SOUTHWEST FISHERIES SCIENCE CENTER

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DOCUMENTATION OF THE 1959-1988 EDITING CRITERIA FOR PORPOISE LIFE HISTORY DATA: PORPOISE DATA MANAGEMENT SYSTEM

By

Charles W. Oliver

ADMINISTRATIVE REPORT LJ-91-07

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Documentation of the 1959-1988 Editing Criteria for Porpoise[1] Life-History Data: Porpoise Data Management System

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INTRODUCTION

Data on the incidental kill of dolphins in the purse-seine fishery for tuna in the eastern tropical Pacific (ETP) have been collected since at least 1966 (Perrin 1969). The fishery ranges from latitudes 30 degrees north to 30 degrees south and westward from the coastline of the Americas to at least 160 degrees west longitude. In late 1971, the National Marine Fisheries Service (NMFS) began fielding observers aboard U.S. vessels specifically to gather research data on this problem. With the passage of the Marine Mammal Protection Act (MMPA) in 1972, NMFS increased the level of data collection for this fishery, with over one hundred and twenty fishing trips observed during 1977. The increased level of effort resulted in a need to automate the processing and archiving of data collected by the NMFS observer program, and other data resulting from amendments to the MMPA. In 1973 the Porpoise[1] Data Management Group (PDMG) was formed at the Southwest Fisheries Science Center (SWFSC), La Jolla, California 92038. The PDMG developed coding instructions, coding formats, manual and computer editing criteria, and computer archival formats for data collected by the observer program, and by SWFSC staff who examined stranded marine mammals beached on the southern California coast.

When dolphins were killed incidentally to the fishing operations, observers attempted to set aside some of the dead animals. Once the fishing operation was completed, observers collected life-history data from those animals and recorded the information on a data form referred to as the Porpoise Life-History form. Similar data were obtained from stranded specimens either collected, or examined, by SWFSC staff assigned to the Cooperative Marine Mammal Salvage Program (Henderson and Hansen, 1983), and subsequently to the California Marine Mammal Stranding Network (NMFS 1982; Seagars and Jozwiak, 1991). The data form evolved through many revisions in the variables and codes recorded, and the appearance of the form. The purpose of this report is to document the Porpoise Life-History Record data collected or archived between 1959 and 1988, and describe the quality control criteria applied to these data through computer programs developed by the PDMG during 1978-1982, and subsequently by personnel within the Multispecies Data Collection and Evaluation Program (MDCEP) at the SWFSC.

BACKGROUND

The NMFS observer program was operated by the SWFSC prior to 1976, and the SWFSC continued to field "gear technicians" to collect specific data on tuna vessel gear and equipment modifications during the period 1976-1982. Since 1976, the NMFS observer program has been operated by the NMFS Southwest Regional (SWR) Office based in Terminal Island, California through a branch office in San Diego, California. Observers were trained, fielded aboard U.S. tuna purse-seine vessels, debriefed upon return and either placed aboard another vessel, assigned other projects, or released. Each observer was provided with a field manual, generally applicable to a calendar year[2,3]. Field manuals for each year, beginning in 1971, are archived at the SWFSC and are the primary source of information, instructions, and examples for all observer activities and data responsibilities. All data forms, coding instructions, codes, etc., are included in the observers' field manual. Copies of the manuals are archived at the SWFSC. While at sea, observers collected a variety of data including information on the numbers and species of dolphins seen and set on, data on the gear operations, compliance with existing government regulations governing fishing on dolphins, and data on temporal, spatial, and environmental conditions as they relate to dolphin populations. NMFS observers recorded data obtained by examination of dead dolphins on the Porpoise Life-History form. The NMFS observer program provided the majority of data maintained by the PDMG.

While there are relatively few Porpoise Life-History records from stranded marine mammals, these records represent the majority of the specimens listed in Table 1 as "Other Marine Mammals". Stranded marine mammal records, and other non-observer records, are identified by an assigned value between 9990-9999 for the variable CRUISE NUMBER.

The Inter-American Tropical Tuna Commission (IATTC) began an observer program in 1979, and fielded observers aboard both U.S. and foreign-registered tuna purse-seine vessels. Although many of the IATTC data forms were different than NMFS forms, they allowed collection of many of the same variables. The NMFS Porpoise Life-History form was used by IATTC observers aboard U.S.-registered vessels and the original data forms were provided to the SWFSC for editing and archiving. The IATTC program also provided observers with field manuals[4,5] similar in content and purpose to the NMFS observer manual. Copies of these field manuals are archived at the IATTC, La Jolla, California 92038.

All coded data obtained from a specimen (dead dolphin) were coded onto a logical record uniquely identified by a SPECIMEN NUMBER consisting of the collector's initials followed by a 4-digit number (e.g., ABC1234). Data for all specimens, from all trips and years, were archived in one of 11 life-history databases. All unsexed specimens are archived in a single database (NSEXDB.DAT). Male and female specimens are archived in one of ten databases:

Species	Males	Females
Spotted dolphins, Stenella attenuata	MSPTDB.DAT	FSPTDB.DAT
Spinner dolphins, Stenella longirostris	MSPNDB.DAT	FSPNDB.DAT
Common dolphins, Delphinus delphis	MDELDB.DAT	FDELDB.DAT
Striped dolphins, Stenella coeruleoalba	MSTKDB.DAT	FSTKDB.DAT
All other cetaceans	MOTHDB.DAT	FOTHDB.DAT

In many cases, a logical record will only contain data on the location, date, species or stock code, length and sex of the specimen, and some information on the reproductive status of the animal (e.g., adult, neonate, pregnant). During the 1970s, observers were generally able to obtain additional specimen material which was preserved (frozen or in formalin) aboard ship, and processed after the cruise ended. Additional data obtained from the preserved materials were coded onto the original life-history data form by experienced technicians prior to keypunching the data. Table 1 shows the number of male and female specimens, by species and sex, archived by the MDCEP in the 10 life-history databases through calendar year 1988.

This report cannot possibly describe all of the editing and data verification procedures that have been applied to these data. Nor can it completely describe the standardized methods for data collection and subsequent laboratory processing. Current shipboard procedures are described by Myrick (1986), but this source does not necessarily describe the procedures used during the 1970s. A useful description of some post-cruise methods used to process and record life-history data is presented in Hohn et al., (1986) [With the author's permission, I have included this paper in the appendices]. Users of these databases should also review the field manuals provided to the observers during their training. These field manuals describe all of the data forms, procedures, and coding instructions the observer was required to complete, and were generally amended each calendar year. The porpoise life-history section of each manual describes in detail the special considerations, procedures, and requirements for life-history data collection for that year. There have been numerous studies of these data, many of which are identified in a bibliography covering the period 1963-1981 (Rivers 1982).

DATA COLLECTION, QUALITY CONTROL, AND ARCHIVING

Data obtained from porpoise specimens were first collected by scientists studying yellowfin tuna aboard U.S.-registered tuna purse-seiners beginning in 1966 (Perrin 1969) and were recorded in field notebooks, or on the field form shown in Figure 1. Information from beached specimens and specimens collected in other fisheries within the ETP were obtained from the literature, museums, and personal contacts, dating back as far as 1959 (Perrin 1975). Beginning in 1971, data were collected and recorded on the form shown in Figure 2, which was subsequently modified prior to the start of the fishing season in January 1973 (Figure 3). Technicians at the SWFSC reviewed data collected by

observers upon their return and, using a number of coding formats, coded information onto 80-column computer cards. These computer cards were then archived according to data format (e.g., Porpoise Life-History, Porpoise School Structure, Porpoise Mortality), and used for analyses. The coding format for the life-history data collected through 1973 was similar to that shown in Appendix 1. The PDMG developed the data collection form shown in Figure 4 (described in Appendix 1) prior to the start of the 1974 season. This expanded form, used during 1974 through part of 1977, was designed to expedite the entry of data onto a computer. All of the pre-1974 life-history data were transferred to the new format (Figure 4 and described in Appendix 1).

As a general rule, any changes, additions, and deletions made to a computer database were also recorded (in blue or red pencil) on the original data-collection form. This has not been done entirely to the life-history data forms because of changes in the data collection forms and computer archival formats. However, computer listings of changes, and other forms of documentation were archived at the SWFSC.

By 1977, over 120 vessel trips carried observers during a calendar year. In response to additional requests for changes to the life-history form, the PDMG modified the coding instructions, etc., and fielded the 1977B Porpoise Life History Record form during late 1977 (Figure 5; described in Appendix 2). Thus, two forms were used during calendar year 1977. Towards the end of 1977, further modifications were made (additional variables added) to the 1977B form, resulting in the 1978 form (Figure 6; described in Appendix 2). This latter form was fielded in 1978 and used until 1983. Although some of the 1978-1980 observer manuals indicate that the 1977B form was used, I did not find any 1977B data forms among the 1978-1980 observer data. During 1978, most of the coded, pre-1978 data, and data collected on both of the forms used during 1977, were transferred to the 1978 format, primarily using a series of computer programs (Appendix 3). A listing of all variables that were not transferred was printed and archived.

A computer program was developed to apply quality control criteria for the 1978 life-history data format, and thus assist in the editing of these data. This program was developed using a group of FORTRAN language programs and subroutines previously developed for editing other marine mammal data (Oliver and Butler, 1991) The program ascertained if, 1) variable values were missing when they should be present (Blank checks), 2) variable values were greater than, or less than, some acceptable criteria (Range checks), and 3) combinations of the values of variables did not meet some criteria (Logical Error checks). The program expects physical records to conform to some pre-defined sequence (e.g., card 2 follows card 1, and CRUISE-NUMBER and SPECIMEN-NUMBER the same for both cards). The program specific to these data is referred to as "Porpoise Life History Edit Program" and was completed during 1978. A single edit program was developed because the quality control criteria were applicable to all

years. During 1978-1979, all of the life-history data (1959-1979) were subjected to the criteria coded in the edit program. The edit program was modified slightly in 1980 to incorporate changes in range criteria and additional logical error criteria.

Form modifications were made and a new form was fielded in 1983 (Figure 7) by the SWR. These latter modifications added a few variables and moved some of the existing variables on the form (Appendix 4). Range, blank and logical error criteria were modified and revised geographical boundaries for management stocks (Figure 8) were implemented with the 1983 edit program. During 1984, all of the historical data (before 1984) were subjected to the edit criteria used during 1983-1984. The coded values for the stage of CORPORA ALBICANTIA (stages 5 and 6) were reversed for pre-1983 records so that these data would conform to the 1983-1988 coding format (Appendix 4; Ruth B. Miller, pers. comm). The definitions of corpora stage (or type) contained in the 1983-1988 coding format reflect the current standard criteria.

Additional editing of the pre-1984 life-history data was accomplished during 1984 by what is now called the Multispecies Data Collection and Evaluation Program (MDCEP), but the editing criteria are not included in this report. Comparisons were made between some variable values (e.g., POSITION, SET NUMBER, DATE, and SPECIES) contained in both IATTC and NMFS collected data formats. The NMFS data formats included the Porpoise Set Log, Marine Mammal Sightings, Fishing Mode, and Porpoise Life-History records. Similar formats were collected and used by IATTC observers.

There were a few changes and additions to the 1984 editing criteria, and in 1986 most of the pre-1985 data were subjected to these additional criteria by the use of special computer programs which performed the edit criteria on the archived data. Thus, virtually all of the editing criteria (range, blank, character, and logical error) described in this report have been repeatedly applied to all of the archived life-history databases.

As part of the archival process, some additional information was added to the logical records. The hemisphere of latitude (1=north, 2=south), and longitude (1=east, 2=west) were calculated from the coded value of QUAD-CAPTURE and incorporated into the variable POSITION in the computer archival format. The FIVE-DEG-SQUARE value (Figure 9) was calculated using the POSITION variable. The CALCULATED-STOCK value was determined using the SPECIES-STOCK and POSITION variables in conjunction with geographic and management criteria in effect at the time (Perrin 1975; Perrin et al., 1985). The READER_CODE and READER_STATUS variables were added to the data as a result of a study of tooth layers conducted on 1973-1978 specimens. These variables are described in the coding format for the pre-1983 data (Appendix 2).

Table 2 references the forms and quality control criteria

applicable to these data, by calendar year. The computer archival formats for data obtained from both males and females are shown in Tables 3-4, respectively. Tables 3-4 also show the frequency of non-blank values, by males and females respectively, for spotted dolphin(MSPTDB,FSPTDB), spinner dolphin(MSPNDB,FSPNDB), common dolphin(MDELDB,FDELDB), streaker dolphin(MSTKDB,FSTKDB), and all other marine mammals(MOTHDB,FOTHDB).

The range, blank , and character criteria performed on the 1959-1982 data are shown in Table 5. Logical error criteria for 1959-1982 are shown in Table 6. Range, blank, character, and logical error criteria generally refer to the coding format (card and column numbers), and not the computer archival format. Logical errors 12, 13, and 21 (Table 6) compared the POSITION data for some SPECIES-STOCK values (e.g., 2,3,6,10,11,88) with the approximate geographical boundaries for the management stocks of spotted and spinner dolphins for pre-1983 data (Figure 8). The range and blank criteria performed on the 1983-1988 data are shown in Table 7. Logical error criteria for 1983-1984 are shown in Table 8, and for 1985-1988 in Table 9. Figures 10-16 show the approximate geographical boundaries of management units applied to the 1983-1988 data for spotted, spinner, common, and striped dolphins. These approximations were based on those described in Perrin et al., (1985).

SPECIES/STOCK IDENTIFICATION AND CODING

The vast majority of life-history data were collected by observers aboard tuna purse-seine vessels operating in the eastern tropical Pacific. A smaller number of records resulted from the examination of stranded marine mammals along the southern California coast. Prior to departure, observers are trained in the identification of marine mammals common to the ETP, and provided with identification guides and references. The four species of dolphins most commonly involved with the fishery for yellowfin tuna are spotted dolphin, Stenella attenuata, spinner dolphin, Stenella longirostris, common dolphin, Delphinus delphis, and striped dolphin, Stenella coeruleoalba. A review of descriptions, and geographical variations, of these species is provided in Perrin et al., (1985). Observers were required to sketch identification characteristics on the life-history form (e.g., color phase, dorsal fin and beak shapes; cape pattern). As part of the quality control process, data forms were reviewed by SWFSC researchers and technicians who entered the appropriate codes to identify the species. These codes were thus repeatedly reviewed prior to archiving and, subsequently, during analysis. Table 1 shows the number of specimens for which life-history data were collected through 1988, by species and sex, for ten of the eleven life-history databases.

NMFS has attempted to assess dolphin populations comprised of management units based upon morphological stock differences and breaks in distribution (Perrin 1975, Staff 1979, Perrin et al., 1985). These management units were delineated by geographic areas

(e.g., Figures 8, 10-16), and approximated by polygons defined by latitude and longitude. The 1978 life-history edit criteria included logical errors which compared the POSITION and SPECIES variables collected by observers with the broad management unit delineations shown in Figure 8. Additional management units were defined, and existing ones altered, as the result of an extensive review of assessment needs in 1979 (Staff 1979). The PDMG added the variable STOCK_CODE to the computer archival format for life-history data in 1980 to enable researchers to easily amend the life-history records. Another review of the management units was conducted by Perrin et al., (1985) and the computer approximations of these boundaries developed by the MDCEP are included here (Figures 10-16). Archived data were subjected to a computer program which used the POSITION and SPECIES variables and computer algorithms approximating the management units (e.g., Figures 10-16) to assign a STOCK_CODE value. Researchers could then perform an analysis using the STOCK_CODE variable. Because management units are subject to review and change, and because the computer algorithms which assign a STOCK_CODE are approximations of the management units, one should ascertain the criteria used to assign any existing STOCK_CODE value before performing an analysis with this variable.

The MDCEP maintains a series of code tables that are an integral part of the porpoise data management system. There are currently 16 code tables which I refer to as "Porpoise CODE TABLE 1", or "Porpoise CODE TABLE 10". Code tables 1-3 and 15 are amended each year, while code tables 4-14 and 16 have had few changes since the early 1980's. Other codes are described in the coding instructions for a particular data collection form. Porpoise CODE TABLE 4 contains the species, stock, or group codes used with the Porpoise Life-History data. A list of all assigned initials for persons who collected life-history data is included in Porpoise CODE TABLE 2. These data are currently maintained by the Multispecies Data Collection and Evaluation Program at the SWFSC.

POINTS TO PONDER

The variable Tubule Diameter is measured in microns, not millimeters as indicated on the 1978-1982, and 1983-1988 forms. The coding format for this variable is correct and the archived data were entered as microns.

Specimen lengths were measured using a two-meter stick and attached calipers during the 1970s, and this continued to be the device of choice by researchers at the SWFSC. The SWR also provided observers with another device in 1979 ("a prototype"), and yet another in 1983 ("PMD" or can). The use of these two new devices, instead of the recommended calipers, was discontinued in March 1986 when researchers at the SWFSC were made aware of their use during 1979-1986. Subsequent studies indicated that both devices result in biased measurements and that the "prototype" is also imprecise. The MDCEP has identified the cruises and specimens affected.

The development of both manual and computer-assisted methods for identifying potential errors in these data resulted from a continuing desire for quality control, an increase in the number of data elements, the number of forms, the number of observed trips, and the realization of the capacity of computers to reduce tedious manual checks. Manual procedures consisting of visual perusal of the data collection forms to identify "errors" were performed by both the observer who collected these data, and one or more members of the tuna/porpoise program staff. Once these data were archived, additional "errors" were sometimes identified by various researchers during analyses. Both types of error identifications were reconciled by experienced technicians using all available data sources and a knowledge of the fishery. Any changes to original data entries were added to the original data forms and to the appropriate computer-coded datafile(s). Records of these post-archival corrections were maintained at the SWFSC within a "Changes Book for Life-History data". These records identify the logical record (SPECIMEN), the variable value, the corrected value and the date the correction was posted.

I use the term "errors" to include data that were incorrect (e.g., month values greater than 12), but also to identify potential problems. These latter "errors" were not necessarily incorrect data, but when identified, caused the editing technicians to review the both the original and coded data. The "error" criteria were defined by researchers, technicians, and the PDMG based upon their experience with these data sources. Potential "errors" were identified if variable values were beyond what the researchers and PDMG considered to be "normal" values. Technicians then investigated errors using the original data forms, a listing of the computer file, the output from the computer edit program, and any data editing instructions, coding formats, etc. Corrections were made, if necessary, and the cycle repeated until the editing technician determined the data were acceptable based upon the established quality control criteria. Data were then archived and available for use by researchers.

For some variables the editing criteria were inviolate (e.g., the value of the YEAR variable must be 75 for data collected during 1975). Values beyond the established range or blank criteria are not necessarily in error. Thus, a value for the variable SPECIMEN LENGTH which exceeds the maximum criteria of 250 centimeters used during 1959-1988 may be valid, although the edit criteria would cause the data editors to review the original data to verify the entry. Thus, a user should not assume that values will always be within the range or blank criteria, although for most records this will be the case. In contrast, logical-error criteria are generally inviolate, except for cases where data were not recorded.

Researchers are often interested in knowing if a variable was not collected on a particular logical record although the occurrence of "missing data" may, or may not, affect the analysis. Variables for which a zero value has meaning present a special problem (e.g., Latitude Degrees, Number of Corpora). The PDMG used "-1" or "9" to identify "missing data" for variables (9 for single byte variables, and -1 for multi-byte variables) during the early 1970s because the FORTRAN compiler used to access these data interpreted both blank and zero values as zeroes for numeric variables. Observers and editing technicians were thus required to enter these "missing data" values for each variable, and this requirement increased the physical size of the computer files. Beginning in late 1974, the PDMG began archiving data on a computer system provided by Computer Sciences Corporation. The data management languages used on this computer system (DML and ALADIN) allowed unrecorded numeric variables (blanks) to be stored as "null or less than zero" with a considerable reduction in the physical size of the computer files. The PDMG group instructed observers and editing technicians to not code variables for which a value was "missing", and transcribed existing "-1" and "9" values to blanks. Thus, a researcher could test a numeric variable for a "less than zero" value to determine if the value was recorded. The reasons we took advantage of this capability were to reduce the amount of data entry, reduce the size of the computer files, and to make it easier to review the data while retaining the ability to identify "missing data" during editing and analysis. In 1981, the PDMG was instructed to transfer the archived data to another computer system which did not easily support a "null" capability. A decision was made not to transcribe the existing "missing data" values (blanks) to a "-1" or "9" value. Thus, a researcher must now interpret the character representation of a variable (blank value), and not a numeric representation (blank and zero the same) if a "missing data" value is important to the analysis.

Acknowledgements

A great many people were involved with the various aspects of developing and maintaining the data management system and these data. These data came to exist as a result of research conducted by William F. Perrin in the 1960s, and his continuing desire to ensure the data were accurate, documented, and available for analyses. Robert Butler and Frank Ralston assisted in the development of the data management concept and system. Ruth Miller performed the bulk of the post-cruise processing, lab analysis, data entry and review of the edit reports for these data during the 1970s, and was assisted by Kelly Peltier among others during the 1980s. Besides her thoroughness in performing these tasks, Ruth was a pleasure to be around. During the 1980s, Al Jackson, Rand Rasmussen, and Mike Trianni (Multispecies Data Collection and Evaluation Program) have directed the maintenance of the historical databases. They have performed the data management activities and historical archiving of these data using the editing criteria supplied by Ruth Miller, Aleta Hohn, Susan Chivers, and others. Ken Wallace has provided programming support and direction in implementing the computer programs which apply the editing criteria and archive these data.

FOOTNOTES

1 Porpoise was, and remains, the term used by tuna fishermen to refer to the dolphins involved in the purse-seine fishery for tuna in the eastern tropical Pacific. "Porpoise" observer, "porpoise" data, and "porpoise" data management group were terms that came to exist, and have persisted, as a result of this use of the term by the tuna fleet. In fact, all of the dolphins involved with the purse-seine fishery are members of the family Delphinidae (delphinids). I use the term "porpoise" to mean dolphins in this report.

2 1979 Tuna/Porpoise Observer Field Manual. National Marine Fisheries Service. 1520 State Street, Suite 200, San Diego, CA 92101.

3 1980 Tuna/Porpoise Observer Field Manual. National Marine Fisheries Service. 1520 State Street, Suite 200, San Diego, CA 92101.

4 1979 Inter-American Tropical Tuna Commission Tuna-Dolphin Investigation Field Manual. Edited by David Bratten, Inter-American Tropical Tuna Commission. c/o Scripps Institution of Oceanography, La Jolla, CA 92093.

5 1980 Inter-American Tropical Tuna Commission Tuna-Dolphin Investigation Field Manual. Edited by David Bratten, Inter-American Tropical Tuna Commission. c/o Scripps Institution of Oceanography, La Jolla, CA 92093.

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Staff, Porpoise/Tuna Interaction Program, Oceanic Fish. Res. Division. 1979. Report of the status of porpoise stocks workshop (August 27-31, 1979, La Jolla, California). Southwest Fisheries Center, Admin. Rep. No. LJ-79-41, 121 p.

Table 1. The number of specimens, by species and sex, in the life-history databases through calendar year 1988. There are 17,479 male and 20,842 female specimens in these 10 databases.

Species	Life History Database Males	Females
Spotted dolphin, *Stenella attenuata*	MSPTDB.DAT	FSPTDB.DAT
Offshore (code 02)	10,147	13,324
Coastal (code 06)	130	193
Spinner dolphin, *Stenella longirostris*	MSPNDB.DAT	FSPNDB.DAT
Unidentified (code 03)	305	224
Eastern (code 10)	2,772	2,848
Whitebelly (code 11)	2,323	2,435
Costa Rican (code 88)	34	42
Common dolphin, *Delphinus delphis*	MDELDB.DAT	FDELDB.DAT
Unidentified (code 05)	1,414	1,460
Longbeaked (code 16)	38	0
Striped dolphin, *Stenella coeruleoalba*	MSTKDB.DAT	FSTKDB.DAT
Unidentified (code 13)	169	137
Other Marine Mammals	MOTHDB.DAT	FOTHDB.DAT
(code 12) *Stenella longirostris*	2	0
(code 15) *Steno bredanensis*	15	21
(code 16) *Delphinus delphis*	5	1
(code 18) *Tursiops truncatus*	67	64
(code 20) *Tursiops truncatus* Subsp. ?	1	0
(code 21) *Grampus griseus*	1	3
(code 22) *Lagenorhynchus obliquidens*	21	43
(code 26) *Lagenodelphis sp.*	8	8
(code 27) *Lissodelphis borealis*	1	3
(code 31) *Peponocephala electra*	1	1
(code 32) *Feresa attenuata*	1	0
(code 33) *Pseudorca crassidens*	0	2
(code 34) *Globicephala* sp.	0	4
(code 36) *Globicephala macrorhynchus*	2	3
(code 37) *Orcinas orca*	0	0
(code 40) *Phocoena phocoena*	0	3
(code 42) Burmeister's porpoise	0	1
(code 44) *Phocoenoides dalli*	2	5
(code 46) *Physeter macrocephalus*	1	0
(code 47) *Kogia brevicops*	0	1
(code 48) *Kogia simus*	2	0
(code 51) *Mesoplodon* sp.	2	2
(code 61) *Ziphius cavirostris*	0	1
(code 69) *Eschrichtius robustus*	12	10
(code 70) *Balaenoptera* sp.	1	1
(code 75) *Balaenoptera musculus*	0	1
(code 76) *Megaptera novaengliae*	0	1
(code 77) Unidentified dolphin or porpoise	2	0

Table 2. Index of the collection forms, data verifications, logical error criteria and computer format data dictionary, by year, for the Porpoise Life History Record for the period 1959-1988.

Year	Original Collection Form Figure	Transcribed Form Figure	NMFS CRUISE NUMBERS	Data Dictionary Table[1]	Data Verification Criteria Table	Logical Error Criteria Table[2]
Pre-1971		3,5,6	1-5	3,4	5	6
1971	1	3,5,6	6-13	3,4	5	6
1972	1	3,5,6	14-27	3,4	5	6
1973	2	3,5,6	28-53	3,4	5	6
1974	3	3,5,6	54-97	3,4	5	6
1975	3	5,6	98-133	3,4	5	6
1976	3	5,6	134-212,215, 216	3,4	5	6
1977	3-4	5,6	213,214,217-324,326-332	3,4	5	6
1978	5	6	325,333-454	3,4	5	6
1979	5	6	455-568	3,4	5	6
1980	5	6	569-674	3,4	5	6
1981	5	6	675-768	3,4	5	6
1982	5	6	769-842	3,4	5	6
1983	6			3,4	7	8
1984	6			3,4	7	8
1985	6			3,4	7	9
1986	6			3,4	7	9
1987	6			3,4	7	9
1988	6			3,4	7	9

[1] Male and unsexed specimens were archived under the format shown in Table 2. Female specimens were archived under the format shown in Table 3.

[2] Logical errors 1-18 and 21 were used for all years (1959-1982). Logical errors 19-20 were added in 1978 but these data were not coded prior to 1978. Logical errors 22-23 were added in 1980 and used only for the years 1980-1982.

Table 3. Frequencies of non-blank entries from the male databases for Spotted dolphin, Stenella attenuata, Spinner dolphin, Stenella longirostris, Common dolphin, Delphinus delphis, Striped dolphin, Stenella coeruleoalba, and "other marine mammals". Data were obtained through calendar year 1988 from the databases as of June 1990.

ELEMENT NAME	**** COLUMNS **** FROM	TO	WIDTH	FREQUENCY OF NON-BLANK VALUES Spotted MSPTDB	Spinner MSPNDB	Common MDELDB	Streaker MSTKDB	Other MOTHDB
SPECIMEN (records)	1	7	7	10277	5434	1452	169	147
INITIALS	1	3	3	10277	5434	1452	169	147
CNUMBER	4	7	4	10277	5434	1452	169	147
CRUISEANDSET	8	14	7					
CRUISE	8	11	4	10277	5434	1452	169	147
SET	12	14	3	10211	5390	1375	164	70
FILLER	15	15	1	na	na	na	na	na
SPECIES-STOCK	16	17	2	10277	5434	1452	169	147
SEX	18	18	1	10277	5434	1452	169	147
DATE	19	24	6					
YEAR	19	20	2	10265	5431	1452	169	146
MONTH	21	22	2	10259	5428	1451	169	146
DAY	23	24	2	10227	5406	1451	169	146
POSITION	25	35	11					
LATITUDE	25	28	4					
LATD	25	26	2	10200	5364	1441	169	118
LATM	27	28	2	10192	5362	1407	169	119
NORS	29	29	1	10257	5392	1439	169	118
LONGITUDE	30	34	5					
LONGD	30	32	3	10200	5364	1441	169	119
LONGM	33	34	2	10190	5362	1407	169	119
EORW	35	35	1	10257	5392	1439	169	118
QUAD-CAPTURE	36	36	1	10258	5392	1437	169	114
SPECIMEN-LENGTH	37	40	4	10203	5406	1419	165	138
COLOR (Spotted dolphin)	41	41	1	10150	na	na	na	na
FILLER	42	47	6	na	na	na	na	na
TEETH-COLL (YES=1)	48	48	1	7017	4238	1015	135	109
TESTIS-COLL (YES=1)	49	49	1	4980	3385	973	133	91
FILLER	50	51	2	na	na	na	na	na
STOMACH-COLL (YES=1)	52	52	1	263	95	85	80	72
HEAD-COLL (YES=1)	53	53	1	689	232	279	82	86
CARCASS-COLL (YES=1)	54	54	1	183	63	75	39	48
FILLER	55	56	2	na	na	na	na	na
PARASITES-COLL (YES=1)	57	57	1	4	0	16	0	3
BLOOD-COLL (YES=1)	58	58	1	1	3	3	0	1
PHOTOS-COLL (YES=1)	59	59	1	305	291	137	68	66
FILLER	60	60	1	na	na	na	na	na
SPECIMEN-WEIGHT	61	67	7	144	46	70	31	33
L-TESTIS-WT	68	74	7	109	80	81	17	23
L-TESTIS-WT-WO-EPI	75	81	7	5	13	4	0	2
R-TESTIS-WT	82	88	7	4919	3329	951	120	62
R-TESTIS-WT-WO-EPI	89	95	7	1591	929	212	24	21
R-TESTIS-LENGTH	96	98	3	4841	3303	907	119	58

Table 3. continued.

ELEMENT NAME	**** COLUMNS **** FROM - TO	WIDTH	FREQUENCY OF NON-BLANK VALUES Spotted MSPTDB	Spinner MSPNDB	Common MDELDB	Streaker MSTKDB	Other MOTHDB
TESTIS-DEVELP	99 - 99	1	56	628	154	51	0
EPIDID-STATE	100 - 100	1	128	540	154	51	0
FILLER	101 - 101	1	na	na	na	na	na
NUM-LAMINAE	102 - 104	3	2030	1621	163	43	0
FILLER	105 - 145	41	na	na	na	na	na
TUBULE-DIA	146 - 148	3	126	295	154	53	0
FILLER	149 - 156	8	na	na	na	na	na
READING-STATUS	157 - 158	2	0	0	0	0	0
READER-CODE	159 - 160	2	0	0	0	0	0
FIVE-DEG-SQUARE	161 - 163	3	0	0	0	0	0
CALCULATED-STOCK	164 - 166	3	0	0	0	0	0

Table 4. Frequencies of non-blank entries from the female databases for Spotted dolphin, Stenella attenuata, Spinner dolphin, Stenella longirostris, Common dolphin, Delphinus delphis, Striped dolphin, Stenella coeruleoalba, and "other marine mammals". Data were obtained through calendar year 1988 from the databases as of June 1990.

ELEMENT NAME	**** COLUMNS **** FROM	TO	WIDTH	FREQUENCY OF NON-BLANK VALUES Spotted FSPTDB	Spinner FSPNDB	Common FDELDB	Streaker FSTKDB	Other FOTHDB
SPECIMEN (records)	1	7	7	13517	5549	1460	137	180
INITIALS	1	3	3	13517	5549	1460	137	179
CNUMBER	4	7	4	13517	5549	1460	137	180
CRUISEANDSET	8	14	7					
CRUISE	8	11	4	13517	5549	1460	137	180
SET	12	14	3	13471	5520	1408	134	77
FILLER	15	15	1	na	na	na	na	na
SPECIES-STOCK	16	17	2	13517	5549	1460	137	180
SEX	18	18	1	13517	5549	1460	137	179
DATE	19	24	6					
YEAR	19	20	2	13510	5546	1458	137	177
MONTH	21	22	7	13503	5541	1457	137	177
DAY	23	24	2	13488	5536	1457	137	177
POSITION	25	35	11					
LATITUDE	25	28	4					
LATD	25	26	2	13439	5491	1447	137	155
LATM	27	28	2	13431	5488	1410	137	155
NORS	29	29	1	13492	5529	1448	137	159
LONGITUDE	30	34	3					
LONGD	30	32	3	13438	5491	1447	137	155
LONGM	33	34	2	13430	5488	1410	137	155
EORW	35	35	1	13492	5529	1448	137	159
QUAD-CAPTURE	36	36	1	13494	5530	1446	137	142
SPECIMEN-LENGTH	37	40	4	13415	5518	1442	136	170
COLOR (Spotted dolphin)	41	41	1	13359	na	na	na	na
MAMMARY-STATE	42	42	1	11960	4902	1295	117	121
FETUS-SEX	43	43	1	1734	512	184	21	14
FETUS-LENGTH	44	47	4	2099	636	249	24	13
TEETH-COLL (YES=1)	48	48	1	9599	4426	1093	115	147
FILLER	49	49	1	na	na	na	na	na
OVAR-UTER-COLL (YES=1)	50	50	1	8249	3519	988	101	129
FETUS-COLL (YES=1)	51	51	1	1247	384	165	20	15
STOMACH-COLL (YES=1)	52	52	1	327	86	67	67	115
HEAD-COLL (YES=1)	53	53	1	1003	254	311	75	128
CARCASS-COLL (YES=1)	54	54	1	193	71	84	29	89
MAMMARY-COLL (YES=1)	55	55	1	2	1	1	0	1
MILK-COLL (YES=1)	56	56	1	3	1	0	0	0
PARASITES-COLL (YES=1)	57	57	1	29	2	2	0	3
BLOOD-COLL (YES=1)	58	58	1	52	22	5	0	2
PHOTOS-COLL (YES=1)	59	59	1	164	237	154	58	89
FILLER	60	60	1	na	na	na	na	na
SPECIMEN-WEIGHT	61	67	7	144	51	98	29	53
L-OVARY-WT	68	74	7	8148	3467	970	102	85

Table 4. continued.

ELEMENT NAME	**** COLUMNS **** FROM - TO	WIDTH	FREQUENCY OF NON-BLANK VALUES Spotted FSPTDB	Spinner FSPNDB	Common FDELDB	Streaker FSTKDB	Other FOTHDB
FILLER	75 - 81	7	na	na	na	na	na
R-OVARY-WT	82 - 88	7	8001	3410	964	97	84
FILLER	89 - 101	13	na	na	na	na	na
NUM-LAMINAE	102 - 104	3	2873	1615	145	49	0
LUTEUM-LOC	105 - 105	1	2214	726	272	20	8
LUTEUM-MAX-DIA	106 - 107	2	2228	726	269	20	9
LUTEUM-MID-DIA	108 - 109	2	2220	726	268	20	9
LUTEUM-MIN-DIA	110 - 111	2	2219	726	269	20	10
NUM-CORPORA-L	112 - 113	2	8107	3400	965	102	73
NUM-CORPORA-R	114 - 115	2	7968	3349	962	98	74
FOLLICLE-MAX-DIA	116 - 118	3	8011	3436	962	103	69
CORPORA1-L	119 - 120	2	7975	3391	959	102	66
CORPORA2-L	121 - 122	2	7975	3391	959	102	66
CORPORA3-L	123 - 124	2	7975	3391	959	102	66
CORPORA4-L	125 - 126	2	7975	3391	959	102	66
CORPORA5-L	127 - 128	2	7975	3391	959	102	66
FILLER	129 - 129	1	na	na	na	na	na
CORPORA6-L	130 - 131	2	7975	3391	959	102	66
CORPORA1-R	132 - 133	2	7833	3340	956	98	66
CORPORA2-R	134 - 135	2	7834	3340	956	98	66
CORPORA3-R	136 - 137	2	7834	3340	956	98	66
CORPORA4-R	138 - 139	2	7834	3340	956	98	66
CORPORA5-R	140 - 141	2	7835	3340	956	98	66
CORPORA6-R	142 - 143	2	7835	3340	956	98	66
TOTAL-CORPORA	144 - 145	2	7894	3302	944	99	69
FILLER	146 - 148	3	na	na	na	na	na
PREGNANT (YES=1)	149 - 149	1	2295	693	262	24	15
FETUS-WEIGHT	150 - 156	7	967	298	126	12	6
READING-STATUS	157 - 158	2	0	0	0	0	0
READER-CODE	159 - 160	2	0	0	0	0	0
FIVE-DEG-SQUARE	161 - 163	3	0	0	0	0	0
CALCULATED-STOCK	164 - 166	3	0	0	0	0	0

Table 5. Data Verification Specifications for the 1959-1982 Porpoise Life History Record (1978 format). This list includes values for both male, female, and unsexed specimens, although the actual edit criteria applied was determined by the coded value of sex for each logical record.

1959-1982 Porpoise Life History Record Form
Data Element Blankness and Range Editing Specifications
Record 1 of 2

Data Element	Columns	Character type[1]	BLANK OK?	Range Lower	Range Upper	Logical Error
Cruise Number(1959-1978)	1- 4	N	No	1	1000	
(1979-1982)				500	1000	
Specimen Number						
Initials	5- 7	A	No	AAA	ZZZ	14,23
Number	8-11	N	No	1	900	15
Record Number 1 of 2	12	N	No	1	1	
Species/Stock Code	13-14	N	No	2	95	
Sex	15	N	No	1	2	
Salvage Date-Year	16-17	N	No	59	78	
(1979-1982)				79	82	
Salvage Date-Month	18-19	N	No	1	12	
Salvage Date-Day	20-21	N	No	1	31	
Set Number	22-24	N	No	1	105	
Position:						
Lat. degrees	25-26	N	No	0	30	12,13
Lat. minutes	27-28	N	No	0	59	
Long. degrees	29-31	N	No	82	150	
Long. minutes	32-33	N	No	0	59	
Capture Quandrant	34	N	No	0	1	
Total Length	35-38	N	No	80	250	
Coloration	39	N	Yes	1	6	
Lactating ? Y/N	40	N	Yes	0	1	
Fetus Sex	41	N	Yes	1	2	
Fetus Length	42-45	N	Yes	1	800	11,22
*Teeth taken ? Y/N	46	N	No	1	2	19,20
Testis taken ? Y/N	47	N	Yes	1	2	20
Ovaries and Uterus taken ? Y/N	48	N	Yes	1	2	20
Fetus taken ? Y/N	49	N	Yes	1	2	
*Stomach taken ? Y/N	50	N	No	1	2	20
*Head taken ? Y/N	51	N	No	1	2	20
*Carcass taken ? Y/N	52	N	No	1	2	
Photos ? Y/N	53	N	Yes	1	2	
Specimen Weight	54-60	N	Yes	22700	1300000	3
Left Gonad Weight	61-67	N	Yes	1	14000	3
Right Gonad Weight	68-74	N	Yes	1	14000	1,17
Right Testis						
Length	75-77	N	Yes	30	300	2
S. G.	78	N	Yes	0	1	
Epi	79	N	Yes	0	2	

Table 5. continued.

1959-1982 Porpoise Life History Record Form
Data Element Blankness and Range Editing Specifications
Record 2 of 2

Data Element	Columns	Character type[1]	BLANK OK?	Range Lower	Range Upper	Logical Error
Cruise Number(1959-1978)	1- 4	N	No	1	1000	
(1979-1982)				500	1000	
Specimen Number						
Initials	5- 7	A	No	AAA	ZZZ	14,23
Number	8-11	N	No	1	900	
Record Number 2 of 2	12	N	No	2	2	
Number of Layers	13-15	N	Yes	0	220	
Luteum Location	16	N	Yes	0	5	
Luteum Diameters						
First	17-18	N	Yes	10	35	
Second	19-20	N	Yes	9	26	
Third	21-22	N	Yes	8	23	
Number of Corpora						
Left Ovary	23-24	N	Yes	0	25	4,6,9
Right Ovary	25-26	N	Yes	0	20	5,7,9
Follicle Diameter	27-29	N	Yes	1	150	10
Number of Corpora on left ovary at stage:						
One	30-31	N	Yes			6
Two	32-33	N	Yes			6
Three	34-35	N	Yes			6
Four	36-37	N	Yes			6
Five	38-39	N	Yes			6
Six	40-41	N	Yes			6
Number of Corpora on right ovary at stage:						
One	42-43	N	Yes			7
Two	44-45	N	Yes			7
Three	46-47	N	Yes			7
Four	48-49	N	Yes			7
Five	50-51	N	Yes			7
Six	52-53	N	Yes			7
Total Number of Corpora on both left and right	54-55	N	Yes	0	27	4,5, 9,18
Tubule Diameter	56-58	N				
Fetus weight	59-65	N				
Reading Status	66-67	N				
Reader Code	68-69	N				

* These elements were not coded prior to 1978 and can be blank.

[1] A = Alpha B = Blank N = Numeric

Table 6. Logical Error criteria used for the 1959-1982 Porpoise Life History Record (1978 format).

ERROR001	IF 'TESTIS COLL' (1.47) IS 1, THEN 'R TESTIS WEIGHT' (1.68) MUST NOT BE BLANK.
ERROR002	IF 'TESTIS COLL' (1.47) IS 1, THEN 'R TESTIS LENGTH' (1.75) MUST NOT BE BLANK.
ERROR003	IF 'OVAR UTER COLL' (1.48) IS 1, THEN 'L OVARY WT' (1.61) OR 'R OVARY WT' (1.68) MUST NOT BE BLANK.
ERROR004	IF 'L OVARY WT' (1.61) IS NOT BLANK, THEN 'NUM CORPORA L' (2.23) AND 'TOTAL CORPORA' (2.54) MUST NOT BE BLANK.
ERROR005	IF SEX (1.15) IS EQUAL TO 2(FEMALE) AND IF 'R OVARY WT' (1.68) IS NOT BLANK, THEN 'NUM CORPORA R' (2.25) AND 'TOTAL CORPORA' (2.54) MUST NOT BE BLANK.
ERROR006	IF 'NUM CORPORA L' (2.23) IS NOT BLANK, THEN 'NUM CORPORA L' MUST EQUAL $('CORPORA1 L' + 'CORPORA2 L' + 'CORPORA3 L' + 'CORPORA4 L' + 'CORPORA5 L' + 'CORPORA6 L') (2.30)).
ERROR007	IF 'NUM CORPORA R' (2.25) IS NOT BLANK, THEN 'NUM CORPORA R' MUST EQUAL $('CORPORA1 R' + 'CORPORA2 R' + 'CORPORA3 R' + 'CORPORA4 R' + 'CORPORA5 R' + 'CORPORA6 R') (2.42)).
ERROR008	IF 'LUTEUM LOC' (2.16) IS BLANK, THEN 'TOTAL CORPORA' (2.54) MUST EQUAL $'NUM CORPORA L' (2.23) + 'NUM CORPORA R' (2.25)).
ERROR009	IF 'LUTEUM LOC' (2.16) IS NOT BLANK, THEN 'TOTAL CORPORA' (2.54) MUST EQUAL $'NUM CORPORA L' (2.23) + 'NUM CORPORA R' (2.25) + 1).
ERROR010	IF 'OVAR UTER COLL' (1.48) IS 1, THEN 'FOLLICLE MAX DIA' (2.27) MUST NOT BE BLANK.
ERROR011	IF 'FETUS COLL' (1.49) IS 1, THEN 'FETUS LENGTH' (1.42) MUST NOT BE BLANK.
ERROR012	IF 'SPECIES STOCK' (1.13) IS 02,03,10,11 OR 88 THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES.
ERROR013	IF 'SPECIES STOCK' (1.13) IS 06, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES.
ERROR014	IF THE OBSERVERS 'INITIALS' ON THE FIRST CARD (1.05) DOES NOT MATCH THE OBSERVERS 'INITIALS' ON THE SECOND CARD (2.05) OR THE OBSERVERS 'INITIALS' ON THE PREVIOUS CARD, THEN THERE IS AN ERROR.
ERROR015	IF THE PRESENT 'CNUMBER' (1.08) FOR A PARTICULAR CRUISE IS LESS THAN OR EQUAL TO THE PREVIOUS 'CNUMBER' FOR THE SAME CRUISE, THEN THERE IS AN ERROR.
ERROR017	IF THE MALE 'SPECIMAN LENGTH' (1.35) IS LESS THAN 160 CM, THEN 'R TESTIS WT' (1.68) MUST NOT BE MORE THAN 50.0 GRAMS.
ERROR018	IF THE FEMALE 'SPECIMAN LENGTH' (1.35) IS LESS THAN 165 CM, THEN 'TOTAL CORPORA' (2.54) MUST NOT BE MORE THAN 02.

Table 6. continued.

ERROR019[1]	IF 'HEAD COLL' (1.51) IS 1, THEN 'TEETH COLL' (1.46) MUST BE 1.
ERROR020[1]	IF 'CARCASS COLL' (1.52) IS 1, THEN 'TEETH COLL' (1.46), GONADS COLLECTED ('OVAR UTER COLL' (1.48) (FEMALES) OR 'TESTIS COLL' (1.47) (MALES)), 'STOMACH COLL' (1.50) AND 'HEAD COLL' (1.51) MUST ALL BE 1.
ERROR021	THE 'POSITION' (1.25) WAS FOUND TO BE BEYOND THE EASTERN BOUNDARY LINE.
ERROR022[2]	IF 'SEX' (1.15) IS TWO AND 'LUTEUM LOC' (2.16) IS FOUR OR FIVE, THEN 'FETUS LENGTH' (1.42) MUST NOT BE BLANK.
ERROR023[2]	IF THE 'SPECIMEN' (1.05) ON THE FIRST CARD DOES NOT MATCH 'SPECIMEN' (2.05) ON THE SECOND CARD, THERE IS AN ERROR.

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1 These data were not coded prior to 1978.

2 Logical errors 1-18 and 21 were used for all years. Logical errors 19-20 were added in 1978 but these data were not coded prior to 1978. Logical errors 22-23 were added in 1980 and used only for the years 1980-1982.

Table 7. Data Verification Specifications for the 1983-1988 Porpoise Life History Record (1983 format). This list includes values for both male, female, and unsexed specimens, although the actual edit criteria applied was determined by the coded value of sex for each logical record.

1983-1988 Porpoise Life History Record Form
Data Element Blankness and Range Editing Specifications
Record 1 of 3

Data Element	Columns	Character type[2]	BLANK OK?	Range Lower	Range Upper
Cruise Number (1983)	1- 4	N	No	835	935
(1984)				906	960
(1985)				906	960
(1986)				?	?
(1987)				997	1125
(1988)				1122	1183
Specimen Number					
Initials	5- 7	A	No	AAA	ZZZ
Number	8-11	N	No	1	900
Record Number 1 of 3	12	N	No	1	1
Species/Stock Code	13-14	N	No	2	95
Sex	15	N	No	1	2
Salvage Date-Year[1]	16-17	N	No	83	88
Salvage Date-Month	18-19	N	No	1	12
Salvage Date-Day	20-21	N	No	1	31
Set Number	22-24	N	No	1	105
Position:					
Lat. degrees	25-26	N	No	0	30
Lat. minutes	27-28	N	No	0	59
Long. degrees	29-31	N	No	82	150
Long. minutes	32-33	N	No	0	59
Capture Quadrant	34	N	No	0	1
Total Length (1983)	35-38	N	No	80	250
(1984-1988)				70	250
Coloration	39	N	Yes	1	6
Lactating ? Y/N	40	N	Yes	0	1
Fetus Sex	41	N	Yes	1	2
Fetus Length	42-45	N	Yes	1	800
Teeth taken ? Y/N	46	N	No	1	2
Testis taken ? Y/N	47	N	Yes	1	2
Ovaries and Uterus taken ? Y/N	48	N	Yes	1	2
Fetus taken ? Y/N	49	N	Yes	1	2
Stomach taken ? Y/N	50	N	No	1	2
Head taken ? Y/N	51	N	No	1	2
Carcass taken ? Y/N	52	N	No	1	2
Mammary taken ? Y/N	53	N	Yes	1	2
Milk taken ? Y/N	54	N	Yes	1	2
Parasites taken ? Y/N	55	N	No	1	2
Blood taken ? Y/N	56	N	No	1	2

Table 7. continued.

1983-1988 Porpoise Life History Record Form
Data Element Blankness and Range Editing Specifications
Record 1 of 3

Data Element	Columns	Character type[2]	BLANK OK?	Range Lower	Range Upper
Photos ? Y/N(1983-1986)	57	N	Yes	1	2
(1987-1988)			No	1	2
Columns 58-80 are blanks					

Table 7. continued.

1983-1988 Porpoise Life History Record Form
Data Element Blankness and Range Editing Specifications
Record 2 of 3

Data Element	Columns	Character type[2]	BLANK OK?	Range Lower	Range Upper
Cruise Number (1983)	1- 4	N	No	835	935
(1984)				906	960
(1985)				906	960
(1986)				?	?
(1987)				997	1125
(1988)				1122	1183
Specimen Number					
Initials	5- 7	A	No	AAA	ZZZ
Number	8-11	N	No	1	900
Record Number 2 of 3	12	N	No	2	2
Specimen Weight	13-19	N	Yes	22700	1300000
Left Gonad Weight with epidiymus:					
(1983)	20-26	N	Yes	1	14000
(1984-1988)				1	12000
Left Gonad Weight without epidiymus:					
(1983)	27-33	N	Yes	1	14000
(1984-1988)				1	12000
Right Gonad Weight with epidiymus:					
(1983)	34-40	N	Yes	1	14000
(1984-1988)				1	12000
Right Gonad Weight without epidiymus:					
(1983)	41-47	N	Yes	1	14000
(1984-1988)				1	12000
Right Testis					
Length (1983)	48-50	N	Yes	30	300
(1984-1988)				30	350
S. G. (1983-1988)	51	N	Yes	0	1
Epi (1983-1988)	52	N	Yes	0	2
This column is blank	53				
Number of Layers:					
(1983)	54-56	N	Yes	0	220
(1984-1988)				0	500
Luteum Location	57	N	Yes	0	5
Luteum Diameters					
First (1983-1988)	58-59	N	Yes	10	35
Second (1983)	60-61	N	Yes	9	26
(1984-1988)				9	30
Third (1983)	62-63	N	Yes	8	23
(1984-1988)				8	25

Table 7. continued.

1983-1988 Porpoise Life History Record Form
Data Element Blankness and Range Editing Specifications
Record 2 of 3

Data Element	Columns	Character type[2]	BLANK OK?	Range Lower	Range Upper
Number of Corpora					
Left Ovary	64-65	N	Yes	0	25
Right Ovary	66-67	N	Yes	0	20
Follicle Diameter	68-70	N	Yes	1	150
Number of Corpora on left ovary at stage:					
One	71-72	N	Yes	0	25
Two	73-74	N	Yes	0	25

Columns 75-80 are blanks

Table 7. continued.

1983-1988 Porpoise Life History Record Form
Data Element Blankness and Range Editing Specifications
Record 3 of 3

Data Element	Columns	Character type[2]	BLANK OK?	Range Lower	Range Upper
Cruise Number (1983)	1- 4	N	No	835	935
(1984)				906	960
(1985)				906	960
(1986)				?	?
(1987)				997	1125
(1988)				1122	1183
Specimen Number					
Initials	5- 7	A	No	AAA	ZZZ
Number	8-11	N	No	1	900
Record Number 3 of 3	12	N	No	3	3
Number of Corpora on left ovary at stage:					
Three	75-76	N	Yes	0	25
Four	77-78	N	Yes	0	25
Five	79-80	N	Yes	0	25
Six	13-14	N	Yes	0	25
Number of Corpora on right ovary at stage:					
One	15-16	N	Yes	0	25
Two	17-18	N	Yes	0	25
Three	19-20	N	Yes	0	25
Four	21-22	N	Yes	0	25
Five	23-24	N	Yes	0	25
Six	25-26	N	Yes	0	25
Total Number of Corpora on both left and right	27-28	N	Yes	0	30
Tubule Diameter	29-31	N	Yes	0	250
Pregnant ? Y/N	32	N	Yes	1	2
Fetus weight	33-39	N	Yes	0	8000

1 Data were checked for the calendar year of collection

2 A = Alpha B = Blank N = Numeric

Table 8. Logical Error criteria used for the 1983-1984 Porpoise Life History Record (1983 format).

ERROR001	IF 'TESTIS COLL' (1.47) IS 1, THEN 'R TESTIS WEIGHT' (2.34) MUST NOT BE BLANK.
ERROR002	IF 'TESTIS COLL' (1.47) IS 1, THEN 'R TESTIS LENGTH' (2.48) MUST NOT BE BLANK.
ERROR003	IF 'OVAR UTER COLL' (1.48) IS 1, THEN 'L OVARY WT' (2.20) OR 'R OVARY WT' (2.34) MUST NOT BE BLANK.
ERROR004	IF 'L OVARY WT' (2.20) IS NOT BLANK, THEN 'NUM CORPORA L' (2.64) AND 'TOTAL CORPORA' (3.27) MUST NOT BE BLANK.
ERROR005	IF SEX (1.15) IS EQUAL TO 2(FEMALE) AND IF 'R OVARY WT' (2.34) IS NOT BLANK, THEN 'NUM CORPORA R' (2.66) AND 'TOTAL CORPORA' (3.27) MUST NOT BE BLANK.
ERROR006	IF 'NUM CORPORA L' (2.64) IS NOT BLANK, THEN 'NUM CORPORA L' MUST EQUAL ('CORPORA1 L' + 'CORPORA2 L' + 'CORPORA3 L' + 'CORPORA4 L' + 'CORPORA5 L' + 'CORPORA6 L') (2.71)).
ERROR007	IF 'NUM CORPORA R' (2.66) IS NOT BLANK, THEN 'NUM CORPORA R' MUST EQUAL ('CORPORA1 R' + 'CORPORA2 R' + 'CORPORA3 R' + 'CORPORA4 R' + 'CORPORA5 R' + 'CORPORA6 R') (3.15)).
ERROR008	IF 'LUTEUM LOC' (2.57) IS BLANK, THEN 'TOTAL CORPORA' (3.27) MUST EQUAL 'NUM CORPORA L' (2.64) + 'NUM CORPORA R' (2.66)).
ERROR009	IF 'LUTEUM LOC' (2.57) IS NOT BLANK, THEN 'TOTAL CORPORA' (3.27) MUST EQUAL 'NUM CORPORA L' (2.64) + 'NUM CORPORA R' (2.66) + 1).
ERROR010	IF 'OVAR UTER COLL' (1.48) IS 1, THEN 'FOLLICLE MAX DIA' (2.68) MUST NOT BE BLANK.
ERROR011	IF 'FETUS COLL' (1.49) IS 1, THEN 'FETUS LENGTH' (1.42) MUST NOT BE BLANK.
ERROR012	IF THE 'SPECIES STOCK' (1.13) IS 02, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR OFFSHORE SPOTTED DOLPHIN.
ERROR013	IF THE 'SPECIES STOCK' (1.13) IS 06, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR COASTAL SPOTTED DOLPHIN.
ERROR014	IF THE 'SPECIES-STOCK' (1.13) IS 90, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR UNIDENTIFIED SPOTTED DOLPHIN.
ERROR015	IF THE 'SPECIES-STOCK' (1.13) IS 10, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR EASTERN SPINNER DOLPHIN.
ERROR016	IF THE 'SPECIES-STOCK' (1.13) IS 11, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR WHITEBELLY SPINNER DOLPHIN.
ERROR017	IF THE 'SPECIES-STOCK' (1.13) IS 88, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR COSTA RICAN SPINNER DOLPHIN.

Table 8. continued.

ERROR018	IF THE 'SPECIES-STOCK' (1.13) IS 03, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR UNIDENTIFIED SPINNER DOLPHIN.
ERROR019	IF THE 'SPECIES-STOCK' (1.13) IS 05, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR COMMON DOLPHIN.
ERROR020	IF THE 'SPECIES-STOCK' (1.13) IS 13, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR STRIPED DOLPHIN.
ERROR021	IF THE PRESENT OBSERVERS 'INITIALS' (1.05) ARE NOT EQUAL TO THE PREVIOUS OBSERVERS 'INITIALS' (1.05) FOR THE SAME 'CRUISE' (1.01), THEN THERE MAY BE AN ERROR.
ERROR022	IF THE PRESENT 'CNUMBER' (1.08) IS NOT INCREASING FROM SPECIMEN TO SPECIMEN FOR THE SAME 'CRUISE' (1.01), THEN THERE IS AN ERROR.
ERROR023	IF THE MALE 'SPECIMEN LENGTH' (1.35) IS LESS THAN 160 CM, THEN 'R TESTIS WT' (2.34) MUST NOT BE MORE THAN 50.0 GRAMS.
ERROR024	IF THE FEMALE 'SPECIMEN LENGTH' (1.35) IS LESS THAN 165 CM, THEN 'TOTAL CORPORA' (3.27) MUST NOT BE MORE THAN 02.
ERROR025	IF 'HEAD COLL' (1.51) IS 1, THEN 'TEETH COLL' (1.46) MUST BE 1.
ERROR026	IF 'CARCASS COLL' (1.52) IS 1, THEN 'TEETH COLL' (1.46), GONADS COLLECTED ('OVAR UTER COLL' (1.48) (FEMALES) OR 'TESTIS COLL' (1.47) (MALES)), 'STOMACH COLL' (1.50) AND 'HEAD COLL' (1.51) MUST ALL BE 1.
ERROR027	IF 'SEX' (1.15) IS TWO AND 'LUTEUM LOC' (2.57) IS FOUR OR FIVE, THEN 'FETUS LENGTH' (1.42) MUST NOT BE BLANK.
ERROR028	IF THE 'SPECIMEN' (1.05) ON THE FIRST CARD DOES NOT MATCH 'SPECIMEN' (2.05) ON THE SECOND CARD, AND DOES NOT MATCH 'SPECIMEN' (3.05) ON THE THIRD CARD, THERE IS AN ERROR.
ERROR029	IF THE MALE 'SPECIMEN LENGTH' (1.35) IS EQUAL TO OR GREATER THAN 160 CM, THEN THE 'RIGHT TESTIS WT' (2.34) MUST BE GREATER THAN 50.0 GRAMS IF NON-BLANK.
ERROR030	IF THE MALE 'SPECIMEN LENGTH' (1.35) IS EQUAL TO OR GREATER THAN 160 CM, THEN THE 'LEFT TESTIS WT' (2.20) MUST BE GREATER THAN 50.0 GRAMS IF NON-BLANK.
ERROR031	IF THE MALE 'SPECIMEN LENGTH' (1.35) IS LESS THAN 160 CM, THEN 'LEFT TESTIS WT' (2.20) MUST NOT BE BE MORE THAN 50.0 GRAMS.
ERROR032	IF THE VALUE OF 'SPECIES STOCK' (1.13) IS OTHER THAN 02, 03, 05, 06, 10, 11, 13, 15, 18, 22, 88, OR 90, THEN FLAG THE SPECIMEN.
ERROR033	IF THE 'SPECIES-STOCK' (1.13) IS 02 OR 06 OR 90, AND THE 'SPECIMEN LENGTH' (1.35) IS GREATER THAN 79 CM BUT LESS THAN 111 CM, THEN THE 'COLORATION' (1.39) SHOULD BE EQUAL TO 1 ... (NEONATE).

Table 8. continued.

ERROR034	IF THE 'SPECIES STOCK' (1.13) IS 02 OR 06 OR 90, AND T 'SPECIMEN LENGTH' (1.35) IS GREATER THAN 119 CM BUT LESS THAN 136 CM, THEN THE 'COLORATION' (1.39) SHOULD BE EQUAL TO 2 ... (TWO-TONED).
ERROR035	IF THE 'SPECIES-STOCK' (1.13) IS 02 OR 06 OR 90, AND THE 'SPECIMEN LENGTH' (1.35) IS GREATER THAN 139 CM BUT LESS THAN 166 CM, THEN THE 'COLORATION' (1.39) SHOULD BE EQUAL TO 4 ... (SPECKLED).
ERROR036	IF THE 'SPECIES STOCK' (1.13) IS 02 OR 06 OR 90, AND THE 'SPECIMEN LENGTH' (1.35) IS GREATER THAN 194 CM BUT LESS THAN 240 CM, THEN THE 'COLORATION' (1.39) SHOULD BE EQUAL TO 6 ... (ADULT).
ERROR037	IF THE 'SPECIES STOCK' (1.13) IS 02 OR 06 OR 90, AND THE 'SPECIMEN LENGTH' (1.35) IS GREATER THAN 79 CM BUT LESS THAN 121 CM, THEN THE 'COLORATION' (1.39) SHOULD BE EQUAL TO 1 (NEONATE) OR 2 (TWO-TONE).
ERROR038	IF THE 'SPECIES STOCK' (1.13) IS 02 OR 06 OR 90, AND THE 'SPECIMEN LENGTH' (1.35) IS GREATER THAN 109 CM BUT LESS THAN 141 CM, THEN THE 'COLORATION' (1.39) SHOULD BE EQUAL TO 2 (TWO-TONE) OR 4 (SPECKLED).
ERROR039	IF THE 'SPECIES STOCK' (1.13) IS 02 OR 06 OR 90, AND THE 'SPECIMEN LENGTH' (1.35) IS GREATER THAN 134 CM BUT LESS THAN 171 CM, THEN THE 'COLORATION' (1.39) SHOULD BE EQUAL TO 4 (SPECKLED) OR 5 (MOTTLED).
ERROR040	IF THE 'SPECIES-STOCK' (1.13) IS 02 OR 06 OR 90, AND THE 'SPECIMEN LENGTH' (1.35) IS GREATER THAN 170 CM BUT LESS THAN 241 CM, THEN THE 'COLORATION' (1.39) SHOULD BE EQUAL TO 5 (MOTTLED) OR 6 (ADULT).
ERROR041	IF BOTH 'L TESTIS WT' (2.20) AND 'L TESTIS WT WO EPI' (2.27) ARE NON-BLANK, THEN 'L TESTIS WT' MUST BE GREATER THAN 'L TESTIS WT WO EPI'.
ERROR042	IF BOTH 'R TESTIS WT' (2.34) AND 'R TESTIS WT WO EPI' (2.41) ARE NON-BLANK, THEN 'R TESTIS WT' MUST BE GREATER THAN 'R TESTIS WT WO EPI'.

Table 9. Logical Error criteria used for the 1985-1988 Porpoise Life History Record (1983 format).

ERROR005	IF THE PRESENT OBSERVERS 'INITIALS' (1.05) ARE NOT EQUAL TO THE PREVIOUS OBSERVERS 'INITIALS' (1.05) FOR THE SAME 'CRUISE' (1.01), THEN THERE MAY BE AN ERROR.
ERROR010	IF THE PRESENT 'CNUMBER' (1.08) IS NOT INCREASING FROM SPECIMEN TO SPECIMEN FOR THE SAME 'CRUISE' (1.01), THEN THERE IS AN ERROR.
ERROR015	IF THE 'SPECIMEN' (1.05) ON THE FIRST CARD DOES NOT MATCH 'SPECIMEN' (2.05) ON THE SECOND CARD, AND DOES NOT MATCH 'SPECIMEN' (3.05) ON THE THIRD CARD, THERE IS AN ERROR.
ERROR020	IF 'HEAD-COLL' (1.51) IS 1, THEN 'TEETH-COLL' (1.46) MUST BE 1.
ERROR025	IF 'CARCASS-COLL' (1.52) IS 1, THEN 'TEETH-COLL' (1.46), GONADS COLLECTED ('OVAR-UTER-COLL' (1.48) (FEMALES) OR 'TESTIS-COLL' (1.47) (MALES)), 'STOMACH-COLL' (1.50) AND 'HEAD-COLL' (1.51) MUST ALL BE 1.
ERROR029	IF 'SEX' (1.15) IS EQUAL TO 1 (MALE), THEN 'TESTIS-COLL' (1.47) MUST NOT BE BLANK.
ERROR030	IF 'TESTIS-COLL' (1.47) IS 1, THEN 'R-TESTIS-WEIGHT' (2.34) MUST NOT BE BLANK.
ERROR035	IF 'TESTIS-COLL' (1.47) IS 1, THEN 'R-TESTIS-LENGTH' (2.48) MUST NOT BE BLANK.
ERROR040	IF BOTH 'L-TESTIS-WT' (2.20) AND 'L-TESTIS-WT-WO-EPI' (2.27) ARE NON-BLANK, THEN 'L-TESTIS-WT' MUST BE GREATER THAN 'L-TESTIS-WT-WO-EPI'.
ERROR045	IF BOTH 'R-TESTIS-WT' (2.34) AND 'R-TESTIS-WT-WO-EPI' (2.41) ARE NON-BLANK, THEN 'R-TESTIS-WT' MUST BE GREATER THAN 'R-TESTIS-WT-WO-EPI'.
ERROR050	IF 'SEX' (1.15) IS EQUAL TO 1 (MALE) AND 'R-TESTIS-WT' (2.34) IS NOT BLANK, THEN 'R-TESTIS-LENGTH' (2.48) MUST NOT BE BLANK.
ERROR055	IF THE MALE 'SPECIMEN-LENGTH' (1.35) IS LESS THAN 160 CM, THEN 'LEFT-TESTIS-WT' (2.20) MUST NOT BE BE MORE THAN 50.0 GRAMS.
ERROR060	IF THE MALE 'SPECIMEN-LENGTH' (1.35) IS LESS THAN 160 CM, THEN 'R-TESTIS-WT' (2.34) MUST NOT BE MORE THAN 50.0 GRAMS.
ERROR065	IF THE MALE 'SPECIMEN-LENGTH' (1.35) IS EQUAL TO OR GREATER THAN 160 CM, THEN THE 'LEFT-TESTIS-WT' (2.20) MUST BE GREATER THAN 50.0 GRAMS IF NON-BLANK.
ERROR070	IF THE MALE 'SPECIMEN-LENGTH' (1.35) IS EQUAL TO OR GREATER THAN 160 CM, THEN THE 'RIGHT-TESTIS-WT' (2.34) MUST BE GREATER THAN 50.0 GRAMS IF NON-BLANK.
ERROR073	IF 'SEX' (1.15) IS EQUAL TO 2 (FEMALE), THEN 'OVAR-UTER-COLL' (1.48), 'FETUS-COLL' (1.49), 'MAMMARY-COLL' (1.53) AND 'MILK-COLL' (1.54) MUST ALL BE NOT BLANK.
ERROR075	IF 'OVAR-UTER-COLL' (1.48) IS 1, THEN 'L-OVARY-WT' (2.20) OR 'R-OVARY-WT' (2.34) MUST NOT BE BLANK.

Table 9. continued.

ERROR080	IF 'OVAR-UTER-COLL' (1.48) IS 1, THEN 'FOLLICLE-MAX-DIA' (2.68) MUST NOT BE BLANK.
ERROR085	IF 'FETUS-COLL' (1.49) IS 1, THEN BOTH 'FETUS-LENGTH' (1.42) AND 'FETUS-WEIGHT' (3.33) MUST NOT BE BLANK.
ERROR086	IF 'FETUS-SEX' (1.41) OR 'FETUS-LENGTH' (1.42) IS NON-BLANK, THEN 'PREGNANT' (3.32) MUST BE EQUAL TO 1 (YES).
ERROR087	IF 'PREGNANT' (3.32) IS EQUAL TO 1 (YES), THEN 'FETUS-LENGTH' (1.42) SHOULD NOT BE BLANK.
ERROR088	IF 'TOTAL-CORPORA' (3.27) IS NOT BLANK, THEN 'PREGNANT' (3.32) MUST NOT BE BLANK.
ERROR090	IF 'TOTAL-CORPORA' (3.27) IS NOT BLANK, THEN 'NUM-CORPORA-L' (2.64) AND 'NUM-CORPORA-R' (2.66) MUST NOT BE BLANK.
ERROR095	IF 'NUM-CORPORA-L' (2.64) IS BLANK, THEN 'CORPORA1-L' (2.71), 'CORPORA2-L' (2.73), 'CORPORA3-L' (2.75), 'CORPORA4-L' (2.77), 'CORPORA5-L' (2.79) AND 'CORPORA6-L' (3.13) MUST ALL BE BLANK.
ERROR096	IF 'NUM-CORPORA-L' (2.64) IS NOT BLANK, THEN 'CORPORA1-L' (2.71), 'CORPORA2-L' (2.73), 'CORPORA3-L' (2.75), 'CORPORA4-L' (2.77), 'CORPORA5-L' (2.79) AND 'CORPORA6-L' (3.13) MUST ALL BE NOT BLANK.
ERROR100	IF 'NUM-CORPORA-R' (2.66) IS BLANK, THEN 'CORPORA1-R' (3.15), 'CORPORA2-R' (3.17), 'CORPORA3-R' (3.19), 'CORPORA4-R' (3.21), 'CORPORA5-R' (3.23) AND 'CORPORA6-R' (3.25) MUST ALL BE BLANK.
ERROR101	IF 'NUM-CORPORA-R' (2.66) IS NOT BLANK, THEN 'CORPORA1-R' (3.15), 'CORPORA2-R' (3.17), 'CORPORA3-R' (3.19), 'CORPORA4-R' (3.21), 'CORPORA5-R' (3.23) AND 'CORPORA6-R' (3.25) MUST ALL BE NOT BLANK.
ERROR105	IF SEX (1.15) IS EQUAL TO 2 (FEMALE) AND 'L-OVARY-WT' (2.20) IS NOT BLANK, THEN 'NUM-CORPORA-L' (2.64) MUST NOT BE BLANK.
ERROR110	IF SEX (1.15) IS EQUAL TO 2 (FEMALE) AND 'R-OVARY-(2.34) IS NOT BLANK, THEN 'NUM-CORPORA-R' (2.66) MUST NOT BE BLANK.
ERROR115	IF 'NUM-CORPORA-L' (2.64) IS NOT BLANK, THEN 'NUM-CORPORA-L' MUST EQUAL ('CORPORA1-L' + 'CORPORA2-L' + 'CORPORA3-L' + 'CORPORA4-L' + 'CORPORA5-L' + 'CORPORA6-L') (2.71)).
ERROR120	IF 'NUM-CORPORA-R' (2.66) IS NOT BLANK, THEN 'NUM-CORPORA-R' MUST EQUAL ('CORPORA1-R' + 'CORPORA2-R' + 'CORPORA3-R' + 'CORPORA4-R' + 'CORPORA5-R' + 'CORPORA6-R') (3.15)).
ERROR125	IF 'LUTEUM-LOC' (2.57) IS BLANK AND 'NUM-CORPORA-L' (2.64) IS NOT BLANK AND 'NUM-CORPORA-R' (2.66) IS NOT BLANK, THEN 'TOTAL-CORPORA' (3.27) MUST EQUAL 'NUM-CORPORA-L' + 'NUM-CORPORA-R'.

Table 9. continued.

ERROR130	IF 'LUTEUM LOC' (2.57) IS NOT BLANK AND 'NUM-CORPORA-L' (2.64) IS NOT BLANK AND 'NUM-CORPORA-R' (2.66) IS NOT BLANK, THEN 'TOTAL-CORPORA' (3.27) MUST EQUAL 'NUM-CORPORA-L' + 'NUM-CORPORA-R' + 1.
ERROR135	IF THE FEMALE 'SPECIMEN-LENGTH' (1.35) IS LESS THAN 165 CM, THEN 'TOTAL-CORPORA' (3.27) MUST NOT BE MORE THAN 02.
ERROR140	IF 'SEX' (1.15) IS TWO AND 'LUTEUM-LOC' (2.57) IS FOUR OR FIVE, THEN 'FETUS-LENGTH' (1.42) MUST NOT BE BLANK.
ERROR145	IF THE 'SPECIES-STOCK' (1.13) IS 02, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR OFFSHORE SPOTTED DOLPHIN.
ERROR150	IF THE 'SPECIES-STOCK' (1.13) IS 06, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR COASTAL SPOTTED DOLPHIN.
ERROR155	IF THE 'SPECIES-STOCK' (1.13) IS 90, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR UNIDENTIFIED SPOTTED DOLPHIN.
ERROR160	IF THE 'SPECIES-STOCK' (1.13) IS 10, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR EASTERN SPINNER DOLPHIN.
ERROR165	IF THE 'SPECIES-STOCK' (1.13) IS 11, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR WHITEBELLY SPINNER DOLPHIN.
ERROR170	IF THE 'SPECIES-STOCK' (1.13) IS 88, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR COSTA RICAN SPINNER DOLPHIN.
ERROR175	IF THE 'SPECIES-STOCK' (1.13) IS 03, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR UNIDENTIFIED SPINNER DOLPHIN.
ERROR180	IF THE 'SPECIES-STOCK' (1.13) IS 05, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR COMMON DOLPHIN.
ERROR185	IF THE 'SPECIES-STOCK' (1.13) IS 13, THEN 'POSITION' (1.25) MUST BE WITHIN THE PRE-DEFINED BOUNDARIES FOR STRIPED DOLPHIN.
ERROR190	IF THE VALUE OF 'SPECIES-STOCK' (1.13) IS OTHER THAN 02, 03, 05, 06, 10, 11, 13, 15, 18, 22, 88, OR 90, THEN FLAG THE SPECIMEN.
ERROR194	IF 'COLOR' (1.39) IS NON-BLANK, THEN 'SPECIES STOCK' (1.13) MUST EQUAL 02 OR 06 OR 90.
ERROR195	IF 'COLOR' (1.39) IS EQUAL TO 1 (NEONATE), THEN 'SPECIMEN-LENGTH' (1.35) SHOULD BE LESS THAN 125 CM.
ERROR200	IF 'COLOR' (1.39) IS EQUAL TO 2 (TWO-TONED), THEN 'SPECIMEN-LENGTH' (1.35) SHOULD BE GREATER THAN 110 CM BUT LESS THAN 160 CM.
ERROR205	IF 'COLOR' (1.39) IS EQUAL TO 4 (SPECKLED), THEN 'SPECIMEN-LENGTH' (1.35) SHOULD BE GREATER THAN 140 CM BUT LESS THAN 180 CM.

Table 9. continued.

ERROR210	IF 'COLOR' (1.39) IS EQUAL TO 5 (MOTTLED), THEN 'SPECIMEN-LENGTH' (1.35) SHOULD BE GREATER THAN 160 CM BUT LESS THAN 190 CM.
ERROR215	IF 'COLOR' (1.39) IS EQUAL TO 6 (ADULT), THEN 'SPECIMEN-LENGTH' (1.35) SHOULD BE GREATER THAN 170 CM.

Figure 1. The Pre-1971 Porpoise Life History Record data collection form.

Porpoise Measurements # _____

Vessel _____ Date _____ Set _____

Position _____ Collector _____

Sp. _____ Sex _____ Photos _____

Teeth	Right	Left
Upper		
Lower		

* 1. Total length _____ (cm)

* 2. Snout to eye _____

* 3. Snout to melon _____

4. Length of gape _____

5. Snout to blowhole _____

* 6. Eye to blowhole _____

* 7. Snout to flipper _____

8. Snout to dorsal tip _____

9. Snout to umbilicus _____

* 10. Girth at axilla _____

11. Maximum girth _____

* 12. Flipper length (axilla) _____

* 13. Flipper width _____

* 14. Dorsal height _____

* 15. Fluke span _____

Stomach contents:

Reproduction:

Ovaries _____

Testes _____

Fetus _____

Mammaries _____

Figure 2. The 1971-1972 Porpoise Life History Record data collection form.

PORPOISE DATA

Specimen no:_____.

Date:_____.

Locality_____.

Set no:_____.

Species:_____.

Coloration:_____.

Sex:_____.

Total length:_____.

Blood collected?_____.

Lactating?_____.

Parasites collected from mammaries?_____.

Ovaries collected?_____.

Pregnant?_____.

Fetus collected?_____.

Testes collected?_____.

Parasites collected from intestines?_____.

Parasites collected from lungs?_____.

Sample of mammaries & milk collected?_____.

Fetal lungs collected?_____.

Section of jaw collected?_____.

Figure 3. The 1973 Porpoise Life History Record data collection form.

PORPOISE SPECIMEN FORM

SPECIMEN NO: _____

SET NO. _____

DATE: _____

LOCALITY: _____

SPECIES: _____

SEX: _____

COLORATION: _____

TOTAL LENGTH: _____

LACTATING? _____

OVARIES COLLECTED? _____

PREGNANT? _____

SIDE OF UTERUS (L OR R): _____

FETUS COLLECTED? _____

TEETH COLLECTED? _____

BLOOD COLLECTED? _____

TISSUE CULTURE SAMPLES? _____

HEAD COLLECTED? _____

SECTION OF JAW COLLECTED? _____

PHOTOS TAKEN? _____

Figure 4. The 1974-1977 Porpoise Life History Record data collection form.

CARD # I & II

PORPOISE LIFE HISTORY FORM

CR #_____ SET #_____

SPECIMEN NUMBER_____ 1-6

SPECIES (CODED)_____ 7-8

SEX (1 = MALE, 2 = FEMALE)_____ 9

I

COLORATION_____ 10

DATE OF CAPTURE (YR/MO/DAY)_____ 11-16

POSITION (LAT./LONG.)_____ 17-25

QUADRANT OF CAPTURE_____ 26

TOTAL LENGTH (CM)_____ 27-31

32 Total Weight (gm) 39 | Layers 42 | Blub. (mm) 45 | V.E. 46 | ST. 47 OM. | L. gonad (gmx10) 54 | R. gonad (gmx10) 62

Mat. 62 ?. | Blank 64 | 65 T ? | Sem. Tub.μ 68 | EPI 69 | C.L. 70 | C.L. Diams. (mm) 72 1 74 2 76 3 | C.A.L. 78 | C.A.R. 80

II

FOLLICLE DIAMETER (TENTHS OF MM) L R 10-13

FETAL SEX (CODED) 1 = MALE, 2 = FEMALE_____ 14

FETAL LENGTH (MM)_____ 14-17

FETAL WEIGHT (GM)_____ 18-24

LACTATING? (CODED)_____ 25

26 28 Depth of Mamm (mm) | D. of L. 31 Horn (mm) | D. of R. 34 Horn (mm) | Ut. Wall 37 | Ut. Folds 40 | Endomet. 43 | Strat Comp.μ 47 | Endo. Glands μ

51 No. & stages of C.A. on L. Ovary 64 | No. & stages of C.A. on R. Ovary 78 | L/R 79 | Cav. 80

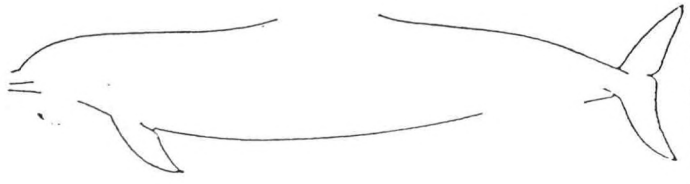
GONAD(S) COLLECTED?_____ TESTIS LN (MM)_____

JAW OR HEAD COLLECTED?_____

PHOTOS TAKEN?_____ ROLL #_____ FRAME #_____

OTHER?_____

COLOR PATTERN & DORSAL FIN:



STAGES OF CORPORA ALBICANTIA

1	2	3	4	5	6	7	8

UTERUS:_____

Figure 5. The 1977B Porpoise Life History Record data collection form.

1977-B PORPOISE LIFE HISTORY FORM

NOAA FORM 88-129
NMFS 8-77

NOAA
U.S. DEPT. OF COMM.

CARD

CR. # (1 4) SPECIMEN # (5 12) [1]

SPECIES/STOCK (13 14) SEX (15)

DATE (YR/MO/DAY) (16 21) SET # (22 24)

POSITION (LAT/LONG) (25 33) QUAD (34)

TOTAL LENGTH (cm.) (35 38) COLORATION (39)

LACTATING ? (40) FETUS: SEX (41) LENGTH (cm.) (42 45)

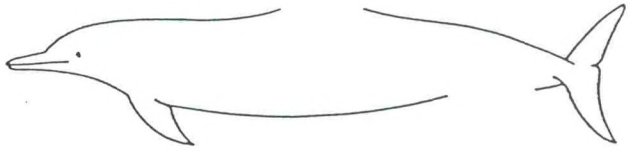
COLLECTED ?: TEETH (46) TESTIS (47) OVARIES & UTERUS (48)

FETUS (49) STOMACH (50) HEAD (51) CARCASS (52)

PHOTOS ? (53) ROLL # _____ FRAME(S) # _____

COLOR PATTERN & DORSAL FIN:

BASIS FOR STOCK ID.:



(OBSERVER'S NAME)

IN FIELD

NOTE: IF FETUS < 25 CM., LEAVE IN UTERUS & PRESERVE (do not sex & measure in field)

IN LAB

54 TOTAL WEIGHT (gm) 61	Lt. GONAD (gm) 67	68 Rt. GONAD (gm) 74	75 Ln (mm) RIGHT TESTIS	SG.	E	80 BL

CARD 2

1 REPEAT COLS. 1-11, CARD 1 11	12	13 LAYERS 15	16 C.L.	17 1 19 2 21 3 C.L. DIAMS. (mm)	23 CA (L)	25 CA (R)

27 FOLL. DIAM. (mm)	30 1 32 2 34 3 36 4 38 5 40 6 C.A. IN LEFT OVARY	42 1 44 2 46 3 48 4 50 5 52 6 C.A. IN RIGHT OVARY	54 Total CORP. (C.A.+C.L.)

NOTES (Uterus, Etc.):

DISPOSITION OF MATERIALS:

C. A. diams. (mm), by Type

1	2	3	4	5	6

Figure 6. The 1978-1982 Porpoise Life History Record data collection form.

PORPOISE LIFE HISTORY FORM

NOAA FORM 88-129
NMFS 11-80

NOAA
U.S. DEPT. OF COM.

CARD 1

CR. # (1–4) SPECIMEN # (5–12)

SPECIES/STOCK (13–14) SEX (15)

DATE (YR/MO/DAY) (16–21) SET # (22–24)

POSITION (LAT/LONG) (25–33) QUAD (34)

TOTAL LENGTH (cm.) (35–38) COLORATION (39)

LACTATING ? (40) FETUS: SEX (41) LENGTH (cm.) (42–45)

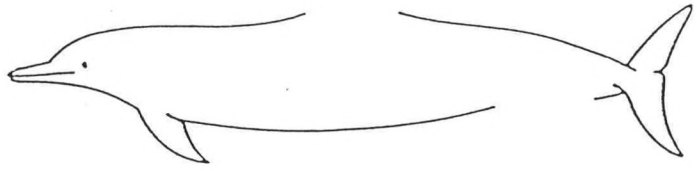
COLLECTED ?: TEETH (46) TESTIS (47) OVARIES & UTERUS (48)

FETUS (49) STOMACH (50) HEAD (51) CARCASS (52)

PHOTOS ? (53) ROLL # _____ FRAME(S) # _____

COLOR PATTERN & DORSAL FIN:

BASIS FOR STOCK ID.:



(OBSERVER'S NAME)

IN FIELD

NOTE: IF FETUS < 25 CM., LEAVE IN UTERUS & PRESERVE (do not sex & measure in field)

IN LAB

54 TOTAL WEIGHT (gm)	61 Lt. GONAD (gm) 67	68 Rt. GONAD (gm) 74	75 Ln (mm) / RIGHT TESTIS	SG.	E	80 BL

CARD 2

1 REPEAT COLS. 1–11, CARD 1 11	12	13 LAYERS 15	16 C.L.	17 1 / 19 2 / 21 3 C.L. DIAMS. (mm)	23 CA (L)	25 CA (R)

27 FOLL. DIAM. (mm)	30 1 / 32 2 / 34 3 / 36 4 / 38 5 / 40 6 C.A. IN LEFT OVARY	42 1 / 44 2 / 46 3 / 48 4 / 50 5 / 52 6 C.A. IN RIGHT OVARY	54 Total CORP. (C.A.+C.L.)

56 TUBULE DIAM. (mm)	58 FETUS WEIGHT (gm)	60 READING STATUS	62 HEADER

C. A. diams. (mm), by Type

1	2	3	4	5	6

NOTES (Uterus, Etc.):

DISPOSITION OF MATERIALS:

Figure 7. The 1983-1988 Porpoise Life History Record data collection form.

NOAA FORM 88-129
NMFS 11-82

PORPOISE LIFE HISTORY FORM

NOAA U.S. DEPT. OF COMM.

CARD 1

CR. # (1–4) SPECIMEN # (5–12)

SPECIES/STOCK (13 14) SEX (15)

DATE (YR/MO/DAY) (16–21) SET # (22 24)

POSITION (LAT/LONG) (25–33) QUAD (34)

TOTAL LENGTH (cm.) (35 38) (SPOTTED ONLY) COLORATION (39)

LACTATING ? (40) FETUS: SEX (41) LENGTH (cm.) (42 45)

COLLECTED ?: TEETH (46) TESTIS (47) OVARIES & UTERUS (48)

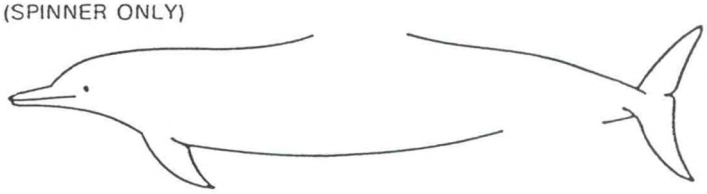
FETUS (49) STOMACH (50) HEAD (51) CARCASS (52)

MAMMARY GLAND (53) MILK (54) PARASITES (55) BLOOD (56)

PHOTOS ? (57) ROLL # _____ FRAME(S) # _____

COLOR PATTERN & DORSAL FIN: (SPINNER ONLY)

BASIS FOR STOCK ID.:



_____
(OBSERVER'S NAME)

IN FIELD

NOTE: IF FETUS< 25 CM., LEAVE IN UTERUS & PRESERVE (do not sex & measure in field)

IN LAB — CARD 2

12 | 13 TOTAL WEIGHT (gm) | 20–26 L.GONAD w/epi.(gm) | 27–33 L.GONAD w/o epi.(gm) | 34–40 R.GONAD w/epi.(gm)

41–47 R.GONAD w/o epi.(gm) | 48 Ln (mm) | SG | E | 53 BL | 54–56 GLG'S | 57 CL | 58–62 C.L. DIAMS. (mm) | 64 CA(L) | 66 CA(R)

CARD 3

68 FOLL. DIAM. (mm) | 71 1 | 73 2 | 75 3 | 77 4 | 79 5 | 12 | 13 6 | 15 1 | 17 2 | 19 3 | 21 4 | 23 5 | 25 6 | 27 Total CORP (C.A.+C.L.)

C.A. IN LEFT OVARY | C.A. IN RIGHT OVARY | C.A. diams. (mm), by Type

29 TUBULE DIAM. (mm) | 32 PREG? | 33–39 FETUS WEIGHT (gm)

NOTES (Uterus, Etc.):

1	2	3	4	5	6

Figure 8. Geographical boundaries for stocks of spotted dolphin, Stenella attenuata, and spinner dolphin, Stenella longirostris, during 1978-1982 and referenced by logical errors 12, 13, and 21 for the 1978-1982 data editing criteria

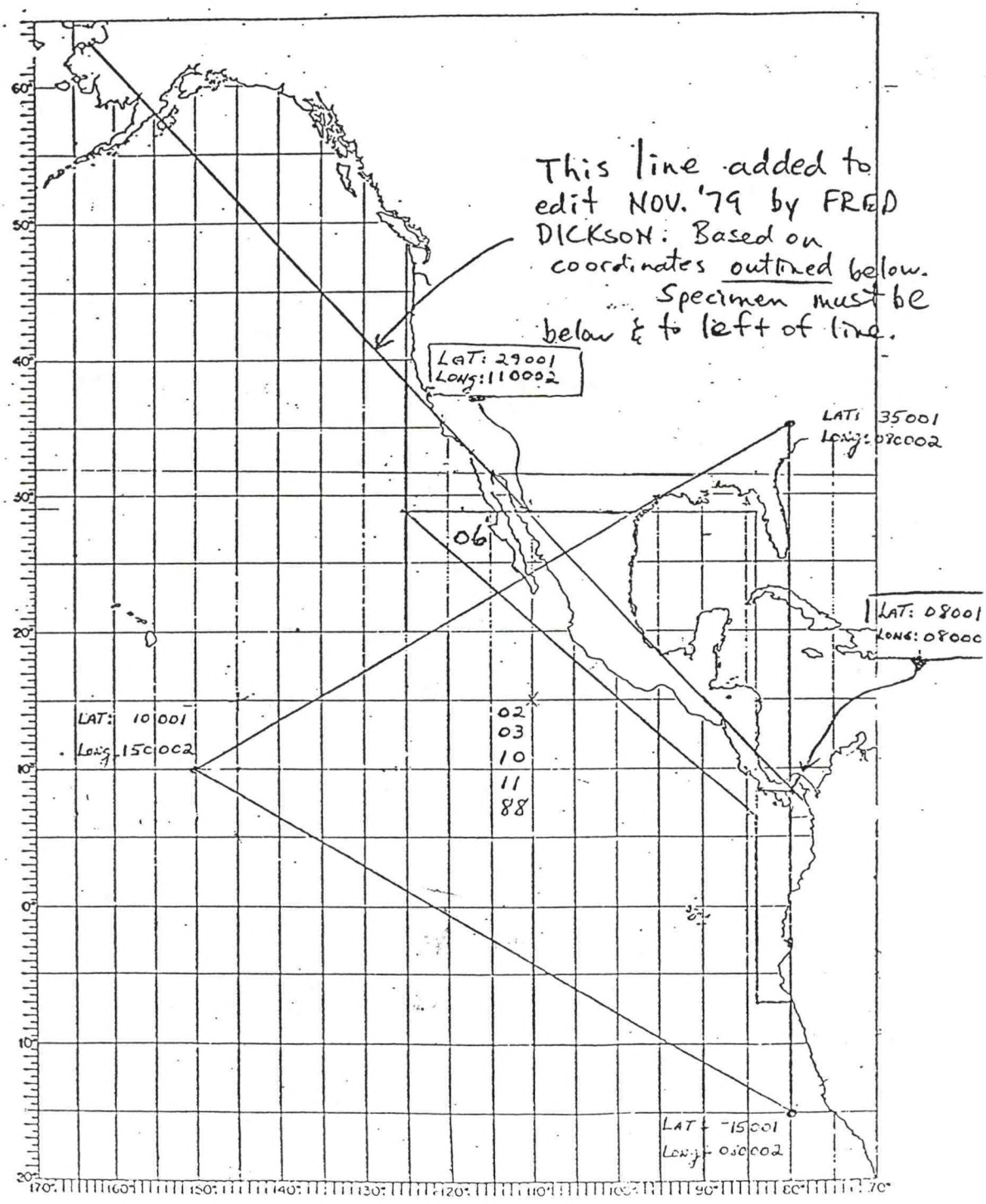


Figure 9. Geographical location and numerical values for calculated five-degree squares

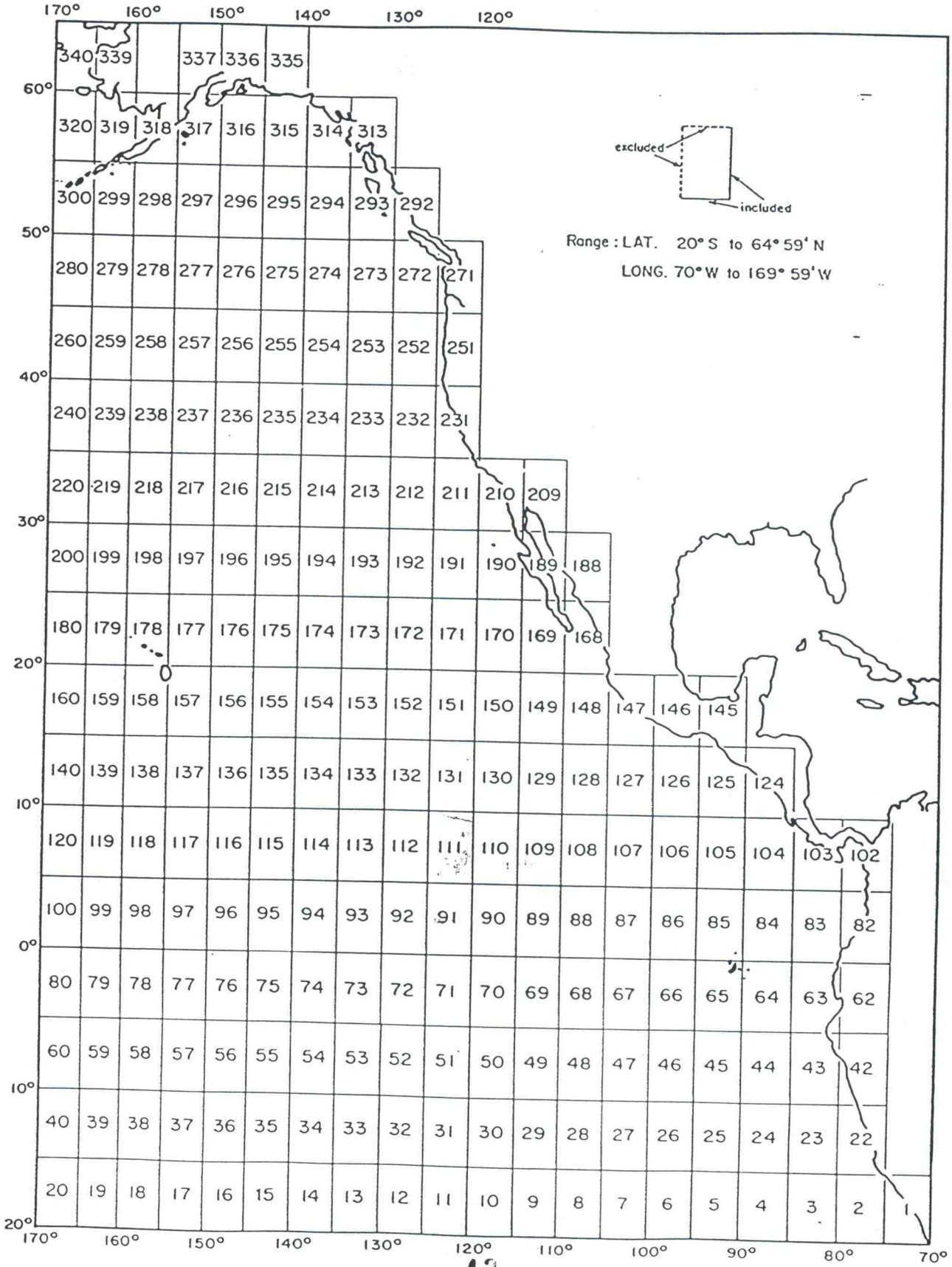


Figure 10. Geographical boundary, defined by the subroutine "GEOSTOCK.FOR", for all specimens collected during 1983-1988.

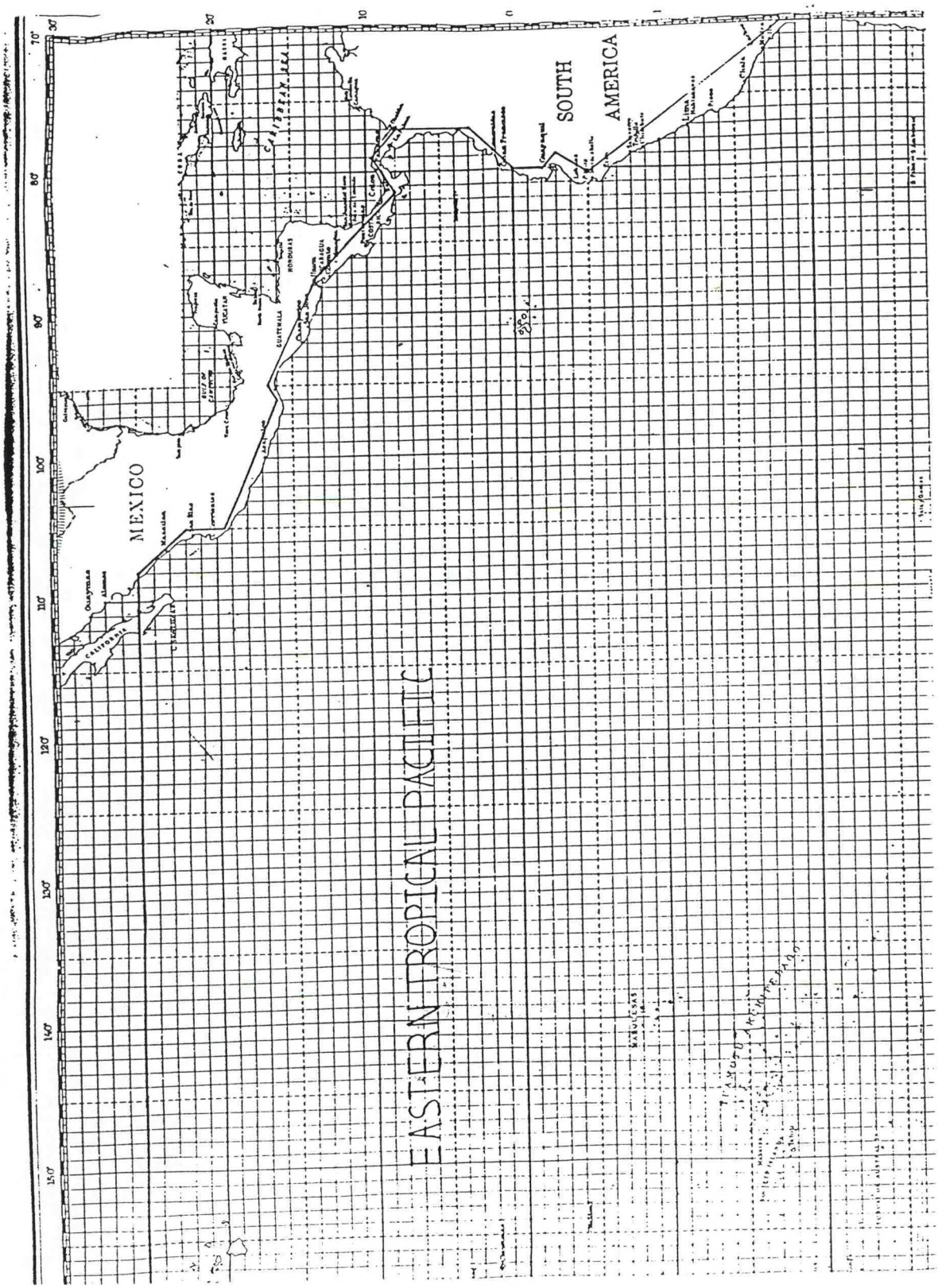


Figure 11. Geographical boundary, defined by the subroutine "GEOSTOCK.FOR", for coastal spotted dolphins, Stenella attenuata, specimens collected during 1983-1988.

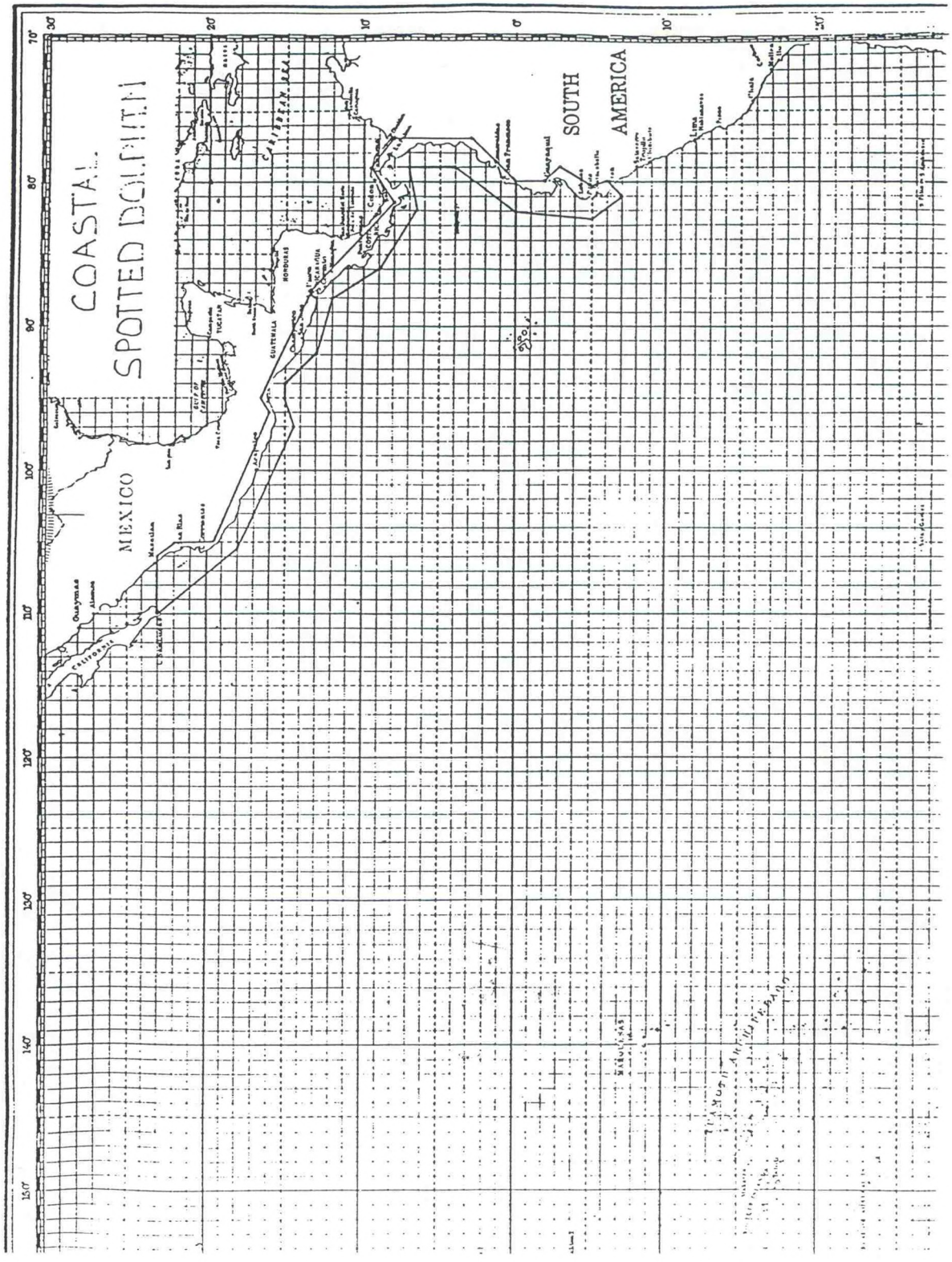


Figure 12. Geographical boundaries, defined by the subroutine "GEOSTOCK.FOR", for northern and southern offshore spotted dolphins, Stenella attenuata, specimens collected during 1983-1988.

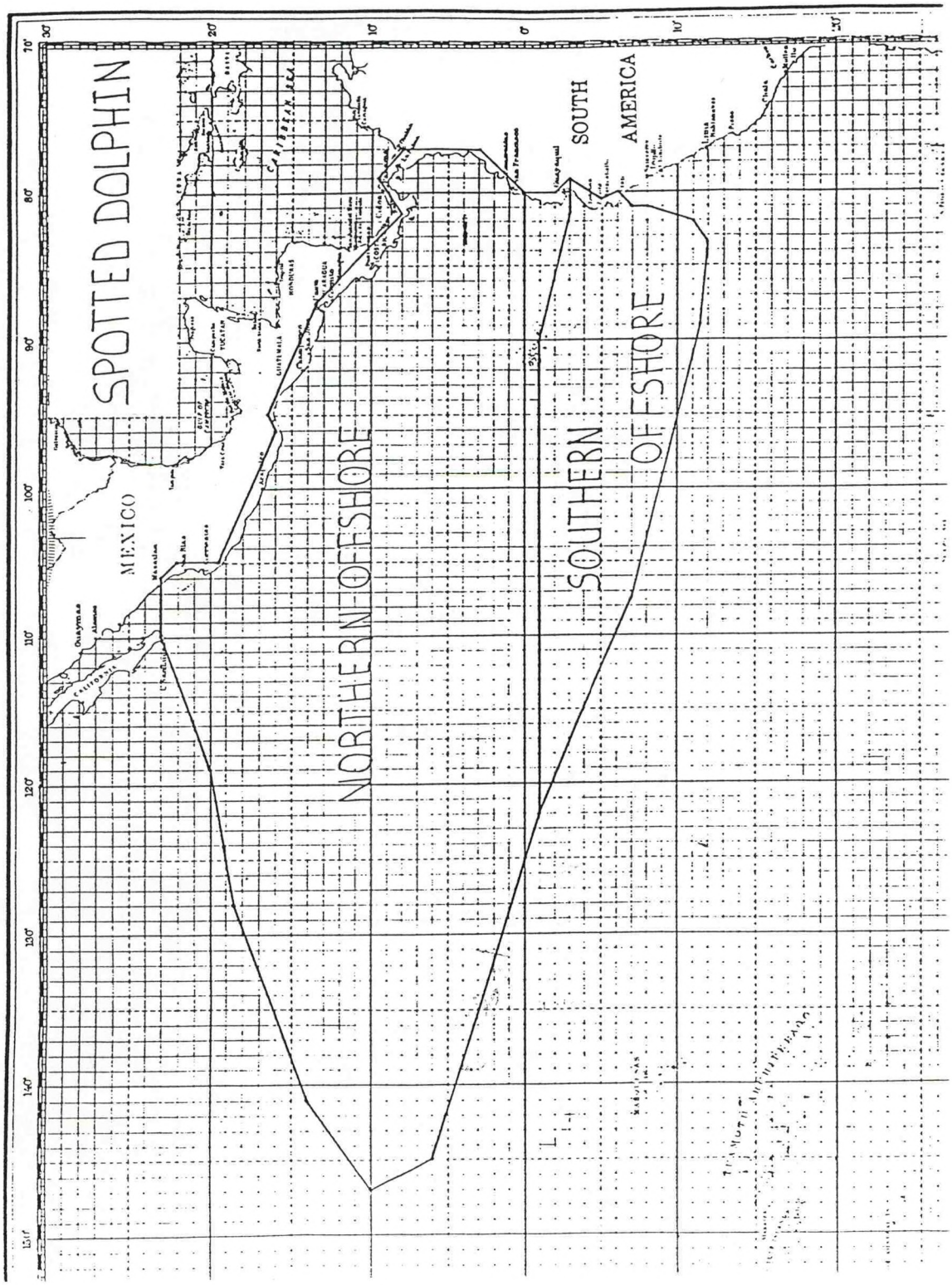


Figure 13. Geographical boundary, defined by the subroutine "GEOSTOCK.FOR", for eastern spinner dolphins, Stenella longirostris, specimens collected during 1983-1988.

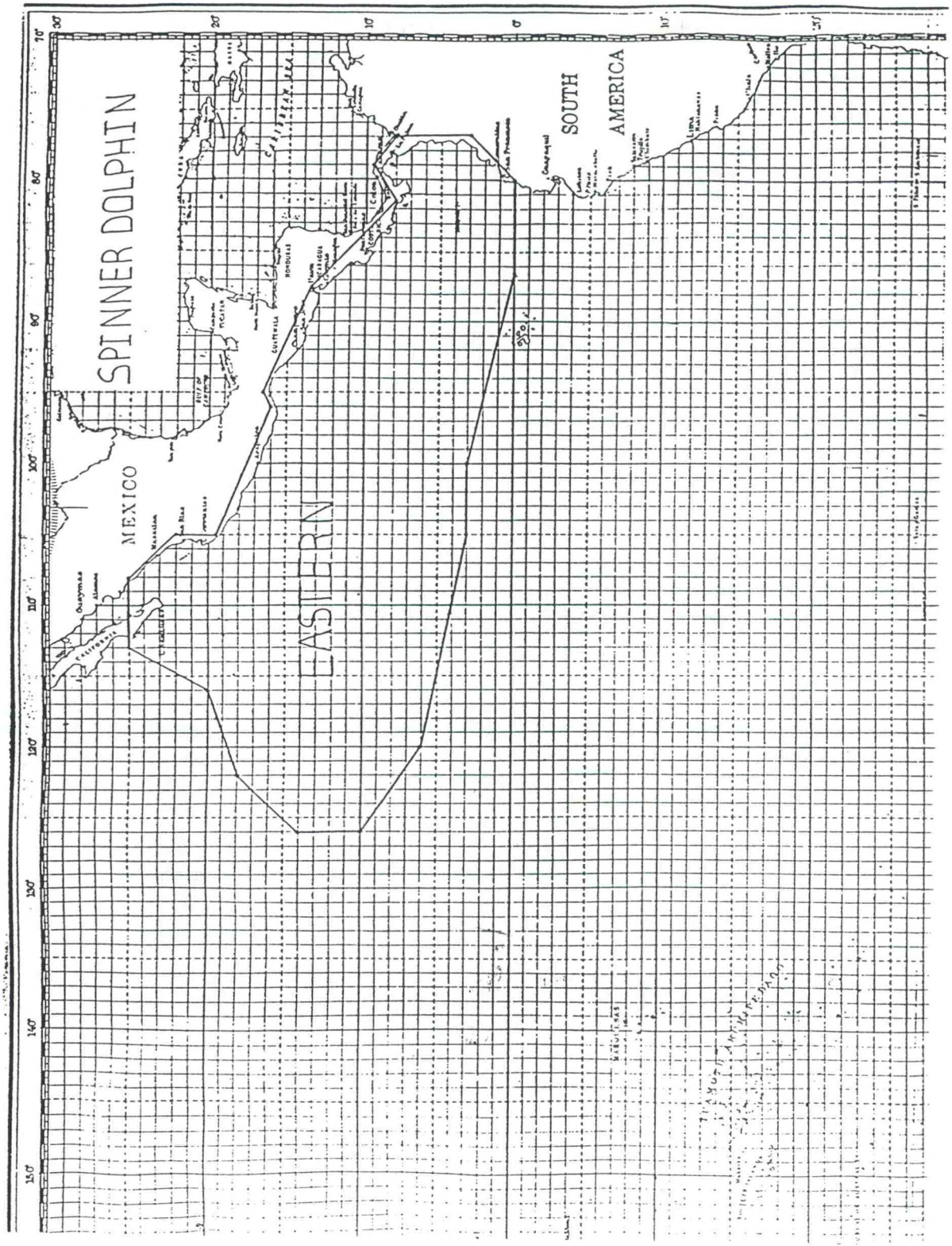


Figure 14. Geographical boundaries, defined by the subroutine "GEOSTOCK.FOR", for northern and southern whitebelly spinner dolphins, Stenella longirostris, specimens collected during 1983-1988.

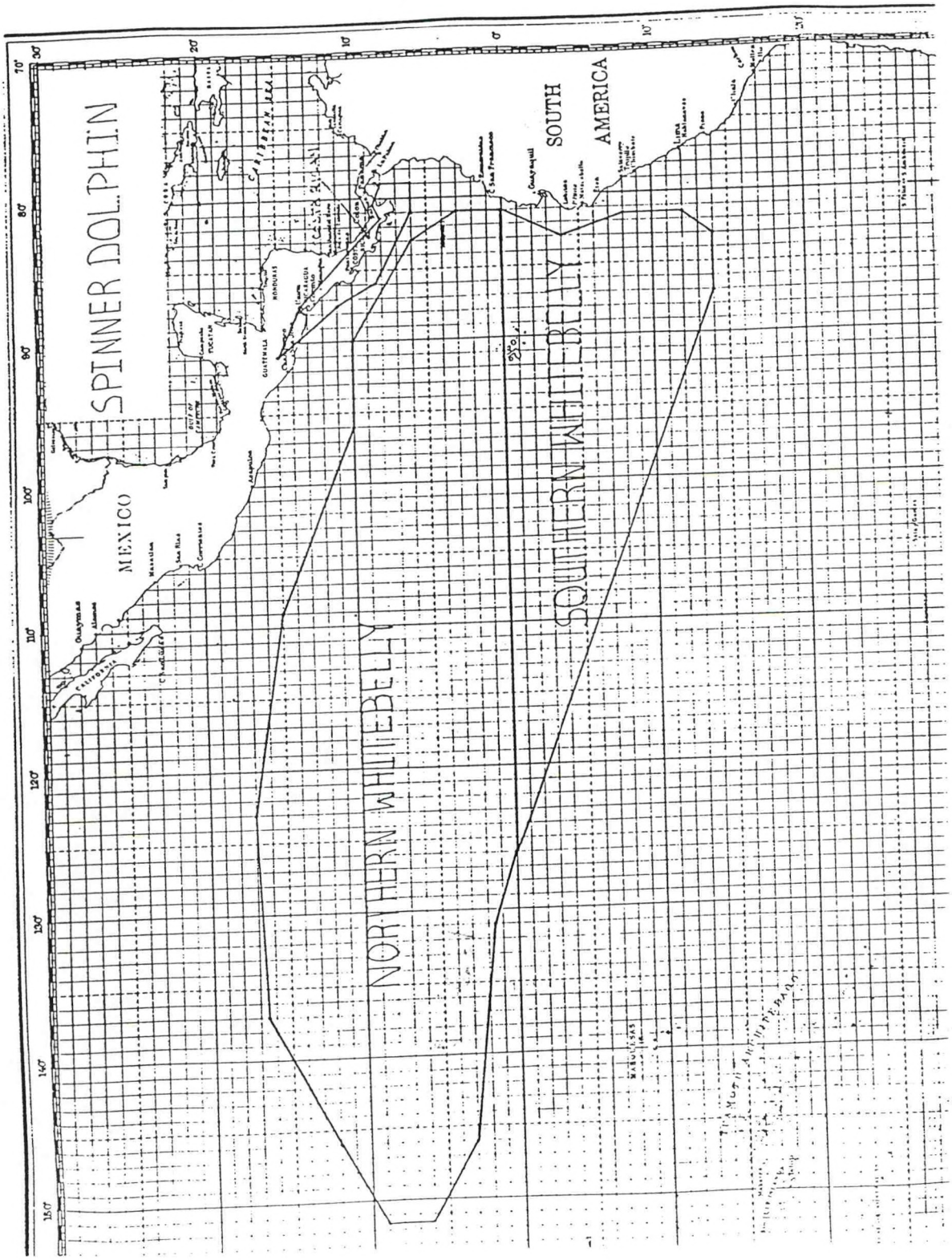


Figure 15. Geographical boundaries, defined by the subroutine "GEOSTOCK.FOR", for northern, central and southern common dolphins, Delphinus delphis, specimens collected during 1983-1988.

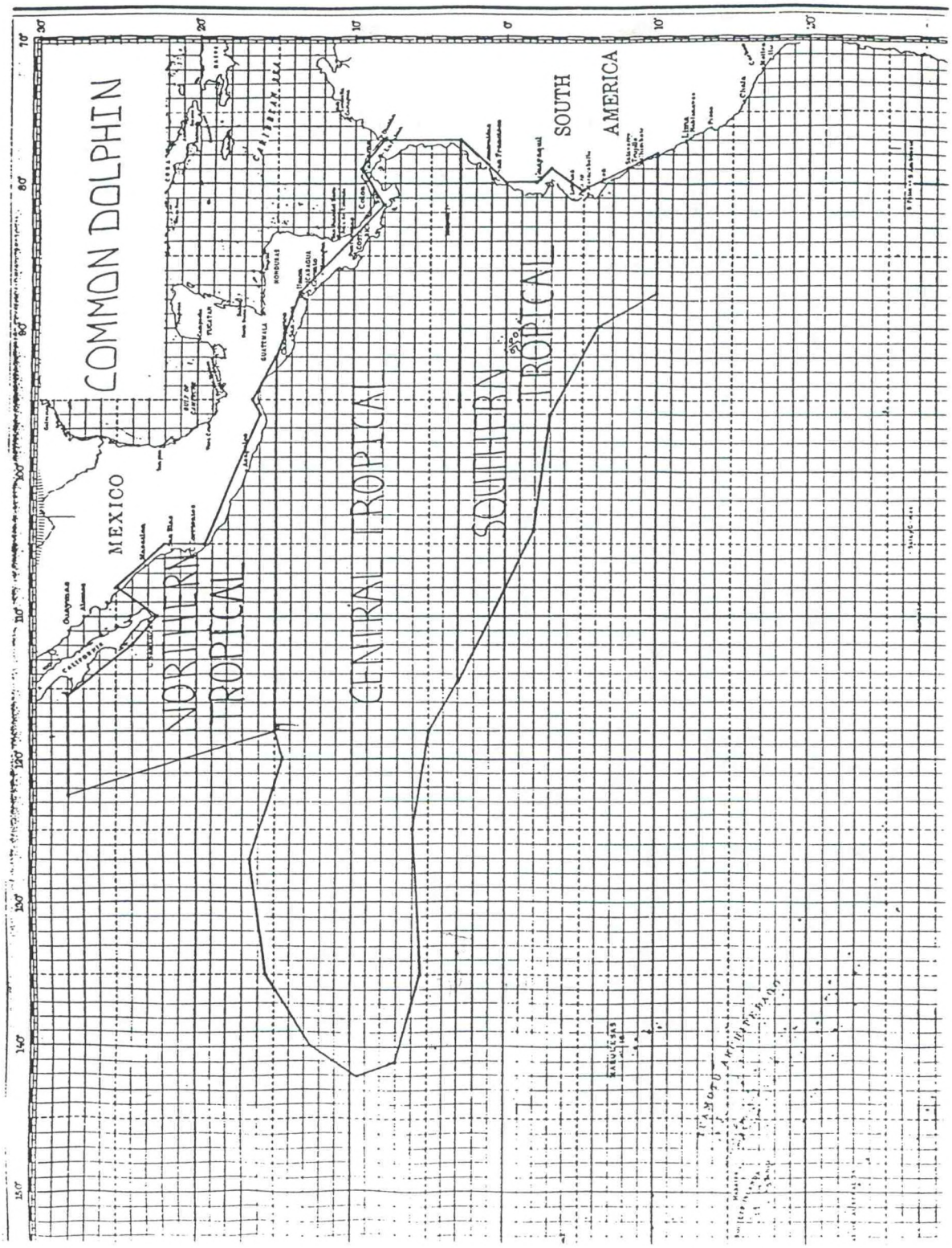
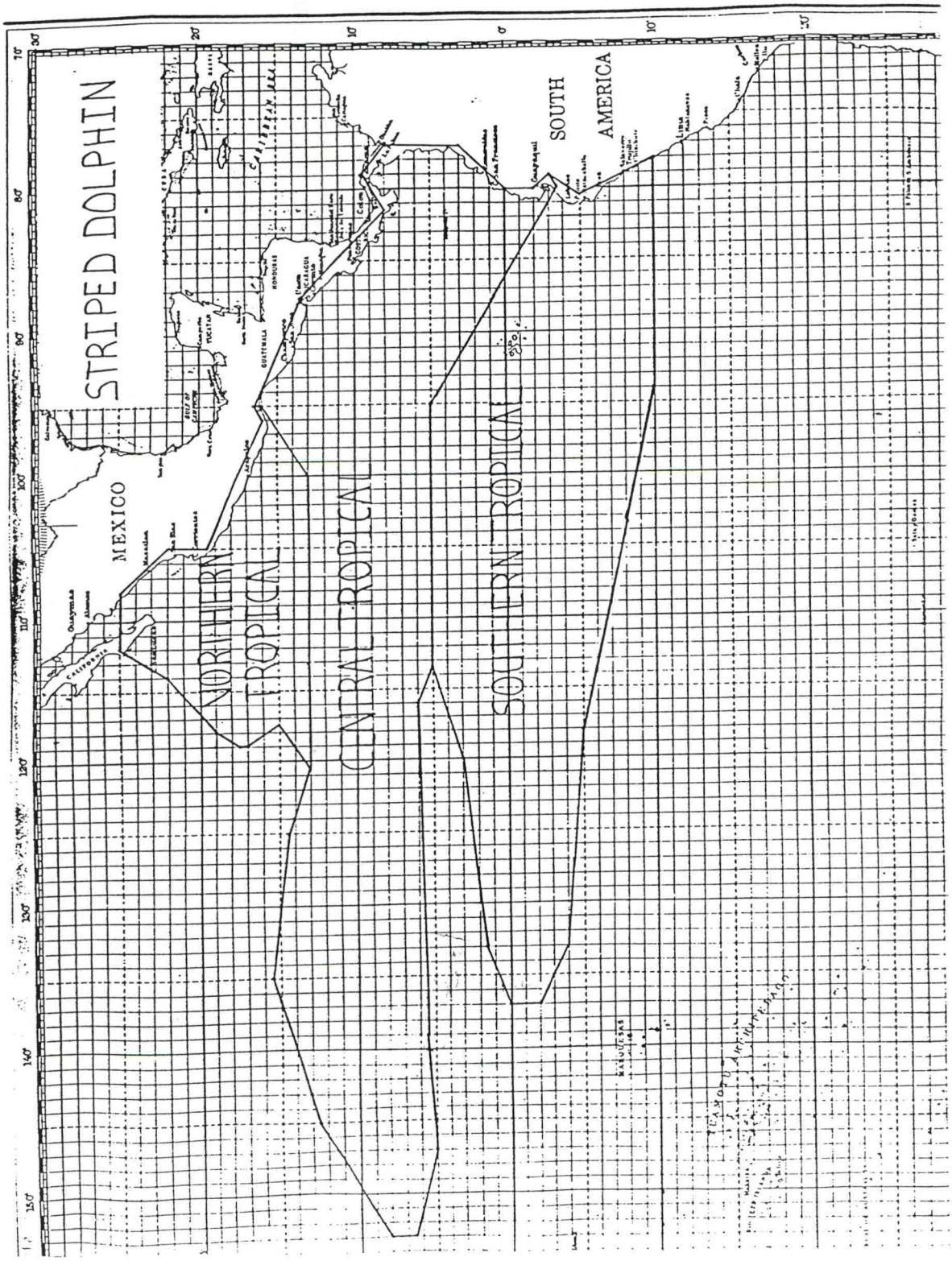


Figure 16. Geographical boundaries, defined by the subroutine "GEOSTOCK.FOR", for northern, central and southern tropical striped dolphins, Stenella coeruleaolba, specimens collected during 1983-1988.



Appendix 1. Coding definitions and instructions for the Porpoise Life History Record 1959-1976, and part of 1977.

CODING FORMAT FOR PORPOISE LIFE HISTORY DATA

CARD NUMBER 1

I. Descriptive Data (repeated for each physical record)

Col. 1-6 1. Specimen number

Col. 7-8 2. Species (coded): CODE TABLE 04

Col. 9 3. Sex (coded):

Code 1 - Male
2 Female

Col. 10 4. Coloration/age category for spotted and spinner dolphins (coded):

Code 0 - Fetus (Spotted and Spinner)
1 - Newborn (Spotted and Spinner)
2 - Two-tone (Spotted)
3 - Subadult (Spinner)
4 - Speckled (Spotted)
5 - Mottled (Spotted)
6 - Adult (Spotted and Spinner)

Col. 11-13 5. Year of capture (2 digits)

Col. 13-14 6. Month of capture (2 digits)

Col. 15-16 7. Day of capture (2 digits)

Col. 17-25 8. Position of capture (9 digits: latitude, longitude)

Latitude Degrees - 2 digits
Latitude Minutes - 2 digits
Longitude Degrees - 3 digits
Longitude Minutes - 2 digits

Col. 26 9. Quadrant of capture (coded):

Code 0 - North/West
1 - South/West
2 - North/East
3 - South/East

Col. 27-31 10. Total length (cm)

Col. 32-39 11. Total Weight (gm)

Col. 40-42 12. Number of dentinal or ear plug laminae multiplied by 10 (3 digits)

Col. 43-45 13. Thickness of blubber (mm)

Col. 46 14. Physically mature? i.e., vertebral epiphyses fused or unfused (coded):

Code 0 - Immature
1 - Maturing
2 - Mature

Col. 47 15. Stomach contents (coded):

Code 0 - Empty
1 - Milk only
2 - Milk + solid food
3 - Solid food only

II. Reproductive Data

Col. 48-54 1. Weight of left testis or ovary (decigrams)

Col. 55-61 2. Weight of right testis or ovary (decigrams)

Col. 62 3. Sexually mature? (coded):

Code 0 - immature
1 - mature

Col. 63-64 4. Blank

Col. 65 5. Degree of testis development as determined by inspection (coded):

Code 0 - Immature
1 - Maturing
2 - Mature

Col. 66-68 6. Mean diameter of seminiferous tubules (microns)

Col. 69 7. Condition of epididymus (coded):

Code 0 - Empty
1 - Some sperm evident
2 - Full of sperm

Col. 70 8. Ovary on which corpus luteum is found (coded):

Code 0 - Left ovary, Fetus in left horn
1 - Right ovary, Fetus in right horn
3 - Right ovary, Fetus in left horn
4 - Left ovary, Fetus in right horn

Col. 71-72 Greatest diameter of largest corpus luteum (mm)

Col. 73-74 Second diameter of largest corpus luteum (mm)

Col. 75-76 Third diameter of largest corpus luteum (mm)

Col. 77-78 Numher of corpora albicantia on left ovary (2 digits)

Col. 79-80 Number of corpora albicantia on right ovary (2 digits)

CARD NUMBER 2

I. Descriptive Data (repeated for each physical record)

Col. 1-6 1. Specimen number

Col. 7-8 2. Species (coded): CODE TABLE 4

Col. 9 3. Sex (coded):

Code 1 - Male
2 - Female

II. Reproductive Data

Col. 10-12 1. Diameter of largest follicle (in tenths of mm)

Col. 13 2. Sex of fetus (coded):

Code 1 - Male
2 - Female

Col. 14-17 3. Length of fetus (mm)

Col. 18-24 4. Weight of fetus (gm)

Col. 25 5. Condition of mammary glands (coded):

Code 0 - Not lactating
1 - Lactating
2 - Virgin
3 - Mature, lactating (by histological criteria)
4 - Mature, non-lactating (by histological criteria)

Col. 26-28 6. Depth of mammary glands (coded):

Col. 29-31 7. Diameter of left horn of uterus (mm)

Col. 32-34 8. Diameter of right horn of uterus (mm)

Col. 35-37 9. Mean thickness of uterine wall (in tenths of mm)

Col. 38-40 10. Mean height of uterine folds (in tenths of mm)

Col. 41-43 11. Mean thickness of endometrium (in tenths of mm)

Col. 44-47 12. Mean thickness of stratum compactum (microns)

Col. 48-50 13. Mean diameter of endometrial glands (microns)

Col. 51-52 14. Number of stage 1 corpora albicantia on left ovary
Col. 53-54 15. Number of stage 2 corpora albicantia on left ovary
Col. 55-56 16. Number of stage 3 corpora albicantia on left ovary
Col, 57-58 17. Number of stage 4 corpora albicantia on left ovary
Col. 59-60 18. Number of stage 5 corpora albicantia on left ovary
Col. 61-62 19. Number of stage 7 corpora albicantia on left ovary
Col. 63-64 20. Number of stage 8 corpora albicantia on left ovary

Col. 65-66 21. Number of stage 1 corpora albicantia on right ovary
Col. 67-68 22. Number of stage 2 corpora albicantia on right ovary
Col. 69-70 23. Number of stage 3 corpora albicantia on right ovary
Col. 71-72 24. Number of stage 4 corpora albicantia on right ovary
Col. 73-74 25. Number of stage 5 corpora albicantia on right ovary
Col. 75-76 26. Number of stage 7 corpora albicantia on right ovary
Col. 77-78 27. Number of stage 8 corpora albicantia on right ovary

NOTE: Description of stages of corpora albicantia for <u>Stenella</u> spp. is attached.

Col. 79 28. Can left and right gonads be distinguished? (coded):

Code 0 - Yes
1 - No

Col. 30 29. Dental pulp cavity closed? (coded):

Code 0 - Cavity open
1 - Cavity almost closed
2 - Cavity closed
3 - Cavity open, tip worn
4 - Cavity closed, tip worn

NOTE: Two data cards must be used for each animal regardless of the amount of data available for that animal. Leave blank all columns of field with "no data" or "not applicable". Always punch zeros when they are part of the data.

Appendix 2. Coding definitions and instructions for the Porpoise Life History Record during part of 1977 (1977B form) and 1978-1982, and transcribed data collected prior to 1978.

FORMAT FOR CETACEAN LIFE HISTORY DATA

Card Number 1

Col. 1-4 Cruise Number

Col. 5-11 Specimen Number (initials and serial no.)

Col. 12 Number of the Card

Col. 13-14 Species/Stock (CODE TABLE 4)

Col. 15 Sex (1=male, 2=female)

Col. 16-17 Year of Capture

Col. 18-19 Month of Capture

Col. 20-21 Day of Capture

Col. 22-24 Set Number

Col. 25-33 Position of Capture (latitude/longitude)

Latitude Degrees - 2 digits
Latitude Minutes - 2 digits
Longitude Degrees - 3 digits
Longitude Minutes - 2 digits

Col. 34 Quadrant of Capture (coded):

Code 0 - North/West
1 South/West
2 North/East
3 South/East

Col. 35-38 Total Length (cm)

Col. 39 Coloration (for S. attenuata only; coded)

Code 1 - Neonatal
2 Two-tone
3 Subadult (not applicable)
4 Speckled
5 - Mottled
6 - Adult (fused)

Col. 40 Condition of Mammary Glands (coded):

Code 0 - Not lactating

1 Lactating

Col. 41 Fetus Sex (coded):

Code Blank - Unknown
1 Male
2 Female

Col. 42-45 Fetus Length (cm, to nearest 1/10 cm). If no fetus, enter zero:

Col. 46 Teeth Collected (coded):

Code 1 - Yes
2 No

Col. 47 Testis Collected (coded):

Code 1 - Yes
2 No

Col. 48 Ovaries and Uterus Collected (coded):

Code 1 - Yes
2 No

Col. 49 Fetus Collected (coded)*

Code 1 - Yes
2 No

Col. 50 Stomach Collected (coded):

Code 1 - Yes
2 No

Col. 51 Head Collected (coded):

Code 1 - Yes
2 - No

Col. 52 Carcass Collected (coded):

Code 1 - Yes
2 No

Col. 53 Photos Taken (coded):

Code 1 - Yes
2 No

Col. 54-60 Total Weight (gm)

Col. 61-67 Left Gonad Weight (gm; to nearest 1/10 g, x 10)

Col. 68-74 Right Gonad Weight (gm; to nearest 1/10 g, x 10)

Col. 75-77 Length Right Testis (mm)

Col. 78 Degree of Testis Development (coded):

Code 0 - No Spermatogenesis Present
1 - Mature, spermatogenesis present

Col. 79 Condition of Epidiymus (coded):

Code 0 - No Sperm Present
1 - Some Sperm Present (can find with searching)
2 - Copious Sperm (no searching required)

Card Number 2

Col. 1-11 Same as Card Number 1

Col. 12 Card Number 2

Col. 13-15 Number of Dentinal or Ear Plug Layers (to nearest 1/10 layer, multiplied by 10)

Col. 16 Ovary on Which Corpus luteum is Found (coded):

Code 0 - Left Ovary, Fetus in Left Horn
1 - Right Ovary, Fetus in Right Horn
2 - Left Ovary, Fetus in Right Horn
3 - Right Ovary, Fetus in Left Horn
4 - left Ovary, No Fetus Found
5 - Right Ovary, No Fetus Found

Col. 17-18 Greatest Diameter of Laregest Corpus Luteum (mm)

Col. 19-20 Second Diameter of Largest Corpus Luteum (mm)

Col. 21-22 Third Diameter of Largest Corpus Luteum (mm)

Col. 23-24 Number of Corpora Albicantia on Left Ovary

Col. 25-26 Number of Corpora Albicantia on Right Ovary

Col. 27-29 Diameter of Largest Follicle (mm)

Col. 30-31 Number of Stage 1 Corpora Albicantia, Left Ovary (see attached description of corpora albicantia stage criteria)

Col. 32-33 Number of Stage 2 Corpora Albicantia, Left Ovary

Col. 34-35 Number of Stage 3 Corpora Albicantia, Left Ovary

Col. 36-37 Number of Stage 4 Corpora Albicantia, Left Ovary

Col. 38-39 Number of Stage 5 Corpora Albitantia, Left Ovary

Col. 40-41 Number of Stage 6 Corpora Albicantia, Left Ovary

Col. 42-43 Number of Stage 1 Corpora Albicantia, Right Ovary
Col. 44-45 Number of Stage 2 Corpora Albicantia, Right Ovary
Col. 46-47 Number of Stage 3 Corpora Albicantia, Right Ovary
Col. 48-49 Number of Stage 4 Corpora Albicantia, Right Ovary
Col. 50-51 Number of Stage 5 Corpora Albicantia, Right Ovary
Col. 52-53 Number of Stage 6 Corpora Albicantia, Right Ovary

Col. 54-55 Total Number of Corpora Albicantia Plus Corpus Luteum

Col. 56-58 Mean diameter of seminiferous tubules (microns with implied tenths).

Col. 59-65 Weight of fetus (grams).

Col. 66-67 A numeric code indicating the disposition of either a jaw and/or tooth sample for this specimen (READING STATUS).

Codes for READING STATUS for S. attenuata for which we have no tooth readings (years 1973-1978 only).

CODE	DESCRIPTION
	Teeth not collected by observer because:
01*	Not directed to (according to collection matrix)
02*	No time (includes lazy observer, next set imminent, etc.)
03*	Specimens or data lost
19*	"Teeth too worn" (as stated by observer on life history)
	Teeth remain in head or carcass which was collected for:
04	Taxonomic purposes (e.g., coastals, southern). Scattered, some may be at SWFC.
05	Parasite study (At Smithsonian)
06	Observer training (should be here)
07	No apparent reason, but collected nonetheless
20	Brain weight series (charter cruise). John says these are in downtown freezer.
	Jaw collected but not sent to Bioanalysis because:
08	Entire cruise not sent (late 1978 cruise)
09	Jaw put in wrong jar during size sorting (includes erroneous length data)
	Jaw discarded because:
10*	Bad specimen (jaw tip collected)
11*	Label/number confusion
12	Animal <150 cm.

Jaw sent to Bioanalysis but not read because:

13* Specimen lost (including number foulup by Bioanalysis...effectively lost)
14* Section unreadable...recuts made...sample exhausted
15 Section unreadable...recut not made...teeth remain
16 Teeth cut for growth curve analysis, but not read (unreadable)
17 Teeth read but not entered on data base (reason unknown)
18 Don't know

Starred (*) codes are those for which teeth are definitely not available for analysis. Unstarred categories likely (but not assuredly) have teeth available.

Col. 68-69 A numeric code identifying the individual whom "scored" a tooth layer slide (READER CODE).

READER-CODE	READER'S- NAME
01	Perrin
02	Holts
03	Clapp
04	Suanico
05	Coe
06	Myrick
07	Henderson
08	Kimura
09	Sloan
10	Hui
11	Seagars
12	Gurevich
13	Mead
14	Odell
15	Stuart
16	Kasuya
17	Brownell
18	Hohn

Note: Two data cards must be used for each animal regardless of the amount of data available for that animal. Leave blank all columns of field with "no data" or "not applicable." Always punch zeros when they are part of the data.

Descriptive Stages of Corpora albicantia
1959-1982

1. Surface raised, smooth or just slightly wrinkled, appears as a small corpus luteum, cortex white, interior solid and interspersed w/white connective tissue. Large and obviously the first stage of degeneration of the corpus luteum. May be white to deeply yellow stained.

2. Surface raised and wrinkled, interior solid or semi-solid mixture of white connective tissue and traces of Corpus luteum rind, some verration remains. Color may mix of white and cream color to deep yellow. Usually large but definitely more degenerated that stage 1.

3. Surface usually not raised, scar generally smaller than stage 1 and heavily wrinkled, may be pedunclulate but flattened. Interior is primarily concentrated white connective tissue and is obviously the end result of a degenerating stage 2 corpus albicans. May be flattened against surface and wide or thin and run deep into the ovary. May have deep yellow stains around the white "center". Occasionally, no scar or other surface evidence is found. Interiorly this is a stage 3 corp. alb. Usually found in ovaries w/many follicles.

4. Corpus albicans flattened and compressed against the surface of a corpus luteum. Slight surface wrinkles and usually having the interior structure of a stage 3 but sometimes the interior is less degenerated and is comparable to a stage 2. This stage cannot be accurately placed in the order of degeneration due to its disfigured nature.

5. A surface scar is found in this stage but no discernible internal structure is present. Possibly the final result of a corpus luteum after a long period of degeneration. Very few of these were found.

6. Deeply yellow or orange stained area w/very slight surface evidence. These were the smallest of the scars and the interior structure was very vague, no concentrated center or white connective tissue was present.

Appendix 3. Memorandum describing the variable deletions, additions, reformatting, and design considerations used to transfer pre-1978 Porpoise Life History data to the 1978-1982 computer format.

NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
P.O. Box 271
La Jolla, CA 92038

October 6, 1978

To: William F. Perrin
Thru: Chuck Oliver
From: Nick Iorio

Subject: 1978 Life History Data Base

In preparation for computer loading of 1978 Life History Data, major changes will have to be agreed upon as to data base-design. The new 1978 Life History Form (previously called "1977B") will require a new data base format, which contains selected, unique pre-1978 data in addition to the 1978 data items.

I propose we amend the 1978 (1977B) form to incorporate those pre-1978 data items you desire to retain on the data base; specifically "TUBULE DIA" and "FETUS WEIGHT." This can be transparent to users and will not require the printing of new forms. A card/column format sheet is attached. This will allow us to modify the current 1978 edit programs to also edit these data items.

For most of the elements on the pre-1978 data form that are not on the 1978 data form, very little data was collected. In the first step, I propose to retain on paper all data values for the following elements and then eliminate them from the new (1978) data base:

Element	Card/Col	Element	Card/Col
MAMMARY DEPTH	2/26	ENDO DIA	2/48
UTERUS DIA L	2/29	BLUBBER THICK	1/43
UTERUS DIA R	2/32	PHYSICAL MATURE	1/46
UTERUS THICK	2/35	STOMACH CONTENT	1/47
UTERUS HEIGHT	2/38	SEXUAL MATURE	1/62
ENDO THICK	2/41	L AND R ID	2/79
STRATUM THICK	2/44	PULP CAVITY	2/80

These values will be deposited with Ruth Miller for future reference.

Following, is the remainder of the process to convert to the 1978 format:

1. Define 1978 data base. It will be:

A. all the elements from the 1978 form;

B. add a left-justified zero to pre-1978 "SPECIMEN NUMBER" so it will be four (4) digits, as in 1978;

C. Change the names of these elements:

Old name	New name
CRUISE AND SET	CRUISEANDSET
N OR S	NORS
E OR W	EORW

D. include these elements from the pre-1978 format:

TUBULE DIA - card 2, columns 56-58 (1977B)
FETUS WEIGHT - card 2, columns 59-65 (1977B)

E. all elements recorded in tenths in the pre-1978- format will now contain the decimal, rather than being implied;

F. corpora for pre-1978 data (1,2,3,4,5,7,8) will be changed to new format (1,2,3,4,5,6):

OLD	2	1	3---4	5	7	8
NEW	1	2	3	4	5	6

2. Write, execute, and document PI (Fortran) program to execute the conversion to 1978 format.

3. Modify existing dump program to dump to cards or paper the 1978 Life History Data Base including pre-1978 elements retained.

The final result will provide one format (1977B) for all years. The existinq edit program will work for all years and allow us to edit the historical, as well as current data. Existing analyses programs will make use of consistent data items.

The only drawback might be in updating pre-1978 original data forms from edit reports presented in 1977B format. Mowever, Ruth Miller feels this will be a minor problem.

This process is currently being executed. Any questions or comments should be directed to me.

CC: T. Smith
C. Oliver
R. Miller
J. Henderson

CARD # I & II

PORPOISE LIFE HISTORY FORM

CR # _____ SET # _____

SPECIMEN NUMBER _____ 1-6

SPECIES (CODED) _____ 7-8

SEX (1 = MALE, 2 = FEMALE) _____ 9

COLORATION _____ 10

DATE OF CAPTURE (YR/MO/DAY) _____ 11-16

POSITION (LAT./LONG.) _____ 17-25

QUADRANT OF CAPTURE _____ 26

TOTAL LENGTH (CM) _____ 27-31

32 Total Weight (gm) 39	Layers 42	Blub. (mm) 45	V.E. 46	ST-OM. 47	L. gonad (gmx10) 54	R. gonad (gmx10) 6

Mat. 62 ?	Blank 64	65 T ?	Sem. Tub.μ 68	EPI 69	C.L. 70	72 74 76 C.L. Diams. (mm) 1 2 3	C.A.L. 78	C.A.R. 80

FOLLICLE DIAMETER (TENTHS OF MM) L _____ R _____ 10-12

FETAL SEX (CODED) 1 = MALE, 2 = FEMALE _____ 13

FETAL LENGTH (MM) _____ 14-17

FETAL WEIGHT (GM) _____ 18-24

LACTATING? (CODED) _____ 25

26 28 Depth of Mamm (mm)	D. of L. 31 Horn (mm)	D. of R. 34 Horn (mm)	Ut. Wall 37	Ut. Folds 40	Endomet. 43	Strat Comp.μ 47	Endo. Glands μ 5

51 No. & stages of C.A. on L. Ovary 64	No. & stages of C.A. on R. Ovary 78	L/R 79	Cav. 80

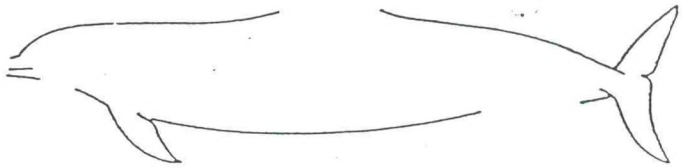
GONAD(S) COLLECTED? _____ TESTIS LN (MM) _____

JAW OR HEAD COLLECTED? _____

PHOTOS TAKEN? _____ ROLL # _____ FRAME # _____

OTHER? _____

COLOR PATTERN & DORSAL FIN:



STAGES OF CORPORA ALBICANTIA

1	2	3	4	5	6	7	8

UTERUS: _____

PORPOISE LIFE HISTORY FORM

NOAA
U.S. DEPT. OF COMM.

CARD

CR.# (1–4) SPECIMEN # (5–12) | CARD 1

SPECIES/STOCK (13–14) SEX (15)

DATE (YR/MO/DAY) (16–21) SET # (22–24)

POSITION (LAT/LONG) (25–33) QUAD (34)

TOTAL LENGTH (cm.) (35–38) COLORATION (39)

LACTATING ? (40) FETUS: SEX (41) LENGTH (cm.) (42–45)

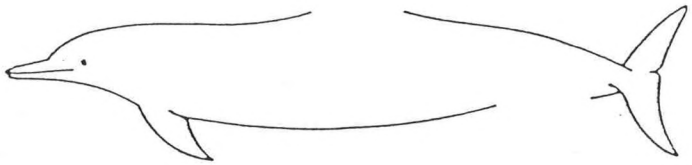
COLLECTED ?: TEETH (46) TESTIS (47) OVARIES & UTERUS (48)

FETUS (49) STOMACH (50) HEAD (51) CARCASS (52)

PHOTOS ? (53) ROLL # _____ FRAME(S) # _____

COLOR PATTERN & DORSAL FIN:

BASIS FOR STOCK ID.:



(OBSERVER'S NAME)

IN FIELD

NOTE: IF FETUS < 25 CM., LEAVE IN UTEROS & PRESERVE (do not sex & measure in field)

IN LAB

54 TOTAL WEIGHT (gm)	61 Lt. GONAD (gm) 67	68 Rt. GONAD (gm) 74	75 Ln (mm) / RIGHT TESTIS	SG.	E	80 BL

CARD 2

1 REPEAT COLS. 1–11, CARD 1 11	12	13 LAYERS 15	16 CL.	17 1 19 2 C.L. DIAMS. (mm)	21 3	23 CA (L)	25 CA (R)

27 FOLL. DIAM. (mm)	30 1	32 2	34 3	36 4	38 5	40 6	42 1	44 2	46 3	48 4	50 5	52 6	54 Total CORP. (C.A.+C.L.)
	C.A. IN LEFT OVARY						C.A. IN RIGHT OVARY						

56 TUBULE DIAM. (mm)	59 FETUS WEIGHT (gm)	66 READING STATUS	68 READER CODE

C.A. diams. (mm), by Type

1	2	3	4	5	6

NOTES (Uterus, Etc.):

DISPOSITION OF MATERIALS:

Appendix 4. Coding format for Porpoise Life History data collected during 1983-1988, and transcribed data collected prior to 1983 (1983 format).

FORMAT FOR CETACEAN LIFE HISTORY DATA

Card Number 1

Col. 1-4 Cruise Number

Col. 5-11 Specimen Number (initials and serial no.)

Col. 12 Number of the Card

Col. 13-14 Species/Stock (CODE TABLE 4)

Col. 15 Sex (1=male, 2=female)

Col. 16-17 Year of Capture

Col. 18-19 Month of Capture

Col. 20-21 Day of Capture

Col. 22-24 Set Number

Col. 25-33 Position of Capture (latitude/longitude)

Latitude Degrees - 2 digits
Latitude Minutes - 2 digits
Longitude Degrees - 3 digits
Longitude Minutes - 2 digits

Col. 34 Quadrant of Capture (coded):

Code 0 - North/West
1 South/West
2 North/East
3 South/East

Col. 35-38 Total Length (cm)

Col. 39 Coloration (for S. attenuata only; coded)

Code 1 - Neonatal
2 Two-tone
3 Subadult (not applicable)
4 Speckled
5 - Mottled
6 - Adult (fused)

Col. 40 Condition of Mammary Glands (coded):

Code 0 - Not lactating
1 Lactating

Col. 41 Fetus Sex (coded):

Code Blank - Unknown
1 Male
2 Female

Col. 42-45 Fetus Length (cm, to nearest 1/10 cm). If no fetus, enter zero:

Col. 46 Teeth Collected (coded):

Code 1 - Yes
2 No

Col. 47 Testis Collected (coded):

Code 1 - Yes
2 No

Col. 48 Ovaries and Uterus Collected (coded):

Code 1 - Yes
2 No

Col. 49 Fetus Collected (coded)*

Code 1 - Yes
2 No

Col. 50 Stomach Collected (coded):

Code 1 - Yes
2 No

Col. 51 Head Collected (coded):

Code 1 - Yes
2 - No

Col. 52 Carcass Collected (coded):

Code 1 - Yes
2 No

Col. 53 Mammary Gland collected (coded):

Code 1 - Yes
2 No

Col. 54 Milk sample collected (coded):

Code 1 - Yes
2 No

Col. 55 Parasites collected (coded):

Code 1 - Yes
2 No

Col. 56 Blood sample collected (coded):

Code 1 - Yes
2 No

Col. 57 Photos Taken (coded):

Code 1 - Yes
2 No

Col. 58-80 These columns were left blank.

Card Number 2

Col. 1-11 Same as Card Number 1

Col. 12 Card Number 2

Col. 13-19 Total Weight (gm)

Col. 20-26 Left Gonad Weight with Epidiymus (in grams to nearest tenth)

Col. 27-33 Left Gonad Weight without Epidiymus (in grams to nearest tenth)

Col. 34-40 Right Gonad Weight with Epidiymus (in grams to nearest tenth)

Col. 41-47 Right Gonad Weight without Epidiymus (in grams to nearest tenth)

Col. 48-50 Length Right Testis (mm)

Col. 51 Degree of Testis Development (coded):

Code 0 - No Spermatogenesis Present
1 - Mature, spermatogenesis present

Col. 52 Condition of Epidiymus (coded):

Code 0 - No Sperm Present
1 - Some Sperm Present (can find with searching)
2 - Copious Sperm (no searching required)

Col. 53 This column is blank

Col. 54-56 Number of Dentinal or Ear Plug Layers (to nearest 1/10 layer)

Col. 57 Ovary on which Corpus Luteum is Found (coded):

Code 0 - Left Ovary, Fetus in Left Horn
1 - Right Ovary, Fetus in Right Horn
2 - Left Ovary, Fetus in Right Horn
3 - Right Ovary, Fetus in Left -Horn
4 - left Ovary, No Fetus Found
5 - Right Ovary, No Fetus Found

Col. 58-59 Greatest Diameter of Laregest Corpus Luteum (mm)

Col. 60-61 Second Diameter of Largest Corpus Luteum (mm)

Col. 62-63 Third Diameter of Largest Corpus Luteum (mm)

Col. 64-65 Number of Corpora Albicantia on Left Ovary

Col. 66-67 Number of Corpora Albicantia on Right Ovary

Col. 68-70 Diameter of Largest Follicle (mm to nearest .1mm)

Col. 71-72 Number of Stage 1 Corpora Albicantia, Left Ovary (see attached description of corpora albicantia stage criteria)
Col. 73-74 Number of Stage 2 Corpora Albicantia, Left Ovary
Col. 75-76 Number of Stage 3 Corpora Albicantia, Left Ovary
Col. 77-78 Number of Stage 4 Corpora Albicantia, Left Ovary
Col. 79-80 Number of Stage 5 Corpora Albitantia, Left Ovary

Card Number 3

Col. 1-11 Same as Card Number 1

Col. 12 Card Number 3

Col. 13-14 Number of Stage 6 Corpora Albicantia, Left Ovary
Col. 15-16 Number of Stage 1 Corpora Albicantia, Right Ovary
Col. 17-18 Number of Stage 2 Corpora Albicantia, Right Ovary
Col. 19-20 Number of Stage 3 Corpora Albicantia, Right Ovary
Col. 21-22 Number of Stage 4 Corpora Albicantia, Right Ovary
Col. 23-24 Number of Stage 5 Corpora Albicantia, Right Ovary

Col. 25-26 Number of Stage 6 Corpora Albicantia, Right Ovary

Col. 27-28 Total Number of Corpora Albicantia Plus Corpus Luteum

Col. 29-31 Mean diameter of seminiferous tubules (microns with implied tenths).

Col. 32 Was the animal Pregnant? (coded):

Code 1 - Yes
2 No

Col. 33-39 Weight of fetus (grams).

Descriptive Stages of Corpora albicantia
1983-1988 and pre-1983 changed during 1984

1. Surface raised, smooth or just slightly wrinkled, appears as a small corpus luteum, cortex white, interior solid and interspersed w/white connective tissue. Large and obviously the first stage of degeneration of the corpus luteum. May be white to deeply yellow stained.

2. Surface raised and wrinkled, interior solid or semi-solid mixture of white connective tissue and traces of Corpus luteum rind, some verration remains. Color may mix of white and cream color to deep yellow. Usually large but definitely more degenerated that stage 1.

3. Surface usually not raised, scar generally smaller than stage 1 and heavily wrinkled, may be pedunclulate but flattened. Interior is primarily concentrated white connective tissue and is obviously the end result of a degenerating stage 2 corpus albicans. May be flattened against surface and wide or thin and run deep into the ovary. May have deep yellow stains around the white "center". Occasionally, no scar or other surface evidence is found. Interiorly this is a stage 3 corp. alb. Usually found in ovaries w/many follicles.

4. Corpus albicans flattened and compressed against the surface of a corpus luteum. Slight surface wrinkles and usually having the interior structure of a stage 3 but sometimes the interior is less degenerated and is comparable to a stage 2. This stage cannot be accurately placed in the order of degeneration due to its disfigured nature.

5. Deeply yellow or orange stained area w/very slight surface evidence. These were the smallest of the scars and the interior structure was very vague, no concentrated center or white connective tissue was present.

6. A surface scar is found in this stage but no discernible internal structure is present. Possibly the final result of a corpus luteum after a long period of degeneration. Very few of these were found.

Appendix 5. English translation of "Methods of collection and analysis of dolphin life history samples (Hohn et al, 1986).

English translation from:
Memorias de la XI Reunion Internacional sobre Mamiferos Marinos,
3-6 Abril, 1986 Guaymas, Sonora, Mexico.

METHODS OF COLLECTION AND ANALYSIS OF DOLPHIN LIFE HISTORY SAMPLES

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INTRODUCTION

The importance of maintaining standard methods for specimen and data collection cannot be over-emphasized. Standard techniques for collecting life history samples and data are important because often data that are collected by several researchers or over several years need to be pooled to obtain an adequate sample size for analysis. Studying the trends in life history parameters of a single population over a long time series and comparing these trends to those of other populations have been among the most important means available for us to understand and interpret population biology. Comparative life history studies are valid, however, only if the investigators use the same techniques.

Scientists at the Southwest Fisheries Center (SWFC) have been conducting research on dolphin populations involved in the United States tuna purse-seine fishery in the eastern tropical Pacific Ocean for 20 years. Life history research on these populations has depended both on the large amounts of data and samples collected by biological technicians, called "observers", aboard the tuna vessels and on the laboratory biologists who process the samples and data collected by observers. Throughout the period, there has been an effort to keep the methods of collection and processing of data and samples as consistent as possible. The purpose of this paper is to briefly describe these procedures in three stages: 1) the collection of data and samples in the field, 2) the collection of additional data from the samples in the laboratory, and 3) use of the data to estimate some basic life history parameters. We also include a list of related research at the SWFC that uses observer-collected data.

DATA AND SAMPLE COLLECTION IN THE FIELD

Since most of the life history samples used at the SWFC are collected by a large number of different observers aboard tuna vessels, a simple and concise form, the "Porpoise Life History Form" (Fig. 1), was developed for observers to take into the field. The form has three main purposes: 1) by having all observers use the same form, it ensures that each observer

collects the same data and, if the written instructions are followed, that the data are collected in the same manner. 2) Its simple format provides a quick way for observers to record data and to know which data have not yet been collected for a specimen. 3) Its design allows for easy numerical coding for most of the variables for easy entry of the data into a computer data file.

The form is divided into two parts; the upper half (labelled "IN FIELD") is completed by the observer in the field while the lower half (labelled "IN LAB") is completed by laboratory personnel after the data and samples have been delivered to the laboratory.

Field data describing the specimen and the circumstances of its collection are recorded by the observer on the top five lines on the upper half of the form. These data are recorded before the specimen is dissected and samples are collected. The minimum field data which describe the specimen are the species and stock designation, color (growth) phase of spotted dolphins (Perrin 1969), sex, and total length. Data which describe the circumstances of collection are date and location of collection and cruise, specimen and (net) set number. These data are important not only for identification of a specimen and for providing background data, but also because they allow cross-referencing with other data files which contain data for related variables, such as the size of the school from which a specimen was taken.

After the preliminary data are collected, the specimen is dissected for collection of samples. The remaining variables on the upper, field half of the form are completed at this time. Most of these variables require a "yes" or "no" response referring to whether samples were collected. For example, if TEETH are collected, the observer writes "yes" in the blank provided. In the lab, the "yes" response is coded as a number 1 in the box labelled "46" while a "no" response would be coded as a 2. The observer also examines females to determine whether they are lactating (again, yes or no) and whether there is a fetus present. If a fetus greater than 25 cm in length is found, its sex and length are recorded in the space provided. If a fetus is less than 25 cm long, the observer leaves it in the uterus and writes "yes" in the FETUS (collected) blank. The remaining spaces are for the observer to write whether photographs were taken and, if so, the roll and frame numbers, and for notes defining the characteristics of the specimen which the observer used to identify it to stock. An outline drawing of a dolphin is also provided for observers to sketch the dorsal fin and ventral keel of spinner dolphins. Until recently we also asked for drawings of spotted dolphin color patterns.

The methods of collecting the tissue samples during the dissection have also been standardized. Every sample is tagged with a label made of high-quality, water-resistant plastic paper on which the observer writes the specimen number in pencil (most

inks dissolve in formalin and alcohol). The label is tied to the sample with a strong string. Teeth are taken from the center of the lower left jaw (mandible) by cutting out a jaw segment containing about eight teeth. For females, both ovaries and the uterus are collected. The ovaries remain attached to the uterus, not cut free. Before the uterus and ovaries are removed, the left ovary is tagged. For males, only the right testis and epididymis is collected, since collecting both testes requires more buckets for storage and transport of the samples. If the testis is small, the tag is tied around the testis. If the testis is large, a small slit is made in the mesentary between the testis and the epididymis and the tag is tied to the epididymis through this slit. Very large testes are slit longitudinally to allow penetration of the preservative.

Other samples are often collected. Stomachs can be collected after the lower end of the esophagus and upper end of the small intestine are tied closed with string. Heads can be removed whole. Sometimes entire carcasses are frozen and returned to the laboratory. At times, we receive special requests for tissues not routinely collected, for example, livers, and these are sampled according to the directions provided by the requestor.

Most of the tissues routinely collected are preserved in formalin (10%) immediately. There are, however, some exceptions (Table 1). It is important to know these exceptions so that samples are not destroyed. For example, stomachs are never placed in formalin. It is best to freeze them at -20°C or colder. They can also be placed in 60 - 70% isopropanol or ethanol. Conversely, it is also important that tissues which will be used for histological studies, including ovaries and testes, not be frozen since freezing damages the tissue. Tissues to be preserved in formalin, for example, teeth, small fetuses and gonads, are placed together in 10% formalin in large buckets (about 20-liter size, one to four needed per cruise). The containers are checked regularly for evaporation of the formalin.

When whole carcasses are collected, they are tagged with unbreakable plastic tie-wraps with the specimen number carved into the plastic or, alternatively, the specimen number is carved into the side of the carcass before it is placed in the ship's wells. String-tied tags are not strong enough to withstand the jostling the carcasses receive in the well.

All data and samples collected by the observers are brought to the laboratory where they are processed further.

SAMPLE PROCESSING AND DATA COLLECTION IN THE LABORATORY

The data collected routinely in the laboratory correspond to the variables on the lower half of the Porpoise Life History Form (IN LAB) and involve measuring, weighing, sectioning, and

otherwise examining the samples. We will describe the general methods we use for collecting these data. Some of the procedures require specialized training; for these, we will only outline the preparation for and value of these procedures.

Rough-sorting

When the samples are brought back to the laboratory, they are "rough-sorted" to verify which samples have been collected and to separate the samples into groups of similar tissues, for example, teeth, ovaries, and testes. The samples that were preserved in formalin are washed under a fume hood to remove residual formalin before handling. The samples that were frozen are placed in the freezer. WARNING: DO NOT BREATHE THE FORMALDEHYDE FUMES; THEY ARE TOXIC.

Testes and Epididymides

Testes are weighed and measured then sectioned for future histological preparation. Before the testis is weighed, the epididymis is removed. The testis is then weighed both with and without the epididymis. The length of the testis is obtained with a caliper-like measuring device (Anthropometer) by simply measuring from one end to the other, but this measurement is made only after the epididymis has been removed so that it is not included in the testis length. The weights and length are recorded on the form. The central cubic centimeter of the testis and a center section of epididymis are collected and stored in 70% ethanol. At a later time, these samples can be histologically sectioned and examined for determination of the state of sexual maturity. The remainders of the testis and epididymis are not saved.

Microscopic examination of testes and epididymal tissue for spermatozoa is the most accurate method for determining different stages of sexual maturity in males. Typically, the presence of spermatozoa in the testis or epididymis tissue is used to indicate sexual maturity. Other factors are also important, for example, seminiferous tubule diameter and testis weight, and may be relied upon as indicators of maturity when no spermatozoa are found once appropriate criteria for a population have been established (see Hohn et al., 1985). For microscopic examination, the testis and epididymis samples are thin-sectioned on a microtome (to 6 micrometers) and stained in haemotoxylin and eosin. Training is required to prepare histological samples and to properly identify the stages of spermatogenesis and other characteristics in testis tissue to properly determine the state of sexual maturity.

Ovaries and Uteri

Ovarian corpora are used to gauge sexual maturity in females. A female is considered sexually mature if she has ovulated at least once. The scars of ovulations are corpora albicantia (CA). The techniques for determination of sexual

maturity require basic laboratory skills, and more importantly, specialized training for the identification of corpora. If specimens are collected, preserved, and stored correctly, ovaries can be stored for long periods of time until a trained biologist can examine them.

The ovaries and uteri are examined more closely than the testes during the rough-sorting phase of data collection. The ovaries are separated from the uterus by cutting through the connective tissue. The right and left ovaries are weighed separately, the weights recorded, and, if no corpus luteum (CL) is present, the ovaries are then placed in alcohol for storage. If a CL is present on either ovary, the uterine horns are carefully examined for the presence of a fetus. Even very small embryos can be seen as a small reddish spot if the uterine horns are opened and examined closely. If a fetus is found, it's length, weight, and sex are recorded. If it is very small, no measurements can be made but its presence is recorded. When a fetus is found in the lab or was found by the observer, the PREG? (pregnant) box is coded Yes. Otherwise, it is coded No. When a CL is present, its length, width, and depth is measured with dial calipers, and which ovary it is located on is recorded. All of these data are coded onto the form. Fetuses may be saved and stored in alcohol. All ovaries are stored in alcohol.

The ovaries must be further examined microscopically for number and size of corpora albicantia (CA) and for maximum follicle diameter. For both sets of data, the ovaries are serially sectioned transversely with each section about 1 mm thick, and the sections are examined under a compound microscope. The CA's are categorized into 6 types (see Perrin et al., 1976) and the diameter of each CA is recorded on the worksheet labeled "CA diams. (mm) by Type" on the bottom right-hand corner of the form. The number of CA's of each type are then totaled for each ovary separately: CA(L) and CA(R). If both ovaries are present, the total number of corpora, including any CL's, is recorded in the TOTAL CORP space. If both ovaries are not available or examined, then the TOTAL CORP space must be left blank. In addition, the diameter of the largest follicle is measured with an ocular micrometer or dial calipers and recorded.

Teeth and Age Estimation

The teeth are used for age estimation. For this purpose, we decalcify, thin-section, and stain them. Many methods have been reported for preparing teeth for counting the growth-layer groups (Perrin and Myrick, 1980), but we have found the method we use to be very successful. The method has been reported in detail (Myrick et al., 1983) and requires training for preparation of sections and "reading" the growth-layer groups (GLGs) to obtain age estimates. We will only summarize the methods here.

To prepare thin-sections, the teeth are first decalcified in acid. We use a product called RDO, a commercially-produced very strong acid. The amount of time required to decalcify a tooth

depends on the size of the tooth (that is, the species) and the approximate age-group (estimated using specimen length) of the specimen. A young animal has a large pulp cavity and only a small amount of dentine deposited, while an old animal has a tooth with a lot of dentine and a small pulp cavity. The tooth from the old animal takes much longer to decalcify. After the tooth is fully decalcified, it is thin-sectioned (25 micrometers) on a freezing microtome. The sections are stained in haemotoxylin, "blued" in a weak ammonia solution, and mounted in 100% glycerin. Estimates of age are made by counting the number of GLGs in the tooth section. Using GLGs to estimate age can be done only after they have been calibrated on the basis of known-age or tetracycline-marked animals (Perrin and Myrick, 1980) so that they represent a known period of time.

LIFE HISTORY ANALYSES

After the samples have been processed and the data have been collected, life history analyses are performed. The analyses must be based on consistent, correct methodology just as in the collection of samples and data. Different methods using the same data sets can produce dissimilar, and, therefore, noncomparable results. Unfortunately, many of the published estimates of life history parameters have been based on questionable analytic methods. Often the methods seemed acceptable at the time but further research has shown them to give incorrect, biased, or imprecise results (see Hohn 1985). Methods and results from those methods that have been reported in the literature must be critically evaluated before they are used.

It is also important to use as large a sample as possible for life history analyses. Small samples may be biased. Often small collections of samples and data sets must be combined to ensure an adequate sample size. In the event that many investigators are collecting samples from the same population at the same time, it is better to pool the samples and divide the specific research areas than to keep the samples and data separate. In order to do this, the data must be collected consistently, as stressed at the beginning of this paper.

Once the state of maturity (immature or mature), age, and reproductive condition (pregnant, lactating, or resting) have been determined or estimated for a sample, many basic life history parameters can also be estimated. All of the important parameters for population dynamics involve females, but there are interesting questions that can be asked about the life history of males (Hohn et al., 1985). Basic life history parameters generally estimated for females include fraction of the sample immature and mature, fraction of mature females pregnant, lactating, and resting, the annual pregnancy rate, and the calving interval (Table 2) (see also Myrick et al., 1986). None of these parameters require age estimates. Age estimates are needed to estimate the age at sexual maturation and longevity,

and, in a nonbiased sample, may be used to estimate natural mortality rates. These parameters are often estimated for males as well as females.

Once any of the above parameters have been estimated, we can look at trends or changes in them with time, which in turn may reflect intrinsic or external influences on the population as a whole. For example, the average age at sexual maturation may change as the population size increases or decreases.

Other Research

The most important tissues for life history research are teeth, ovaries, and testes. There is, however, much other interesting and important research that is done on other samples that are collected. This other work helps contribute to a general understanding of the animals or populations. We will discuss three of these other research areas: feeding habits, stock discrimination using DNA, and determination of contaminant concentrations in certain tissues.

Stomach contents are examined to determine feeding habits. Frozen stomachs are defrosted, then the contents removed, volumed and/or weighed, rinsed, and identified. Important data on the stomach contents include their "fullness" and the identification and number of each species of fish, squid, and invertebrate. Invertebrates are preserved in 5% formalin, squid beaks and fish remains in 60 - 70% alcohol, and otoliths are air dried. Hyslop (1980) presents the most comprehensive review of stomach contents analysis and the biases inherent in each method. Most food habits studies of cetaceans have not addressed the effect the reproductive condition of the animal may have on its diet (Perrin et al., 1973; and Fitch and Brownell, 1968). Bernard and Hohn (1985) examined stomach contents of pregnant and lactating spotted dolphins (Stenella attenuata) collected by observers in the ETP and demonstrated significant dietary differences between them.

Stock separation studies on skipjack tuna have been conducted using mitochondrial DNA in liver samples (see Graves et al., 1984). These same techniques are currently being applied to study stocks of dolphins. Small sections of liver are collected and rapidly frozen. These samples are then analyzed for DNA sequence differences between samples, stocks, and species. The greater the degree of sequence difference, the less the given samples are related (Johnson et al., 1983).

The tissues collected for contaminant analysis are liver (2" cut from the middle lobe), kidney (one half of the right kidney), brain (cerebellum near the back of the skull), muscle (4 - 5" square next to dorsal fin), and blubber (adjacent to the muscle sample, wrapped separately). These samples are collected in lipid-free aluminum foil and frozen for chemical analysis of such contaminants as pesticides and their by-products. Fishery killed cetaceans are better for these studies than beach-cast

animals because contaminants may be more concentrated in the blubber or other organs of an emaciated or sick stranded animal than would be found in an otherwise healthy animal (see Aguilar, 1985).

Much information on non-reproductive aspects of dolphin biology can be learned from the data and samples that are collected. Most of the research requires a high level of technical training, but the SWFC scientists listed have expertise in the fields listed and can be contacted for basic information regarding their projects (Table 3).

SUMMARY

This paper documents the general methods used at the SWFC to collect life history samples and data. Other methods are available, but these have been successful for a long period of time. The most important considerations for any system developed for sample and data collection and life history research are:

1. Collect as many samples or specimens and as much data as possible when the opportunity arises.

2. Preserve and store samples properly.

3. Maintain standard methods for specimen and data collection; the methods must be the same as or comparable to other researchers' who are doing similar work.

4. Maintain standard and correct methods for data analyses.

5. Pool sample and data sets if necessary to have adequate sample sizes.

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Table 1. Correct methods for preservation and long-term storage of tissues.

PRESERVACION Y ALMACENAMIENTO DE EJEMPLARES - METODO CORRECTO PARA LA PRESERVACION Y ALMACENAMIENTO DE LOS TEJIDOS A LARGO PLAZO

TEJIDOS	PRESERVACION	ALMACENAMIENTO A LARGO PLAZO
OVARIOS	FORMALINA	ETANOL
TESTICULOS	FORMALINA	ETANOL
FETOS		
<25 CM	FORMALINA	ETANOL
>25 CM	CONGELAMIENTO	CONGELACION
DIENTES	FORMALINA	ETANOL
CABEZAS	CONGELAMIENTO	CONGELACION O FORMALINA
CADAVERES	CONGELAMIENTO	CONGELACION
ESTOMAGOS		
COMPLETOS	CONGELAMIENTO	CONGELACION
CONTENIDO	ETANOL	ETANOL

Table 2. Methods used to estimate some fundamental parameters of female dolphin life histories.

ESTIMACION DE LOS PARAMETROS REPRODUCTIVOS

NOTA: USE SOLAMENTE EJEMPLARES EN LOS QUE AMBOS OVARIOS HAN SIDO EXAMINADOS EN BUSCA DE CORPORA

$$\text{FRACCION DE INMADURAS} = \frac{\text{NUMERO DE HEMBRAS SIN CORPORA (=NUMERO INMADURO)}}{\text{NUMERO DE HEMBRAS CUYOS OVARIOS FUERON EXAMINADOS EN BUSCA DE CORPORA}}$$

$$\text{FRACCION DE MADURAS} = \frac{\text{NUMERO DE HEMBRAS CON UNA O MAS CORPORAS (=NUMERO DE MADUREZ)}}{\text{NUMERO DE HEMBRAS CUYOS OVARIOS FUERON EXAMINADOS EN BUSCA DE CORPORA}}$$

$$\text{FRACCION DE PREÑADAS} = \frac{\text{NUMERO DE HEMBRAS CON FETO O EMBRION}}{\text{NUMERO DE HEMBRAS MADURAS}}$$

$$\text{FRACCION DE LACTANTES} = \frac{\text{NUMERO DE HEMBRAS LACTANTES}}{\text{NUMERO DE HEMBRAS MADURAS}}$$

$$\text{TASA DE PREÑEZ ANUAL} = \frac{\text{FRACCION DE PREÑADAS}}{\text{TIEMPO DE GESTACION (EN AÑOS)}}$$

$$\text{PERIODO DE LACTANCIA} = \text{(FRACCION DE LACTANCIA) X (INTERVALO DE CRIA)}$$

$$\text{INTERVALO DE CRIA} = \frac{1}{\text{TASA DE PREÑEZ ANUAL}} \quad \text{o} \quad \text{(PERIODO DE GESTACION) + (PERIODO DE LACTANCIA) + (INTERVALO DE DESCANSO)}$$

Table 3. Research conducted at the Southwest Fisheries Center on various aspects of dolphin biology.

AREA DE INVESTIGACION CIENTIFICOS	
HABITOS ALIMENTICIOS	HANNAH BERNARD
BIOLOGIA DE REPRODUCCION RESPUESTAS COMPENSATORIAS DE LA DENSIDAD SEGREGACION DE MANADAS	SUSAN CHIVERS
ESTIMACION DE EDAD CALIBRACION DE PATRONES DE LAS CAPAS DENTARIAS	ALBERT MYRICK, JR.
BIOLOGIA DE POBLACION DISTRIBUCION TAXONOMIA	WILLIAM PERRIN
ESTIMACION DE MORTALIDAD NATURAL TASAS DE CRECIMIENTO POBLACIONAL ESTIMACION DE ABUNDANCIA	JAY BARLOW
EVALUACION DE POBLACION ABUNDANCIA METODOS DE TRANSECTO RECONOCIMENTOS AEREOS Y DESDE EMBARCACIONES	RENNIE HOLT
EFECTOS DE OBSERVADORES ESTIMACION DE MORTALIDAD INCIDENTAL INDICES DE ABUNDANCIA	BRUCE WAHLEN
ESTRUCTURA E IDENTIFICACION DE STOCKS (ANALISIS DE ADN)	ANDREW DIZON
BIOENERGETICA CONDICIONES FISIOLOGICAS-INDICES DE SALUD	ELIZABETH VETTER
DISTRIBUCION ECOLOGICA ESTIMACION DE ABUNDANCIA TASAS VITALES	STEPHEN REILLY
CICLO VITAL SEGREGACION DE MANADAS	ALETA HOHN
DINAMICA DE POBLACIONES	DOUGLAS DEMASTER

Fig. 1. Spanish translation of the "Porpoise Life History Form" used by National Marine Fisheries Service and Inter-American Tropical Tuna Commission observers.

FORMULARIO DEL CICLO VITAL DE LOS DELFINES

NOAA FORM 88 129
NMFS 11 82

PORPOISE LIFE HISTORY FORM

NOAA U.S. DEPT. OF COMM.

CARD 1

* Cr. (1–4) *EJEMPLAR (5–12)

ESPECIE/STOCK (13–14) SEXO (15)

FECHA (año/mes/dia) (16–21) * LANCE (22–24)

POSICION (LAT/LONG) (25–33) CUADRADO (34)

LONGITUD TOTAL (cm) (35–38) (Solo S. attenuata) COLORACION (39)

AMAMANTANDO? (40) FETO: SEXO (41) LONGITUD (cm) (42–45)

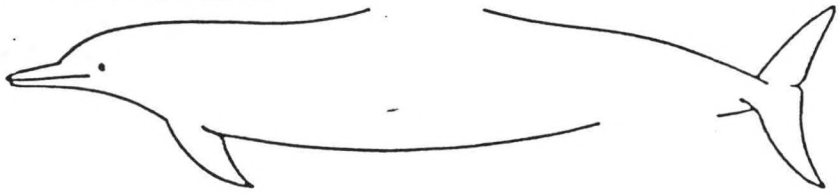
RECOLECTADO? DIENTES (46) TESTICULOS (47) OVARIOS Y UTERO (48)

FETO (49) ESTOMAGO (50) CABEZA (51) CADAVER (52)

GLANDULA MAMARIA (53) LECHE (54) PARASITOS (55) SANGRE (56)

FOTOGRAFIAS? (57) * ROLLO * CUADROS

PATRON DE COLOR Y ALETA DORSAL: (Sólo S. longirostris)



En qué se basa para la identificación del stock:

(Nombre del observador)

(no determine el sexo ni mida en el lugar)

En el lugar

Nota: Si el feto 25 cm., déjelo en el utero y preservelo

EN LAB — CARD 2

12 | 13 PESO TOTAL (gm) | 20–26 GONADA I. con epi. (gm) | 27–33 GONADA I. sin epi. (gm) | 34–40 GONADA D. con epi.(gm)

41–47 GONADA D. sin epi.(gm) | 48 Lg (mm) | S.G | E | 53 BL | 54–56 GLG'S | 57 C.L. | 58 60 62 C.L. DIAMS (mm) | 64 CA(I) | 66 CA(D)

68 FOLIC. DIAM(mm) | 71 1 | 73 2 | 75 3 | 77 4 | 79 5 C.A. EN EL OVARIO IZQ. | 3 12 | 13 6 | 15 1 | 17 2 | 19 3 | 21 4 | 23 5 | 25 6 C.A. EN EL OVARIO DERECHO | 27 TOTAL CORP.

C.A. DIAM. (mm), POR TIPO

29 TUBULO DIAM(mm) | 32 GRA VIDA | 33–39 PESO FETO (gm)

1	2	3	4	5	6

NOTAS (Uteros, Etc.):