wash hands and areas of contact thoroughly after contact.
- Clean/wash gear thoroughly after each use.
- Report any animal bite, scratch, or other significant exposure to marine animal blood, saliva, or excretions.
- Tell your physician that you work with marine animals.

MARINE MAMMALS SAMPLING PROTOCOLS

ALIVE

1. PHOTOGRAPH
2. ID: Using the Incidental Take Worksheet, describe in detail identifying characteristics of the animal.
3. RELEASE: Comment on behavior upon release and any gear remaining on the animal


DO NOT TAG LIVE ANIMALS!!!



MARINE MAMMAL SAMPLING PROTOCOLS (con't)

DEAD

1. PHOTOGRAPH: Include the Photo Sheet for scale.
 - a. Close up of gear entanglement (if possible)
 - b. Entire animal on all sides
 - c. Close up of the head
 - d. Close up of the teeth
 - e. Genital area
 - f. Any wounds, marks, scars, or damage
 - g. Close up of dorsal fin on both sides
2. TAG: Using the yellow marine mammal tag provided, tag the tail of cetaceans or the hind flipper of seals.
3. ID: Using the Incidental Take Worksheet, describe in detail identifying characteristics of the animal.
3. RELEASE: After all protocols have been met return the animal to the water and comment on behavior upon release (e.g. sank immediately) and any gear (if any) remaining on the animal.

IDENTIFICATION WORKSHEET NORTHEAST FISHERIES AT-SEA MONITORING PROGRAM
TRIP ID:
PSID #:
DATE:
SPECIES:




SEA BIRD SAMPLING PROTOCOLS

ALIVE

1. PHOTOGRAPH
2. ID: Describe in detail identifying characteristics of the animal
3. CHECK AND RECORD BAND(S)
4. RELEASE: With the vessel slowed, lower the bird by hand to the water (or as close as possible), releasing hold of the head last. Release away from gear. Comment on behavior upon release.




Figures 8. & 9. Examples of bird band sizes & the placement of a bird band around the leg. Photo courtesy of John Cassady

SEA BIRD SAMPLING PROTOCOLS (con't)

DEAD


1. PHOTOGRAPH: Include the Photo Sheet for scale.
 - a. Close up of gear entanglement (if possible)
 - b. Whole bird
 - c. Dorsal and ventral with the wings spread out
 - d. Close up of beak
 - e. Close up of feet and legs
 - f. Any wounds, marks, scars, or damage
2. ID: Using the Incidental Take Worksheet, describe in detail identifying characteristics of the animal
3. CHECK FOR PRESENCE OF BANDS: If there is a band present, remove the band, record the number, and send in the band with your trip data.
4. RELEASE: After all protocols have been met return the animal to the water and comment.

IDENTIFICATION WORKSHEET NORTHEAST FISHERIES AT-SEA MONITORING PROGRAM
TRIP ID:
PSID #:
DATE:
SPECIES:


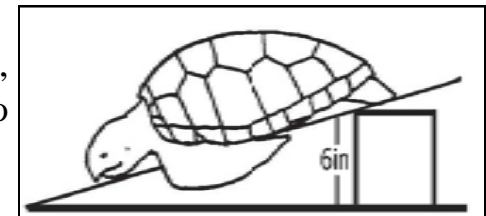
SEA TURTLE SAMPLING PROTOCOLS

ALIVE/COMATOSE

1. PHOTOGRAPH: Include the Photo Sheet for scale.
 - a. Close up of gear entanglement (if possible)
 - b. Head: top, both sides, and head on (prefrontal scales)
 - c. Entire animal on all sides, including the plastron and carapace
 - d. Any wounds, marks, scars, or damage
 - e. Any tags that are present
2. ID: Using the Incidental Take Worksheet, describe in detail identifying characteristics of the animal. Include scute counts (vertebral, costal, inframarginals, prefrontals)
3. CHECK FOR PRESENCE OF TAGS:
If there is a tag present, record the number in the COMMENTS section
4. RESUSCITATION:
 - a. Place the turtle right side up (on plastron)
 - b. Elevate the hind quarters 6 inches or ~20 degrees for a period of 4 to 24 hours
 - c. Protect from environmental conditions
 - d. Periodically rock the turtle from side to side by holding the outer edge of the carapace and lifting one side about 3 inches
 - e. Touch the upper eyelid and pinch the tail (reflex test) periodically to see if there is a response

IDENTIFICATION WORKSHEET NORTHEAST FISHERIES AT-SEA MONITORING PROGRAM
TRIP ID:
PSID #:
DATE:
SPECIES:


All turtles 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, including sea turtles that fail to respond to the reflex test or fail to move within several hours (up to 24, if possible).

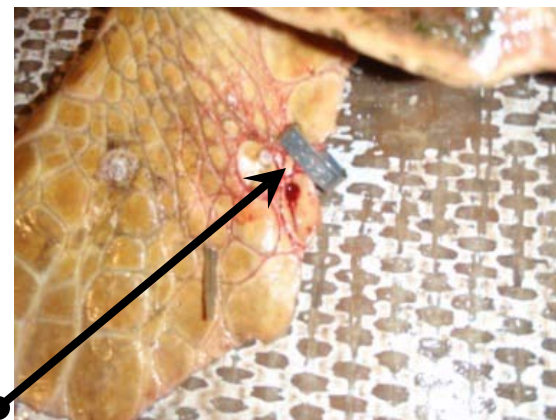


SEA TURTLE SAMPLING PROTOCOLS (con't)

DEAD

1. PHOTOGRAPH: Include the Photo Sheet for scale.
 - a. Close up of gear entanglement (if possible)
 - b. Head: top, both sides, and head on (prefrontal scales)
 - c. Entire animal on all sides, including the plastron and carapace
 - d. Any wounds, marks, scars, or damage
 - e. Any tags that are present
2. ID: Using the Incidental Take Worksheet, describe in detail identifying characteristics of the animal. Include scute counts (vertebral, costal, inframarginals, prefrontals)
3. CHECK FOR PRESENCE OF TAGS: If there is a tag present, record the number in the COMMENTS section
4. RELEASE: After all protocols have been met return the animal to the water.

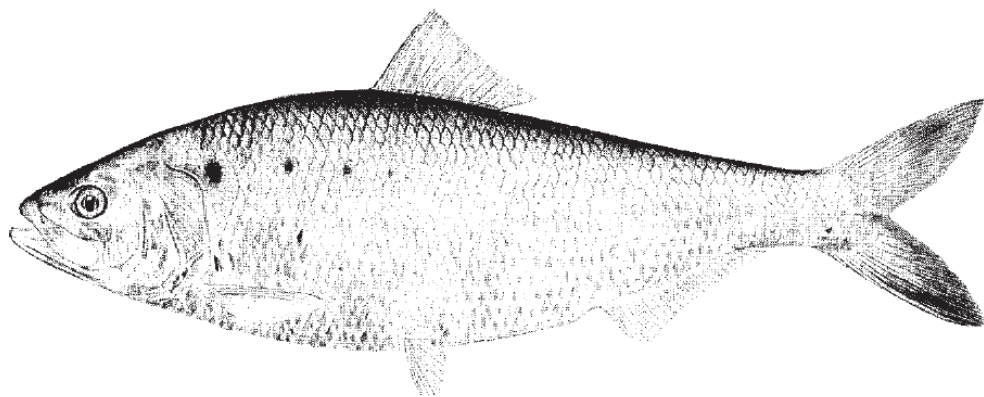
All turtles must be released over the stern of the boat when fishing gear is not in use, the engine gears are in neutral, and in areas where they are unlikely to be recaptured or injured by fishing gear or vessels. This includes sea turtles that fail to respond to the reflex test or fail to move within several hours (up to 24, if possible).



Tag on the flipper of a loggerhead turtle

SELECTED SPECIES IDENTIFICATION: SHAD

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 during training.

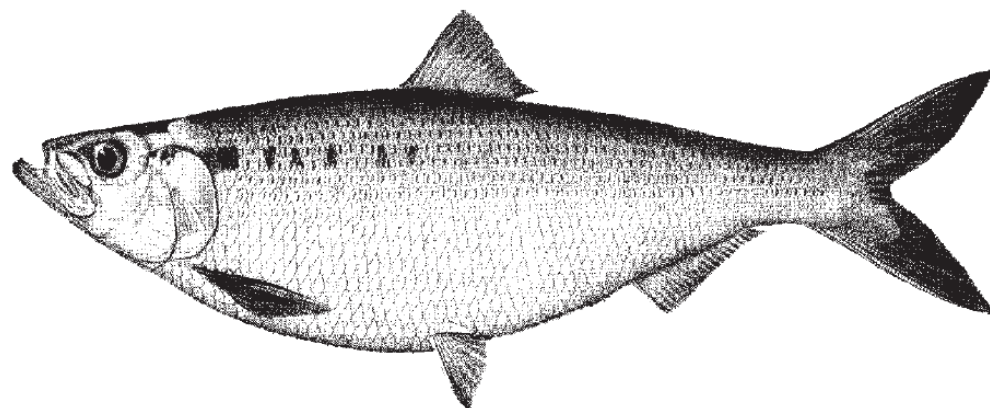


AMERICAN SHAD *Alosa sapidissima*

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.



HICORY SHAD *Alosa mediocris*

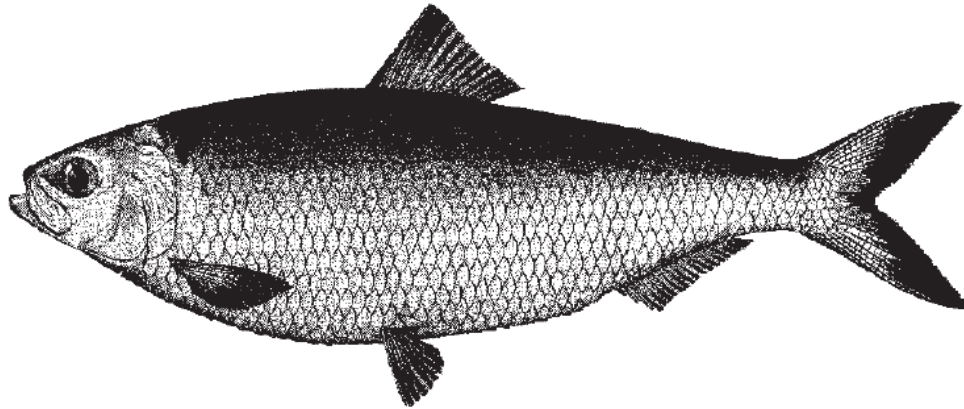
Key characteristics

- 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 10. American shad (top) and hickory shad (bottom).

Source: Fishes of Chesapeake Bay by E. O. Murdy et al., published by Smithsonian Institution Press.

SELECTED SPECIES IDENTIFICATION: HERRING

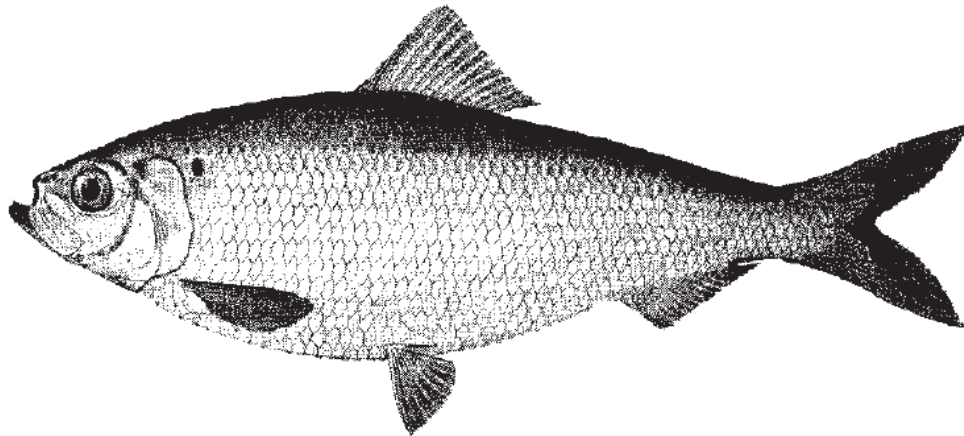


BLUEBACK HERRING *Alosa aestivalis*

Key characteristics

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

Vs.



ALEWIFE *Alosa pseudoharengus*

Key characteristics

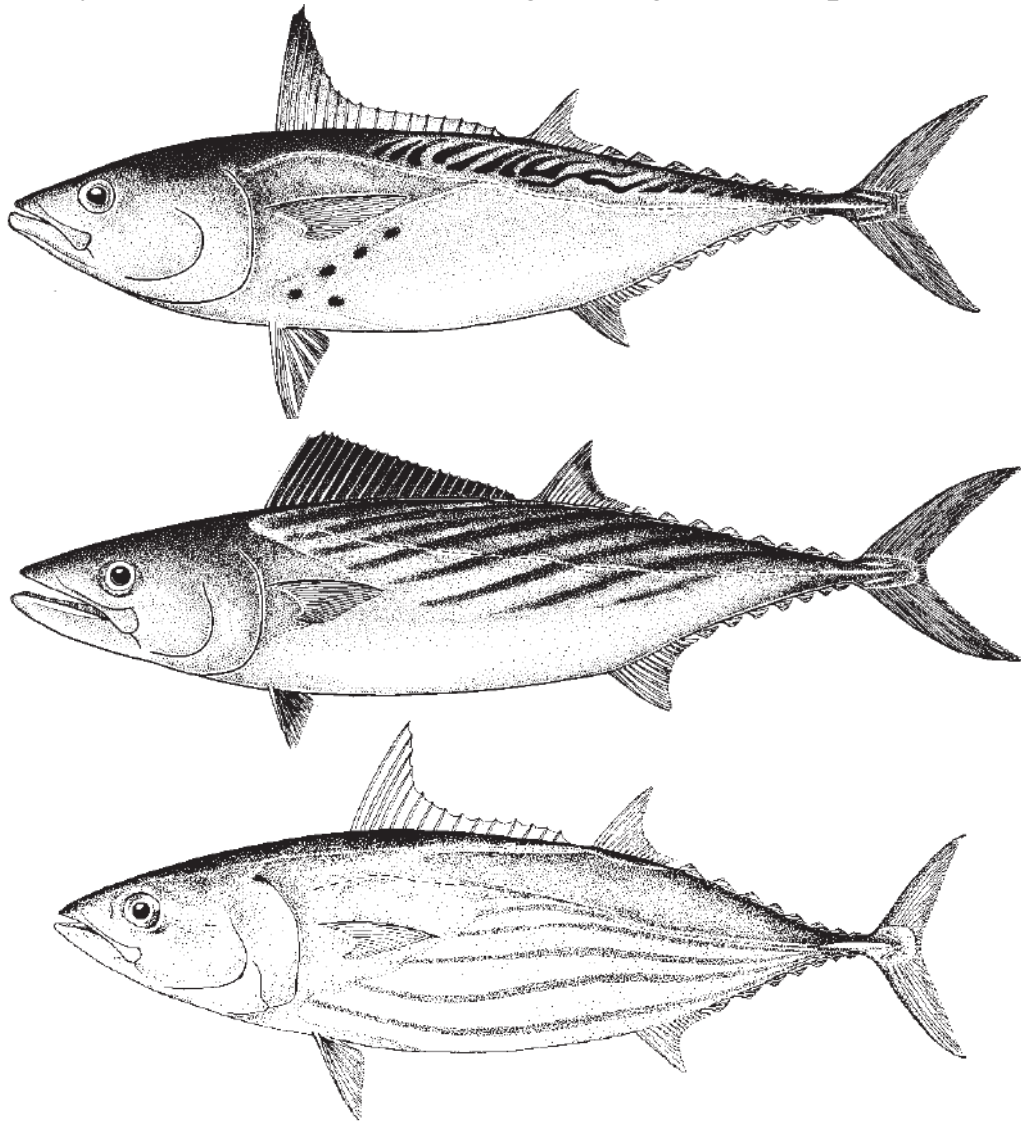
- peritoneum (belly lining) is pale gray or pink colored back is blue-green in color
- eye width is less than the distance between the front of the eye to tip of the snout
- body shape is slightly deeper than the blueback

Figure 11. Blueback herring (top) and Alewife (bottom).

Source: *Fishes of Chesapeake Bay* by E. O. Murdy et al., published by Smithsonian Institution Press

SELECTED SPECIES IDENTIFICATION: TUNA

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



LITTLE TUNNY *Euthynnus alletteratus* (False albacore)

Key characteristics

- 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*

Key characteristics

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

Vs.

SKIPJACK TUNA *Euthynnus pelamis*

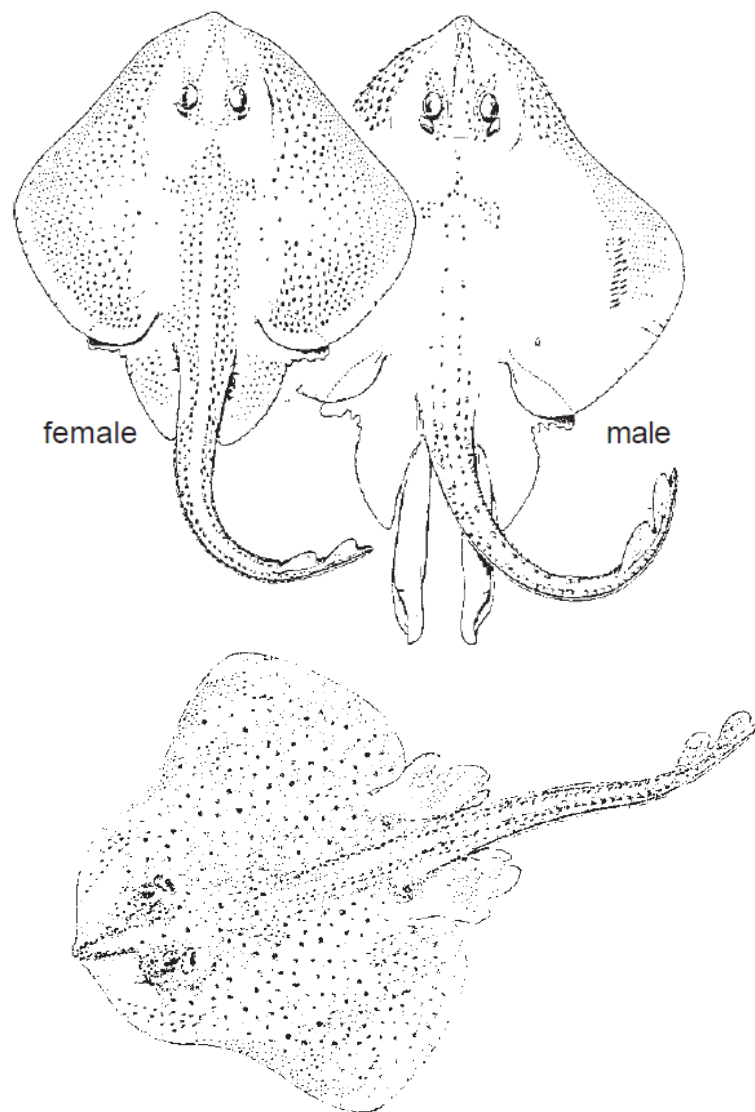
Key characteristics

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

Figure 12. 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 34 of tunas, mackerels, bonitos and related species known to date by B.B. Collette & C.E. Nauen, UNFAO.

SELECTED SPECIES IDENTIFICATION: SKATE



LITTLE SKATE *Leucoraja erinacea*

Key characteristics

- maximum length 56 cm
- matures at smaller size than winter skate
- 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, on either side of the cloaca

Vs.

WINTER SKATE *Leucoraja ocellata*

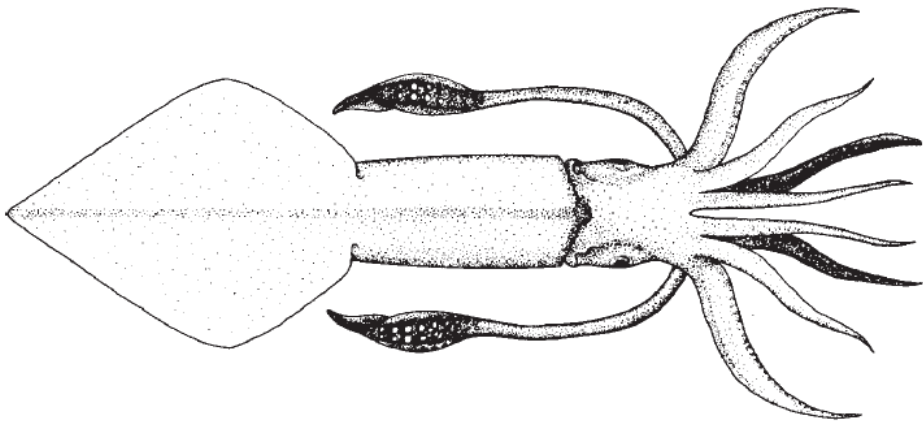
Key characteristics

- maximum length 109 cm
- matures at a larger size than little skates
- animals less than 56 cm will be sexually immature, male will have small claspers that rarely extend beyond the posterior edge of the disk females do not have a granular patch on either side of the cloaca

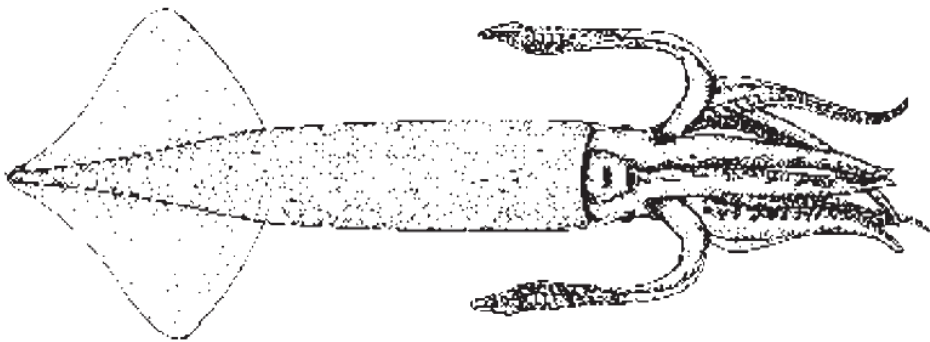
Figure 13. Little skate (top) and winter skate (bottom).

Source: Fishes of the Gulf of Maine by H.B. Biegelow & W.C. Shroder, U.S Fish and Wildlife Service.

SELECTED SPECIES IDENTIFICATION: SQUID



dorsal view



ventral view

ATLANTIC LONGFIN SQUID *Loligo pealei*

(Long-finned squid)

Key characteristics

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

Vs.

SHORTFIN SQUID *Illex illecebrosus*

Key characteristics

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

Figure 14. Longfin squid (top) and shortfin squid (bottom).
Source: FAO Species Identification Sheets for fishery purposes. Western Central Atlantic.Vol 6, UNFAO.

CATCH ESTIMATION GUIDELINES

Accurate weights are extremely important. It will be possible to obtain actual weights for each haul 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: Achieve round weights unless they are landing parts of a particular species, i.e. 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. Your first priority should be actual weights or accurate estimates on discards. If there is a small amount of discards, ask the crew to throw the discarded fish aside in totes or baskets for you to weigh at the end of the haul. Typically the kept portion of the catch will be sorted into baskets or totes, making it possible to obtain an estimated weight using the basket/tote count method.
- Representative sampling is when a relatively small sample is removed from an entire population of all possible participants. Ideally, the sample would have all species and would closely match the characteristics of the population when extrapolated.
- Random sampling is when all species of the catch have an equal chance of being selected.
- 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.

CATCH ESTIMATION GUIDELINES (con't)

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 represent the entire catch.**
2. Calculate the total subsample volume by multiplying the number of subsampling containers by the volume of the subsampling container.
 - Volume of a standard fish tote = 2.65 ft^3
 - Volume of an orange basket = 1.47 ft^3
3. Calculate the sample weight multiplier by dividing the total catch volume (Step 1) by the total subsample volume (Step 2).
4. Extrapolate the total weight of each species from the subsample by multiplying the weight of each individual species by the sample weight multiplier. These are recorded as estimated weights on the Haul Tab/Log, using the volume-to-volume estimation method (02).

** Examples of calculating the volume for odd shaped containers can be found in the ASM Program Manual and Cheatsheets.

CATCH ESTIMATION GUIDELINES (con't)

Example: Estimating Large Catches and Total Species Weights Using Volume to Volume Method

1. Fish are dumped into a rectangular checker pen. The at-sea monitor calculates the volume as:
 $5.2 \text{ ft (length)} \times 8.7 \text{ ft (width)} \times 1.4 \text{ ft (average depth)} = 63.34 \text{ ft}^2 \text{ (volume)}.$
2. The subsample consisted of eight (8) orange baskets. The at-sea monitor made sure the subsamples were random and representative of the catch. The subsample volume would be:
 $8 \text{ (number of baskets)} \times 1.47 \text{ ft}^3 \text{ (volume of an orange basket)} = 11.76 \text{ ft}^3 \text{ (subsample volume)}.$
3. The sample weight multiplier is calculated as:
 $63.34 \text{ ft}^3 \text{ (total volume of catch)} \div 11.76 \text{ ft}^3 \text{ (total subsample volume)} = 5.39 \text{ (sample weight multiplier)}.$
4. The total subsample consists of 126 lbs Monkfish, 78 lbs Atlantic Cod and 93 lbs Summer Flounder.
 $126 \text{ lbs (Monkfish)} \times 5.39 \text{ (sample weight multiplier)} = 679 \text{ lbs (estimated total Monkfish weight)}$
 $78 \text{ lbs (Atlantic Cod)} \times 5.39 \text{ (sample weight multiplier)} = 420 \text{ lbs (estimated total Cod weight)}$
 $93 \text{ lbs (Summer Fld)} \times 5.39 \text{ (sample weight multiplier)} = 501 \text{ lbs (estimated total Summer Fld weight)}.$

CATCH ESTIMATION GUIDELINES (con't)

Estimation Based on Basket or Tote Counts

1. The catch is separated into baskets or totes by species. For each species:
 - Achieve an average weight per basket by taking actual weights of at least 3 totes (A).
 - Count the total number of 'clean' baskets; make sure that all of the baskets are filled to approximately the same level (B).
2. To calculate the total catch weight, multiply the number of baskets by the average weight (A x B). This is recorded as an estimated weight on the Haul Tab/Log using the basket or tote count estimation method (03).

Example: Basket Count Method

1. Baskets are filled with Atlantic long-fin squid.
2. The basket weight is 3.50 lbs and the at-sea monitor tared the scale prior to weighing the squid.
3. The at-sea monitor weighs 8 subsample baskets at 66, 65, 64, 67, 66, 67, 67 and 68 lbs. The average weight per basket is 66.25 lbs.
4. As the baskets are being filled, the at-sea monitor counts 42 full flush baskets of squid, and at the end there is one basket that is about half full. The last basket weighs 37 lbs.
5. The total weight for Atlantic long-fin squid is:
 $66.25 \text{ lbs (average weight per subsample basket)} \times 42 \text{ (number of full baskets)} + 37 \text{ lbs (last basket weight)} = 2820 \text{ lbs}$

CATCH ESTIMATION GUIDELINES (con't)

The key to accurate sampling is:

- To obtain a sufficiently sized sample. **Collect as large a sample as possible (at least 20%)** of the entire catch amount.
- To be as **random and unbiased** as possible when selecting a sample. Each fish from the entire catch should have an equal chance of being selected for the sample. 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.
- If possible remove large items (i.e. debris, rocks) and all rare species from the catch to achieve more accurate calculated volumes.

Some other basic guidelines:

- Collect samples 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 samples to collect, as time and conditions permit.
- Instead of a few, large samples, 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, all calculation should be recorded in the comments section of the corresponding Catch Estimation Worksheet.



Revised 12/09/10