SEAMAP

Vertical Line Operations Manual

Gulf States Marine Fisheries Commission
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Ocean Springs, MS 39564

March 20, 2018
Final

Purpose

The primary purpose of the SEAMAP Vertical Line Survey is to characterize the spatial and temporal distribution, indices of abundance, and age and size distribution of commercially and recreationally important reef fish species by habitat type and depth strata in the coastal waters of the Gulf of Mexico and the adjoining Exclusive Economic Zone. Fisheries-independent data characterizing population dynamics of fish assemblages on non-structured and structured bottom habitats (e.g. natural hard bottom and artificial structures) in offshore waters are also obtained. A description of the gear used and construction methods are included. All biological data are submitted to the SEAMAP data management system.

SEAMAP Vertical Line Survey Objectives

1) Characterize reef fish assemblages by depth strata and habitat types utilizing currently approved standardized hooked gear using standard SEAMAP protocols.

2) Conduct sampling to provide reef fish life history information.

3) Quantify and characterize habitats within depth strata of the Gulf of Mexico using remote sensing technologies and video toward a comprehensive goal of creating a Gulf-wide habitat map.

Vertical Survey Design

The SEAMAP Vertical Longline Survey began in 2010 when Alabama started sampling their offshore waters. Louisiana began sampling in 2011 and Texas started in 2015. All partners use three 22-foot backbones containing 10, 18 inch gangions outfitted with either an 8/0, 11/0 or 15/0 circle hook (each backbone has only one hook size), and terminating in a 10 pound lead weight. Three bandit reels deploy the gear simultaneously on or near a reef structure and, once locked in at depth, are allowed to fish for 5 minutes. All bandit reels then retrieve the lines simultaneously. Catch data are collected once the lines are onboard. Environmental data is collected upon completion of fishing at each station.

Until 2016 each state partner randomly selected stations off their coast independent of other states. There were discrepancies among the partners regarding number of stations sampled, the frequency of sampling, the size of the sampling universe, the depths fished, and the depth strata targeted. In an effort to make the vertical line data as useful as possible in federal and state stock assessments, the SEAMAP Subcommittee initiated an effort to develop a standard protocol for station selection procedures. This effort sought to better standardize the sampling effort among the partners and develop a more uniform design and resultant data. At the November 2015 SEAMAP Subcommittee meeting, it was agreed that the depth zones targeted would be from 10-20 m, 20-40 m, and from 40-150m and station selection protocols were established.

The SEAMAP Subcommittee decided to divide the Gulf offshore waters between 10 and 150m into 150x150m grid blocks. Unknown habitat, known natural reef (hard bottom), presumed reef either natural or artificial, oil/gas platforms, and artificial reefs were the five habitat classifications developed by the SEAMAP Subcommittee. Each 150x150m grid block is assigned a habitat classification based upon several different datasets used to develop the sampling universe. A grid

block can be classified as more than one habitat type if it has more than one habitat located within it.

For the station selection process, the total amount of habitat within the three depth zones is computed. The percentage of area covered by each depth zone determines the percentage of the total stations that will be sampled within each depth zone (i.e. if a depth zone contains 40% of the total area, 40% of the total stations will be assigned to that depth zone). The total area of each habitat classification is calculated within each depth stratum. The total of each habitat classification, excluding unknown habitat, is then used to calculate the percentage of habitats within the depth zone. This percentage is used to determine how many stations are assigned to each habitat type within the depth zone. Stations are randomly selected based upon the habitat classification percentages within each depth zone. SEAMAP partners are provided with coordinates and information on the selected sampling target station.

Vessel Requirements

Vertical longline projects can be supported by a variety of vessels. The size and capacity of a vessel are directly related to cruise duration capabilities and accommodations for scientific crew. Regardless of size, all vessels should be equipped with adequate communications, navigational, and Coast Guard approved safety equipment. All vessels should be equipped with a minimum of three bandit reels to accommodate the deployment and retrieval of the gear. Vessels should also be able to safely operate within the sampled depth strata, which can be as shallow as 10 m or as deep as 150 m.

Survey Equipment, Gear, and Bait

Mainline and Reel

- Commercial grade bandit rigs (3) [e.g. Waterman Standard Electric Bottom Reel]
- 300 lb test clear monofilament (~500 ft) [e.g. Hi-Liner 1.8mm 300lb clear]
- 2.2 mm double barrel sleeve, black (1) [e.g. Hi Seas A2] see Figure 1
- 6/0 snap swivel, black (1) [e.g. Rosco 851] see Figure 1

Backbones (3 rigs)

- 400 lb test clear monofilament (~70 ft) [e.g. Hi-Liner 2.0mm 400lb clear]
- 2/0 2.3mm swivel sleeve, black (27) [e.g. Hi-Liner Swivel Sleeve] see Figure 1
- 2.2 mm double barrel sleeve, black (12) [e.g. Hi Seas A2] see Figure 1
- 6/0 3-way swivel, black (3) – [e.g. Rosco 848] see Figure 1

Gangions (30 gangions, 3 rigs)

- 100 lb test clear monofilament (95-125 ft) [e.g. Exsum 100 lb test clear]
- 8/0 circle hooks (10) [e.g. MUSTAD 39960D]
- 11/0 circle hooks (10) [e.g. MUSTAD 39960D]
- 15/0 circle hooks (10) [e.g. MUSTAD 39960D]

Weights (3-10lb rigs)

- 10 lb weight (rebar, shot, anchor, etc) (3) [e.g. greatfullead.com]
- 200 lb test clear monofilament (6 in for each rig) [e.g. Exsum 200 lb test clear]

- 6/0 Rosco snap swivel (6) [e.g. Rosco 851] see Figure 1

Bait

- Atlantic mackerel (*Scomber scombrus*)

Gear Construction

Mainline Construction

A standard commercial bandit reel holds approximately 500 feet of 300 lb. test monofilament. Once spooled with clear monofilament, attach a 6/0 snap swivel to the tag end of the main line. The swivel is attached using a Flemish Eye secured with a 2.2 mm double sleeve.

Backbone Construction

The backbone is made of 400 lb. test clear monofilament line and is 22 feet long. Cut a 13-foot and an 11-foot piece of 400 lb monofilament. Tie a Flemish eye knot at one end of each backbone and secure the tag end with a crimped 2.2 mm double sleeve. From the bottom of the sleeve (furthest from the knot), measure down 2 feet and place the center of a 2/0 swivel sleeve at the 2 foot mark and crimp. From the midpoint of this sleeve, measure down another 2 feet and place the center of a second 2/0 swivel sleeve at the 2 foot mark and crimp. Do this until there are 5 swivel sleeves on the 13-foot line and four swivel sleeved on the 11-foot line. Take the free ends of one backbone and thread it through the eye of a 3-way swivel and secure it with a 2.2 mm double sleeve (ensure that the swivel sleeve is 2 feet from the 2/0 swivel sleeve on the line). Take the other backbone and thread the free end through the opposite eye of the 3-way swivel mentioned above to connect the two backbones together. Secure the connection with a 2.2 mm double sleeve (ensure that the swivel sleeve is 2 feet from the 2/0 swivel on the line). Cut any remaining line. You should now have one complete 22 foot backbone with a 3-way swivel at the number six hook position. A weight will be attached to this terminal knot by means of a snap.

Gangion Construction

Ten gangions are developed for each backbone. To make a gangion cut 38-50 inches of 100 lb. monofilament. Fold the line in half to make a double stranded gangion. Thread the folded end through the front side (hook side) of the eye of the circle hook, then feed the circle portion of the hook through the fold (Figure 2) and pull tight. Securely hook the circle hook, and twist the two lines of the gangion around each other to create a furl down the length of the gangion. Tie a double overhand knot at the 18 inch mark (from the eye of the hook to the knot). Cut the free monofilament line to leave short tabs. Watch a video at this link for a demonstration of how to make an 18 inch gangion.

Attachment of Gangions to Backbone

To attach the gangions to the backbone, select 10 gangions all of the same hook size. Thread the knot end through eye of a swivel sleeve on the back bone (Figure 3). Take the hook and thread it through the first twist (near the knot) of the gangion (Figure 4) and pull tight (Figure 5). Do this for all swivel sleeves on the backbone.

Weight Leader

Cut a 6 inch section of 200 lb. clear monofilament. Loop the monofilament through the eye of a weight. Attach both free ends to a Rosco snap swivel and cinch. Cut any free line. The snap will

be attached to the Flemish eye knot at the terminal end of each backbone. This allows for removal of the weight as necessary. Alabama uses large rebar that has been welded together (Figure 6). The rebar does not roll around on the deck of the boat.

Habitat Mapping

Potential station locations are developed from known artificial reef locations, oil and gas platforms, fisher based information, and prior habitat mapping. Using acoustics for habitat mapping is highly encouraged, but not required. The use of acoustics allows for the expansion of the sampling universe as well as refining the existing sampling universe.

Sampling Frequency

One key objective of the Vertical Line Survey is sampling red snapper through their reproductive season of April through October with a July/August peak. Monthly sampling from April through October across the entire red snapper range would be ideal. Unfortunately, sampling effort is limited by available funding and vessel availability. Therefore, sampling should be conducted from April through October.

Florida – Sampling occurs from April to October. This sampling is not currently funded by SEAMAP.

Alabama – Sampling occurs in two seasons. Alabama samples in April and May and also in August and September.

Mississippi – Sampling occurs monthly from April to October. Sampling effort must have a two week buffer between consecutive seasons. For example, if the last day of May sampling was conducted on May 30th, June sampling should not begin until June 13th. This sampling is not currently funded by SEAMAP.

Louisiana – Sampling occurs from April to October.

Texas – Sampling occurs from April to October.

Station Conduction Guideline

Sampling is conducted during daylight hours only, between sunrise and sunset. Gear should not be deployed until 30 minutes after sunrise and should be set 30 minutes before sunset.

When arriving on a station, the Captain should scan the designated station area using the vessel's echosounder to assess the bottom profile and determine the footprint of the structure and the vertical relief if possible. It is protocol to target the structure only with the gear and not any fish that show up on the sounder. Sea state and direction of currents will determine the best fishing location for ease of positioning the vessel.

The three backbones (8/0, 11/0, or 15/0) will be fished on the three bandit rigs simultaneously at each sampling station and will only be fished once. Based on the structure footprint, sea condition, and current, determine the best placement for the bandit rigs (see Appendix 1).

On the first station of the day, each bandit rig is randomly assigned a backbone (8/0, 11/0, or 15/0). The backbones (8/0, 11/0, or 15/0) are then rotated clockwise for the remainder of the stations for that cruise day so that the same backbone (8/0, 11/0, or 15/0) is not fished in the same vessel location (Appendix 1) at each station. In situations where it is not feasible to set three rigs simultaneously, two rigs can be set. In these instances, randomly (without replacement) select an order for the hook sizes at the first station (example, you randomly select an 8/0, 11/0, and 15/0 rotation for the day). You would then fish 8/0 and 11/0 at the first station and then fish 11/0 and 15/0 at the second station continuing in this pattern at all subsequent stations that day. Rotate the bandit rigs between stations so that the same backbone (8/0, 11/0, or 15/0) is not fished in the same vessel location (Appendix 1) at each station. You would randomly select a new hook size order the following day.

The snap on the mainline of the bandit is attached to the Flemish eye knot on the top of the backbone. Make sure to note the position of each bandit reel on the vessel (see Appendix 1) and also note which backbone (8/0, 11/0, or 15/0) was fished at each station.

Procedures for Moving Stations

Examining the sea bottom topography with an echosounder prior to a vertical longline set can help prevent gear loss or damage and survey delays. When the bottom profile of a station is deemed unsafe to drop the gear to the bottom, the gear may be fished above the structure at that station (depth will be at the discretion of the field party chief).

If upon arriving at a station and no structure is found (e.g. platform is removed or unable to locate hard bottom) (see Appendix 2), the stations may be moved to the next nearest habitat of the same type and the same depth strata (even if it is in an adjacent grid). If the location for a habitat of the same type is not known, survey the neighboring grids from 30 minutes to no more than 1 hour to find a target location of the needed habitat type. If no habitat of the same type is found within the 1 hour search time, an alternate station should be selected from the provided alternate station list. An alternate station list is provided that contains up to five alternate stations in the same water depth and of the same habitat type. Efforts should be made to find suitable habitat to sample within the assigned grid or in the surrounding grids before choosing an alternate station. If you are unable to find the original sampling site or habitat, the missing habitat should be reported to the Gulf States Marine Fisheries Commission where it will be removed from the sampling universe.

If upon arriving at a station, there are recreational fishers, platform support vessels, or the structure is a sulfide platform, (see Appendix 2) the station may be moved to the next nearest like habitat but a note should be made as to why the station was not fishable. This station should not be removed from the sampling universe.

Bait Preparation

Prior to arrival at a station, the Atlantic mackerel (*Scomber scomber*) used for bait should be thawed, not to the point of being soft, and cut so each piece is only slightly larger than the hook width (Figure 7). All bait should be double hooked through the skin to help it stay on the hook longer and minimize lost bait during deployment (Figure 7). Bait quick thawed in water will lose the integrity of the skin and will be more likely to tear. A slow thaw in air is better.

Deployment Guidelines

When the vessel is in position for fishing, coordinate so that all three bandit rigs are dropped simultaneously. Gear is typically fished with the weight just off the bottom to maintain a taught line, but depth fished can be determined based on various factors including hangs, safety, and sonar readings. Hypoxia is also another reason to not deploy the line to the bottom. In the case of hypoxia, fish will not be at the bottom, but will still be around the structure higher in the water column. Using sonar to target fish IS NOT a valid reason to not fish on the bottom. If the line is not deployed to the bottom, make sure to record the depth fished and state why the line was fished at the depth that it was fished. When all three rigs are locked in at the fishing depth, begin timing the five minute fishing time.

Environmental Data Collection

After the gear has been deployed and retrieved, environmental data should be collected at the station. Environmental parameters include: water temperature (°C; surface, mid, bottom), water salinity (surface, mid, bottom), water dissolved oxygen (mg/L; surface, mid, bottom), water depth (m), and Secchi depth (m). If you are not fishing on the bottom, also record temperature, salinity, and dissolved oxygen at the depth where you were fishing. A CTD is the preferred method for collecting environmental data, but backup gear should be available if a problem with the CTD occurs. See Appendix 3 for gear codes. All of these environmental measurements are mandatory! Make sure to have backup gear on hand during all sampling.

Haulback Guidelines

After the five minute fish time, all three rigs are reeled in simultaneously. When at the surface, the backbone should be boarded by pulling in the backbone hand over hand, and laying the backbone with catch attached on deck. Status of each hook on each backbone should be recorded (see Appendices 2 & 4).

Biological Data Collection

For all fish landed, note should be made as to which hook and rig it was caught on. Hooks are numbered consecutively on each rig from 1-10, with the number 1 hook being closest to the weight and the number 10 hook being closest to the attachment to the bandit mainline. Fish to be retained are immediately marked with an in house tag with a unique identifier number that is recorded on the data sheet so individuals can be tracked during work up. The fish are then placed on ice. Fish to be released are assessed for biological data (see below) and then tagged with a tag/recapture tag and are released overboard. Retained fish can be worked up on the vessel or back at the lab.

Required biological data collected for captures includes (but is not limited to); stretch total length (TL mm), fork length (FL mm), standard length (for teleost species, SL mm), precaudal length (for sharks, PCL mm), sex (if externally visible), reproductive development stage (if identifiable), and whole weight (WGT kg). Retained species of interest have otoliths, gonads, and other biological samples removed, and biological samples are properly archived for later analysis. The recommendation is that you sample all managed species based upon time and funding. Any sub-sampling must be random.

Gear Damage and/or Loss

Gear damage or tangles can lead to lost survey time. Often gear damage can be minimized by being cognizant of bottom features at set locations, maintaining proper set direction, and maintaining proper vessel orientation during haulback (e.g., caution not to tangle the line in the propeller). However, gear damage can occur even during the best of circumstances. Notations concerning gear damage are made in the data sheet comment section and are a matter of record for associated vertical longline data. If appropriate, an operation code can be listed to detail the damage, but also include details in the comment section. Data collected from sets with gear damage are not disregarded. It is however, important to document any problems that did occur (e.g. number of gangions lost, mainline entangled, etc.). To minimize gear loss, it is imperative that gear is checked prior to deployment to ensure it is fishing properly. It is recommended this check be done during every haulback so damaged gear is immediately pulled out and does not accidentally get reused. If hooks are bent or dull, or if monofilament is kinked or has abrasions, the gear should be replaced immediately.

Use of Cameras

The use of underwater video cameras is a beneficial option to assess fish diversity, relative abundance, record fish interactions with the gear, and habitat characterization. A camera may be mounted at the terminal end of the main line facing downward. If only using one camera this position is preferred. A second camera may be fixed on the weighted end of the fishing rig facing upwards, thus documenting as much data as possible. The use of cameras is not required, although encouraged. A description of a particularly useful camera set up is listed in Appendix 5 below.

Station and Environmental Data Format

DATE (date in MM/DD/YYYY format)

VESSEL (text field with name of vessel or SEAMAP number if vessel has a SEAMAP number)

SOURCE (FL, AL, MS, LA, TX, or US)

SEAMAPSTATION (A concatenation of the six digit date, VL and station number for the day) – station 2 on March 16, 2012 would have a SEAMAP Station Number of 031612VL02

ENV_LAT (Enter position occupied at start time in degrees, minutes, and hundredths of minutes, observing indicated decimals and entering trailing zeros)

ENV_LON (Enter position occupied at start time in degrees, minutes, and hundredths of minutes, observing indicated decimals and entering trailing zeros – make sure that all values are negative in the Gulf of Mexico)

SECCHI (depth in meters of the Secchi depth)

ENV_TIME (military time for when the environmental data were collected)

TEMPSUR (temperature in degrees Celsius taken at the water's surface – record to 1 decimal point)

TEMPMID (temperature in degrees Celsius taken at the water's middle depth– record to 1 decimal point)

TEMPMAX (temperature in degrees Celsius taken at the water's maximum depth – record to 1 decimal point)

SALSUR (salinity in psu measured to 1 decimal point)

SALMID (salinity in psu measured to 1 decimal point)

SALMAX (salinity in psu measured to 1 decimal point)

DOSUR (dissolved oxygen (mg/L) measured to 1 decimal point)

DOMID (dissolved oxygen (mg/L) measured to 1 decimal point)

DOMAX (dissolved oxygen (mg/L) measured to 1 decimal point)

DFTEMP (temperature measured to 1 decimal point – this measurement is made if you are fishing an oil or gas platform and are fishing in the water column and not on the bottom)

DFSAL (salinity measured to 1 decimal point – this measurement is made if you are fishing an oil or gas platform and are fishing in the water column and not on the bottom)

DFDO (dissolved oxygen measured to 1 decimal point – this measurement is made if you are fishing an oil or gas platform and are fishing in the water column and not on the bottom)

GEARCODE (see Appendix 1 for a list of gear codes, multiple gears can be used with each one separated by a comma – V2 is the default gear type used in this survey)

STRUCTURETYPE (artificial reef, platform, natural bottom, unstructured, unidentified – these are the only STRUCTURETYPE options and should be spelled exactly as seen here. Unidentified would be the STRUCTURETYPE if you looked and tried to determine what the structure type was, but were unable to determine it.)

STRUCTURENAME (name of the platform or artificial reef if it has a name)

ENV_COMMENT (any comments about the environmental sampling)

VERTICALRELIEF (height in meters of the vertical relief of the structure that is being fished – measured to 1 decimal point)

Drop Data

SEAMAPSTATION (A concatenation of the six digit date, VL and station number for the day) – station 2 on March 16, 2012 would have a SEAMAP Station Number of 031612VL02

DROP_NUM (1 or 2 are the only current options – 1 signifies the first drop while 2 signifies the second drop performed at the same station)

BACKBONE (Valid options are 8, 11, or 15 which corresponds to the hook size on that particular backbone. The inclusion of this field allows each backbone to have a separate soak time in case one line becomes tangled or fishes longer than the other lines.)

STA_LAT (Enter position occupied at start time in degrees, minutes, and hundredths of minutes, observing indicated decimals and entering trailing zeros)

STA_LON (Enter position occupied at start time in degrees, minutes, and hundredths of minutes, observing indicated decimals and entering trailing zeros – make sure that all values are negative in the Gulf of Mexico)

TIME (military time for start of the station)

TIMESOAK (minutes that the line fished for)

OPSCODE (Operation codes in Appendix 2 for issues that may affect the station or the individual lines while fishing)

DEPTH (depth in meters of the station location)

DEPTHFISHED (depth in meters where the vertical line is actually fished – the chief scientist should provide reasoning for fishing this depth in the comments section)

COMMENT (any comments about the station)

Biological Catch Data

SEAMAPSTATION (use the station number from the station record – this is the primary key to link the catch data to the station and environmental record)

DROP_NUM (1 or 2 are the only current options – 1 signifies the first drop while 2 signifies the second drop performed at the same station)

CAMERA (Y and N are the only valid responses – was a camera used to record video of the drop)

HOOKNUM (1 = bottom 10 = top – which hook caught the fish)

HOOKSIZE (8, 11, or 15)

BAITSTATUS (codes for on, off, lost hook, hook lost bait before deployment, partially baited – See Appendix 4)

FISHID (identifier for each fish – start with the source code from above followed by a three digit number that increases sequentially in the form AL0002 for the second fish caught by Alabama)

GENUS (genus id)

SPECIES (species id)

BIOCODE (taken from the SEAMAP biocode list)

SEX (male, female, undetermined, or not taken – can be filled in later for fish or immediately for elasmobranchs – undetermined is used when you try to determine the sex, but cannot determine if it is male or female – not taken is when you did not try to determine sex)

GONADWT (gonad weight in grams)

GEARLOC (location code –See Appendix 4)

PCL (pre caudal length in mm)

SL (standard length in mm)

FL (fork length in mm)

TL (total length in mm)

DW (disc width for rays or turtles in mm)

WEIGHT (recorded in kg)

SAMPLES (list of biological samples taken like otoliths, gut contents, gonads (maturity), other - will let people know that additional information is available for this fish, although that data may not be in the database)

COMMENT (other samples taken or other events associated with the catch record)

Figures

2/0 2.3mm swivel sleeve (black) | 6/0 snap swivel (black) | 2.2 mm double barrel sleeves (black) | 3-way swivel (black)

Figure 1. Parts needed for construction of the backbone and gangions.

Figure 2. Attachment of gangion to the hook.

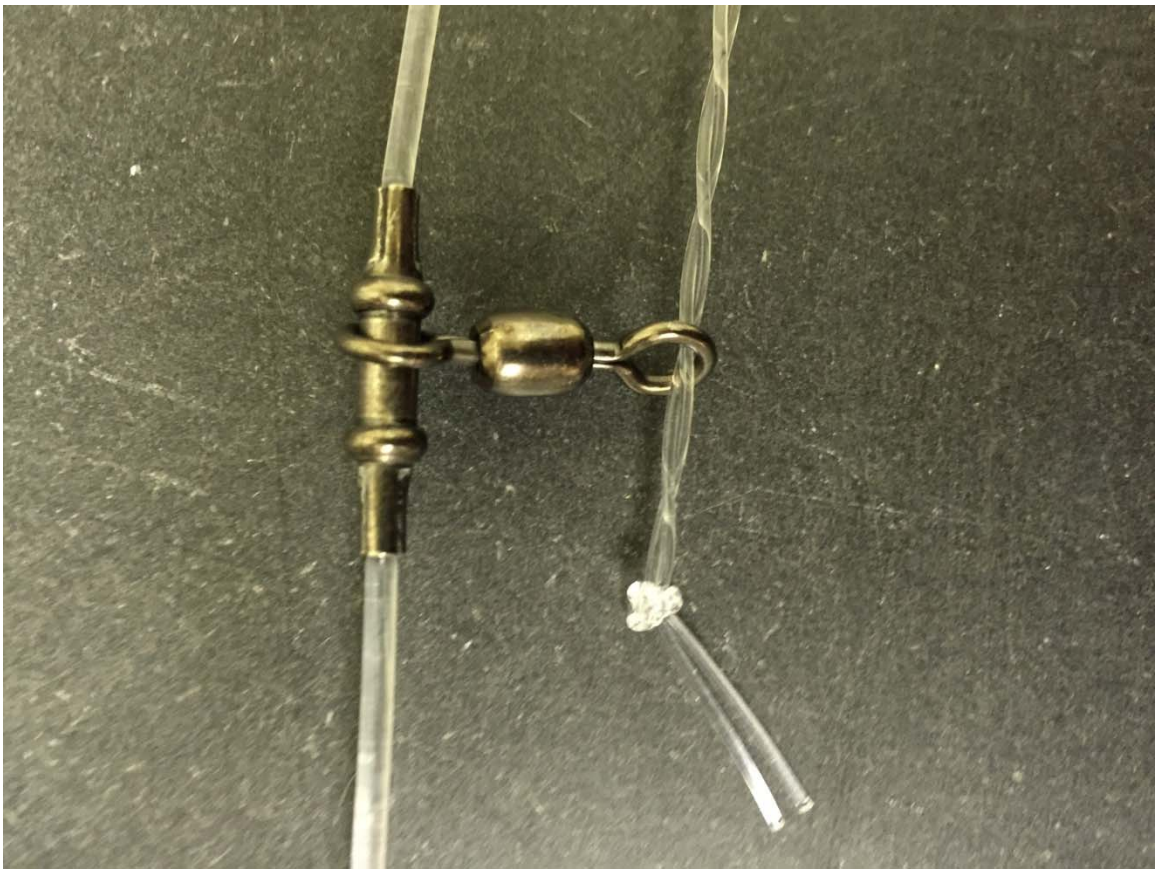


Figure 3. Thread the knot of the gangion through the eye of the swivel sleeve.

Figure 4. Thread the hook through the first twist (near the knot) of the gangion.

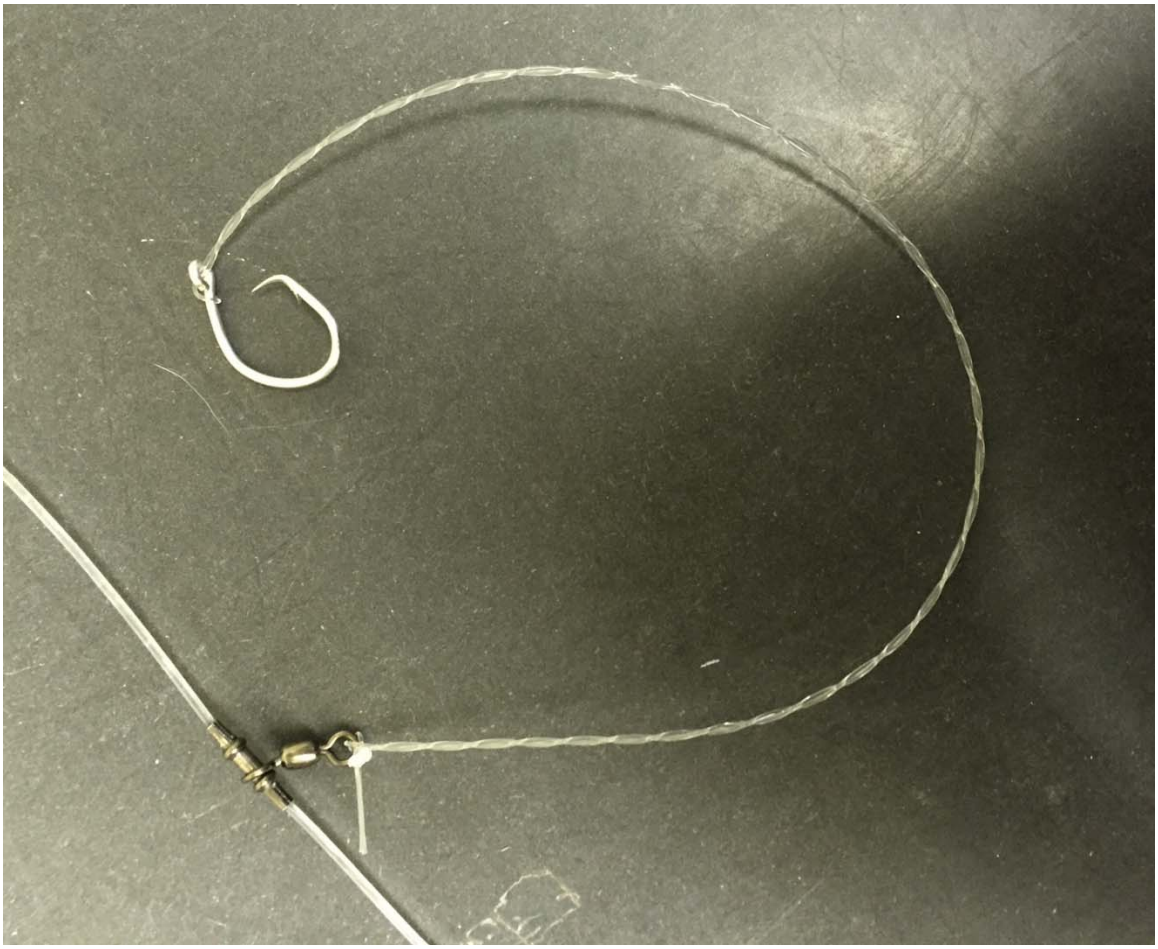
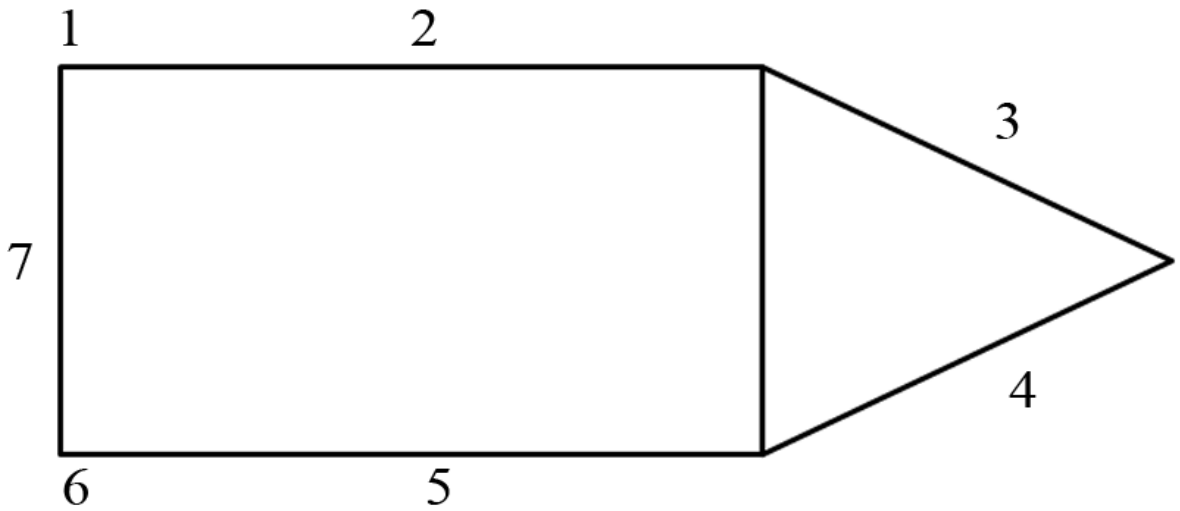


Figure 5. Completed gangion attachment to the backbone.

Figure 6. Rebar weight that Alabama uses on the end of the backbone.

Figure 7. Proportional bait for each hook size, double hooking of the bait onto the hook.

Appendix 1. Gear Location



Gear Location Explanation – use the code closest to the position of where the gear is deployed

1	Port Side of Vessel in the Stern Position
2	Port Side of Vessel Midship
3	Port Side of Vessel in the Bow Position
4	Starboard Side of Vessel in the Bow Position
5	Starboard Side of Vessel Midship
6	Starboard Side of Vessel in the Stern Position
7	Stern of Vessel

Appendix 2. SEAMAP Operation Codes for Vertical Line Survey

D – Drift/current issues resulting in the vessel not being able to get to position
J – Vessel off position
K – Bad weather
Q – Vessel issues resulting in the vessel not being able to operate properly
O – Oil/gas operation that is occurring that impedes the vessels ability to sample a station
S – Hydrogen sulfide platform causing the vessel not to be able to sample station
X – Oil/gas platform removed
R – Recreational fisherman is occupying the station and vessel is unable to sample

These issues can affect the entire bandit and not just one single hook. However they need to be separated because they do not impact the entire sampling event. If one of these impacts a single bandit the other two may still fish perfectly.
T8 – 8/0 Tangled
T11 – 11/0 Tangled
T15 – 15/0 Tangled
L8 – 8/0 Lost whole rig
L11 – 11/0 Lost whole rig
L15 – 15/0 Lost whole rig
Y8 – 8/0 Lost partial rig
Y11 – 11/0 Lost partial rig
Y15 – 15/0 Lost partial rig

Appendix 3. 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
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, YSI
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/LAB

HL	HANDLINE
HO	TRAWL, HIGH OPENING BOTTOM
IT	TRAP, ICHTHYOPLANKTON, ILLUMINATED
JP	JACKPOLE
KP	LONGLINE, KALI POLE
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	MICROPEKTON
SJ	SQUID JIG
SM	TRAWL, STANDARD MONGOOSE
SN	TRAWL, SEPARATOR
SO	SONAR
SS	SONAR, SIDE SCAN
ST	TRAWL, SHRIMP
SX	SALINITY, CTD
SY	SALINITY,YSI
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, YSI
UD	DREDGE, UNSPECIFIED
VC	CAMERA, VIDEO
VD	VERTICAL DRIFTLINE
VJ	VISUAL OBSERVATION
VL	VERTICAL LONGLINE
V2	VERTICAL LONGLINE WHERE EACH FISH IS IDENTIFIED TO HOOK
VP	VERTICAL PROFILE
WI	WEATHER INSTRUMENT
WT	TRAP, LOBSTER, WOOD
XB	EXPENDABLE BATHYTHERMOGRAPH (XBT)

Appendix 3. Cont.

SEAMAP Examples of Gear Code Use

For Salinity - Reading obtained by CTD: BG, SX

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, and a vertical line with each fish identified to hook.

BG, BC, TC, SX, SE, OX, and V2

Highlighted gear codes are ones that are typically used during the Vertical Line Survey. Other gear codes may be used, but typically you will use the highlighted gear codes.

Appendix 4. Hook/Bait Status Codes

Bait Status Codes

B	Whole Bait Retrieved
D	Damaged Hook - No Bait
F	Fish on Hook
L	Fish Caught on Two Hooks
M	Missing Hook
N	No Bait
P	Partial Bait Retrieved
U	Predation
X	Damaged Hook - Partial Bait Retrieved
Y	Lost Fish Once Boarded Onto Deck
Z	Damaged Hook - Whole Bait Retrieved

Appendix 5. Camera Description

A Go Pro Hero HD 960 camera with a flat lens housing has been used successfully to record video of the line while fishing (Figure 1). The camera housing is mounted to a ½" strip of starboard measuring 12" X 1 7/8" (Figure 2). A stabilizing fin approximately 6 3/4" X 9 1/2" is attached in order to keep the camera stable in the current. Two 5/16" U-bolts attach the mainline to the back side. A groove is cut into the center of the back side along the length of the starboard. This groove, along with the U-bolts, clamps the mainline or terminal weight line and prevents slippage.

Figure 1. A Go Pro Hero HD 960 Camera Case with a flat lens housing.

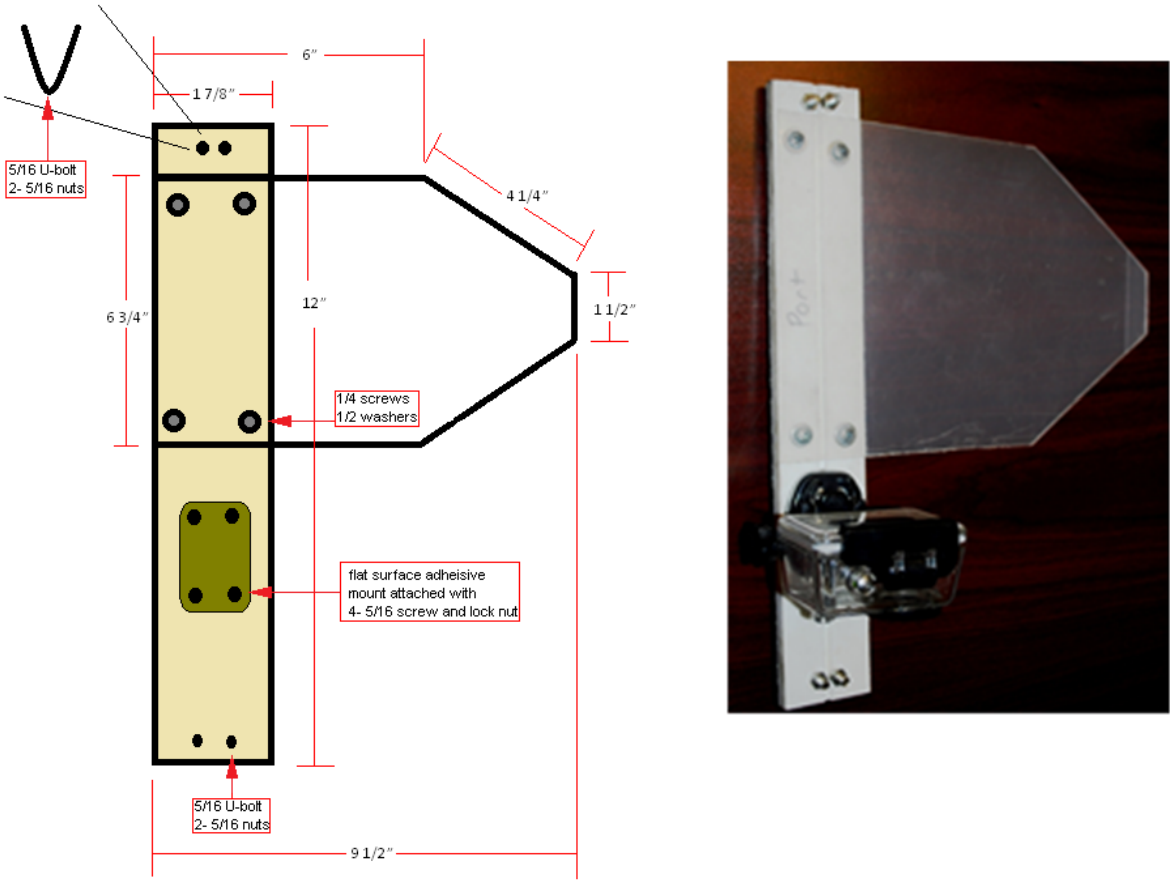


Figure 2. Camera mounting used to mount the camera to the mainline.