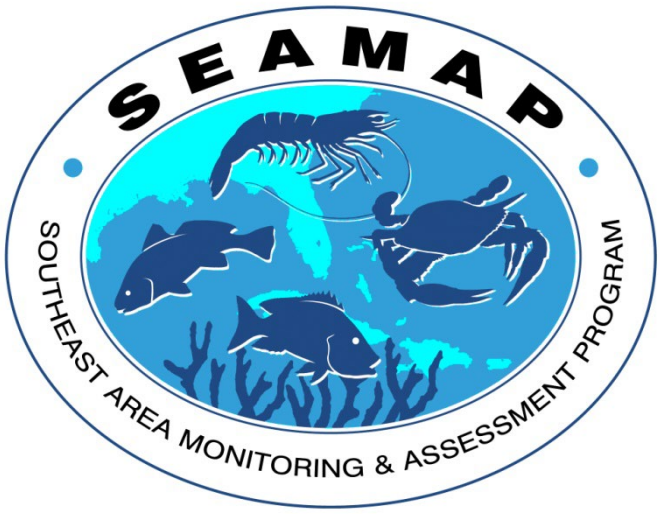
SEAMAP

Trawling Operations Manual



Gulf States Marine Fisheries Commission
2404 Government St
Ocean Springs, MS 39564

March 29, 2022

I. COLLECTING BIOLOGICAL DATA

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A. Introduction

SEAMAP surveys use trawling gear to collect biological data (i.e., finfish, shrimp, and other invertebrates). Prior to 1987 three types of SEAMAP trawling surveys were conducted: offshore butter-fish, summer shrimp (Texas Closure), and fall groundfish. The offshore butterfish surveys were discontinued in 1986. The same survey design for the summer shrimp (Texas Closure) and fall groundfish surveys has been used from 1987 to 2008. Survey changes in 2008 are detailed below.

B. Summer and Fall Trawl Surveys

1. Trawling - sampling will be conducted around the clock. (Note: Several of the state vessels will not be able to operate around the clock or at night due to size limitations and availability of personnel). All tows are to be conducted for 30 minutes in length. If a tow is greater or less than 30 minutes, do not change the method of towing (i.e., reduce vessel speed or drastically alter course) and explain the situation in the comments section. The station will still be considered a good sample unless the trawl fishes differently.

If the selected station is in an untrawlable area (bad bottom, artificial reef zone, etc.), proceed to the nearest trawlable location to perform the station. For stations located in areas that have known hard bottom, are a known sponge habitat (> 50 kg of sponges in previous trawls), or an otherwise sensitive habitat, drop the station and do not attempt it. If an artificial reef is in the area, avoid the artificial reef by moving the station no more than 1 nautical mile and try to stay in the same depth zone and statistical zone. If a snag, obstruction, excessive mud tow, or more than 50 kg of sponge is encountered during the trawl, do not repeat the station. Only resample the station if human error caused the problem such as not properly tying the bag end of the net. Make sure to notate the appropriate operation code and use the comment field to describe what happened during the tow. Any catch from the tow should be worked up if time allows.

Some stations may be located near the maximum depth for the depth zone the station is located in, and a 30 minute tow may exceed the maximum depth for that zone. If a 30 minute tow will exceed the maximum depth of the depth zone, the station should be moved approximately 1.5 nautical miles in a direction such that the entire tow will occur within the targeted statistical zone and depth zone.

Environmental data must be collected within 1 hour of a trawling event and must pass within ½ nautical mile of the SEAMAP sample site. In the event of a snag while trawling, the trawl station should be abandoned. The correct operations code should be entered into the database.

All SEAMAP Partners must have sea turtle related gear onboard (release gear, assessment forms, and possibly PIT tag reader). At least one person onboard every vessel must have sea turtle handling training. All partners need to be able to measure, weigh if possible, and release sea turtles. If taking biological samples, additional training is required. Do not post photos of any sea

turtles on social media. Make sure to use the forms and guides in the sea turtle kit (measure, weigh, ID, photograph, PSIT form, sample if trained). The highest priority should be reviving any sea turtle that needs resuscitation. Be sure to follow the resuscitation guidelines. Sea turtles needing resuscitation must be kept onboard for a minimum of 4 hours and up to 24 hours. Contact NOAA vet if needed to get an extension beyond 24 hours. If the animal is seriously injured, and could feasibly be returned to shore, call 1-877-942-5343 to coordinate with local sea turtle stranding responders. If possible, retain the carcass of lethal take and report take via nmfs.ser.ea_loa.takereport@noaa.gov within 24 hours.

For details on how to handle Sturgeon and Sawfish, have Appendix D Southeast Fisheries Science Center Protected Species Handling, Data Collection, and Reporting Procedures available.

2. Survey strategy – In the fall of 2008, NMFS changed their method of selecting sampling sites. The states adopted this change beginning in 2010. Diurnal stratifications were dropped in the selection process, and geographic strata (which were mostly 2 to 3 statistical zone groupings) were changed to single zones. Both station selection methods, the old and the new, are probability based designs. With probability sampling, each element in the sampling universe has a known, positive probability of selection. This property of probability sampling avoids selection bias and enables one to use statistical theory to make valid inferences from the sample to the survey population. More specifically, the new method employs proportional allocation. In this type of sampling, a unit's selection probability is proportional to its size measure which in this case is geographical surface area. For example, if Unit A has twice the surface area of Unit B, then Unit A will have twice the probability of having a sample selected from it than B. The end result is that Unit A will have about twice the number of samples as B. In addition, each statistical zone was divided into two depth zones, 5-20 and 21-60 fathoms. Locations inside of marine protected areas or habitat areas of particular concern were removed from the sampling universe prior to the selection process. Even though diurnal strata were dropped in the sampling site selection process, this information is not lost since samples can be post-stratified. The following is an example of how sampling sites are now selected.

Three raster files were downloaded from https://www.ngdc.noaa.gov/mgg/coastal/crm.html to get bathymetry for the entire Gulf of Mexico. The three files were combined to form a single bathymetry layer. The raster file was converted from meters to fathoms. A 5 fathom and 60 fathom contour was created and then converted to polylines. Ship channels were deleted from the 5 fathom contour where they entered passes into the estuaries. The 5 fathom and 60 contours were combined to form a polygon. The initial 5-60 fathom polygon used for this process represents approximately 242,327 km^2 of available habitat across the entire Gulf of Mexico. A 20 fathom contour was also produced and combined with the 5-60 fathom polygon to divide the polygon into a 5-20 fathom and 20-60 fathom depth zone.

The NMFS statistical zones were then added to produce a polygon with 38 parts. The polygon contained a shallow and deep depth zone for statistical zones 2-21. Minor portions of statistical zone 12 were added to statistical zone 11 and statistical zone 13 since only a very little bit of statistical zone 12 falls within the 5-60 fathom depth contour.

The next steps involve using various datasets to remove coral and sponge habitat as well as avoid hangs and obstructions that may damage the trawl net. Buffers were put around some datasets to ensure that the trawl does not get too close to the habitat or obstruction.

The following areas were removed from the available trawling area without any additional buffering.

- Florida Keys National Marine Sanctuary
- Pulley Ridge Habitat Area of Particular Concern
- Middle Grounds Habitat Area of Particular Concern
- Madison/Swanson Habitat Area of Particular Concern
- Flower Gardens Habitat Area of Particular Concern
- Stetson Bank Habitat Area of Particular Concern
- McGrail Bank Habitat Area of Particular Concern
- Gulf of Mexico Fishery Management Council Habitat Areas of Particular Concern with no fishing restrictions
- Gulf of Mexico Fishery Management Council Recommended (2018) Habitat Areas of Particular Concern
- Alabama Artificial Reef Zones
- Texas Artificial Reef Zones except the High Island General Permit Area – bounding boxes around the Texas artificial reefs within the High Island General Permit Area were provided by TPWD

The following areas were removed with a 250 m buffer around their coordinates.

- Florida artificial reefs
- Alabama artificial reefs outside of their Artificial Reef Zone
- Mississippi artificial reefs
- Louisiana artificial reefs
- Florida Geoforms side scan survey data from statistical zone 2-10. Geoforms classified as FlatHB were not removed from the sampling universe.
- A Gulf of Mexico Fishery Management Council point file listing known coral throughout the Gulf of Mexico
- SEAMAP trawls from 2000 onward where an Operation Code was listed that indicated that the trawl encountered some type of obstruction or was torn. Start and end points were used to form a trawl track with a 250 m buffer around the entire trawl track.
- SEAMAP trawls where any coral was reported in the catch. The entire trawl track was buffered.
- SEAMAP trawls where the total catch of sponges was greater than 50 kg. The entire trawl track was buffered.
- Trawl tracks from the NMFS Small Pelagic Survey where an obstruction was encountered. The entire trawl track was buffered.
- SEAMAP Reef Fish Survey station locations
- NMFS Panama City Reef Fish Survey station locations

Finally, a 0.25 nautical mile buffer was placed around all oil and gas platforms.

After all of these areas were removed, approximately 228,817 km^2 in 2019 were left available for trawling. Available trawling area was calculated for each statistical zone and water depth. Trawling stations were proportionally allocated based upon the area contained within each statistical zone and water depth. Stations were selected randomly with a 5 nautical mile buffer between the stations. Some stations may be closer than 5 nautical miles due to stations being near the boundary in an adjacent water depth or statistical zone. There is currently not a way to buffer within statistical zone and water depth and over the entire 5-60 fathom area.

3. Sampling Catch

a. All organisms should be removed from the net for processing. Any gilled organisms and any organisms that fall out of the net onto the deck of the vessel should be processed with the catch also.

b. If the total weight of the catch is less than 22.7 kilos and is not excessively diverse in species composition, then it is recommended that the entire catch be processed. If a catch is especially diverse, then the watch leader may exercise the option of subsampling. Regardless of catch size, all penaeid shrimp, lionfish, and red snapper should be processed. Any species that the watch leader feels is not adequately represented in the subsample should be processed in its entirety. (i.e., sharks, skates, rays, large fish, or rare species). Also any species that the watch leader deems as a select species (shrimp during Summer Shrimp/Groundfish Survey, snapper, grouper, elasmobranchs, lionfish, or anything rare) should be processed in its entirety. If you have a question on the identification of any elasmobranchs, they should be photographed with a lateral photo for sharks and dorsal view for skates and rays. Send the photos and/or specimens to the SEAMAP Program Coordinator at NMFS to confirm species identification.

c. Recommended Guidelines – If the total weight of the catch is between 22.7 and 45.4 kilos, obtain a sample equal to 50% of the total weight and process.

d. Recommended Guidelines – If the total weight of the catch is between 45.4 and 90.7 kilos, obtain a sample equal to 25% of the total weight and process.

e. Recommended Guidelines – If total weight of catch is between 90.7 and 136.0 kilos, obtain a sample equal to 18% of the total weight and process.

f. Recommended Guidelines – If the total weight of catch is greater than 136.0 kilos, obtain a sample equal to 12% of the total weight and process.

Note: If time allows, the watch leader should process the entire catch regardless of catch weight.

4. Processing Catch (Sample)

a. Separate entire catch or aliquot sample into its component species, then weigh (a species total weight) and count the number of individuals for each species.

b. Record species, weight, and number on the field data sheet (NMFS Pascagoula Station Sheet-Type II) or in the fishery scientific computing system (FSCS).

c. Measure up to 20 organisms that are identified to the species level except for summer penaeid shrimp (see section e below). At the discretion of the Field Party Chief, individuals identified to the genus or higher level can be measured either at the time of capture or upon subsequent laboratory identification. Record measurements on the General Length Frequency Form or in FSCS. Record individual weights and lengths for every 5th organism up to 20 except for red snapper, lionfish, sharks, large organisms, and summer penaeid shrimp. Sex every 5th organism, and only assign a maturity state if you are 100% confident. Record individual lengths, weights, sex, and maturity stage (if, 100% confident) for the first 20 red snapper and lionfish, and the first 50 summer penaid shrimp.

d. All partners should retain representative samples of known species to be verified in the lab. Three specimens of known species should be retained by each shift in each area. Area will vary and be based on statistical zones. All partners should work to exchange samples with other partners for additional verification and training. If specimens are large (e.g. sharks, goliath grouper, large eels, or other specimens that are too large for available freezer space) or can be released alive, take a lateral photograph or several photographs from multiple angles, in place of saving the organism as a representative sample.

e. Process shrimp species in the following prescribed manner:

1. **For the summer trawl survey only, to include: sex, length frequency, and weight**. *Farfantepenaeus aztecus* (brown shrimp), *F. duorarum* (pink shrimp) and *Litopenaeus setiferus* (white shrimp) will be separated from each trawl catch station. A random sample of up to 50 of each species from each trawl catch will be processed for sex and individual weights. Total number and total weight by sex will be recorded. Individual lengths will be recorded for all sexed shrimp. Individual weights should be recorded for every fifth sexed shrimp. Shrimp in excess of 50 individuals should be processed by species for total number and total weight.

2. **For non-Summer trawl surveys, shrimp are treated the same as finfish and other invertebrates. Only 20 shrimp lengths are recorded per station.**

f. Proceed to the next station.

C. SEAMAP Station Sheet Instructions

1. GENERAL COMMENTS - A SEAMAP Station Sheet (Appendix 1) or similar should be completed for every SEAMAP station. The top section (down to the heavy black line across page) should be completed for each station occupied, regardless of gear types(s) used.

Please use a lead pencil and make entries **DARK** enough and **LEGIBLE** enough so that the key entry operator can read them. All numeric fields are to be right justified or aligned with the decimal place. Leading zeros are not required, **but enter trailing zeros**.

2. Data Requirements for All Stations:

FIELD BY FIELD INSTRUCTIONS

VESSEL - Enter 2-digit numerical code from Appendix 2, Vessel Codes. If your vessel has not been assigned a code, notify NMFS Pascagoula to receive one.

PASCAGOULA STATION NUMBER - This is a unique sequential consecutive 5-digit number within each cruise, preferably starting with "00001." For state vessels enter the 2-digit vessel code followed by a 3-digit station number. Transfer this station number to the environmental or plankton sheet. Do not duplicate this station number for other stations on a cruise.

CRUISE - Enter 4-digit cruise number. Except for the *Oregon II* and other vessels having historically different cruise numbering conventions, the cruise number for **ALL VESSELS** shall be the calendar year of the survey followed by the cruise number for the year, e.g. "1201" first cruise for year 2012, "1202"- second cruise for year 2012, etc. Use this cruise number on all sheets during a cruise; do not change it.

START TIME - Obtain time zone code from Appendix 3, Time Zone Codes. **GMT should be used for all time fields.** Enter military time (0000-2359), HHMM, of start of station. For fishing stations, enter dog-off time or end of gear set. For environmental and plankton stations, enter the time data acquisition started.

START LATITUDE & LONGITUDE - Enter position occupied at start time in degrees, minutes, and hundredths of minutes, observing indicated decimals and entering trailing zeros.

START DEPTH - Enter starting depth in meters and tenths.

SEAMAP/OTHER STATION NO. - Use for SEAMAP or other alternate station numbers. For SEAMAP Station numbers, use five alpha/numeric characters and right justify, but be consistent in field length - all numbers should be the same number of characters, T0065, W0102, E1106.

DATE - Enter station date (based on start time), in the format MMDDYY.

END TIME – Format same as for start time - fishing stations end at start of haulback, others when data acquisition ends.

END LATITUDE & LONGITUDE - Enter position occupied at end time in degrees, minutes, and hundredths of minutes, observing indicated decimals and entering trailing zeros.

END DEPTH - Enter end depth in meters and tenths, observing the indicated decimal and entering a trailing zero.

GEAR TYPES USED AT THIS STATION - Enter codes for all gear types used- see Appendix 4, Gear Codes.

SURFACE AND BOTTOM TEMPERATURES - If taken, enter temperatures in degrees Celsius, observing 2 indicated decimals. Add trailing zeros if necessary. If more than one method is used, data entry precedence is 1) CTD, 2) XBT, and 3) bucket.

Use the actual time that all weather events are recorded. Wind speed and direction may be measured by either the ship's onboard instruments or handheld anemometers and a compass. Hand held anemometers and compasses are available from wildlife and fishery supply houses

AIR TEMPERATURE - Enter in degrees Celsius and tenths (dry bulb), observing 1 indicated decimal.

BAROMETRIC PRESSURE - Enter in millibars of mercury, observing 1 indicated decimal.

WIND SPEED - Enter wind speed in knots, no decimals.

WIND DIRECTION - Enter wind direction in compass degrees, 001-360.

WAVE HEIGHT - Enter wave height in meters, observing 1 indicated decimal.

SEA CONDITION - Enter Beaufort scale- see Appendix 5, Beaufort Sea Condition Table.

DATA SOURCE CODE - Enter code identifying data collecting entity – see Appendix 3.

VESSEL SPEED - Enter vessel speed, in knots, during the station, observing 1 indicated decimal.

STATISTICAL ZONE - Enter statistical zone from Figure 1-1. Leave blank if you are outside a statistical zone.

NET NO. - 1 = Port, 2 = Starboard and 3 = Stern Trawl.

The data above must be recorded regardless of type of station.

3. Data Requirements for Biological and Trawling stations:

FIELD BY FIELD INSTRUCTIONS

NMFS FAUNAL ZONE - Enter NMFS Faunal Zone from Figure 1-2.

GEAR SIZE - Enter gear size as the headrope length in feet

GEAR TYPE - Enter the code for fishing gear type used from Appendix 4, Gear Codes.

MESH SIZE - Enter stretched mesh size in inches for the cod end of the net:

a 40-ft trawl is 1.63 inches
a 65-ft trawl is 2.00 inches

OPERATION - Enter codes only for abnormal stations from Appendix 6, Operation Codes. An operation code should not be used if the trawl did not have any problems. An operation code should only be entered if the station had some deviation that would cause the station to not be used for analysis purposes. If the tickler chain is broken or stretched during the tow, the tow should be considered a bad tow and an OP code should be used.

MINUTES FISHED - Enter minutes actually fished (end set to start haulback).

TOTAL LIVE CATCH - Enter total **LIVE** catch in kilograms, observing 1 decimal. For extremely small catches, you **must** enter a minimum weight of 0.1 kg. **DO NOT** include weight of dead shell, mud, sand, wood, rocks, trash, etc. Hermit crabs should be removed from their shell to get an accurate weight. The hermit crab shell then goes into the trash weight. Such items should be mentioned in the comments section or with an operation code. Use an actual or estimated weight, but do make an entry.

The following two fields should be completed **ONLY** if the catch was sampled:

SELECT WEIGHT - Enter total weight of all species removed from the catch **IN THEIR ENTIRETY.** This will normally include commercial shrimp; some food or sport fish; sharks, skates, rays, or other large fish; or other species that are rare or poorly represented in the catch. Observe 3 decimal places. Do not record any weight data in this section if the catch was NOT sampled.

SAMPLE WEIGHT - Total weight of the sample, obtained by summing the various sample components. Be sure not to include any of the 'select' species in the sample. Observe 3 decimal places. **DO NOT** record data in this section if the catch was **NOT** sampled.

SPECIES DATA SECTION - Crustacea, other, finfish.

GENUS AND SPECIES - Locate organism in pre-printed species list. If not present, enter first seven characters of genus name and first six of species name, or, if not identified to species level, enter up to thirteen characters of genus, family, class, etc. In the field, DO NOT GUESS on the identification of a specimen. If there is any doubt about the identification, bring the specimen back to lab for further examination and identification.

YOY - Make an entry from the codes below only if:
Two distinct size classes occur for a species (two entries would occur for this species to split the species into big and small groups, one for each size class); leave the larger size class entry code blank; use T entry code for smaller size class; samples were taken; organisms were counted, but no weight is available; the organism(s) weight was estimated; or if colonial organisms such as

sponges, corals, or zoobotryon were weighed, but not counted. Otherwise, leave this field blank. Splitting the species into big and small groups is done so the mean weight is accurate. A mix of large and small individuals will make the mean weight inaccurate. It will be up to the watch leader whether all weights will be forced into FSCS manually.

YOY Entry Codes:
T - denotes young of the year.
S - denotes specimens were retained frozen or preserved.
C - denotes counts were recorded without a weight.
E - denotes an estimated weight was recorded.
W - denotes a recorded weight, but individual numbers are unavailable for colonial organisms, sponges, corals, etc.

NUMBER - Enter number of individuals in SELECT or SAMPLE. For some colonial organisms, sponges and corals, enter the number of pieces.

SAMPLE WT. (kg) - Enter weight in kilos of organism in the SAMPLE column, observing three decimal places. Enter trailing zeros where needed.

SELECT WT. (kg) - Enter weight in kilos of organism in the SELECT column, observing three decimal places. Enter trailing zeros where needed. **IMPORTANT:** If the catch was worked up in its entirety (not sampled), **ALL** weight entries will be in the **SELECT** column. Do not list a species in both the sample and **SELECT** column.

Subtotal the sample and select weights columns for each category, then combine for total sample and select weights.

GEAR DATA - Detail gear used. If the same gear is to be used for the entire cruise, this section need be filled out only for the first station.

COMMENTS - Enter comments or observations, problems encountered, samples saved, etc. Use descriptive comments and use no punctuation to describe anything unusual about the stations or why the station may have deviated from normal operations.

RECORDER - Enter initials of person(s) completing form.

For SEAMAP partners who are not using the shipboard system for data entry, Appendix 7 outlines several examples calculating sub-sampling expansion factors for trawl catches with emphasize on catches that include trash. If a specimen is damaged, but can still be identified to species, it will not be considered trash. However, if a length or individual weight cannot be accurately quantified, those measurements will not be recorded. This will allow for the occurrence of a species to be recorded in the data even though the condition of the specimen has been compromised. If a specimen is obviously from a previous trawl, discard as trash.

Figure 1 – 1. NMFS Gulf Shrimp Landing Statistical Zones

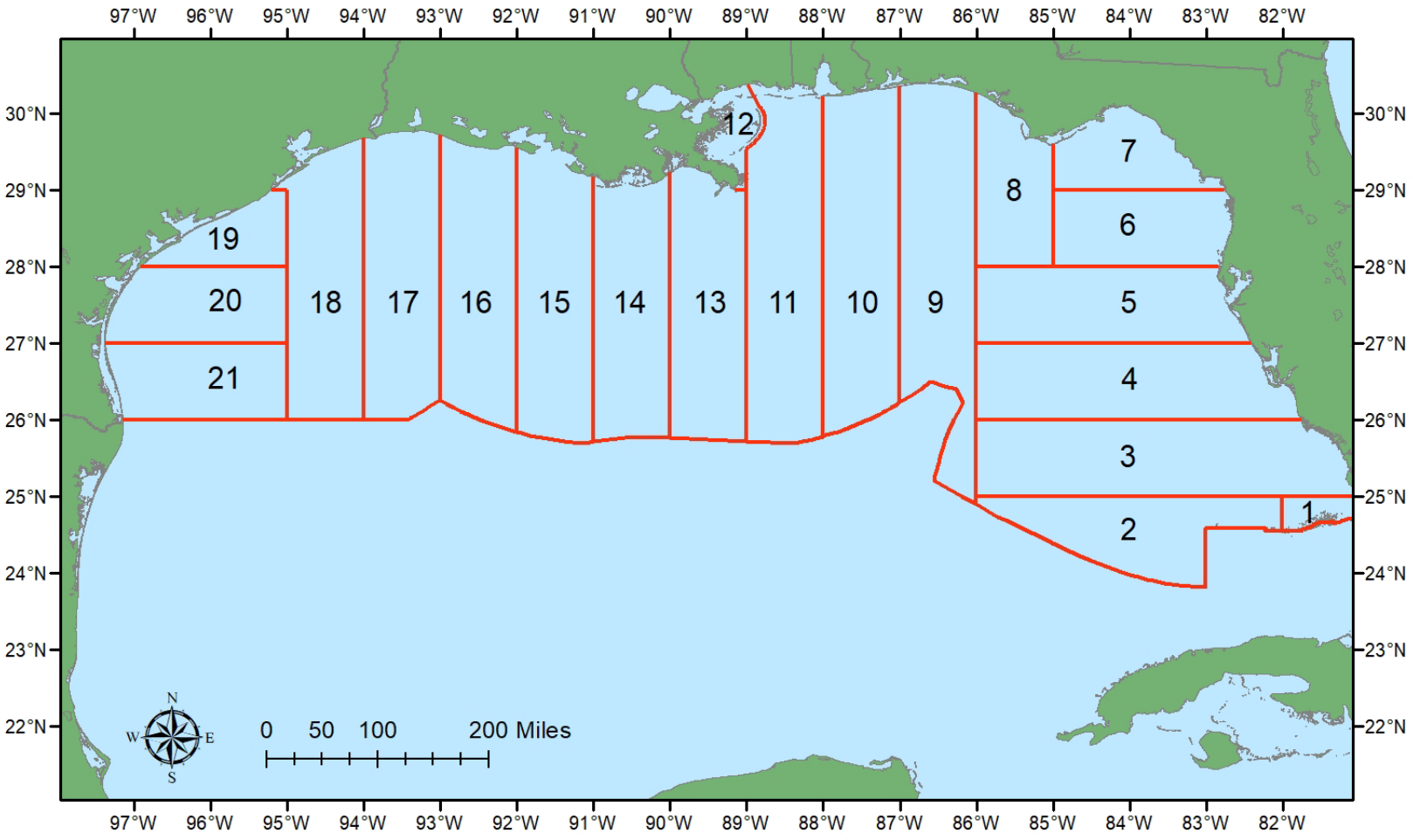
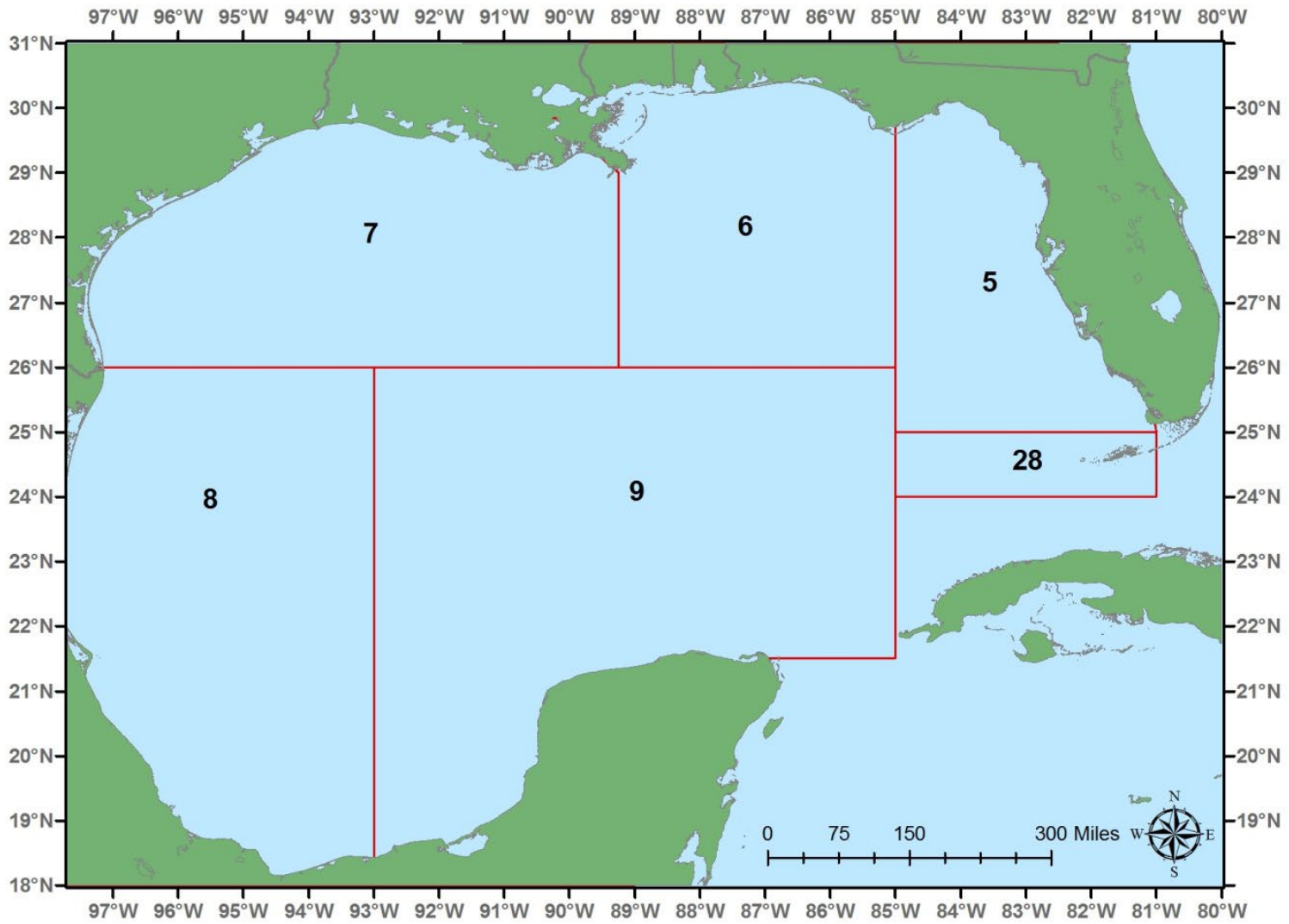


Figure 1 - 2. NMFS Faunal Zones



D. SEAMAP GROUNDFISH LENGTH FREQUENCY FORM INSTRUCTIONS

1. INTRODUCTION

Length frequency data can be collected using a measuring board with millimeter divisions or the electronic fish measuring boards. The wands and all fish measuring boards should be tested for accuracy prior to each cruise.

Using the SEAMAP General Length Frequency Form (Appendix 1) at each station, randomly select a maximum of 20 specimens or less if present, for a given species and sex every fifth one.

The electronic fish measuring boards can be used in place of the SEAMAP General Length Frequency and SEAMAP Shrimp Length Frequency Form (Appendix 1).

2. SEAMAP GENERAL LENGTH FREQUENCY FORM INSTRUCTIONS

VES-STATION-CRUISE-DATA SOURCE - Transcribe from the SEAMAP Station Sheet.

GENUS-SPECIES - Record first seven characters of the genus and the first six of the species.

MEASUREMENT CODE - Refer to Appendix 8, Length Frequency Measurement Code Finder List. Consult FPC if you are unsure of which measurement to use. A consistent measurement should be used for each species.

LENGTH - Enter measurement in millimeters.

SEX - Enter code:
U = Undetermined
M = Male
F = Female
N = Not Examined

Refer to Appendix 9 for detailed information on how to determine sex. For commercial shrimp (pink, brown, white) and *Callinectes*, record sex codes. For other invertebrates, record if you know how to accurately determine the sex and if possible.

Collection of Real Time Data for the Summer Shrimp/Groundfish Survey

SEAMAP began distributing real time shrimp data during the summer of 1982. The purpose of the distribution is to inform recipients of the distribution and catch rate of shrimp caught during the annual Summer Shrimp/Groundfish Survey. The data from the survey are transmitted to the Gulf States Marine Fisheries Commission weekly as they are collected. Plots of station locations and catch rates of penaeid shrimp and total catch are prepared and edited for weekly distribution to management agencies, fishermen, processors and researchers. Six to seven weekly data

summaries are produced each summer and distributed via email and posted to the Commission's web site.

The following data elements need to be collected and sent to the Commission as a spreadsheet or a delimited text file in the following format.

STATIONKEY – A concatenation of the vessel number, cruise number and station number. The format should be a long integer. An example for vessel 17 during cruise 1402 and the third station would be 171402003.

VESSEL – The SEAMAP assigned number for the vessel used during sampling.

CRUISE – The up to four digit cruise number for the survey.

STATION – This is the same as the Pascagoula Station Number.

SEAMAP – This is the same as the SEAMAP/OTHER STATION NO.

START_LAT – The starting latitude of the trawl station in DECIMAL DEGREES out to four decimal places.

START_LAT MIN – The starting latitude of the trawl station in degrees and minutes. Use the format 29.23 for a station located at 29 degrees and 23 minutes. You can round to the nearest minute.

START_LON – The starting longitude of the trawl station in DECIMAL DEGREES out to four decimal places. Make sure to include the minus sign before longitude (-89.7362).

START_LON MIN – The starting longitude of the trawl station in degrees and minutes. Use the format -89.54 for a station located at -89 degrees and 54 minutes. You can round to the nearest minute.

END_LAT – The ending latitude of the trawl station in DECIMAL DEGREES out to four decimal places.

END_LON – The ending longitude of the trawl station in DECIMAL DEGREES out to four decimal places. Make sure to include the minus sign before longitude (-89.7362).

START_DATE – The station start date and time (military time) in the format 7/1/2012 10:01.

END_DATE – The station start date and time (military time) in the format 7/1/2012 10:31.

TOWS – The number of tows performed. This should now be 1.

START_DEPTH – Starting depth in meters rounded to nearest whole number.

END_DEPTH – Ending depth in meters rounded to the nearest whole number.

SURF_TEMP – Surface water temperature in degrees Celsius.

SURF_SAL – Surface water salinity.

SURF_OX – Surface dissolved oxygen readings in parts per million, observing one indicated decimal place.

BOT_TEMP – Bottom water temperature in degrees Celsius.

BOT_SAL – Bottom water salinity.

BOT_OX – Bottom dissolved oxygen readings in parts per million, observing one indicated decimal place.

MIN_FISHED – Total number of minutes fished out to 2 decimal places.

TOT_LIVE – Total catch of all organisms caught during the trawl. The same as TOTAL LIVE CATCH.

NUM_BROWN – The number of brown shrimp caught during the trawl.

NUM_PINK – The number of pink shrimp caught during the trawl.

NUM_WHITE – The number of shrimp shrimp caught during the trawl.

WT_BROWN – The weight in kilograms of the brown shrimp catch. Weight should be out to three decimal places.

WT_PINK – The weight in kilograms of the pink shrimp catch. Weight should be out to three decimal places.

WT_WHITE – The weight in kilograms of the white shrimp catch. Weight should be out to three decimal places.

Sample format for the real time file that needs to be sent to the Gulf States Marine Fisheries Commission.

STATIONKEY	VESSEL	CRUISE	STATION	SEAMAP	START_LAT	START_LAT MIN	START_LON	START_LON MIN	END_LAT	END_LON	START_DATE	END_DATE	TOWS	START_DEPTH	END_DEPTH
40299204	4	299	204	E0902	30.14	30.08	-86.992	-87	30.1233	-87.0085	7/1/2012 19:17	7/1/2012 19:47	1	15	17
40299205	4	299	205	E0903	30.1995	30.12	-86.8483	-86.51	30.1793	-86.861	7/1/2012 21:31	7/1/2012 22:01	1	16	18
40299208	4	299	208	E0907	29.9507	29.57	-86.3117	-86.19	29.947	-86.285	7/2/2012 9:28	7/2/2012 9:59	1	31	30
40299209	4	299	209	E0908	29.8498	29.51	-86.1677	-86.1	29.8328	-86.1495	7/2/2012 11:52	7/2/2012 12:22	1	25	24
40299210	4	299	210	E0909	29.8013	29.48	-86.093	-86.06	29.8205	-86.1083	7/2/2012 13:26	7/2/2012 13:56	1	24	23
40299211	4	299	211	E0906	29.9057	29.54	-86.1548	-86.09	29.9287	-86.1642	7/2/2012 15:53	7/2/2012 16:23	1	23	23
40299212	4	299	212	E0904	30.0958	30.06	-86.1935	-86.12	30.1133	-86.2062	7/2/2012 18:17	7/2/2012 18:47	1	19	17
40299216	4	299	216	E0910	29.7205	29.43	-86.0158	-86.01	29.6963	-86.0145	7/7/2012 9:30	7/7/2012 10:01	1	24	24
40299223	4	299	223	E0813	29.0263	29.02	-85.3077	-85.18	29.0368	-85.284	7/8/2012 1:23	7/8/2012 1:53	1	25	24
40299227	4	299	227	E0706	29.4842	29.29	-84.8003	-84.48	29.4627	-84.8112	7/8/2012 9:50	7/8/2012 10:20	1	13	13
40299228	4	299	228	E0708	29.3987	29.24	-84.7897	-84.47	29.4147	-84.8077	7/8/2012 11:20	7/8/2012 11:50	1	14	14
40299230	4	299	230	E0707	29.424	29.25	-84.5107	-84.31	29.4043	-84.5218	7/8/2012 15:30	7/8/2012 16:00	1	15	15

SURF_TEMP	SURF_SAL	SURF_OX	BOT_TEMP	BOT_SAL	BOT_OX	MIN_FISHED	TOT_LIVE	NUM_BROWN	NUM_PINK	NUM_WHITE	WT_BROWN	WT_PINK	WT_WHITE
28.8	33.8	6.4	26.1	36	6.4	30.25	15.889	0	0	0	0	0	0
28.4	34.6	6.4	26.4	36	6.4	30.183	64.367	0	0	0	0	0	0
27.9	35.5	6.3	24	36.2	6.3	30.733	20.861	0	0	0	0	0	0
27.7	35.8	6.4	26.2	35.9	6.2	30.183	7.36	0	0	0	0	0	0
27.9	35.8	6.4	26.7	35.9	6.2	30.267	7.708	0	0	0	0	0	0
28	35.7	6.4	26.2	35.8	6.4	30.217	8.969	0	0	0	0	0	0
27.9	35.6	6.4	26.8	35.8	6.4	30.45	19.254	0	0	0	0	0	0
28.5	35.4	6.3	24.3	36.2	5.9	30.45	22.493	0	0	0	0	0	0
29.2	35.3	6.3	24.6	36.3	6.5	30.217	33.271	0	41	0	0	0.701	0
28.5	35.6	6.3	27.2	36	5.9	30.3	80.034	0	0	0	0	0	0
29	35.5	6.4	27.2	36	6.1	30.3	43.603	0	0	0	0	0	0
29.2	35.1	6.3	27.1	36.1	6.1	30.217	436.404	1	0	0	0.01	0	0

II. STANDARD SEAMAP SHRIMP AND GROUNDFISH SAMPLING TRAWL GEAR SPECIFICATIONS

II. Standard SEAMAP Shrimp and Groundfish Sampling Trawl Gear Specifications

A. Introduction

The SEAMAP trawl surveys use a 42' semi-balloon trawl with 8'x40" chain doors towed at 2.5 knots. The complete trawl and door specifications, towing warp scope ratio, efficiency checks, and inspection schedule for this gear have been included as a guide for proper use.

B. SEAMAP 42' Semiballoon Trawl Specifications

Webbing (Nylon):

Bosom, wings and comers - 2" stretched x #18 twine.
Intermediate - 1-1/2" stretched x #24 twine.
Codend - 1-5/8" stretched x #42 twine w/1/4" x 2" galvanized rings.
Chaffing gear - 3-1/2" stretched x #90 polyethylene 60 x 40.

Hanging Cable:

Headrope and footrope - 9/16" diameter (6x6) polyethylene cover stainless steel combination net rope.
Leglines - 6 ft with heavy duty wire rope thimbles.

Weight:

Loop chain - 1/4" galvanized chain, 16 links per loop, tied every foot. Tickler chain should be 42” shorter than footrope as measured from trawl door to trawl door.

Mud Rollers:

17 mud rollers on a separate line (1/2" polypropylene) tied every 3 feet, with 3" of slack (top of roller to bottom of footrope). The mud rollers are a Biloxi Type and are 5" x 9" with ¾" center hole.

Floatation:

Floats – 6 – 3" x 4" spongex floats spaced 5 ft apart, across the middle of the headrope.

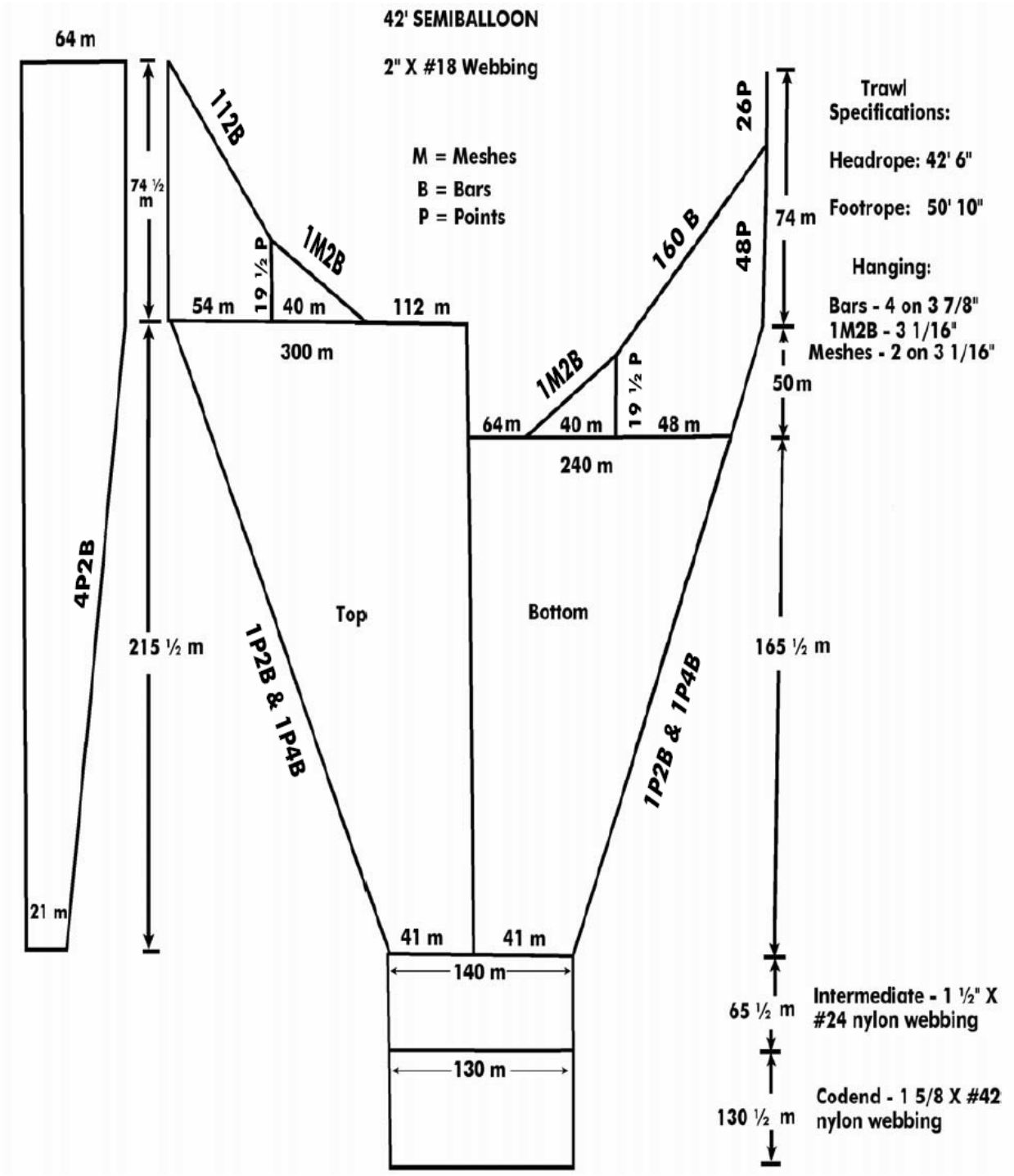
Lazyline:

18 fathoms of 3/4" polydacron.
Purse rope - 3/4" polydacron 16 ft. long.

Net Treatment:

Green plastic net coat.

Figure 2-1. Standard SEAMAP SEAMAP 42’ Trawl Schematic.



C. **Door Specifications:**
Length and Height 8’40”
Chain - 1/2" proof coil chain
Swivels - 1/2"
Bolts - 5/16"
Planking - 5/4 yellow pine, Grade 1
Stiffeners - 4"x4"
Uprights - 2"x10"
Shoe - 1"x6" stock
Lift pads in center
Bonded and bolted
Doors have 23-1/2" bridle (tow point to door face)

Tickler Chain Specifications:
Type - Standard free tickler
Size - 1/4" galvanized chain
Length - 42" shorter than the footrope including the leglines.

Bridle Specifications:
Wire Type - 6x19 strand marine lube
Diameter - 9/16"
Length - 30 fathoms

Total Trawl Twine Area:
240.2794 sq. ft.

Total Door Surface Area:
53.2 sq. ft. (per set)

Recommended Towing Speed:
2.5 knots

Figure 2-2. SEAMAP 8 Foot x 40 Inch Otter Door Design.

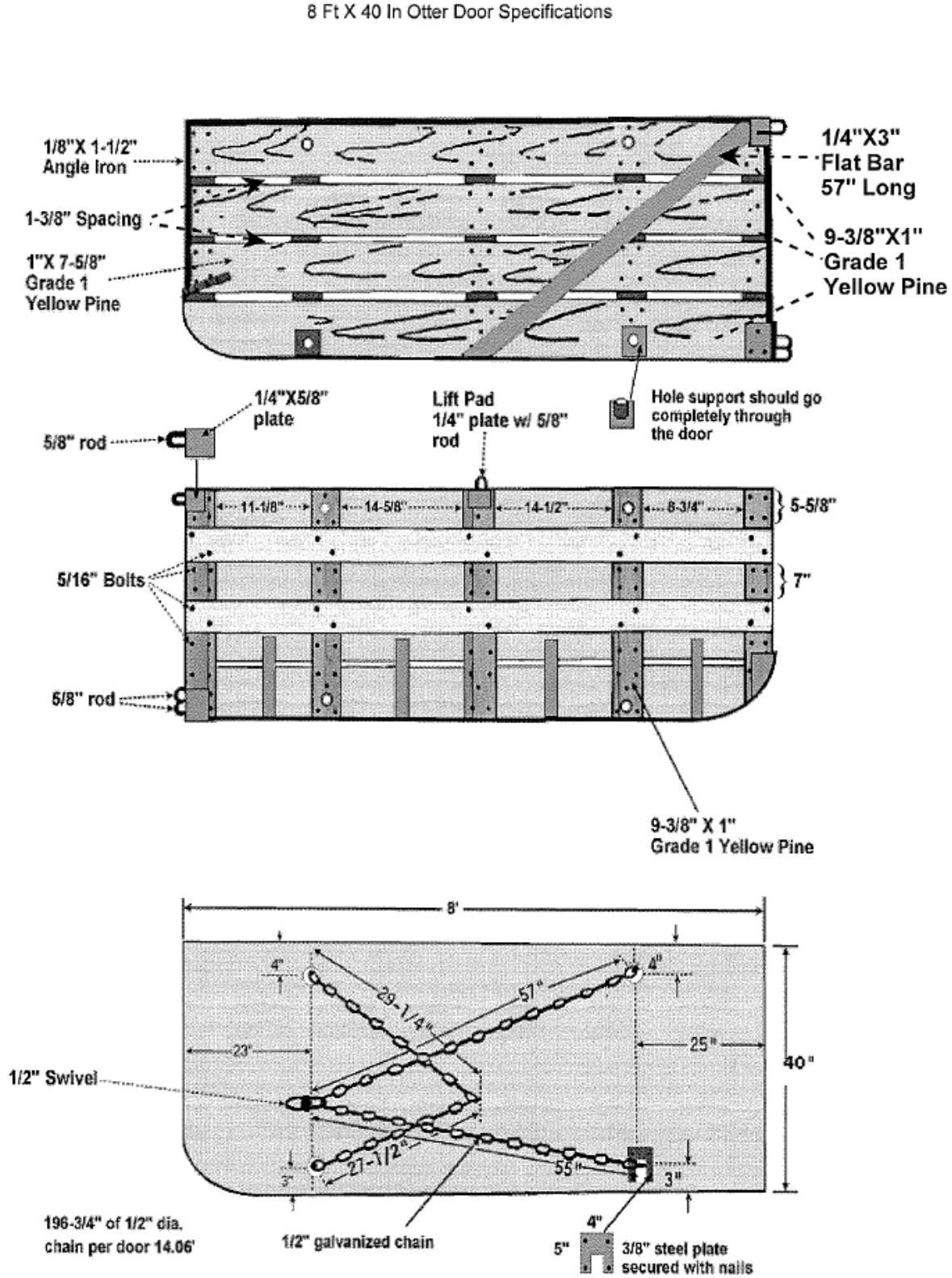
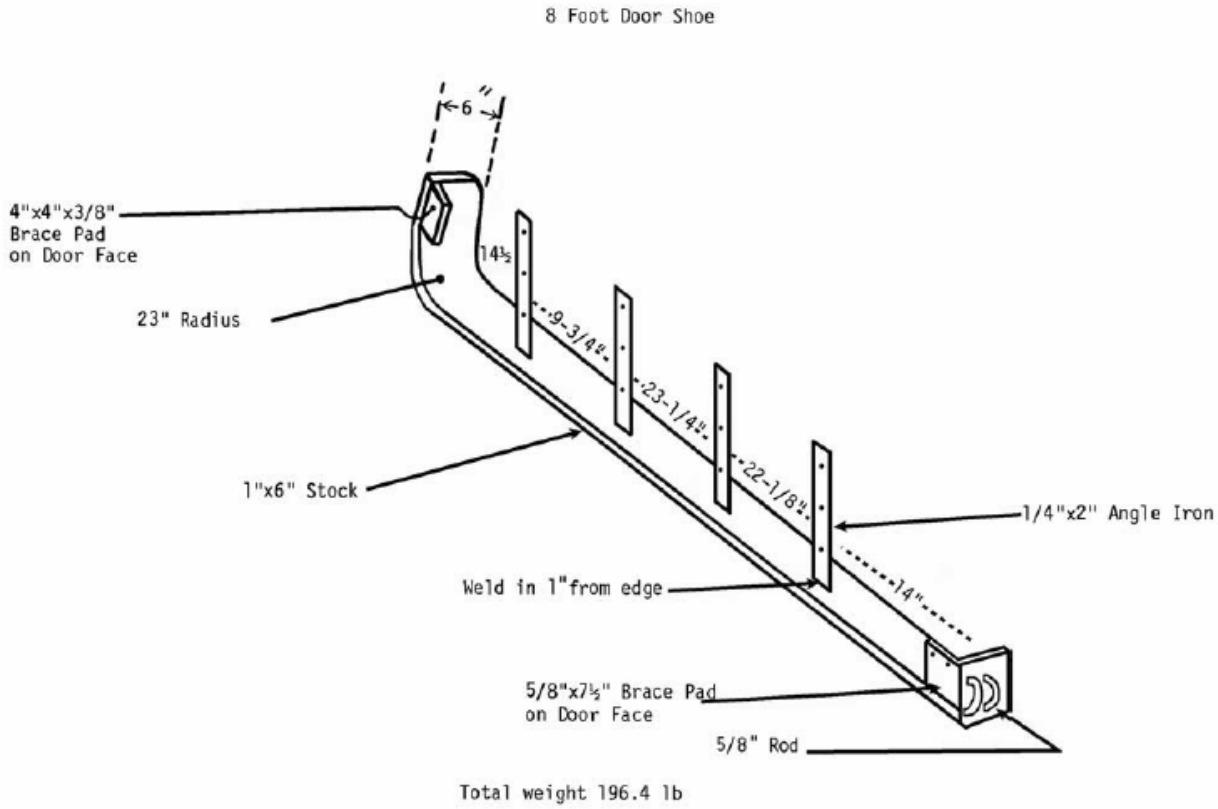


Figure 2-3. SEAMAP 8 Foot Door Shoe Design.



D. Recommended Towing Warp Scope Ratio Table

Water Depth Fathoms	Warp Fathoms	Scope Ratio	Water Depth Fathoms	Warp Fathoms	Scope Ratio
5	35	7.0	33	132	4.0
6	35	5.8	34	136	4.0
7	35	5.0	35	140	4.0
8	40	5.0	36	144	4.0
9	45	5.0	37	148	4.0
10	50	5.0	38	152	4.0
11	55	5.0	39	156	4.0
12	60	5.0	40	160	4.0
13	65	5.0	41	164	4.0
14	70	5.0	42	168	4.0
15	75	5.0	43	172	4.0
16	80	5.0	44	176	4.0
17	85	5.0	45	180	4.0
18	90	5.0	46	184	4.0
19	95	5.0	47	188	4.0
20	100	5.0	48	192	4.0
21	102	4.9	49	196	4.0
22	104	4.7	50	200	4.0
23	106	4.6	51	194	3.8
24	108	4.5	52	198	3.8
25	110	4.4	53	201	3.8
26	112	4.3	54	205	3.8
27	114	4.2	55	209	3.8
28	116	4.1	56	213	3.8
29	118	4.1	57	217	3.8
30	120	4.0	58	220	3.8
31	124	4.0	59	224	3.8
32	128	4.0	60	210	3.5

E. CHECKS TO DETERMINE TRAWL FISHING EFFICIENCY

1. SEAMAP Survey Trawl
   Door Shine - 8' x 40" Doors
   a. If the door is fishing properly, shine will be down the entire length of the leading edge and should taper to a point on the front of the shoe.
   b. Shine only on the back, or heel, of the shoe indicates improper tow cable scope ratio, improper door chain setting, or too much setback in the leglines.
   c. If shine is uniform across the entire shoe width, the scope ratio may be incorrect or tilt angle of the door inadequate.
   d. Shine on the nose or front portion of the shoe indicates improper door chaining, inadequate setback in the trawl footrope, inadequate weight on the footrope, or too short of a scope ratio.
   e. Door angle of attack can be determined by measuring the angle of the shine. For maximum efficiency the angle of attack should be approximately 36^{o}.

2. Footrope Loop Chain Shine
   a. Shine should be apparent on the middle 6 to 8 links of each loop of chain around the entire footrope length, indicating that the trawl is fishing at least 4 inches off the bottom.
   b. Hard bottom contact is indicated by shine on almost all links of the loops around the entire footrope length. This condition indicates the trawl is under spread or has too much weight on the footrope.
   c. No footrope-bottom contact is indicated by a lack of shine on any of the loop chain links. The trawl is overspread or has insufficient weight on the footrope.

3. Catch Composition and Consistency
   a. The amount of benthic invertebrates and debris in the catch indicates the degree of bottom contact and tickler chain efficiency.
   b. Variations in catch consistency can be an indication of possible gear adjustment problems.

GEAR AND RIGGING INSPECTION SCHEDULE

Gear or Rigging	Inspection	Interval
Doors	Shoe Shine	At least once a day.
Loop Chain	Shine	At least once a day.
Tickler Chain	Tangles, breaks, or stretching	Check for tangles or breaks every tow and stretch every fishing day
Trawl	Tears and holes	Every tow for obvious tears and holes. The trawl should be brought on board once a day to check for less obvious damage.
Bridle	Twists	If twists extend 25% or more of the bridle's length, the bridle should be untwisted.

III. COLLECTING ENVIRONMENTAL DATA

III. COLLECTING ENVIRONMENTAL DATA

A. INTRODUCTION

This section describes standard operational procedures for collecting environmental data at sea and establishes **primary measurements** (minimum requirements) for all SEAMAP cruises. Those measurements are: water temperature, salinity, dissolved oxygen, chlorophyll (plankton stations only), and Secchi disc depth (only required if the CTD does not record transmissivity). A full water column profile is preferred and is now the SEAMAP standard. Full water column profiles include the area between the bottom (as defined by SEAMAP) and the surface. The bottom is defined as the following: a) if real-time data streaming and an altimeter are available, the bottom is the closest point to zero, b) if real-time data streaming is not available, the bottom is between 1 and 2 meters above the station depth. The bottom as defined here will represent the max environmental depth. In case of equipment malfunctions, minimum sampling depths include the surface, mid-water, and bottom (or 200 meters where depths are greater than 200 meters). Back up equipment for environmental information (water temperature, salinity, and dissolved oxygen) is mandatory and should allow you to gather data at the surface, mid and bottom water if the main CTD breaks down. Samples are to be taken in conjunction with each biological station, either immediately before (preferred) gear deployment or after gear retrieval. Additional measurements and more frequent sampling may be required depending on the type of SEAMAP survey.

Environmental data must be collected no more than 1 hour before any trawling or plankton event and must pass within ½ nautical mile of the SEAMAP sample site. If a second trawl is attempted after encountering a snag during the trawl, a second environmental sample should be taken if trawling away from the environmental sample point. Environmental data should be collected prior to the second trawl if the beginning of the second trawl is more than 1 hour from the initial collection of environmental data.

The SEAMAP is striving to acquire the most accurate data possible. A CTD or STD is primarily used to collect water temperature, salinity, dissolved oxygen, chlorophyll, and transmissivity. The preferred chlorophyll sampling method is extraction. Water samples can be collected with water collection bottles. Dissolved oxygen is measured with in-situ D.O. sensors, onboard the vessel with D.O. meters (laboratory probe), or by a titration method. Secchi depth is measured with a standard white matte finish, 30 cm or 52 cm diameter Secchi disc.

When a CTD or STD is unavailable or breaks down, hydrocasts with water collection bottles will be used to collect water samples for measurement of the parameters identified as minimal. Sampling depths will be calculated by using wire length and angle tables or by direct measurement, when possible. If no other method is available, then temperature of the water samples collected at the surface, mid-water and maximum depth will be determined by other acceptable methods. When salinity cannot be determined at sea, water samples should be collected and returned to shore for later analysis.

It is recommended that instrument QA/QC checks should be made regularly. The CTD should be sent off to the manufacturer for calibration per the manufacturer's recommended service interval. Calibration, maintenance, and flushing should be conducted according to manufacturer standards

but measurements of the CTD and self-logging sonde should be checked before every cruise. Water quality should be recorded with multiple methods to cross-reference and QA/QC CTD measurements during the survey. If multiple methods to cross-reference and QA/QC CTD measurements are not performed at every station, measurements should be checked at least once daily.

Please use a lead pencil and make entries dark and legible to facilitate data entry. All numeric fields on the SEAMAP Environmental Data Sheet (Appendix 1) are to be right justified or aligned with the decimal place. Leading zeros are not required, but enter trailing zeros. On all SEAMAP surveys, a SEAMAP Environmental Data Sheet (Appendix 1) must be completed for every environmental station.

B. ENVIRONMENTAL FORM INSTRUCTIONS

The methods of collecting environmental data and the completion of the SEAMAP Environmental Data Sheet are as follows:

1. Required Data.

   VESSEL - Enter 2-digit numerical code from Appendix 2, Vessel Codes. If your vessel has not been assigned a code, notify NMFS Pascagoula to receive one.

   PASCAGOULA STATION NUMBER - This is a unique sequential consecutive 5-digit number within each cruise, preferably starting with "00001cf." For state vessels enter the 2-digit vessel code followed by a 3-digit station number. Transfer this station number to the environmental or plankton sheet. Do not duplicate this station number for other stations on a cruise.

   CRUISE - Enter 4-digit cruise number. Except for the *Oregon II* and other vessels having historically different cruise numbering conventions, the cruise number for **ALL VESSELS** shall be the calendar year of the survey followed by the cruise number for the year, e.g. "1201" first cruise for year 2012, "1202"- second cruise for year 2012, etc. Use this cruise number on all sheets during a cruise; do not change it.

   DATA SOURCE CODE - Enter data source code from Appendix 3.

   CTD LATITUDE - Enter latitude position occupied when deploying the CTD in degrees, minutes, and hundredths of minutes, observing indicated decimals and entering trailing zeros.

   CTD LONGITUDE - Enter longitude position occupied when deploying the CTD in degrees, minutes, and hundredths of minutes, observing indicated decimals and entering trailing zeros.

   CTD START TIME - Enter military time (0000-2359), HHMM, of start of CTD deployment.

CTD END TIME - Enter military time (0000-2359), HHMM, when the CTD has been retrieved.

CLOUD TYPE - Cloud type is no longer collected on Gulf of Mexico SEAMAP cruises.

% CLOUD COVER - Circle percent cloud cover during daylight hours only. Cloud cover is determined for the entire sky, not just that portion overhead. Allowable values are 25%, 50%, 75% and 100%.

SECCHI DISC – Only take secchi readings if transmissivity is unavailable. Enter secchi disc reading in meters (see Tables 1, 2, and 3 for meter/feet/fathom conversion factors), observing one indicated decimal. Take readings only during daylight hours and from shady side of platform. See section C.1. below for transparency measurements with the Secchi disc.

STATION LOCATION CODE - Enter S (start) or E (end) for position location closest to where environmental data was actually collected. Enter U if location was unknown.

AIR TEMPERATURE - Enter in degrees Celsius and tenths (dry bulb), observing 1 indicated decimal.

BAROMETRIC PRESSURE - Enter in millibars of mercury, observing 1 indicated decimal.

WAVE HEIGHT - Enter wave height in meters, observing 1 indicated decimal.

SEA CONDITION - Enter Beaufort scale- see Appendix 5, Beaufort Sea Condition Table.

WATER COLOR – As of 2022, SEAMAP no longer collects water color during trawling operations.

PRECIPITATION - Enter code from Appendix 5. Record precipitation no matter when it occurred during the station.

SAMPLE DEPTHS - Enter midwater and maximum sample depths in whole meters. See section C.3. below for the hydrocast sampling procedure.

WATER DEPTH - Enter water depth in meters, observing one indicated decimal place, at the point where environmental data were taken. This should be equal to or greater than the maximum sample depth.

MAX ENVIRONMENTAL DEPTH – depth in meters where the deepest environmental reading was recorded

TEMPERATURES - Enter surface, midwater, and maximum sample depth temperatures in degrees Celsius (see Table 4 for conversion factors), observing two indicated decimals, adding trailing zeros if needed. If state vessels have additional equipment for measuring temperature, please document type of equipment. Thermometer readings should be entered in the blocks provided at the bottom of the data sheet.

SALINITIES - Enter surface, midwater, and maximum sample depth salinity measurements, observing three indicated decimals, adding trailing zeros if needed. If samples are taken for later analysis, record vessel code or name, cruise, station number, date, and sample depth on each sample. Indicate on the bottom of the form if samples were taken for later analysis. If salinity is determined with a refractometer, record the readings in the boxes provided at the bottom of the form. See Section C.3 below for collecting salinity samples from a hydrocast.

CHLOROPHYLL - Enter surface, chlorophyll maximum when taken, and maximum sample depth of chlorophyll measurements in milligrams per cubic meter observing four indicated decimals. If samples are taken for later analysis, document the number of samples taken at each depth on the bottom of the form. See Section C.4 below for chlorophyll sampling procedures.

OXYGEN - Enter surface, midwater and maximum sample depth dissolved oxygen readings in parts per million, observing one indicated decimal place. See Section C.5 below for Dissolved Oxygen (D.O.) sampling procedures.

TRANSMISSIVITY - Enter transmission as percent transmission for surface, midwater and maximum sample depth. No decimals are used. This is a measure of the amount of suspended material in the water. If a transmissometer is not available, be sure to collect secchi depth.

C. SAMPLE COLLECTION METHODOLOGY

1. MEASUREMENT OF TRANSPARENCY WITH SECCHI DISC

The Secchi disc is used to measure transparency of sea water (approximate index) and is dependent upon the available illumination, limiting measurements to daylight periods only. Daylight hours may be defined as being from one hour after sunrise to one hour before sunset. Either standard-sized Secchi disc can be used. For inshore stations, there is no difference in the readings depending on size. For very clear offshore water, the larger size disc should be used.

a. DO NOT wear sunglasses during the measurements.

b. Lower Secchi disc with a rope marked in meters on the shaded side of the ship.

c. Lower disc until it is just perceptible.

d. Note the depth of the disc in meters. The measurement is made from the water surface to the disc.

e. Continue lowering until the disc is no longer visible and again note the depth of the disc.

f. Average the two depths and record the resulting depth in the appropriate blocks on the data sheet, observing one indicated decimal place.

2. HYDROCAST SAMPLING PROCEDURES

Water samples need to be collected for **QA/QC purposes** and to obtain temperature, salinity, D.O., and chlorophyll when a CTD, STD or handheld sonde is unavailable. Water samples are collected with the aid of water collection bottles (Niskin) attached to a hydrowire at the surface, mid and bottom depths or at the surface, 100 meters and 200 meters for stations with depths greater than 200 meters. The procedure for a hydrocast with water collection bottles is as follows:

a. Verify (by communication with the bridge) that ship is on station, is "dead" in the water and oriented so cast is on weather side of ship.

b. Obtain bottom depth from bridge for proper bottle placement on the hydrowire.

c. Attach the deepest water collection bottle to the hydrowire above a hydroweight as follows:
   1. Ensure air vent and drain valve are closed.
   2. Attach the loop in the top stopper wire to the left release mechanism. The bottom stopper wire is clipped below the ball on the top stopper wire.
   3. Clamp the **water collection** bottle to the cable finger tight, top clamp first, then bottom clamp.

d. When the first bottle is ready for lowering (just below the sea surface), zero the meter wheel.

e. Lower this bottle until the meter wheel reads the equivalent of the desired depth. If you have a strong wire angle make sure to use an inclinometer to adjust your water depth. Take into account the distance from the deck of the ship to the water surface before attaching the next bottle.

f. Calculate the length of wire required to reach desired depth of each bottle (see wire angle Table 8) or compute the depth by using the following formulas for computing wire required, depth of bottom bottle or COS angle:

   depth of bottle = wire out x COS angle
   wire required = depth ÷ COS angle
   COS angle = depth ÷ wire out

(1 fathom = 1.83 meter = 6 feet)

At shallow water stations an alternative to Steps D and E is to initially "bump" the sea floor with the hydro-weight. Use the wire length to determine placement of the mid-water sample bottle. Retrieve the hydroweight and attach the midwater bottle.

g. Haul back or pay out wire until the meter wheel reads required wire length for second bottle.

h. Clamp a second water collection bottle to hydrowire and set stoppers.

i. Attach a messenger lanyard to the bottle at the right release mechanism and **CLIP THE MESSENGER TO THE HYDROWIRE** below the bottle.

j. Pay-out the wire and attach remaining bottles and messengers at the calculated wire length.

k. End cast preparation with a water collection bottle and attached messenger just below the surface. Record sample depths in appropriate boxes on data sheet.

l. **CLIP A MESSENGER** to the wire and release to trip the cast, allowing approximately 1 minute per 100 meters of wire length for messenger travel.

m. Retrieve the cast, observing ascending cable, and warning winch operator when each bottle is first visible.

n. Remove the bottle from the wire by loosening the bottom clamp first. Care should be taken so as to not shake the bottle or otherwise disturb the water sample before taking the D.O. samples.

o. Take temperature measurements by opening top stopper and immersing hand held thermometer or use a sonde. Record temperature in appropriate boxes on data sheet.

p. Immediately after taking temperature, draw dissolved oxygen samples before retrieving salinity samples. You can also use a sonde.

3. COLLECTING WATER SAMPLES FOR SALINITY

a. Salinity samples are to be drawn after all the oxygen samples are collected.

b. Rinse the sample bottles three times, using about one-fourth bottle of water for each rinse.

c. Shake the bottles vigorously during each rinse and pour the rinse water inside the bottle cap to rinse it also.

d. Draw the salinity samples directly from the drain spigot, filling the sample bottle to within one-half (½) inch of the top.

e. Do not force the cap on the sample bottle too tightly. Pressure supplied between thumb and forefinger is sufficient.
f. Label each bottle with the vessel name, cruise number, station number, date, and depth (surface, mid-water, or bottom).

4. COLLECTING DISSOLVED OXYGEN (DO) PROCEDURES

Water samples for dissolved oxygen determination should be drawn from the water collection bottles as soon as the bottles are retrieved and before any other samples are taken.

a. Collecting the Water Sample

1. Attach a clear plastic tube of the proper diameter, about 25 cm in length, to the spigot at the bottom of the water collection bottle. Lift the free end of the tubing to near the level of the air vent, and then open the air vent and the spigot, letting the tubing fill with water. There should be no air trapped in the tubing. If air bubbles are observed, let the water flow out slowly by slightly lowering the free end of the tubing and tapping on the tubing until the bubbles are cleared.

2. Place the free end of the tube deep into the B.O.D. bottle (biochemical oxygen demand) and fill approximately 1/4 full.

3. Close the drain valve, swirl the water around in the bottle to rinse it, and discard the water.

4. Reinsert the tube into the bottle near the bottom and allow water to flow.

5. Count the number of seconds it takes for the bottle to fill and begin to overflow the B.O.D. bottle.

6. Continue counting and allow the water to overflow until the bottle has filled at least three times. For example: If it takes a count of 7 to fill the bottle, continue letting the water overflow and count to 21.

7. Place the ground glass stopper in the top of the B.O.D. bottle and as you do so, twist it gently. Leave the excess water on top of the bottle. This provides an additional air seal. Draw samples from the remaining water collection bottles following the same procedure.

8. Samples are now ready to be measured with an oxygen meter or by the Winkler titration method within 30 minutes of collection.

APPENDICES

APPENDIX 1. **SEAMAP TRAWL STATION SHEET**

START

VESSEL NO. | PASCAGOULA STATION NO. | CRUISE NO. | TIME ZN HH MM | LATITUDE DD MM MM | LONGITUDE DD MM MM | DEPTH (M)

END

SEAMAP / OTHER STATION NO. | DATE MO DY YR | TIME HH MM | LATITUDE DD MM.MM | LONGITUDE DD MM.MM | DEPTH (M)

GEAR TYPES USED AT THIS STATION

TEMPERATURES (°C): SURFACE | BOTTOM | AIR

BAROMETRIC PRESSURE (MB) | WIND SPEED (KN) | WIND DIRECT. (DEGREES) | WAVE HEIGHT (M) | SEA CONDITION (BEAUFORT) | DATA SOURCE CODE | VESSEL SPEED (KN) | STATISTICAL ZONE | NET NO.

NMFS FAUNAL ZONE | GEAR SIZE | GEAR TYPE | MESH SIZE (IN) | OPERATION CODE | MINUTES FISHED | WATER COLOR | TOTAL LIVE CATCH (KG)

FILL IN ONLY IF CATCH WAS SAMPLED

SELECT | SAMPLE

CRUSTACEANS YOY

GENUS	SPECIES	X	NUMBER	SAMPLE WEIGHT (KG)	SELECT WEIGHT (KG)
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
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				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
TOTAL CRUSTACEAN WEIGHTS					

OTHER LIVE ANIMALS YOY

GENUS	SPECIES	X	NUMBER	SAMPLE WEIGHT (KG)	SELECT WEIGHT (KG)
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
				4	5
TOTAL OTHER LIVE ANIMAL WEIGHTS					

GEAR DATA:

COMMENTS:

RECORDER:

FINFISH		YOY					
GENUS	SPECIES	X	NUMBER	SAMPLE WEIGHT (KG)		SELECT WEIGHT (KG)	
					4		5
					4		5
					4		5
					4		5
					4		5
					4		5
					4		5
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					4		5
					4		5
			TOTAL FINFISH WEIGHTS				

GENERAL LENGTH FREQUENCY FORM

VESSEL NO. | PASCAGOULA STATION NO. | CRUISE NO. | DATA SOURCE CODE | SEAMAP / OTHER STATION NO. | DATE MO DAY YR

GENUS / SPECIES / MEAS CODE

	LENGTH (MM)	WT (KG)	SEX	LENGTH (MM)	WT (KG)	SEX	LENGTH (MM)	WT (KG)	SEX	LENGTH (MM)	WT (KG)	SEX
1												
2												
3												
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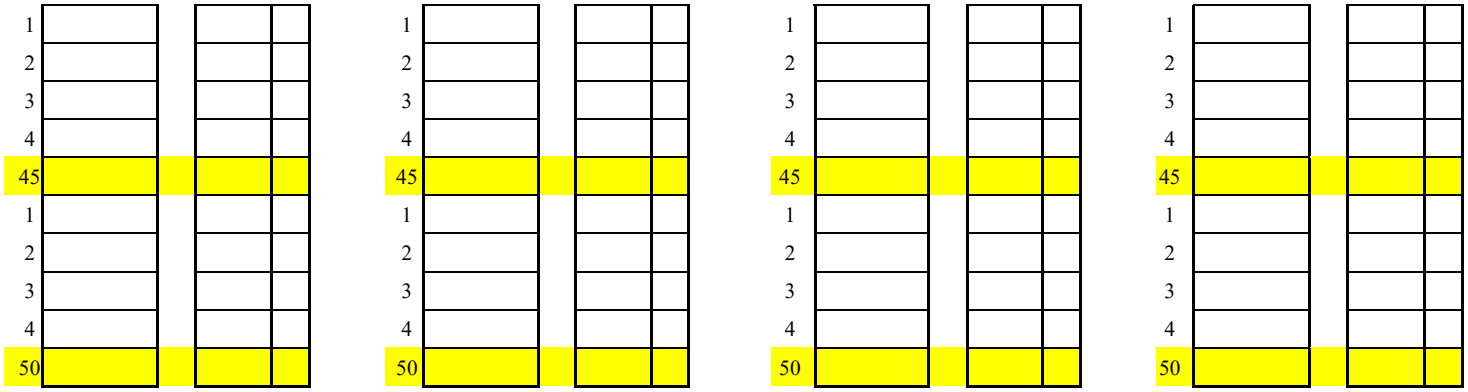


MEASUREMENT CODES				SEX CODES	
51	FORK LENGTH	56	RADIAL DIAMETER	U	UNDETERMINED
52	STANDARD LENGTH	57	OTHER	M	MALE
53	TOTAL LENGTH	58	SNOUT-ANUS	F	FEMALE
54	WIDTH	59	CURVILINEAR LENGTH		
55	MANTLE LENGTH	60	CURVILINEAR WIDTH		

SEAMAP ENVIRONMENTAL DATA SHEET

Shift Leader Initials_____

VESSEL | CRUISE | SOURCE

PASCAGOULA # | SEAMAP STATION # | MON | DAY | YR

ZONES: STATISTICAL | FAUNAL | TIME

WAVE HT. (M) | WIND DEGREES | KNOTS | STAT. LOCATION | PRECIPITATION | AIR TEMP (°C) | BAROMETRIC PRESSURE (mbar)

SEA CONDITION (BEAUFORT SCALE)

DAYLIGHT ONLY: | WATER COLOR | % CLOUD COVER (0, 25, 50, 75, 100) | SECCHI DISC (M)

WATER DATA FROM CTD CAST

	DEPTH (M)	CONDUCTIVITY (RATIO)	SALINITY	TEMPERATURE (°c)	DISSOLVED OXYGEN
TOP					
MID					
BOT					

	TRANSMISSIVITY
TOP	
MID	
BOT	

CTD Coordinates: LATITUDE DEG MINUTES | LONGITUDE DEG MINUTES

CTD START (HH MM) | CTD END (HH MM)

FILE ID_____

	SURFACE	MIDWATER	BOTTOM
CHLOROPHYLL *FROM LAB (Mg/M^{3})			
CHLOROPHYLL *FROM CTD (Mg/M^{3})			

COMMENTS:

Type of CTD used:

APPENDIX 2: VESSEL CODES

VESSEL CODES

01---OREGON
02---SILVER BAY
03---GEORGE M. BOWERS
04---OREGON II
05---COMBAT
06---PELICAN
07---FRIGATA
08---KINGFISHER
09---HERNAN CORTEZ
10---GERONIMO
11---UNDAUNTED
12---ANTILLAS
13---CALAMAR
14---ALCYON
15---GULF RANGER
16---WESTERN GULF
17---TOMMY MUNRO
18---TANYA & JOE
19---ONJUNKU
20---JEFF & TINA
21---DELAWARE II
22---OSV ANTELOPE
23---A.E. VERRILL
24---FLORENCE MAY
25---LOUISIANA INSHORE VESSELS
26---SUNCOASTER
27---MISSISSIPPI INSHORE VESSELS
28---CHAPMAN
29---NISSIHINO MARU #201
30---R/V BELLOWS
31---R.J. KEMP (ARANSAS BAY)
32---MATAGORDA BAY
33---LAGUNA MADRE
34---GALVESTON BAY
35---LUMCON PELICAN
36---HERNAN CORTEZ II (CORAL SEA)
37---OLD COLONY
38---SEAWOLF
39---ATLANTIC HARVESTER
40---SABINE
41---PERSISTANCE
42---CAPTAIN GRUMPY
43---GULF STREAM
44---KELCY ANN
45---MR. JUG
46---CALANUS
47---A. NEEDLER
48---B.I.P.
49---ALBATROSS IV
50---MOLLY M.
51---LADY LISA
52---MISS CARRIE
53---CSS HUDSON
54---CORAL SEA
55---CARETTA
56---R/V ABREU
57---R/V GUAY ANILLA
58---SEAHORSE
59---LINDSAY
60---TEDDY♠S SCOW
61---RELENTLESS
62---RAFFIELD VESSELS
63---GORDON GUNTER
64---FERREL
65---TRINITY BAY
66---ALABAMA 38 ft BERTRAM
67---NUECES BAY
68---MCARTHUR
69---SAN JACINTO
70---R/V SARINNA
71---HARVESTING SYSTEM TECH/HST
72---GANDY
73---E.O. WILSON
74---THE MCILWAIN
75---WEATHERBIRD II
76---PISCES
77---ALABAMA DISCOVERY
87---SAN ANTONIO BAY
88---BLAZING SEVEN
90---SABINE
92---COPANO BAY
93---ACADIANA
95---POINT SUR
99---OTHER VESSELS

APPENDIX 3: DATA SOURCE AND TIME ZONE CODES

DATA SOURCE CODES

FL - - Florida
AL - - Alabama
MS - - Mississippi
LA - - Louisiana
TX - - Texas
US - - National Marine Fisheries Service
99 - - Other

TIME ZONE CODES

1……Eastern Standard Time
2……Eastern Daylight Savings Time
3……Central Standard Time
4……Central Daylight Savings Time
8……Greenwich Mean Time
9……Other - Explain in Comments Section

APPENDIX 4: GEAR CODES

CODE	GEAR TYPE
*T	TRAWL, STAR
01	COMBINATION--SS+CC
02	COMBINATION--SS+PR
03	COMBINATION--CC+PR
04	COMBINATION--SS+CC+PR
05	COMBINATION--FM+SS
06	COMBINATION--FM+SS+PR
07	COMBINATION--FM+PR
A	ASSORTED
AC	BIOSONICS ACOUSTIC SYSTEM
BB	TRAWL, BIB
BC	BOTTLE CAST
BG	BATHYTHERMOGRAPH (CTD, STD)
BL	LONGLINE , BOTTOM
BS	SEINE, BEACH
BT	TRAWL, BEAM
CA	CHLOROPHYLL, EXTRACTION
CC	CAMERA, CLOSED CIRCUIT TELEVISION
CD	DREDGE, CLAM
CM	CURRENT DOPPLER
CR	CORAL REEF MODUAL
CS	CONTINUOUS FLOW SYSTEM
CT	TRAP, CRAB
DL	DEEP LINE
DN	PLANKTON, DOUBLE NEUSTON
OR	NEKTON
DR	SURFACE DRIFTER
DV	DIVING
EF	TRAWL, FISH, EXPERIMENTAL
ES	TRAWL, SHRIMP, EXPERIMENTAL
FD	TRAWL, FISH DEFLECTOR
FE	TRAWL, FISH EXCLUDER
FL	FLUORESCENCE, CONTINUOUS FLOW SYSTEM
FM	FATHOMETER
FP	FISH PUMP
FT	TRAWL, FISH
FX	FLUORESCENCE, IN SITU
GN	GILL NET
GR	BOTTOM GRAB OR CORE SAMPLER
HL	HANDLINE
HO	TRAWL, HIGH OPENING BOTTOM
IT	TRAP, ICHTHYOPLANKTON, ILLUMINATED
JP	JACKPOLE
KP	LONGLINE, KALI POLE
MO	PLANKTON, MOCNESS
MQ	MARQUESETTE
MS	TRANSMISSIVITY
MT	TRAWL, MIDWATER
NN	PLANKTON, SINGLE NEUSTON OR NEKTON
NS	NETSONDE
OB	LONGLINE, OFF-BOTTOM
OD	ODOMETER
OF	OVERFLIGHT
OH	OXYGEN, TITRATION, HACH KIT
OI	OXYGEN, SENSOR, IN SITU
OO	OXYGEN, SENSOR, ON DECK
OR	OYSTER RAKE
OW	OXYGEN, TITRATION, WINKLER
OX	OXYGEN, SENSOR, CTD
OY	OXYGEN, SENSOR, SONDE
PN	PLANKTON, GENERAL (BONGO, ETC.)
PR	PROFILER, 3.5 KHZ SUB-BOTTOM
PS	SEINE, PURSE
PT	TRAWL, SCALLOP
QD	DREDGE, QUAHOG
RE	SALINITY, REFRACTOMETER
RF	RECORDING FATHOMETER
RG	PLANKTON, RING NET
RL	TAG RELEASE
RN	ROUND NET
RR	ROD AND REEL
RS	TRAWL, NON-STANDARD
RT	ROTENONE
RV	REMOTELY OPERATED VEHICLE (ROV)
S5	TRAWL, MONGOOSE
S6	TRAWL MONGOOSE
SA	SALINITY, AUTOSAL
SB	SALINITY, BECKMAN RS5
SC	CAMERA, STILL
SD	DREDGE, SCALLOP
SE	SECCHI DISC
SF	SALINITY, CONTINUOUS FLOW SYSTEM
SH	TRAWL, SHUMAN
SI	SALINITY, SENSOR, IN SITU
SL	SALINITY, BENCH TOP/LABORATORY
SJ	SQUID JIG
SM	TRAWL, STANDARD MONGOOSE
SN	TRAWL, SEPARATOR
SO	SONAR
SS	SONAR, SIDE SCAN
ST	TRAWL, SHRIMP

KT	TRAWL, WING
LL	LONGLINE, SURFACE
LN	LIFT NET
LP	SEINE, LAMPARA
LR	TRAP, LOBSTER, REED
LT	NIGHT LIGHT
LW	TRAP, LOBSTER, WIRE
MC	CAMERA, MOVIE
ML	MISCELLANEOUS- DETAIL IN COMMENTS
MN	MICRONEKTON
SX	SALINITY, CTD
SY	SALINITY, SONDE
T3	TEMPERATURE SCS
TA	TEMPERATURE, CONTINUOUS FLOW SYSTEM
TB	TEMPERATURE, BECKMAN RS5
TC	TEMPERATURE, CTD
TD	DREDGE, TUMBLER
TE	TRAWL, TURTLE EXCLUDER
TF	TEMPERATURE, FLUKE
TG	TROLLING GEAR
TH	TEMPERATURE, THERMOMETER
TI	TEMPERATURE, SENSOR, IN SITU
TM	TEMPERATURE, BUCKET
TN	TRAWL, TRY NET
TO	TEMPERATURE, SENSOR, ON DECK
TR	TRAP, FISH
TS	SEINE, PURSE, TURTLE
TT	TRAWL, TWIN
TU	PLANKTON, TUCKER TRAWL
TV	TRAP VIDEO
TY	TEMPERATURE, SONDE
UD	DREDGE, UNSPECIFIED
VC	CAMERA, VIDEO
VD	VERTICAL DRIFTLINE
VJ	VISUAL OBSERVATION
VL	VERTICAL LINE
V2	VERTICAL LONGLINE WHERE EACH FISH IS IDENTIFIED TO HOOK
VP	VERTICAL PROFILE
WI	WEATHER INSTRUMENT
WT	TRAP, LOBSTER, WOOD
XB	EXPENDABLE BATHYTHERMOGRAPH (XBT)

Highlighted codes are the most common types of gear codes used during trawling operations.

SEAMAP Examples of Gear Code Use

For Chlorophyll - Sample obtained from bottle cast for extraction BC, CA

For Salinity - Reading obtained by CTD: BG, SX

Sample obtained from bottle cast for AUTOSAL analysis BC, SL

For - Oxygen reading obtained by CTD: BG, OX

Sample obtained from bottle cast for titration by the Winkler method BC, OW

For Temperature - Reading obtained by CTD: BG, TC

Scenario Example -

Procedures at a SEAMAP station included a CTD profile, a Secchi disc reading, a bottle cast for water samples, a sediment grab, and a trawl.

BG, BC, TC, SX, SE, OX, CA, GR, and ST

There are only seven spaces on the data sheet to enter the nine listed gear types used. Record in the Comment section the additional two gear types used.

APPENDIX 5: PRECIPITATION CODES AND BEAUFORT SEA STATE

PRECIPITATION CODES

0 None	5 Sleet
1 Light Rain	6 Sleet/Rain
2 Moderate Rain	7 Hail
3 Heavy Rain	8 Fog
4 Snow	

BEAUFORT SEA CONDITION TABLE

Sea Condition	Description
0	Wind speed under 1 knot, sea like a mirror.
1	Wind speed 1-3 knots; small ripples on surface with the appearance of scales.
2	Wind speed 4-6 knots; small wavelets with glassy appearance.
3	Wind speed 7-10 knots; large wavelets; crests begin to break; scattered whitecaps.
4	Wind speed 11-16 knots; small waves becoming longer; numerous whitecaps.
5	Wind speed 17-21 knots; moderate waves taking longer to form; many whitecaps; some spray.
6	Wind speed 22-27 knots; larger waves forming; whitecaps everywhere; more spray.
7	Wind speed 28-33 knots; sea heaps up; white foam from breaking waves begins to be blown in streaks.
8	Wind speed 34-40 knots; moderately high waves of greater length; edges of crests begin to break into spin-drift; foam is blown in well marked streaks.
9	Wind speed 41-47 knots; high waves; sea begins to roll; dense streaks of foam; spray may reduce visibility.

APPENDIX 6. OPERATION CODES

A = Net not spread
B = Gear bogged
C = Bag choked
D = Gear not digging
E = Twisted warp or line
F = Gear fouled
G = Bag untied
K = Bad weather stopped operation
L = Lost whole rig
M = Miscellaneous (detail in comments)
N = Shark damage
O = Gear off bottom
P = Vessel off position
T = Torn webbing
U = Unknown
W = Water haul
X = Lost fish
Z = Hangup

APPENDIX 7

The following outlines several examples calculating sub-sampling expansion factors for trawl catches with emphasize on catches that include trash. The terms of reference for the entire trawl and individual taxonomic component is outline in alternate terminology than the original SEAMAP manual in hopes of clarifying where values are coming from. Of course the process by which these values are arrived may be different.

Terms for Entire Trawl

Total_Trawl_Weight = Total weight of all items removed from trawl including trash. Note: This is probably not even being recorded in most cases.

Select_Trash_Weight = Total weight of trash (tires etc.) removed from Total_Trawl_Weight prior to sub-sampling. Note: This is probably not even being recorded in most cases.

Working_Catch_Weight = Total weight of trawl catch after large trash has been removed (TOTAL_TRAWL_WEIGHT - SELECT_TRASH_WEIGHT) prior to sub-sampling. This should be equivalent to Total_Live_Weight when no trash is taken in the trawl.

Total_Live_Weight = Total weight of biological catch from trawl.

Select_Weight = Total weight of biological catch removed from trawl prior to sub-sampling.

Sample_Weight = Total weight of sub-sampled portion of the catch which may include trash.

Sample_Trash_Weight = Total weight of trash found in sub-sample (SAMPLE_WEIGHT).

Expansion_Factor = (TOTAL_LIVE_WEIGHT – SELECT_WEIGHT)/SAMPLE_WEIGHT or alternately (Working_Catch_Weight – Select_Weight)/Sample_Weight.

Expanded_Trash_Weight (EXPANDED_TRASH_WEIGHT) = expanded total weight of trash found in the sub-sample taken from (Working_Catch_Weight – Select_Weight) or the total weight of catch from from which the sub-sample was taken.

Terms for Individual Counts and Weights

CNT = Total count of a processed organism.

CNTEXP = Expanded total count of a processed organism accounting for sub-sampling.

SAMPLE_BGS = Total weight of a processed organism.

SELECT_BGS = Expanded total weight of a processed organism accounting for sub-sampling.

Example 1.

Example 1 represents a clean 100 kg trawl without trash and no sub-sampling.

TOTAL_TRAWL_WEIGHT=100, SELECT_TRASH_WEIGHT = 0, WORKING_CATCH_WEIGHT = 100, TOTAL_LIVE_WEIGHT = 100, SELECT_WEIGHT = 0, and SAMPLE_WEIGHT = 0.

No expansion factor (EXPANSION FACTOR) is generated.

CNTEXP = CNT and SELECT_BGS = SAMPLE_BGS.

Example 2.

Example 2 represents a 100 kg trawl with a single large piece of trash (25 kg) and no sub-sampling.

TOTAL_TRAWL_WEIGHT=100, SELECT_TRASH_WEIGHT = 25, WORKING_CATCH_WEIGHT = 75, TOTAL_LIVE_WEIGHT = 75, SELECT_WEIGHT=0 AND SAMPLE_WEIGHT = 0.

No expansion factor (EXPANSION FACTOR) is generated.

CNTEXP = CNT and SELECT_BGS = SAMPLE_BGS.

Example 3.

Example 3 represents a 100 kg trawl with a combinations of 25 kg of select taxa and a sub-sample of 25 kg and no trash.

TOTAL_TRAWL_WEIGHT=100, SELECT_TRASH_WEIGHT = 0, WORKING_CATCH_WEIGHT = 100, TOTAL_LIVE_WEIGHT = 100, SELECT_WEIGHT=25 AND SAMPLE_WEIGHT = 25.

Expansion factor EXPANSION FACTOR is equal to (TOTAL_LIVE_WEIGHT – SELECT_WEIGHT)/SAMPLE_WEIGHT = (100-25)/25 = 3.

CNTEXP = (CNT x EXPANSION FACTOR) and SELECT_BGS = (SAMPLE_BGS x EXPANSION FACTOR) for only for organisms that were subsampled. CNT and CNTEXP should be a minimum of 1 or be rounded to the nearest whole number.

SAMPLE_BGS and SELECT_BGS should be a minimum of 0.001 or be rounded to the nearest 0.0001 kg.

Example 4.

Example 4 represents a 100 kg trawl with a combination of 25 kg of select taxa, a sub-sample of 25 kg and 1 kg of trash found in the sub-sample during processing.

TOTAL_TRAWL_WEIGHT=100, SELECT_TRASH_WEIGHT = 0, WORKING_CATCH_WEIGHT = 100, TOTAL_LIVE_WEIGHT = ?, SELECT_WEIGHT=25, SAMPLE_WEIGHT = 25 AND SAMPLE_TRASH_WEIGHT = 1.

Expansion factor EXPANSION FACTOR is equal to (WORKING_CATCH_WEIGHT – SELECT_WEIGHT)/SAMPLE_WEIGHT = (100-25)/25 = 3.

Since 1 kg of trash (SAMPLE_TRASH_WEIGHT) was found in the 25 kg sub-sample (SAMPLE_WEIGHT) of the 75 kg (Working_Catcht_Weight – Select_Weight) from which the subsample was taken, the Expanded_Trash_Weight is then (SAMPLE_TRASH_WEIGHT x EXPANSION FACTOR) = 3 kg.

Total_Live_Weight (TOTAL_LIVE_WEIGHT) is then (Working_Catch_Weight – Expanded_Trash_Weight) or (100 - 3) = 97.

Alternately the Expansion_Factor is (Total_Live_Weight – Select_Weight)/(Sample_Weight – Sample_Trash_Weight) is (97 – 25)/(25-1) = (72/24) = 3.

CNTEXP = (CNT x EXPANSION FACTOR) and SELECT_BGS = (SAMPLE_BGS x EXPANSION FACTOR) for only for organisms that were subsampled. CNT and CNTEXP should be a minimum of 1 or be rounded to the nearest whole number.

SAMPLE_BGS and SELECT_BGS should be a minimum of 0.001 or be rounded to the nearest 0.0001 kg.

APPENDIX 8. LENGTH FREQUENCY MEASUREMENT CODE FINDER LIST

Make sure to use the new measurement codes. The old measurement codes are for reference only. NMFS working on illustrated guide to show how measurements should be taken.

Measurement Type	Old Measurement Codes	New Measurement Codes
fork length	01	51
standard length	02	52
total length	03,04,06,08,11,12,17,18,21,25,29,32	53
width	05,10,14,16,22,24,26,30,31	54
mantle length	13	55
radial diameter	15	56
other	20	57
snout-anus	23	58
curvilinear length	27	59
curvilinear width	28	60

Code No.	Type measurement
51	Fish, fork length
52	Fish, standard length
53	Fish, total length • if fish has produced caudal ray elements at the fork or upper and/or lower caudal lobes take standard length, Code 52 measurement
54	Skates and rays, disc width
57	Other - specify and check with Field party Chief for special Code no.
58	Fish, snout/anal length

CRUSTACEANS

Code No.	Type measurement
53	Shrimp, total length (Default Measurement)
53	Shrimp, carapace length (measure when requested)
53	Crab, carapace length (Default measurement) If carapace length exceeds carapace width (measure when requested other wise)
53	Lobster, total length (rostral tip to end of telson) (Measure when requested)
54	Crab, carapace width (lateral measurement) If carapace length exceeds carapace width-measure carapace length instead (code 06)

OTHER SPECIES
(Exclusive of fish and crustaceans)

Code No.	Type measurement
53	Bivalve, total length (clams) (All bivalves except scallops) Parallel to hinge joint, umbo to bill edge
53	Scallop, total length (All scallops) (hinge to bill length)
53	Univalve snails (most univalves): total length- point to point; Shelled - Columella total length (apex to tip of anterior canal - Spire axis); for Abalones and Chitons use maximum total length of shell; for sea hares use total length.
53	Sea turtles - maximum linear carapace total length
53	Worm, total length
54	Disc width anemones and corals (solitary)
54	Starfish - disc width(between arm bases-default measurement); Sand dollars, sea biscuits, heart urchins, etc.- greatest linear distance

54	Sea pansy and other colonial invertebrates, maximum disc width; Jellyfish- bell diameter
54	Univalve snails, spiral width (includes Argonauts)
55	Squid, mantle length
56	Starfish, total radial diameter (measure when requested)

APPENDIX 9. SEX DETERMINATION AND REPRODUCTIVE MACRO STAGING

A few notes:
-Hermaphrodites will be difficult to sex in an "inactive" stage.
-Most fish will be Inactive.
-For stock assessment purposes and otherwise, females matter more than males. Therefore, it matters less if males cannot be staged or is staged incorrectly.

Sex
Sex determination will provide stock assessors with sex ratio data, which will provide an ability to split the adult population into a spawning stock biomass of only females. Males should not be included in spawning stock biomass because they are not the limiting factor in the production of offspring.

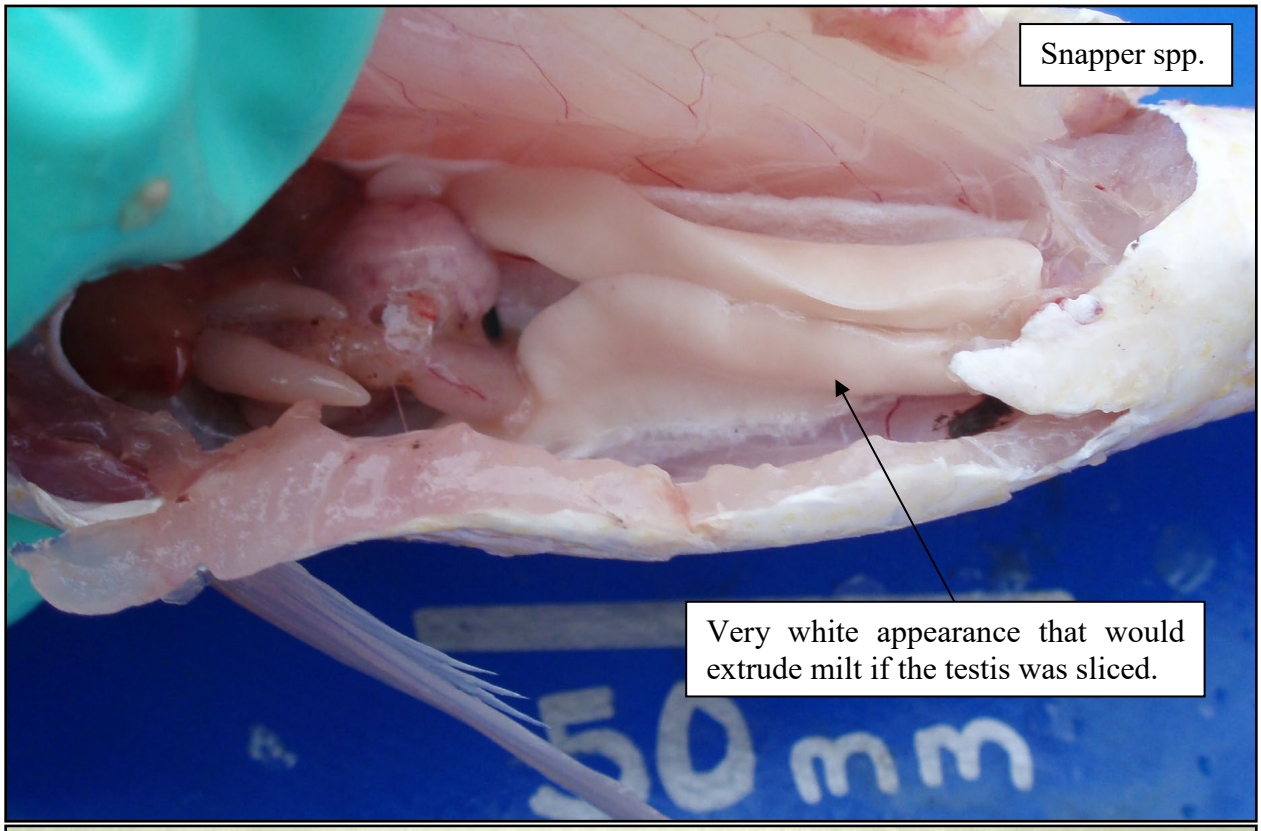
Sex	Description
Male (M)	Look for milt, testis will have more edges than ovaries, not as round or cylindrical, more opaque than ovaries
Female (F)	Ovaries are round or cylindrical that taper to a point at the anterior of the fish, they do not have edges like testis
Undetermined (U)	Unable to determine sex
Not Examined (N)	Did not examine the gonads to determine sex

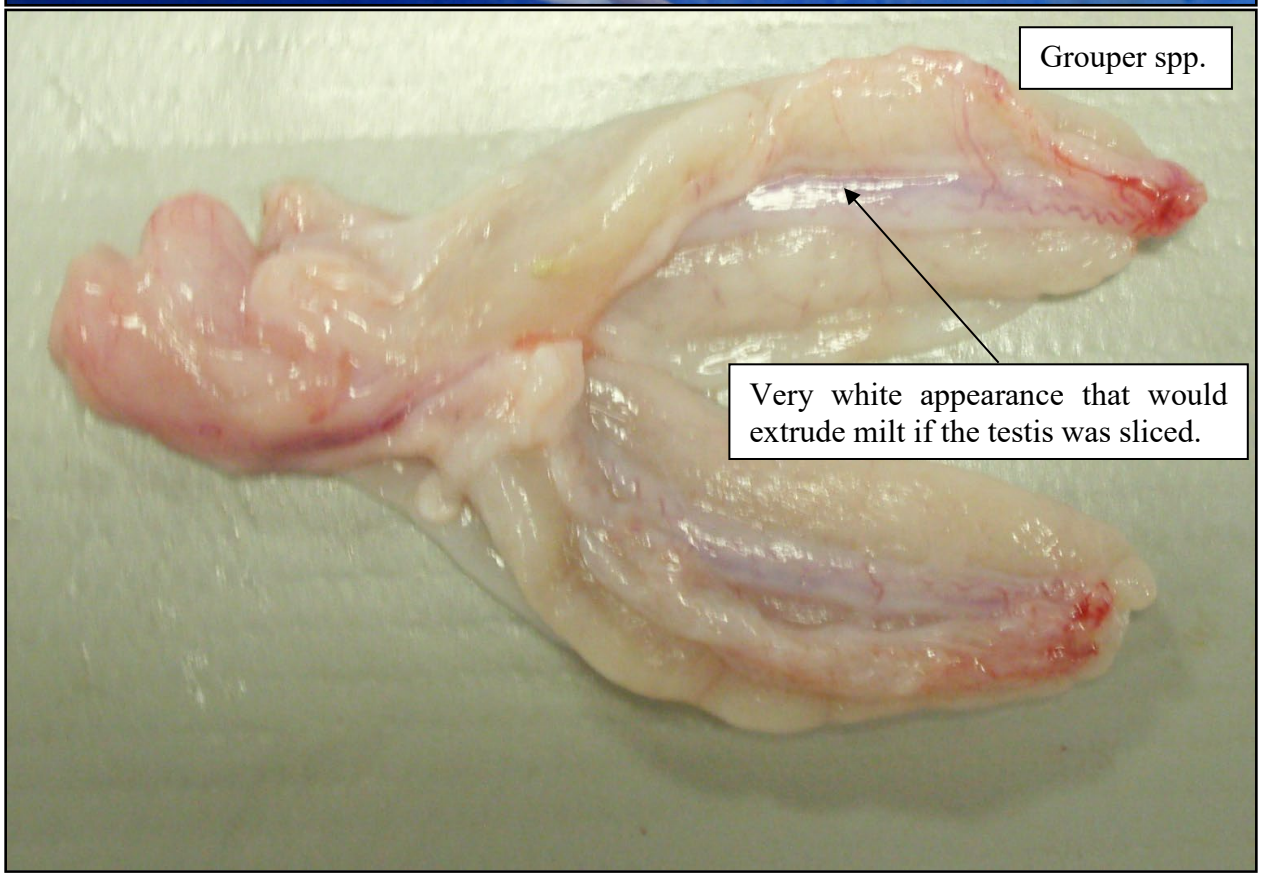
Stage
Reproductive staging is utilized to calculate maturity indices that more accurately estimate spawning stock biomass. The Ripe classification can also aid in verifying spawning fraction that could be used for spawning stock calculations if fecundity has a non-linear relationship with biomass.

Stage	Male Description	Female Description
Ripe	Fully white with milt extruding from the cut testis	Large clear oocytes (hydrated) that can be seen through the ovarian wall, ovarian wall tight
Active	White in color with little to no milt when cut in half	Opaque small orange or yellow oocytes (vitellogenic) within the ovary, looks like millions of small granules within the ovary
Inactive	Gray and drab coloring, no milt at all	No oocytes visible by the naked eye, inside of the ovary looks like jelly
Undetermined	Unsure of the proper stage	Unsure of the proper stage
Not examined		

Ripe

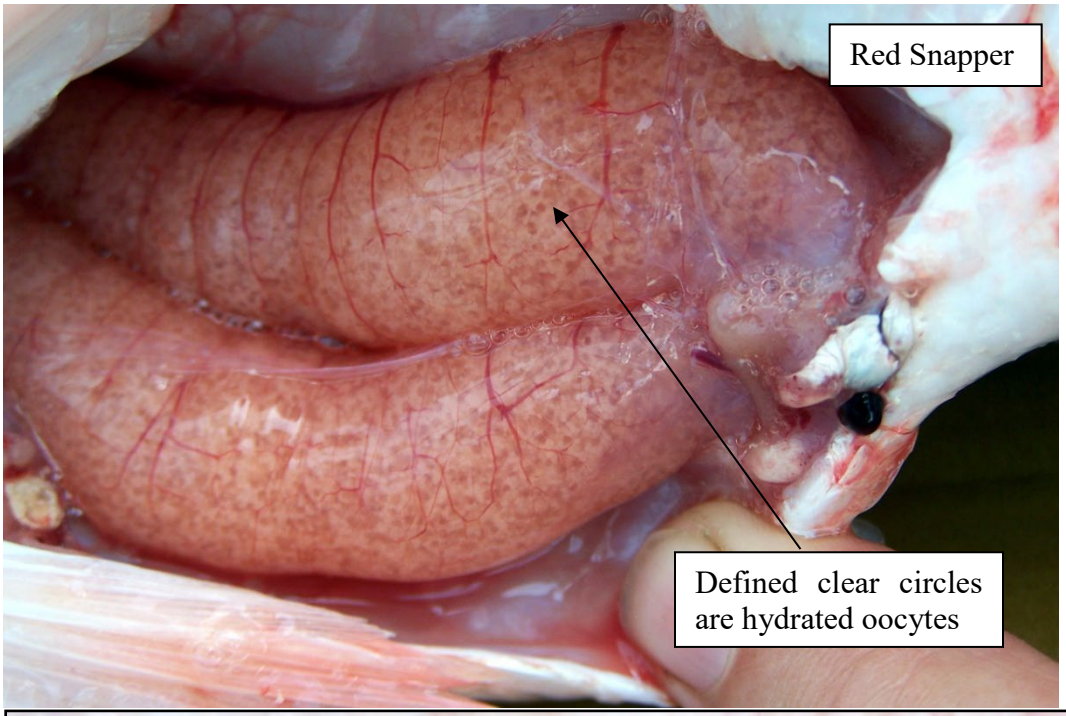
Male:

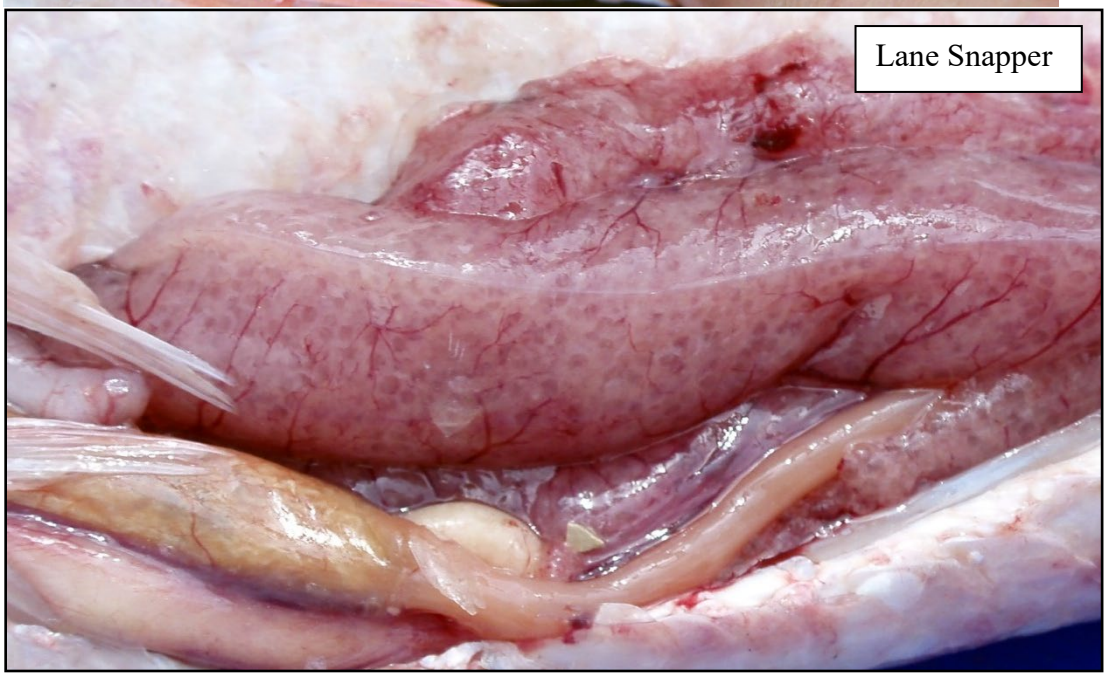

Snapper spp.
Very white appearance that would extrude milt if the testis was sliced.
50 mm


Grouper spp.
Very white appearance that would extrude milt if the testis was sliced.

Ripe

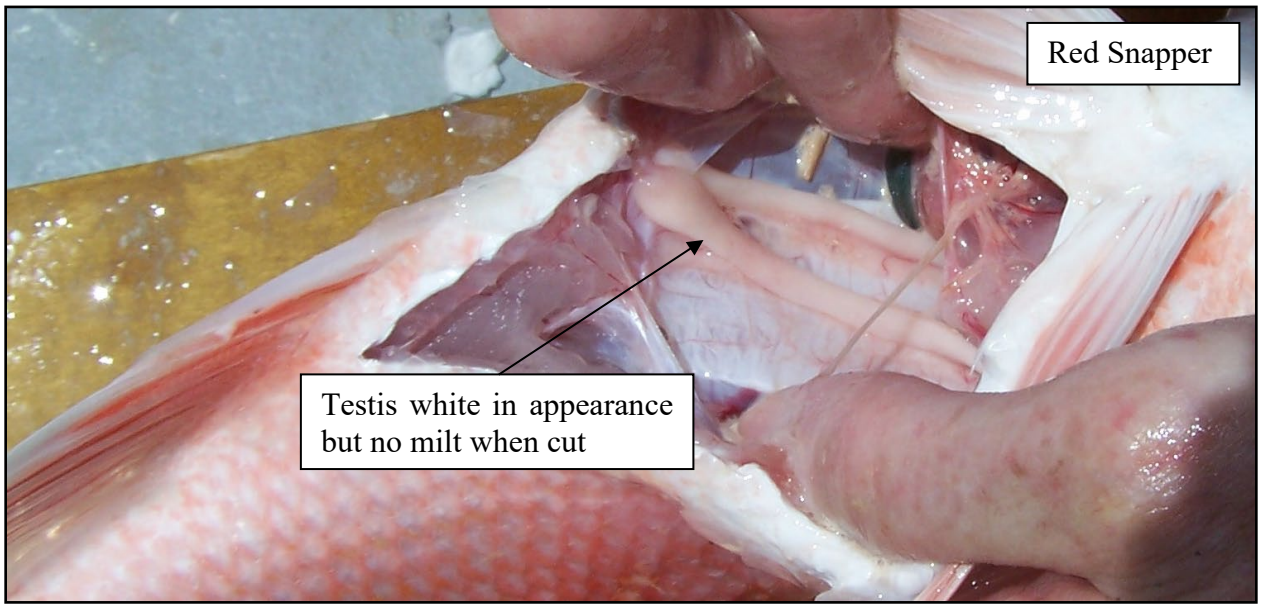
Female:


Red Snapper
Defined clear circles are hydrated oocytes


Lane Snapper

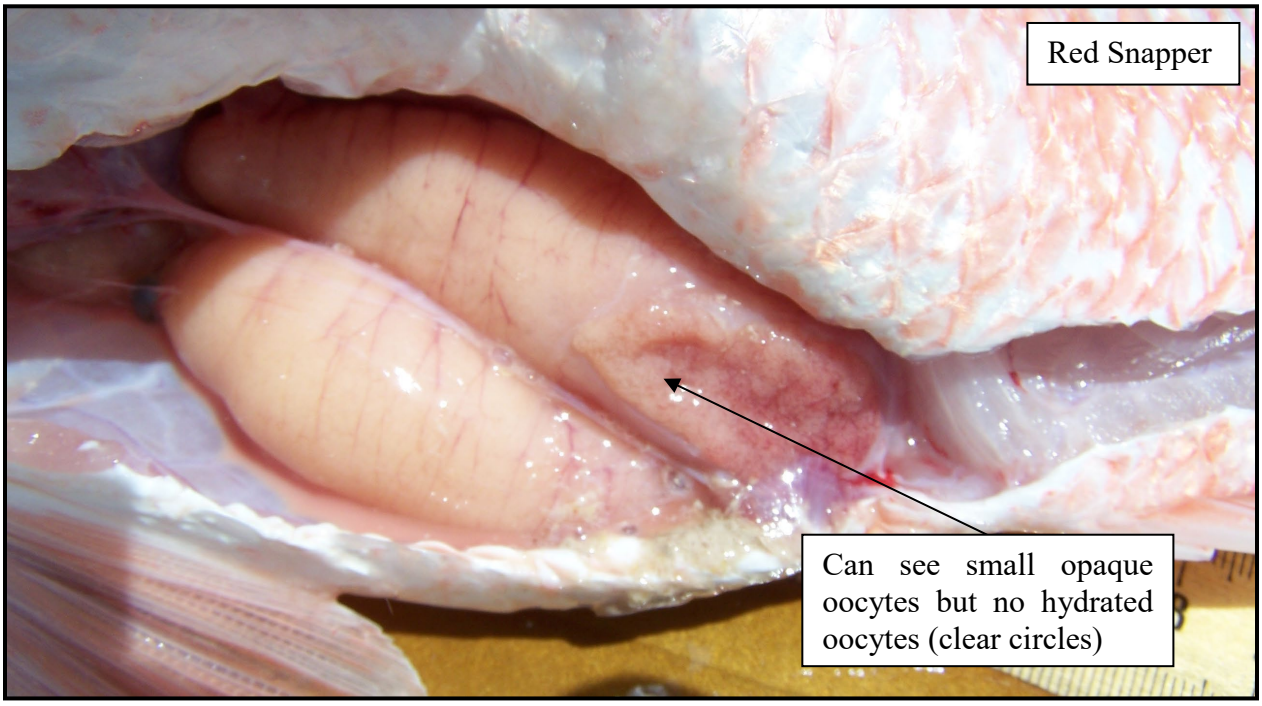
Active

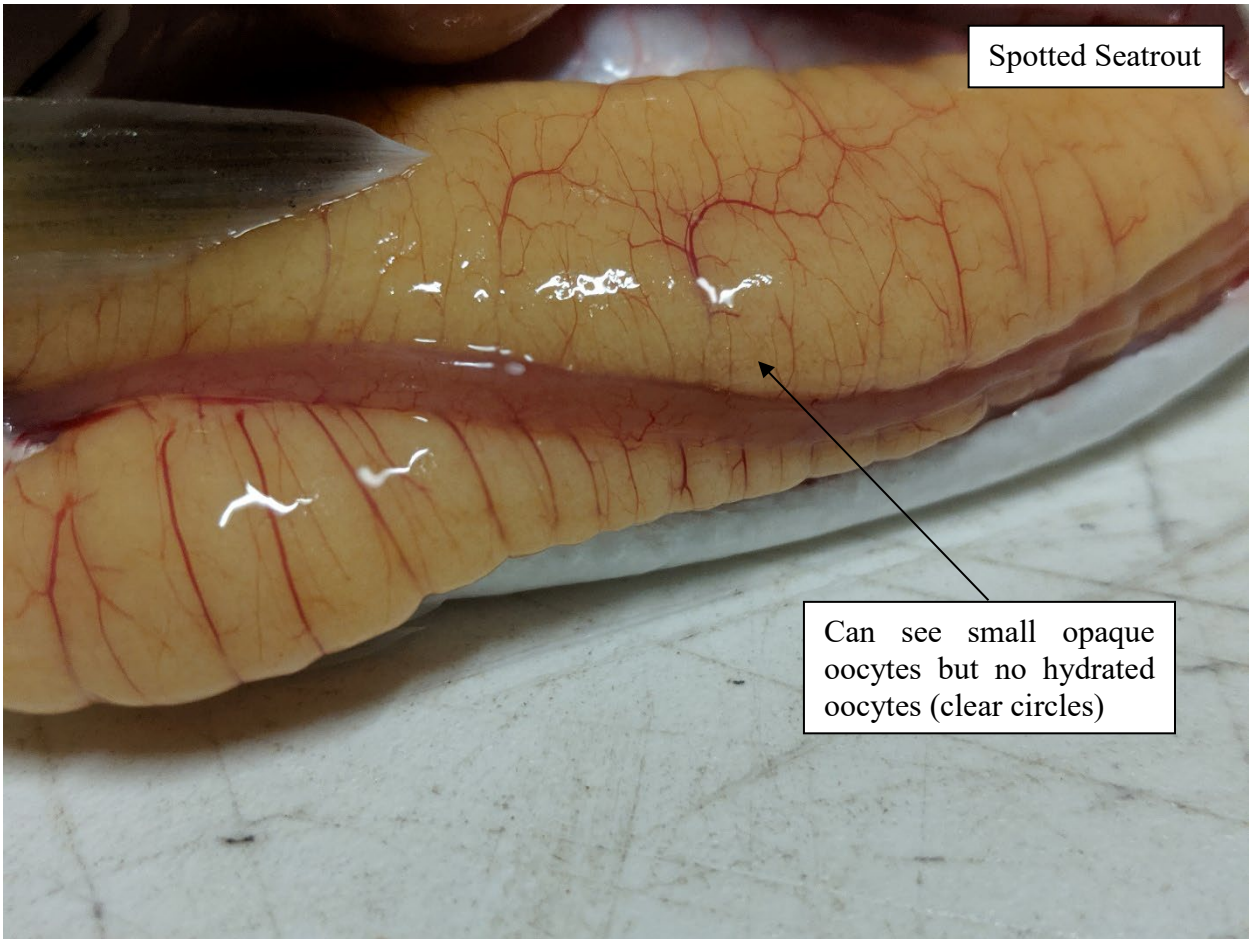
Male:



Active

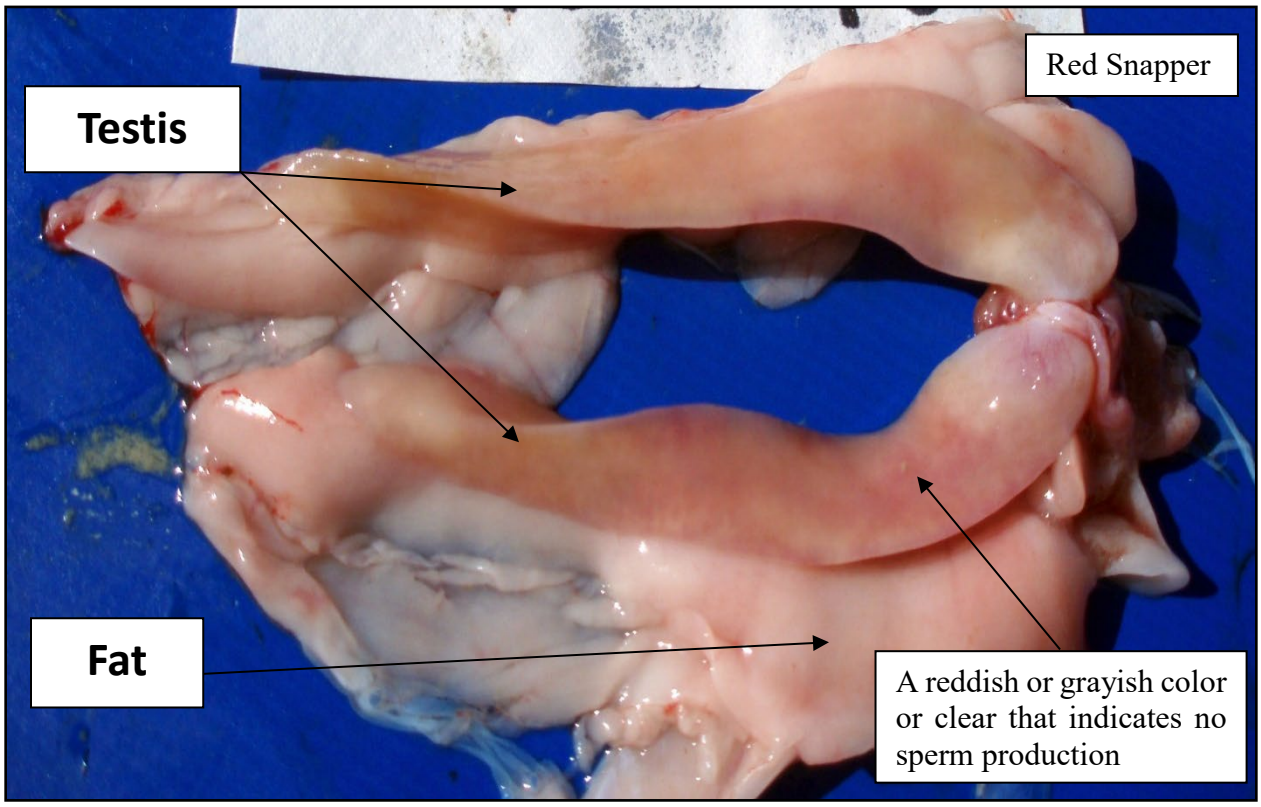
Female:

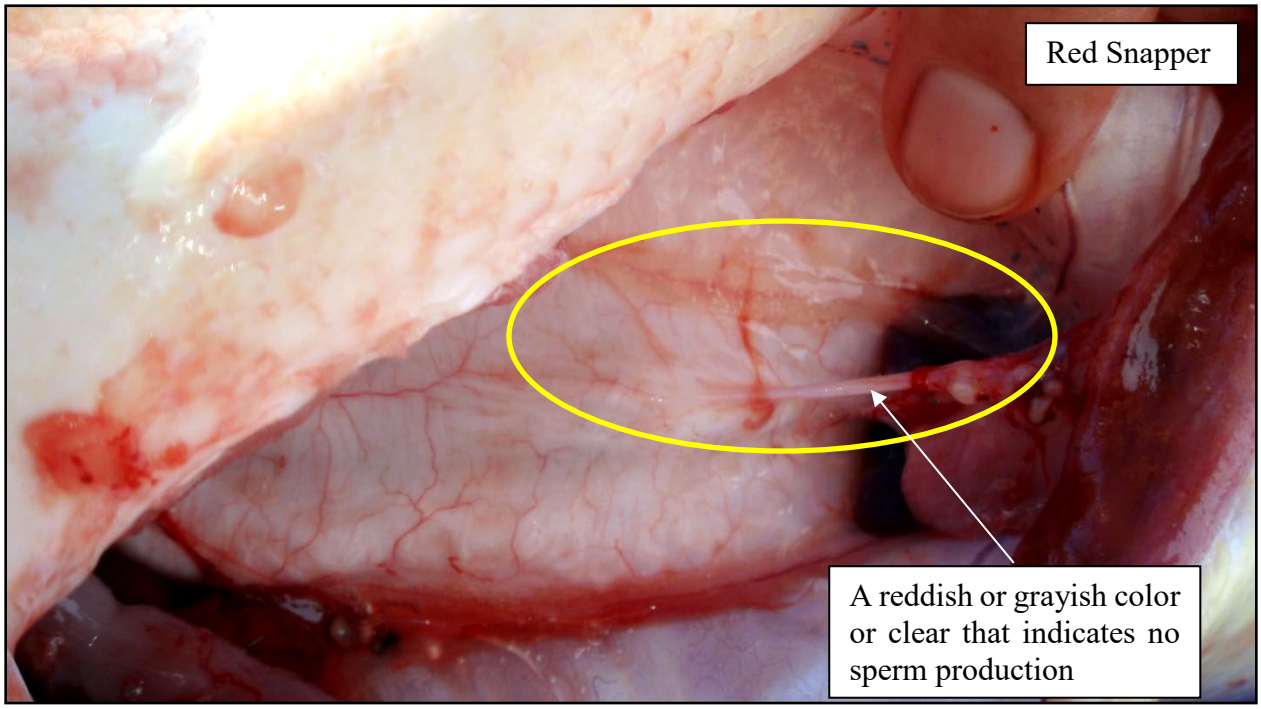



Spotted Seatrout
Can see small opaque oocytes but no hydrated oocytes (clear circles)

Inactive

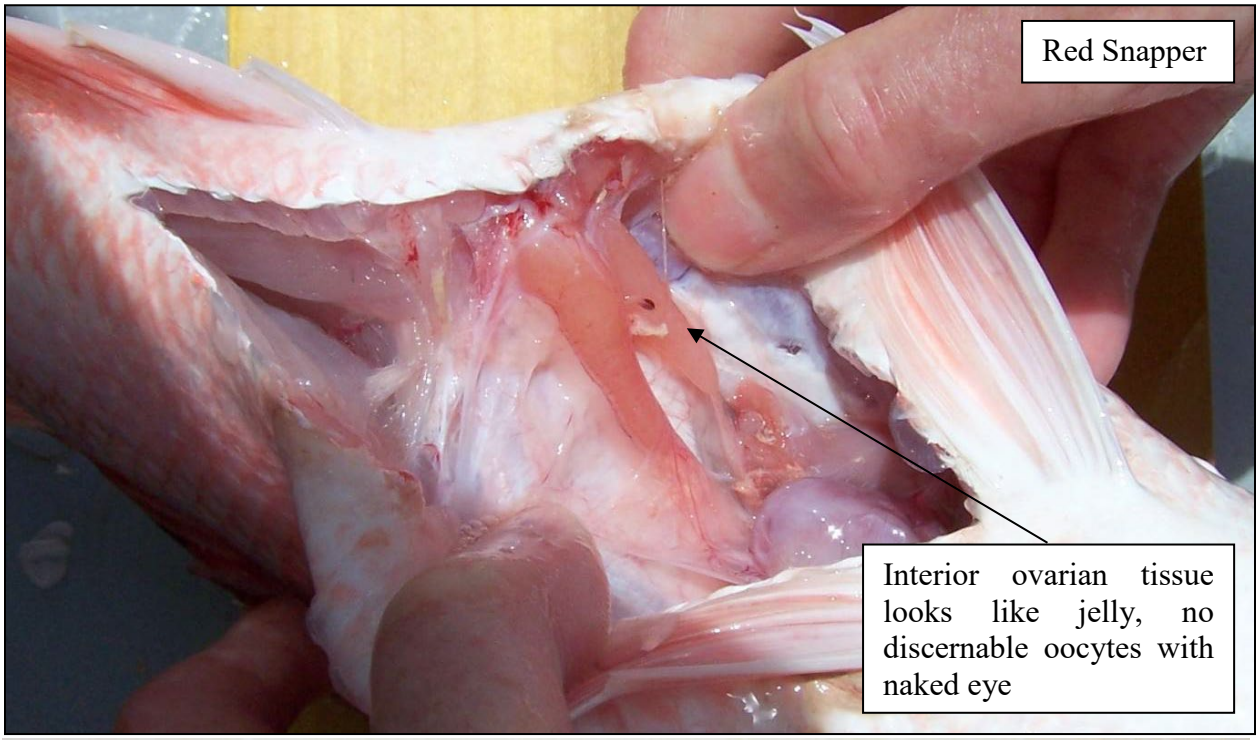
Male:

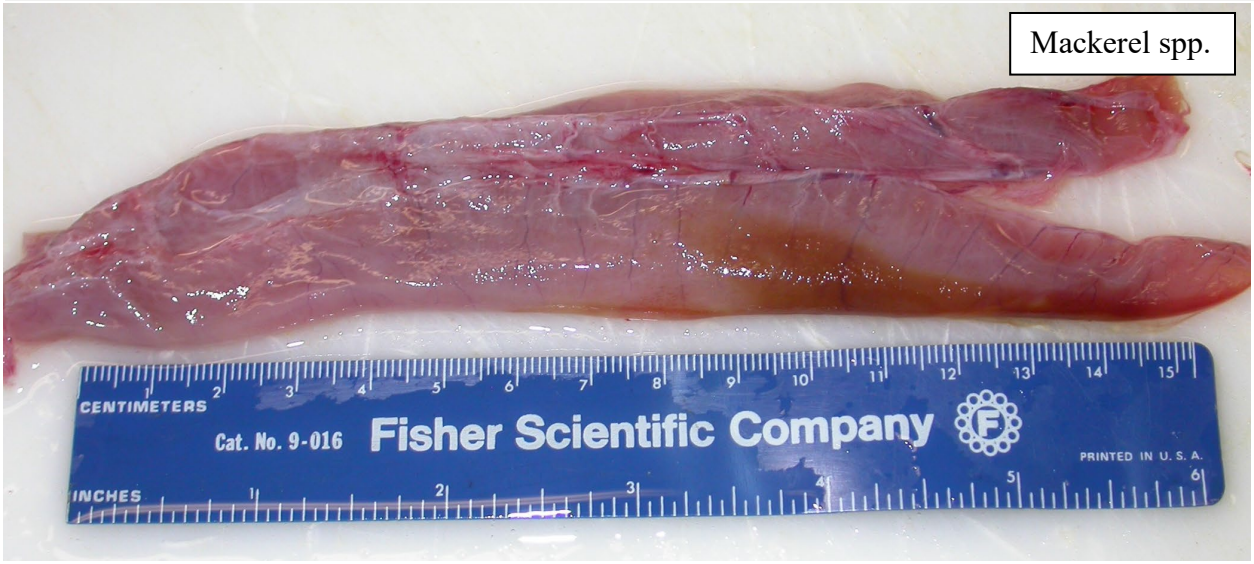


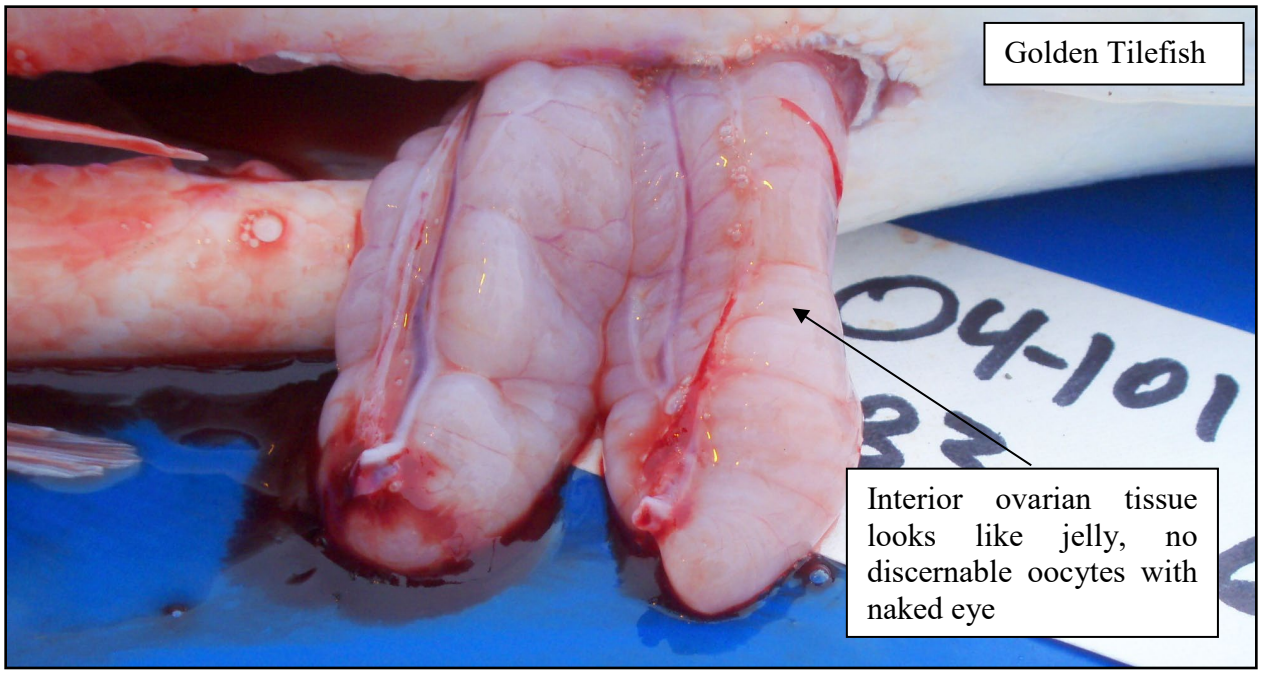


Inactive

Female:






Golden Tilefish
04-101
Interior ovarian tissue looks like jelly, no discernable oocytes with naked eye