MARINE MAMMAL DATA TRANSFER AND DOCUMENTATION

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1. ABSTRACT:

The University of Rhode Island maintains an extensive computerized data base containing marine mammal and other sighting information for the continental shelf waters off the northeastern United States. These data were collected during the Cetacean and Turtle Assessment Program and other studies. Since the study area closely coincides with the National Marine Fisheries Service Northeast Fisheries Center's area of interest, and since the National Marine Fisheries Service is assigned the primary responsibility for the management and protection of marine mammals in these waters, a complete copy of the URI data base was transferred to the Northeast Fisheries Center's computer facility at Woods Hole, Massachusetts. The data were reformatted for maximum compatibility with other data bases maintained by the National Marine Fisheries Service. This report represents full documentation for the transferred data base.

2. INTRODUCTION:

The National Marine Fisheries Service (NMFS) acts as custodian of marine mammals and living marine resources under provisions of the Marine Mammal Protection Act, Endangered Species Act, and Fisheries Conservation and Management Act. The Northeast Fisheries Center (NEFC) of NMFS is responsible for conducting research and providing scientific information in support of the administrative and management mission of the Northeast Regional Office (NER).

The Cetacean and Turtle Assessment Program (CETAP) was conducted at the University of Rhode Island's (URI) Narragansett Bay Campus between October 1978 and February 1983 under contract to the Outer Continental Shelf environmental studies office of the Bureau of Land Management (BLM, now Minerals Management Service - MMS), U.S. Department of the Interior. CETAP's primary goal was to provide data on the distribution and abundance of whales, dolphins, and sea turtles in the continental shelf waters off the northeastern United States for use by federal agencies in decision-making relative to offshore oil and gas exploration and development activities (Edel et al., 1981). CETAP surveys during three years of field work covered over 460,000 kilometers of trackline and logged over 11,000 sightings of cetaceans and 2,800 sightings of sea turtles (CETAP, 1982b). These sightings included six endangered whale species: right whale (Eubalaena glacialis), humpback whale (Megaptera novaeangliae), sperm whale (Physeter catodon), blue whale (Balaenoptera musculus), fin whale (B. physalus), and sei whale (B. borealis); two endangered turtle species: leatherback turtle (Dermochelys coriacea) and Kemp's ridley turtle (Lepidochelys kempi); and two threatened turtle species: loggerhead turtle (Caretta caretta) and green turtle (Chelonia mydas). The CETAP data also include over 6,000 additional historical cetacean and turtle sightings collected prior to CETAP, as well as some 4,000 sightings of pelagic marine species other than cetaceans or turtles.

URI researchers have added additional data to the data base since the completion of the CETAP study. We have had an on-going program of spring surveys in the Great South Channel region, including a variety of independent work and a series of aerial surveys in the Great South Channel region funded by NMFS-NEFC in 1985 (Kenney et al., in preparation). A large number of additional right whale sightings have also been added as part of a detailed analysis of right whale distributional biology (Winn et al., in press).

The CETAP study has been the only one of its kind and scope off the northeast coast, and it produced a unique data base relative to the whales, dolphins, sea turtles, and certain other marine creatures inhabiting the surface waters overlying the northeastern U.S. continental shelf. The CETAP/URI data base may well represent the single most extensive and complete record of the cetacean and turtle populations of these waters. The data have already been used by several agencies in environmental impact assessments for oil lease sales, ocean dumping, and mammal incidental take permits. The data base, as currently archived on the URI computer system, however, is not easily accessible nor directly compatible with other data sets existing for the same region. For example, the CETAP study area is essentially identical to the region sampled by NMFS-NEFC in both the MARMAP program (Sherman, 1980) and the groundfish survey program (Grosslein, 1969). NMFS-NEFC also has marine mammal data collected by Manomet Bird Observatory (MBO) aboard NMFS survey cruises. This project was undertaken to transfer the CETAP/URI sighting data base to the NEFC computer system, so that all of the relevant data would then be in a single location in compatible formats. This would enable researchers working with any of the species to better study the ecological interactions among the various species, furthering the conservation and management of these resources.

3. OBJECTIVES:

The data base transfer project had four objectives:

1.) Transfer a copy of the CETAP data base from the computer system at URI to the VAX 11/785 computer system at NMFS-NEFC in Woods Hole, Massachusetts.
2.) Change the format of the transferred data base to make it compatible with the format of the NEFC's bottom trawl survey data base.
3.) Provide the documentation required to enable NEFC researchers and others to utilize the transferred data.
4.) Provide a copy of the software developed to quantify the level of sighting effort by measuring the length of trackline surveyed within 10-minute blocks.

4. CETAP BACKGROUND:

In 1953 the Outer Continental Shelf (OCS) Lands Act was passed, establishing Federal jurisdiction over the submerged lands of the continental shelf seaward of state boundaries. Designated by the Secretary of the Interior, first BLM, and subsequently MMS, became responsible for the leasing of submerged Federal lands. In 1969 the National Environmental Policy Act required that all Federal agencies utilize a "systematic, inter-disciplinary approach" when investigating exploitation of man's environment. The OCS Lands Act Amendments of 1978, in conjunction with the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973, required that studies be conducted in areas of proposed marine oil and gas development to ascertain the environmental impact of such activities on the marine environment.

In an effort to address the lack of general knowledge about marine mammals and marine turtles in the OCS waters between Cape Hatteras, North Carolina, and Nova Scotia, Canada, BLM sponsored a comprehensive 4-year study. CETAP was initiated at the University of Rhode Island in October 1978. The general objectives were as follows:

1.) To determine which species of cetaceans and marine turtles inhabit and/or migrate through the Mid- and North Atlantic OCS regions;
2.) To identify, delineate and describe areas of importance for feeding, breeding, calving, etc. to cetaceans and marine turtles in these regions;
3.) To determine the temporal and spatial distribution of cetaceans and marine turtles in these regions;
4.) To determine behavioral characteristics of cetaceans and marine turtles in these regions;
5.) To estimate the size and extent of cetacean and marine turtle populations in these regions; and
6.) To emphasize all the above objectives for those species classified as threatened or endangered by the U.S. Departments of Interior and Commerce.

4.1. 1979 Data Collection:

4.1.1. Dedicated Aerial Surveys:

The principal thrust of the CETAP data collection effort was an aerial survey program. In 1979, the study area was divided into nine sampling blocks (Figure 1). Eight blocks (A-H) are approximately equal in size, averaging 9725 n.mi.^{2}, with the ninth block (I) about one-third as large (3357 n.mi.^{2}). The determining factors behind choosing the blocks were as follows:

1.) Each block could be sampled in a single day;
2.) Block boundaries and the parallel transect lines within them run NW-SE, approximately perpendicular to the depth contours between Cape Hatteras and the OCS edge south of Cape Sable, Nova Scotia;
3.) One day's sampling survey, about 400 linear nautical miles of transect flying, would sample 7.5% of the sea surface within a block. This assumes a sampling swath of 1 n.mi. to either side of the transect. Potential transect lines were drawn on 2 n.mi. centers within each block. A block boundary has a transect line 1 n.mi. to either side. The number of potential transects within each block is shown below.

Number of Transects for Each Area

A	53
B	50
C	43
D	42
E	40
F	47
G	48
H	56
I	33
Total	412

The aircraft selected for the survey work was a twin-engine Beechcraft AT-11, a military version of a Beechcraft 18, equipped with an airborne temperature sensing radiometer and twin belly-mounted 70 mm cameras. The AT-11 has a two-man station in its acrylic plastic nose bubble, permitting an unobstructed forward, lateral, and downward view. A microprocessor-controlled Loran C receiver provided accurate positioning as well as digital information on such variables as ground speed, range and bearing to the next target position, and most importantly, course deviations of 1/8 n.mi. or greater.

CETAP's aerial surveys used visual assessment methods. While on transects, two observers in the bubble scanned the sea surface from forward to the sideward physical limits imposed by the fuselage. Each observer was responsible for the field of view on only one side of the aircraft. The field of visual scanning was approximately 60° in azimuth. Factors which interfered with viewing such as sun glare, precipitation, fog, and sea state were recorded. The scanning method used on a transect was consistent and noted in the data log.

Scanning required an intensified effort in the near field (relative to the far) due to the apparent angular acceleration of the sea surface. Each observer restricted his efforts to within a one n.mi. swath. Only sightings made within the swath were used for eventual population estimates.

Prior to participation in a data collection flight, all observers went through ground, as well as inflight, training. Training flights typically lasted 5-7 hours and were designed to familiarize observers with survey techniques and to afford them an opportunity to see various types of cetaceans (i.e. large whales, medium whales, and dolphins) from the air.

Sampling teams consisted of four trained observers. One pair occupied the bubble observation station; the second pair was split to man an aft equipment station and the data recorder's station. Each forward observer, upon sighting whales, turtles, and other biological and/or human activities in his field of view, verbally reported the information over the aircraft's intercom system. Both the recording-station observer and a tape recorder recorded observations. Observer pairs rotated at the completion of each line (approximately every hour).

Responsibilities onboard were divided among the personnel. The flight crew was responsible for the safe operation of the aircraft and its navigation along transects. The navigator recorded aircraft position, altitude, heading, and speed at five-minute intervals during the flight, and whenever so requested by the scientific party to mark a sighting, environmental parameter change, survey leg/watch change, or other event. Additionally, the navigator made time reference marks on the radiometer strip chart whenever positional data were recorded. The scientific party was responsible for reporting and recording sightings and for maintaining and calibrating the inflight instrumentation (i.e. radiometer, cameras, magnetic tape recorders, etc).

CETAP's sampling design was chosen with features that considered scientific requirements, logistics, and maximization of flight time efficiency. Sampling transects aligned in a northwest-southeast direction were selected at random and without replacement from the total pool of transects within each block. In deference to the contractually available flight time, eight surveys, each of which sampled a theoretical 7.5% of the study area, were spaced throughout the year. Survey periods were defined as 45 day increments; the first 30 days within each increment was for sampling and the remaining 15 days for data separation, crew rest, and data reduction. Weather totally dominated decisions as to the sequence of sampling. Although consideration was given to sampling order, it became impractical to pass up "useable" weather. Further, some areas (i.e. outer Georges Bank) proved so difficult to survey due to weather constraints that they had to be emphasized on any occasion of acceptable weather in order to sample them at all.

4.1.2. Platforms of Opportunity:

Another of CETAP's field research operations was a Platforms-of-Opportunity Program (POP). During 1979, POP operated in the following way: Aircraft and vessels (the platforms) known to be operating within the study area were identified. The operators of the platforms were then contacted regarding scheduled flights or cruises and ability to provide space available, on a not-to-interfere basis, to a marine mammal/turtle observer. CETAP made an attempt to spread out the observers so that all parts of the study area were equally surveyed. This ideal was approximated but not totally achieved, therefore these data were not considered in any population estimation analyses. Potential POP observers were trained by attending observer training courses held by CETAP at a variety of locations. Observers were assigned to platforms based on their experience, performance during training courses, proximity to the port of departure, and availability.

4.1.3. Special Surveys:

Certain species were not adequately sampled by the regular surveys, and certain areas or events were unique and/or of short duration and thus would not be sampled by the regular surveys. Special surveys of various types were conducted to remedy these deficiencies. The more important of the special surveys conducted was the Right Whale Survey and Right Whale Minimum Count. This special survey was conducted during May 1979 over the entire Gulf of Maine and OCS regions immediately south of the Gulf. The motivation behind the survey was the paucity of data on northern right whales and the hypothesized severity of their endangered species status.

Another form of special survey was the identification and enumeration of "hot spots". A hot spot was defined as an area of cetacean concentration which was known from long standing historical records or from reports of other active investigators and/or mariners/pilots, and thus was worthy of a 'special overflight for confirmation of the report, whale identification verification, and whale counting purposes. Only one hot spot flight was conducted in 1979. The regular surveys and other special surveys proved adequate for data collection.

4.1.4. Nearshore Marine Turtle Flights:

Five nearshore marine turtle flights were conducted by the Turtle Watch Group of CETAP. The objectives of the flights were to determine the distribution of nesting sites within the study area and furthermore to determine local turtle densities and possible migratory routes.

4.1.5. Oil Spill Investigation Flights:

As the result of an at-sea collision, the Liberian freighter Regal Sword sank near Cape Cod on 18 June 1979. Two types of fuel carried on board the sunken ship (Bunker C and #2 fuel oil) seeped out and thus provided CETAP with an opportunity to assess the effects of the oil on nearby cetaceans. Observers were sent on USCG platforms and CETAP's chartered survey aircraft to investigate cetaceans found in and near the oil. The primary objective was the determination of whether cetaceans in or near the oil behaved differently than cetaceans in adjoining non-polluted water. This effort is elaborated upon in Goodale et al. (1981).

4.1.6. Opportunistic Data:

This type of data collection involved the identification of mariners, aircraft pilots, other researchers studying the OCS, and interested volunteers, who, through their activities at sea, had the occasion to encounter cetaceans and turtles within the study area. These people were contacted, interviewed, and provided with a simple, standardized checklist for recording temporal and spatial information on identified and counted whales and turtles. Occasionally individuals unknown to CETAP would hear of the program and submit unsolicited reports of cetacean and/or turtle sightings.

4.1.7. Historical Data:

During the early portion of the study, an attempt was made to incorporate into the data base any cetacean/turtle sighting data which may have been previously collected by researchers or others working in the study area. Data sources included Dr. Winn's files from previous research cruises, Naval Oceanographic Office records, Coast Guard records, the Gulf of Maine Whale Sighting Network records, Watkins and Schevill's Cape Cod Bay data, etc. The historical data included in the data base go back to 1958.

4.2. 1980 and 1981 Data Collection:

4.2.1. Dedicated Aerial Surveys:

The 1979 aerial survey methodology was modified in 1980 and 1981 due to contractual changes and efforts to refine data collection. Two changes were made in 1980. Stratified sampling was employed to increase the reliability of abundance estimates. Each of the survey blocks was sub-divided into depth strata, with the 20 and 50 fathom isobaths as the stratum boundaries. This alteration resulted in the redesign of blocks A-D into blocks J-Q due to complex submarine topography of the Gulf of Maine and Georges Bank (Figure 2). Sampling effort per survey within each stratum was at least that of 1979, and allocated based upon the 1979 sighting densities. As a result of the stratification, twice as much effort would be required to sample the study area in 1980 as was needed in 1979. Therefore the eight survey periods were reduced to four.

Three changes were instituted in 1981. At the behest of BLM, sampling was restricted to lease sale areas and areas of known endangered species abundance (Figure 3). Secondly, replicate samples were taken in order to gauge variability present in abundance estimation based on aerial survey data. Finally, two slopewater survey blocks (R and S) were added (Figure 3).

4.2.2. Other Surveys:

Various special aerial surveys were conducted, with emphasis on endangered species, in both 1980 and 1981. The primary area of coverage was the waters east and southeast of Cape Cod (Figures 4 and 5). A similar survey was conducted off Nova Scotia in the late summer of 1980 (Figure 6). The 1980 endangered species surveys were conducted using both the AT-11 and a second aircraft, a Cessna 337-G Skymaster. All of the 1981 endangered species surveys and the 1980 Nova Scotia surveys were conducted with the Skymaster. The number of observers was reduced to two on Skymaster flights, and they sat in the rear seats behind the pilot and navigator/data recorder. Details of these surveys can be found in CETAP (1982a, 1982b).

In both 1980 and 1981, dedicated shipboard cruises aboard the R/V TIOGA were conducted in May in the Cape Cod/Great South Channel region. The primary objective of these cruises was to collect quantitative behavioral and ecological data on endangered whale species, with emphasis on the right whale. The results of these efforts are detailed in CETAP (1982a, 1982b), especially in Special Topic sections C and D of the latter.

The remainder of the data collection efforts in 1980 and 1981 were similar in design to those described above for 1979, with the exception that shipboard POP surveys were discontinued in 1981.

4.3. Data reduction:

Raw data in the form of field forms and notes from the observers were first checked over for completeness and accuracy, and species identification codes and reliabilities were assigned. The data were then transcribed onto computer coding forms. During the transcription process, codes for all coded variables were assigned. After the transcription forms were checked, they were sent to keypunch, where the data were punched onto 80-column cards. The data were then read from the cards into computer disk files. Computer data files were subjected to a number of quality control procedures to detect any errors which may have been introduced at the several steps in the data entry process. Data files for a given year were merged for preparation of annual reports to BLM, during which all variables were put into standard formats and units. At the completion of the CETAP study, all three years' survey data, as well as the historical data, were merged into a master file. Copies of this file were archived on magnetic tape at the URI Academic Computer Center, as well as submitted to the Minerals Management Service, Reston, VA.

5. ADDITIONAL DATA:

Since the completion of CETAP, URI researchers have continued the collection of whale sighting data. In the spring of both 1982 and 1983, one or more URI scientists collected data in the Great South Channel region from Coast Guard Fisheries Patrol flights and from cruises aboard the R/V Regina Maris. These data were used in an analysis of the distributional biology of western North Atlantic right whales (Winn et al., in press), along with some other data from a variety of sources. Major sources included the New England Aquarium's Bay of Fundy research program in 1981 (Kraus and Prescott, 1982) and sightings made on the Scotian Shelf between 1966 and 1972 from Canadian whaling vessels operating out of the shore processing station at Blandford, Nova Scotia (Mitchell et al., in press). We have also continued a program of aerial surveys for right whales during the spring in the Great South Channel. Two flights were conducted in May and June of 1984 with funding from the Marine Mammal Commission (Winn et al., 1985), although the data were analyzed by hand and never computerized. Four flights were conducted in May and June of 1985 with support from NMFS-NEFC; these data were computerized and are included in the NEFC copy of the data base.

6. METHODOLOGY:

The initial step in the data transfer was to discuss with NEFC what exactly they wished to be transferred. During a meeting, a complete list of all variables contained in the CETAP archived data was gone over in detail, deciding which variables should be transferred and which deleted. The discussion also included determination of the desired formats for all variables in the transferred data base. In each case, a primary objective was to make sure that variable formats were as compatible as possible with those in other data sets already established by NEFC. It was also determined that, in all cases possible, there should be no missing values or empty columns in the data. A specific value indicating missing was to be inserted for each variable. The format of the magnetic tape to provide easiest transfer was also discussed.

The original data base contained 69,655 observations and 112 variables. After deletion of some variables, combination of others, reformatting, and some additions, the number of variables in the new data base was 74. The number of observations was increased to 73,722 by inclusion of the additional data discussed in section 5 above. All of the procedures involved in the data base work at URI were completed using the facilities of the Graduate School of Oceanography Computer Center and the URI Academic Computer Center. All of the programs used in the project were Statistical Analysis System (SAS) software (Helwig and Council, 1982).

During the process of reformatting the data base, frequent checks of values, ranges, minima/maxima, codes, frequencies, etc. were performed to assess the reformatting procedure. This led to the discovery of several errors in the data base, which were all corrected before being included in the NEFC copy of the data. The correction occasionally required going back into the raw data files, which have also been archived at URI.

Once it appeared that a final version of the data base was ready, this data set was written to a disk file for testing, and then to 9-track magnetic tape for the actual transfer. For all coded, character, or discrete numeric variables, the frequencies of occurrence of each value were computed; for continuous numeric variables, simple descriptive statistics were calculated. A complete listing of the frequency tables and statistics was prepared. This was submitted to NEFC, along with a listing of variables in the format of the FILFMT list in the NEFC Data Dictionary system, for NEFC approval. A few changes were suggested and made.

The last objective in the project was to provide a documented copy of the program which quantifies survey sighting effort as the total length of transect line covered within blocks measuring 10 minutes of latitude by 10 minutes of longitude. This enables combining a variety of dedicated and POP data and correcting for uneven survey coverage to result in valid depictions of relative abundance or density. This method has been used successfully by URI for a number of analyses, including studies of cetacean high-use habitats (Kenney and Winn, in press) and of the distributional ecology of both right whales (Winn et al., in press) and humpback whales (Kenney, in preparation). The final version of the effort program which had been used for these analyses was no longer available, having been lost during a change-over in the operating system of the mainframe computer. However, a number of early versions of the program were archived on tape and accessible. The most complete and latest of these was restored to the computer. Because the NEFC version of the data contains somewhat different variable and formats, a number of modifications of the program were required. During the modification and testing, documentation in the form of comment lines contained within the program which completely explained each step in the program were added. The program was tested repeatedly after each modification to make sure it was functioning as designed. When modification and testing was complete, a final full test run was made using the data was which was to be transferred as input.

7. RESULTS:

7.1. Objectives 1 and 2:

The first two objectives of this project were to transfer a complete copy of the CETAP data base to the NEFC VAX computer system in Woods Hole, and to reformat the data base into a format compatible with other NEFC data. The reformatting was completed before the data tape was written. The completed data tape was mailed to NEFC on 10 March 1986 so that it could be loaded and ready on 17 March. At that time, NEFC and URI personnel jointly accessed the data base to check for compatibility with the VAX hardware and NEFC data base management software.

7.2. Objective 3:

The third objective of this project was to provide complete documentation of the transferred data base. This report represents that documentation. The final data base contains 73,722 observations and 74 variables. The following two sections contains complete descriptions of the physical data tape and the data files contained therein.

7.2.1. Tape Documentation:

Tape format: 9-track, 6250 bpi density, non-labelled, EBCDIC
Tape contains five files, with cumulative usage of 65.14% of the tape.

Files 1, 2, and 3:

These files are raw EBCDIC data files, three identical copies. All variables are written without intervening spaces. All numeric variables are written with leading zeroes to completely fill the field. All character variables except SCINAME and SPPNM also completely fill their fields; these two exceptions are left-justified within their fields. There are no missing values. The data records are fixed blocks; logical record length is 240; block size is 4800; blocking factor is 20; the number of blocks is 3687, with the last block of 480 bytes; the total number of bytes in the data set is 17,693,280. Each file is 334.2 feet in length, and occupies 14.18% of the tape. The locations of the variables within the files are shown in section 7.2.2 below.

Files 4 and 5:

These files are SAS data sets with all information normally associated with SAS files, e.g. variable names, labels, etc. The SAS member name in each file is "DATABASE". There are 634 blocks, ranging in length from 98 to 32641 bytes, wholly determined by SAS. Each file is 266.59 feet in length, and occupies 11.30% of the tape. All variables have associated labels, and no variables have defined SAS formats. The SAS variable names and labels are listed in section 7.2.2 below.

7.2.2. Data Base Documentation:

The following section lists all of the variables which are contained in the NEFC copy of the CETAP/URI sighting data base. Each entry contains the variable name, whether it is a character or numeric variable, the associated label in the SAS data sets (tape files 4 and 5), the column locations in the raw data sets (tape files 1, 2, and 3), and any required descriptive information. Complete listings of the codes for all variables are to be found in Appendix I and Appendix II. Frequencies of use of the different codes, or statistics for the continuous numeric variables, are contained in Appendix III.

AIRTEMP NUMERIC AIR TEMPERATURE (C) 001-003
Degrees Celsius, rounded to whole degrees

ALT NUMERIC ALTITUDE OF OBSERVER (M) 004-007
Aircraft altitude, in meters. Standard survey altitude was 229 meters (750 feet).

ANHEAD NUMERIC ANIMAL HEADING 008-009
Approximate direction on a 16-point compass rose.

BEAUFORT	NUMERIC	BEAUFORT SEA STATE	010-011
BEHAV1	NUMERIC	BEHAVIOR	012-013
BEHAV2	NUMERIC	BEHAVIOR	014-015
BEHAV3	NUMERIC	BEHAVIOR	016-017
BEHAV4	NUMERIC	BEHAVIOR	018-019
BEHAV5	NUMERIC	BEHAVIOR	020-021
BEHAV6	NUMERIC	BEHAVIOR	022-023
BEHAV7	NUMERIC	BEHAVIOR	024-025
BEHAV8	NUMERIC	BEHAVIOR	026-027
BEHAV9	NUMERIC	BEHAVIOR	028-029
BEHAV10	NUMERIC	BEHAVIOR	030-031
BEHAV11	NUMERIC	BEHAVIOR	032-033
BEHAV12	NUMERIC	BEHAVIOR	034-035
BEHAV13	NUMERIC	BEHAVIOR	036-037
BEHAV14	NUMERIC	BEHAVIOR	038-039
BEHAV15	NUMERIC	BEHAVIOR	040-041

BLOCK CHARACTER SAMPLING BLOCK 042
Aerial survey block. Block designations changed from year to year (see Figures 1, 2, and 3). In 1980, there were identically numbered right whale survey blocks in the Gulf of Maine and off Nova Scotia (see Figures 4 and 6).

CETSPPCD CHARACTER CETAP/MANOMET SPECIES CODE 180-183
4-letter code for each species, based on the common name. These were taken from the MBO codes.

CIRCLFLG NUMERIC CIRCLING TIME ACCURATE? 043
For dedicated aerial surveys sightings where the aircraft broke from the transect line to identify and/or count animals, can the time required for investigation of that single sighting be accurately computed from the time difference between leaving the track (LEGSTAGE=3) and returning (LEGSTAGE=4)? Often additional sightings or other phenomena would be encountered while circling, requiring additional time to investigate. This variable was not used in the 1979 data.

CLOUD NUMERIC CLOUD COVER (OKTAS) 044-045

CONFIDNC NUMERIC PRECISION 046-047
Estimated precision of the number of animals sighted

DATAMETH NUMERIC METHOD OF DATA COLLECTION 048
How the number of animals at a sighting were counted or estimated.

DAY NUMERIC DAY 049-050

DDSOURCE CHARACTER DIRECT DATA SOURCE 051-053
The source directly providing the data in a specific file to CETAP or URI.

DEBRIS NUMERIC DEBRIS IN WATER 054

DEPTH NUMERIC DEPTH AT OBSERVATION (M) 055-058
Water depth, in meters, at a sighting location, included for sighting events only. Most often interpolated from charts during data reduction, but occasionally measured directly by fathometer during a cruise.

DIVETIME NUMERIC DIVE TIME 059-062
Estimated length of extended dive of an animal, in minutes and seconds (MMSS). Only used rarely.

EVENTNO NUMERIC EVENT NUMBER 063-067
Sequential numbers assigned during transcription for each data file. Events are defined as: sightings, change in LEGTYPE or LEGSTAGE, change in any environmental or survey parameters, other occurrence to be noted e.g. human activities, or periodic position entry to record platform track (typically at 5-minute intervals for airplanes, 30 minute for ships). Event numbers were usually multiplied by 10 during data entry to allow for easier insertion of corrections.

FILEID CHARACTER FILE ID NUMBER 068-074
Unique identification number assigned to each data file, including identifiers for data type, year, and date.

FLUKES NUMERIC HUMPBACK FLUKE PHOTOS? 075
Are fluke photographs available in CETAP files?

GLAREAMT	NUMERIC	AMOUNT OF GLARE	076

The amount of sun glare affecting observer field of view.

GLARELOC	NUMERIC	LOCATION OF GLARE	077

The location of the glare referred to above.

GROUPS	NUMERIC	NUMBER OF GROUPS	078-079

The number of distinct grouping of animals within a given sighting.

HEADING	NUMERIC	PLATFORM HEADING	080-082

Compass heading (true) of the survey platform.

HERDTYPE	CHARACTER	HERD TYPE	083

Description of the spatial arrangement of animals within a given sighting.

HUMANACT	NUMERIC	HUMAN ACTIVITIES	084-085
IDREL	NUMERIC	ID RELIABILITY	086

The reliability of the species identification assigned to a given sighting. The general philosophy used in assigning identifications and reliabilities was to use the ID which resulted in the highest value of IDREL while still including the maximum possible amount of scientific information.

IDSOURCE	CHARACTER	INDIRECT DATA SOURCE	087-089

The original collector of the data in a file.

LAT	NUMERIC	LATITUDE (DDMM)	090-093
LEGGOOD	NUMERIC	LEG MADE GOOD	094

Was a given aerial survey leg made good according to specified criteria? To be made good, at least 65% of the line must have been completed in sea state of 3 or below, visibility of at least 2 miles, 2 observers on watch, and proper aircraft altitude and groundspeed.

LEGNO	NUMERIC	LEG NUMBER	095-096

For aerial surveys.

LEGSTAGE	NUMERIC	LEG/WATCH STAGE	097

Some mention must be made of LEGSTAGE sequences for the dedicated aerial surveys. The LEGTYPE-LEGSTAGE codes for a census track are 2-1 at the start, 2-5 at the end, and 2-2 for all events in between. The complication comes when the airplane leaves the track to investigate a sighting. There will be one event with codes 2-2 for the sighting. Then there will be another, different, event at the identical time with codes 2-3 for leaving the track. The codes for returning to the track are 2-5. Any events, including additional sightings, which occur while circling were coded as non-specific legs (LEGTYPE=4) with LEGSTAGE left blank (now changed to the missing value code of 9).

LEGTYPE	NUMERIC	LEG TYPE	098
LON	NUMERIC	LONGITUDE (DDMM)	099-102

MONTH	NUMERIC	MONTH	103-104
NUMADULT	NUMERIC	NUMBER OF ADULTS	105-107
NUMBER	NUMERIC	TOTAL NUMBER Total number of animals at a sighting.	108-111
NUMCALF	NUMERIC	NUMBER OF CALVES	112-114
NUMFEMAL	NUMERIC	NUMBER OF FEMALES	115-117
NUMIMMAT	NUMERIC	NUMBER OF IMMATURES	118-120
NUMMALE	NUMERIC	NUMBER OF MALES	121-123
NUMSUBAD	NUMERIC	NUMBER OF SUBADULTS	124-126
PHOTOS	NUMERIC	PHOTOS AVAILABLE? Are photographs of this sighting available in CETAP files?	127
PLATFORM	NUMERIC	PLATFORM ID NUMBER	128-130
PORTOBS	CHARACTER	PORT OBSERVER (AERIAL) Identity of the two observers on watch and making any sightings was included in 1980 and 1981. The plan was to try to assess inter-observer variability of sighting efficiency, which was never done.	131
RELBEAR	NUMERIC	BEARING The bearing in degrees of a sighting from the survey platform, with dead ahead = 000.	132-134
SCINAME	CHARACTER	SCIENTIFIC NAME	135-174
SIDIST	NUMERIC	RADIAL DISTANCE (KM) Estimated distance to a sighting from the survey platform.	175
SIGHTNO	NUMERIC	SIGHTING NUMBER Sequential numbers assigned within a data file. For most CETAP files, sightings of species other than cetaceans or turtles were assigned sighting numbers of 999 to enable easy deletion from data analyses in accordance with BLM's directives.	176-178
SIGHTOBS	CHARACTER	SIGHTING OBSERVER (AERIAL) See PORTOBS.	179
SIZEGRP	NUMERIC	GROUP SIZE The modal size of sub-groups within a specific sighting.	214
SPPNM	CHARACTER	COMMON NAME	184-213
STAROBS	CHARACTER	STARBOARD OBSERVER (AERIAL) See PORTOBS.	215

STRATUM CHARACTER DEPTH STRATUM 216
Dedicated aerial surveys in 1980 and 1981 were stratified by depth zone, with the strata being 0-20, 20-50, and >50 fathoms.

STRIP NUMERIC SAMPLING STRIP 217-218
Identifies the right angle distance interval of a sighting from the transect line for dedicated aerial surveys. The distances were used to estimate the sighting probability density functions for abundance estimation.

SURFTEMP NUMERIC WATER TEMPERATURE (C) 219-222
In degrees Celsius, to the nearest tenth. Decimal point is in column 221 in the raw data files. Most temperatures were derived from airborne infrared radiometer aboard the survey plane.

TAXCODE NUMERIC TAXON CATEGORY 223
Indicates the general classification of a sighting - whale, dolphin, turtle, or other.

TIME NUMERIC TIME OF EVENT (EST) 224-227
Time of event, Eastern Standard Time, 24-hour military format.

VISIBLTY NUMERIC VISIBILITY CONDITIONS 228
General visibility/weather conditions.

WNDDIRCD NUMERIC WIND DIRECTION 229-230
16 point compass rose.

YEAR NUMERIC YEAR 231-232
Last two digits of the year.

Columns 233-240 of the raw data files are filled with 1's to serve as a marker for the end of each record.

7.3. Objective 4:

The fourth and final objective of this project was to provide a fully documented copy of the effort quantification program to NEFC. The program is written in SAS code, and documentation is contained internally in comment lines. The documented program is contained in Appendix IV. A copy of this program on magnetic tape was delivered to NMFS-NEFC on 21 May 1986.

8. RECOMMENDATIONS:

To maintain and enhance the value of the data base, we recommend that NMFS should continue to add newly acquired data to it. It may be adviseable to require that any contractor performing marine mammal research with NMFS-NEFC funding support submit a tape (or disk) of all data collected during the research as a stipulation of the contract. This tape should be in a format, defined in advance, which allows easy inclusion of the data into the master data base on the VAX. We plan to submit a copy of sighting data to be collected this season from several different projects as a test of the feasibility of adding data to the data base.

9. ACKNOWLEDGMENTS:

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Table 1. Cornerpoints for the various CETAP and other aerial survey blocks, as shown in Figures 1 through 7. The listing for each block begins with the northernmost point and proceeds clockwise.

FIGURE	BLOCK	LATITUDE	LONGITUDE
1	A	43 43.5	69 49.5
		42 25.7	68 02.3
		41 11.5	69 42.0
		41 38.0	70 17.0
	B	44 37.9	67 21.8
		43 47.5	66 10.6
		42 25.7	68 02.3
		43 43.5	69 49.5
	C	43 09.4	67 03.0
		41 44.0	65 09.5
		40 36.8	66 20.6
		42 09.8	68 24.0
	D	42 09.8	68 24.0
		40 36.8	66 20.6
		40 02.0	67 25.0
		40 00.0	68 07.4
		41 11.5	69 42.0
	E	41 38.0	70 17.0
		40 00.0	68 07.4
		39 37.0	69 32.6
		39 42.2	70 10.5
		41 02.2	71 55.1
	F	41 02.2	71 55.1
		39 42.2	70 10.5
		39 31.0	71 45.0
		38 59.1	72 05.8
		40 25.0	73 58.9
	G	40 25.0	73 58.9
		38 59.1	72 05.8
		37 43.7	73 24.8
		38 56.5	74 56.0
	H	38 56.5	74 56.0
		37 43.7	73 24.8
		36 45.5	74 15.0
		35 45.3	74 17.2
		37 06.5	75 57.0
	I	37 06.5	75 57.0
		35 45.3	74 17.2
		34 50.3	75 00.0
		35 14.5	75 31.3

Table 1. (continued).

FIGURE	BLOCK	LATITUDE	LONGITUDE
3	R	40 36.8	66 20.6
		40 06.0	65 37.0
		39 22.0	66 43.0
		39 25.0	67 22.0
		40 00.0	68 07.4
		40 02.0	67 25.0
	S	38 59.1	72 05.8
		38 25.0	71 21.0
		37 10.0	72 40.0
		37 43.7	73 24.8
4	1	42 37	68 50
		42 13	68 32
		41 37	69 54
		41 40	69 57
		42 05	70 07
	2	42 13	68 32
		41 47	68 12
		41 11	69 35
		41 37	69 54
	3	41 47	68 12
		41 22	67 53
		40 46	69 16
		41 11	69 35
	4	41 31	67 31
		40 28	66 45
		40 12	67 20
		41 16	68 07
	5	41 16	68 07
		40 12	67 20
		39 56	67 56
		41 00	68 43
	6	41 00	68 43
		39 56	67 56
		39 41	68 29
		39 41	68 38
		40 41	69 20
		40 46	69 16
	7	40 41	69 20
		39 41	68 38
		39 41	70 14
		39 51	70 23
		40 10	69 41

Table 1. (continued).

FIGURE	BLOCK	LATITUDE	LONGITUDE
5	1	42 37.5	68 49.5
		41 58.5	68 21.0
		41 16.5	69 57.5
		41 19.0	70 03.5
		41 37.5	70 17.5
		42 04.0	70 06.5
	2	41 58.5	68 21.0
		40 21.5	67 53.5
		40 38.0	69 33.0
		41 14.0	70 00.0
		41 16.5	69 57.5
6	1	44 56	66 52
		44 14	66 21
		43 41	67 38
		43 44	68 05
		44 08	68 22
		44 39	67 12
	2	44 14	66 21
		44 02	66 26
		43 26	66 10
		43 08	65 44
		42 06	65 19
		42 03	65 36
		42 36	66 08
		42 30	66 36
		43 34	67 16
		43 41	67 38
	3	44 00	63 55
		42 49	63 26
		42 41	64 14
		42 10	65 20
		43 08	65 44
		43 54	64 24
	4	44 10	61 47
		43 14	61 26
		42 49	63 26
		43 45	63 49
7	-	42 23.2	68 48.3
		41 27.8	68 05.5
		40 55.2	60 20.3
		41 41.0	69 55.0
		41 53.0	69 57.7

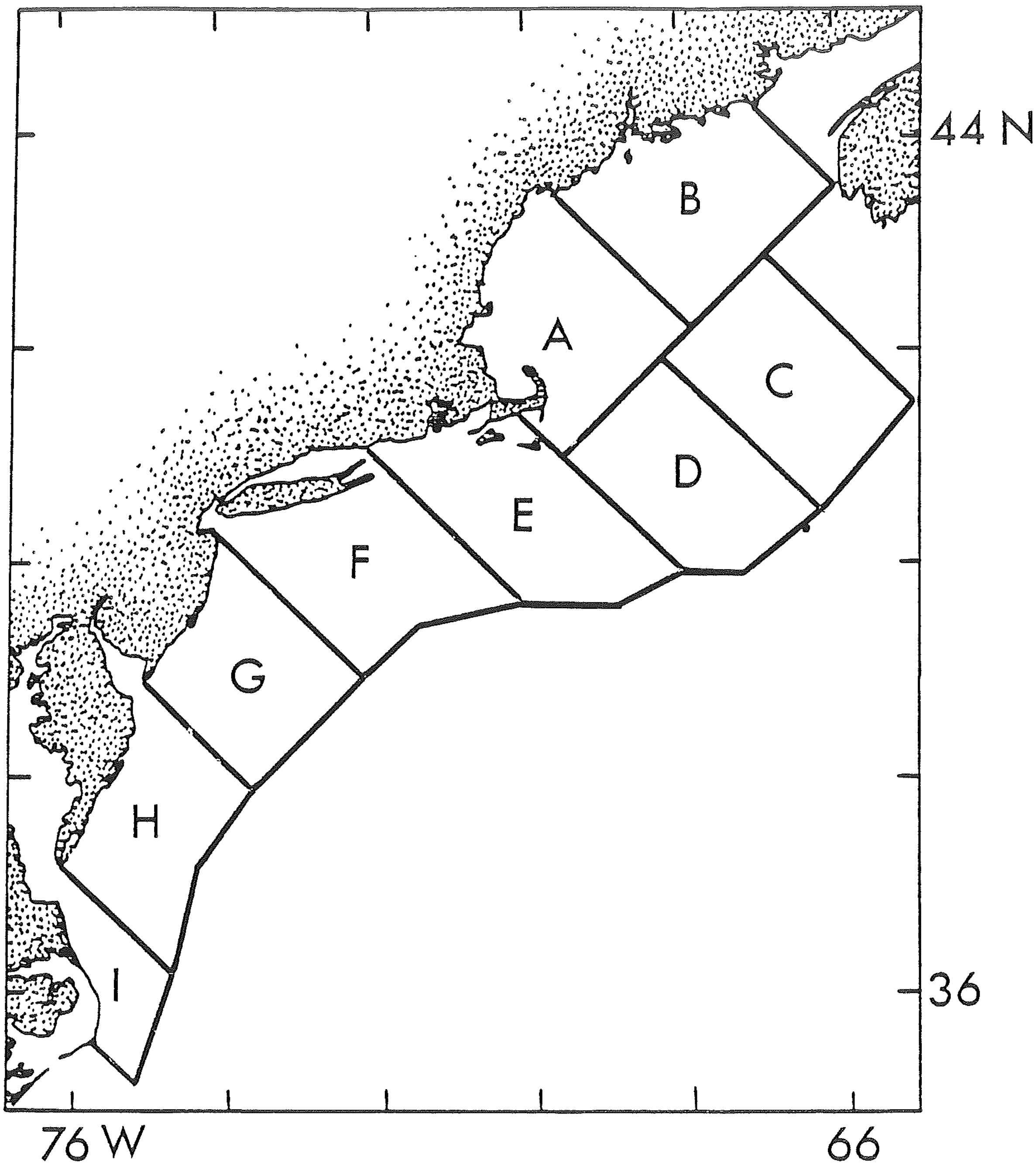

Figure 1. CETAP 1979 dedicated aerial survey blocks. Cornerpoints of the blocks are listed in Table 1.

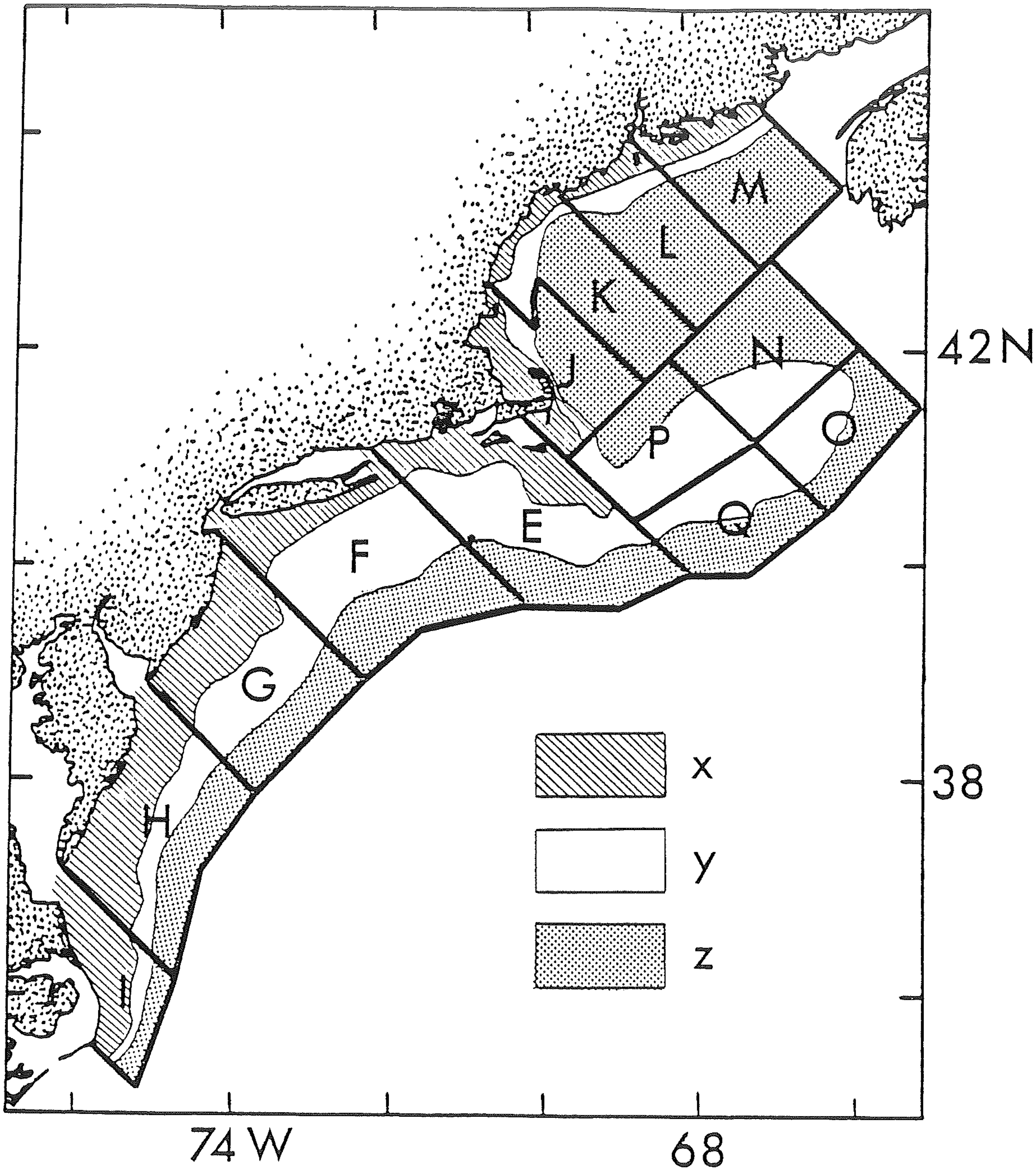

Figure 2. CETAP 1980 dedicated aerial survey blocks, stratified by depth. Depth strata are: x = 0 - 20 fathoms; y = 20 - 50 fathoms; z = >50 fathoms. Cornerpoints in Table 1.

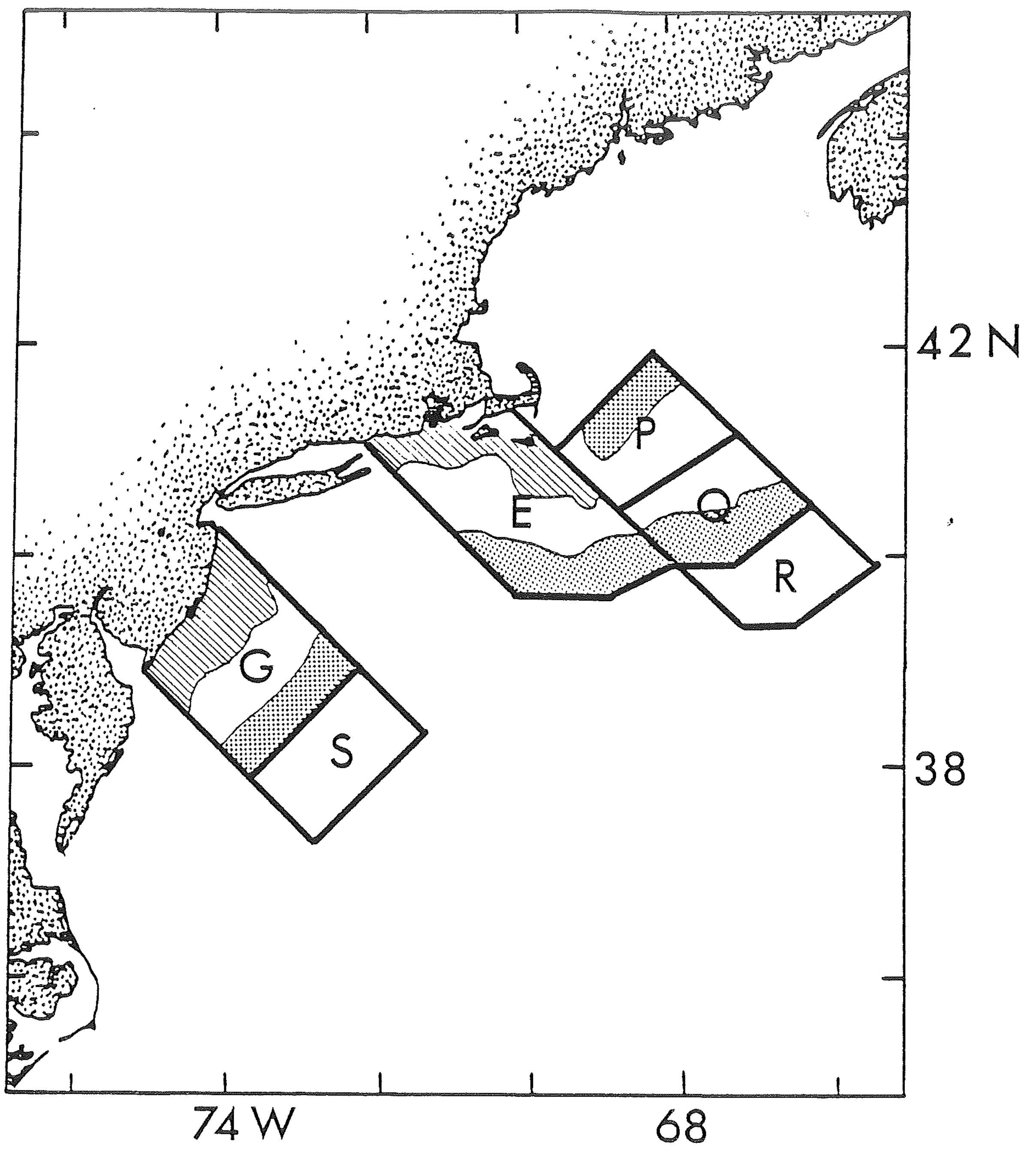

Figure 3. CETAP 1981 dedicated aerial survey blocks. Depth strata are the same as 1980. Cornerpoints in Table 1.

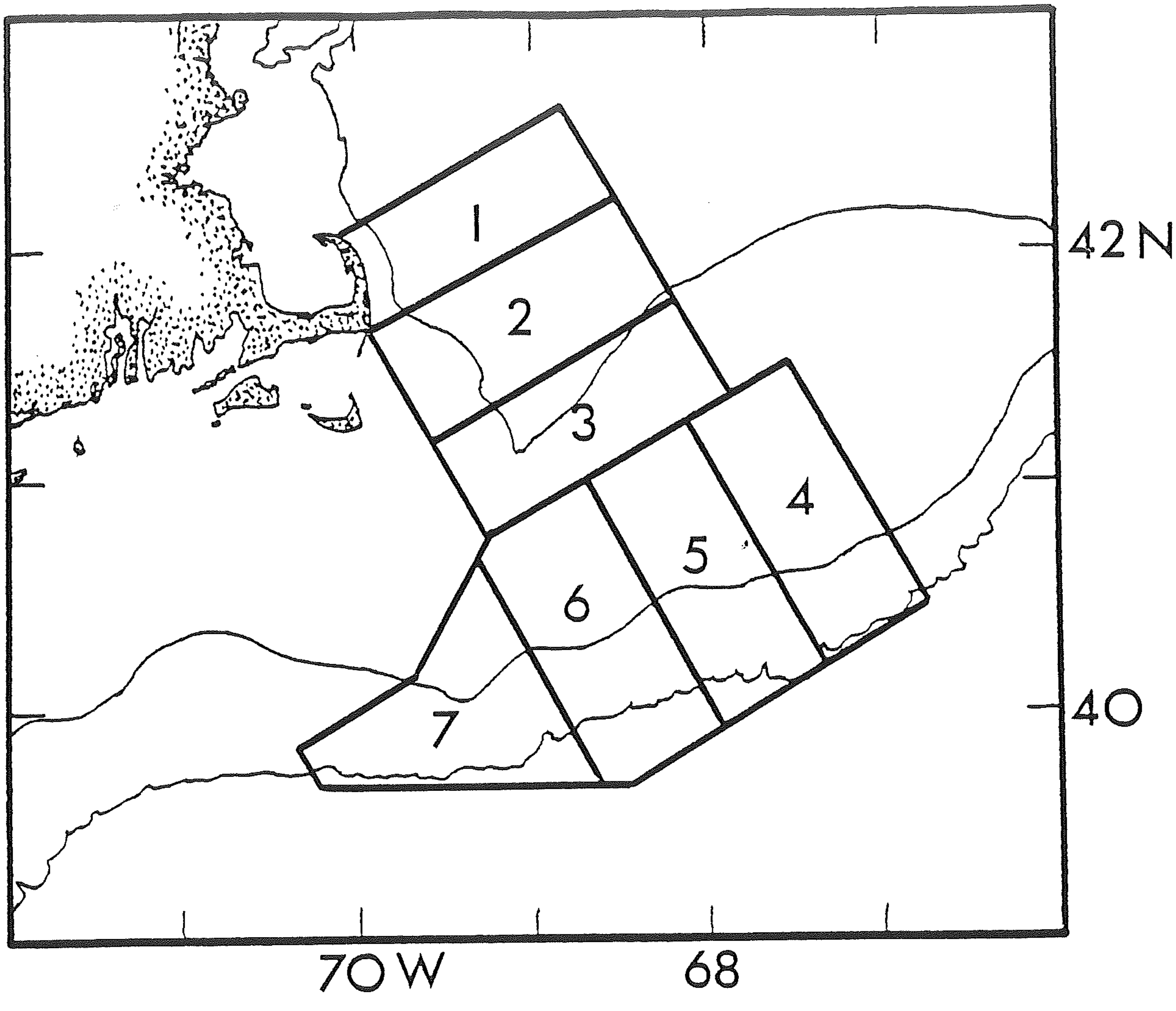

Figure 4. CETAP 1980 right whale/endangered species aerial survey blocks. 100 and 2000 meter isobaths shown. Cornerpoints in Table 1.

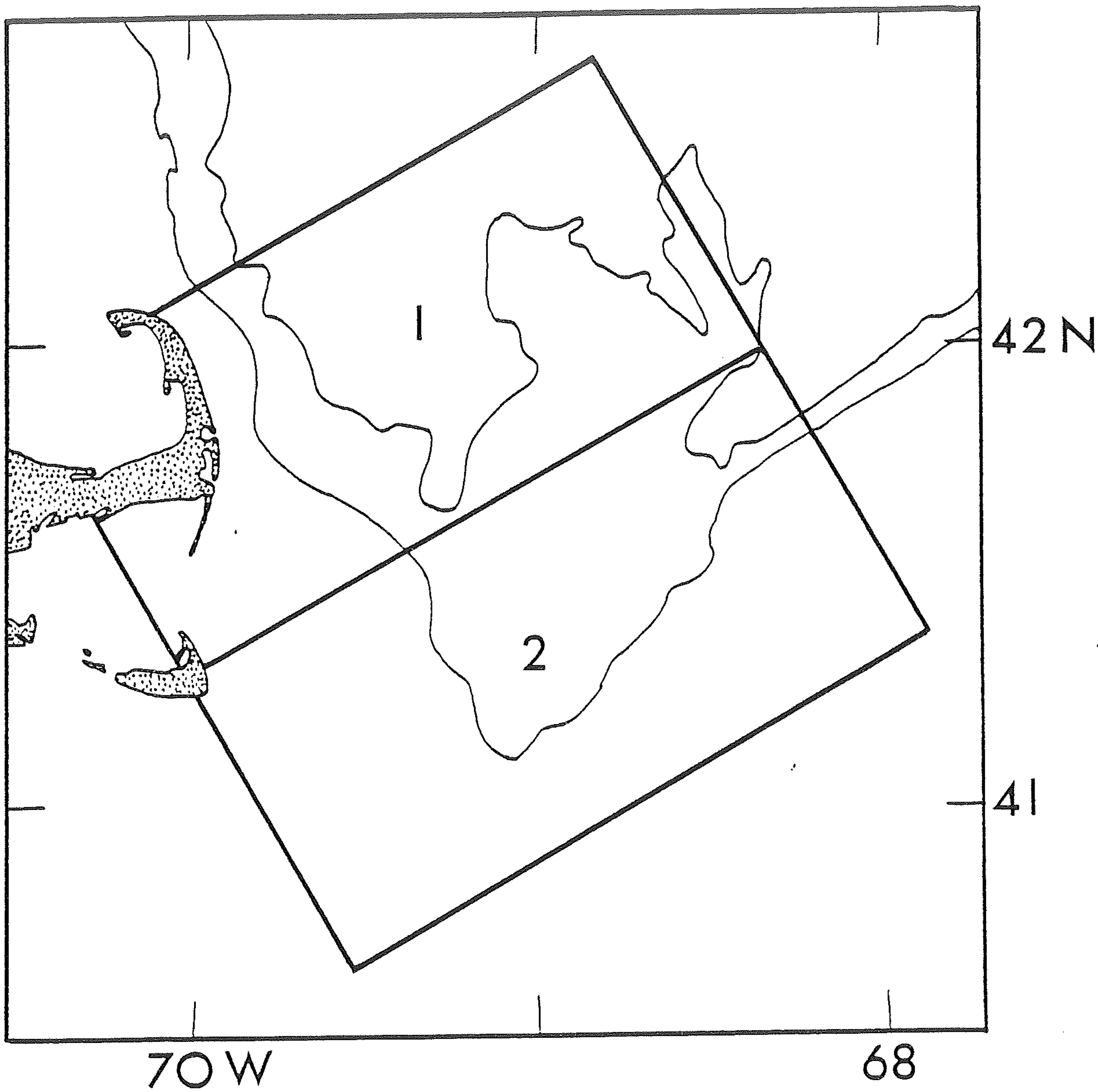

Figure 5. CETAP 1981 right whale/endangered species aerial survey blocks. 10, 50, and 100 fathom isobaths shown. Cornerpoints in Table 1.

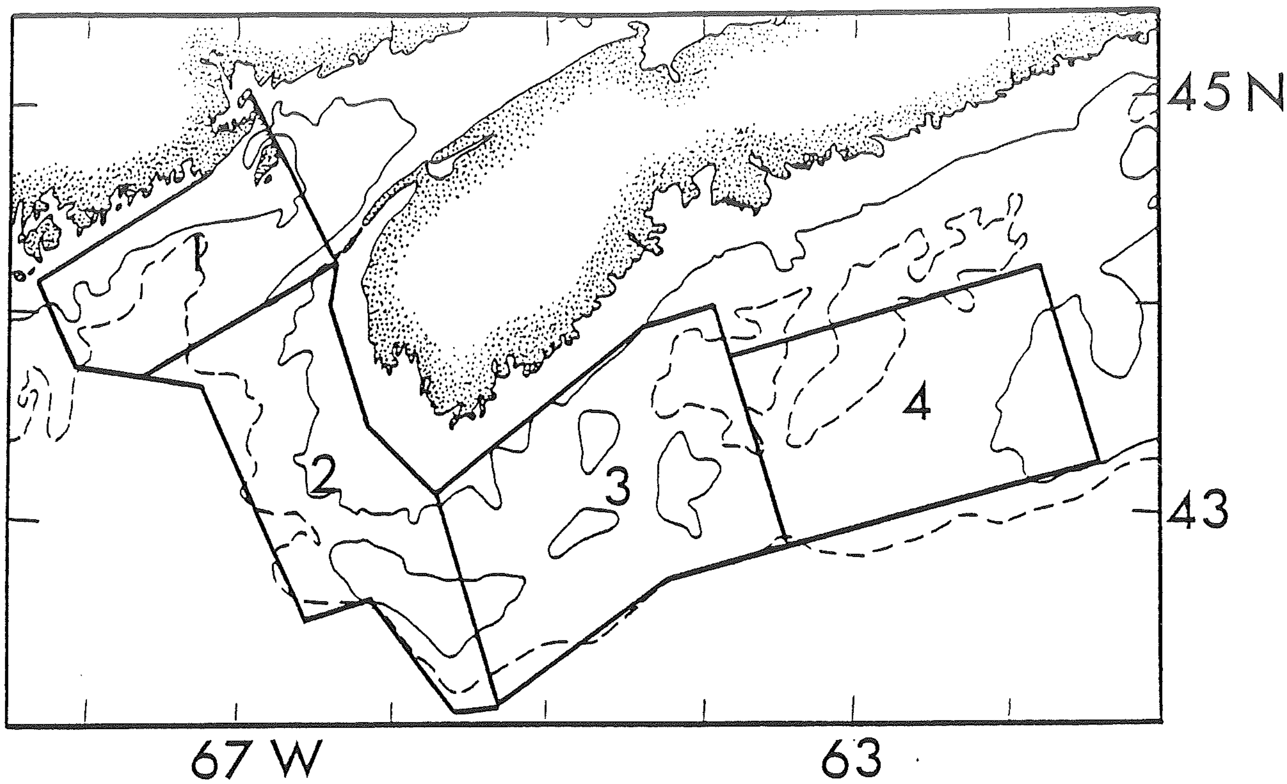

Figure 6. CETAP 1980 Nova Scotia right whale aerial survey blocks. 50 and 100 fathom isobaths shown. Cornerpoints in Table 1.

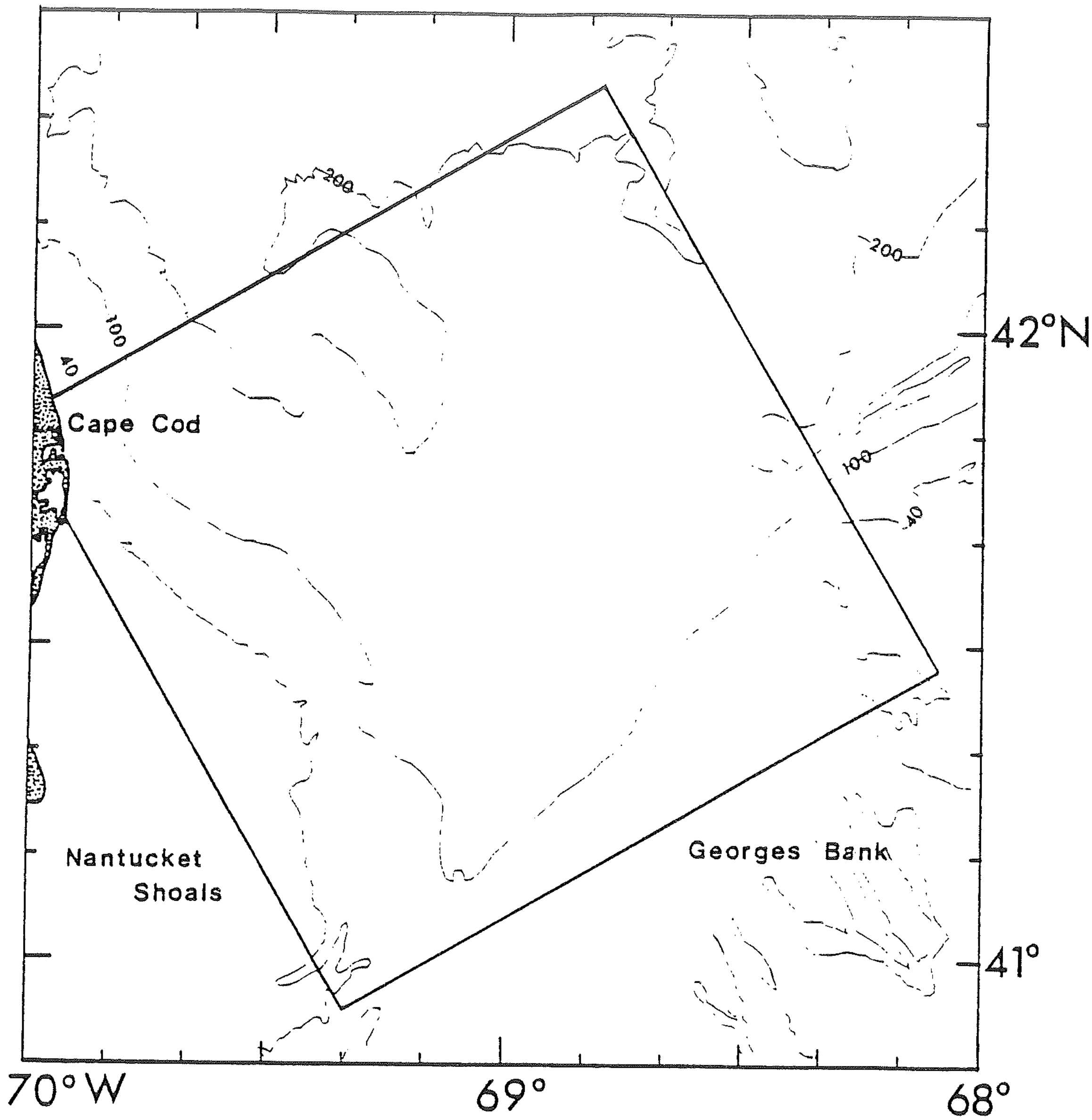

Figure 7. URI Great South Channel aerial survey block used in 1984 and 1985, also projected for 1986 and future surveys. 40, 100, and 200 meter isobaths shown. Cornerpoints in Table 1.

Appendix I. Listing of variables contained in the CETAP/URI marine mammal sighting data base transferred to the NMFS-NEFC VAX system. Listing follows the format of the NEFC Data Dictionary System FILFMT documentation procedure. Entries contain descriptions and/or codes for all variables except BEHAV1 - BEHAV15, CETSPPCD, PLATFORM, SCINAME, and SPPNM. Code listings for these variables can be found in Appendix II.

FILFMT

FIELD_NAME	FIELD_ABBREV	TEXT
AIR_TEMPERATURE	AIRTEMP	3 DIGITS FOR AIR TEMPERATURE ROUNDED TO THE NEAREST FULL DEGREE (C). MISSING VALUE=999.
AIRCRAFT_ALTITUDE	ALT	4 DIGITS FOR ALTITUDE OF SURVEY AIRCRAFT IN METERS. MISSING=9999.
ANIMAL_HEADING	ANHEAD	COMPASS HEADING OF ANIMAL OR GROUP. 00=N 01=NNE 02=NE 03=ENE 04=E 05=ESE 06=SE 07=SSE 08=S 09=SSW 10=SW 11=WSW 12=W 13=WNW 14=NW 15=NNW 16=CIRCLING 17=VARIOUS COURSES 99=MISSING
BEAUFORT_SEA_STATE	BEAUFORT	2 DIGITS FOR BEAUFORT SEA STATE. MISSING=99.
BEHAVIOR_CODE_1	BEHAV1	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_2	BEHAV2	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_3	BEHAV3	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_4	BEHAV4	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_5	BEHAV5	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_6	BEHAV6	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_7	BEHAV7	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_8	BEHAV8	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_9	BEHAV9	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_10	BEHAV10	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_11	BEHAV11	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).

BEHAVIOR_CODE_12	BEHAV12	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_13	BEHAV13	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_14	BEHAV14	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
BEHAVIOR_CODE_15	BEHAV15	2 DIGIT CODE FOR BEHAVIOR OF ANIMAL(S).
AERIAL_SURVEY_BLOCK	BLOCK	1 CHARACTER DESIGNATOR FOR AERIAL SURVEY BLOCK. =A-S FOR DEDICATED AERIAL SURVEYS. =W FOR 1985 GREAT SOUTH CHANNEL SURVEYS. =0-7 FOR CETAP RIGHT WHALE SURVEYS. =1-2 FOR ENDANGERED SPECIES SURVEYS. =. FOR MISSING VALUE.
CETAP_SPECIES_CODE	CETSPPCD	4 CHARACTER CODE FOR EACH SPECIES.
CIRCLING_TIME_FLAG	CIRCLFLG	1 DIGIT TO DESIGNATE WHETHER THE TIME FOR IDENTIFICATION AND COUNTING OF ANIMALS IN A GIVEN SIGHTING CAN BE ACCURATELY COMPUTED BY THE TIME DIFFERENCE BETWEEN LEAVING THE TRACK AND RETURNING. 1=NO 2=YES 9=MISSING
CLOUD_COVER_CODE	CLOUD	2 DIGITS TO CODE FOR CLOUD COVER IN "OKTAS". 00=0 01=1 OKTA OR LESS, BUT NOT ZERO 02=2 OKTAS 03=3 OKTAS 04=4 OKTAS 05=5 OKTAS 06=6 OKTAS 07=7 OKTAS 08=8 OKTAS 09=SKY OBSCURED, OR CLOUD AMOUNT CANNOT BE ESTIMATED (NIGHT, FOG) 10=SHADOWS CAUSED BY SCATTERED CLOUD COVER 99=MISSING
CONFIDENCE_CODE	CONFIDNC	2 DIGITS FOR ESTIMATED PRECISION OF THE NUMBER OF ANIMALS SIGHTED. 00=+/-0 01=+/-1 02=+/-2 03=+/-5 04=+/-10 05=+/-25 06=+/-50

		07=+/-100 08=+/-1000 09=+, "AT LEAST" FOR GROUP COUNTS 10=NO ESTIMATE OF CONFIDENCE LEVEL 11=NUMBER OF ANIMALS UNKNOWN 99=MISSING
COUNTING_METHOD	DATAMETH	1 DIGIT TO DESIGNATE HOW THE ANIMALS AT A SIGHTING WERE COUNTED. 1=VISUAL COUNT 2=VISUAL ESTIMATE 3=PHOTOGRAPHIC COUNT 4=ACOUSTIC COUNT 9=MISSING
DAY	DAY	DAY IN MONTH (01=31). DAY UNKNOWN (00)
DIRECT_DATA_SOURCE	DDSOURCE	3 CHARACTERS FOR SOURCE CONTRIBUTING DATA TO CETAP/URI. CAM=CHARLES A. MAYO CET=CETAP CHS=CAPE HATTERAS NATIONAL PARK SERVICE CRS=C. ROBERT SHOOP EDM=EDWARD D. MITCHELL GWO=GUY W. OLIVER HEH=HERBERT E. HAYES HEW=HOWARD E. WINN MBO=MANOMET BIRD OBSERVATORY OGB=OLLIE G. BRAZIER OTH=OTHER (MISCELLANEOUS) RAR=RICHARD A. ROWLETT RXP=ROBERT PRESCOTT SDK=SCOTT D. KRAUS SKK=STEVEN K. KATONA TXA=THOMAS AZAROVITZ UCG=U.S. COAST GUARD
DEBRIS_CODE	DEBRIS	1 DIGIT CODE FOR DEBRIS OBSERVED IN WATER. 0=SARGASSUM WEED LINE 1=FLOTSAM (NATURAL ORIGIN) 2=JETSAM (HUMAN ORIGIN) 3=OIL SLICK 4=OIL SHEEN 5=OIL PATCHES 6=OTHER 7=COMBINATIONS OF ABOVE 9=MISSING
DEPTH	DEPTH	4 DIGITS FOR DEPTH IN METERS. 9999=MISSING

DIVE_TIME	DIVETIME	4 DIGITS FOR TIME SPENT SUBMERGED IN MINUTES AND SECONDS (MMSS). 9999=MISSING
EVENT_NUMBER	EVENTNO	5 DIGITS FOR SEQUENTIAL EVENT NUMBERS WITHIN EACH FILEID. USUALLY WERE MULTIPLIED BY 10 DURING DATA ENTRY TO FACILITATE LATER CORRECTIONS.
FILE_ID_NUMBER	FILEID	1 CHARACTER AND 6 DIGITS TO IDENTIFY EACH DATA FILE UNIQUELY. --FIRST POSITION (CHARACTER) INDICATES DATA TYPE --SECOND POSITION (DIGIT) INDICATES SURVEY NUMBER OR DATA SUBTYPE WHERE SHOWN (AS _N), OTHERWISE DIFFERENTIATES FILES WITH SAME DATE A=DEDICATED AERIAL SURVEY _N=SURVEY NUMBER D=DEDICATED AERIAL REPLICATE SURVEY IN BLOCK D _N=SURVEY NUMBER E=ENDANGERED SPECIES SURVEY F=POP AERIAL SURVEY _0=MISCELLANEOUS _1=USCG RADIOTHERMOGRAPHY _2=USCG FISHERIES PATROL _3=TURTLE SURVEY (SHOOP) _4=COASTAL SURVEY (MEAD) _5=USCG HARBOR PATROL G=DEDICATED AERIAL REPLICATE SURVEY IN BLOCK G _N=SURVEY NUMBER H=HISTORICAL (CETACEANS) I=AIR/SHIP INTERACTIVE SURVEY _1=SHIP _2=AERIAL J=HISTORICAL (TURTLE SIGHTINGS) K=HISTORICAL (TURTLE STRANDING) L=DEDICATED AERIAL LEASE SALE SURVEY M=POP AERIAL RIGHT WHALE SURVEY (1979 MINIMUM RIGHT WHALE COUNT) _1=AT-11 _2=SKYMASTER (AERO-MARINE) _3=SKYMASTER (KATONA) _4=ISLANDER _5=CESSNA 206 _6=CESSNA 150 O=OPPORTUNISTIC (CETACEANS) P=POP SHIP SURVEY Q=MISCELLANEOUS RIGHT WHALE SIGHTINGS R=DEDICATED AERIAL RIGHT WHALE SURVEY _1=AT-11 _2=SKYMASTER

		T=MISCELLANEOUS AERIAL SURVEY _1=HOT SPOT (POP) _2=TRAINING (DEDICATED) _3=OIL SPILL (DEDICATED) _4=OIL SPILL (POP) U=OPPORTUNISTIC (TURTLE SIGHTINGS) W=DEDICATED SHIP RIGHT WHALE SURVEY Y=OPPORTUNISTIC (TURTLE STRANDINGS) --THIRD AND FOURTH POSITIONS (DIGITS) ARE THE LAST TWO DIGITS OF YEAR. --LAST THREE DIGITS ARE JULIAN DATE OF THE FIRST DAY OF DATA IN THE FILE.
FLUKE_PHOTO_CODE	FLUKES	1 DIGIT CODE FOR WHETHER FLUKE PHOTOGRAPHS FOR A GIVEN HUMPBACK WHALE SIGHTING ARE IN CETAP FILES. 1=NO 2=YES 9=MISSING
GLARE_AMOUNT	GLAREAMT	1 DIGIT CODE FOR AMOUNT OF SUN GLARE AFFECTING AERIAL OBSERVER VISIBILITY. 1=MODERATE 2=NONE 3=SEVERE 9=MISSING
GLARE_LOCATION	GLARELOC	1 DIGIT CODE FOR WHICH SIDE OF AIRPLANE IS AFFECTED BY SUN GLARE. 1=BOTH PORT AND STARBOARD 2=PORT 3=STARBOARD 4=UNKNOWN, NOT REPORTED 9=MISSING
NUMBER_OF_SUBGROUPS	GROUPS	2 DIGITS FOR NUMBER OF DISTINCT SUBGROUPS WITHIN A GIVEN SIGHTING 01=NO DISTINCT SUBGROUPING 00=MISSING
PLATFORM_HEADING	HEADING	3 DIGITS FOR COMPASS HEADING IN DEGREES TRUE OF THE SURVEY PLATFORM. 999=MISSING
HERD_TYPE_CODE	HERDTYPE	1 CHARACTER CODE FOR OBSERVERS' BEST FIT OF THE GENERAL FORM OF A GIVEN GROUP OF ANIMALS TO THE DEFINED CATEGORIES. A=DIFFUSE, INDETERMINATE B=CLUSTERED, BUNCHED C=MULTIPLE SUBGROUP CLUSTERS D=VEE FORMATION E=TRIANGLE FORMATION F=LATERAL FORMATION (FLANK TO FLANK) G=LINE FORMATION (HEAD TO TAIL) H=OVAL FORMATION

		J=DIAGONAL FORMATION .=MISSING
HUMAN_ACTIVITY_CODE	HUMANACT	2 DIGIT CODE FOR HUMAN ACTIVITIES OBSERVED. 00=COMMERCIAL FISHING FLEET 01=SUPERSONIC AIRCRAFT 02=SUBSONIC AIRCRAFT 03=TURBOPROP AIRCRAFT 04=PROPELLER AIRCRAFT 05=HELICOPTER 06=DIVER(S) 07=SWIMMER(S) 08=MULTIPLE ACTIVITIES 09=SEVERAL COMMERCIAL FISHING VESSELS 10=OIL DRILLSHIP 11=FIXED FISHING GEAR 12=OIL RIG 13=SONAR IN USE 14=BUOY TENDING 15=TENDING OIL RIG 16=RESEARCH ACTIVITY 17=EXPLOSIVE DISCHARGE 18=CABLE/PIPE LAYING 19=DRILLING 20=DREDGING 21=GARBAGE DUMPING 22=TOXIC WASTE DUMPING 23=OIL SEEPAGE 24=COMMERCIAL LONGLINE FISHING 25=COMMERCIAL NET FISHING 26=SINGLE COMMERCIAL FISHING VESSEL 27=SPORT FISHING VESSEL(S) 28=SINGLE LARGE MERCHANT VESSEL 29=MULTIPLE LARGE MERCHANT VESSELS 30=SINGLE SMALL MERCHANT VESSEL 31=MULTIPLE SMALL MERCHANT VESSELS 32=SINGLE SAILING VESSEL 33=MULTIPLE SAILING VESSELS 34=SINGLE RECREATIONAL MOTORBOAT 35=MULTIPLE RECREATIONAL MOTORBOATS 36=LIGHT BOAT TRAFFIC 37=HEAVY BOAT TRAFFIC 38=SUBMARINE 39=UNIDENTIFIED FISHING VESSEL(S) 40=MODERATE BOAT TRAFFIC 99=MISSING
ID_RELIABILITY_CODE	IDREL	1 DIGIT CODE FOR RELIABILITY OF THE SPECIES IDENTIFICATION. 1=UNSURE 2=PROBABLE 3=DEFINITE 9=MISSING

INDIRECT_DATA_SOURCE	IDSOURCE	3 CHARACTERS FOR ORIGINAL COLLECTOR OR SOURCE OF DATA. BWS=BLANDFORD WHALING STATION CAM=CHARLES A. MAYO CET=CETAP FLIGHT TEAM CHS=CAPE HATTERAS NATIONAL PARK SERVICE CRS=C. ROBERT SHOOP GSC=GREAT SOUTH CHANNEL SURVEY GWO=GUY W. OLIVER HEH=HERBERT E. HAYES HEW=HOWARD E. WINN JGM=JAMES G. MEAD JPR=J. PERRAN ROSS MBO=MANOMET BIRD OBSERVATORY NEA=NEW ENGLAND AQUARIUM OGB=OLLIE G. BRAZIER OTH=OTHER (MISCELLANEOUS) POP=POP OBSERVERS RAR=RICHARD A. ROWLETT RXP=ROBERT PRESCOTT SDK=SCOTT D. KRAUS SKK=STEVEN K. KATONA SSS=SAMUEL S. SADOVE TXA=THOMAS AZAROVITZ UCG=U.S. COAST GUARD WAW=WILLIAM A. WATKINS
LATITUDE	LAT	LATITUDE IN DEGREES AND MINUTES (DDMM).
LEG_MADE_GOOD_CODE	LEGGOOD	1 DIGIT CODE INDICATING WHETHER AN AERIAL SURVEY LINE WAS AT LEAST 65% COMPLETED IN ACCEPTABLE SURVEY CONDITIONS. 1=NO 2=YES 9=MISSING
LEG_NUMBER	LEGNO	2 DIGITS FOR AERIAL SURVEY LINE NUMBER. 99=MISSING
SURVEY_WATCH_STAGE	LEGSTAGE	1 DIGIT CODE FOR STAGE OF WATCH DURING SURVEY. 9=MISSING --DEDICATED AERIAL SURVEY: RECORDED ONLY DURING SURVEY LINES (LEGTYPE=2) 1=BEGIN LINE 2=CONTINUE LINE 3=BREAK OFF LINE TO CIRCLE 4=RESUME LINE 5=END LINE 6=SIGHTING BY OBSERVER OTHER THAN THOSE OFFICIALLY ON WATCH --POP SHIP AND AERIAL SURVEYS: RECORDED INDEPENDENT OF LEGTYPE 0=OFF-WATCH PERIOD (OTHER THAN SIGHTING)

		1=BEGIN WATCH PERIOD 2=CONTINUE WATCH PERIOD 5=END WATCH PERIOD 6=SIGHTING BY OTHER OBSERVER DURING A WATCH PERIOD 7=SIGHTING BY DEDICATED OBSERVER DURING AN OFF-WATCH PERIOD 8=SIGHTING BY OTHER OBSERVER DURING AN OFF-WATCH PERIOD
SURVEY_LEG_TYPE	LEGTYPE	1 DIGIT CODE FOR TYPE OF SURVEY LEG. 1=DEDICATED AERIAL, TRANSIT 2=DEDICATED AERIAL, SURVEY LINE 3=DEDICATED AERIAL, CROSSLEG 4=DEDICATED AERIAL, OTHER (CIRCLING) 5=POP SHIP, UNDERWAY 6=POP SHIP, NOT UNDERWAY 7=POP AERIAL, SURVEY LINE 9=MISSING
LONGITUDE	LON	LONGITUDE IN DEGREES AND MINUTES (DDMM).
MONTH	MONTH	MONTH (01-12). 00=MONTH UNKNOWN
NUMBER_OF_ADULTS	NUMADULT	3 DIGITS FOR NUMBER OF ADULTS OBSERVED OUT OF THE TOTAL NUMBER OF ANIMALS SIGHTED. 999=MISSING.
TOTAL_NUMBER	NUMBER	4 DIGITS FOR THE TOTAL NUMBER OF ANIMALS SIGHTED. 9999=MISSING.
NUMBER_OF_CALVES	NUMCALF	3 DIGITS FOR NUMBER OF CALVES OBSERVED OUT OF THE TOTAL NUMBER OF ANIMALS SIGHTED. 999=MISSING.
NUMBER_OF_FEMALES	NUMFEMAL	3 DIGITS FOR NUMBER OF FEMALES OBSERVED OUT OF THE TOTAL NUMBER OF ANIMALS SIGHTED. 999=MISSING.
NUMBER_OF_IMMATURES	NUMIMMAT	3 DIGITS FOR NUMBER OF IMMATURES OBSERVED OUT OF THE TOTAL NUMBER OF ANIMALS SIGHTED. 999=MISSING.
NUMBER_OF_MALES	NUMMALE	3 DIGITS FOR NUMBER OF MALES OBSERVED OUT OF THE TOTAL NUMBER OF ANIMALS SIGHTED. 999=MISSING.

NUMBER_OF_SUBADULTS	NUMSUBAD	3 DIGITS FOR NUMBER OF SUBADULTS OBSERVED OUT OF THE TOTAL NUMBER OF ANIMALS SIGHTED. 999=MISSING.
PHOTO_CODE	PHOTOS	1 DIGIT CODE INDICATING WHETHER PHOTOGRAPHS OF A GIVEN SIGHTING EXIST IN CETAP FILES. 1=NO 2=YES 9=MISSING
PLATFORM_ID_CODE	PLATFORM	3 DIGIT CODE FOR SURVEY OR SIGHTING PLATFORM.
PORT_OBSERVER	PORTOBS	1 CHARACTER CODE TO IDENTIFY THE AERIAL OBSERVER ON THE PORT SIDE OF THE PLANE. 0=G. CARTER 1=G. STONE 2=F. FAIRFIELD 3=C. DEUTSCH 4=T. DOTY 5=TURTLE WATCH GROUP OBSERVER 6=J. HAIN 7=H. WINN 8=G. SCOTT 9=R. SHOOP A=M. HYMAN B=C. PRICE C=R. EDEL D=T. CARR E=G. LEBARON F=OTHER AIRCRAFT CREW G=T. THOMPSON H=R. KENNEY I=W. ROOSENBURG J=J. ROANOWICZ K=D. GOODALE L=R. OWEN M=R. MEDVED .=MISSING
RELATIVE_BEARING	RELBEAR	3 DIGITS FOR BEARING IN DEGREES OF A GIVEN SIGHTING RELATIVE TO THE PLATFORM, WITH BOW=000. 999=MISSING
SCIENTIFIC_NAME	SCINAME	40 CHARACTER SCIENTIFIC NAME FOR EACH SPECIES.
DISTANCE_CODE	SIDIST	1 DIGIT CODE FOR DISTANCE IN NAUTICAL MILES FROM PLATFORM TO A SIGHTING. 1= 0 - 1/16 2= >1/16 - 1/8 3= >1/8 - 1/4

		4= >1/4 - 1/2 5= >1/2 - 1 6= >1 - 3 7= >3 9=MISSING
SIGHTING_NUMBER	SIGHTNO	3 DIGITS FOR SEQUENTIAL SIGHTING NUMBERS WITHIN A FILEID. SIGHTINGS OTHER THAN CETACEANS OR TURTLES WERE USUALLY ASSIGNED SIGHTNO=999. 000=NO SIGHTING
SIGHTING_OBSERVER	SIGHTOBS	1 CHARACTER CODE FOR OBSERVER ACTUALLY MAKING A GIVEN SIGHTING. CODES SAME AS PORTOBS.
SPP_NAME	SPPNM	SPECIES COMMON NAME.
SUBGROUP_SIZE_CODE	SIZEGRP	1 DIGIT CODE FOR MODAL SIZE OF SUBGROUPS WITHIN A GIVEN SIGHTING. 0=NO MODAL SUBGROUP SIZE 1=1-2 2=3 3=4 4=5-10 5=11-20 6=21-100 7=>100 9=MISSING
STARBOARD_OBSERVER	STAROBS	1 CHARACTER CODE TO IDENTIFY THE AERIAL OBSERVER ON THE STARBOARD SIDE OF THE PLANE. CODES SAME AS PORTOBS.
DEPTH_STRATUM_CODE	STRATUM	1 CHARACTER CODE TO IDENTIFY THE DEPTH STRATUM OF DEDICATED AERIAL SURVEY BLOCKS. X=0-20 FATHOMS Y=20-50 FATHOMS Z=>50 FATHOMS 0=NON-STRATIFIED AERIAL SURVEY BLOCK .=MISSING
SAMPLING_STRIP	STRIP	2 DIGIT CODE TO IDENTIFY THE RIGHT ANGLE DISTANCE INTERVAL FROM THE DEDICATED AERIAL SURVEY LINE CONTAINING A GIVEN SIGHTING. BECAUSE OF RESTRICTED DOWN-WARD VISIBILITY, DISTANCES FOR SKYMASTER ARE ACTUALLY FROM ABOUT 1/8 MILE TO EITHER SIDE OF SURVEY LINE. ODD NUMBERS ARE PORT SIDE, EVEN ARE STARBOARD. 1,2= 0 - 1/4 NAUTICAL MILE 3,4= 0 - 1/8 5,6= 1/8 - 1/4 7,8= 1/4 - 1/2

		9,10= 1/2 - 3/4 11,12= 3/4 - 1 13,14= >1 (AT-11) 1 - 2 (SKYMASTER) 15,16= >2 (SKYMASTER) 99= MISSING
SURFACE_TEMPERATURE	SURFTEMP	3 DIGITS FOR SURFACE WATER TEMPERATURE (BUCKET OR AIRBORNE RADIOMETER) TO 0.1 DEGREE C.
TAXONOMIC_CATEGORY	TAXCODE	1 DIGIT CODE TO IDENTIFY THE GENERAL CATEGORY OF SIGHTING. 1=LARGE CETACEAN 2=SMALL CETACEAN 3=TURTLE 4=OTHER 9=MISSING
TIME	TIME	4 DIGIT MILITARY TIME (HHMM), ALWAYS EASTERN STANDARD TIME. 9999=MISSING
VISIBILITY_CODE	VISIBLTY	1 DIGIT CODE FOR GENERAL VISIBILITY CONDITIONS FOR SURVEY. 1=CLEAR VISIBILITY FOR AT LEAST 2 NAUTICAL MILES. 2=VISIBILITY LESS THAN 2 MILES, FOG 3=<2 MILES, HAZE 4=<2 MILES, RAIN 5=<2 MILES, SNOW 9=MISSING
WIND_DIRECTION_CODE	WNDDIRCD	2 DIGITS FOR COMPASS DIRECTION OF WIND. 00=N 01=NNE 02=NE 03=ENE 04=E 05=ESE 06=SE 07=SSE 08=S 09=SSW 10=SW 11=WSW 12=W 13=WNW 14=NW 15=NNW 16=VARIABLE 17=NO WIND 18=NOT AVAILABLE 99=MISSING
YEAR	YEAR	LAST 2 DIGITS OF YEAR

Appendix II. Listings of code groups for variables which are not included in FILFMT listing for the CETAP/URI cetacean sighting data base.

BEHAV1-15 BEHAVIOR_CODE_1-15

(* = code used only during 1979;
= code added in 1980)

00 = DEAD, IN WATER
01 = DEAD, STRANDED
06 = FAST SWIMMING (>10 KNOTS)
07 = MODERATE SWIMMING (1-10 KNOTS)
08 = SLOW SWIMMING (<1 KNOT)
09 = OBVIOUS SPEED CHANGE
10 = APPARENTLY INFLUENCED BY PLATFORM
11 = PORPOISING
12 = RIDING VESSEL BOW WAVE
13 = BREACH (WHALES)
14 = AEROBATICS (DOLPHINS)
15 = SWIMMING UPSIDE DOWN
16 = SWIMMING ON SIDE
17 = SWIMMING AT SURFACE
18 = SWIMMING BELOW SURFACE
19 = FLIPPERING
20 = LOBTAILING, TAIL SLASHING
21 = SPYHOPPING
22 = MOTIONLESS AT SURFACE
23 = DIVE, FLUKES NOT RAISED
24 = DIVE, FLUKES RAISED
25 = BLOW, MIST VISIBLE
26 = BLOW, MIST NOT VISIBLE
27 = RESPIRATION INTERVALS RECORDED*
28 = DIVE INTERVALS RECORDED
29 = SYNCHRONOUS DIVING*
30 = SWIMMING IN WAKE OF VESSEL
31 = APPARENT VESSEL AVOIDANCE*
32 = APPARENTLY ATTRACTED TO VESSEL*
33 = APPARENTLY NOT INFLUENCED BY VESSEL*
34 = SWIMMING STEADILY IN ONE DIRECTION
35 = CIRCULAR MOVEMENT
36 = MOTIONLESS BELOW SURFACE, ON SIDE*
37 = DEFECATION
38 = CLOSE TO FISHING GEAR*
39 = MOTIONLESS BELOW SURFACE, UPSIDE DOWN*
40 = MOTHER WITH YOUNG
42 = APPARENT NURSING
43 = PENIS OBSERVED
44 = BODY CONTACT, NOT BELLY-TO-BELLY
45 = RIDING WHALE BOW WAVE
46 = SYNCHRONOUS SWIMMING*
47 = SYNCHRONOUS BREATHING*
48 = SHALLOW DIVE*
49 = APPARENTLY ATTRACTED BY OTHER VESSEL*
50 = ASSOCIATED WITH SEAWEED

51 = ASSOCIATED WITH OTHER CETACEANS
52 = ASSOCIATED WITH PINNIPEDS
53 = ASSOCIATED WITH BIRDS
54 = APPARENT FEEDING
55 = DEFINITE FEEDING*
56 = SURFACE SKIMMING, MOUTH OPEN*
57 = FEEDING ON SIDE, MOUTH OPEN*
58 = BUBBLES OBSERVED
59 = ASSOCIATED WITH SMALL FISH
60 = ASSOCIATED WITH LARGE FISH
61 = ASSOCIATED WITH SQUID
62 = ASSOCIATED WITH JELLYFISH
63 = ASSOCIATED WITH VISIBLE ZOOPLANKTON
64 = ASSOCIATED WITH SHARKS*
65 = DISTINCT SUBGROUPS*
66 = APPARENT COOPERATIVE BEHAVIOR*
67 = BELLY-TO-BELLY CONTACT
68 = MOTIONLESS BELOW SURFACE#
69 = DIVING (TURTLES)#
70 = CRAWLING UP BEACH (TURTLES)
71 = DIGGING NEST HOLE (TURTLES)
72 = LAYING EGGS (TURTLES)
73 = COVERING NEST (TURTLES)
74 = CRAWLING TOWARDS SEA (TURTLES)
75 = YOUNG HATCHING (TURTLES)
76 = HAULED OUT ON BEACH (SEALS)#
77 = HAULED OUT ON ROCKS (SEALS)#
78 = MILLING#
79 = ASSOCIATED WITH PHYSICAL FEATURE#
80 = AUDIBLE SOUNDS PRODUCED
81 = UNDERWATER SOUNDS RECORDED#
82 = APPARENT OIL AVOIDANCE
83 = APPARENT OIL ATTRACTION#
84 = IN CONTACT WITH OIL
85 = APPARENTLY NOT INFLUENCED BY OIL#
86 = CHANGE IN GROUP HEADING#
87 = CHANGE IN GROUP STRUCTURE#
91 = THRASHING, VIOLENT BEHAVIOR#
92 = TANGLED IN FISHING GEAR#
93 = ABNORMAL BEHAVIOR#
94 = UNCODEABLE BEHAVIOR#
99 = MISSING#

PLATFORM **PLATFORM_ID_CODE**

(020-039: U.S. COAST GUARD VESSELS)
020 = ALERT
021 = VIGILANT
022 = UNIMAK
023 = VIGOROUS
024 = INGHAM
025 = ACTIVE

026 = TAMAROA
027 = TANEY
028 = CHILULA
029 = DECISIVE
030 = CHEROKEE
031 = DUANE
032 = SHERMAN
033 = RELIANCE

(040-074: NOAA VESSELS)
040 = ALBATROSS IV
041 = GEORGE B. KELEZ
042 = MT. MITCHELL
043 = DELAWARE
044 = ADVANCE

(075-089: FOREIGN RESEARCH VESSELS)
075 = WIECZNO
076 = ANTON DOHRN
077 = ARGUS
078 = ALLIOT ,
079 = BELAGORSK
080 = EVRIKA

(090-149: INSTITUTIONAL RESEARCH VESSELS)
090 = HENLOPEN
091 = OCEANUS
092 = ANNANDALE
093 = ENDEAVOR
094 = ALERT (EPA CHARTER)
095 = CHALLENGE
096 = BELUGA
097 = JERE A. CHASE
098 = TRIDENT

(150-169: SAILING RESEARCH VESSELS)
150 = REGINA MARIS
151 = WESTWARD

(170-249: WHALE/BIRD WATCH VESSELS)
170 = MISS OCEAN CITY
171 = DOLPHIN III
173 = VIKING QUEEN
174 = VIKING STARSHIP

(250-264: CETAP CHARTER)
250 = STONE HORSE
251 = WALTER E. PHIPPS
252 = THREE OF A KIND
253 = WHEN AND IF
254 = FLYING SORCERESS
255 = TIOGA

(265-289=FOREIGN FISHING VESSELS)
265 = CANADIAN WHALING VESSEL, BLANDFORD STATION

(290-374: COMMERCIAL FISHING VESSELS)
290 = CHRISTINA M.

(375-424: CHARTER FISHING VESSELS)
375 = MISS OCEAN CITY
376 = FYLYING SORCERESS
377 = YANKEE CAPTAIN
378 = SEA DOLL MEDITATION

(425-474: PASSENGER FERRIES)
425 = BLOCK ISLAND
426 = MARINE EVANGELINE
427 = CARIBE
428 = BLUE NOSE

(475-525: TUGS AND WORK BOATS)
475 = ALASKAN SEAHORSE

(526-550: BLM CHARTER)
526 = SUB SIG
527 = EDGERTON
528 = OCEANUS
529 = EASTWARD
530 = ELIZABETH
531 = ATLANTIC TWIN

(551-599: MISCELLANEOUS VESSELS)
551 = WALTER E. PHIPPS
552 = SUNBEAM
553 = TIOGA
554 = BAGATELLE
555 = STATE OF MAINE
575 = WHOI MISCELLANEOUS (WATKINS)
580 = PRIVATE YACHTS (SAIL/POWER)
586 = MISC. COAST GUARD OPPOR/HIST
588 = MISC. FOREIGN R/V OPPOR/HIST
589 = MISC. INSTITUTIONAL R/V OPPOR/HIST
591 = MISC. WHALE/BIRD WATCH OPPOR/HIST
593 = MISC. COMMERCIAL F/V OPPOR/HIST
594 = MISC. CHARTER F/V OPPOR/HIST
597 = MISC. YACHT OPPOR/HIST.
599 = MISC. OTHER OPPOR/HIST

(600-624: HELICOPTERS)
600 = UNITED HELICOPTERS
601 = USCG SHIP-BASED

625 = PRIVATE AIRCRAFT

(626-634: DEDICATED AIRCRAFT)
626 = SKYMASTER (AERO-MARINE)
627 = AT-11 (AERO-MARINE)
628 = ISLANDER (NEW ENGLAND AIRWAYS)
629 = SKYMASTER (KATONA CHARTER)

630 = CESSNA 150 (KATONA CHARTER)
631 = CESSNA 206 (CETAP RECON CHARTER)

(635-644: U.S. COAST GUARD AIRCRAFT)
635 = RADIOTHERMOGRAPHY (ART)
640 = FISHERIES PATROL-CAPE COD
641 = FISHERIES PATROL-CAPE HATTERAS
642 = HARBOR PATROL

(645-699: MISCELLANEOUS AIRCRAFT)
645 = NEW ENGLAND AIRWAYS
650 = FISHSPOTTER
691 = MISC. COAST GUARD OPPOR/HIST
695 = NAVY ANTI-SUBMARINE WARFARE ENVIRONMENTAL PREDICTION SERVICES (ASWEPS)
699 = MISC. OTHER OPPOR/HIST

700 = SHORE STATION

900 = UNKNOWN

CETSPPCD **CETAP_SPECIES_CODE**
SCINAME **SCIENTIFIC_NAME**
SPPNM **SPP_NAME**

CETSPPCD	SCINAME	SPPNM
....	NO SIGHTING	NO SIGHTING
BASH	CETORHINUS MAXIMUS	BASKING SHARK
BELU	DELPHINAPTERUS LEUCAS	BELUGA
BEWH	MESOPLODON SP.	BEAKED WHALE
BLSH	PRIONACE GLAUCA	BLUE SHARK
BLWH	BALAENOPTERA MUSCULUS	BLUE WHALE
BODO	TURSIOPS TRUNCATUS	BOTTLENOSED DOLPHIN
FIWH	BALAENOPTERA PHYSALUS	FIN WHALE
FKWH	PSEUDORCA CRASSIDENS	FALSE KILLER WHALE
GOBH	ZIPHIUS CAVIROSTRIS	GOOSE-BEAKED WHALE
GRAM	GRAMPUS GRISEUS	GRAY GRAMPUS
GRTU	CHELONIA MYDAS	GREEN TURTLE
HAPO	PHOCOENA PHOCOENA	HARBOR PORPOISE
HASE	PHOCA VITULINA	HARBOR SEAL
HHSH	SPHYRNA SP.	HAMMERHEAD SHARK
HUWH	MEGAPTERA NOVAEANGLIAE	HUMPBACK WHALE
KIWH	ORCINUS ORCA	KILLER WHALE
LETU	DERMOCHELYS CORIACEA	LEATHERBACK TURTLE
LOTU	CARETTA CARETTA	LOGGERHEAD TURTLE
MIWH	BALAENOPTERA ACUTOROSTRATA	MINKE WHALE
NBWH	HYPEROODON AMPULLATUS	NORTHERN BOTTLENOSED WHALE
OCSU	MOLA MOLA	OCEAN SUNFISH
OTBI	NOT APPLICABLE	OTHER BILLFISH
PIWH	GLOBICEPHALA SP.	PILOT WHALE
PSWH	KOGIA SP.	PYGMY/DWARF SPERM WHALE

PYKW	FERESA ATTENUATA	PYGMY KILLER WHALE
RITU	LEPIDOCHELYS KEMPI	KEMP'S RIDLEY TURTLE
RIWH	EUBALAENA GLACIALIS	NORTHERN RIGHT WHALE
RTDO	STENO BREDANENSIS	ROUGH-TOOTHED DOLPHIN
SADO	DELPHINUS DELPHIS	SADDLEBACK DOLPHIN
SCFI	NOT APPLICABLE	FISH SCHOOL
SCRA	NOT APPLICABLE	SCHOOLS OF RAYS
SEWH	BALAENOPTERA BOREALIS	SEI WHALE
SIRA	NOT APPLICABLE	SINGLE RAY
SNDO	STENELLA LONGIROSTRIS	SPINNER DOLPHIN
SPDO	STENELLA ATTENUATA/PLAGIODON	SPOTTED DOLPHIN
SPWH	PHYSETER CATODON	SPERM WHALE
STDO	STENELLA COERULEOALBA	STRIPED DOLPHIN
SWFI	XIPHIUS GLADIUS	SWORDFISH
TUNS	NOT APPLICABLE	UNIDENTIFIED TUNA
UNBA	BALAENOPTERA SP.	UNIDENTIFIED BALAENOPTERA
UNBF	NOT APPLICABLE	UNIDENTIFIED BLACKFISH
UNBW	ZIPHIIDAE	UNIDENTIFIED BEAKED WHALE
UNDO	NOT APPLICABLE	UNIDENTIFIED DOLPHIN/PORPOISE
UNFI	NOT APPLICABLE	UNIDENTIFIED FISH
UNFS	NOT APPLICABLE	UNIDENTIFIED FIN/SEI
UNGD	NOT APPLICABLE	SPOTTED OR BOTTLENOSED DOLPHIN
UNLD	LAGENORHYNCHUS SP.	UNIDENTIFIED LAGENORHYNCUS
UNLW	NOT APPLICABLE	UNIDENTIFIED LARGE WHALE
UNMW	NOT APPLICABLE	UNIDENTIFIED MEDIUM WHALE
UNRO	BALAENOPTERIDAE	UNIDENTIFIED RORQUAL
UNSH	NOT APPLICABLE	UNIDENTIFIED SHARK
UNST	STENELLA SP.	UNIDENTIFIED STENELLA
UNTU	NOT APPLICABLE	UNIDENTIFIED TURTLE
WBDO	LAGENORHYNCHUS ALBIROSTRIS	WHITE-BEAKED DOLPHIN
WSDO	LAGENORHYNCHUS ACUTUS	ATLANTIC WHITE-SIDED DOLPHIN

Appendix III. Listing of occurrence frequencies or descriptive statistics of all variables contained in the CETAP/URI marine mammal sighting data base transferred to NMFS-NEFC. For continuous numeric variables, the listing shows the number of observations with valid values (N), the number with missing values (NMISS), and the minimum (MIN), maximum MAX), and mean (MEAN) values. For character, discrete numeric, or coded variables, the listing shows the number of times each value occurs in the data base.

FIELD NAME	FIELD ABBREV
AIRTEMP	**AIR_TEMPERATURE**

N = 17948
NMISS = 55774
MIN = -24
MAX = 37
MEAN = 15.1

ALT **AIRCRAFT_ALTITUDE**

N = 34659
NMISS = 39063
MIN = 0
MAX = 1981
MEAN = 219.6

ANHEAD **ANIMAL_HEADING**

ANHEAD	FREQUENCY
00	941
01	211
02	968
03	203
04	840
05	186
06	1020
07	167
08	945
09	179

ANHEAD	FREQUENCY
10	809
11	146
12	846
13	169
14	937
15	200
16	169
17	640
99	64128

BEAUFORT **BEAUFORT_SEA_STATE**

BEAUFORT	FREQUENCY
00	3969
01	12632
02	14772
03	16014
04	7919
05	2367
06	836

BEAUFORT	FREQUENCY
07	268
08	133
09	11
10	2
11	1
99	14789

BEHAV1 BEHAVIOR_CODE_1

BEHAV1	FREQUENCY
00	55
01	27
06	145
07	573
08	219
09	6
10	154
11	541
12	306
13	293
14	207
15	108
16	118
17	1654
18	625
19	35
20	62
21	24
22	260
23	201
24	204
25	1833
26	121
27	31
28	67
29	4
30	27
31	47
32	104
33	156
34	252
35	179
36	3
37	44
38	17
40	434
44	20
45	22

BEHAV1	FREQUENCY
46	18
47	1
48	12
49	3
50	19
51	446
52	4
53	308
54	379
55	97
56	2
58	17
59	91
60	34
61	14
62	4
63	7
64	7
65	108
66	3
67	35
68	34
69	36
70	1
76	11
77	25
78	53
79	100
80	13
81	14
84	12
85	1
86	3
87	4
92	9
93	1
94	70
99	62548

BEHAV2 BEHAVIOR_CODE_2

BEHAV2	FREQUENCY
00	3
06	61
07	244
08	119
09	7
10	131
11	234
12	150

BEHAV2	FREQUENCY
45	22
46	21
47	8
48	18
49	1
50	11
51	126
52	6

13	105
14	154
15	112
16	173
17	513
18	426
19	64
20	74
21	27
22	36
23	450
24	200
25	580
26	76
27	125
28	65
29	7
30	32
31	33
32	67
33	135
34	246
35	88
36	1
37	15
38	10
39	2
40	132
42	3
44	19
53	340
54	192
55	58
56	3
57	5
58	44
59	111
60	30
61	18
62	6
63	4
64	6
65	38
66	2
67	23
68	11
69	5
76	1
77	1
78	28
79	26
80	8
81	7
84	2
86	5
87	10
91	3
92	3
94	47
99	67553

BEHAV3 **BEHAVIOR_CODE_3**

BEHAV3	FREQUENCY
00	1
06	33
07	133
08	58
09	15
10	63
11	128
12	60
13	48
14	75
15	92
16	132
17	245
18	198
19	35
20	80
21	19
22	27
23	159
24	152

BEHAV3	FREQUENCY
43	1
44	14
45	12
46	7
47	5
48	8
49	1
50	7
51	80
53	197
54	80
55	26
57	5
58	16
59	81
60	20
61	2
62	5
63	3
64	4

25	377	65	30
26	55	67	24
27	77	68	1
28	91	69	2
29	19	76	1
30	28	77	1
31	19	78	22
32	45	79	22
33	43	80	10
34	164	81	4
35	60	84	1
37	20	86	8
38	13	87	6
39	1	91	2
40	122	94	37
42	2	99	70088

BEHAV4 **BEHAVIOR_CODE_4**

BEHAV4	FREQUENCY	BEHAV4	FREQUENCY
06	18	45	9
07	84	46	8
08	15	47	3
09	12	48	1
10	27	49	1
11	47	50	8
12	24	51	59
13	15	52	3
14	58	53	125
15	52	54	54
16	101	55	5
17	108	57	2
18	83	58	21
19	21	59	42
20	45	60	8
21	16	61	12
22	12	62	1
23	59	63	3
24	66	64	1
25	186	65	19
26	22	66	1
27	28	67	11
28	56	68	2
29	20	69	1
30	14	78	14
31	13	79	6
32	38	80	11
33	118	81	1
34	69	84	1
35	38	85	1
37	9	86	6
38	3	87	9
40	80	91	1
42	3	94	36

43	1	99	71661
44	14		

BEHAV5 **BEHAVIOR_CODE_5**

BEHAV5	FREQUENCY	BEHAV5	FREQUENCY
06	17	38	3
07	25	40	43
08	10	42	1
09	5	43	1
10	30	44	8
11	23	45	7
12	6	46	10
13	15	47	1
14	29	48	1
15	31	50	3
16	55	51	32
17	43	53	88
18	36	54	45
19	10	55	4
20	20	57	3
21	13	58	11
22	7	59	23
23	21	60	8
24	38	61	4
25	75	62	4
26	8	63	2
27	12	65	16
28	36	67	22
29	31	78	6
30	2	79	8
31	3	80	3
32	39	86	5
33	29	87	6
34	31	94	39
35	23	99	72582
37	10		

BEHAV6 **BEHAVIOR_CODE_6**

BEHAV6	FREQUENCY	BEHAV6	FREQUENCY
06	5	38	1
07	9	40	32
08	5	42	2
09	5	43	5
10	23	44	12
11	11	45	7
12	2	47	3
13	5	48	1
14	13	50	1
15	10	51	20
16	27	53	35
17	23	54	34

18	19
19	3
20	7
21	6
22	6
23	12
24	22
25	28
26	2
28	5
29	13
30	5
31	3
32	26
33	11
34	12
35	20
37	6
55	8
58	9
59	17
60	3
61	2
62	1
63	1
65	4
66	1
67	9
78	10
79	5
80	6
86	2
87	7
91	1
94	30
99	73109

BEHAV7 **BEHAVIOR_CODE_7**

BEHAV7	FREQUENCY
06	3
07	8
08	5
09	2
10	9
11	5
12	1
13	3
14	8
15	10
16	15
17	8
18	14
19	5
20	4
21	1
22	4
23	6
24	9
25	18
26	1
27	1
28	5
29	10
30	3
32	17
33	5
34	8
35	6
37	3
40	11
44	9
45	3
46	4
50	4
51	22
53	27
54	11
55	2
56	1
58	7
59	8
60	3
65	2
67	10
78	5
79	2
80	3
81	2
86	6
87	5
91	1
94	26
99	73351

BEHAV8 BEHAVIOR_CODE_8

BEHAV8	FREQUENCY
06	1
07	3
08	3
09	4
10	4
11	6
13	1
14	4
15	3
16	10
17	7
18	6
19	1
20	3
21	1
22	2
23	5
24	6
25	10
28	1
29	11
30	2
31	1
32	8
33	1
34	1
35	4
37	1

BEHAV8	FREQUENCY
40	9
44	2
45	2
46	1
47	1
48	1
50	2
51	9
53	8
54	9
55	1
57	1
58	4
59	3
61	2
64	1
65	1
66	1
67	3
78	2
79	2
80	1
81	1
86	1
87	5
94	16
99	73523

BEHAV9 BEHAVIOR_CODE_9

BEHAV9	FREQUENCY
06	1
07	1
08	1
09	2
10	1
11	4
14	2
15	2
16	1
17	5
18	7
19	1
20	2
22	1
23	2
24	2
25	3
26	1

BEHAV9	FREQUENCY
35	5
37	1
40	6
44	1
46	1
48	1
51	3
53	6
54	1
55	1
58	4
59	4
61	3
65	2
67	1
78	1
79	1
80	3

28	1	83	1
29	2	86	1
30	1	94	9
32	4	99	73615
33	4		

BEHAV10 BEHAVIOR_CODE_10

BEHAV10	FREQUENCY	BEHAV10	FREQUENCY
07	1	37	3
10	1	40	1
13	1	42	1
15	1	44	2
16	1	45	1
17	2	51	1
18	3	53	5
19	1	54	4
20	1	56	1
24	2	58	3
25	1	59	4
28	2	67	2
29	1	79	1
32	2	80	1
33	2	86	2
34	1	94	6
36	1	99	73660

BEHAV11 BEHAVIOR_CODE_11

BEHAV11	FREQUENCY	BEHAV11	FREQUENCY
17	1	53	4
18	1	54	4
20	1	58	2
24	3	59	3
25	3	62	1
26	1	65	1
32	1	78	1
35	2	79	2
37	1	80	1
40	1	87	1
44	1	94	4
45	1	99	73680
51	1		

BEHAV12 BEHAVIOR_CODE_12

BEHAV12	FREQUENCY	BEHAV12	FREQUENCY
13	1	53	1
23	1	55	2
25	3	59	1
35	1	65	2
39	1	78	1

42	2		86	1
44	1		94	4
46	2		99	73695
51	3			

BEHAV13 **BEHAVIOR_CODE_13**

BEHAV13	FREQUENCY	BEHAV13	FREQUENCY
24	1	54	1
37	1	66	1
40	1	67	1
44	1	80	2
47	1	94	2
48	1	99	73707
51	2		

BEHAV14 **BEHAVIOR_CODE_14**

BEHAV14	FREQUENCY
10	1
25	1
44	1
53	2
59	1
94	2
99	73714

BEHAV15 **BEHAVIOR_CODE_15**

BEHAV15	FREQUENCY
13	1
35	1
58	1
65	1
67	1
80	1
94	2
99	73714

BLOCK **AERIAL_SURVEY_BLOCK**

BLOCK	FREQUENCY	BLOCK	FREQUENCY
.	48202	O	399
A	1163	P	1165
B	676	Q	939
C	566	R	210
D	1040	S	314
E	3475	W	2555
F	1905	0	249
G	2831	1	499
H	2225	2	1084

I	1417	3	263
J	563	4	148
K	397	5	81
L	284	6	233
M	307	7	167
N	365		

CETSPPCD CETAP_SPECIES_CODE

CETSPPCD	FREQUENCY	SCINAME	SPPNM
....	48080	NO SIGHTING	NO SIGHTING
BASH	174	CETORHINUS MAXIMUS	BASKING SHARK
BELU	10	DELPHINAPTERUS LEUCAS	BELUGA
BEWH	14	MESOPLODON SP.	BEAKED WHALE
BLSH	195	PRIONACE GLAUCA	BLUE SHARK
BLWH	13	BALAENOPTERA MUSCULUS	BLUE WHALE
BODO	1152	TURSIOPS TRUNCATUS	BOTTLENOSED DOLPHIN
FIWH	2888	BALAENOPTERA PHYSALUS	FIN WHALE
FKWH	5	PSEUDORCA CRASSIDENS	FALSE KILLER WHALE
GOBH	6	ZIPHIUS CAVIROSTRIS	GOOSE-BEAKED WHALE
GRAM	499	GRAMPUS GRISEUS	GRAY GRAMPUS
GRTU	7	CHELONIA MYDAS	GREEN TURTLE
HAPO	1287	PHOCOENA PHOCOENA	HARBOR PORPOISE
HASE	112	PHOCA VITULINA	HARBOR SEAL
HHSH	128	SPHYRNA SP.	HAMMERHEAD SHARK
HUWH	1503	MEGAPTERA NOVAEANGLIAE	HUMPBACK WHALE
KIWH	37	ORCINUS ORCA	KILLER WHALE
LETU	133	DERMOCHELYS CORIACEA	LEATHERBACK TURTLE
LOTU	3457	CARETTA CARETTA	LOGGERHEAD TURTLE
MIWH	746	BALAENOPTERA ACUTOROSTRATA	MINKE WHALE
NBWH	25	HYPEROODON AMPULLATUS	NORTHERN BOTTLENOSED WHALE
OCSU	1825	MOLA MOLA	OCEAN SUNFISH
OTBI	12	NOT APPLICABLE	OTHER BILLFISH
PIWH	1051	GLOBICEPHALA SP.	PILOT WHALE
PSWH	3	KOGIA SP.	PYGMY/DWARF SPERM WHALE
PYKW	1	FERESA ATTENUATA	PYGMY KILLER WHALE
RITU	6	LEPIDOCHELYS KEMPI	KEMP'S RIDLEY TURTLE
RIWH	1089	EUBALAENA GLACIALIS	NORTHERN RIGHT WHALE
RTDO	2	STENO BREDANENSIS	ROUGH-TOOTHED DOLPHIN
SADO	661	DELPHINUS DELPHIS	SADDLEBACK DOLPHIN
SCFI	66	NOT APPLICABLE	FISH SCHOOL
SCRA	49	NOT APPLICABLE	SCHOOLS OF RAYS
SEWH	87	BALAENOPTERA BOREALIS	SEI WHALE
SIRA	186	NOT APPLICABLE	SINGLE RAY
SNDO	6	STENELLA LONGIROSTRIS	SPINNER DOLPHIN
SPDO	166	STENELLA ATTENUATA/PLAGIODON	SPOTTED DOLPHIN
SPWH	397	PHYSETER CATODON	SPERM WHALE
STDO	127	STENELLA COERULEOALBA	STRIPED DOLPHIN
SWFI	14	XIPHIUS GLADIUS	SWORDFISH
TUNS	12	NOT APPLICABLE	UNIDENTIFIED TUNA
UNBA	49	BALAENOPTERA SP.	UNIDENTIFIED BALAENOPTERA
UNBF	99	NOT APPLICABLE	UNIDENTIFIED BLACKFISH
UNBW	32	ZIPHIIDAE	UNIDENTIFIED BEAKED WHALE
UNDO	2181	NOT APPLICABLE	UNIDENTIFIED DOLPHIN/PORPOISE

UNFI	85	NOT APPLICABLE	UNIDENTIFIED FISH
UNFS	322	NOT APPLICABLE	UNIDENTIFIED FIN/SEI
UNGD	12	NOT APPLICABLE	SPOTTED OR BOTTLENOSED DOLPHIN
UNLD	44	LAGENORHYNCHUS SP.	UNIDENTIFIED LAGENORHYNCUS
UNLW	1073	NOT APPLICABLE	UNIDENTIFIED LARGE WHALE
UNMW	294	NOT APPLICABLE	UNIDENTIFIED MEDIUM WHALE
UNRO	486	BALAENOPTERIDAE	UNIDENTIFIED RORQUAL
UNSH	1139	NOT APPLICABLE	UNIDENTIFIED SHARK
UNST	171	STENELLA SP.	UNIDENTIFIED STENELLA
UNTU	477	NOT APPLICABLE	UNIDENTIFIED TURTLE
WBDO	79	LAGENORHYNCHUS ALBIROSTRIS	WHITE-BEAKED DOLPHIN
WSDO	948	LAGENORHYNCHUS ACUTUS	ATLANTIC WHITE-SIDED DOLPHIN

CIRCLFLG **CIRCLING_TIME_FLAG**

CIRCLFLG	FREQUENCY
1	175
2	416
9	73131

CLOUD **CLOUD_COVER_CODE**

CLOUD	FREQUENCY
00	17392
01	4553
02	2535
03	1726
04	1787
05	1429

CLOUD	FREQUENCY
06	1434
07	2285
08	8758
09	779
10	143
99	30901

CONFIDNC **CONFIDENCE_CODE**

CONFIDNC	FREQUENCY
00	16898
01	641
02	728
03	638
04	260
05	121
06	56

CONFIDNC	FREQUENCY
07	14
08	2
09	1467
10	4292
11	332
99	48093

DATAMETH **COUNTING_METHOD**

DATAMETH	FREQUENCY
1	19703
2	1533
3	34
4	37
9	52415

DAY **DAY**

DAY	FREQUENCY
00	927
01	2410
02	2070
03	2061
04	1784
05	1881
06	2218
07	2446
08	2190
09	3518
10	3095
11	2384
12	2766
13	2159
14	2320
15	1905

DAY	FREQUENCY
16	2406
17	2773
18	2785
19	3182
20	2385
21	3224
22	2483
23	3158
24	2204
25	1898
26	2232
27	1797
28	2372
29	1404
30	2155
31	1130

DDSOURCE **DIRECT_DATA_SOURCE**

DDSOURCE	FREQUENCY
CAM	524
CET	51925
CHS	7
CRS	190
EDM	313
GWO	233
HEH	316
HEW	6650
MBO	2372

DDSOURCE	FREQUENCY
OGB	1272
OTH	567
RAR	673
RXP	1
SDK	157
SKK	4198
TXA	848
UCG	3476

DEBRIS **DEBRIS_CODE**

DEBRIS	FREQUENCY
0	118
1	1045
2	228
3	147
4	107

DEBRIS	FREQUENCY
5	4067
6	15
7	67
9	67928

DEPTH **DEPTH**

N = 20837
NMISS = 52885
MIN = 0
MAX = 5578
MEAN = 428.2

DIVETIME DIVE_TIME

```
        N = 107
    NMISS = 73615
      MIN = 00:06
      MAX = 16:00
```

EVENTNO EVENT_NUMBER

N = 73722 (NEVER MISSING, NO STATISTICS COMPUTED)

FILEID FILE_ID_NUMBER

N = 73722 (NEVER MISSING, 964 DIFFERENT FILEID'S)

SURVEY TYPE (FIRST CHARACTER OF FILEID)

SURVTYPE	FREQUENCY
A	19252
D	177
E	780
F	9512
G	286
H	9672
I	15
J	1135
K	1
L	130

SURVTYPE	FREQUENCY
M	960
O	2967
P	22305
Q	553
R	5050
T	695
U	2
W	222
Y	8

FLUKES FLUKE_PHOTO_CODE

FLUKES	FREQUENCY
1	1511
2	95
9	72116

GLAREAMT GLARE_AMOUNT

GLAREAMT	FREQUENCY
1	9837
2	22013
3	9545
9	32327

GLARELOC GLARE_LOCATION

GLARELOC	FREQUENCY
1	2318
2	8048

3	8146
4	749
9	54461

GROUPS NUMBER_OF_SUBGROUPS

N = 278
NMISS = 73319 (NO DISTINCT SUBGROUPS, CODE=01, N=125)
MIN = 2
MAX = 30
MEAN = 3.6

HEADING PLATFORM_HEADING

N = 37287
NMISS = 36435
MIN = 000
MAX = 359
MEAN = 196

HERDTYPE HERD_TYPE_CODE

HERDTYPE	FREQUENCY
.	72715
A	190
B	242
C	333
D	2
E	3
F	174
G	33
H	7
J	23

HUMANACT HUMAN_ACTIVITY_CODE

HUMANACT	FREQUENCY
00	311
01	18
02	6
03	7
04	19
05	39
06	3
07	2
08	204
09	836
10	5
11	781
12	44
13	12
14	14
15	3
16	499
17	21
18	2
19	5
20	28
21	2
22	2
23	54
24	57
25	276
26	994
27	144
28	360
29	113
30	46
31	20
32	99
33	5
34	33
35	11
36	122
37	62
38	30
39	99
40	15
99	68319

IDREL ID_RELIABILITY_CODE

IDREL	FREQUENCY
1	312
2	3218
3	22112
9	48080

IDSOURCE **INDIRECT_DATA_SOURCE**

IDSOURCE	FREQUENCY
BWS	313
CAM	530
CET	24880
CHS	7
CRS	657
GSC	3514
GWO	254
HEH	18
HEW	377
JGM	83
JPR	1
MBO	2434

IDSOURCE	FREQUENCY
NEA	157
OGB	178
OTH	1650
POP	28255
RAR	437
RXP	1
SDK	4
SKK	3868
SSS	2
TXA	848
UCG	5194
WAW	60

LAT **LATITUDE**

N = 73722
NMISS = 0
MIN = 01 52
MAX = 64 15
MEAN = 40 01

LEGGOOD **LEG_MADE_GOOD_CODE**

LEGGOOD	FREQUENCY
1	1849
2	20677
9	51196

LEGNO **LEG_NUMBER**

N = 24273
NMISS = 49449
MIN = 00
MAX = 64

LEGSTAGE SURVEY_WATCH_STAGE

LEGSTAGE	FREQUENCY
0	2546
1	5839
2	39967
3	1811
4	1806
5	5853
6	339
7	13
8	20
9	15528

LEGTYPE SURVEY_LEG_TYPE

LEGTYPE	FREQUENCY
1	2511
2	21033
3	1556
4	1083
5	25097
6	2361
7	9705
9	10376

LON **LONGITUDE**

```
    N = 73722
NMISS = 0
  MIN = 05 20
  MAX = 98 00
 MEAN = 70 25
```

MONTH **MONTH**

MONTH	FREQUENCY
01	2962
02	2180
03	4977
04	6820
05	13020
06	8578
07	7583
08	8518
09	6148
10	5306
11	3725
12	3905

NUMADULT **NUMBER_OF_ADULTS**

```
    N = 326
NMISS = 73396
  MIN = 1
  MAX = 170
 MEAN = 5.5
```

NUMBER **TOTAL_NUMBER**

```
    N = 25293
NMISS = 48429
  MIN = 1
  MAX = 2000
 MEAN = 10.1
```

NUMCALF **NUMBER_OF_CALVES**

N = 383
NMISS = 73339
MIN = 1
MAX = 20
MEAN = 2.0

NUMFEMAL **NUMBER_OF_FEMALES**

N = 45
NMISS = 73677
MIN = 0
MAX = 8
MEAN = 1.5

NUMIMMAT **NUMBER_OF_IMMATURES**

N = 96
NMISS = 73626
MIN = 1
MAX = 20
MEAN = 2.3

NUMMALE **NUMBER_OF_MALES**

N = 19
NMISS = 73703
MIN = 1
MAX = 2
MEAN = 1.1

NUMSUBAD **NUMBER_OF_SUBADULTS**

N = 43
NMISS = 73679
MIN = 1
MAX = 27
MEAN = 4.2

PHOTOS **PHOTO_CODE**

PHOTOS	FREQUENCY
1	23245
2	2008
9	48469

PLATFORM **PLATFORM_ID_CODE**

PLATFORM	FREQUENCY
020	697
021	438
022	1731
376	8
377	31
378	30

023	1568	425	1
024	824	426	21
025	994	427	11
026	1156	428	81
027	477	475	17
028	260	526	849
029	2163	527	136
030	1377	528	59
031	91	529	746
032	2	530	114
033	1004	531	69
040	3208	551	4
041	600	552	43
042	71	553	224
043	281	554	16
044	164	555	92
075	317	575	83
076	780	580	123
077	2	586	2042
078	716	588	115
079	543	589	73
080	1018	591	419
090	54	593	121
091	192	594	34
092	28	597	39
093	141	599	1052
094	77	600	3
095	109	601	55
096	200	625	510
097	13	626	6562
098	214	627	21433
150	195	628	86
151	195	629	37
170	54	630	61
171	1258	631	45
173	202	635	4198
174	5	640	4983
250	73	641	16
251	56	642	40
252	59	645	3
253	27	650	89
254	22	691	11
255	377	695	682
265	313	699	21
290	89	700	509
375	14	900	3276

PORTOBS **PORT_OBSERVER**

PORTOBS	FREQUENCY	PORTOBS	FREQUENCY
.	53305	M	2103
A	255	0	2775
B	782	1	1931
C	203	2	2629

D	1575
E	808
G	121
H	772
I	200
J	193
K	38
L	242
3	1675
4	2255
5	534
6	490
7	452
8	226
9	158

RELBEAR **RELATIVE_BEARING**

N = 1695
NMISS = 72027
MIN = 000
MAX = 355
MEAN = 175

SCINAME **SCIENTIFIC_NAME**

(FREQUENCIES LISTED UNDER CETSPPCD)

SIDIST **DISTANCE_CODE**

SIDIST	FREQUENCY
1	1846
2	584
3	551
4	592
5	500
6	521
7	104
9	69024

SIGHTNO **SIGHTING_NUMBER**

N = 25642
NMISS = 48080 (NO STATISTICS COMPUTED)

SIGHTOBS **SIGHTING_OBSERVER**

SIGHTOBS	FREQUENCY
.	69631
A	48
B	173
C	22
D	372
E	136
F	44
G	9
H	371
I	76
J	68
K	3
L	39
M	36
0	834
1	416
2	501
3	276
4	411
5	78
6	80
7	48
8	36
9	14

SPPNM **SPECIES_COMMON_NAME**

(FREQUENCIES LISTED UNDER CETSPPCD)

SIZEGRP SUBGROUP_SIZE_CODE

SIZEGRP	FREQUENCY
0	48
1	20
2	25
3	22
4	68

SIZEGRP	FREQUENCY
5	40
6	22
7	2
9	73475

STAROBS **STARBOARD_OBSERVER**

STAROBS	FREQUENCY
.	52300
A	190
B	940
C	44
D	1199
E	774
F	14
G	289
H	4176
I	456
J	403
K	67

STAROBS	FREQUENCY
L	283
0	2892
1	2622
2	1918
3	1589
4	2023
5	691
6	576
7	2
8	175
9	99

STRATUM **DEPTH_STRATUM_CODE**

STRATUM	FREQUENCY
.	47636
X	1680
Y	3556
Z	4831
0	16019

STRIP **SAMPLING_STRIP**

STRIP	FREQUENCY
01	572
02	509
03	897
04	803
05	491
06	493
07	279
08	247
09	113

STRIP	FREQUENCY
10	87
11	55
12	43
13	49
14	43
15	12
16	11
99	69018

SURFTEMP SURFACE_TEMPERATURE

N = 36581
NMISS = 37141
MIN = -2.0
MAX = 31.7
MEAN = 15.04

TAXCODE TAXONOMIC_CATEGORY

TAXCODE	FREQUENCY
1	11346
2	8915
3	4079
4	3997
9	45385

TIME TIME

N = 68089
NMISS = 5633
MIN = 0000
MAX = 2359

VISIBLTY VISIBILITY_CODE

VISIBLTY	FREQUENCY
1	39434
2	2454
3	4896
4	1215
5	138
9	25585

WNDDIRCD WIND_DIRECTION_CODE

WINDDIR	FREQUENCY
00	2323
01	946
02	3241
03	1232
04	1757
05	1215
06	2461
07	941
08	2787
09	1443

WINDDIR	FREQUENCY
10	5179
11	1097
12	3118
13	2654
14	4003
15	1628
16	67
17	2521
18	3802
99	31307

YEAR YEAR

YEAR	FREQUENCY
58	1
59	2
60	1
61	1
63	45
64	44
65	67
66	364
67	692
68	708
69	228
70	569
71	403

YEAR	FREQUENCY
72	146
73	31
74	850
75	3102
76	1567
77	1178
78	2199
79	30388
80	19562
81	7927
82	110
83	23
85	3514

Appendix IV. Listing of the Statistical Analysis System (SAS) program which quantifies sighting effort by measuring the length of trackline surveyed within blocks measuring 10 minutes of latitude by 10 minutes of longitude. Complete documentation is contained within the program.

```
*********************************************************************
*****                                                           *****
*****               SURVEY EFFORT MEASUREMENT PROGRAM           *****
*****                                                           *****
*********************************************************************
                                 *;
*********************************************************************
*****                                                           *****
*****  THIS PROGRAM CALCULATES SIGHTING EFFORT FOR DEDICATED     *****
*****  AND POP AERIAL AND SHIPBOARD MARINE MAMMAL SURVEYS,       *****
*****  MEASURED AS LENGTH OF SURVEY TRACK LINE SUCCESSFULLY      *****
*****  COMPLETED WITHIN DEFINED CONDITIONS IN BLOCKS WHICH ARE   *****
*****  10 MINUTES OF LATITUDE BY 10 MINUTES OF LONGITUDE.        *****
*****  OUTPUT IS A LISTING OF SEASON, LAT/LONG OF THE BLOCK      *****
*****  CENTER, AND EFFORT.  THE PROGRAM IS WRITTEN IN SAS CODE   *****
*****  AS OPERATIONAL ON THE UNIVERSITY OF RHODE ISLAND MAIN-    *****
*****  FRAME COMPUTER SYSTEM.  IT IS DESIGNED TO USE AS INPUT    *****
*****  THE CETAP DATA BASE TAPE AS FORMATTED FOR THE NMFS        *****
*****  WOODS HOLE VAX COMPUTER SYSTEM, OR OTHER RAW SIGHTING     *****
*****  DATA FILE IN IDENTICAL FORMAT.                            *****
*****                                                           *****
*****  DOCUMENTATION AND COMMENTS ARE PLACED IN FRAMES OF AS-    *****
*****  TERISKS FOLLOWED BY A SEMICOLON, IN SAS COMMENT FORMAT.   *****
*****  MATERIAL IN LOWER CASE ENCLOSED BY SQUARE BRACKETS,       *****
*****  E.G. [these three words], DESIGNATES FILE NAMES, ETC.     *****
*****  WHICH WILL BE DETERMINED BY THE PROGRAM USER.             *****
*****                                                           *****
*****  ORIGINAL PROGRAM WRITTEN BY GERALD B. EPSTEIN, CETAP,     *****
*****  UNIVERSITY OF RHODE ISLAND, DECEMBER 1982.                *****
*****                                                           *****
*****  MODIFICATIONS AND DOCUMENTATION BY ROBERT D. KENNEY,      *****
*****  UNIVERSITY OF RHODE ISLAND, JANUARY 1986.                 *****
*****                                                           *****
*****  TESTED USING NMFS DATA TAPE, 27 JANUARY 1986.             *****
*****                                                           *****
*********************************************************************
                                 *;
*********************************************************************
*****                                                           *****
*****  READ IN THE INPUT DATA SET FROM TAPE.  [infile data set   *****
*****  name] AS DEFINED IN JOB CONTROL STATEMENT.  STARTING      *****
*****  AND ENDING COLUMN NUMBERS FOR VARIABLES ARE CORRECT FOR   *****
*****  NMFS-VAX VERSION OF CETAP DATA BASE, BUT CAN BE EASILY    *****
*****  CHANGED TO INPUT FROM ANY SIGHTING DATA SET ON TAPE OR    *****
*****  DISK, AS LONG AS THE REQUIRED VARIABLES EXIST.  ANY       *****
*****  VARIABLES NOT EXISTING IN SUCH A DATA SET CAN BE          *****
*****  CREATED IN INITIAL DATA STEPS, E.G. FILEID='P186000',     *****
*****  OR SUBSEQUENT STATEMENTS IN THE PROGRAM USING THOSE       *****
*****  VARIABLES WILL NEED TO BE MODIFIED OR DELETED.            *****
*****                                                           *****
*********************************************************************
                                 *;
```

```
DATA DATABASE;
     INFILE [infile data set name];
     INPUT FILEID $ 68-74 EVENTNO 63-67 SIGHTNO 176-178
           MONTH 103-104 DAY 49-50 TIME 224-227
           LATDEG 90-91 LATMIN 92-93 LONDEG 99-100 LONMIN 101-102
           ALT 4-7 BEAUFORT 10-11 VISIBLTY 228
           LEGTYPE 98 LEGSTAGE 97;

**********************************************************************
*****                                                            *****
*****   CREATE VARIABLES "FID1" = FIRST CHARACTER OF FILEID, AND *****
*****   "FID" = FIRST TWO CHARACTERS OF FILEID.  THESE DEFINE    *****
*****   THE TYPE OF SURVEY IN A FILE.  THEN INCLUDE ONLY THOSE   *****
*****   DATA WITH THE PROPER SURVEY TYPES, BASICALLY DEDICATED   *****
*****   OR POP USING STANDARD METHODS.                           *****
*****                                                            *****
**********************************************************************
                                  *;
     FID1 = SUBSTR(FILEID,1,1);
     FID = SUBSTR(FILEID,1,2);
     IF (FID1='A' OR FID1='D' OR FID1='G' OR FID1='L' OR FID1='E' OR
        FID1='R' OR FID1='T' OR FID1='P' OR FID1='I' OR FID1='W' OR
        FID='M1' OR FID='M2' OR FID='F0' OR FID='F1' OR FID='F2');

**********************************************************************
*****                                                            *****
*****             DELETE IF TIME IS MISSING (=9999).             *****
*****                                                            *****
**********************************************************************
                                  *;
     IF TIME=9999 THEN DELETE;

**********************************************************************
*****                                                            *****
*****                 DEFINE CALENDAR SEASONS.                   *****
*****   (MONTHS AND DAYS CAN BE CHANGED TO SUBDIVIDE THE DATA    *****
*****   INTO ANY TIME PERIODS DESIRED, E.G. 8 MARMAP SEASONS)    *****
*****                                                            *****
**********************************************************************
                                  *;
     IF (MONTH=12 AND DAY GE 21) OR MONTH=1 OR MONTH=2 OR
           (MONTH=3 AND DAY LE 20) THEN SEASON='WINTER';
       ELSE IF (MONTH=3 AND DAY GE 21) OR MONTH=4 OR MONTH=5 OR
           (MONTH=6 AND DAY LE 20) THEN SEASON='SPRING';
       ELSE IF (MONTH=6 AND DAY GE 21) OR MONTH=7 OR MONTH=8 OR
           (MONTH=9 AND DAY LE 20) THEN SEASON='SUMMER';
       ELSE IF (MONTH=9 AND DAY GE 21) OR MONTH=10 OR MONTH=11 OR
           (MONTH=12 AND DAY LE 20) THEN SEASON='FALL';

**********************************************************************
*****                                                            *****
*****   DEFINE VARIABLES FOR TIME HOURS AND MINUTES.             *****
*****                                                            *****
**********************************************************************
                                  *;
```

```
     TIMEDEC = TIME/100;
     TIMEHR = INT(TIMEDEC);
     TIMEMIN = INT(100*(TIMEDEC - TIMEHR));

**********************************************************************
*****                                                            *****
*****   KEEP ONLY THOSE VARIABLES NEEDED FOR FURTHER STEPS.      *****
*****                                                            *****
**********************************************************************
                                  *;
     KEEP FILEID FID1 FID EVENTNO SIGHTNO LATDEG LATMIN LONDEG LONMIN
          TIMEHR TIMEMIN BEAUFORT ALT LEGTYPE LEGSTAGE SEASON VISIBLTY;


**********************************************************************
*****                                                            *****
*****   SORT THE DATA SET BY FILEID, EVENTNO, AND SIGHTNO.       *****
*****                                                            *****
**********************************************************************
                                  *;
PROC SORT DATA=DATABASE;
     BY FILEID EVENTNO SIGHTNO;


**********************************************************************
*****                                                            *****
*****   CREATE A NEW DATASET FROM THE FIRST.  THIS DATASET WILL  *****
*****   CONTAIN DISTANCES BETWEEN SUCCESSIVE POINTS ON A SURVEY  *****
*****   LINE, IF THAT SEGMENT WAS COMPLETED UNDER ACCEPTABLE     *****
*****   CONDITIONS.  THE RETAIN STATEMENT HOLDS THE VALUES OF    *****
*****   THE VARIABLES WITH NAMES ENDING IN "1" FROM THE PREVIOUS *****
*****   LINE IN THE FILE.  SINCE THESE ARE DEFINED IN "LAGALL"   *****
*****   AS EQUAL TO THE CORRESPONDING VARIABLE, THE RESULT IS    *****
*****   THAT EACH OBSERVATION HAS A SET OF ITS OWN VARIABLES AND *****
*****   A SET OF THE SAME VARIABLES FROM THE PREVIOUS OBSERVA-   *****
*****   TION TO BE USED FOR COMPUTATIONS, ETC.  THE NEWLY DE-    *****
*****   FINED VARIABLES "DISTANCE" (=DISTANCE BETWEEN POINTS)    *****
*****   AND "ETIME" (=ELAPSED TIME TO COVER THAT DISTANCE) ARE   *****
*****   INITIALLY SET TO ZERO.                                   *****
*****                                                            *****
**********************************************************************
                                  *;
DATA MILESHRS;
     SET DATABASE;
     BY FILEID;
     RETAIN TIMEHR1 TIMEMIN1 LATDEG1 LATMIN1 LONDEG1 LONMIN1
            LEGTYPE1 LEGSTAG1 BEAUFOR1 ALT1 VISIBLT1;
     DISTANCE = 0;
     ETIME = 0;
```

```
*********************************************************************
*****                                                           *****
*****   IF THE FIRST LINE IN A FILEID, THEN RESET AND BEGIN     *****
*****   COMPUTATIONS.  SET DISTANCE AND ELAPSED TIME TO MISSING *****
*****   (PRELAG) FOR POP SURVEYS WHEN OFF WATCH.                *****
*****                                                           *****
*********************************************************************
                                   *;
    IF FIRST.FILEID THEN DO;
       IF (LEGTYPE = 5 OR LEGTYPE = 6 OR LEGTYPE = 7) AND
          (LEGSTAGE = 7 OR LEGSTAGE = 8 OR LEGSTAGE = 9)
          THEN GO TO PRELAG;
       GO TO LAGALL;
       END;

*********************************************************************
*****                                                           *****
*****   WHEN A SEGMENT IS DONE IN UNACCEPTABLE CONDITIONS       *****
*****   (BEAUFORT > 3, AIRCRAFT ALTITUDE > 1000 FT, OR VISIBIL- *****
*****   ITY < 2 MILES), SET DISTANCE AND TIME TO MISSING.       *****
*****                                                           *****
*********************************************************************
                                   *;
    IF BEAUFOR1 GT 3 OR ALT1 GT 304.8 OR (2 LE VISIBLT1 LE 5)
       THEN GO TO PRELAG;

*********************************************************************
*****                                                           *****
*****   FOR POP SURVEYS, IF (1) OBSERVERS JUST BEGAN WATCH AT   *****
*****   CURRENT POINT, OR (2) OBSERVERS ARE OFF WATCH AT CURRENT *****
*****   POINT, OR (3) OBSERVERS WERE OFF WATCH AT PREVIOUS POINT, *****
*****   THEN TRACK SEGMENT BETWEEN THE POINTS WAS NOT ACCEPTABLY *****
*****   SURVEYED.                                               *****
*****                                                           *****
*********************************************************************
                                   *;
    IF (LEGTYPE=5 OR LEGTYPE=6 OR LEGTYPE=7) AND LEGSTAGE=1
       THEN GO TO LAGALL;
    IF (LEGSTAGE=7 OR LEGSTAGE=8 OR LEGSTAGE=9) THEN GO TO PRELAG;
    IF (LEGSTAG1=7 OR LEGSTAG1=8 OR LEGSTAG1=9) THEN GO TO LAGALL;

*********************************************************************
*****                                                           *****
*****   COMPUTE LAT/LONG OF CURRENT (2) AND PREVIOUS (1) POINTS *****
*****   IN RADIANS.  (0.017453 RADIANS PER DEGREE)              *****
*****                                                           *****
*********************************************************************
                                   *;
    RLAT1 = 0.017453*(LATDEG1 + LATMIN1/60);
    RLON1 = 0.017453*(LONDEG1 + LONMIN1/60);
    RLAT2 = 0.017453*(LATDEG + LATMIN/60);
    RLON2 = 0.017453*(LONDEG + LONMIN/60);
```

```
*******************************************************************
*****                                                         *****
*****   COMPUTE GREAT CIRCLE DISTANCE IN NAUTICAL MILES BETWEEN   *****
*****   THE PAIRS OF LAT/LONG POINTS.  (57.29678 DEGREES/RADIAN,  *****
*****   60 NAUTICAL MILES PER DEGREE).  TO GET RESULTS IN KILO-   *****
*****   METERS, INSERT "1.852 *" AT THE FRONT OF THE EQUATION.    *****
*****                                                         *****
*******************************************************************
                                  *;
     DISTANCE = 60 * 57.29678 * ARCOS((SIN(RLAT1) * SIN(RLAT2)) +
                (COS(RLAT1) * COS(RLAT2)) * COS(RLON2 - RLON1));

*******************************************************************
*****                                                         *****
*****   COMPUTE ELAPSED TIME IN HOURS BETWEEN THE PAIRS OF        *****
*****   LAT/LONG POINTS.  RESET IF TIME IS NEGATIVE.              *****
*****                                                         *****
*******************************************************************
                                  *;
     ETIME = ((60*TIMEHR + TIMEMIN) - (60*TIMEHR1 + TIMEMIN1))/60;
     IF ETIME LE 0 THEN DO;
        GO TO LAGALL;
        END;

*******************************************************************
*****                                                         *****
*****   COMPUTE SPEED IN KNOTS BETWEEN POINTS.  IF DISTANCE IS    *****
*****   IN KILOMETERS, THEN MUST DIVIDE AGAIN BY 1.852.  (SINCE   *****
*****   THERE ARE MANY CASES WHERE POSITIONS ARE LESS THAN ONE    *****
*****   MINUTE APART, ESPECIALLY THE GREAT SOUTH CHANNEL SURVEYS  *****
*****   WITH COMPUTER DATA-LOGGING VERY 15 SECONDS, THIS WOULD    *****
*****   CREATE MANY ETIME=0.  SO WE FIRST CHANGE ALL THE 0'S TO   *****
*****   15 SECONDS, OR 0.0041666... HOURS).                       *****
*****                                                         *****
*******************************************************************
                                  *;
          ELSE IF ETIME=0 THEN ETIME=0.0041667;
     SPEDKNOT = DISTANCE/ETIME;

*******************************************************************
*****                                                         *****
*****   IF SPEED IS OVER 250 KNOTS FOR AERIAL SURVEYS OR 25       *****
*****   KNOTS FOR SHIPBOARD SURVEYS, THEN INVALIDATE DISTANCE     *****
*****   AND ELAPSED TIME BY SETTING TO MISSING, EXCEPT IF THERE   *****
*****   WAS A SIGHTING AT THAT POSITION.                          *****
*****                                                         *****
*******************************************************************
                                  *;
     IF (FID1='A' OR FID1='D' OR FID1='G' OR FID1='L' OR
        FID1='E' OR FID1='R' OR FID1='M' OR FID1='T' OR
        FID1='F'OR FID='I2') AND (SPEDKNOT GT 250) THEN DO;
          IF SIGHTNO NE 000 THEN GO TO LAGALL;
          DISTANCE = .;
          ETIME = .;
          GO TO LAGALL;
```

```
          END;
     IF (FID1='P' OR FID1='W' OR FID='I1') AND (SPEDKNOT GT 25)
        THEN DO;
          IF SIGHTNO NE 000 THEN GO TO LAGALL;
          DISTANCE = .;
          ETIME = .;
          GO TO LAGALL;
          END;

***********************************************************************
*****                                                            *****
*****   OUTPUT THE FINAL OBSERVATION WITH ANY COMPUTATIONS COM-  *****
*****   PLETED, THEN RESET ALL VARIABLE1 = VARIABLE.  THE VARI-  *****
*****   BLE1'S WILL THEN BE RETAINED TO THE NEXT OBSERVATION.    *****
*****                                                            *****
***********************************************************************
                                   *;
     LAGALL:
        OUTPUT;
        BEAUFOR1 = BEAUFORT;
        ALT1 = ALT;
        VISIBLT1 = VISIBLTY;
        LEGTYPE1 = LEGTYPE;
        LEGSTAG1 = LEGSTAGE;
        LATDEG1 = LATDEG;
        LATMIN1 = LATMIN;
        LONDEG1 = LONDEG;
        LONMIN1 = LONMIN;
        TIMEHR1 = TIMEHR;
        TIMEMIN1 = TIMEMIN;
        RETURN;

***********************************************************************
*****                                                            *****
*****   SET DISTANCE AND ELAPSED TIME TO MISSING FOR OFF-WATCH   *****
*****   AND UNACCEPTABLE SURVEY CONDITIONS.                      *****
*****                                                            *****
***********************************************************************
                                   *;
     PRELAG :
        DISTANCE = .;
        ETIME = .;
        GO TO LAGALL;

***********************************************************************
*****                                                            *****
*****   KEEP ONLY VARIABLES NEEDED FOR FURTHER PROCEDURES.       *****
*****                                                            *****
***********************************************************************
                                   *;
     KEEP LATDEG LATMIN LATDEG1 LATMIN1 LONDEG LONMIN LONDEG1 LONMIN1
          DISTANCE ETIME SEASON ;
```

```
*********************************************************************
*****                                                          *****
*****   CREATE A DATA SET, DELETING ALL OBSERVATIONS WITH      *****
*****   MISSING OR INVALID VALUES FOR DISTANCE OR TIME.        *****
*****                                                          *****
*********************************************************************
                                   *;
DATA MILESHR2;
     SET MILESHRS;
     IF DISTANCE=0 OR DISTANCE=.  OR ETIME=. OR
        DISTANCE GT 70 OR ETIME LT 0 THEN DELETE;


*********************************************************************
*****                                                          *****
*****   DELETE DATA SETS WHICH ARE NO LONGER NECESSARY IN ORDER *****
*****   TO FREE UP MEMORY SPACE.                               *****
*****                                                          *****
*********************************************************************
                                   *;
PROC DELETE DATA=DATABASE MILESHRS;


*********************************************************************
*****                                                          *****
*****   WHERE TWO SUCCESSIVE POINTS ARE IN THE SAME 10' X 10'  *****
*****   BLOCK, THE ENTIRE LINE SEGMENT WHOSE DISTANCE HAS BEEN *****
*****   COMPUTED ABOVE IS WITHIN THE BLOCK.  FOR POINTS IN SEP- *****
*****   ARATE BLOCKS, HOWEVER, THE LINE SEGMENT MUST BE PARTI- *****
*****   TIONED BETWEEN THE BLOCKS.  THE POINTS OF INTERSECTION *****
*****   OF THE SEGMENTS WITH THE 10' LATITUDE AND/OR LONGITUDE *****
*****   LINES ARE FOUND AND ADDED AS INTERMEDIATE OBSERVATIONS *****
*****   IN THE DATA SET.  THIS IS ACCOMPLISHED BY DEFINING THE *****
*****   EQUATION FOR THE GREAT CIRCLE THROUGH A PAIR OF POINTS, *****
*****   THEN INSERTING THE APPROPRIATE 10' LATITUDE OR LONGI-  *****
*****   TUDE VALUE AND SOLVING FOR THE OTHER.  EACH DIRECTION  *****
*****   OF TRAVEL IS CONSIDERED AS A SEPARATE CASE.  THE VARI- *****
*****   ABLE N IS AN INDEX VARIABLE WHICH IS INCREMENTED SO    *****
*****   THAT EACH OF THE ORIGINAL TRACKLINE SEGMENTS IS UNIQUE- *****
*****   LY NUMBERED.                                           *****
*****                                                          *****
*********************************************************************
                                   *;
DATA CHOP;
     SET MILESHR2;
     LONCHECK=0;
     ARRAY LATTEN(INDEX) LATTEN1-LATTEN10;
     ARRAY LONTEN(INDEX) LONTEN1-LONTEN10;
     ARRAY TENLAT(DEXIN) TENLAT1-TENLAT10;
     ARRAY TENLON(DEXIN) TENLON1-TENLON10;
     N+1;
```

```
*************************************************************************
*****                                                              *****
*****   DEFINE CONSTANT K = MINUTES PER RADIAN.                    *****
*****                                                              *****
*************************************************************************
                                  *;
     K=60*57.29678;

*************************************************************************
*****                                                              *****
*****   CREATE NEW LAT/LONG VARIABLES.  NOW THE CURRENT POINT      *****
*****   HAS NAMES ENDING IN 2, AND THE PREVIOUS POINT HAS NAMES    *****
*****   ENDING IN 1.                                               *****
*****                                                              *****
*************************************************************************
                                  *;
     LONDEG2=LONDEG;
     LONMIN2=LONMIN;
     LATDEG2=LATDEG;
     LATMIN2=LATMIN;

*************************************************************************
*****                                                              *****
*****   CONVERT LAT/LONGS FROM DEGREES AND MINUTES TO RADIANS.     *****
*****                                                              *****
*************************************************************************
                                  *;
     LAT1=(LATDEG1 + LATMIN1/60)/57.29678;
     LAT2=(LATDEG2 + LATMIN2/60)/57.29678;
     LON1=(LONDEG1 + LONMIN1/60)/57.29678;
     LON2=(LONDEG2 + LONMIN2/60)/57.29678;

*************************************************************************
*****                                                              *****
*****   DELETE WHERE BOTH POSITIONS ARE THE SAME (DISTANCE=0).     *****
*****                                                              *****
*************************************************************************
                                  *;
     IF (LAT1=LAT2) AND (LON1=LON2) THEN DELETE;

*************************************************************************
*****                                                              *****
*****   CASE 1: PLATFORM TRAVEL IN NORTHWEST OR SOUTHEAST          *****
*****           QUADRANT.  START AND END VARIABLES ARE REVERSED    *****
*****           FOR NORTHWEST.  THESE STEPS OUTPUT THE VARIABLES   *****
*****           LATKEEP AND LONKEEP, IN MINUTES.                   *****
*****                                                              *****
*************************************************************************
                                  *;
     IF (LAT1 LT LAT2 AND LON1 LT LON2) OR
        (LAT1 GT LAT2 AND LON1 GT LON2) THEN DO;
        IF LON1 GT LON2 THEN DO;
           CLATDEG1=LATDEG1;
           CLATMIN1=LATMIN1;
           CLONDEG1=LONDEG1;
```

```
    CLONMIN1=LONMIN1;
    LATDEG1=LATDEG2;
    LATMIN1=LATMIN2;
    LONDEG1=LONDEG2;
    LONMIN1=LONMIN2;
    LATDEG2=CLATDEG1;
    LATMIN2=CLATMIN1;
    LONDEG2=CLONDEG1;
    LONMIN2=CLONMIN1;
    CLAT1=LAT1;
    CLON1=LON1;
    LAT1=LAT2;
    LON1=LON2;
    LAT2=CLAT1;
    LON2=CLON1;
    END;
SIN1=SIN(LON1);
SIN2=SIN(LON2);
COS1=COS(LON1);
COS2=COS(LON2);
COPHI1=COS(LAT1);
COPHI2=COS(LAT2);
Q1=SQRT((1/(COPHI1*COPHI1))-1);
Q2=SQRT((1/(COPHI2*COPHI2))-1);
D=(COS1*SIN2)-(COS2*SIN1);
DA=(Q1*SIN2)-(Q2*SIN1);
DB=(Q2*COS1)-(Q1*COS2);
A=DA/D;
B=DB/D;
LONTEN1=10*INT(((LONDEG1*60)+LONMIN1+10)/10);
LONTOP=((LONDEG2*60)+LONMIN2);
TOP=INT((LONTOP/10)-(LONTEN1/10));
LATKEEP=LAT1*K;
LONKEEP=LON1*K;
OUTPUT;
IF TOP GT 0 THEN DO INDEX=2 TO (TOP+1);
   LONTEN=(LONTEN1+((INDEX-1)*10))/K;
   END;
LONTEN1=LONTEN1/K;
IF TOP GT 0 OR (TOP=0 AND LONTEN1 LT (LONTOP/K))
     THEN DO INDEX=1 TO (TOP+1);
   LATTEN=ARCOS(SQRT(1/(((A*COS(LONTEN)+B*SIN(LONTEN))**2)+1)));
   LATKEEP=LATTEN*K;
   LONKEEP=LONTEN*K;
   OUTPUT;
   END;
TENLAT1=10*INT(((LATDEG1*60)+LATMIN1+10)/10);
TOPLAT=((LATDEG2*60)+LATMIN2);
POT=INT((TOPLAT/10)-(TENLAT1/10));
IF POT GT 0 THEN DO DEXIN=2 TO (POT+1);
   TENLAT=(TENLAT1+((DEXIN-1)*10))/K;
   END;
TENLAT1=TENLAT1/K;
IF POT GT 0 OR (POT=0 AND TENLAT1 LT (TOPLAT/K)) THEN
     DO DEXIN=1 TO (POT+1);
```

```
          COSLAT=COS(TENLAT);
          QE=SQRT((1/(COSLAT*COSLAT))-1);
          TWOAQE=2*A*QE;
          A2B2=(A*A)+(B*B);
          QE2MINB2=(QE*QE)-(B*B);
          TENLON=ARCOS((TWOAQE+SQRT((TWOAQE*TWOAQE)-(4*A2B2*QE2MINB2)))/
               (2*A2B2));
          IF (TENLON LT (LON1-.00005)) OR (TENLON GT (LON2+.00005)) THEN
               TENLON=ARCOS((TWOAQE-SQRT((TWOAQE*TWOAQE)-
               (4*A2B2*QE2MINB2)))/(2*A2B2));
          LATKEEP=TENLAT*K;
          LONKEEP=TENLON*K;
          OUTPUT;
          END;
       END;

***********************************************************************
*****                                                             *****
*****   CASE 2: PLATFORM TRAVEL IN NORTHEAST OR SOUTHWEST         *****
*****           QUADRANT.  START AND END VARIABLES ARE REVERSED   *****
*****           FOR NORTHEAST.                                    *****
*****                                                             *****
***********************************************************************
                                     *;
    IF (LAT1 LT LAT2 AND LON1 GT LON2) OR
         (LAT1 GT LAT2 AND LON1 LT LON2) THEN DO;
       LONCHECK=1;
       IF LON1 GT LON2 THEN DO;
          CLATDEG1=LATDEG1;
          CLATMIN1=LATMIN1;
          CLONDEG1=LONDEG1;
          CLONMIN1=LONMIN1;
          LATDEG1=LATDEG2;
          LATMIN1=LATMIN2;
          LONDEG1=LONDEG2;
          LONMIN1=LONMIN2;
          LATDEG2=CLATDEG1;
          LATMIN2=CLATMIN1;
          LONDEG2=CLONDEG1;
          LONMIN2=CLONMIN1;
          CLAT1=LAT1;
          CLON1=LON1;
          LAT1=LAT2;
          LON1=LON2;
          LAT2=CLAT1;
          LON2=CLON1;
          END;
       SIN1=SIN(LON1);
       SIN2=SIN(LON2);
       COS1=COS(LON1);
       COS2=COS(LON2);
       COPHI1=COS(LAT1);
       COPHI2=COS(LAT2);
       Q1=SQRT((1/(COPHI1*COPHI1))-1);
       Q2=SQRT((1/(COPHI2*COPHI2))-1);
```

```
D=(COS1*SIN2)-(COS2*SIN1);
DA=(Q1*SIN2)-(Q2*SIN1);
DB=(Q2*COS1)-(Q1*COS2);
A=DA/D;
B=DB/D;
LONTEN1=10*INT(((LONDEG1*60)+LONMIN1+10)/10);
LONTOP=((LONDEG2*60)+LONMIN2);
TOP=INT((LONTOP/10)-(LONTEN1/10));
LATKEEP=LAT1*K;
LONKEEP=LON1*K;
OUTPUT;
IF TOP GT 0 THEN DO INDEX=2 TO (TOP+1);
   LONTEN=(LONTEN1+((INDEX-1)*10))/K;
   END;
LONTEN1=LONTEN1/K;
IF TOP GT 0 OR (TOP=0 AND LONTEN1 LT (LONTOP/K))
     THEN DO INDEX=1 TO (TOP+1);
   LATTEN=ARCOS(SQRT(1/(((A*COS(LONTEN)+B*SIN(LONTEN))**2)+1)));
   LATKEEP=LATTEN*K;
   LONKEEP=LONTEN*K;
   OUTPUT;
   END;
TENLAT1=10*INT(((LATDEG2*60)+LATMIN2+10)/10);
TOPLAT=((LATDEG1*60)+LATMIN1);
POT=INT((TOPLAT/10)-(TENLAT1/10));
IF POT GT 0 THEN DO DEXIN=2 TO (POT+1);
   TENLAT=(TENLAT1+((DEXIN-1)*10))/K;
   END;
TENLAT1=TENLAT1/K;
IF POT GT 0 OR (POT=0 AND TENLAT1 LT (TOPLAT/K))
     THEN DO DEXIN=1 TO (POT+1);
   COSLAT=COS(TENLAT);
   QE=SQRT((1/(COSLAT*COSLAT))-1);
   TWOAQE=2*A*QE;
   A2B2=(A*A)+(B*B);
   QE2MINB2=(QE*QE)-(B*B);
   TENLON=ARCOS((TWOAQE-SQRT((TWOAQE*TWOAQE)-(4*A2B2*QE2MINB2)))/
        (2*A2B2));
   IF (TENLON LT (LON1-.00005)) OR (TENLON GT (LON2+.00005)) THEN
        TENLON=ARCOS((TWOAQE+SQRT((TWOAQE*TWOAQE)-
        (4*A2B2*QE2MINB2)))/(2*A2B2));
   LATKEEP=TENLAT*K;
   LONKEEP=TENLON*K;
   OUTPUT;
   END;
END;

**********************************************************************
*****                                                            *****
*****   CASE 3: PLATFORM TRAVEL DUE EAST OR WEST.  START AND     *****
*****           END VARIABLES ARE REVERSED FOR EAST.             *****
*****                                                            *****
**********************************************************************
                                 *;
```

```
      IF (LAT1=LAT2) THEN DO;
         IF LON1 GT LON2 THEN DO;
            CLATDEG1=LATDEG1;
            CLATMIN1=LATMIN1;
            CLONDEG1=LONDEG1;
            CLONMIN1=LONMIN1;
            LATDEG1=LATDEG2;
            LATMIN1=LATMIN2;
            LONDEG1=LONDEG2;
            LONMIN1=LONMIN2;
            LATDEG2=CLATDEG1;
            LATMIN2=CLATMIN1;
            LONDEG2=CLONDEG1;
            LONMIN2=CLONMIN1;
            CLAT1=LAT1;
            CLON1=LON1;
            LAT1=LAT2;
            LON1=LON2;
            LAT2=CLAT1;
            LON2=CLON1;
            END;
         LONTEN1=10*INT(((LONDEG1*60)+LONMIN1+10)/10);
         LONTOP=((LONDEG2*60)+LONMIN2);
         TOP=INT((LONTOP/10)-(LONTEN1/10));
         LATKEEP=LAT1*K;
         LONKEEP=LON1*K;
         OUTPUT;
         IF TOP GT 0 THEN DO INDEX=2 TO (TOP+1);
            LONTEN=(LONTEN1+((INDEX-1)*10))/K;
            END;
         LONTEN1=LONTEN1/K;
         IF TOP GT 0 OR (TOP=0 AND LONTEN1 LT (LONTOP/K))
              THEN DO INDEX=1 TO (TOP+1);
            LATTEN=LAT1;
            LATKEEP=LATTEN*K;
            LONKEEP=LONTEN*K;
            OUTPUT;
            END;
         END;

**********************************************************************
*****                                                           *****
*****   CASE 4: PLATFORM TRAVEL DUE NORTH OR SOUTH.  START AND  *****
*****           END VARIABLES ARE REVERSED FOR SOUTH.           *****
*****                                                           *****
**********************************************************************
                                 *;
      IF (LON1=LON2) THEN DO;
         IF LAT1 GT LAT2 THEN DO;
            CLATDEG1=LATDEG1;
            CLATMIN1=LATMIN1;
            CLONDEG1=LONDEG1;
            CLONMIN1=LONMIN1;
            LATDEG1=LATDEG2;
            LATMIN1=LATMIN2;
```

```
            LONDEG1=LONDEG2;
            LONMIN1=LONMIN2;
            LATDEG2=CLATDEG1;
            LATMIN2=CLATMIN1;
            LONDEG2=CLONDEG1;
            LONMIN2=CLONMIN1;
            CLAT1=LAT1;
            CLON1=LON1;
            LAT1=LAT2;
            LON1=LON2;
            LAT2=CLAT1;
            LON2=CLON1;
            END;
         LATKEEP=LAT1*K;
         LONKEEP=LON1*K;
         OUTPUT;
         TENLAT1=10*INT(((LATDEG1*60)+LATMIN1+10)/10);
         TOPLAT=((LATDEG2*60)+LATMIN2);
         POT=INT((TOPLAT/10)-(TENLAT1/10));
         IF POT GT 0 THEN DO DEXIN=2 TO (POT+1);
            TENLAT=(TENLAT1+((DEXIN-1)*10))/K;
            END;
         TENLAT1=TENLAT1/K;
         IF POT GT 0 OR (POT=0 AND TENLAT1 LT (TOPLAT/K))
              THEN DO DEXIN=1 TO (POT+1);
            TENLON=LON1;
            LATKEEP=TENLAT*K;
            LONKEEP=TENLON*K;;
            OUTPUT;
            END;
         END;
      LATKEEP=LAT2*K;
      LONKEEP=LON2*K;
      OUTPUT;

***********************************************************************
*****                                                             *****
*****   KEEP ONLY VARIABLES NEEDED FOR LATER STEPS.               *****
*****                                                             *****
***********************************************************************
                                    *;
      KEEP LATKEEP LONKEEP N K LONCHECK SEASON;


***********************************************************************
*****                                                             *****
*****   CALCULATE THE DISTANCE BETWEEN THE NEW PAIRS OF POINTS,   *****
*****   AND SET UP INDEXING VARIABLES FOR ASSIGNMENT OF EFFORT    *****
*****   TO THE 10' X 10' BLOCKS.  THE INDEXING VARIABLES, ILAT    *****
*****   AND ILON, ARE THE SOUTHEAST CORNERS OF THE BLOCKS, IN     *****
*****   MINUTES.  LATKEEP AND LONKEEP ARE ALSO IN MINUTES,        *****
*****   AND LAT AND LON ARE IN RADIANS.                           *****
*****                                                             *****
***********************************************************************
                                    *;
```

```
PROC SORT DATA=CHOP;
     BY N LATKEEP;
DATA DISTANCE;
     SET CHOP;
     BY N;
     RETAIN ILAT1 ILON1 LAT1 LON1;
     ILAT=10*INT(LATKEEP/10);
     ILON=10*INT(LONKEEP/10);
     LAT=LATKEEP/K;
     LON=LONKEEP/K;

************************************************************************
*****                                                             *****
*****   FOR THE FIRST POINT ON EACH OF THE ORIGINAL TRACKLINE     *****
*****   SEGMENTS, DO NOT COMPUTE DISTANCE FROM THE PREVIOUS       *****
*****   POINT.                                                    *****
*****                                                             *****
************************************************************************
                                   *;
     IF FIRST.N THEN GO TO LAGKEEP;
     DISTANCE = 3437.7468 * ARCOS((SIN(LAT1) * SIN(LAT)) +
          (COS(LAT1) * COS(LAT)) * COS(LON-LON1));
     LAGKEEP:
        OUTPUT;
        ILAT1=ILAT;
        ILON1=ILON;
        LAT1=LAT;
        LON1=LON;


************************************************************************
*****                                                             *****
*****   FOR SOME CASES WHERE THE STARTING POINT OF A SEGMENT IS   *****
*****   ON THE WESTERN EDGE OF THE BLOCK, THE DISTANCE IS AS-     *****
*****   SIGNED TO THE WRONG BLOCK.  THIS DATA STEP CORRECTS THIS  *****
*****   BY SUBTRACTING 10 MINUTES FROM THE INDEX LONGITUDE.  IT   *****
*****   ALSO DELETES ANY POINTS WHERE DISTANCE IS MISSING.        *****
*****                                                             *****
************************************************************************
                                   *;
DATA CLEAN;
     SET DISTANCE;
     IF DISTANCE NE .;
     IQ=ROUND((LON1*K*100),1);
     IF LONCHECK=1 AND MOD(IQ,1000)=0 THEN ILON1=ILON1-10;

************************************************************************
*****                                                             *****
*****   CREATE NEW INDEX VARIABLES FOR FINAL OUTPUT IN DEGREES    *****
*****   AND MINUTES (DDMM).  THE 5 ADDED AT THE END CONVERTS      *****
*****   THE INDEX FROM THE SOUTHEAST CORNER TO THE CENTER OF      *****
*****   THE BLOCK.                                                *****
*****                                                             *****
************************************************************************
                                   *;
```

```
     INDEXLAT = 100*INT(ILAT1/60) + MOD(ILAT1,60) + 5;
     INDEXLON = 100*INT(ILON1/60) + MOD(ILON1,60) + 5;
     KEEP SEASON INDEXLAT INDEXLON DISTANCE;


**********************************************************************
*****                                                            *****
*****   DELETE DATA SETS WHICH ARE NO LONGER NECESSARY IN ORDER  *****
*****   TO FREE UP MEMORY SPACE.                                 *****
*****                                                            *****
**********************************************************************
                                  *;
PROC DELETE DATA=CHOP DISTANCE;


**********************************************************************
*****                                                            *****
*****   ADD UP ALL OF THE INDIVIDUAL DISTANCES WITHIN EACH       *****
*****   SEASON AND 10-MINUTE BLOCK.                              *****
*****                                                            *****
**********************************************************************
                                  *;
PROC SORT DATA=CLEAN;
     BY SEASON INDEXLAT INDEXLON;
PROC MEANS DATA=CLEAN SUM NOPRINT;
     BY SEASON INDEXLAT INDEXLON;
     VAR DISTANCE;
     OUTPUT OUT=EFFSEASN SUM=DISTANCE;


**********************************************************************
*****                                                            *****
*****   ADD UP THE FOUR SEASONAL VALUES IN EACH BLOCK TO GET A   *****
*****   WHOLE-YEAR TOTAL EFFORT.                                 *****
*****                                                            *****
**********************************************************************
                                  *;
PROC SORT DATA=EFFSEASN;
     BY INDEXLAT INDEXLON;
PROC MEANS DATA=EFFSEASN SUM NOPRINT;
     BY INDEXLAT INDEXLON;
     VAR DISTANCE;
     OUTPUT OUT=EFFTOT1 SUM=DISTANCE;


**********************************************************************
*****                                                            *****
*****   ADD A SEASON VARIABLE = 'ALL' BACK TO THE TOTAL EFFORT   *****
*****   DATA SET, THEN COMBINE THE SEASONAL AND TOTAL DATA SETS. *****
*****                                                            *****
**********************************************************************
                                  *;
DATA EFFTOTAL;
     SET EFFTOT1;
     SEASON='ALL   ';
```

```
DATA EFFORT;
     SET EFFSEASN EFFTOTAL;

*********************************************************************
*****                                                           *****
*****   DELETE DATA SETS WHICH ARE NO LONGER NECESSARY IN ORDER *****
*****   TO FREE UP MEMORY SPACE.                                *****
*****                                                           *****
*********************************************************************
                                   *;
PROC DELETE DATA=EFFSEASN EFFTOT1 EFFTOTAL;

*********************************************************************
*****                                                           *****
*****   AS A RELIABILITY CHECK ON THE RESULTS, FIRST ADD UP THE *****
*****   TOTAL EFFORT FOR EACH SEASON FROM THE ORIGINAL TRACK-   *****
*****   LINE SEGMENTS (DATA=MILESHR2), THEN THE CHOPPED-UP      *****
*****   SEGMENTS (DATA=CLEAN), AND FINALLY THE 10-MINUTE BLOCK  *****
*****   TOTALS (DATA=EFFORT).                                   *****
*****                                                           *****
*********************************************************************
                                   *;
PROC SORT DATA=MILESHR2;
     BY SEASON;
PROC MEANS DATA=MILESHR2 SUM;
     BY SEASON;
     VAR DISTANCE;
PROC SORT DATA=CLEAN;
     BY SEASON;
PROC MEANS DATA=CLEAN SUM;
     BY SEASON;
     VAR DISTANCE;
PROC SORT DATA=EFFORT;
     BY SEASON;
PROC MEANS DATA=EFFORT SUM;
     BY SEASON;
     VAR DISTANCE;


*********************************************************************
*****                                                           *****
*****   OUTPUT THE FINAL DATA SET TO DISK OR TAPE.  ALSO PRINT  *****
*****   A HARD COPY LISTING.                                    *****
*****                                                           *****
*********************************************************************
                                   *;
DATA [output dataset name].EFFORT;
     SET EFFORT;
     FILE PRINT NOTITLES;
     PUT @1 SEASON $6. @10 INDEXLAT 4. @17 INDEXLON 4. @24 DISTANCE 8.2;
*********************************************************************
*********************************************************************
*********************************************************************
```