SOUTHWEST FISHERIES CENTER

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# Trip Report: Porpoise Population Aerial Survey of the Eastern Tropical Pacific Ocean January 22 - April 25, 1979

BY

TERRY D. JACKSON



ADMINISTRATIVE REPORT No. LJ-80-1

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# INTRODUCTION

The Marine Mammal Protection Act of 1972 charges the U.S. Department of Commerce, NOAA's National Marine Fisheries Service to monitor the status of porpoise stocks which are impacted by the Eastern Tropical Pacific (ETP) Ocean tuna purse seine fishery. In addition to mortality and reproductive rates, population size must be determined before a new assessment can be made. The mission of the 1979 aerial survey was to determine, according to line transect theory and aerial porpoise sighting observations, the total number of porpoise by stocks in the ETP. In this report, the procedures of the aerial survey and some of the data gathered during the survey are documented.

## EQUIPMENT AND ITINERARY

Aircraft: PBY-5A Catalina - a modified, four engine, ex-Navy amphibian patrol aircraft owned and operated by Pyramid Aviation Company, Petaluma, California.

Trip Period: Because of mechanical and other problems, the survey was disrupted three times resulting in a prolonged three-phase operation. The time periods for these phases were:

Phase I. 22 January to 28 January 1979
Phase II. 5 February to 18 February 1979
Phase III. 15 March to 25 April 1979

Area of Operation: The aircraft operated along the Pacific Coast of Central and South America between Puerto Vallarta, Mexico and Lima, Peru. Flights within these boundaries began near shore and extended as far seaward as safety permitted, usually around 600 nautical miles.

Within this region, there also existed an area of concentrated search effort between the airplane and two NOAA research vessels, the *David Starr Jordan* and the *Townsend Cromwell*. This zone, ranging from Acapulco, Mexico to San Jose, Costa Rica, was referred to as the "calibration area" (Figure 4).

Itinerary: Prior to departing on the survey, three training shakedown flights were conducted out of San Diego. Flight schedules for the various phases of the survey follow:

Phase I

| Flight No. | Mode | Date | Depart (local time) | Arrive (local time) |
|---|---|---|---|---|
| 1 | Ferry/survey | 1/22 | San Diego, CA (0646) | Mazatlan, Mexico (1444) |
| 1 | Ferry | 1/23 | Mazatlan, Mexico (1214) | Puerto Vallarta, Mexico (1359) |
| 2 | Survey | 1/26 | Puerto Vallarta, Mexico (0750) | Puerto Vallarta, Mexico (1740) |
| - | Ferry | 1/28 | Puerto Vallarta, Mexico (0711) | Tijuana, Mexico (1405) |
| | | | Tijuana, Mexico (1430) | San Diego, CA (1445) |

Note: Due to the late start of the survey two scheduled flights north of Puerto Vallarta, Mexico were temporarily postponed in order to have the aircraft and research vessels working within the calibration area during the same time interval.

(The scientific party returned to San Diego, California via the PBY on January 28, 1979).

Phase II

| Flight No. | Mode | Date | Depart (local time) | Arrive (local time) |
|---|---|---|---|---|
| - | Ferry | 2/ 3 | San Diego, CA (0655) | Puerto Vallarta, Mexico (1505) |
| - | Ferry | 2/ 5 | Puerto Vallarta, Mexico (0915) | Acapulco, Mexico (1250) |
| 3 | Survey | 2/ 6 | Acapulco, Mexico (0650) | Acapulco, Mexico (1929) |
| 4 | Survey | 2/10 | Acapulco, Mexico (0730) | Acapulco, Mexico (1946) |
| 5 | Survey | 2/12 | Acapulco, Mexico (0715) | Acapulco, Mexico (2026) |
| 6 | Survey | 2/14 | Acapulco, Mexico (0652) | Acapulco, Mexico (1944) |
| - | Ferry | 2/15 | Acapulco, Mexico (1223) | Tapachula, Mexico (1555) |
| 7 | Survey | 2/17 | Tapachula, Mexico (0751) | Tapachula, Mexico (2004) |

Note: Originally a flight was scheduled between flight numbers 2 and 3. It too was cancelled in order to work within the calibration area.

(The scientific party returned to San Diego, California via commercial airlines on February 19, 1979. The aircraft flew from Tapachula, Mexico to San Jose, Costa Rica to have one of the auxiliary engines replaced.

Phase III

| Flight No. | Mode | Date | Depart (local time) | Arrive (local time) |
|---|---|---|---|---|
| 8 | Survey | 3/15 | San Jose, Costa Rica (0603) | San Jose, Costa Rica (1813) |
| 9 | Survey | 3/18 | San Jose, C.R. (0615) | San Jose, C.R. (1720) |
| 10 | Survey | 3/20 | San Jose, C.R. (0638) | San Jose, C.R. (1954) |
| - | Ferry | 3/21 | San Jose, C.R. (1210) | San Salvador, El Salvador (1508) |
| 11 | Survey | 3/23 | San Salvador, E.S. (0648) | San Salvador, E.S. (1900) |
| 12 | Survey | 3/27 | San Salvador, E.S. (0618) | Guatemala City, Guatemala (2125) |
| - | Ferry | 3/28 | Guatemala City, Guatemala (1305) | San Salvador, E.S. (1425) |
| 13 | Survey | 3/30 | San Salvador, E.S. (0656) | San Salvador, E.S. (1835) |
| - | Ferry | 3/31 | San Salvador, E.S. (1046) | San Jose, C.R. (1424) |
| 14 | Survey | 4/ 4 | San Jose, C.R. (0620) | Guayaquil, Ecuador (1829) |
| 15 | Survey | 4/ 6 | Guayaquil, Ecuador (0628) | Guayaquil, Ecuador (1824) |
| 16 | Survey | 4/ 8 | Guayaquil, Ecuador (0628) | Guayaquil, Ecuador (1805) |
| - | Ferry | 4/ 9 | Guayaquil, Ecuador (1231) | Lima, Peru (1735) |
| 17 | Survey | 4/11 | Lima, Peru (0649) | Lima, Peru (1759) |
| 18 | Survey | 4/15 | Lima, Peru (0621) | Lima, Peru (1856) |
| - | Ferry | 4/16 | Lima, Peru (1515) | Trujillo, Peru (1724) |

| Flight No. | Mode | Date | Depart (local time) | Arrive (local time) |
|---|---|---|---|---|
| 19 | Survey | 4/21 | Trujillo, Peru (0649) | Trujillo, Peru (1730) |
| - | Ferry | 4/22 | Trujillo, Peru (0900) | Talara, Peru (1121) |
| | | | Talara, Peru (1244) | Guayaquil, Ecuador (1421) |
| 20 | Survey | 4/23 | Guayaquil, Ecuador (0625) | San Jose, Costa Rica (1656) |
| - | Ferry | 4/24 | San Jose, C.R. (0804) | Puerto Vallarta, Mexico (1937) |
| - | Ferry | 4/25 | Puerto Vallarta, Mexico (0845) | San Diego, CA (1601) |

Personnel: The scientific party, consisting of six observers, remained constant from the beginning of the project until April 15, 1979 when two individuals departed. These two observers were replaced by one trained alternate for the remaining three flights.

There were two changes in the flight crew during the operation. Chief pilot, Richard Probert departed following Phase II. Michael Penketh, co-chief pilot during the first two phases, became sole chief pilot. Michael Brown came on as third pilot at the beginning of Phase III.

Phases I and II

Scientific Party:
- Terry Jackson, LT. NOAA, Chief Scientist
- Rennie Holt, Dr., NMFS
- Wayne Perryman, LCDR, NOAA
- Charles Oliver, NMFS
- William Walker, Los Angeles Natural History Museum (contractor)
- Stephen Leatherwood, Hubbs-Sea World Research Institute (contractor)

Flight Crew:
- Richard Probert, Co-Chief Pilot
- Michael Penketh, Co-Chief Pilot
- Theodore Sveum, 1st Pilot
- Lawrence Boyle, Flight Engineer

Phase III

Scientific Party: Frank Ralston, NMFS, replaced Stephen Leatherwood and William Walker on April 15, 1979. All other observers remained the same.

Flight Crew: Michael Penketh, Chief Pilot
Theodore Sveum, 1st Pilot
Michael Brown, 2nd Pilot
Lawrence Boyle, Flight Engineer

## OBJECTIVES AND PROCEDURES

Objectives and Tasks:

The primary objective of this mission was to observe, from a slow, low-flying, long range aircraft, schools of dolphin along pre-determined tracklines equally spaced within the population boundaries of the eastern tropical Pacific ocean. Ultimately, a population estimate, by dolphin stock, will be calculated from these and other survey data.

Specific tasks and objectives of the survey included:

1. Working the aircraft and research vessels, (*David Starr Jordan* and *Townsend Cromwell*) within a pre-determined calibration area during approximately the same time interval to compare density estimates of the three platforms. This calibration technique was designed to quantify the suspected bias inherent in dolphin sighting data from research ships due to vessel avoidance by the dolphins.

2. Obtaining an estimated school size of each dolphin school sighted and worked. These numbers will be derived from a combination of observer estimates and vertical photographs taken from the aircraft.

3. Collecting dolphin abundance data within the survey boundaries, combining this information with that collected by the research vessels and computing an overall density of dolphin within the area covered by all three platforms. This estimate may then be compared to past surveys to detect changes in the population with time.

4. Identifying the species of dolphin sighted and noting the distinguishing characteristics evident from the air. If the school was mixed, estimates were made as to the percentage of each species within the school.

5. Noting swimming patterns, school configuration, and other behavioral aspects of the dolphins.

6. Recording infrared spectrometer sea surface temperature measurements for possible correlation with dolphin distribution.

7. On a not-to-interfere basis, making observations of other marine mammals, birds, fishes, sea turtles, etc. when seen from the aircraft.

8. Scheduling foreign scientists to observe the inflight operation.

Aircraft: The airplane selected for the project was a four-engine PBY-5A Catalina, an ex-Navy amphibious patrol plane specially modified to meet the demands of the operation. The four engines consisted of two large radial engines inboard (Pratt and Whitney, R1830-94) and two smaller piston engines outboard (Lycoming GSO480-B2D6).

Reasons for selecting this particular aircraft were:

1. Flying Speed - capable of flying 90-130 knots depending on prevailing winds. Searching speed was to average 115-120 knots. The slower speed also allowed tighter turns on the dolphin schools sighted.

2. Observation Areas - as a patrol aircraft, the plane was equipped with two tear-drop shaped bubble windows (approximately 7 x 3 3/4 feet) aft of the wing. The starboard blister window was solid plexiglass, with no obstructions. The port blister contained an emergency exit which caused some structural interference when scanning aft. Both stations offered the observer an unobstructed vertical view from less than one-tenth of a mile off the trackline outward to as far as he could see given altitude and environmental conditions. The bubble configuration also permitted one-hundred eighty degree visibility along the longitudinal axis of the plane.

The nose of the plane was modified with a plexiglass bubble window (approximately 18 x 24 inches) used by a third observer to survey the trackline. From this station the bow observer, lying on his stomach with his head in the bubble, had unobstructed visibility greater than one-hundred and eighty degrees vertically and horizontally forward of his position.

3. Range - fully loaded and in ideal conditions, the plane was capable of flying 1900 nautical miles (16 hours at 120 knots). Actual conditions and safety, however, generally kept the flights to about 1500 nautical miles (12.5 hours at 120 knots).

4. Safety - as an amphibian, the plane was designed to safely land on the water should an emergency occur.

   A three engine ferry capability offered an added safety margin and reduced logistical support. This ability enabled the plane to ferry between airports for mechanical assistance in case the occupied airport did not have adequate facilities.

5. Cost - the hourly contract rate allowed a sufficient number of flights considering the large area being surveyed and the budget.

6. Wing Position - as a high wing aircraft, the wing did not interfere with the search area during normal survey operations.

7. Space - six observers and gear were needed for the project. Due to the lengths of the flights, three pilots were also required. The airplane was capable of carrying this weight and a full load of fuel.

Flight Procedures: For safety, the airplane normally took off at first light. Searching began as soon as the trackline was reached. If the track began near the airport, a later takeoff was scheduled to give sufficient light for sighting. As a rule of thumb, a minimum of thirty minutes after sunrise was allowed before searching began.

Once on track, the pilots followed a pre-determined trackline and maintained an altitude of 900 feet unless cloud ceilings necessitated flying lower. The aircraft's speed was maintained at about 120 knots using a combination of indicated airspeed and ground speed readings from the Global Navigational System (GNS). Generally, the plane's course was not changed to avoid squalls.

On all flights except number 6 from Acapulco, Mexico, searching began in the morning, near shore, and continued as the plane flew away from the coast. The search effort was maintained until the pilot determined it was necessary to turn around. Searching occasionally was done on the inbound leg depending upon offshore distance, prevailing winds, and time of day. If searching was possible on the flight to shore, a 15-20 minute dogleg, perpendicular to the original course, was normally flown to separate the inbound and outbound legs. Inbound search was concluded when darkness fell or when the pilots decided it was necessary to climb to a higher altitude to attain greater flying efficiency.

The possibility of departing at night, arriving at the end of the track during daylight, and searching inbound, was discussed but found unfeasible due to safety, i.e., the plane would not stay airborne, fully loaded with fuel, if a main engine quit on takeoff. Therefore, daylight was required for all takeoffs. Flight number 6 used a modified version of this technique. The plane took off at daybreak, flew directly to a point 550 miles from shore, turned, and searched inbound along the trackline.

Total time of each flight differed depending on course, the destination airport, and weather conditions. A normal survey flight lasted approximately 12 hours. The maximum distance from shore also varied depending upon the trackline, distance between departure and arrival airports, wind, and amount of time spent circling schools. An hour of circling time was allocated for each flight. If this time was not used by the end of the track, the flight was either extended or the time was used searching inbound.

The original flights were scheduled to alternate working flights with fuel, maintenance days. Whenever the schedule required a move between operational bases an extra day or two was added to clear customs, ferry the plane, enter the facility, and move all nonessential gear to a hotel. Problems that caused time delays are discussed in the appendix.

Instruments and Equipment:

Radiation Thermometer

Sea surface temperature was sensed with a Barnes PRT-S Precision Radiation Thermometer equipped with a special narrow aperture band-pass filter (10.5-12.5 microns). The sensor transducer was directed through a small hatch in the airstair door of the PBY. The thermometer output was fed to a Varian G-14 strip chart recorder run at a speed of 1-inch-per-minute.

Navigation System

A Global Navigation System (GNS-500A) provided primary control throughout the survey. Using this unit, theoretically accurate to .01 miles, the recorder was able to continually monitor date, time (GMT), geographic position, perpendicular distance of the school from the trackline, ground speed, and the distances and time to any desired geographic position.

Cameras

Four different format cameras were carried aboard the aircraft to photograph dolphin schools and document the mission.

1. K-17C, 9-inch format, aerial reconnaissance and mapping camera. The main components of the system were a World War II camera body fitted with a 6-inch, F/6.3 lens covered by a minus blue anti-vignetting filter, a film magazine (Model A-9B) capable of holding 490 exposures and cycling at a rate of 1 1/4 seconds, an intervalometer (Type B-3B) which automatically tripped the shutter and advanced the film at about two second intervals, and a camera mount (Type A-11-A) which consisted of a two directional leveling ring and shock absorbing system. A nearby venturi provided a vacuum for the film magazine. The entire assembly was mounted over an opening in the airstair door along the centerline of the airplane. Kodak Ektachrome EF Aerographic SO-397 film was used on all flights. The film was kept cool in a refrigerator aboard the aircraft or in hotel rooms when not mounted on the camera.

2. Hasselblad 500c, 2 1/4-inch format camera, fitted with an 80 mm lens and prism view-finder site. The Hasselblad was held by hand and fired whenever possible in conjunction with the 9-inch camera. No filters were used on the Hasselblad.

   Kodak High Speed Ektachrome, EPD120, (ASA-200) film in twelve exposure rolls was used on the project. Each roll contained pictures of separate dolphin schools.

3. Nikon Nikkomat ELW, 35 mm camera, was used to document the project. To obtain close up photographs for species verification, a 500mm telephoto lens was aboard and tested but found to be impractical due to the narrow viewing area of the lens and the relative speed of the plane and dolphins.

4. Canon Scopic, 16 mm motion picture camera. This system was used only once during the project due to the difficulty of taking movies from a fast moving aircraft.

Binoculars

Three types of binoculars were carried aboard the aircraft. Two were used to inspect possible targets seen with the unaided eye. The other was used to identify the mammals within a sighting. No binoculars were used by the bow observer.

To inspect areas of interest, Swift Admiral Mark I, Model No. 751 (10 x 50 power) or Carl Zeiss (15 x 60 power) were used. For species identification, Minolta Celtic (7 x 35 power) wide angle (11°) binoculars were used.

Smoke Lights and Dye Markers

Mark 25 smoke lights designed to ignite on contact with the sea surface and produce a copious column of smoke for about 15 minutes, were used as an aid to relocate schools of dolphin. One-hundred of these flares were obtained through the Naval Weapons Supply Center, Seal Beach, California.

Small floating dye markers were sometimes used in conjunction with the smoke flare to provide a directional reference on the sea surface. The recipe used to make up the markers was one tablespoon of eosin dye mixed with equal amounts of sand (for weight) and 2 to 3 pieces of "peanut" styrofoam packing material (for buoyancy). This material was then folded in tissue paper and secured with a rubber band. Caution: eosin dye is corrosive and leaves indelible stains if wet.

Duty Stations: Six duty stations were used on the PBY from the onset until April 15, 1979 when the scientific party was reduced to five. Starting in the bow, an observer rotated through the following positions.

1. Bow: The bow observer laid on a padded platform with his neck and head extended into the nose plexiglass bubble. His search responsibility was to guard a path of water approximately one-tenth of a mile wide directly beneath the aircraft. He was also responsible for guiding the aircraft over the school once it was sighted.

2. Recorder: The recorder sat at a table behind the pilot with a GNS readout unit mounted on the bulkhead nearby. His duties were to take transect data at regular intervals and make notes of any pertinent information transmitted to him via the internal communication system (ICS). At times of sightings, he was responsible for immediately recording the time, position, and cross track distance (if possible). Other data required by the Transect and Sighting Forms (Figures 1 and 2) were recorded while the sighted school was being observed. Observer estimates of school size were seldom mentioned over the ICS.

3. Left Waist: The port side observer sat on a cushioned chair at the forward edge of the blister window. His job was to search an area visible from the edge of the plane outboard to a subjective limit set primarily by sea state and sun position. The bubble window allowed both waist observers to look slightly under the airplane, thereby, providing overlap with the bow observer.

4. Camera: The camera operator stayed in the same compartment as the waist observers and was responsible for annotating the temperature data, operating the 9-inch and Hasselblad cameras, and dropping smoke lights and dye markers when directed. Occasionally, he was required to observe through the camera hatch if the bow observer felt he could not effectively cover the trackline due to sun glare.

5. Right Waist: The starboard observers job and duty station were identical to the left waist position except on the opposite side of the aircraft.

6. Off: The last station was a non-duty rest position where the observer was free to do as he wished. If not sleeping, he was often called if a school was sighted and worked.

   All observers, including the "off" observer if desired, were in constant communication with each other and the flight deck via the ICS. Scientific personnel changed positions every 45 minutes. A die was rolled each flight day to determine the starting position.

   For the last three flights with five observers, the "off" position was eliminated. The rotation sequence was changed so that the observer moved from left waist, to right waist, to camera, to bow. By this change the observer could rest before moving into the important bow position.

General Search Procedures:

The search mode of each survey flight began when the plane turned seaward to follow the trackline. On a cue from the bow observer, time and position were recorded, the temperature recorder was notated, and the observers began scanning the sea surface for signs of dolphins. Sighting cues used to locate the dolphins differed depending on the sea state, sun position, the size of the school, behavior, and distance from the aircraft.

The offtrack distance in which a school could be sighted decreased as the sea state increased.

For example, with calm seas, Beaufort two or less, various sea surface patterns could be distinguished up to several miles away from the aircraft. These patterns, referred to as scars, would then be scrutinized with binoculars to determine the presence of dolphins. Under the same conditions, but closer to the plane, surface commotions and/or the dolphins' silhouette near the surface were often the sighting cues. As sea conditions worsened, larger swells and more white caps, scars and other surface disturbances became more subtle. Such a change necessitated that the observer concentrate his efforts closer to the aircraft. Under adverse sea conditions, Beaufort six or higher, the dolphin figure was usually the only discernible sign. At this point, all searching was done close in to the airplane. Bird activity was also used as a possible sighting cue.

Throughout each working flight, the recorder maintained a Transect Record (Figure 1) of the flight, leg number, date, altitude, ground speed (indicated on the GNS), and the code numbers of personnel at each of the observer stations. Sea state and sun positions were also noted after consultation with the observers. A new transect record or leg was started at each 45 minute rotation of observers, when the airplane made a major course or altitude change, or when environmental conditions underwent a definable change, e.g., a change in Beaufort or sun position. Geographic positions and Greenwich Mean Times were recorded at the beginning and end of each leg and at 5 to 8 minute intervals (transect checks) throughout the leg. Positions were also recorded for each sighting and when the aircraft diverted or returned to the trackline. "Search" or "no search" modes were noted for each position notation and "sighting record numbers" were referenced to specific positions where a sighting occurred.

When a sighting was announced, the recorder immediately logged the time, position, and assigned a sequential sighting number. Concurrently, the person making the sighting determined if the plane should divert from track and investigate or continue on course. Several factors were considered in reaching this decision: 1) School size - schools estimated less than 15 were generally not worked unless more animals were suspected to be in the area, 2) Probable species -sightings such as whales and *Grampus* were seldom overflown, 3) Time and fuel - most or all of the time and fuel allocated for circling may have expired, 4) Aircraft weight - early in the flight the aircraft was heavy with fuel and could not maneuver without a disproportionate consumption of fuel, and 5) Environmental conditions. With these factors in mind, the observer chose whether or not the plane should divert.

If the observer decided not to divert he told the pilot to continue on track. He then relayed his information concerning the sighting to the recorder who filled out a Sighting Record (Figure 2) data sheet. Observer search effort continues if the airplane did not divert.

If a turn was requested, the following series of events usually took place. The observer who made the sighting asked the pilots to turn left or right so he could continue observing the school as the plane circled. At the same time, he also instructed the recorder to note the "cross track" distance if he felt the school was far enough away to obtain an accurate reading. The next step was to decide if conditions were conducive for aerial photography. Assuming they were, a photographic run was ordered. This meant that the plane positioned itself between the sun and the school so the approach was made with the sun on the aircraft's tail, a pattern found most effective in tests conducted prior to the survey. It also keyed the pilots to reduce airspeed to approximately 95 knots while maintaining 900 feet. Normally, the bow observer, having visually located the sighting while the plane circled, directed the pilots over the school. From the bow position, he also commanded the camera operator to start and stop the 9-inch picture series. Hasselblad pictures were sometimes taken depending on the operator's ability and whether or not he had to make angle adjustments with the 9-inch camera. The types and numbers of photographs shot were recorded after each pass in the Camera Log (Figure 3).

Following the photographic sequence, the aircraft changed its approach pattern slightly to allow optimum lighting for the observers to estimate school size. On these passes, still at 900 feet, the plane approached with the sun to port and the dolphin school close in (.1-.2 nm) on the starboard side. As the aircraft approached the school, the pilot, usually directed by the bow observer, dipped the starboard wing to give the observers in the right blister window a near vertical view of the school with minimum glare. All available observers made independent estimates of school size on each pass. Using this same circling pattern, the aircraft then descended to 600 feet for species identification. On these passes two observers, usually the marine mammal identification specialists, viewed the dolphins through the wide angle binoculars while the remaining observers looked with their unaided eye. Between each pass discussions on noted identification characteristics took place to assist in determining the species. Circling in this manner continued until a positive identification was made or time restraints necessitated continuation of the trackline.

As the aircraft ascended to 900 feet to resume searching each observer made notes, in a personal notebook, according to the assigned sighting number, regarding estimated school size (best-high-low) and species composition. School size was not discussed over the ICS if more than one observer made an estimate. Search effort resumed when the plane was at altitude and back on track.

Toward the beginning of the survey, photographic runs were occasionally requested after the identification passes at 600 feet. This practice was later abandoned because the dolphins behavior was not suitable for photography (e.g., running hard or diving) and fuel was wasted with the full power settings needed to climb to 900 feet in a short period of time.

On occasion, when sightings occurred in rapid succession, the recorder asked that each observer make notes in his own log book concerning the sighting. Sighting numbers were supplied over the ICS to insure that data was coded accurately.

As previously mentioned, the observers rotated positions every 45 minutes to help alleviate tedium and fatigue. This practice, however, also placed less experienced observers in critical positions (camera operator or identification specialist) during various times of the flights. To minimize this inefficiency, the position of each observer within the group remained constant. This guaranteed, for example, that an experienced camerman and an identification expert were available in the aft observer stations to do the job for which they were best qualified. The observer's initial starting position, however, was selected randomly each flight day by the roll of a die. The number on the die dictated where a particular observer started that day, the rest positioned accordingly.

## RESULTS

Results:

### Flight Statistics

During the three phases of the project, 20 survey flights were conducted resulting in 15,390 nautical miles (137.53 hours) searched using standardized recording and searching procedures. Another 2,000 miles (18.16 hours) were spent "off track" investigating the various sightings as they occurred along each track. In addition, 14,564 miles (126.80 hours) were flown either ferrying from airport to airport or "deadheading" between the trackline and the base of operation. Thus, a total of 31,954 nautical miles were flown to complete the 20 flights.

Not included in this total were approximately 1,600 nautical miles flown by the contractor to ferry the aircraft between airports for repairs and approximately 890 nautical miles (7.82 hours) flown as training flights out of San Diego.

Figure 4 shows the tracklines of the flights when the aircraft was actively searching (temporary suspensions of search due to weather are not included). The "deadhead" and ferry tracks are also not indicated. Table I gives a breakdown, by flight, of approximate numbers of nautical miles flown in the various modes.

### Cetaceans

A total of 387 sightings was made on the 20 flights of the survey;, 288 were dolphins, 98 were whales, and 1 was an unidentified marine mammal. Nine species of dolphins were sighted, identified, and their numbers estimated. There was a total of 153 such sightings. In addition, sightings of 146 dolphin schools remained unidentified as to species.

There were 105 sightings of whales. Of these, 63 were identified as to species, leaving 42 sightings categorized as unidentified small or large whales.

A sighting by species summary revealed a total of 404 schools of marine mammals. The difference between this number and the total number of sightings (387) results from two or more species identified in one sighting. Sightings by species/stock and the school size estimates are given in Table 2.

A listing of sightings, by species or category giving the date, flight number, geographic position, and the mean best estimate of aggregation size are given in Tables 3-24. The distribution of the sightings for species and categories are shown in Figures 15 to 17.

One hundred seventy-four sightings were unidentified to species. As mentioned previously, whale sightings were generally not investigated unless dolphins were suspected to be in the area. Thus, only whales sighted near the track were identified as the aircraft passed overhead. Conversely, all dolphin sightings were investigated provided there was time, the suspected species was considered important to the mission, or the school size was estimated greater than 15 animals. On several occasions the schools being worked dove out of sight as the aircraft approached at 600 feet, resulting in an unidentified school. Unidentified dolphins also resulted when the aircraft could not relocate the sighting due to animal behavior or adverse weather conditions.

Sea Surface Temperature

The radiation thermometer strip chart recordings for flights 3 through 20 (no data was collected on flights 1 and 2 due to electrical problems) were read at two minute intervals and converted to actual sea surface temperature based on inflight calibration data. The corrected temperature at each sighting, within a one degree quadrangle, was then averaged to obtain a sea surface temperature for the one degree block. These averaged temperatures and contours, manually drawn at two degree (F) intervals, are shown in Figure 18.

## Photography

The objective of the work with the vertically directed cameras was to photograph the animals with enough resolution and contrast so that their individual bodies could be scored on the film and counts compared to the observer estimates of school size.

High contrast foam and splash patterns created by active dolphin herds are of course photographed easily, but generally submerged dolphin bodies will only photograph well during two brief periods of the day. At these times, the angle of incidence of the sun's rays with the sea surface is low enough so that there will be relatively low reflectance back into the lens, but there will be enough light penetrating the water to illuminate the animals' bodies for the lens and film being used. The chances of encountering a school of dolphins at these times during a low sea state and with the operational time available for photography are not very high, and on many occasions film was exposed under less than ideal conditions.

A total of thirty-eight dolphin schools were photographed with the 9-inch camera, 18 of which were simultaneously photographed with the Hasselblad. Both systems performed well and transparencies of suitable quality for school size estimates were obtained for 15 schools (15 from 9-inch, 6 from Hasselblad).

All 9-inch film was processed by Rapid Color, Glendale, California or by the Photographic Laboratory, Miramar Naval Air Station, San Diego, California. The transparencies were taken to the NASA test facility at Bay St Louis, Mississippi, where they were magnified and analyzed on Variscan Mark II projectors. By placing a sheet of clear mylar over the veriscan screen, it was possible to mark each animal that appeared in the photograph. Each acceptable photograph was marked and the school size estimated by three experienced aerial observers. The Hasselblad film was also analyzed using a similar technique except that these transparencies were projected against paper. Preliminary analyses shows a close correlation between school size estimates from the aerial photographs and estimates of the same schools made by observers in the field.

Photographs with the 9-inch camera were taken at an F-stop of 6.3 and a shutter speed of 100th of a second. Even at this slow speed, the film had to be pushed one stop during processing to correct for underexposure. Hasselblad camera settings varied throughout the day and were determined for each school with a spot meter. Most photographs were taken at 900 feet although a few were taken as low as 600 feet.

Guest Participants: The following persons participated as guest observers on these flights:

Flight 3. February 6- Sr. Arturo Hernandez Junquera. Servicios de Produccion, Mexico City, Mexico.

Flights 3 and 4. February 10 and 12- Mr. Jeff Laake, International Tropical Tuna Commission, San Diego, CA. U.S.A.

Flights 11 and 12. March 23 and 27- M.S. Ricardo A. Hernandez Rivas, Fisheries Resource Services, Canton El Matasano, Soyapango, El Salvador, C.A.

Flight 16. April 8- Dr. Roberto Jimenez, Oceanographic Institute of the Navy, Guayaquil, Ecuador, and Sr. Rafael Estrada, National Department of Fisheries, Guayaquil, Ecuador.

Problems: Extensive delays were caused by various problems associated with mechanical breakdowns, navigational instrument and communication radio failures and other aircraft malfunctions. Minor delays were also caused by the normal problems of operating in foreign countries away from support facilities.

A summary of these problems and the events causing delay are listed chronologically in the appendix.

Dec. 27, 1979
**Date prepared**

Terry D. Jackson
**Terry D. Jackson, LT, NOAA**
**Chief Scientist**

January 4/80
Date approved

Izadore Barrett
Izadore Barrett
Center Director

## APPENDIX I.

## SUMMARY OF TIME-LOST PROBLEMS

The majority of time lost during the 1979 Aerial Survey was attributed to one of three major delays. The first postponed the projects outset by fourteen days, the second ended Phase I after only six days in the field, and the third caused a twenty-one day break between Phase II and III. Reasons for these delays and other associated problems are reviewed below.

Original planning required that the airplane arrive in San Diego, California on January 2, 1979 for equipment installation and training flights. It was to depart for the survey area on or about January 8. In reality, on January 3 the aircraft was flown from its base in Long Beach, California to Oakland, California to repair the communication and navigation radios. The aircraft finally arrived in San Diego on January 9 but was not yet ready to begin the project. Obstacles still to be overcome were; a faulty gyro compass, FAA approval for a restricted rating, aircraft performance tests, repairs to the Global Navigation System (GNS), the continuing unreliability of the radios, and test flights to check scientific equipment and procedures. On January 17 the airplane was ferried to Palm Springs, California for compass repairs and the installation of a new high-powered VHF radio. It returned to San Diego on January 20. Despite these problems, three shakedown flights were flown over local waters to familiarize scientists and crew with observation procedures and gear. The project got underway at 0646 on January 22 when the plane departed the United States to begin Phase I.

### Phase I

The aircraft arrived in Puerto Vallarta, Mexico on January 23 after an overnight stop in Mazatlan, Mexico. No survey flights were flown the following two days due to an electrical short the first day and dead batteries the second. On January 26 research flight number 2 was completed with two of the three pilots. The third pilot had departed the project earlier that morning. Two days later the aircraft and all personnel returned to San Diego to replace the navigation and communication radios. This decision was reached after a discussion with the flight crew who contended that the present radio system was unsafe to depend on after dark. Since the project required long flights that returned after sunset we elected to delay the mission still longer to obtain the necessary range.

### Phase II

The aircraft departed San Diego on February 3 to resume survey operations from Acapulco, Mexico. Enroute, a day was lost in Puerto Vallarta due to an electrical short in the main engine pitch control. Research flight 3 was completed from Acapulco on February 6. During that flight the high frequency (HF) radio, used to give enroute position reports, failed resulting in the plane turning around prior to completing the track. A new HF unit and electronic specialist arrived from the United States on February 9 and repaired the radio. Three more flights were conducted from Acapulco according to schedule. On February 17 Phase II came to an abrupt end when the left auxiliary engine failed during flight 7 from Tapachula, Mexico. The scientific party returned to San Diego on February 19. A few days later the aircraft was ferried to San Jose, Costa Rica for an engine change. The new engine arrived in San Jose on February 24.

Twenty-one days elapsed between the time the engine first failed off Tapachula and it was installed and tested in San Jose. The main reasons for this long interim period were: 1) a replacement engine had to be located and shipped from the United States, 2) the new engine remained in customs for four days, 3) engine maintenance could only be performed Monday through Thursday due to the unavailability of electrical power the other three days, 4) the engine maintenance manual was lost and had to be replaced, and 5) the American aircraft mechanic was not permitted to work on the engine during the change. On March 11, the new engine was tested and found operable.

Phase III

The final phase of the project began on March 12 when the scientific party arrived in San Jose to rejoin the aircraft. The first working flight did not occur until March 15 due to a faulty HF radio display unit. Flight 9 was also delayed a day because of low oil pressure indicated on one of the main engines. On March 20 and 23, flights 10 and 11 were completed as scheduled. The next flight, however, was delayed two days due to a failure of the GNS unit the morning of the mission. Flight 12 began from San Salvador, El Salvador the morning of March 27; it ended that evening in Guatemala City, Guatemala. Bad weather encountered while returning to San Salvador forced the plane into Guatemala City, the closest available airport. The plane flew back to San Salvador the following day and completed flight 13 on March 30. A 100-hour aircraft inspection was performed in San Jose, Costa Rica between March 31 and April 2.

An attempt to depart San Jose on April 3 faltered due to problems in clearing immigration early in the morning. Special arrangements were made and the work/ferry flight between San Jose and Guayaquil, Ecuador was completed April 4. Successful flights were staged from Ecuador on April 6 and 7 as scheduled. On April 9 plans were changed and the aircraft ferried to Lima, Peru instead of Chiclayo, Peru because permission to stage from Chiclayo was cancelled and no alternate northern airport had been selected.

After arriving in Lima we learned that the cable requesting permission to enter Peru had not yet been received at the airport. The request was found later that day at a communications center downtown and the matter resolved. The next morning, however, take off permission was refused because this same authorization had still not been transferred to the airport. The flight was not completed until April 11. On flight 17 a fuel pressure gauge failed grounding the aircraft three more days while a new gauge was flown in from California. Flight 18 was flown on April 15. The aircraft flew to Trujillo, Peru, the alternate airport selected in place of Chiclayo, on April 16. Four days later fuel was finally purchased in Trujillo, the problem being a shortage of money. The flight crew did not have enough cash to purchase fuel for two flights and cover the costs of their hotel. Money was wired to Lima and picked up on April 19. While in Lima aircraft authorization to fly within Peru's airspace was also extended. On April 21, flight 19 was successfully completed.

From this point forward all ferry flights back to the United States and the last remaining survey flight were completed without delay. The aircraft and crew arrived in San Diego the evening of April 25.

Note: Flights in northern Mexico, originally bypassed to work the calibration area with the research vessels, were never completed due to Mexico's cancellation of the research clearance.

Figure 1:

# 1979 AERIAL SURVEY TRANSECT RECORD

FLIGHT: ____________ LEG: ____________ DATE: ____________

FROM: ____________ TO: ____________

| BLANK | FLIGHT NO. | LEG NO. | DATE YR | DATE MO | DATE DAY | ALTITUDE (FEET) | GROUND SPEED (KNOTS) |
|---|---|---|---|---|---|---|---|
| 1 | 4 | 6 | 8 | 10 | 12 | 14 | 18 |

| OBSERVER CODES BOW | BLANK | LEFT WAIST | RIGHT WAIST | RECORDER | SUN POSITION HORIZ. | SUN POSITION VERT | BEAUFORT NO. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

REASON FOR POSITION

1. Begin Leg
2. Track Check
3. Divert
4. Overschool
5. Return
6. End Leg

| LATITUDE DEG. | LATITUDE MIN. | N/S | LONGITUDE DEG. | LONGITUDE MIN. | E/W | G.M.T. | REASON FOR POSITION | SEARCHING Y/N | SIGHTING NO. |
|---|---|---|---|---|---|---|---|---|---|
| 36 | 38 | 41 | 42 | 45 | 48 | 49 – 53 | 54 | 55 | 56 – 58 |

NOAA FORM No. 88-174 1/79

Figure 2:

# 1979 AERIAL SURVEY SIGHTING RECORD

| SIGHTING NO. | FLIGHT NO. | LEG NO. | CARD NO. | DATE YR | DATE MO | DATE DAY | OBSERVER CODES BOW | LEFT WAIST | RIGHT WAIST | RECORD-ER |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | 6 | 8 | 9 | 11 | 13 | 15 | 17 | 19 | 21 |
| | | | 1 | | | | | | | |

GMT

OBSERVER CODES
1. BARHAM
2. CHARTER
3. COE
4. JACKSON
5. LEATHERWOOD
6. OLIVER
7. POWERS
8. WALKER
9. PERRYMAN
10. HOLT

| CLOCK POSITION OF SUN HORIZ | VERT | SEA SURF. TEMP. (°F + TENTHS) | BEAUFORT NO. | SIGHT BY WHOM |
|---|---|---|---|---|
| 23 | 25 | 27 | 30 | 31 |

| ⊥ (N.M.) | DISTANCE DETERMINED |
|---|---|
| 33 | 36 |

1. GNS
2. ESTIMATED
3. INCLINOMETER

L R

| POSITION OF SCHOOL LATITUDE DEG | LATITUDE MIN. | N/S | LONGITUDE DEG | LONGITUDE MIN. | E/W |
|---|---|---|---|---|---|
| 37 | 39 | 41 | 42 | 45 | 47 |

SCHOOL SIZE ESTIMATES

| SIGHTING NO. | CARD NO. | OBS CODE | BEST | HIGHEST | LOWEST |
|---|---|---|---|---|---|
| | | 48 | 50 | 54 | 58 |
| 1 | 4 (2) | 5 | 7 | 11 | 15 |
| | | 24 | 26 | 30 | 34 |
| | | 43 | 45 | 49 | 53 |
| | | 62 | 64 | 68 | 72 |

SPECIES

| | % | CODE | NAME |
|---|---|---|---|
| (1) | 62 | 65 | |
| (2) | 19 | 22 | |
| (3) | 38 | 41 | |
| (4) | 57 | 60 | |
| (5) | 76 | 79 | |

| SIGHTING NO. | CARD NO. | | | | |
|---|---|---|---|---|---|
| 1 | 4 (3) | 5 | 7 | 11 | 15 |

PORPOISE 19 BIRDS 20 TUNA 21

| ALTITUDE 9'' PHOTOS | | 70 mm CAMERA ROLL NO. | 1st. FRAME | LAST FRAME | 9'' CAMERA ROLL NO. | 1st. FRAME | LAST FRAME | 35 mm CAMERA ROLL NO. | 1st. FRAME | LAST FRAME |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 26 | 27 | 30 | 33 | 36 | 39 | 42 | 45 | 48 | 51 |

26-SCHOOL MODE AT TIME OF 9'' PHOTOS
1. TRAVELING
2. RESTING
3. FEEDING

Y/N WAS PLANE IN SEARCH MODE, IF SO, WAS SIGHTING CUE THE MARINE MAMMALS?

54

70

55 58 61

NOAA FORM No. 88-173 1/79

Figure 3:

AERIAL SURVEY CAMERA LOG

Sighting # __________ Flight # __________ Observer # __________

9" CAMERA

| Intervalometer Reading | PASS # 1 | | PASS # 2 | |
|---|---|---|---|---|
| | Begin | End | Begin | End |
| | PASS # 3 | | PASS # 4 | |
| | Begin | End | Begin | End |

Altitude __________ NOTES: (School Configuration/% of School in Frame)

HASSELBLAD

Back # __________ Back # __________ Back # __________

Roll # __________ Roll # __________ Roll # __________

F Stop __________ Shutter Speed __________ Altitude __________

Motion Pictures

Roll # __________

35 mm

Roll # __________

Frames __________

NOTES:

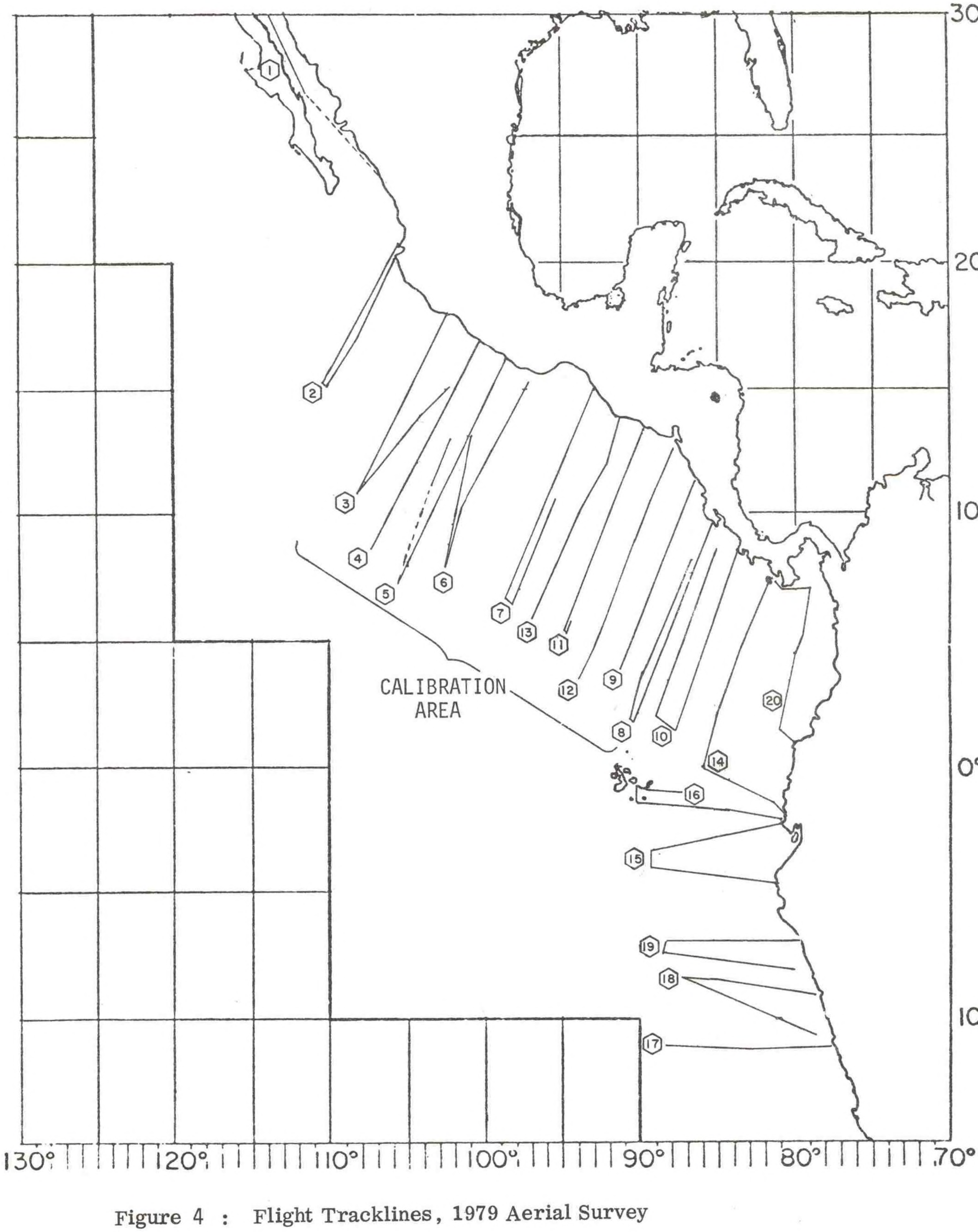



Figure 4 : Flight Tracklines, 1979 Aerial Survey

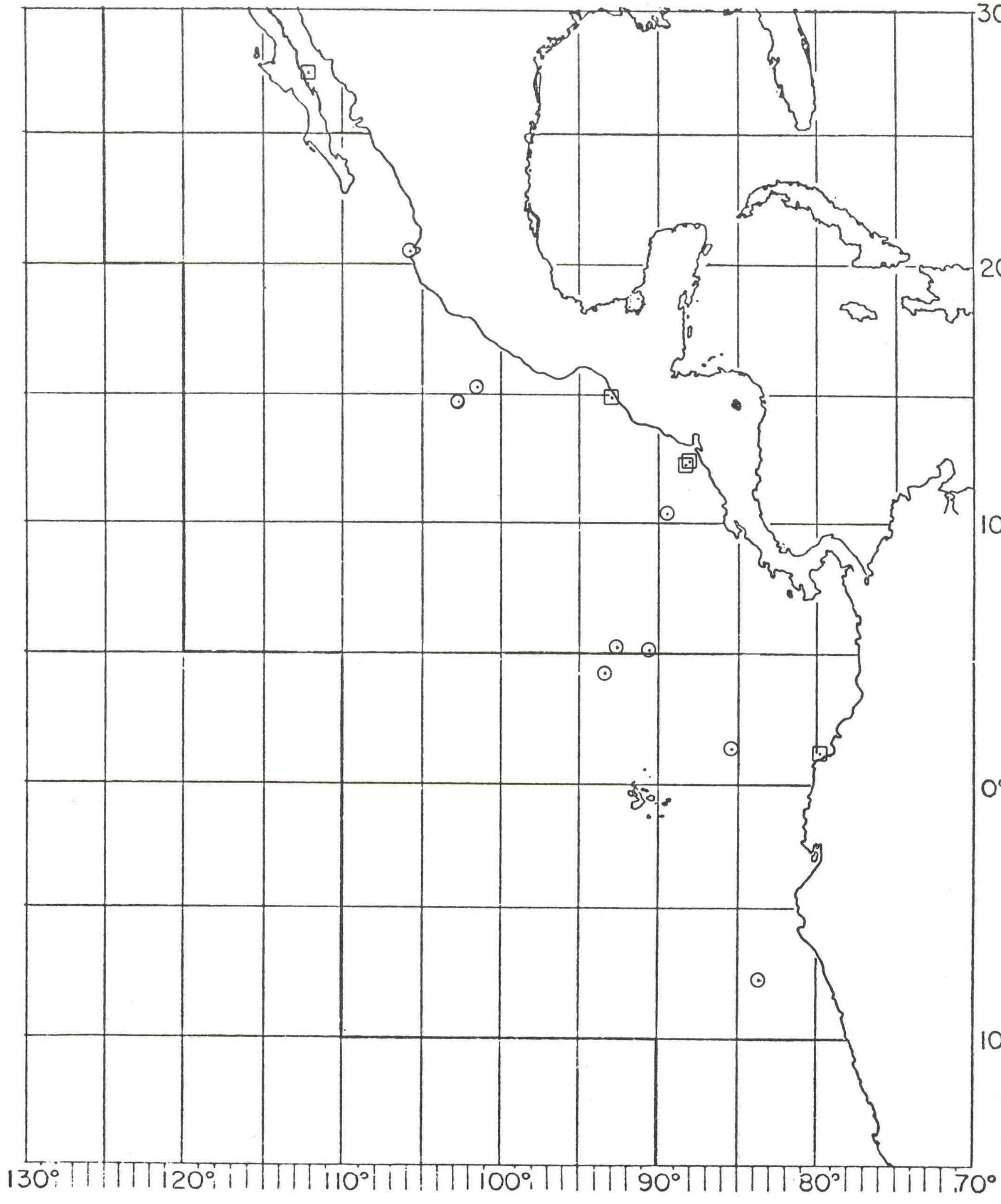



Figure 5: 1979 Aerial Survey

⊙ Offshore spotted dolphin
( Stenella attenuata )

⊡ Coastal spotted dolphin
( S. a. graffmani )

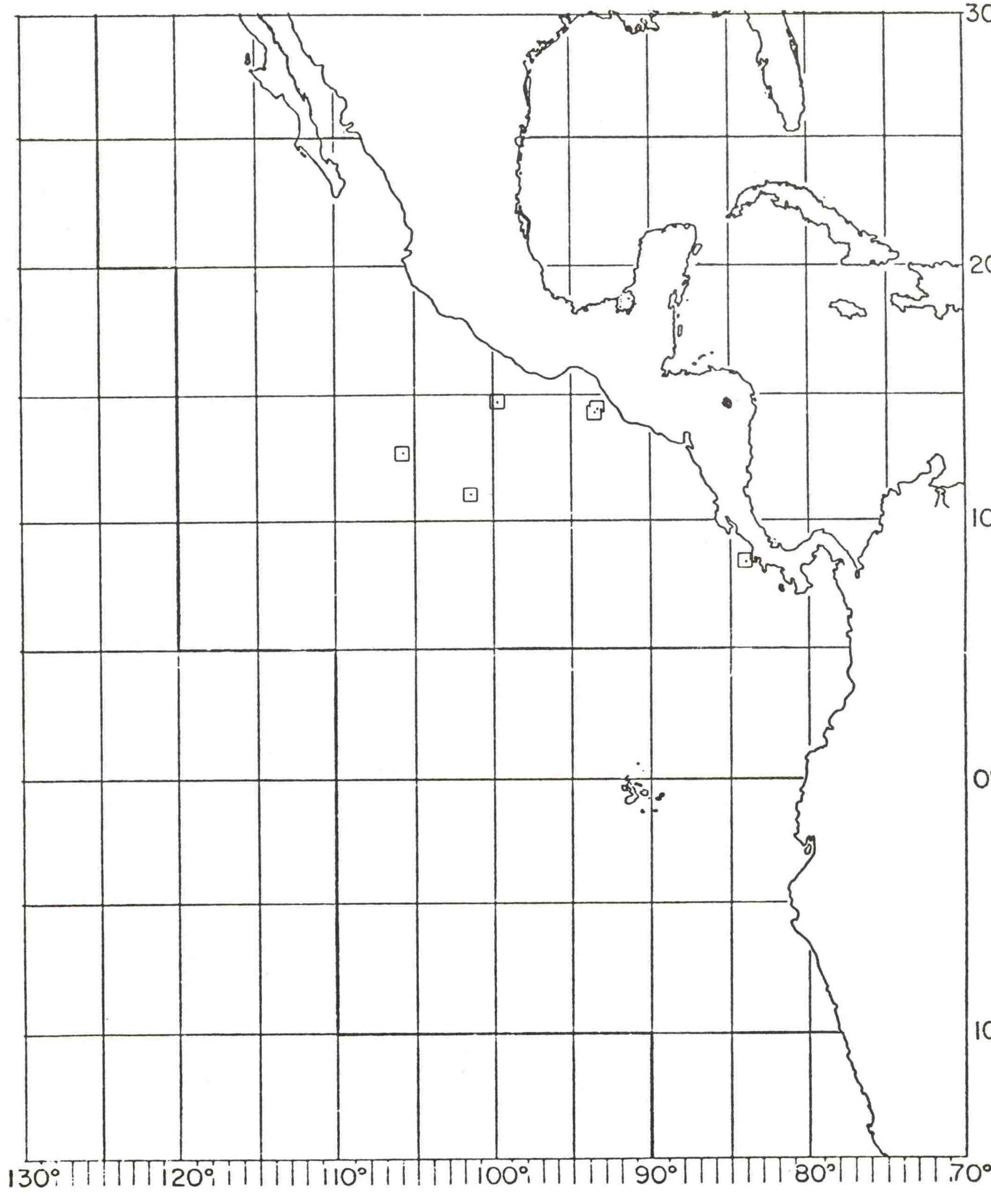



Figure 6 . 1979 Aerial Survey ⊡ Eastern spinner dolphin ( Stenella longirostris, subsp. )

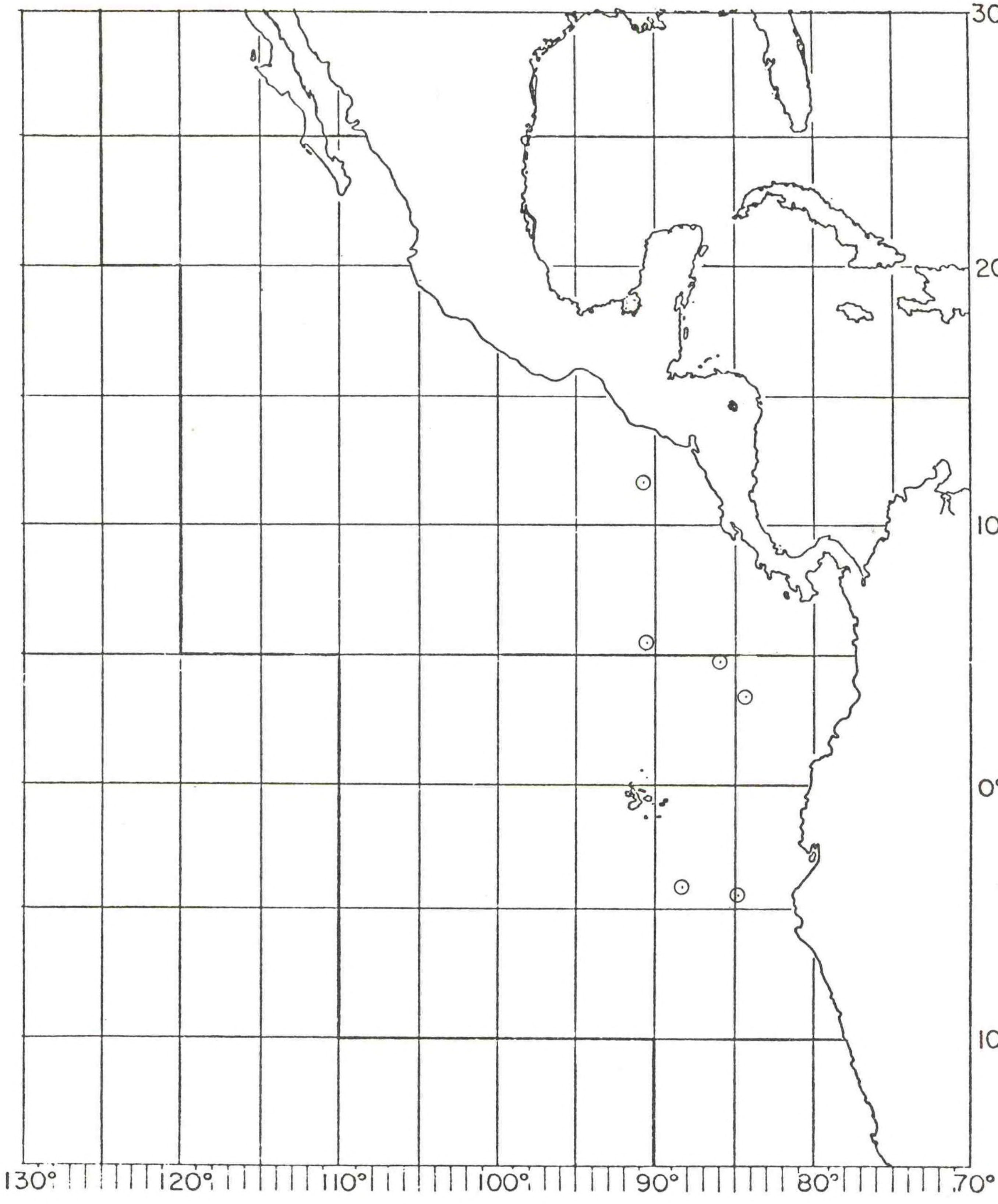



Figure 7. 1979 Aerial Survey ⊙ Striped dolphin ( Stenella coeruleoalba )

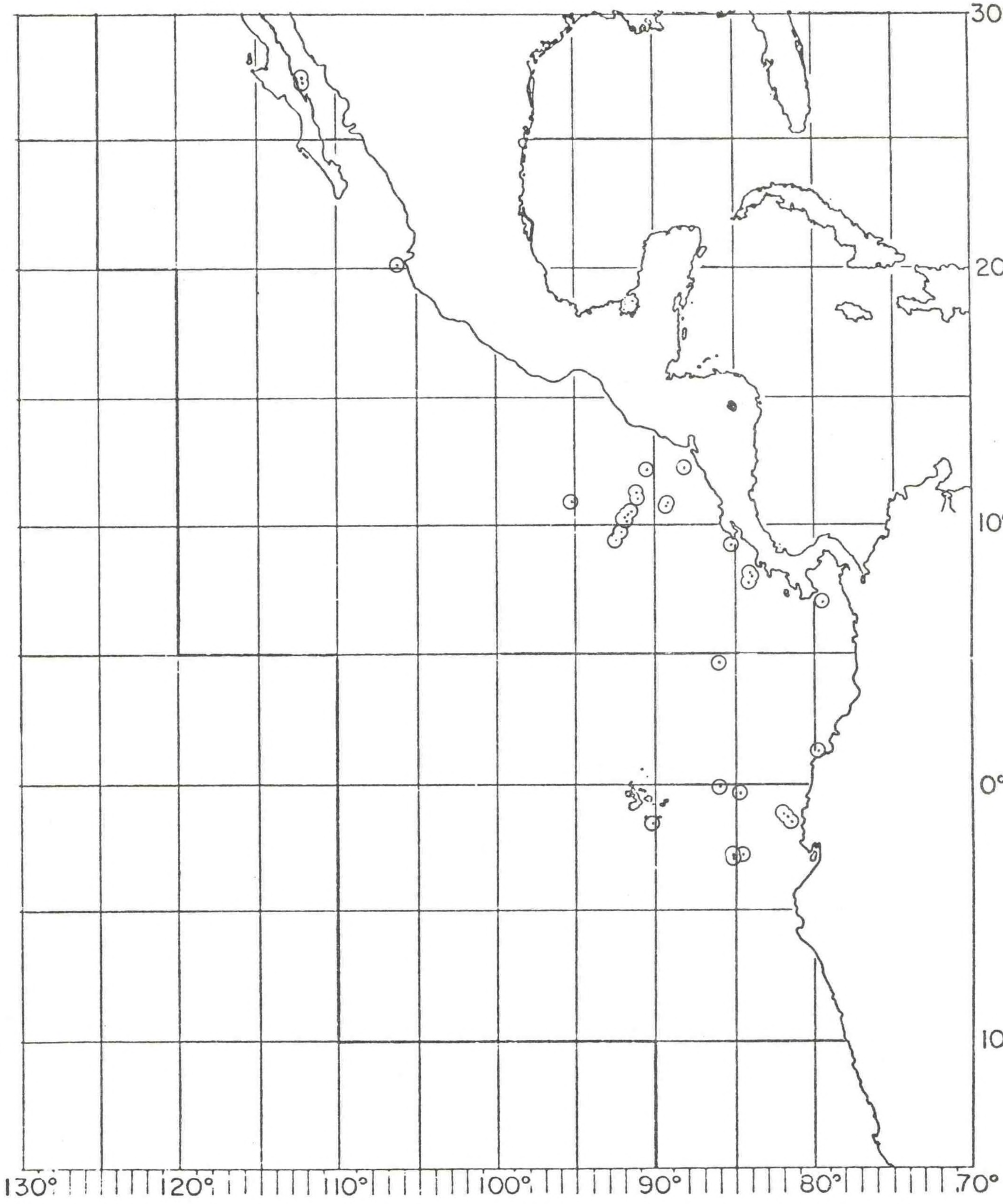



Figure 8: 1979 Aerial Survey ⊙ Common dolphin (*Delphinus delphis*)

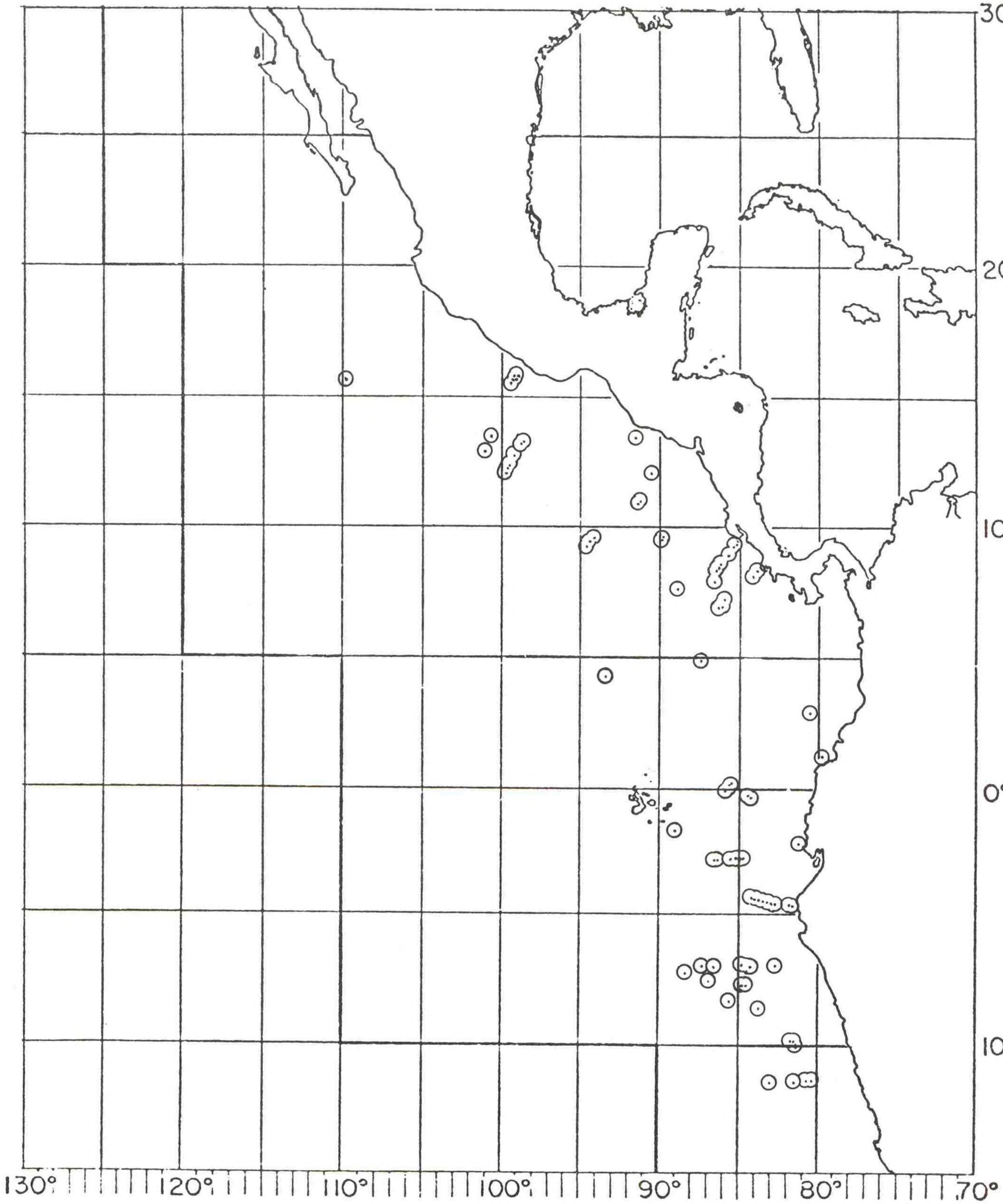



Figure 9. 1979 Aerial Survey ⊙ Risso's dolphin ( Grampus griseus )

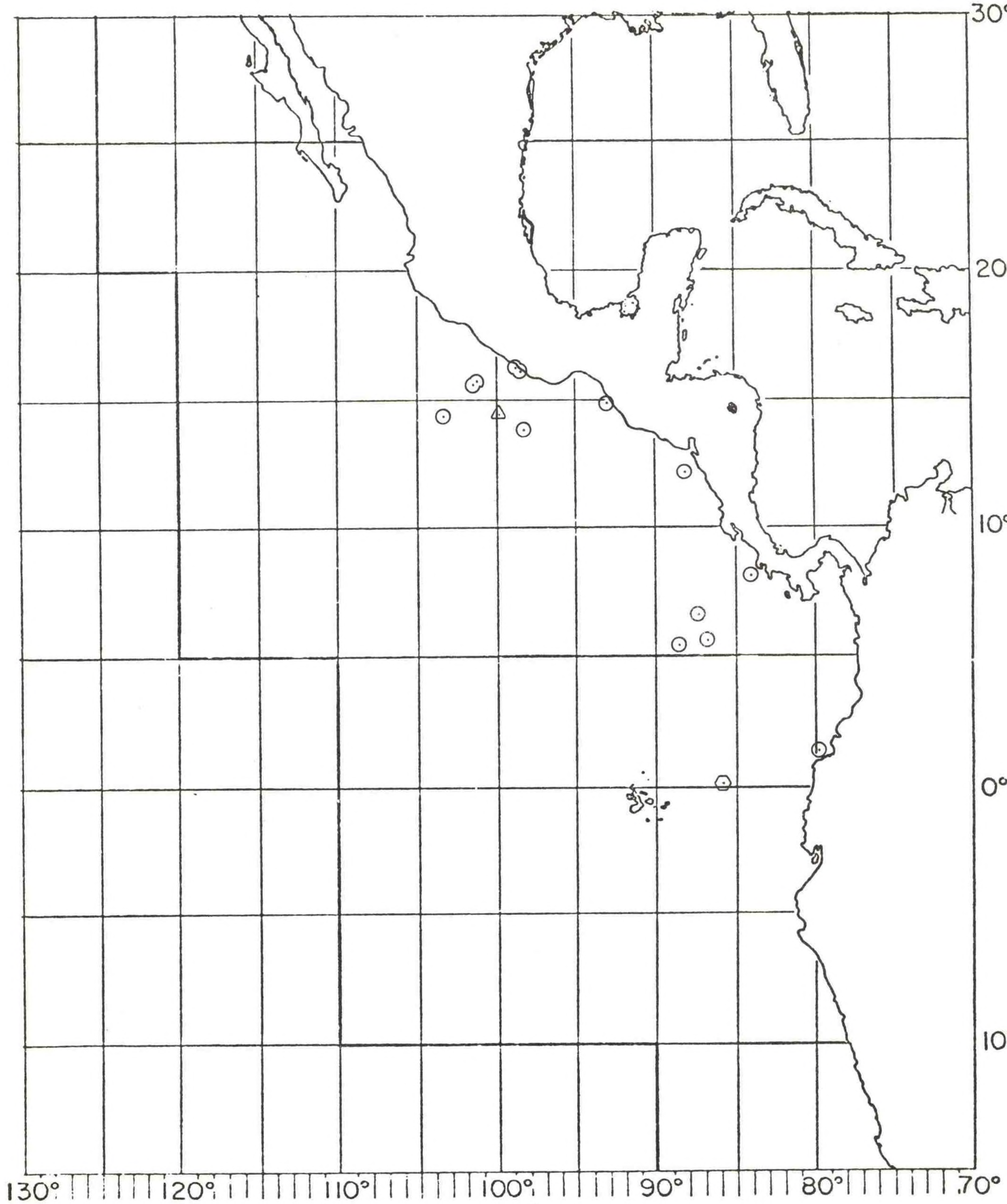
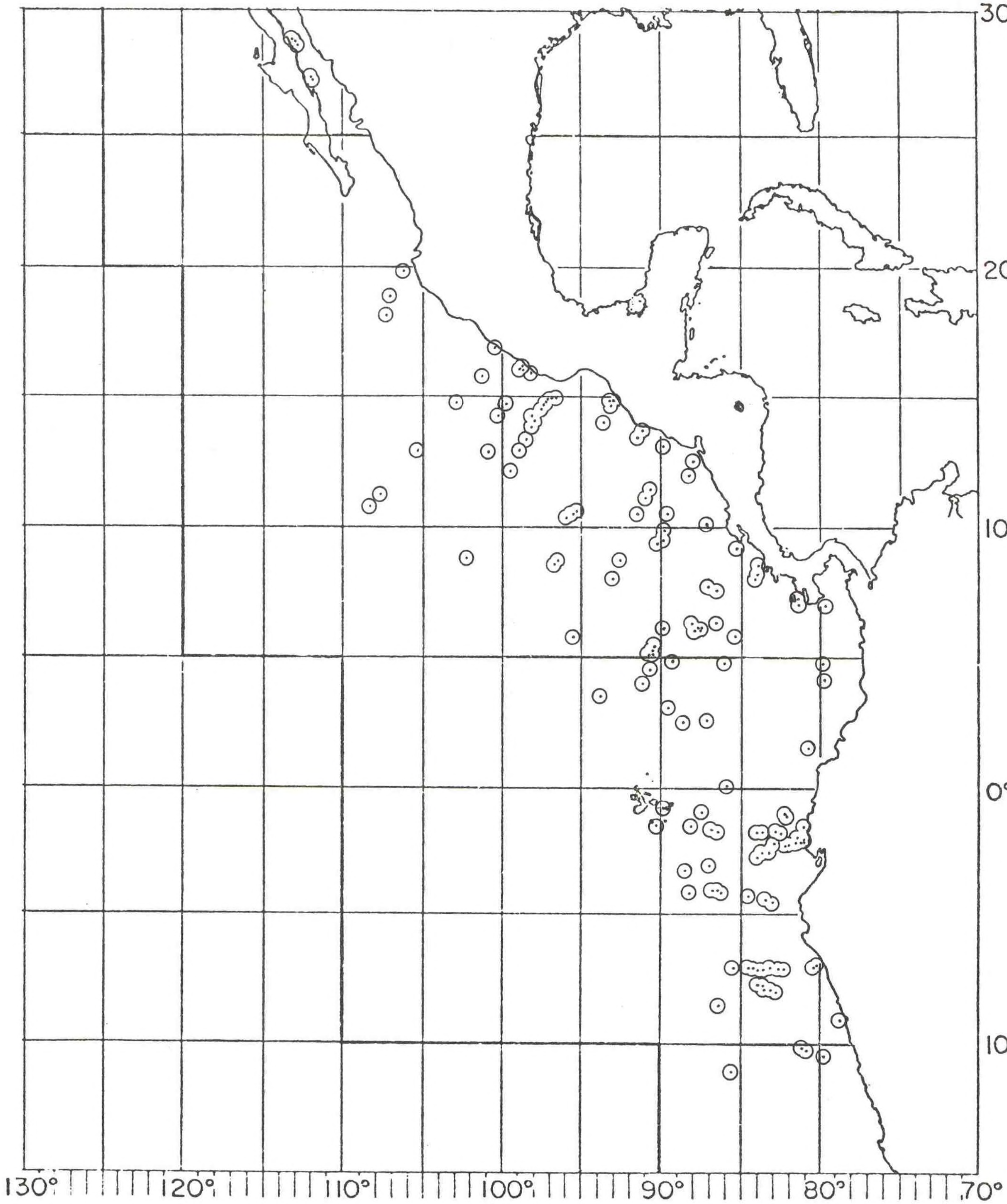



Figure 10. 1979 Aerial Survey

⊙ Bottlenosed dolphins
( Tursiops truncatus )
△ Rough-toothed dolphin ( Steno bredanensis )
⬡ Fraser's Dolphin ( Lagenodelphis hosei )




Figurell. 1979 Aerial Survey ⊙ Unidentified dolphins

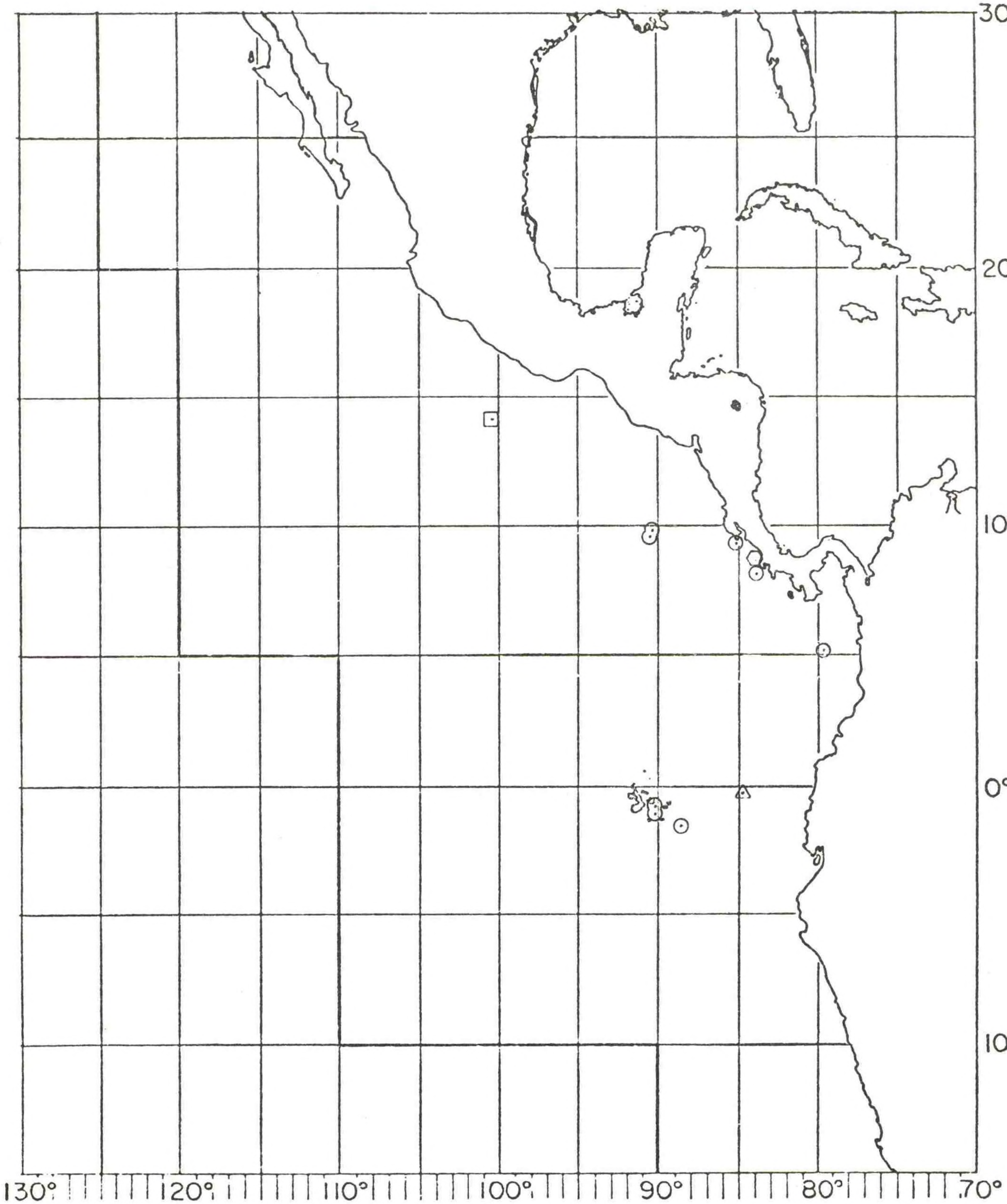



Figure 12 1979 Aerial Survey

⊙ Pilot whale ( Globicephala sp. )

⊡ False killer whale ( Pseudorca crassidens )

△ Killer whale ( Orcinas orca )

⊙ Dwarf sperm whale ( Kogia simus )

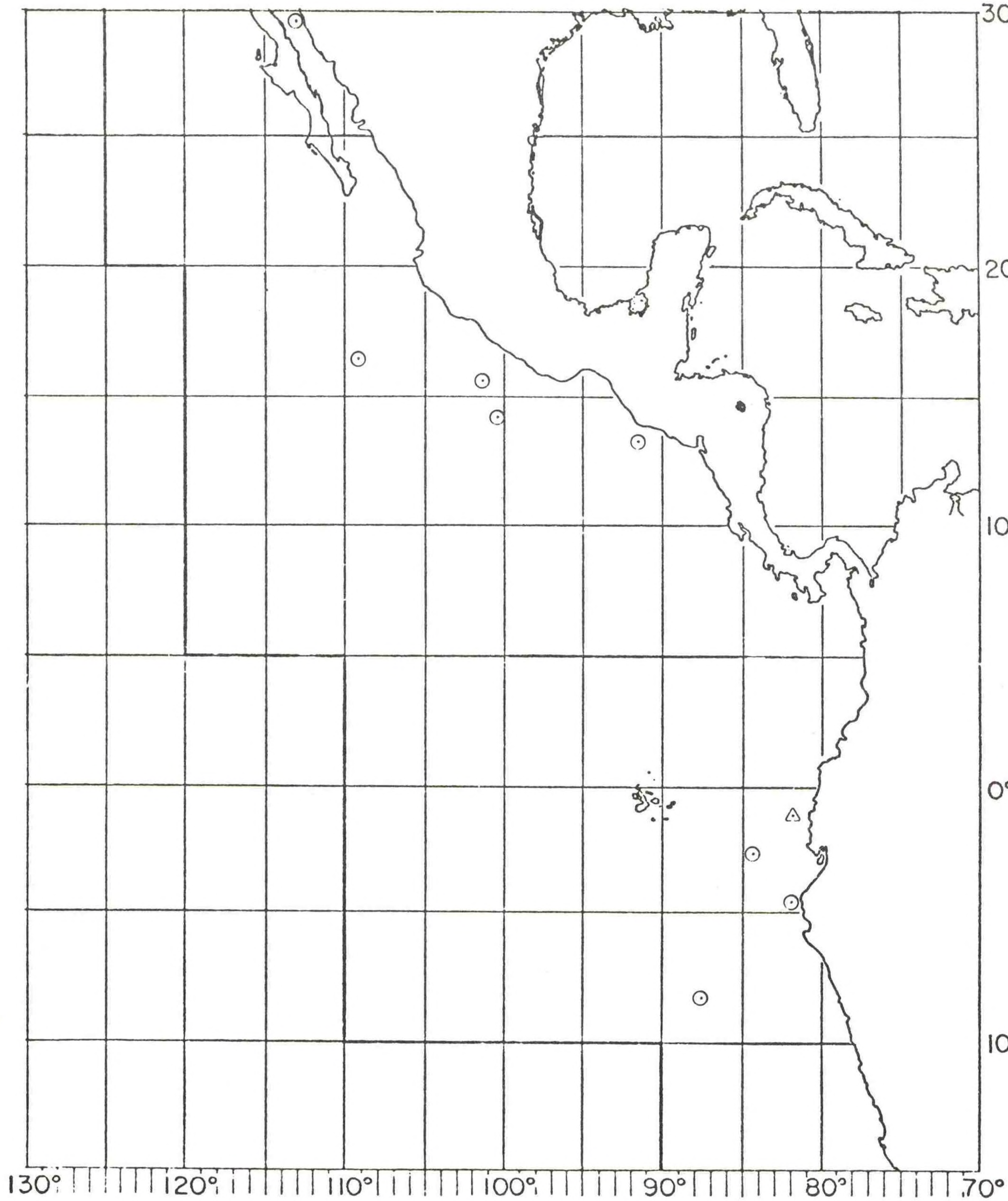



Figure 13. 1979 Aerial Survey

⊙ Rorqual whales ( Balaenoptera sp. )

△ Bryde's whale ( Balaenoptera edeni )

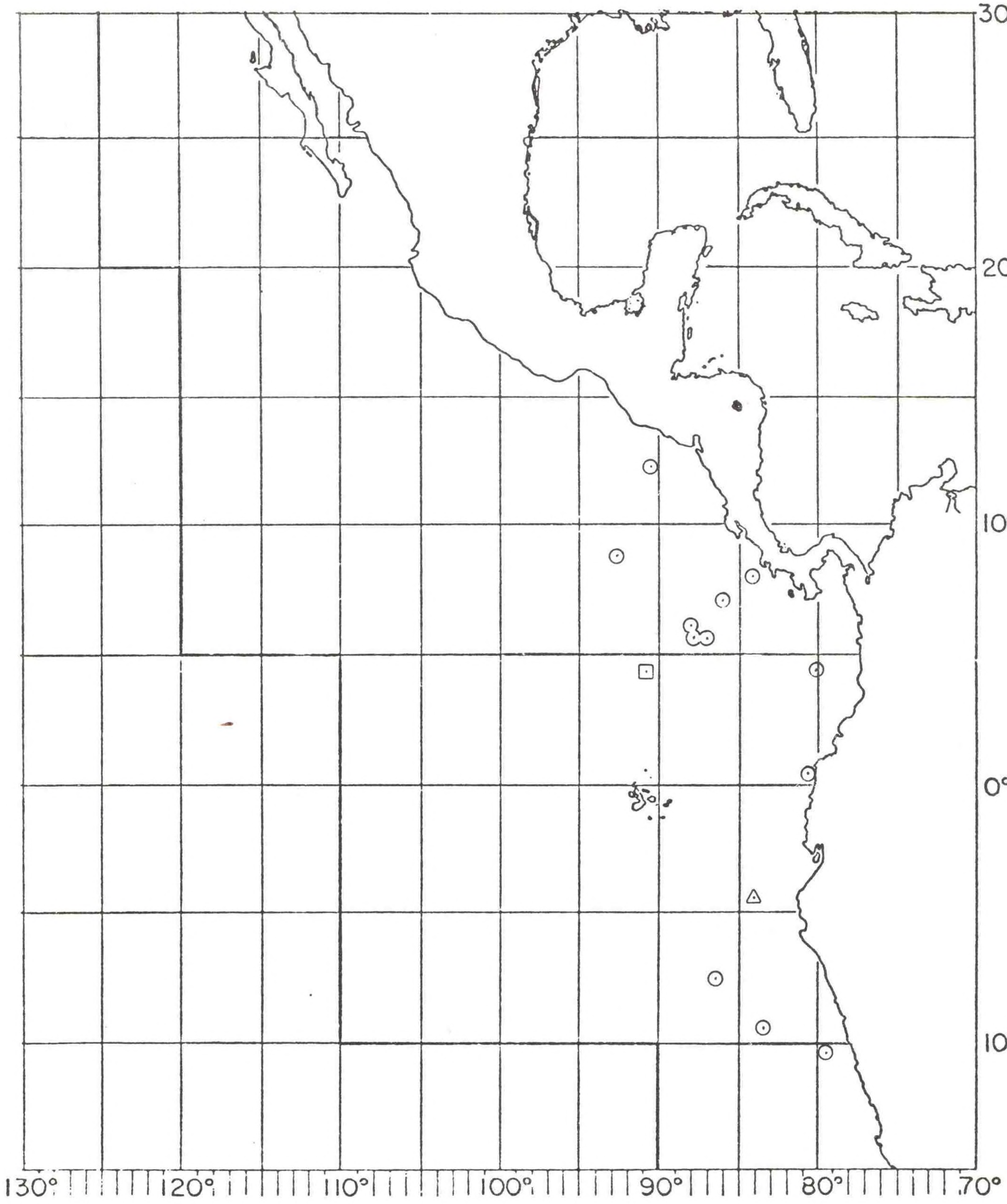



Figure 14 1979 Aerial Survey

⊙ Beaked whale ( Ziphiidae )

△ Unidentified Mesoplodont ( Mesoplodon Sp. )

⊡ Cuvier's beaked whale ( Ziphius cavirostris )

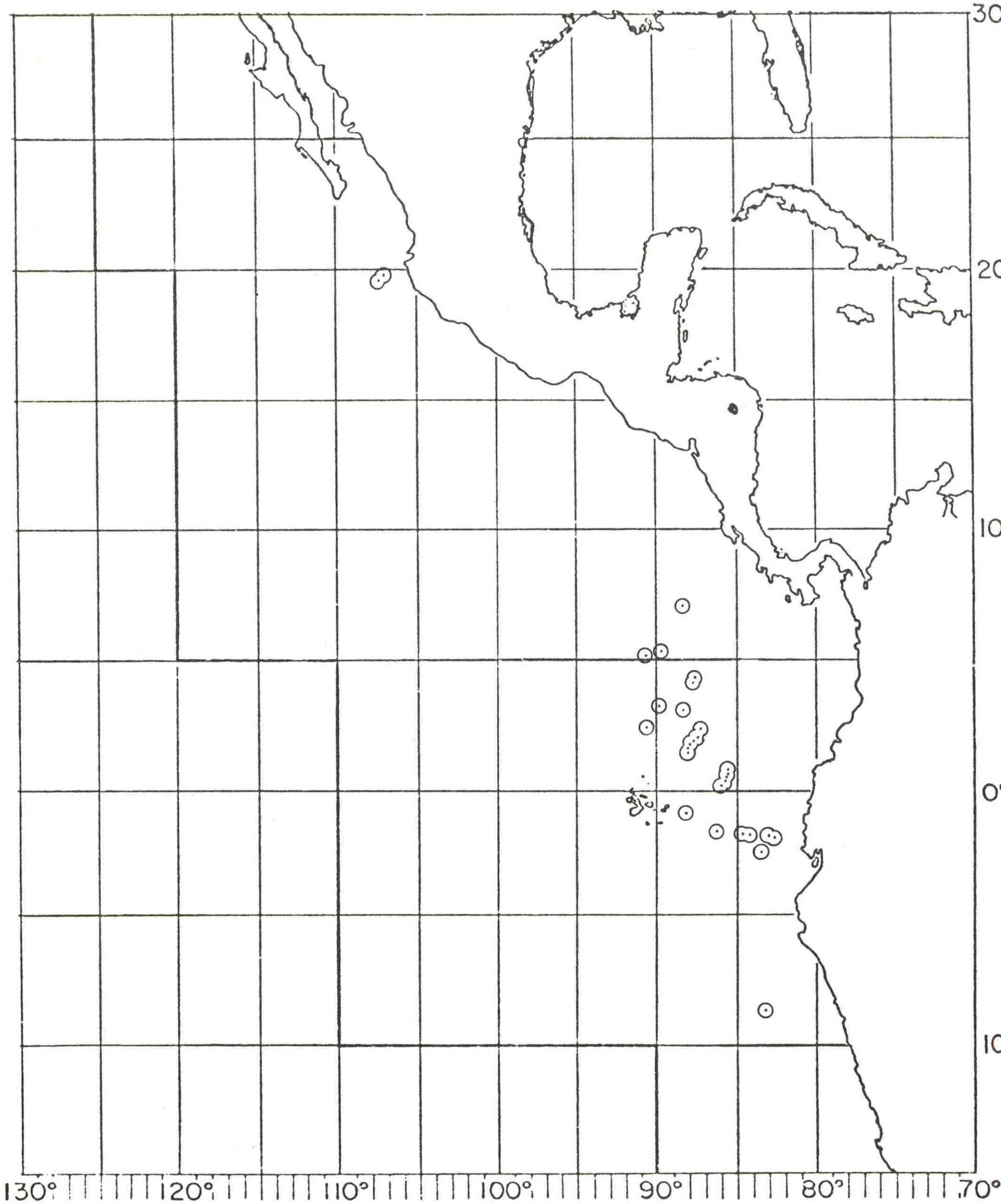



Figure 15. 1979 Aerial Survey ⊙ Sperm whale ( Physeter catodon )

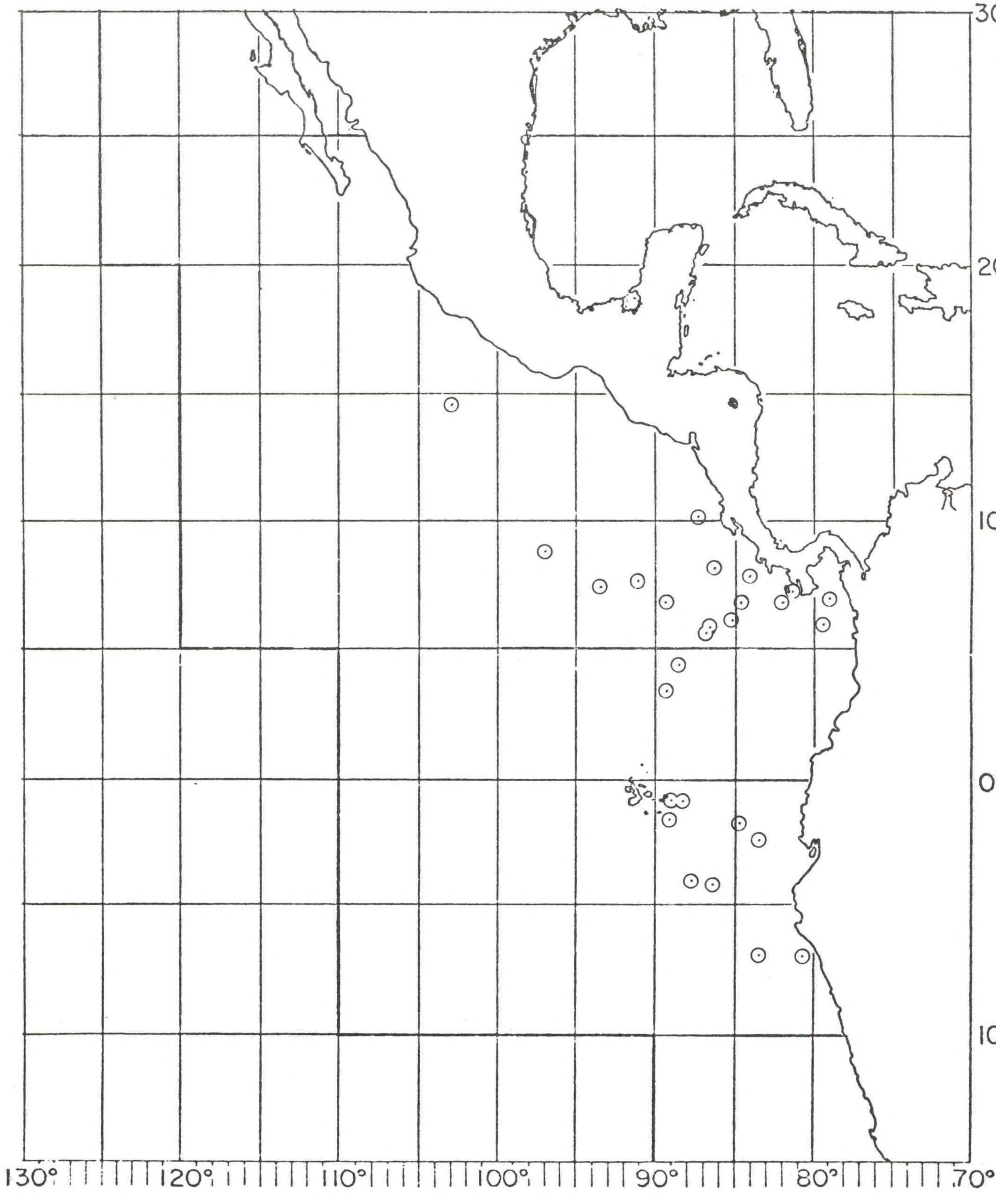



Figure 16. 1979 Aerial Survey ⊙ Unidentified Small Whales

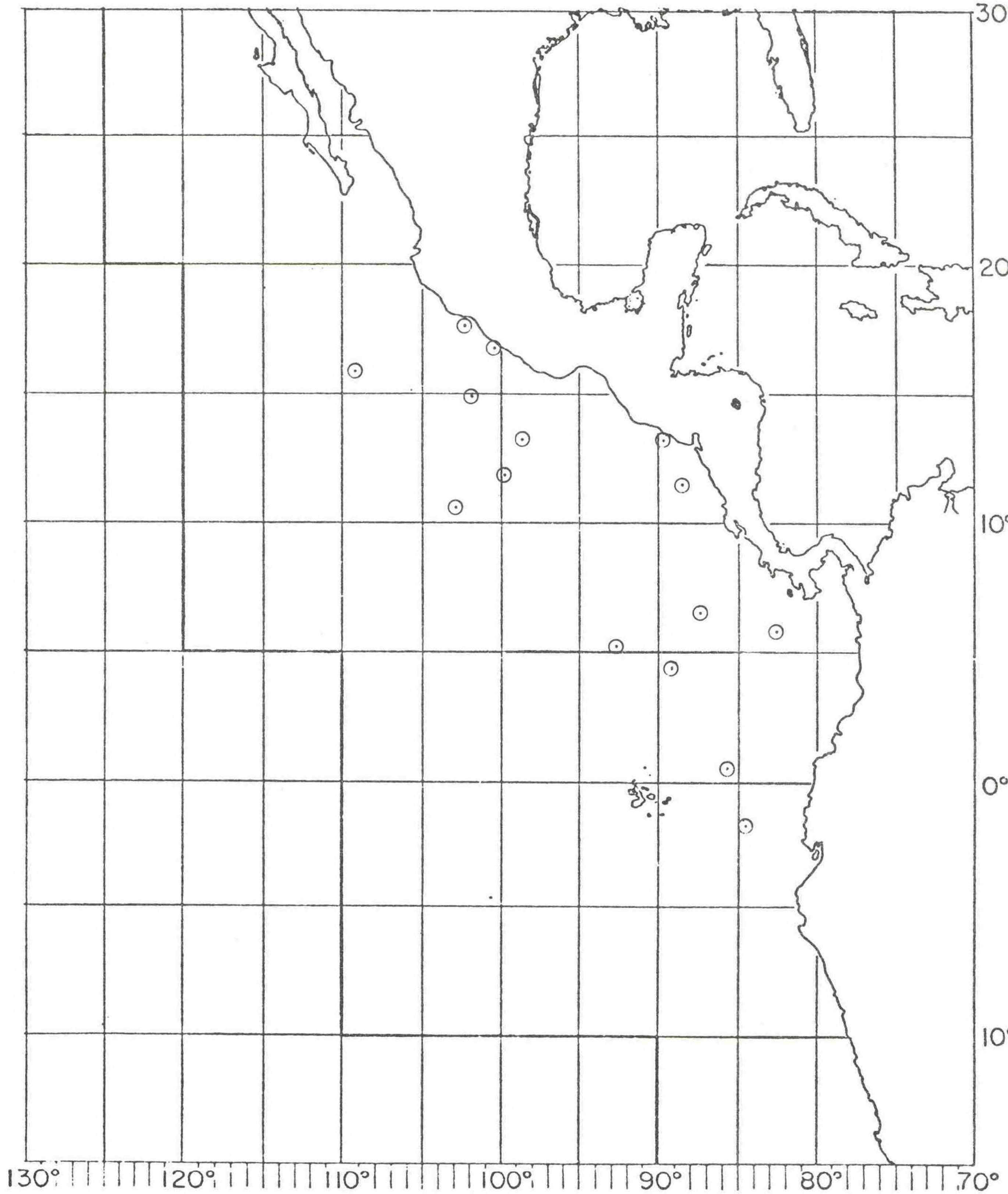



Figure 17    1979 Aerial Survey    ⊙ Unidentified Large Whales

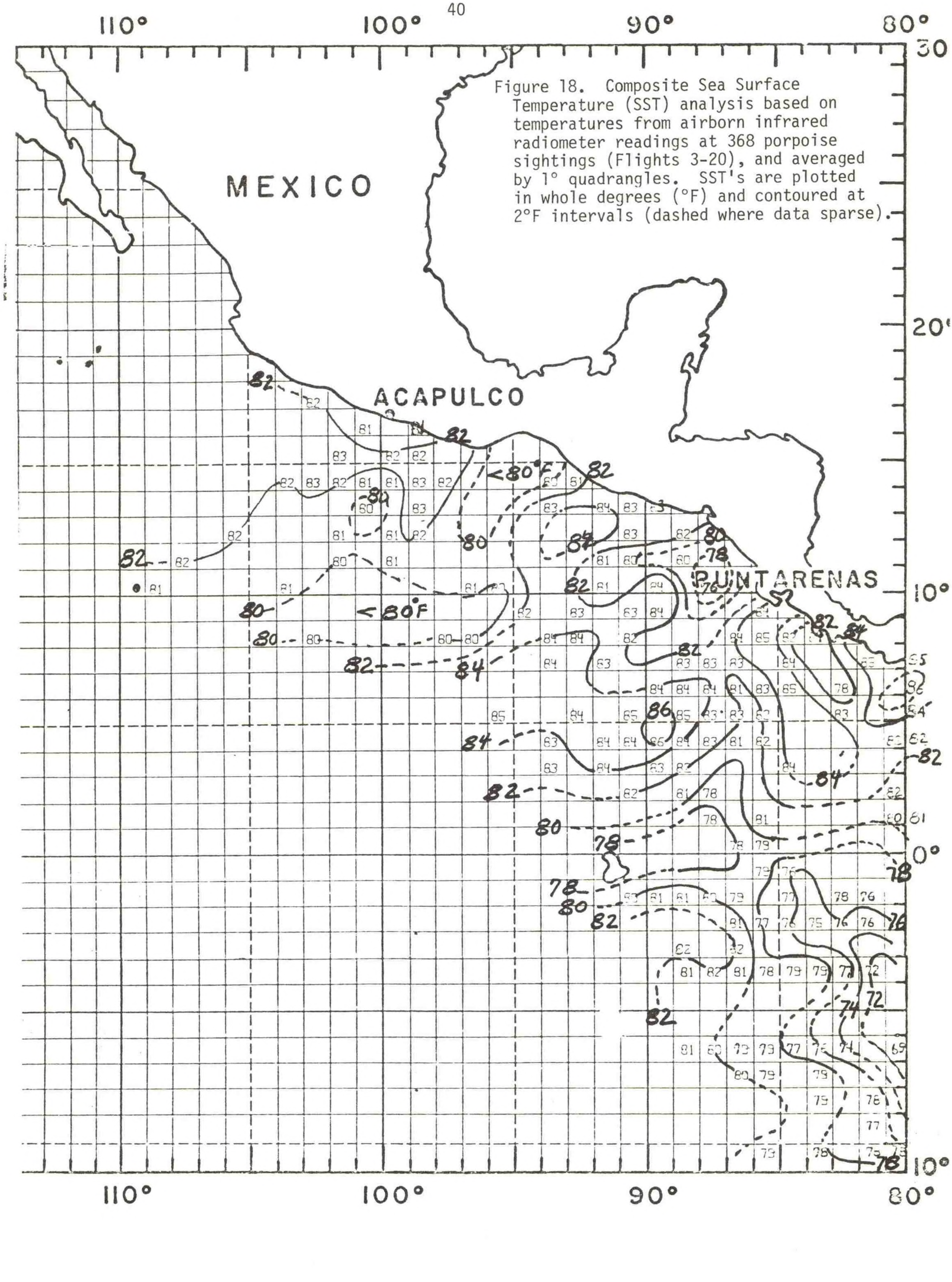



Figure 18. Composite Sea Surface Temperature (SST) analysis based on temperatures from airborn infrared radiometer readings at 368 porpoise sightings (Flights 3-20), and averaged by 1° quadrangles. SST's are plotted in whole degrees (°F) and contoured at 2°F intervals (dashed where data sparse).

Table 1. Approximate Distances (nautical miles) and Times (hours) Flown on 1979 Aerial Survey

( f indicates ferry flights, no searching)

| Flight No. | Date | Deadheading Distance | Deadheading Time | Off Track Time | Search Distance | Search Time | Ferry Distance | Ferry Time |
|---|---|---|---|---|---|---|---|---|
| | | | | Phase I | | | | |
| 1 | 1/22 | 626 | 5.43 | .40 | 194.9 | 2.07 | - | - |
| 1 f | 1/23 | - | - | - | - | - | 159 | 1.75 |
| 2 | 1/26 | 58 | 0.58 | .99 | 804.4 | 8.21 | - | - |
| | | | | Phase II | | | | |
| 2 f | 2/ 5 | - | - | - | - | - | 392 | 3.52 |
| 3 | 2/ 6 | 329 | 4.27 | 1.27 | 956.5 | 8.58 | - | - |
| 4 | 2/10 | 690 | 6.05 | .62 | 638.4 | 5.60 | - | - |
| 5 | 2/12 | 345 | 3.02 | .97 | 796.7 | 9.11 | - | - |
| 6 | 2/14 | 407 | 3.61 | .95 | 866.8 | 8.24 | - | - |
| 6 f | 2/15 | - | - | - | - | - | 444 | 3.47 |
| 7 | 2/17 | 308 | 2.76 | 1.22 | 939.9 | 8.17 | - | - |
| | | | | Phase III | | | | |
| 8 | 3/15 | 137 | 1.37 | 1.04 | 1136.2 | 9.69 | - | - |
| 9 | 3/18 | 738 | 6.05 | .58 | 522.8 | 4.30 | - | - |
| 10 | 3/20 | 226 | 1.94 | 1.26 | 1003.1 | 8.97 | - | - |
| 10 f | 3/21 | - | - | - | - | - | 373 | 2.90 |
| 11 | 3/23 | 650 | 5.53 | 1.50 | 572.5 | 5.30 | - | - |
| 12 | 3/27 | 914 | 7.88 | 1.89 | 629.7 | 5.27 | - | - |
| 12 f | 3/28 | - | - | - | - | - | 147 | 1.27 |
| 13 | 3/30 | 792 | 7.68 | 0.0 | 591.0 | 4.90 | - | - |
| 13 f | 3/31 | - | - | - | - | - | 373 | 3.57 |
| 14 | 4/ 4 | 298 | 2.96 | 1.12 | 783.0 | 8.01 | - | - |
| 15 | 4/ 6 | 243 | 2.35 | 1.45 | 979.7 | 8.02 | - | - |
| 16 | 4/ 8 | 522 | 4.45 | .88 | 740.8 | 6.22 | - | - |
| 16 f | 4/ 9 | - | - | - | - | - | 613 | 5.00 |
| 17 | 4/11 | 711 | 6.08 | 0.0 | 607.3 | 5.01 | - | - |
| 18 | 4/15 | 325 | 2.74 | .43 | 1025.4 | 8.39 | - | - |
| 18 f | 4/16 | - | - | - | - | - | 264 | 2.08 |
| 19 | 4/21 | 151 | 1.33 | .77 | 995.0 | 8.54 | - | - |
| 19 f | 4/22 | - | - | - | - | - | 444 | 3.83 |
| 20 | 4/23 | 545 | 4.70 | .82 | 606.1 | 4.93 | - | - |
| 20 f | 4/24 | - | - | - | - | - | 1390 | 11.48 |
| | 4/25 | - | - | - | - | - | 950 | 7.20 |
| Totals: | | 9,015 | 80.78 | 18.16 | 15,390 | 137.53 | 5549 | 46.07 |

Grand Total: 29,954 nm in 264.38 hours with 18.16 hours circling

Table 2. 1979 Aerial Survey: Sighting Summary

SIGHTING SUMMARY 05/17/79 14:43:51 PAGE 32

| SPECIES NAME (SCIENTIFIC NAME) | SPECIES CODE | SPECIES SIGHTINGS TOTAL | PURE | MIXED | ESTIMATED-AVERAGED-TOTAL-NUMBERS LOW / N | HIGH / N | BEST / N |
|---|---|---|---|---|---|---|---|
| OFFSHORE SPOTTED DOLPHIN (STENELLA ATTENUATA) | 2 | 9 | 8 | 1 | 370.09( 9) | 514.56( 9) | 414.40( 9) |
| COMMON DOLPHIN (DELPHINUS DELPHIS) | 5 | 32 | 27 | 5 | 193.90( 32) | 284.29( 30) | 235.90( 32) |
| COASTAL SPOTTED DOLPHIN (S.A. GRAFFMANI) | 6 | 5 | 5 | 0 | 132.20( 5) | 170.80( 5) | 149.20( 5) |
| EASTERN SPINNER DOLPHIN (STENELLA LONGIROSTRIS SUBSP.B | 10 | 6 | 5 | 1 | 540.68( 6) | 798.51( 6) | 648.65( 6) |
| STRIPED DOLPHIN (S. COERULEOALBA) | 13 | 6 | 6 | 0 | 73.83( 6) | 97.33( 6) | 87.17( 6) |
| ROUGH-TOOTHED DOLPHIN (STENO BREDANENSIS) | 15 | 1 | 1 | 0 | 43.00( 1) | 63.00( 1) | 54.00( 1) |
| BOTTLENOSED DOLPHINS (TURSIOPS TRUNCATUS) | 18 | 13 | 7 | 6 | 16.12( 13) | 19.69( 11) | 18.04( 13) |
| RISSO'S DOLPHIN (GRAMPUS GRISEUS) | 21 | 80 | 74 | 6 | 14.35( 79) | 14.43( 73) | 15.45( 80) |
| FRASER'S DOLPHIN (LAGENODELPHIS HOSEI) | 26 | 1 | 1 | 0 | 50.00( 1) | 73.00( 1) | 60.00( 1) |
| UNIDENTIFIED DOLPHIN OR PORPOISE | 77 | 146 | 135 | 11 | 34.12(138) | 40.49(120) | 32.79(132) |
| TOTALS | | 299 | 269 | 30 | | | |

Table 2. ( Continued )

SIGHTING SUMMARY 05/17/79 14:43:51 PAGE 33

| SPECIES NAME (SCIENTIFIC NAME) | SPECIES CODE | SPECIES SIGHTINGS TOTAL | PURE | MIXED | ESTIMATED-AVERAGED-TOTAL-NUMBERS LOW / N | HIGH / N | BEST / N |
|---|---|---|---|---|---|---|---|
| FALSE KILLER WHALE (PSEUDORCA CRASSIDENS) | 33 | 1 | 1 | 0 | 7.00( 1) | 8.00( 1) | 7.00( 1) |
| PILOT WHALE (GLOBICEPHALA SP.) | 34 | 8 | 6 | 2 | 10.75( 8) | 12.95( 7) | 11.52( 8) |
| KILLER WHALE (ORCINAS ORCA) | 37 | 1 | 1 | 0 | 16.00( 1) | 16.00( 1) | 16.00( 1) |
| SPERM WHALE (PHYSETER CATODON) | 46 | 29 | 28 | 1 | 11.49( 27) | 12.86( 27) | 11.18( 29) |
| DWARF SPERM WHALE (KOGIA SIMUS) | 48 | 1 | 1 | 0 | 1.00( 1) | 1.00( 1) | 1.00( 1) |
| BEAKED WHALE (ZIPHIID) | 49 | 12 | 12 | 0 | 2.08( 12) | 2.08( 12) | 2.08( 12) |
| UNID. MESOPLODONT (MESOPLODON SP.) | 51 | 1 | 1 | 0 | 2.00( 1) | 2.00( 1) | 2.00( 1) |
| CUVIER'S BEAKED WHALE (ZIPHIUS CAVIROSTRIS) | 61 | 1 | 1 | 0 | 3.00( 1) | 3.00( 1) | 3.00( 1) |
| RORQUAL (BALAENOPTERA SP.) | 70 | 8 | 8 | 0 | 1.43( 7) | 1.43( 7) | 1.38( 8) |
| BRYDE'S WHALE (B. EDENI) | 72 | 1 | 1 | 0 | 1.00( 1) | 1.00( 1) | 1.00( 1) |
| UNIDENTIFIED SMALL WHALE | 78 | 27 | 24 | 3 | 14.49( 27) | 20.18( 21) | 16.81( 26) |
| UNIDENTIFIED LARGE WHALE | 79 | 15 | 15 | 0 | 1.27( 15) | 1.27( 15) | 1.27( 15) |
| TOTALS | | 105 | 99 | 6 | | | |
| GRAND TOTALS | | 404 | 358 | 36 | | | |

Table 3. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 1

SPECIES: OFFSHORE SPOTTED DOLPHIN (STENELLA ATTENUATA) SPECIES CODE: 2

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 10 | 2 | 1 | 790126 | 20 26 N | 105 44 W | 258. |
| 27 | 3 | 2 | 790206 | 14 41 N | 102 50 W | 731. |
| 34 | 4 | 2 | 790210 | 15 17 N | 101 38 W | 437. |
| 132 | 9 | 3 | 790318 | 5 4 N | 90 36 W | 295. |
| 205 | 12 | 3 | 790327 | 10 21 N | 89 26 W | 228. |
| 215 | 12 | 3 | 790327 | 5 6 N | 92 48 W | 341. |
| 216 | 12 | 3 | 790327 | 4 6 N | 93 27 W | 45. |
| 228 | 14 | 3 | 790404 | 1 23 N | 85 23 W | 172. |
| 367 | 19 | 3 | 790421 | 7 48 S | 83 38 W | 1223. |

Table 4. 1979 Aerial Survey: Sighting by Species

S'GHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 4

SPECIES: COASTAL SPOTTED DOLPHIN (S.A. GRAFFMANI) SPECIES CODE: 6

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 4 | 1 | 1 | 790122 | 28 24 N | 112 48 W | 143. |
| 78 | 7 | 2 | 790217 | 14 52 N | 92 55 W | 121. |
| 197 | 12 | 3 | 790327 | 12 23 N | 88 2 W | 65. |
| 198 | 12 | 3 | 790327 | 12 18 N | 88 6 W | 143. |
| 371 | 20 | 3 | 790423 | 1 6 N | 79 58 W | 274. |

Table 5. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES  05/17/79 14:43:51 PAGE 5

SPECIES: EASTERN SPINNER DOLPHIN (STENELLA LONGIROSTRIS SUBSP.B  SPECIES CODE: 10

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 23 | 3 | 2 | 790206 | 12 45 N | 105 39 W | 469. |
| 47 | 5 | 2 | 790212 | 14 39 N | 99 50 W | 110. |
| 56 | 6 | 2 | 790214 | 11 8 N | 101 34 W | 160. |
| 81 | 7 | 2 | 790217 | 14 22 N | 93 17 W | 1240. |
| 82 | 7 | 2 | 790217 | 14 18 N | 93 21 W | 1750. |
| 137 | 10 | 3 | 790320 | 8 27 N | 83 51 W | 163. |

Table 6. 1979 Aerial Survey: Sighting by Species



SPECIES: STRIPED DOLPHIN (S. COERULEOALBA) SPECIES CODE: 13

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 126 | 9 | 3 | 790318 | 5 27 N | 90 23 W | 71. |
| 151 | 10 | 3 | 790320 | 4 46 N | 85 59 W | 12. |
| 178 | 11 | 3 | 790323 | 11 37 N | 90 49 W | 104. |
| 227 | 14 | 3 | 790404 | 3 26 N | 84 14 W | 26. |
| 267 | 15 | 3 | 790406 | 4 20 S | 84 58 W | 138. |
| 272 | 15 | 3 | 790406 | 4 2 S | 88 14 W | 172. |

Table 7. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 2

SPECIES: COMMON DOLPHIN (DELPHINUS DELPHIS) SPECIES CODE: 5

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | | | LONGITUDE DEG MIN | | | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1 | 1 | 790122 | 27 | 9 | N | 112 | 7 | W | 278. |
| 9 | 1 | 1 | 790122 | 27 | 9 | N | 112 | 6 | W | 251. |
| 11 | 2 | 1 | 790126 | 20 | 6 | N | 106 | 2 | W | 22. |
| 90 | 7 | 2 | 790217 | 10 | 58 | N | 95 | 6 | W | 159. |
| 119 | 8 | 3 | 790315 | 9 | 15 | N | 85 | 10 | W | 627. |
| 141 | 10 | 3 | 790320 | 8 | 10 | N | 84 | 0 | W | 165. |
| 142 | 10 | 3 | 790320 | 8 | 8 | N | 83 | 59 | W | 124. |
| 146 | 10 | 3 | 790320 | 7 | 46 | N | 84 | 13 | W | 204. |
| 152 | 10 | 3 | 790320 | 4 | 40 | N | 86 | 3 | W | 250. |
| 176 | 11 | 3 | 790323 | 12 | 7 | N | 90 | 29 | W | 101. |
| 181 | 11 | 3 | 790323 | 11 | 14 | N | 91 | 2 | W | 175. |
| 182 | 11 | 3 | 790323 | 10 | 58 | N | 91 | 11 | W | 256. |
| 184 | 11 | 3 | 790323 | 10 | 31 | N | 91 | 29 | W | 50. |
| 186 | 11 | 3 | 790323 | 10 | 18 | N | 91 | 38 | W | 73. |
| 187 | 11 | 3 | 790323 | 10 | 15 | N | 91 | 40 | W | 135. |
| 188 | 11 | 3 | 790323 | 10 | 2 | N | 91 | 50 | W | 55. |
| 189 | 11 | 3 | 790323 | 9 | 40 | N | 92 | 3 | W | 37. |
| 190 | 11 | 3 | 790323 | 9 | 19 | N | 92 | 18 | W | 31. |
| 199 | 12 | 3 | 790327 | 12 | 13 | N | 88 | 9 | W | 92. |
| 202 | 12 | 3 | 790327 | 10 | 55 | N | 89 | 2 | W | 108. |
| 203 | 12 | 3 | 790327 | 10 | 47 | N | 89 | 8 | W | 108. |
| 239 | 14 | 3 | 790404 | 0 | 2 | S | 85 | 54 | W | 203. |
| 242 | 14 | 3 | 790404 | 0 | 24 | S | 84 | 49 | W | 848. |
| 249 | 14 | 3 | 790404 | 1 | 22 | S | 82 | 2 | W | 155. |
| 250 | 14 | 3 | 790404 | 1 | 29 | S | 81 | 45 | W | 325. |
| 251 | 14 | 3 | 790404 | 1 | 35 | S | 81 | 32 | W | 58. |
| 279 | 15 | 3 | 790406 | 2 | 48 | S | 85 | 8 | W | 374. |
| 280 | 15 | 3 | 790406 | 2 | 47 | S | 85 | 2 | W | 583. |

Table 7. ( Continued )

SIGHTINGS BY ᶜ ECIES — 05/17/79 14:43:51 PAGE 3

SPECIES: COMMON DOLPHIN (DELPHINUS DELPHIS) — SPECIES CODE: 5

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 283 | 15 | 3 | 790406 | 2 44 S | 84 41 W | 508. |
| 315 | 16 | 3 | 790408 | 1 38 S | 90 5 W | 706. |
| 373 | 20 | 3 | 790423 | 1 19 N | 79 55 W | 282. |
| 383 | 20 | 3 | 790423 | 7 0 N | 79 18 W | 106. |

Table 8. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 9

SPECIES: RISSO'S DOLPHIN (GRAMPUS GRISEUS) SPECIES CODE: 21

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 17 | 2 | 1 | 790126 | 15 36 N | 109 52 W | 34. |
| 42 | 5 | 2 | 790212 | 15 50 N | 98 54 W | 5. |
| 43 | 5 | 2 | 790212 | 15 46 N | 98 56 W | 11. |
| 44 | 5 | 2 | 790212 | 15 45 N | 98 58 W | 24. |
| 45 | 5 | 2 | 790212 | 15 42 N | 99 0 W | 9. |
| 46 | 5 | 2 | 790212 | 15 38 N | 99 3 W | 25. |
| 52 | 5 | 2 | 790212 | 13 27 N | 100 47 W | 38. |
| 54 | 6 | 2 | 790214 | 12 52 N | 101 5 W | 6. |
| 59 | 6 | 2 | 790214 | 12 4 N | 99 43 W | 7. |
| 60 | 6 | 2 | 790214 | 12 17 N | 99 29 W | 1. |
| 61 | 6 | 2 | 790214 | 12 18 N | 99 28 W | 3. |
| 62 | 6 | 2 | 790214 | 12 41 N | 99 3 W | 1. |
| 65 | 6 | 2 | 790214 | 13 9 N | 98 41 W | 5. |
| 66 | 6 | 2 | 790214 | 13 12 N | 98 39 W | 8. |
| 92 | 8 | 3 | 790315 | 7 48 N | 86 37 W | 29. |
| 112 | 8 | 3 | 790315 | 8 19 N | 86 33 W | 4. |
| 113 | 8 | 3 | 790315 | 8 22 N | 86 28 W | 16. |
| 114 | 8 | 3 | 790315 | 8 24 N | 86 26 W | 15. |
| 115 | 8 | 3 | 790315 | 8 52 N | 85 42 W | 4. |
| 116 | 8 | 3 | 790315 | 9 9 N | 85 23 W | 1. |
| 118 | 8 | 3 | 790315 | 9 15 N | 85 10 W | 5. |
| 122 | 9 | 3 | 790318 | 7 35 N | 88 56 W | 13. |
| 139 | 10 | 3 | 790320 | 8 17 N | 83 56 W | 6. |
| 144 | 10 | 3 | 790320 | 8 1 N | 84 6 W | 34. |
| 164 | 10 | 3 | 790320 | 4 57 N | 87 22 W | 4. |
| 169 | 10 | 3 | 790320 | 6 53 N | 86 13 W | 10. |
| 170 | 10 | 3 | 790320 | 6 55 N | 86 11 W | 8. |
| 172 | 10 | 3 | 790320 | 7 13 N | 86 0 W | 76. |

Table 8. ( Continued )

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 10

SPECIES: RISSO'S DOLPHIN (GRAMPUS GRISEUS) SPECIES CODE: 21

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 177 | 11 | 3 | 790323 | 12 0 N | 90 34 W | 25. |
| 182 | 11 | 3 | 790323 | 10 58 N | 91 11 W | 13. |
| 183 | 11 | 3 | 790323 | 10 44 N | 91 18 W | 6. |
| 207 | 12 | 3 | 790327 | 9 35 N | 89 55 W | 1. |
| 209 | 12 | 3 | 790327 | 9 34 N | 89 56 W | 46. |
| 217 | 12 | 3 | 790327 | 4 8 N | 93 26 W | 10. |
| 220 | 13 | 3 | 790330 | 13 21 N | 91 34 W | 12. |
| 222 | 13 | 3 | 790330 | 9 35 N | 94 10 W | 7. |
| 223 | 13 | 3 | 790330 | 9 19 N | 94 24 W | 4. |
| 224 | 13 | 3 | 790330 | 9 9 N | 94 34 W | 17. |
| 229 | 14 | 3 | 790404 | 1 13 N | 85 28 W | 10. |
| 230 | 14 | 3 | 790404 | 1 10 N | 85 30 W | 6. |
| 240 | 14 | 3 | 790404 | 0 2 S | 85 52 W | 4. |
| 243 | 14 | 3 | 790404 | 0 24 S | 84 49 W | 3. |
| 244 | 14 | 3 | 790404 | 0 28 S | 84 40 W | 3. |
| 253 | 15 | 3 | 790406 | 4 39 S | 81 40 W | 160. |
| 254 | 15 | 3 | 790406 | 4 38 S | 81 49 W | 129. |
| 256 | 15 | 3 | 790406 | 4 32 S | 82 49 W | 26. |
| 257 | 15 | 3 | 790406 | 4 32 S | 82 54 W | 9. |
| 259 | 15 | 3 | 790406 | 4 30 S | 83 12 W | 6. |
| 260 | 15 | 3 | 790406 | 4 29 S | 83 27 W | 11. |
| 262 | 15 | 3 | 790406 | 4 27 S | 83 43 W | 7. |
| 263 | 15 | 3 | 790406 | 4 26 S | 83 54 W | 19. |
| 264 | 15 | 3 | 790406 | 4 25 S | 84 3 W | 17. |
| 276 | 15 | 3 | 790406 | 2 57 S | 86 29 W | 1. |
| 277 | 15 | 3 | 790406 | 2 57 S | 86 22 W | 12. |
| 278 | 15 | 3 | 790406 | 2 51 S | 85 38 W | 14. |
| 280 | 15 | 3 | 790406 | 2 47 S | 85 2 W | 7. |

Table 8. ( Continued )

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 11

SPECIES: RISSO'S DOLPHIN (GRAMPUS GRISEUS) SPECIES CODE: 21

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 281 | 15 | 3 | 790406 | 2 47 S | 85 0 W | 13. |
| 282 | 15 | 3 | 790406 | 2 46 S | 84 54 W | 13. |
| 297 | 16 | 3 | 790408 | 2 12 S | 81 14 W | 19. |
| 313 | 16 | 3 | 790408 | 1 42 S | 89 1 W | 15. |
| 324 | 17 | 3 | 790411 | 11 25 S | 80 19 W | 7. |
| 325 | 17 | 3 | 790411 | 11 26 S | 80 43 W | 10. |
| 326 | 17 | 3 | 790411 | 11 28 S | 81 35 W | 8. |
| 327 | 17 | 3 | 790411 | 11 28 S | 83 0 W | 6. |
| 331 | 18 | 3 | 790415 | 8 36 S | 83 42 W | 9. |
| 332 | 18 | 3 | 790415 | 8 26 S | 85 25 W | 1. |
| 336 | 18 | 3 | 790415 | 9 54 S | 81 44 W | 16. |
| 337 | 18 | 3 | 790415 | 9 55 S | 81 38 W | 13. |
| 338 | 18 | 3 | 790415 | 10 0 S | 81 25 W | 19. |
| 348 | 19 | 3 | 790421 | 7 0 S | 82 52 W | 12. |
| 354 | 19 | 3 | 790421 | 7 0 S | 84 18 W | 4. |
| 356 | 19 | 3 | 790421 | 6 59 S | 84 56 W | 11. |
| 358 | 19 | 3 | 790421 | 7 0 S | 86 35 W | 5. |
| 359 | 19 | 3 | 790421 | 6 59 S | 87 19 W | 11. |
| 360 | 19 | 3 | 790421 | 7 20 S | 88 21 W | 2. |
| 361 | 19 | 3 | 790421 | 7 35 S | 86 57 W | 15. |
| 363 | 19 | 3 | 790421 | 7 44 S | 84 43 W | 22. |
| 364 | 19 | 3 | 790421 | 7 44 S | 84 29 W | 2. |
| 372 | 20 | 3 | 790423 | 1 15 N | 79 56 W | 14. |
| 376 | 20 | 3 | 790421 | 2 54 N | 80 35 W | 1. |

Table 9. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 8

SPECIES: BOTTLENOSED DOLPHINS (TURSIOPS TRUNCATUS) SPECIES CODE: 18

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 25 | 3 | 2 | 790206 | 14 21 N | 103 18 W | 22. |
| 31 | 4 | 2 | 790210 | 15 42 N | 101 19 W | 34. |
| 33 | 4 | 2 | 790210 | 15 34 N | 101 26 W | 19. |
| 37 | 5 | 2 | 790212 | 16 12 N | 98 36 W | 8. |
| 40 | 5 | 2 | 790212 | 16 5 N | 98 1 W | 12. |
| 68 | 6 | 2 | 790214 | 13 46 N | 98 13 W | 2. |
| 79 | 7 | 2 | 790217 | 14 54 N | 93 0 W | 2. |
| 94 | 8 | 3 | 790315 | 6 31 N | 87 24 W | 6. |
| 104 | 8 | 3 | 790315 | 5 27 N | 88 33 W | 15. |
| 143 | 10 | 3 | 790320 | 8 8 N | 84 1 W | 71. |
| 166 | 10 | 3 | 790320 | 5 38 N | 86 58 W | 27. |
| 199 | 12 | 3 | 790327 | 12 13 N | 88 9 W | 1. |
| 372 | 20 | 3 | 790423 | 1 15 N | 79 56 W | 16. |

Table 10. 1979 Aerial Survey: Sighting by Species



SPECIES: ROUGH-TOOTHED DOLPHIN (STENO BREDANENSIS) SPECIES CODE: 15

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 48 | 5 | 2 | 790212 | 14 30 N | 99 57 W | 54. |

Table 11. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 12

SPECIES: FRASER'S DOLPHIN (LAGENODELPHIS HOSEI) SPECIES CODE: 26

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 237 | 14 | 3 | 790404 | 0 13 N | 85 54 W | 60. |

Table 12. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 24

SPECIES: UNIDENTIFIED DOLPHIN OR PORPOISE SPECIES CODE: 77

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 2 | 1 | 1 | 790122 | 28 50 N | 113 4 W | 28. |
| 3 | 1 | 1 | 790122 | 28 27 N | 112 52 W | 3. |
| 5 | 1 | 1 | 790122 | 28 25 N | 112 47 W | 3. |
| 6 | 1 | 1 | 790122 | 27 19 N | 112 1 W | 4. |
| 7 | 1 | 1 | 790122 | 27 12 N | 112 5 W | 11. |
| 12 | 2 | 1 | 790126 | 19 51 N | 106 17 W | 250. |
| 13 | 2 | 1 | 790126 | 18 50 N | 107 8 W | 4. |
| 19 | 2 | 1 | 790126 | 18 4 N | 107 26 W | 100. |
| 21 | 3 | 2 | 790206 | 10 51 N | 108 16 W | 5. |
| 22 | 3 | 2 | 790206 | 11 14 N | 107 48 W | 4. |
| 24 | 3 | 2 | 790206 | 12 52 N | 105 23 W | 5. |
| 27 | 3 | 2 | 790206 | 14 41 N | 102 50 W | 7. |
| 28 | 4 | 2 | 790210 | 16 51 N | 100 17 W | 13. |
| 30 | 4 | 2 | 790210 | 15 45 N | 101 16 W | 24. |
| 36 | 5 | 2 | 790212 | 16 14 N | 98 33 W | 0.* |
| 38 | 5 | 2 | 790212 | 16 7 N | 98 39 W | 15. |
| 39 | 5 | 2 | 790212 | 16 7 N | 98 40 W | 23. |
| 41 | 5 | 2 | 790212 | 15 55 N | 98 50 W | 5. |
| 47 | 5 | 2 | 790212 | 14 39 N | 99 50 W | 1. |
| 49 | 5 | 2 | 790212 | 14 11 N | 100 12 W | 4. |
| 55 | 6 | 2 | 790214 | 12 52 N | 101 5 W | 25. |
| 57 | 6 | 2 | 790214 | 8 41 N | 102 23 W | 103. |
| 60 | 6 | 2 | 790214 | 12 17 N | 99 29 W | 3. |
| 63 | 6 | 2 | 790214 | 12 53 N | 98 54 W | 2. |
| 67 | 6 | 2 | 790214 | 13 17 N | 98 36 W | 20. |
| 68 | 6 | 2 | 790214 | 13 46 N | 98 13 W | 7. |
| 69 | 6 | 2 | 790214 | 13 56 N | 98 4 W | 9. |
| 70 | 6 | 2 | 790214 | 14 2 N | 98 10 W | 8. |

Table 12. ( Continued )

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 25

SPECIES: UNIDENTIFIED DOLPHIN OR PORPOISE SPECIES CODE: 77

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 71 | 6 | 2 | 790214 | 14 32 N | 97 38 W | 1. |
| 72 | 6 | 2 | 790214 | 14 35 N | 97 35 W | 9. |
| 73 | 6 | 2 | 790214 | 14 44 N | 97 27 W | 6. |
| 74 | 6 | 2 | 790214 | 14 45 N | 97 27 W | 5. |
| 75 | 6 | 2 | 790214 | 14 48 N | 97 25 W | 52. |
| 76 | 6 | 2 | 790214 | 14 50 N | 97 24 W | 0.* |
| 77 | 7 | 2 | 790217 | 14 54 N | 92 54 W | 11. |
| 79 | 7 | 2 | 790217 | 14 54 N | 93 0 W | 16. |
| 80 | 7 | 2 | 790217 | 14 40 N | 93 4 W | 5. |
| 83 | 7 | 2 | 790217 | 13 55 N | 93 37 W | 4. |
| 84 | 7 | 2 | 790217 | 10 23 N | 96 10 W | 3. |
| 86 | 7 | 2 | 790217 | 8 27 N | 96 52 W | 1. |
| 87 | 7 | 2 | 790217 | 8 34 N | 96 48 W | 1. |
| 88 | 7 | 2 | 790217 | 10 24 N | 95 30 W | 150. |
| 89 | 7 | 2 | 790217 | 10 32 N | 95 24 W | 2. |
| 93 | 8 | 3 | 790315 | 7 36 N | 86 43 W | 8. |
| 97 | 8 | 3 | 790315 | 4 58 N | 88 21 W | 8. |
| 100 | 8 | 3 | 790315 | 3 1 N | 89 29 W | 1. |
| 105 | 8 | 3 | 790315 | 6 4 N | 88 10 W | 0.* |
| 107 | 8 | 3 | 790315 | 6 7 N | 88 7 W | 23. |
| 107 | 8 | 3 | 790315 | 6 7 N | 88 7 W | 23. |
| 108 | 8 | 3 | 790315 | 6 7 N | 88 7 W | 12. |
| 109 | 8 | 3 | 790315 | 6 15 N | 88 4 W | 0.* |
| 111 | 8 | 3 | 790315 | 7 44 N | 87 7 W | 11. |
| 117 | 8 | 3 | 790315 | 9 11 N | 85 16 W | 65. |
| 121 | 9 | 3 | 790318 | 10 7 N | 87 19 W | 12. |
| 125 | 9 | 3 | 790318 | 6 2 N | 89 59 W | 8. |
| 127 | 9 | 3 | 790318 | 5 25 N | 90 22 W | 1. |

Table 12. ( Continued )

SIGHTINGS BY SPECIES    05/17/79 14:43:51 PAGE 26

SPECIES: UNIDENTIFIED DOLPHIN OR PORPOISE    SPECIES CODE: 77

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 128 | 9 | 3 | 790318 | 5 19 N | 90 25 W | 1. |
| 129 | 9 | 3 | 790318 | 5 12 N | 90 29 W | 1. |
| 130 | 9 | 3 | 790318 | 5 7 N | 90 34 W | 1. |
| 133 | 9 | 3 | 790318 | 4 37 N | 90 50 W | 2. |
| 135 | 9 | 3 | 790318 | 3 51 N | 91 18 W | 8. |
| 136 | 10 | 3 | 790320 | 8 32 N | 83 48 W | 14. |
| 140 | 10 | 3 | 790320 | 8 13 N | 83 59 W | 1. |
| 144 | 10 | 3 | 790320 | 8 1 N | 84 6 W | 19. |
| 149 | 10 | 3 | 790320 | 5 51 N | 85 23 W | 10. |
| 150 | 10 | 3 | 790320 | 4 49 N | 85 58 W | 30. |
| 153 | 10 | 3 | 790320 | 2 38 N | 87 14 W | 48. |
| 160 | 10 | 3 | 790320 | 2 32 N | 88 42 W | 4. |
| 168 | 10 | 3 | 790320 | 6 28 N | 86 28 W | 11. |
| 174 | 11 | 3 | 790323 | 12 58 N | 89 58 W | 9. |
| 179 | 11 | 3 | 790323 | 11 34 N | 90 50 W | 3. |
| 180 | 11 | 3 | 790323 | 11 13 N | 91 2 W | 15. |
| 185 | 11 | 3 | 790323 | 10 31 N | 91 32 W | 0.* |
| 191 | 11 | 3 | 790323 | 6 45 N | 92 39 W | 2. |
| 193 | 11 | 3 | 790323 | 8 9 N | 93 4 W | 8. |
| 195 | 11 | 3 | 790323 | 5 45 N | 95 26 W | 0.* |
| 196 | 12 | 3 | 790327 | 12 28 N | 87 58 W | 6. |
| 200 | 12 | 3 | 790327 | 12 4 N | 88 15 W | 1. |
| 204 | 12 | 3 | 790327 | 10 29 N | 89 21 W | 5. |
| 206 | 12 | 3 | 790327 | 9 54 N | 89 44 W | 180. |
| 208 | 12 | 3 | 790327 | 9 34 N | 89 56 W | 0.* |
| 210 | 12 | 3 | 790327 | 9 20 N | 90 6 W | 25. |
| 218 | 12 | 3 | 790327 | 3 32 N | 93 49 W | 10. |
| 219 | 13 | 3 | 790330 | 13 42 N | 91 25 W | 4. |

Table 12. ( Continued )

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 27

SPECIES: UNIDENTIFIED DOLPHIN OR PORPOISE SPECIES CODE: 77

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 220 | 13 | 3 | 790330 | 13 21 N | 91 34 W | 3. |
| 238 | 14 | 3 | 790404 | 0 3 N | 85 59 W | 20. |
| 246 | 14 | 3 | 790404 | 1 15 S | 82 24 W | 4. |
| 247 | 14 | 3 | 790404 | 1 16 S | 82 21 W | 25. |
| 252 | 14 | 3 | 790404 | 1 41 S | 81 12 W | 0.* |
| 258 | 15 | 3 | 790406 | 4 30 S | 83 10 W | 1. |
| 261 | 15 | 3 | 790406 | 4 29 S | 83 32 W | 35. |
| 266 | 15 | 3 | 790406 | 4 22 S | 84 33 W | 7. |
| 268 | 15 | 3 | 790406 | 4 12 S | 86 26 W | 3. |
| 269 | 15 | 3 | 790406 | 4 11 S | 86 36 W | 2. |
| 270 | 15 | 3 | 790406 | 4 11 S | 86 42 W | 13. |
| 273 | 15 | 3 | 790406 | 4 2 S | 88 17 W | 70. |
| 274 | 15 | 3 | 790406 | 3 12 S | 88 35 W | 40. |
| 275 | 15 | 3 | 790406 | 3 1 S | 86 52 W | 77. |
| 285 | 15 | 3 | 790406 | 2 40 S | 84 0 W | 7. |
| 286 | 15 | 3 | 790406 | 2 37 S | 83 41 W | 575. |
| 287 | 15 | 3 | 790406 | 2 36 S | 83 18 W | 511. |
| 290 | 15 | 3 | 790406 | 2 26 S | 82 8 W | 525. |
| 291 | 15 | 3 | 790406 | 2 25 S | 82 4 W | 0.* |
| 292 | 15 | 3 | 790406 | 2 24 S | 82 53 W | 0.* |
| 293 | 15 | 3 | 790406 | 2 23 S | 81 42 W | 246. |
| 294 | 15 | 3 | 790406 | 2 23 S | 81 24 W | 0.* |
| 295 | 15 | 3 | 790406 | 2 23 S | 81 24 W | 0.* |
| 296 | 15 | 3 | 790406 | 2 22 S | 81 15 W | 0.* |
| 298 | 16 | 3 | 790408 | 2 11 S | 81 36 W | 39. |
| 299 | 16 | 3 | 790408 | 2 6 S | 82 41 W | 0.* |
| 301 | 16 | 3 | 790408 | 2 5 S | 82 54 W | 4. |
| 302 | 16 | 3 | 790408 | 2 1 S | 83 38 W | 6. |

Table 12. ( Continued )

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 28

SPECIES: UNIDENTIFIED DOLPHIN OR PORPOISE SPECIES CODE: 77

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 303 | 16 | 3 | 790408 | 1 59 S | 84 14 W | 35. |
| 309 | 16 | 3 | 790408 | 1 52 S | 86 29 W | 4. |
| 310 | 16 | 3 | 790408 | 1 51 S | 86 56 W | 3. |
| 311 | 16 | 3 | 790408 | 1 45 S | 88 15 W | 5. |
| 316 | 16 | 3 | 790408 | 1 38 S | 90 10 W | 3. |
| 319 | 16 | 3 | 790408 | 0 59 S | 89 53 W | 2. |
| 323 | 16 | 3 | 790408 | 1 11 S | 87 29 W | 10. |
| 328 | 17 | 3 | 790411 | 11 20 S | 85 42 W | 4. |
| 329 | 18 | 3 | 790415 | 9 1 S | 78 42 W | 1. |
| 334 | 18 | 3 | 790415 | 8 34 S | 86 26 W | 3. |
| 339 | 18 | 3 | 790415 | 10 2 S | 81 14 W | 32. |
| 340 | 18 | 3 | 790415 | 10 5 S | 81 3 W | 5. |
| 341 | 18 | 3 | 790415 | 10 25 S | 79 52 W | 30. |
| 343 | 19 | 3 | 790421 | 6 58 S | 80 9 W | 153. |
| 344 | 19 | 3 | 790421 | 6 59 S | 80 17 W | 3. |
| 346 | 19 | 3 | 790421 | 7 0 S | 82 49 W | 2. |
| 347 | 19 | 3 | 790421 | 7 0 S | 82 38 W | 8. |
| 349 | 19 | 3 | 790421 | 6 59 S | 83 22 W | 30. |
| 351 | 19 | 3 | 790421 | 7 0 S | 83 38 W | 55. |
| 352 | 19 | 3 | 790421 | 7 0 S | 83 43 W | 13. |
| 353 | 19 | 3 | 790421 | 6 59 S | 84 13 W | 6. |
| 355 | 19 | 3 | 790421 | 6 59 S | 84 22 W | 5. |
| 357 | 19 | 3 | 790421 | 6 59 S | 85 17 W | 1. |
| 365 | 19 | 3 | 790421 | 7 45 S | 84 0 W | 3. |
| 366 | 19 | 3 | 790421 | 7 46 S | 83 57 W | 10. |
| 368 | 19 | 3 | 790421 | 7 50 S | 83 31 W | 13. |
| 369 | 19 | 3 | 790421 | 7 51 S | 83 13 W | 2. |
| 370 | 19 | 3 | 790421 | 7 52 S | 82 55 W | 8. |

Table 12. ( Continued )

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 29

SPECIES: UNIDENTIFIED DOLPHIN OR PORPOISE SPECIES CODE: 77

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 375 | 20 | 3 | 790423 | 1 27 N | 80 53 W | 15. |
| 378 | 20 | 3 | 790423 | 4 50 N | 79 54 W | 9. |
| 379 | 20 | 3 | 790423 | 4 1 N | 79 49 W | 2. |
| 384 | 20 | 3 | 790423 | 7 0 N | 79 41 W | 65. |
| 386 | 20 | 3 | 790423 | 7 12 N | 81 28 W | 16. |
| 387 | 20 | 3 | 790423 | 7 16 N | 81 35 W | 18. |

Table 13. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 14

SPECIES: PILOT WHALE (GLOBICEPHALA SP.) SPECIES CODE: 34

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 119 | 8 | 3 | 790315 | 9 15 N | 85 10 W | 6. |
| 143 | 10 | 3 | 790320 | 8 8 N | 84 1 W | 18. |
| 211 | 12 | 3 | 790327 | 8 54 N | 90 22 W | 27. |
| 212 | 12 | 3 | 790327 | 8 47 N | 90 27 W | 1. |
| 312 | 16 | 3 | 790408 | 1 43 S | 88 40 W | 9. |
| 317 | 16 | 3 | 790408 | 1 18 S | 90 9 W | 12. |
| 318 | 16 | 3 | 790408 | 1 9 S | 90 9 W | 10. |
| 380 | 20 | 3 | 790423 | 5 8 N | 79 47 W | 9. |

Table 14. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 13

SPECIES: FALSE KILLER WHALE (PSEUDORCA CRASSIDENS) SPECIES CODE: 33

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 51 | 5 | 2 | 790212 | 14 1 N | 100 21 W | 7. |

Table 15. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 15

SPECIES: KILLER WHALE (ORCINAS ORCA) SPECIES CODE: 37

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 241 | 14 | 3 | 790404 | 0 22 S | 84 56 W | 16. |

Table 16. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 18

SPECIES: DWARF SPERM WHALE
(KOGIA SIMUS)

SPECIES CODE: 48

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 138 | 10 | 3 | 790320 | 8 25 N | 83 49 W | 1. |

Table 17. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 22

SPECIES: RORQUAL (BALAENOPTERA SP.) SPECIES CODE: 70

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 790122 | 29 26 N | 113 6 W | 1. |
| 16 | 2 | 1 | 790126 | 16 25 N | 109 11 W | 1. |
| 32 | 4 | 2 | 790210 | 15 38 N | 101 24 W | 1. |
| 50 | 5 | 2 | 790212 | 14 6 N | 100 18 W | 2. |
| 221 | 13 | 3 | 790330 | 13 11 N | 91 38 W | 3. |
| 255 | 15 | 3 | 790406 | 4 36 S | 82 6 W | 1. |
| 284 | 15 | 3 | 790406 | 2 43 S | 84 29 W | 1. |
| 333 | 18 | 3 | 790415 | 8 21 S | 86 41 W | 1. |

Table 18. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 23

SPECIES: BRYDE'S WHALE (B. EDENI) SPECIES CODE: 72

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 248 | 14 | 3 | 790404 | 1 20 S | 82 8 W | 1. |

Table 19. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 19

SPECIES: BEAKED WHALE (ZIPHIID) SPECIES CODE: 49

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 96 | 8 | 3 | 790315 | 5 38 N | 87 56 W | 2. |
| 106 | 8 | 3 | 790315 | 6 4 N | 88 10 W | 1. |
| 145 | 10 | 3 | 790320 | 7 50 N | 84 12 W | 1. |
| 165 | 10 | 3 | 790320 | 5 33 N | 87 1 W | 2. |
| 171 | 10 | 3 | 790320 | 7 2 N | 86 6 W | 4. |
| 175 | 11 | 3 | 790323 | 12 18 N | 90 23 W | 2. |
| 192 | 11 | 3 | 790323 | 8 41 N | 92 43 W | 3. |
| 335 | 18 | 3 | 790415 | 9 24 S | 83 32 W | 3. |
| 342 | 18 | 3 | 790415 | 10 29 S | 79 33 W | 1. |
| 362 | 19 | 3 | 790421 | 7 35 S | 86 36 W | 2. |
| 374 | 20 | 3 | 790423 | 1 27 N | 80 47 W | 2. |
| 377 | 20 | 3 | 790423 | 4 28 N | 80 1 W | 2. |

Table 20. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 20

SPECIES: UNID. MESOPLODONT (MESOPLODON SP.) SPECIES CODE: 51

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 265 | 15 | 3 | 790406 | 4 25 S | 84 3 W | 2. |

Table 21. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES    05/17/79 14:43:51 PAGE 21

SPECIES: CUVIER'S BEAKED WHALE
(ZIPHIUS CAVIROSTRIS)

SPECIES CODE: 61

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 134 | 9 | 3 | 790318 | 4 22 N | 91 0 W | 3. |

Table 22. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 16

SPECIES: SPERM WHALE (PHYSETER CATODON) SPECIES CODE: 46

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 14 | 2 | 1 | 790126 | 18 47 N | 107 10 W | 4. |
| 15 | 2 | 1 | 40126 | 18 40 N | 107 17 W | 2. |
| 101 | 8 | 3 | 790315 | 2 24 N | 90 27 W | 2. |
| 102 | 8 | 3 | 790315 | 3 10 N | 89 58 W | 1. |
| 110 | 8 | 3 | 790315 | 7 6 N | 87 32 W | 3. |
| 124 | 9 | 3 | 790318 | 6 15 N | 89 49 W | 1. |
| 131 | 9 | 3 | 790318 | 5 6 N | 90 35 W | 4. |
| 154 | 10 | 3 | 790320 | 2 22 N | 87 21 W | 35. |
| 155 | 10 | 3 | 790320 | 2 0 N | 87 34 W | 26. |
| 156 | 10 | 3 | 790320 | 1 50 N | 87 40 W | 10. |
| 157 | 10 | 3 | 790320 | 1 46 N | 87 42 W | 35. |
| 158 | 10 | 3 | 790320 | 1 39 N | 87 44 W | 36. |
| 159 | 10 | 3 | 790320 | 1 34 N | 87 44 W | 35. |
| 161 | 10 | 3 | 790320 | 3 1 N | 88 26 W | 4. |
| 162 | 10 | 3 | 790320 | 4 5 N | 87 52 W | 6. |
| 163 | 10 | 3 | 790320 | 4 14 N | 87 47 W | 1. |
| 231 | 14 | 3 | 790404 | 0 50 N | 85 38 W | 1. |
| 232 | 14 | 3 | 790404 | 0 49 N | 85 38 W | 1. |
| 233 | 14 | 3 | 790404 | 0 46 N | 85 40 W | 8. |
| 234 | 14 | 3 | 790404 | 0 41 N | 85 41 W | 6. |
| 236 | 14 | 3 | 790404 | 0 23 N | 85 50 W | 1. |
| 289 | 15 | 3 | 790406 | 2 29 S | 83 39 W | 23. |
| 300 | 16 | 3 | 790408 | 2 6 S | 82 46 W | 14. |
| 301 | 16 | 3 | 790408 | 2 5 S | 82 54 W | 18. |
| 304 | 16 | 3 | 790408 | 1 57 S | 84 20 W | 1. |
| 306 | 16 | 3 | 790408 | 1 57 S | 84 40 W | 38. |
| 308 | 16 | 3 | 790408 | 1 53 S | 86 24 W | 2. |
| 322 | 16 | 3 | 790408 | 1 8 S | 88 18 W | 1. |

Table 22 ( Continued )

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 17

SPECIES: SPERM WHALE (PHYSETER CATODON) SPECIES CODE: 46

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 330 | 18 | 3 | 790415 | 8 39 S | 83 16 W | 5. |

Table 23. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 30

SPECIES: UNIDENTIFIED SMALL WHALE SPECIES CODE: 78

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 26 | 3 | 2 | 790206 | 14 29 N | 103 9 W | 3. |
| 85 | 7 | 2 | 790217 | 8 43 N | 97 20 W | 1. |
| 91 | 8 | 3 | 790315 | 8 3 N | 86 28 W | 4. |
| 98 | 8 | 3 | 790315 | 4 17 N | 88 44 W | 2. |
| 99 | 8 | 3 | 790315 | 3 18 N | 89 19 W | 1. |
| 120 | 9 | 3 | 790318 | 10 9 N | 87 17 W | 8. |
| 123 | 9 | 3 | 790318 | 6 47 N | 89 29 W | 4. |
| 146 | 10 | 3 | 790320 | 7 46 N | 84 13 W | 11. |
| 147 | 10 | 3 | 790320 | 6 47 N | 84 49 W | 1. |
| 148 | 10 | 3 | 790320 | 6 7 N | 85 13 W | 1. |
| 166 | 10 | 3 | 790320 | 5 38 N | 86 58 W | 40. |
| 167 | 10 | 3 | 790320 | 5 44 N | 86 55 W | 1. |
| 194 | 11 | 3 | 790323 | 7 20 N | 93 38 W | 1. |
| 213 | 12 | 3 | 790327 | 7 38 N | 91 11 W | 6. |
| 225 | 14 | 3 | 790404 | 6 44 N | 82 18 W | 1. |
| 268 | 15 | 3 | 790406 | 4 12 S | 86 26 W | 1. |
| 271 | 15 | 3 | 790406 | 4 6 S | 87 39 W | 2. |
| 288 | 15 | 3 | 790406 | 2 30 S | 83 41 W | 8. |
| 307 | 16 | 3 | 790408 | 1 57 S | 84 56 W | 0.* |
| 314 | 16 | 3 | 790408 | 1 41 S | 89 13 W | 2. |
| 320 | 16 | 3 | 790408 | 1 4 S | 89 2 W | 3. |
| 321 | 16 | 3 | 790408 | 1 5 S | 88 36 W | 325. |
| 345 | 19 | 3 | 790424 | 7 0 S | 80 47 W | 3. |
| 350 | 19 | 3 | 790421 | 7 0 S | 83 31 W | 3. |
| 381 | 20 | 3 | 790423 | 5 54 N | 79 30 W | 1. |
| 382 | 20 | 3 | 790423 | 6 54 N | 79 8 W | 2. |
| 385 | 20 | 3 | 790423 | 7 12 N | 81 26 W | 2. |

Table 24. 1979 Aerial Survey: Sighting by Species

SIGHTINGS BY SPECIES 05/17/79 14:43:51 PAGE 31

SPECIES: UNIDENTIFIED LARGE WHALE SPECIES CODE: 79

| OBS.# | FLIGHT# | PHASE# | DATE YRMODY | LATITUDE DEG MIN | LONGITUDE DEG MIN | MEAN BEST EST (*=DATA NOT AVAILABLE) |
|---|---|---|---|---|---|---|
| 18 | 2 | 1 | 790126 | 15 53 N | 109 12 W | 1. |
| 20 | 3 | 2 | 790206 | 17 34 N | 102 33 W | 1. |
| 29 | 4 | 2 | 790210 | 16 46 N | 100 26 W | 1. |
| 35 | 4 | 2 | 790210 | 14 58 N | 101 54 W | 2. |
| 53 | 5 | 2 | 790212 | 10 34 N | 103 2 W | 2. |
| 58 | 6 | 2 | 790211 | 11 49 N | 99 58 W | 2. |
| 64 | 6 | 2 | 790214 | 13 5 N | 98 45 W | 1. |
| 95 | 8 | 3 | 790315 | 6 27 N | 87 27 W | 1. |
| 103 | 8 | 3 | 790315 | 4 20 N | 89 14 W | 1. |
| 173 | 11 | 3 | 790323 | 13 12 N | 89 52 W | 1. |
| 201 | 12 | 3 | 790327 | 11 28 N | 88 39 W | 1. |
| 214 | 12 | 3 | 790327 | 5 18 N | 92 40 W | 1. |
| 226 | 14 | 3 | 790404 | 5 49 N | 82 52 W | 1. |
| 235 | 14 | 3 | 790404 | 0 36 N | 85 43 W | 2. |
| 305 | 16 | 3 | 790408 | 1 57 S | 84 37 W | 1. |