

**VESSEL-TRIP SAMPLING PLAN FOR U.S. LONGLINE VESSELS OPERATING IN THE
ATLANTIC**

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SUMMARY

Observer sampling in the U.S. large pelagic longline fleet was implemented in 1992. To derive a representative sampling of the fleet, vessels were selected for observation in the Gulf of Mexico, Caribbean Sea, and Atlantic Ocean using the 1991 mandatory pelagic data base. The distribution of observer days among nine geographical areas and four quarters of the year are randomly drawn in proportion to the fishing effort reported in the data base.

RESUME

En 1992, un échantillonnage d'observateurs a été mis à exécution pour la flottille palangrière des Etats-Unis de grands pélagiques. De façon à obtenir un échantillonnage représentatif de la flottille, des bateaux ont été sélectionnés pour l'observation dans le Golfe du Mexique, les Caraïbes, et l'Océan Atlantique en utilisant la base de données impérative des pélagiques de 1991. La distribution des jours d'observateurs dans neuf zones géographiques et quatre trimestres de l'année est tracée de façon aléatoire proportionnellement à l'effort de pêche signalé dans la base de données.

RESUMEN

El muestreo por medio de observadores se inició en 1992 en la flota palangrera estadounidense de pesca de grandes pelágicos. Para obtener un muestreo representativo de la flota, en la observación se seleccionaron barcos del Golfo de México, Caribe y océano Atlántico, empleando la base de datos obligatoria de grandes pelágicos para 1991. La distribución de los días de observador entre nueve zonas geográficas y cuatro trimestres del año, está representada de forma aleatoria en proporción con el esfuerzo de pesca que figura en la base de datos.

Introduction

Collection of reliable catch and effort data on tunas, swordfish and sharks has become increasingly important with the need to manage pelagic fisheries to comply with international agreements and to meet national goals. An observer program covering the U.S. Atlantic pelagic longline fleet was initiated to confirm and augment mandatory pelagic logbook information collected from long line fishing vessels in the eastern U.S..

The pelagic logbook data base is comprised of mandatory catch and effort information reported by U.S. vessels permitted to participate in the U.S. Atlantic swordfish fishery. Date of set, latitude and longitude, type of gear used, and numbers of specific species caught are included in each record. The 1991 data base consists of approximately 16,000 records. Ninety percent of these records are from long line vessels.

U.S. long line fishing in the Atlantic ranges from the Grand Banks to the Caribbean and the Gulf of Mexico. Since long line fishing effort varies greatly by geographical area and with time of year, the fishery is divided, for analytical purposes, into nine areas (Figure 1) and four calendar quarters (Table 1).

Observer sea days were allocated in proportion to the fishing effort reported in each area and quarter in 1991. Vessel selection was made independently for each area and quarter from a randomized sample of pelagic long line vessels reporting fishing activity in that area and quarter during 1991.

Methods

A longline data base was made by selecting vessels from the pelagic logbook data base which were not bottom long line fishing and which were reporting at least 100 hooks per set. These data were summarized to produce a data base from which vessels could be selected for the observer program. These data were preliminary in that the 1991 information had not yet received the full range of quality assurance steps used for CPUE analysis. However, for the purposes of developing a sampling plan for observers on US pelagic longline vessels, the data were judged to be adequate.

Each set was interpreted as one day of fishing. To avoid possible duplicate reports in the preliminary 1991 data, all sets except the first set reported by a vessel for any one date were deleted.

Vessel captains are asked to provide information about the first and last set of a trip. When this information was not provided, trip lengths were determined on the basis of length of

time between reported daily fishing effort. For areas near shore (areas 2-6) a interval lapse in fishing of more than three days was used to define a new trip. For offshore areas (areas 1,7,8,9) a new trip was started after the interval exceeded 9 days.

The data were sorted by area, quarter, vessel and trip. Total days fished, number of trips, and average days fished per trip were computed for each vessel within each area and quarter. This summarized data formed the data base from which vessels were selected. Total days fished and number of vessels fishing were computed for each area and quarter.

Within each area and quarter vessels were selected by allotting each vessel a range of the total fishing days in proportion to fishing days reported by that vessel and randomly selecting 5% of the total days in each area and quarter (Table 2). The probability of a vessel being selected was related to the reported effort a vessel made in each area and quarter. Vessels with large a proportion of fishing effort had a greater chance of being selected than a vessels with a smaller proportion of the reported fishing effort in an area and quarter. Identification numbers of selected vessels were used to extract name, address and gear information from the 1992 swordfish permit file. Vessels not listed in the 1992 permit file were considered no longer active in the fishery and dropped from the list.

Selected vessels were listed in random order within each area and quarter. Selected vessels were included on the primary list for each area and quarter until the cumulative sum of the vessels average sets per trip was equal to or greater than five percent of the total days fished within that area and quarter. The remaining vessels were placed on a secondary list. Vessels on the primary list will be contacted to arrange observer trips. The secondary list will be held in reserve in case more vessels are needed for the program.

A statistical software package was used to perform all the data manipulations described in this paper with the exception of merging 1992 Permit file information with the selected vessel identification numbers which was done with a spreadsheet program.

Results and Discussion

Low levels of effort were reported in the late Summer and Fall in the Caribbean and in the Winter in the north. Very little effort was reported in offshore areas 8 and 9 (Table 2). Because of the low reported effort, no observer sea days will be allocated to area/quarters reporting less than 90 days of fishing in 1991.

In the areas where trips tend to be short such as the Gulf of Mexico and the Florida East Coast it was necessary to go back and select another five to ten percent of the fishing days in order to have sufficient expected trip days. Comparatively large number of vessels were selected in the Gulf of Mexico (57) and the Florida East Coast (43) because the average number of sets per trip was often low (Table 3). If these vessels are normally returning to port after one or two days of fishing it will be necessary to alter the study design so that an observer stays with

a vessel for more than one trip.

Data Collection by Scientific Observers

The data to be collected by scientific observers operating in this program, includes specific fisheries information and recording these data on various log forms. These forms were originally developed by the NEFSC Woods Hole Laboratory and only minor revisions have been made by the SEFSC observer program. Similar log formats allow for greater consistency in data collection between the two regions. The data forms include: 1) Gear Characteristics Log, 2) Haul Log, 3) Longline Hook Inventory, 4) Individual Animal Log, and 5) Incidental Take Log.

At the beginning of each trip, the observer, with the aid of the captain will complete a detailed description of the gear being used on the Gear Characteristics Log. A new gear characteristics Log Form will also be completed when changes to the gear characteristics occur. Information pertinent to the gear deployment and retrieval during a set and/or haul back (*i.e.* set: begin/end time, position, water temperature and depth, as well as haulback: end time, position, water temperature and depth) are recorded on a Haul Log Form for each set of the gear. The Longline Hook Inventory Form provides a detailed description of the gear and is completed to allow documentation of set-specific configuration (position of high fliers, radio buoys, floats, gangions and light sticks placed along the line while the gear is being deployed). The Individual Animal Log is completed during the haulback of the gear for documenting each fish caught on the gear. On these forms, data on morphometric measurements (length and weight), sex identification, and biological samples obtained (reproductive tissue and certain skeletal hardparts) are recorded for fish brought onboard the vessel. In addition, the condition of the animal (alive or dead) when it is brought along side the vessel and whether it is kept or thrown back is also recorded on this form. Although the swordfish are the primary species of interest, data are recorded on other large pelagic species as well, including tunas, billfishes, marine mammals, and sea turtles. Capture of marine mammals, sea birds and sea turtles are also recorded on Incidental Take Logs. These forms are completed when a marine mammal, sea bird, or sea turtle is taken by the gear in use.

Responsibilities of Observers

Prior to embarking on a vessel trip, a briefing and training session is required of observer staff to provide clarification of regulations and instructions for completion of data sheets and necessary forms. The observer is responsible for obtaining detailed information of the gear characteristics and to record these details on the appropriate forms as discussed above. In order to meet this responsibility, the observer needs to be present during all gear deployment and hauling operations. During haulback of the gear, the observer will collect length measurements on specific pelagic species of interest (see Figures 2-5) brought onboard and these data recorded on appropriate forms. All other pelagic species brought aboard will also be

measured in standard fork length (SFL, tip of upper snout to fork of tail along contour of body). The observer will also be responsible for collecting specific biological tissue and skeletal hardparts as required.

Because of their data collection duties, the observer is not to participate as a deckhand during the fishing operations, or stand vessel or crew watches. The observer will record interactions with marine mammals, sea birds and sea turtles including, but limited to, sighting information and data collection for each marine mammal and sea turtle captured by the vessel in fishing operations. Specific tissue samples from these species will also be collected by the observer, if so required. The observer will maintain an official field diary including, but limited to, hours worked, tows observed, description of catch, samples and sightings accomplished, compliance issues encountered, communications and US Coast Guard boardings, should they occur.

The observer may also maintain an appropriate photographic record of the trip, and maintain a photo log using data logs provided or in a field diary. A camera and film is equipment issued to observer personnel.

When the vessel has returned to the dock, the observer is also responsible for monitoring the unloading of the vessel catch for purpose of obtaining dressed weights of the landed catch. The observer is also responsible for transporting sample materials collected during the vessel trip to the Miami Facility or other NMFS-approved facilities.

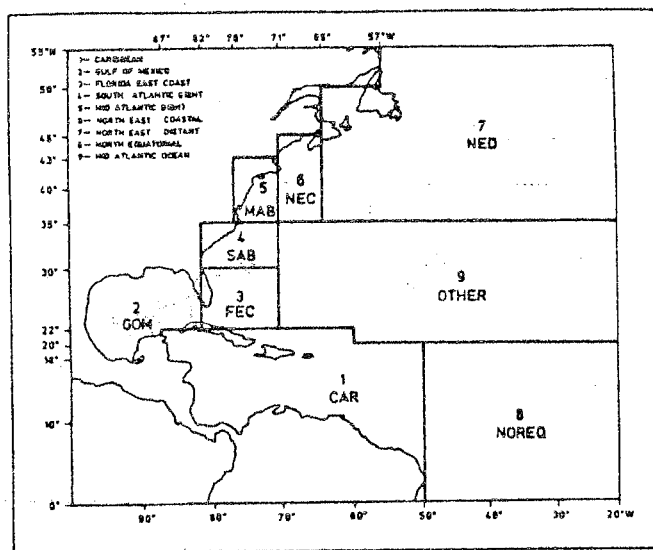
Implementation of the Sampling Plan

Observer coverage of the U.S. large pelagic fleet is being implemented by the Northeast (NEFSC, Woods Hole, MA) and Southeast Fisheries Science Centers (SEFSC, Miami, FL) of the National Marine Fisheries Service. Vessels generally fishing north of 35° N latitude are sampled by the NEFSC while vessels fishing south of that latitude are sampled by the SEFSC. Data collected during prior years indicates that approximately 2/3 of the total U.S. fishing effort is made south of 35° N. Observer sampling in the southern region was initiated in May 1992, while coverage in the northern region started in June (most fishing in the northern region is from June through November). Selection notification letters, along with return trip notification forms, were mailed from the SEFSC to vessel owners/captains on the selection list generated from the random selection process described above. The letter specified that the owner/captain would need to notify the Observer Program Coordinator in writing of the vessel's fishing trips through the calendar quarter of interest, giving at least 5 business days notice prior to departure. The NEFSC, in association with its contractor providing observers, utilized the approach of verbal notification via phone or personal contact. Once the observer is deployed to a vessel and the fishing trip is completed, that vessel is relieved of observer coverage for the remainder of the quarter.

Although the observer program is mandatory, the program relies on the cooperation of the vessel owners/captains to be successful. The initial responses from the owners/captains were positive and in favor of observer coverage. The concern expressed by the majority of owners/captains and the major obstacle to acceptance of the observer, was the need of liability insurance to protect themselves against potential injury law suits. The liability insurance issue has been temporarily resolved through reimbursement of reasonable insurance costs to the owner/captain. Some owners/captains have refused any observer coverage due to the insurance company not having a coverage for such a purpose, vessel size being too small and lacking facilities, the vessel is currently fishing other gear, or the owner has sold or lost the vessel.

As of September, 1992, a total of 24 longline vessel trips and 19 gillnet vessel trips have been observed. A total of 18 longline vessel trips have been observed in waters south of 35° N, using trained and certified observers from the SEFSC. Five of the vessels fished the coastal waters of Florida and the Florida Keys. Seven of the trips fished the waters of the South Atlantic Bight. Six trips in total were observed in the Gulf of Mexico. Four of these trips were monitored through the cooperative interaction with Louisiana State University and two trips were observed by SEFSC observers. The length of those trips completed have ranged from 4 to 12 days. The East Coast and South Atlantic Bight trips have targeted swordfish, while the Gulf of Mexico trips are targeting tunas (yellowfin and bigeye). Scientific observers identified by the NEFSC have completed coverage on 6 longline vessel trips and have also observed 19 gillnet vessel trips targeting swordfish in waters north of 35° N latitude since April, 1992.

Figure 1. The fishing area definitions used in classifying the US pelagic longline effort.



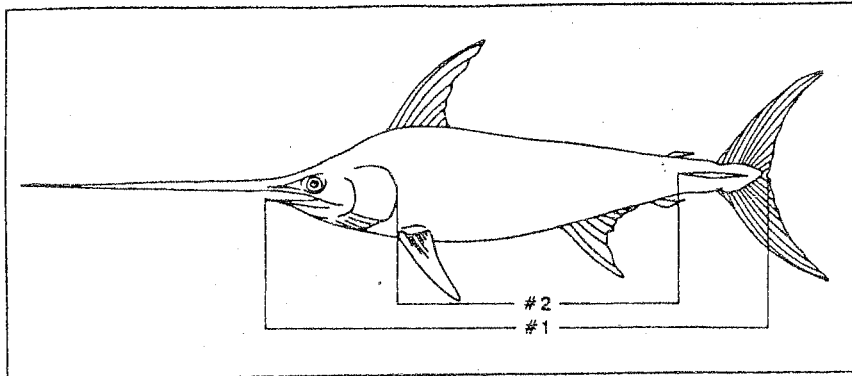


Figure 2 Swordfish measurements in order of importance.
 #1 Tip of lower jaw to fork (curved); #2 Cleithrum to the anterior origin of the caudal keel (curved)

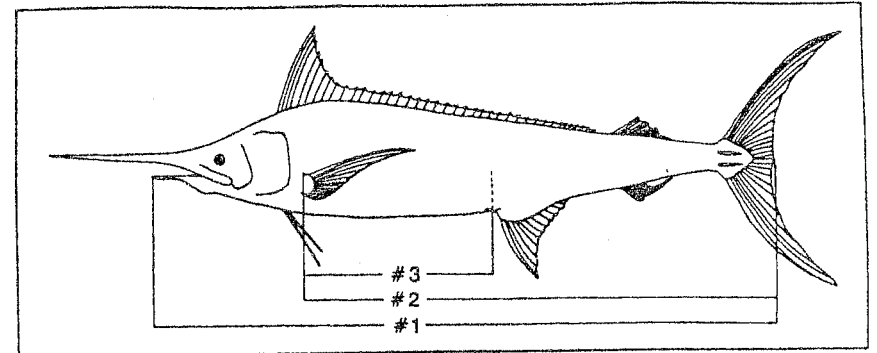


Figure 4 Billfish measurements in order of importance.
 #1 Tip of lower jaw to fork (curved); #2 Anterior pectoral fin to fork (curved); #3 Anterior pectoral fin to anal opening following the mid-line (curved)

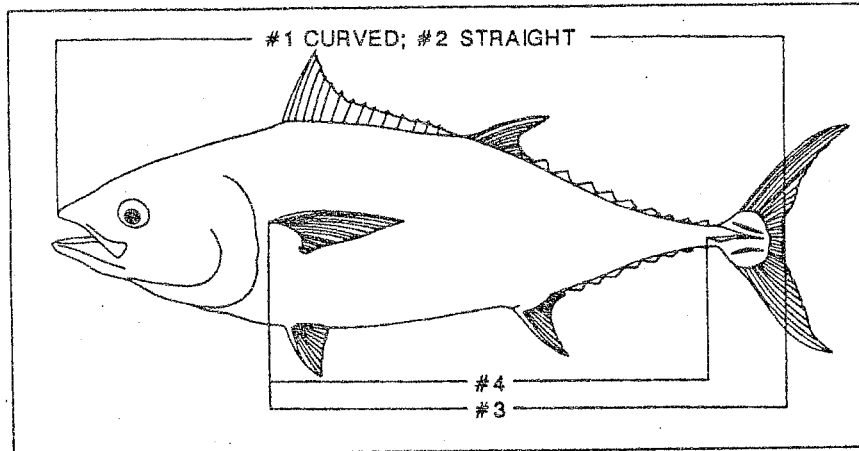


Figure 3 Tuna measurements in order importance.
 #1 Tip of upper jaw to fork (curved); #2 Tip of upper jaw to fork (straight); #3 Anterior pectoral fin to fork (curved); #4 Anterior pectoral fin to caudal keel (curved)

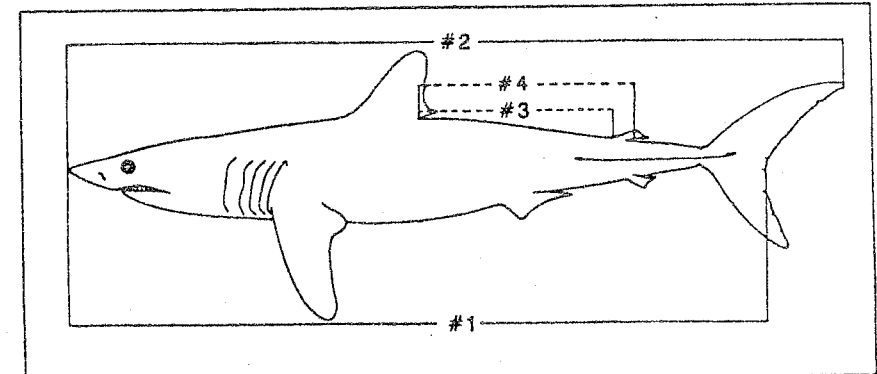


Figure 5 Shark measurements in order of importance.
 #1 Tip of snout to fork (straight); #2 Tip of snout to tip of upper caudal lobe (straight); #3 Posterior 1st dorsal fin to anterior 2nd dorsal fin (straight); #4 Anterior pectoral fin to fork (curved)

Table 1. Quarter definitions

Quarter	Beginning date	Ending date
1	January 1	March 31
2	April 1	June 30
3	July 1	September 30
4	October 1	December 31

Table 2. Total reported 1991 fishing days and number of long line vessels for each area and quarter.

AREA	QUARTER	TOTAL DAYS FISHING	NUMBER OF VESSELS
CARIBBEAN	1	703	37
CARIBBEAN	2	185	20
CARIBBEAN	3	13	5
CARIBBEAN	4	35	6
GULF OF MEXICO	1	1197	96
GULF OF MEXICO	2	1004	101
GULF OF MEXICO	3	1033	72
GULF OF MEXICO	4	644	65
FLORIDA EAST COAST	1	916	52
FLORIDA EAST COAST	2	1041	63
FLORIDA EAST COAST	3	559	44
FLORIDA EAST COAST	4	351	34
SOUTH ATLANTIC BIGHT	1	275	34
SOUTH ATLANTIC BIGHT	2	429	38
SOUTH ATLANTIC BIGHT	3	313	28
SOUTH ATLANTIC BIGHT	4	97	13
MID ATLANTIC BIGHT	1	379	21
MID ATLANTIC BIGHT	2	295	35
MID ATLANTIC BIGHT	3	645	50
MID ATLANTIC BIGHT	4	864	60
NORTH EAST COASTAL	1	1	1
NORTH EAST COASTAL	2	345	35
NORTH EAST COASTAL	3	1131	57
NORTH EAST COASTAL	4	218	30
NORTH EAST DISTANT	1	6	1
NORTH EAST DISTANT	2	174	23
NORTH EAST DISTANT	3	783	37
NORTH EAST DISTANT	4	158	18
NORTH EQUATORIAL	1	8	3
NORTH EQUATORIAL	2	7	2
NORTH EQUATORIAL	3	9	2
OTHER	1	134	12
OTHER	2	11	7
OTHER	3	16	10
OTHER	4	25	7

Table 3. Expected days fishing for 5% sampling fraction and number of vessels selected for each area and quarter.

AREA	QUARTER	EXPECTED DAYS FISHING	NUMBER OF VESSELS
CARIBBEAN	1	40	4
CARIBBEAN	2	36	3
GULF OF MEXICO	1	63	17
GULF OF MEXICO	2	57	17
GULF OF MEXICO	3	58	14
GULF OF MEXICO	4	34	9
FLORIDA EAST COAST	1	49	13
FLORIDA EAST COAST	2	56	15
FLORIDA EAST COAST	3	29	7
FLORIDA EAST COAST	4	23	8
SOUTH ATLANTIC BIGHT	1	15	4
SOUTH ATLANTIC BIGHT	2	28	6
SOUTH ATLANTIC BIGHT	3	25	6
SOUTH ATLANTIC BIGHT	4	8	3
MID ATLANTIC BIGHT	1	23	3
MID ATLANTIC BIGHT	2	16	4
MID ATLANTIC BIGHT	3	48	9
MID ATLANTIC BIGHT	4	54	7
NORTH EAST COASTAL	2	21	3
NORTH EAST COASTAL	3	64	7
NORTH EAST COASTAL	4	15	4
NORTH EAST DISTANT	2	22	4
NORTH EAST DISTANT	3	52	4
NORTH EAST DISTANT	4	18	1
OTHER	1	41	3