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REPORT OF PORPOISE EXPERIMENT TESTING DETECTION OF ON-TRACK SCHOOLS (PET DOTS), MARCH 7-APRIL 5, 1981

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Center

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INTRODUCTION

The National Marine Fisheries Service (NMFS) has the responsibility of assessing the status of the porpoise stocks which are affected by the Eastern Tropical Pacific tuna purse seine fishery. Stock assessments rely on estimates of the present population size of the stocks. Population abundance estimates were made in 1975 (Smith 1975[1], 1981) and 1979 (Holt and Powers, 1982) using line transect methods. I conducted an experimental aerial survey in 1980 off the coast of Costa Rica to test several of the assumptions made in the use of line transect theory for estimating porpoise abundance with aerial survey data. This paper describes the experimental procedures and the data obtained in this survey.

OBJECTIVES

The primary objective of the experiment was to examine the effect of environmental factors and observer performance on line transect methods used for estimating density of dolphin schools. Environmental factors investigated were sea state and sun glare. Observer performance was examined with experienced and inexperienced teams of observers. A secondary objective was to evaluate the use of aerial photographies for measuring dolphin lengths, determining species composition of schools, and comparing the precision of observer estimates of dolphin school size.

Specific requirements to accomplish the objectives of the survey were:

1. Use of a slow, low flying aircraft with a configuration permitting unobstructed views to the front, downward, and to both sides of the plane.

2. Fly tracklines so that similar flights were made under a range of sea state conditions and with different orientations to the sun.

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[1]Smith, T. D. 1975. Estimates of sizes of two populations of porpoise (Stenella) in the eastern tropical Pacific Ocean. Southwest Fisheries Center Adminstrative Report No. LJ-75-67. La Jolla, CA 88 pp.

3. Insure that observers with aerial surveying experience and those without experience had equal opportunity to search for schools under all environmental conditions.

4. Search for dolphin schools using methods compatible with line transect theory and estimate, either visually or using a navigational system, the perpendicular distance of each school from the trackline.

5. When conditions permitted, obtain vertical 1.97 cm and 0.89 cm format photographs of dolphin schools for enumeration of individuals and for studying school composition.

6. When necessary, leave the trackline and circle dolphin schools to: (a) estimate the number of individuals, (b) identify the species, and (c) record swimming patterns, school configuration and other behavioral aspects.

7. Have two observers in the bow such that one monitors the activities of the other to determine if schools are missed and not recorded.

VARIABLES MEASURED

Sea State

Sea state was measured using the Beaufort scale (Table 1) which ranged from Beaufort 0 (very calm seas) to Beaufort 6 (rough seas). Sea state conditions were recorded at the time searching began or was resumed, at the time of a dolphin sighting and whenever sea state conditions changed.

Sun Glare

Sun glare effects are dependent not only upon the sun's horizontal position but also its vertical position. Horizontal sun position was recorded using the positions of a clock face with 12 o'clock directly ahead. Vertical position was recorded as 12, 1, 2, or 3 with 12 directly overhead and 3 on the horizon (Figure 1). Sun positions were not recorded during cloudy conditions. Sun glare conditions were recorded at the time searching began or was resumed, at the time of a sighting and whenever sun position changed.

During previous aerial surveys (Holt and Powers, 1982), the bow observer was instructed to terminate the searching effort if he felt that all animals (schools with >14 animals) on the trackline could not be detected with probability of one. This may have occurred due to rain, darkness, very rough sea states or more frequently the presence of direct sun glare on the trackline. During this experiment we continued to search during all sun positions in order to define a range of conditions where all schools on the trackline could be detected.

Observer Performance

The critical assumption that all schools on the trackline are detected may be affected by the ability of individual observers to detect schools. Experience in detecting animals from the air may be critical. Therefore, in this experiment data for observers with previous aerial survey experience and those without were collected. In addition, a bow monitor provided a direct visual check of the bow observer's performance.

STUDY AREA AND ITINERARY

Area of Operation

The aircraft operated along the Pacific coast near Liberia, Costa Rica. Flights occurred in a coastal band extending seaward for approximately 55.5 km and parallel to the coast for approximately 111 km (Figure 2). The experimental design required the study area be sampled under all environmental conditions. The area defined was offshore the coastline from 9°41' to 10°40'N latitude and from 85°20' to 86°21'W longitude. This area was selected by examining the location of effort encountered under the various sea state conditions. Furthermore, the location of the western longitudinal boundary was selected to maximize the chance of enough survey effort in the area while insuring all experimental factors were spatially distributed and to reduce the inclusion of bias owing to onshore-to-offshore density gradients (Appendix I).

Flight Schedule

The survey was scheduled to begin January 2, 1981; however, because of mechanical and logistical problems, the first survey flight did not occur until March 7, 1981. The plane was ferried from its home base in Naples, Florida to San Jose, Costa Rica between February 18-22, 1981, and to the study base at Liberia, Costa Rica on March 1, 1981. Survey flights were conducted between March 7 and April 5, 1981 out of Liberia. The plane was ferried back to Naples between April 7-9, 1981. Survey flight schedules were:

Flight number	Date	Departure (local time)	Return (local time)	Flight Length (hours:minutes)
1	3/7	1455	1720	2:25
2	3/9	1400	1732	3:32
3	3/10	0750	1144	3:54
4	3/11	0830	1200	3:30
		1314	1708	3:54
5	3/12	0637	1016	3:39
		1252	1714	4:22
6	3/13	0632	1105	4:33
		1312	1655	3:43

Flight number	Date	Departure (local time)	Return (local time)	Flight Length (hours:minutes)
7	3/15	0651	1113	4:22
		1335	1726	3:51
8	3/16	0637	1118	4:41
9	3/17	0637	1245	6:08
10	3/19	0646	1207	5:21
		1438	1720	2:42
11	3/20	0854	1146	2:52
12	3/21	0620	1108	4:48
		1338	1651	3:13
13	3/22	0614	1029	4:13
13	4/1	0657	0926	2:29
14	4/3	1358	1742	3:44
15	4/4	618	1045	4:27
		1445	1800	3:15
16	4/5	0614	1050	4:36
		1409	1710	3:01

PERSONNEL

Scientific Party

Rennie Holt, Chief Scientist, NMFS
William Brinkerhoff, NMFS
Larry Hansen, NMFS
Mark Lowry, NMFS
Frank Ralston, NMFS
William Walker, Los Angeles Natural History Museum (contractor)

Flight Crew

John Olson, Chief Pilot (Flights 1-13)
Timothy Flynn, Chief Pilot (Flights 14-16)
Robert DeRosa, Co-Pilot

EQUIPMENT

Aircraft

A Beech, AT11-A modified, two-engine, ex-military bombardier trainer aircraft, owned and operated by Aero-Marine Surveys, Inc., Groton, Connecticut was used in the survey. Reasons for selecting this aircraft were:

1. Flying speed - The plane was capable of flying a minimum of 185-278 km/hr depending on prevailing winds. Experience with previous aerial surveys indicates flights should be flown in this range to ensure detection of schools on the trackline.

2. Observation areas - As a bombardier trainer, the nose of the airplane was made of plexiglass, allowing unobstructed forward and downward visibility. Modified left and right waist windows were installed in the rear of the plane. These windows were 41x58 cm and allowed unobstructed vertical and aft view with less than 185 m from the trackline. Forward visibility at distances greater than approximately 555 m was partially obstructed by the wings of the plane.

3. Range - Fully loaded and in good flying conditions the plane was capable of flying at least 1159 km.

4. Safety - The plane could fly on one engine if necessary.

5. Cost - The hourly contract rate allowed a sufficient number of flights to obtain the needed sample sizes. Additionally, the plane was offered at the lowest price in the competitive bidding process.

6. Experience of contractor - Aero-Marine Surveys had considerable experience conducting surveys of this type.

Navigation System

An Omega Navigation System (ONS) was used throughout the survey. The system was used by the scientists to obtain geographic position, ground speed, and perpendicular distance of a school from the trackline. Data could be "frozen" in the display mode for subsequent transferring to data sheets.

Cameras

Three different format-size cameras were used to photograph dolphin schools and document the survey. These were a KA-62A (1.97 cm) format aerial reconnaissance camera, four 70 mm (0.89 cm format) Hasselblad cameras, and a Nikon 35 mm camera.

Binoculars

Two types of binoculars were used. One, SWIFT Admiral Mark I, Model No. 751 (10x50 power) glasses, was used primarily to inspect possible targets seen with the unaided eye at long distances from the plane and the other, Minolta Celtic (7x35 power) wide angle binoculars, was used in making species identifications.

Dye Markers

A mixture of eosin, powered aluminum and small gravel enclosed in a paper bag was dropped from the plane as near a school as possible to aid in returning to the location of the school.

Clock

A digital Casio battery operated clock was used to record time of sightings and positions. The clock displayed hours and minutes only. Consequently, calculations of ground speed for some legs of effort where few kilometers were searched were imprecise.

DUTY STATIONS

Six duty stations were used during the survey, with observers rotating sequentially through all stations.

1. Bow: The bow observer sat in the plexiglass nose. His major responsibility was to detect all schools in a path approximately 185 m wide directly beneath the aircraft. He usually directed the plane over a school when in a circling mode.

2. Recorder: The recorder sat directly behind the pilots where he could visually monitor the ONS readout. He did not have access to the ONS controls, and had to request the pilots to display specific data elements in the readout unit. 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 plane's position, time, and perpendicular distance of the school from the trackline. Other data required by the transect and sighting forms (Figures 3 and 4) were recorded while the sighted school was being observed. Observer school size estimates were generally not given over the ICS.

3. Left Waist: The port side observer sat on a cushion in the extreme aft of the cabin and observed an area from the edge of the plane outboard to a varied limit set primarily by environmental conditions and plane altitude. The viewing window was located in the rear of the plane so that the observer could see downward slightly under the plane, for observation of part of the trackline.

4. Bow Monitor: The bow monitor sat beside the bow observer in the plexiglass nose of the aircraft. His major duty was to serve as a visual check of the ability of the bow observer to detect schools directly beneath the airplane. The bow monitor refrained from indicating the presence of a school until it was obvious that the bow observer had failed to detect its presence i.e. the plane had completely overflown the school without its detection.

5. Right Waist: The starboard observer sat on a cushion adjacent the port observer but on the starboard side of the aircraft. His duties were identical to the left waist observer except on the opposite side of the aircraft.

6. Off: The last station was a nonduty rest position.

OBSERVER TEAMS AND ROTATION

Observers changed positions either when the plane reversed directions to survey in the opposite direction or after 45-55 minutes if the plane was following tracklines that zig-zagged across the study area. As a result of the rotational system observers were effectively partitioned into two teams, each with three members. The members of the "experienced" team had participated in previous aerial surveys that used line transect methods, while the members of the "inexperienced" team had not participated in aerial surveys of any type and were not familiar with line transect methods except as instructed during the presurvey training. Experienced observers were assigned number codes 8, 10 and 11 while inexperienced observer codes were 12, 13 and 14. Each team represented an independent effort in that members of a team always occupied the observational positions (bow observer, left and right waist) at the same time, and alternated observing with members of the other team.

The experienced and inexperienced teams alternated occupying the observational positions at the beginning of each flight. The bow monitor was a member of the opposing team. A die was rolled to determine specific starting duty stations within each team. Positions were assigned so that each observer had approximately equal access to each starting position.

Training for the study included flights aboard U.S. Coast Guard helicopters near San Diego, emphasizing (1) sighting cues used to detect marine mammals, (2) methods to estimate school sizes, (3) use of the Beaufort scale, and (4) familiarization with each element collected on the data forms.

PROCEDURES

Flight Procedures

One day's searching effort was considered as a single flight, although the plane may have made a refueling stop. Ideally a typical day's activities consisted of: departing the aerodrome between 0600-0630, a 10-minute ferry to the study site, surveying until 1130, returning to airport and refueling, departing around 1330, surveying until 1700 and finally returning to the aerodrome to refuel for the next day's flight. This schedule was modified frequently due to mechanical and logistical problems so that only the morning or afternoon segment was completed. Because of delays encountered prior to the beginning of the survey flights, a 4-day flight schedule was attempted. The first and third days' flights included morning and afternoon segments, the second day's flight included only a morning segment, and the fourth day was an off day. This schedule however could not be maintained due to mechanical and logistical emergencies. In practice, flights were generally completed when the plane and crew were available. A summary of events that contributed to flight schedule changes is given in Appendix II.

Once on a survey track, the pilots followed a predetermined line and maintained an altitude of 274 m. The aircraft's ground speed was generally maintained between 185 and 278 km/hr dependent upon wind speed and direction. The plane's course usually was not altered to avoid rain squalls.

Tracklines were oriented to provide a range of orientations of the plane to the sun. Generally lines were placed parallel to the coast in a north-south and northwest-southeast directions (Figure 2). Lines were also surveyed which criss-crossed the study area to obtain desired sun orientations. The same trackline may have been flown on more than one occasion. The location of the first trackline flown each day was varied with distance from shore.

Search Procedures

In general, searching procedures used to detect dolphin schools followed those used in the NMFS 1979 aerial survey (Jackson, 1979[2]) with a major difference that the search mode was not terminated under adverse conditions. The search mode of each survey flight began when the plane was on the trackline. On a cue from the pilot, time and position were recorded 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, size of the school, behavior of the dolphins, and distance of the school from the aircraft.

The distance from the plane at which a school could be observed 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 disturbances and/or the dolphins themselves were often the sighting cues. As sea conditions worsened, with larger swells and more white caps, scars and other surface disturbances became more difficult to detect. Such changes necessitated that the observer concentrate his efforts closer to the aircraft. Under adverse sea conditions, Beaufort five or higher, the animal itself was usually the only discernible sign. In these situations, all searching was done close in to the airplane. Bird activity was also used as a sighting cue during all sea states.

All observers, including the "off" observer if he desired, were in constant communication with each other and the pilots via the ICS. Throughout each survey flight, the recorder maintained a Transect Record (Figure 3) of the flight, leg number, date, altitude, ground speed (indicated on the ONS), and the code numbers of personnel at each of the observer stations. Sea state and sun position were also noted after consultation with the observers. A new transect record or leg was started at each rotation of observers, when the airplane made a major course or altitude change, or when environmental conditions changed, e.g., a change in Beaufort or sun position. Geographic

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[2]Jackson, T. D. 1979. Trip report: porpoise population aerial survey of the eastern tropical Pacific Ocean, January 22-April 25, 1979, Southwest Fisheries Center Administrative Report. LJ-80-1, La Jolla, CA 74 pp.

positions and local times were recorded at the beginning and end of each leg and at frequent intervals (transect checks) throughout the leg. Local time was subsequently converted to Greenwich Mean Time. 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 geographic position and "sighting record numbers" were referenced to specific positions where a sighting occurred.

When a sighting was announced, the recorder immediately logged the time and position, and assigned a sequential sighting number. Concurrently, the person making the sighting determined if the plane should be diverted from track to investigate. The plane generally did not divert if (a) the school consisted solely of large whales, (b) a suspected cue was detected at a perpendicular distance substantially greater than 1.85 km, (c) the school size was obviously less than 15 animals, or (d) for schools with more than 15 animals, environmental conditions were unsuitable for photography. If the observer determined that a sighting was made but decided not to divert the plane for further observations, he instructed the pilot to continue on track. He then relayed his information concerning the sighting to the recorder who filled out a Sighting Record (Figure 4) data sheet. Observer search effort continued if the airplane was not diverted.

If the observer decided to divert the plane, he asked the pilot 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 an accurate reading could be obtained.

If conditions were suitable for aerial photography, the observer requested a photographic run. The pilots then positioned the plane between the sun and the school, so that the approach was made with the sun on the aircraft's tail, a pattern found most effective in previous aerial surveys. The observer also instructed the pilots to reduce airspeed to approximately 185 km/hr while maintaining 274 m. Normally, the bow observer, having visually located the school while the plane circled, directed the pilots over the school during a photographic pass. From the bow position, he either fired the cameras or commanded another observer to start and stop the picture series. When the plane was directly over the school, the recorder was instructed to obtain another cross-track distance and, if possible, a geographic position. The perpendicular distance of the school from the aircraft was subsequently calculated.

Following the photographic run(s), the approach pattern was changed slightly to allow optimum observation for the observers to estimate school size. On these passes, still at 274 m, the plane was positioned so that the dolphin school was situated within 185 or 370 m of the plane and on the side opposite the sun. As the aircraft approached the school, the pilot, usually directed by the bow observer, dipped the wing to give the observers a near vertical view of the school with minimum glare. All available observers made independent estimates of school size. Using this same circling pattern, species identification was attempted. One observer, usually Mr. Walker, the marine mammal identification specialist, viewed the dolphins through 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 constraints (usually less than 10 minutes) necessitated returning to the trackline.

If conditions were not suitable for photography, the circling procedure was abbreviated. An attempt was made to estimate school size and, if possible, to determine species identification in one pass. If it was apparent that school size was greater than 14, the plane returned to track.

Line transect methods require determining perpendicular distances of objects, recorded as points, from the trackline (Burnham et al., 1980). Dolphin school configurations are not points but range from tight compact clusters to loose aggregations. In theory, the mid-point of the configuration should be utilized to determine perpendicular distance; however, given the speed of the aircraft and the spatial distribution of the animals, this was not practical. Instead, the perpendicular distance for a school was estimated by determining the distance of the initial sighting cue (i.e. first animal(s) detected) to the trackline.

The applied definition of a "school" affects the number of schools recorded. A group of dolphins spatially distributed over a small area in a loose aggregation could be viewed as one large school or several smaller independent schools. We tended to view those aggregations as one school. The decision was somewhat subjective, but we attempted to be consistent over all experimental conditions.

As the aircraft returned to track to resume searching, each observer made notes, in a personal notebook, of 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 the searching altitude and back on track.

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

RESULTS

The primary objective of collecting data to allow comparison of sighting survey results under various sea state and sun angle conditions was accomplished with 373 sightings of marine mammals made while surveying 13,157 km in 16 flights. The tracklines searched for all flights (Figure 2) were in the area from 8°N to 11°N latitude, and from 85°W to 88°W longitude. Within the study area, 252 marine mammal sightings, which met all selection criteria, were made while surveying 10,712 km on 15 flights (Figures 5-19).

Data collected on each leg of effort for all flights, including the date, altitude, indicated ground speed, location of each observer, sun position, sea state, number of sightings of schools of marine mammals, km covered, and mean km/hr for each leg are given in Table 2. Data collected outside the study area are presented in Table 3. The "speed km/hr" was ground speed recorded from the ONS at the time each leg began while "mean km/hr in leg" was averaged ground speed calculated by dividing distances searched in a leg, determined from starting and ending geographic positions, by elapsed time in search mode. The latter is a better indicator of speed.

The details for each of the marine mammal sightings classified by species groups are given in Table 4. Included are the flight and leg, date, sun position, Beaufort number, observer making the sighting, perpendicular distance to the sighting, geographic position, and the school size. Most of the schools were not identified to species, as discussed previously. Eight of the 373 marine mammal schools recorded during the survey were identified as including two species (mixed schools) and, therefore, are presented twice in the species lists and summary tables (i.e. total schools in Table 4 equal 381). Sightings which occurred outside the study area are denoted by an asterisk in Table 4.

The requirements of the survey, listed on page 1, necessary to accomplish the objectives were met to various degrees. Requirements 2, 3, 4 and 7 were completed adequately: various sea states and sun orientations were encountered; experienced and inexperienced observer teams remained intact throughout the experiment; perpendicular distances were estimated for virtually all sightings and a bow monitor was present on all legs of all flights. During the survey, two schools were detected by the bow monitor which were not detected by the bow observer. These were schools 30 and 210 (Table 4). Requirement for use of a slow flying aircraft with unobstructed forward and downward views was partially met. The aircraft's speed was satisfactory; however, the view forward of the aircraft from the side ports was restricted by the wings. This reduced the time a school was available for detection before it was overflown. Requirement 5, aerial photography, was not accomplished due to very high sea states and minimal off-track circling. Requirement 6 was met, except that the procedure to minimize off-track circling resulted in a large number of the schools recorded as unidentified dolphins (Table 4).

The data presented here will allow evaluation of line transect density estimation methods under different sighting conditions and for observer effects. Detailed analyses of the data are under way.

LITERATURE CITED

Bowditch, N. 1966. American practical navigator, an epitome of navigation. U. S. Naval Oceanographic Office. H. O. Pub. No. 9. Washington, DC. 1524 pp.

Burnham, K. P., D. R. Anderson and J. L. Laake. 1980. Estimation of density for line transect sampling of biological populations. J. Wildl. Manag. Monographs No. 72, 220 pp.

Holt, R. S., and J. E. Powers. 1982. Abundance estimation of dolphin stocks involved in the eastern tropical Pacific yellowfin tuna fishery determined from aerial and ship surveys. NOAA TM-NMFS-SWFC-23, 95 pp.

Smith, T. D. 1981. Line transect techniques for estimating density of porpoise schools. J. Wildl. Manag. 45(3):650-647.

Table 1. Sea state conditions measured by the Beaufort scale (from Bowditch, 1966).

Wind force (Beaufort)	Knots	Descriptive	Sea conditions	Probable wave height in ft.
0	0- 1	Calm	Sea smooth and mirror-like.	-
1	1- 3	Light air	Scale-like ripples without foam crests.	1/4
2	4- 6	Light breeze	Small short wavelets; crests have a glassy appearance and do not break.	1/2
3	7-10	Gentle breeze	Large wavelets; some crests begin to break; foam of glassy appearance. Occasional white foam crests.	2
4	11-16	Moderate breeze	Small waves, becoming longer; fairly frequent white foam crests.	4
5	17-21	Fresh breeze	Moderate waves, taking a more pronounced long form; many white foam crests; there may be some spray.	6
6	22-27	Strong breeze	Large waves begin to form; white foam crests are more extensive everywhere; there may be some spray.	10
7	28-33	Near gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind; spindrift begins.	14

Table 2. Searching effort, sun position, Beaufort number, and observer positions during each leg of flights 1 through 16. Observer and Beaufort number codes defined in text. Cloudy conditions denoted by '0' horizontal and vertical position. Zero value for 'speed KM/HR' denotes data not recorded.

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
1	1	81 3 7	900	190	10	0	11	13	12	10	1	2	1	29.38	135.62
1	2	81 3 7	920	247	13	0	8	14	12	11	1	2	1	48.94	195.75
1	3	81 3 7	900	229	14	8	10	12	13	6	2	3	0	32.31	215.41
1	4	81 3 7	900	229	14	8	10	12	13	6	3	4	2	27.39	182.56
1	5	81 3 7	950	210	14	8	10	12	13	6	3	3	1	10.09	201.84
2	1	81 3 9	900	240	12	8	14	13	10	11	1	4	1	17.97	269.55
2	2	81 3 9	900	240	12	8	14	13	10	11	1	5	1	114.79	245.98
2	3	81 3 9	900	240	12	8	14	13	10	11	1	4	0	9.49	284.69
2	4	81 3 9	900	275	11	14	10	8	12	11	1	4	0	85.12	268.81
2	5	81 3 9	900	244	11	14	10	8	12	11	1	3	0	6.43	32.14
2	6	81 3 9	900	222	13	10	12	14	11	5	1	3	1	82.08	205.20
2	7	81 3 9	900	196	13	10	12	14	11	5	1	4	1	49.52	198.07
2	8	81 3 9	900	185	8	12	11	10	13	5	2	4	1	38.64	193.21
2	9	81 3 9	900	185	8	12	11	10	13	5	2	5	0	52.25	184.42
2	10	81 3 9	900	197	8	12	11	10	13	5	2	4	2	32.62	217.45
2	11	81 3 9	900	201	8	12	11	10	13	6	2	5	0	14.65	175.78
3	1	81 310	900	246	11	13	8	10	12	9	2	3	3	40.24	219.48
3	2	81 310	900	240	11	13	8	10	12	9	2	4	0	24.27	242.70
3	3	81 310	900	246	11	13	8	10	12	9	2	5	0	32.59	244.45
3	4	81 310	900	246	11	13	8	10	12	9	2	3	0	14.72	220.87
3	5	81 310	900	236	11	13	8	10	12	9	2	2	1	28.77	246.62
3	6	81 310	900	246	14	8	12	13	11	9	1	3	5	128.78	214.63
3	7	81 310	900	218	10	12	11	8	14	0	0	3	1	11.00	165.03
3	8	81 310	900	238	10	12	11	8	14	0	0	3	1	95.89	205.47
3	9	81 310	900	223	13	11	14	12	10	0	0	3	3	38.85	211.88
3	10	81 310	900	236	13	11	14	12	10	3	12	3	1	65.51	218.35
3	11	81 310	900	209	13	11	14	12	10	3	12	4	1	12.31	147.67
3	12	81 310	900	190	13	11	14	12	10	3	12	3	0	29.33	251.38
3	13	81 310	900	234	13	11	14	12	10	5	12	3	1	20.37	174.63
3	14	81 310	900	214	13	11	14	12	10	5	12	4	0	24.86	213.12
4	1	81 311	900	251	13	10	12	14	11	6	1	4	2	151.76	260.17
4	2	81 311	900	247	8	12	11	10	13	10	1	4	0	23.79	237.88

FLT	LEG	YRMODA		ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
4	3	81	311	900	247	8	12	11	10	13	10	1	5	0	69.24	230.80
4	4	81	311	900	238	8	12	11	10	13	9	1	4	0	72.37	228.52
4	5	81	311	900	209	14	11	13	12	8	1	1	4	1	70.01	210.04
4	6	81	311	900	205	14	11	13	12	8	1	1	3	1	28.02	186.81
4	7	81	311	900	210	14	11	13	12	8	1	12	2	1	66.47	221.56
4	8	81	311	900	207	10	13	8	11	14	12	12	2	1	34.40	343.97
4	9	81	311	900	240	10	13	8	11	14	6	12	3	2	42.49	182.10
4	10	81	311	900	223	10	13	8	11	14	6	12	4	0	23.02	197.31
4	11	81	311	900	196	10	13	8	11	14	6	12	3	0	17.05	340.94
4	12	81	311	900	209	12	8	14	13	10	9	1	3	2	28.02	210.12
4	13	81	311	900	222	12	8	14	13	10	9	1	4	0	22.10	189.42
4	14	81	311	900	247	12	8	14	13	10	3	2	4	1	55.25	236.81
4	15	81	311	900	247	11	14	10	8	12	3	1	3	4	46.23	173.36
4	16	81	311	900	203	11	14	10	8	12	8	1	2	0	11.26	225.12
4	17	81	311	900	203	11	14	10	8	12	8	1	3	2	29.22	292.18
4	18	81	311	900	203	11	14	10	8	12	8	1	4	2	14.74	176.82
4	19	81	311	900	194	13	10	12	14	11	8	1	4	0	58.19	205.37
4	20	81	311	900	255	13	10	12	14	11	3	1	4	0	49.91	249.55
4	21	81	311	900	246	8	12	11	10	13	3	1	4	0	20.81	249.73
4	22	81	311	900	246	8	12	11	10	13	3	1	3	0	7.01	210.19
4	23	81	311	900	238	8	12	11	10	13	3	1	2	2	11.81	236.21
4	24	81	311	900	238	8	12	11	10	13	3	1	3	0	14.18	212.75
4	25	81	311	900	238	8	12	11	10	13	8	2	3	2	23.62	236.18
4	26	81	311	900	234	8	12	11	10	13	8	2	3	1	26.78	229.58
4	27	81	311	900	222	14	11	13	12	8	8	2	4	0	58.26	183.99
4	28	81	311	900	240	14	11	13	12	8	3	2	4	1	38.86	233.17
4	29	81	311	900	209	14	11	13	12	8	6	3	3	0	32.48	194.86
5	1	81	312	900	222	8	14	10	11	13	4	2	3	0	33.51	223.43
5	2	81	312	900	212	8	14	10	11	13	3	2	5	0	22.28	222.80
5	3	81	312	900	246	8	14	10	11	13	10	1	4	1	33.15	221.03
5	4	81	312	900	240	8	14	10	11	13	10	1	3	2	23.63	283.58
5	5	81	312	900	229	12	10	13	14	8	9	2	3	1	16.79	201.44
5	6	81	312	900	233	12	10	13	14	8	10	2	4	0	11.99	239.82

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
5	7	81 312	900	192	12	10	13	14	8	4	2	4	0	28.54	214.06
5	8	81 312	900	212	12	10	13	14	8	4	2	2	0	29.14	218.59
5	9	81 312	900	234	11	13	8	10	12	9	1	3	1	21.99	263.91
5	10	81 312	900	234	11	13	8	10	12	9	1	4	1	39.23	196.13
5	11	81 312	900	216	11	13	8	10	12	9	2	4	0	31.88	239.07
5	12	81 312	900	246	11	13	8	10	12	10	2	5	0	18.25	273.79
5	13	81 312	900	246	11	13	8	10	12	10	2	3	0	9.02	270.73
5	14	81 312	900	247	14	8	12	13	11	10	1	3	1	23.08	230.77
5	15	81 312	900	231	14	8	12	13	11	10	1	2	1	28.18	241.57
5	16	81 312	900	231	14	8	12	13	11	10	1	4	0	6.46	193.65
5	17	81 312	900	231	14	8	12	13	11	4	1	4	0	18.61	223.35
5	18	81 312	900	201	14	8	12	13	11	4	1	3	0	9.02	180.45
5	19	81 312	900	201	14	8	12	13	11	4	1	2	4	30.43	202.85
5	20	81 312	900	222	10	12	11	8	14	3	1	4	4	55.13	206.74
5	21	81 312	900	222	10	12	11	8	14	3	1	3	0	9.91	148.64
5	22	81 312	900	233	10	12	11	8	14	11	1	4	0	34.43	229.56
5	23	81 312	900	251	10	12	11	8	14	11	1	3	1	19.66	294.93
5	24	81 312	900	244	10	12	11	8	14	1	12	3	0	10.66	213.13
5	25	81 312	900	233	13	11	14	12	10	3	12	4	0	25.42	217.86
5	26	81 312	975	238	13	11	14	12	10	3	12	3	1	26.18	224.44
5	27	81 312	900	236	8	14	10	11	13	3	12	3	2	55.25	207.19
5	28	81 312	900	214	8	14	10	11	13	8	1	3	0	55.24	220.95
5	29	81 312	900	209	12	11	13	14	8	8	1	3	0	35.73	214.39
5	30	81 312	900	216	12	11	13	14	8	8	1	4	0	19.70	197.03
5	31	81 312	900	246	12	11	13	14	8	2	1	4	0	30.57	229.25
5	32	81 312	900	225	12	11	13	14	8	2	1	3	1	24.87	213.19
5	33	81 312	900	231	11	13	8	10	12	3	1	3	1	53.40	246.47
5	34	81 312	900	231	11	13	8	10	12	3	1	2	1	2.58	77.33
5	35	81 312	900	227	11	13	8	10	12	9	2	3	1	60.03	225.11
5	36	81 312	900	233	14	8	12	13	11	9	1	3	3	36.37	218.22
5	37	81 312	900	207	14	8	12	13	11	9	1	4	0	20.81	208.11
5	38	81 312	900	209	14	8	12	13	11	3	2	4	0	37.75	226.50
5	39	81 312	900	231	14	8	12	13	11	3	2	3	1	20.65	247.81

FLT	LEG	YRMODA		ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
5	40	81	312	900	212	10	12	11	8	14	3	2	3	2	58.04	217.65
5	41	81	312	900	222	10	12	11	8	14	0	0	0	0	0.00	0.00
5	42	81	312	900	240	10	12	11	8	14	9	2	3	0	19.89	238.72
5	43	81	312	900	238	10	12	11	8	14	0	0	3	2	31.87	191.21
5	44	81	312	900	249	13	11	14	12	10	9	2	2	0	14.80	222.04
5	45	81	312	900	223	13	11	14	12	10	0	0	4	0	35.55	213.28
5	46	81	312	900	223	13	11	14	12	10	8	2	4	0	4.97	149.15
6	1	81	313	900	227	14	11	13	12	8	10	2	3	0	45.69	228.43
6	2	81	313	900	227	14	11	13	12	8	9	2	2	2	27.18	203.85
6	3	81	313	900	227	14	11	13	12	8	11	1	3	1	11.52	230.46
6	4	81	313	900	227	14	11	13	12	8	11	2	3	0	4.78	47.82
6	5	81	313	900	205	10	13	8	11	14	11	2	3	1	18.61	223.35
6	6	81	313	900	205	10	13	8	11	14	11	2	2	0	4.30	129.12
6	7	81	313	900	205	10	13	8	11	14	5	2	3	0	0.00	0.00
6	8	81	313	900	205	10	13	8	11	14	5	2	2	1	47.91	239.54
6	9	81	313	900	242	10	13	8	11	14	4	2	3	1	11.34	170.08
6	10	81	313	900	242	10	13	8	11	14	4	2	2	1	24.02	288.26
6	11	81	313	900	242	10	13	8	11	14	4	2	3	1	32.05	240.37
6	12	81	313	900	253	12	8	14	13	10	10	2	2	1	13.51	202.69
6	13	81	313	900	227	12	8	14	13	10	10	2	3	1	31.52	210.15
6	14	81	313	900	210	12	8	14	13	10	11	2	2	3	74.16	222.48
6	15	81	313	900	210	11	13	10	8	12	5	1	2	4	17.02	255.33
6	16	81	313	900	238	11	13	10	8	12	5	1	2	1	25.74	220.62
6	17	81	313	900	238	11	13	10	8	12	5	1	3	0	18.95	284.18
6	18	81	313	900	210	11	13	10	8	12	4	2	2	1	20.26	202.56
6	19	81	313	900	236	11	13	10	8	12	4	2	2	2	22.85	228.53
6	20	81	313	900	236	11	13	10	8	12	4	2	3	0	0.00	0.00
6	21	81	313	900	244	13	10	12	14	11	10	1	2	2	55.38	207.69
6	22	81	313	900	231	13	10	12	14	11	12	1	2	0	36.45	218.71
6	23	81	313	900	214	13	10	12	14	11	12	1	1	1	23.65	236.55
6	24	81	313	900	216	8	12	11	10	13	6	12	2	5	61.59	246.36
6	25	81	313	900	209	8	12	11	10	13	3	12	2	1	43.47	260.79
6	26	81	313	900	236	8	12	11	10	13	3	12	3	1	11.89	178.32

FLT	LEG	YRMODA		ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
6	27	81	313	900	231	10	13	8	11	14	3	12	3	0	19.89	238.74
6	28	81	313	900	231	10	13	8	11	14	3	12	2	1	14.94	179.25
6	29	81	313	900	216	10	13	8	11	14	3	1	1	0	16.94	338.90
6	30	81	313	900	216	10	13	8	11	14	3	1	2	0	2.03	61.01
6	31	81	313	900	216	10	13	8	11	14	4	1	3	1	56.27	211.00
6	32	81	313	900	227	12	8	14	13	10	11	1	3	1	59.73	224.00
6	33	81	313	900	229	12	8	14	13	10	10	1	2	0	7.79	233.59
6	34	81	313	900	216	12	8	14	13	10	8	1	2	4	52.37	261.86
6	35	81	313	900	240	11	14	10	8	12	3	2	3	2	54.56	251.80
6	36	81	313	900	227	11	14	10	8	12	3	2	2	1	16.77	201.27
6	37	81	313	900	222	11	14	10	8	12	5	2	2	3	58.67	234.67
6	38	81	313	900	223	13	10	12	14	11	11	1	2	0	50.58	233.45
6	39	81	313	900	223	13	10	12	14	11	11	1	1	1	8.92	178.47
6	40	81	313	900	220	13	10	12	14	11	9	1	1	4	33.92	226.16
6	41	81	313	900	231	13	10	12	14	11	9	1	2	2	15.92	238.86
6	42	81	313	900	220	8	12	11	10	13	3	1	3	4	34.03	226.85
6	43	81	313	900	236	8	12	11	10	13	3	2	2	1	18.32	219.87
6	44	81	313	900	233	8	12	11	10	13	3	2	1	0	6.26	187.90
6	45	81	313	900	238	8	12	11	10	13	9	2	1	1	23.80	238.05
6	46	81	313	900	231	8	12	11	10	13	9	2	2	1	33.57	223.81
7	1	81	315	900	233	10	12	11	8	14	9	2	3	1	49.56	228.74
7	2	81	315	900	220	10	12	11	8	14	11	2	1	0	54.80	219.21
7	3	81	315	900	225	13	11	14	12	10	5	2	2	0	62.91	222.04
7	4	81	315	900	205	13	11	14	12	10	3	2	3	1	59.77	224.15
7	5	81	315	900	220	8	14	10	11	13	9	1	3	0	48.07	221.85
7	6	81	315	900	227	8	14	10	11	13	9	1	4	0	11.05	220.99
7	7	81	315	900	223	8	14	10	11	13	9	1	3	0	2.22	133.03
7	8	81	315	900	223	8	14	10	11	13	11	1	2	0	34.06	227.08
7	9	81	315	900	210	8	14	10	11	13	11	1	1	0	27.30	204.72
7	10	81	315	900	220	12	10	13	14	8	6	1	1	2	60.28	226.05
7	11	81	315	900	201	12	10	13	14	8	3	1	2	0	11.45	229.05
7	12	81	315	900	220	12	10	13	14	8	3	1	3	2	45.36	226.81
7	13	81	315	900	233	11	13	8	10	12	10	1	3	2	53.98	215.90

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
7	14	81 315	900	223	11	13	8	10	12	12	1	2	1	34.33	205.98
7	15	81 315	900	220	11	13	8	10	12	12	1	1	0	34.71	297.55
7	16	81 315	900	223	14	8	12	13	11	6	12	1	2	15.33	306.68
7	17	81 315	900	247	14	8	12	13	11	6	12	2	1	27.71	277.12
7	18	81 315	900	218	14	8	12	13	11	6	12	1	0	15.57	233.61
7	19	81 315	900	216	14	8	12	13	11	4	12	2	0	21.36	213.61
7	20	81 315	900	234	14	8	12	13	11	4	12	3	2	34.31	228.71
7	21	81 315	900	238	12	11	14	13	10	2	1	3	1	59.77	188.73
7	22	81 315	900	223	12	11	14	13	10	5	1	3	0	29.78	223.32
7	23	81 315	900	218	12	11	14	13	10	5	1	2	0	19.60	235.24
7	24	81 315	900	223	12	11	14	13	10	5	1	3	1	4.76	285.32
7	25	81 315	900	218	8	14	10	11	13	11	1	3	1	72.71	229.60
7	26	81 315	900	220	8	14	10	11	13	9	1	3	2	46.30	198.41
7	27	81 315	900	227	12	10	13	14	8	2	1	3	1	59.67	210.61
7	28	81 315	900	220	12	10	13	14	8	6	2	3	2	61.56	217.28
7	29	81 315	900	229	11	13	8	10	12	11	2	3	1	69.84	246.48
7	30	81 315	900	229	11	13	8	10	12	8	2	3	2	51.40	220.31
7	31	81 315	900	227	14	8	12	13	11	3	2	3	0	59.29	222.35
7	32	81 315	900	225	14	8	12	13	11	9	2	3	0	50.28	232.07
8	1	81 316	900	229	12	8	14	13	11	9	2	3	0	19.15	229.80
8	2	81 316	900	229	12	8	14	13	11	9	2	2	2	16.32	195.80
8	3	81 316	900	234	12	8	14	13	11	9	2	3	1	17.54	263.14
8	4	81 316	900	231	12	8	14	13	11	12	2	3	0	13.30	266.08
8	5	81 316	900	218	12	8	14	13	11	12	2	2	0	31.39	209.29
8	6	81 316	900	227	12	8	14	13	11	12	2	3	2	14.66	219.90
8	7	81 316	900	222	12	8	14	13	11	12	2	2	1	3.94	236.15
8	8	81 316	900	220	10	14	11	8	12	5	2	2	0	58.03	217.62
8	9	81 316	900	218	10	14	11	8	12	5	2	3	0	6.31	189.34
8	10	81 316	900	227	10	14	11	8	12	3	2	3	1	17.52	210.28
8	11	81 316	900	210	10	14	11	8	12	3	2	2	2	34.87	232.46
8	12	81 316	900	212	13	11	12	14	10	10	1	2	1	53.79	248.25
8	13	81 316	900	238	13	11	12	14	10	10	1	3	0	13.26	265.26
8	14	81 316	900	223	13	11	12	14	10	12	1	3	1	28.25	211.90

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
8	15	81 316	900	231	13	11	12	14	10	12	1	2	0	37.96	227.77
8	16	81 316	900	231	8	12	10	11	13	6	1	2	1	40.73	222.17
8	17	81 316	900	236	8	12	10	11	13	6	1	3	0	25.49	218.51
8	18	81 316	900	218	8	12	10	11	13	4	1	3	0	22.05	220.51
8	19	81 316	900	229	8	12	10	11	13	4	1	2	1	15.03	225.40
8	20	81 316	900	222	8	12	10	11	13	4	1	1	0	16.95	254.24
8	21	81 316	900	225	14	10	13	12	8	9	12	1	4	39.07	260.49
8	22	81 316	900	216	14	10	13	12	8	10	12	3	0	12.35	246.99
8	23	81 316	900	227	14	10	13	12	8	12	12	2	3	24.16	207.10
8	24	81 316	900	236	14	10	13	12	8	12	12	2	3	35.89	215.32
8	25	81 316	900	225	11	13	8	10	14	12	12	2	0	18.61	223.32
8	26	81 316	900	225	11	13	8	10	14	12	12	3	1	27.39	234.75
8	27	81 316	900	225	11	13	8	10	14	12	12	2	0	9.44	188.83
8	28	81 316	900	225	11	13	8	10	14	12	12	3	0	6.77	202.95
8	29	81 316	900	222	11	13	8	10	14	3	12	3	1	54.55	233.78
9	1	81 317	900	225	11	12	10	8	14	9	2	3	0	52.66	243.06
9	2	81 317	900	233	11	12	10	8	14	12	2	3	2	28.48	170.89
9	3	81 317	900	220	11	12	10	8	14	12	2	2	0	16.48	247.14
9	4	81 317	900	231	11	12	10	8	14	12	2	3	1	23.13	231.34
9	5	81 317	900	227	13	10	14	12	11	5	2	3	0	42.79	213.96
9	6	81 317	900	227	13	10	14	12	11	5	2	2	1	15.60	187.16
9	7	81 317	900	220	13	10	14	12	11	5	2	3	0	5.41	324.85
9	8	81 317	900	214	13	10	14	12	11	3	2	3	2	22.96	172.20
9	9	81 317	900	214	13	10	14	12	11	3	2	2	0	32.74	280.63
9	10	81 317	900	229	8	14	11	10	13	10	1	2	1	28.77	215.77
9	11	81 317	900	233	8	14	11	10	13	10	1	3	1	24.12	206.76
9	12	81 317	900	231	8	14	11	10	13	12	1	3	0	12.64	189.64
9	13	81 317	900	214	8	14	11	10	13	12	1	2	2	48.75	225.02
9	14	81 317	900	231	12	11	13	14	8	6	1	2	2	84.97	221.67
9	15	81 317	900	223	12	11	13	14	8	4	1	2	2	56.27	225.09
9	16	81 317	900	216	10	13	8	11	12	11	1	2	2	57.29	245.54
9	17	81 317	900	216	10	13	8	11	12	11	1	3	0	4.30	257.83
9	18	81 317	900	231	10	13	8	11	12	12	1	2	0	31.16	233.69

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
9	19	81 317	900	244	10	13	8	11	12	12	1	3	0	34.70	231.33
9	20	81 317	900	229	14	8	12	13	10	6	12	3	3	52.14	240.65
9	21	81 317	900	216	14	8	12	13	10	6	12	2	0	15.58	233.66
9	22	81 317	900	220	14	8	12	13	10	3	12	3	0	34.32	228.81
9	23	81 317	900	229	14	8	12	13	10	3	12	2	2	16.78	201.34
10	1	81 319	900	218	12	10	14	13	8	2	2	2	2	56.17	210.66
10	2	81 319	900	218	12	10	14	13	8	11	2	2	4	63.31	211.03
10	3	81 319	900	214	11	14	8	10	12	5	1	2	3	69.57	219.71
10	4	81 319	900	203	11	14	8	10	12	3	1	2	2	54.53	233.70
10	5	81 319	900	212	13	8	12	14	11	10	1	2	5	70.05	247.25
10	6	81 319	900	229	13	8	12	14	11	12	1	1	1	23.09	197.88
10	7	81 319	900	220	13	8	12	14	11	12	1	2	0	40.77	222.36
10	8	81 319	900	229	10	12	11	8	13	6	1	2	2	69.17	218.44
10	9	81 319	900	205	10	12	11	8	13	3	1	2	7	49.68	212.91
10	10	81 319	900	220	14	11	13	12	10	9	12	1	4	62.56	234.61
10	11	81 319	900	229	14	11	13	12	10	12	12	2	4	67.56	202.68
10	12	81 319	900	222	8	13	10	11	14	12	12	3	0	30.27	227.03
10	13	81 319	900	214	8	13	10	11	14	12	12	2	1	31.93	239.52
10	14	81 319	900	212	8	13	10	11	14	12	12	2	5	54.96	219.84
10	15	81 319	900	223	11	14	8	10	12	2	1	3	0	19.39	166.20
10	16	81 319	900	222	11	14	8	10	12	3	1	3	0	35.92	239.49
10	17	81 319	900	238	11	14	8	10	12	5	1	3	0	63.74	224.96
10	18	81 319	900	214	13	8	12	14	11	11	2	3	0	68.30	227.66
10	19	81 319	900	223	13	8	12	14	11	9	2	3	2	54.10	231.84
10	20	81 319	900	227	10	12	11	8	13	3	2	3	1	63.18	222.99
10	21	81 319	900	225	14	11	13	12	10	9	2	3	2	59.14	253.45
11	1	81 320	900	246	11	14	8	10	13	10	1	4	0	16.77	251.48
11	2	81 320	900	246	11	14	8	10	13	0	0	3	0	16.59	248.83
11	3	81 320	900	223	11	14	8	10	13	0	0	4	0	20.81	208.15
11	4	81 320	900	229	11	14	8	10	13	0	0	3	0	20.34	203.35
11	5	81 320	900	218	11	14	8	10	13	12	1	2	1	14.47	289.32
11	6	81 320	900	229	11	14	8	10	13	12	1	3	0	20.96	209.56
11	7	81 320	900	214	12	8	13	14	11	6	1	3	2	32.08	213.84

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM7AR IN LEG
11	8	81 320	900	240	12	8	13	14	11	6	1	2	0	10.21	306.21
11	9	81 320	900	222	12	8	13	14	11	0	0	4	0	45.28	208.96
11	10	81 320	900	214	12	8	13	14	11	4	1	3	0	18.05	216.54
11	11	81 320	900	227	12	8	13	14	11	4	1	4	0	12.59	251.73
11	12	81 320	900	247	10	13	11	8	12	10	12	4	1	20.09	241.03
11	13	81 320	900	244	10	13	11	8	12	0	0	3	1	36.86	245.77
11	14	81 320	900	236	10	13	11	8	12	0	0	4	0	19.65	168.42
11	15	81 320	900	210	10	13	11	8	12	0	0	2	0	12.22	244.34
11	16	81 320	900	212	10	13	11	8	12	1	12	4	0	28.28	242.38
11	17	81 320	900	216	14	11	12	13	10	6	12	4	0	33.62	252.15
11	18	81 320	900	222	14	11	12	13	10	0	0	2	1	11.05	220.90
11	19	81 320	900	255	14	11	12	13	10	0	0	4	0	25.58	219.23
11	20	81 320	900	192	14	11	12	13	10	0	0	4	0	11.40	171.06
11	21	81 320	900	192	14	11	12	13	10	0	0	3	0	22.71	227.08
11	22	81 320	900	233	14	11	12	13	10	4	12	3	0	14.09	211.36
11	23	81 320	900	233	14	11	12	13	10	4	12	4	0	6.40	383.98
12	1	81 321	900	231	13	11	12	14	10	9	2	3	0	25.45	218.17
12	2	81 321	900	240	13	11	12	14	10	9	2	4	0	27.27	233.72
12	3	81 321	900	233	13	11	12	14	10	11	2	2	0	18.15	217.84
12	4	81 321	900	231	13	11	12	14	10	11	2	3	0	8.72	174.37
12	5	81 321	900	220	13	11	12	14	10	11	2	2	0	10.28	308.26
12	6	81 321	900	220	13	11	12	14	10	0	0	3	0	12.01	180.08
12	7	81 321	900	220	13	11	12	14	10	0	0	2	0	10.36	207.24
12	8	81 321	900	229	8	12	10	11	13	5	2	3	0	24.77	212.30
12	9	81 321	900	233	8	12	10	11	13	0	0	2	0	15.14	302.76
12	10	81 321	900	227	8	12	10	11	13	0	0	3	0	13.40	200.93
12	11	81 321	900	231	8	12	10	11	13	5	2	2	0	8.71	261.29
12	12	81 321	900	229	8	12	10	11	13	5	2	3	0	5.99	359.48
12	13	81 321	900	233	8	12	10	11	13	3	2	3	0	17.19	206.24
12	14	81 321	900	216	8	12	10	11	13	3	2	4	0	26.16	224.26
12	15	81 321	900	227	8	12	10	11	13	3	2	3	1	10.05	201.01
12	16	81 321	900	229	14	10	13	12	8	9	1	3	0	27.85	238.74
12	17	81 321	900	229	14	10	13	12	8	9	1	4	0	23.20	198.87

FLT	LEG	YRMODA		ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
12	18	81	321	900	209	14	10	13	12	8	10	1	3	0	7.97	239.11
12	19	81	321	900	209	14	10	13	12	8	11	1	3	0	11.38	227.56
12	20	81	321	900	209	14	10	13	12	8	11	1	2	0	9.28	185.55
12	21	81	321	900	220	14	10	13	12	8	11	1	3	0	3.16	189.33
12	22	81	321	900	225	14	10	13	12	8	11	1	2	0	24.32	243.19
12	23	81	321	900	229	11	13	8	10	14	5	1	3	0	19.87	198.74
12	24	81	321	900	234	11	13	8	10	14	5	1	2	0	12.22	183.32
12	25	81	321	900	222	11	13	8	10	14	5	1	3	0	9.94	298.08
12	26	81	321	900	225	11	13	8	10	14	5	1	2	1	19.51	195.08
12	27	81	321	900	231	11	13	8	10	14	5	1	3	0	8.61	258.19
12	28	81	321	900	222	11	13	8	10	14	3	1	3	0	15.86	237.93
12	29	81	321	900	223	11	13	8	10	14	3	1	4	0	17.49	262.39
12	30	81	321	900	233	11	13	8	10	14	3	1	3	5	18.34	183.43
12	31	81	321	900	247	12	8	14	13	11	9	1	3	1	14.18	283.66
12	32	81	321	900	236	12	8	14	13	11	9	1	2	2	23.94	205.19
12	33	81	321	900	212	12	8	14	13	11	9	1	3	0	30.76	230.67
12	34	81	321	900	233	12	8	14	13	11	0	0	3	0	14.97	224.50
12	35	81	321	900	223	12	8	14	13	11	0	0	2	0	52.07	223.15
12	36	81	321	900	216	10	14	11	8	12	0	0	2	1	71.40	214.20
12	37	81	321	900	229	10	14	11	8	12	6	12	3	0	7.96	238.77
12	38	81	321	900	225	10	14	11	8	12	4	12	3	0	33.15	220.99
12	39	81	321	900	0	10	14	11	8	12	6	12	2	1	20.81	208.06
12	40	81	321	900	234	8	12	10	11	13	0	0	3	0	28.91	216.84
12	41	81	321	900	220	8	12	10	11	13	3	1	3	1	33.90	226.01
12	42	81	321	900	223	8	12	10	11	13	3	1	2	1	13.86	277.14
12	43	81	321	900	216	8	12	10	11	13	0	0	2	0	34.83	208.95
12	44	81	321	900	210	14	10	13	12	8	8	1	2	1	76.54	241.72
12	45	81	321	900	231	14	10	13	12	8	8	1	3	0	33.95	226.36
12	46	81	321	900	236	11	13	8	10	14	3	1	3	4	64.19	213.98
12	47	81	321	900	222	11	13	8	10	14	3	1	2	0	46.40	232.01
12	48	81	321	900	225	12	8	14	13	11	9	2	2	0	20.27	243.21
12	49	81	321	900	233	12	8	14	13	11	9	2	1	0	32.44	216.28
12	50	81	321	900	244	12	8	14	13	11	9	2	2	0	20.83	312.37

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
12	51	81 321	900	240	12	8	14	13	11	9	2	3	0	39.41	236.44
13	1	81 322	900	229	8	13	10	11	12	0	0	2	1	54.88	219.51
13	2	81 322	900	233	8	13	10	11	12	0	0	2	2	56.18	210.69
13	3	81 322	900	214	8	13	10	11	12	10	2	2	0	8.22	246.73
13	4	81 322	900	223	14	10	12	13	8	5	2	2	1	56.21	240.89
13	5	81 322	900	210	14	10	12	13	8	0	0	1	1	50.88	339.20
13	6	81 322	900	0	11	12	8	10	14	5	1	2	6	50.90	203.59
13	7	81 322	900	227	11	12	8	10	14	11	1	2	0	53.75	215.00
13	8	81 322	900	0	11	12	8	10	14	0	0	3	0	0.00	0.00
13	9	81 322	900	222	13	8	14	12	11	5	1	2	0	58.07	248.86
13	10	81 322	900	238	13	8	14	12	11	12	1	2	0	16.37	245.58
13	11	81 322	900	234	13	8	14	12	11	11	1	1	0	20.89	208.94
13	12	81 322	900	216	13	8	14	12	11	11	1	2	0	22.80	195.39
13	13	81 322	900	223	10	14	11	8	13	5	1	2	1	33.58	223.90
13	14	81 322	900	236	10	14	11	8	13	5	1	1	1	30.87	231.49
13	15	81 322	900	218	10	14	11	8	13	12	12	1	3	53.36	228.69
14	1	81 4 3	900	220	13	11	12	14	8	12	1	3	1	24.53	294.41
14	2	81 4 3	900	220	13	11	12	14	8	5	1	4	0	10.44	125.23
14	3	81 4 3	900	188	13	11	12	14	8	5	1	3	2	24.23	207.73
14	4	81 4 3	900	231	13	11	12	14	8	12	1	3	1	35.99	215.94
14	5	81 4 3	900	222	10	14	8	11	13	5	1	3	1	27.44	205.79
14	6	81 4 3	900	218	10	14	8	11	13	12	1	3	1	19.74	169.17
14	7	81 4 3	900	203	10	14	8	11	13	6	1	3	2	30.29	227.15
14	8	81 4 3	900	216	10	14	8	11	13	12	1	3	0	29.49	353.83
14	9	81 4 3	900	223	12	8	13	14	10	5	2	3	0	27.34	182.27
14	10	81 4 3	900	222	12	8	13	14	10	12	2	3	1	23.61	236.09
14	11	81 4 3	900	205	12	8	13	14	10	6	2	3	4	30.83	168.15
14	12	81 4 3	900	222	12	8	13	14	10	12	2	3	2	30.37	227.75
14	13	81 4 3	900	222	11	13	10	8	12	7	2	3	3	45.43	272.59
14	14	81 4 3	900	218	11	13	10	8	12	11	2	2	1	6.93	138.54
14	15	81 4 3	900	222	11	13	10	8	12	11	2	3	1	32.20	241.51
14	16	81 4 3	900	222	11	13	10	8	12	8	2	3	0	33.01	247.54
14	17	81 4 3	900	223	11	13	10	8	12	8	2	4	0	6.09	182.62

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
15	1	81 4 4	900	0	8	12	10	11	14	8	2	3	0	17.88	268.27
15	2	81 4 4	900	242	8	12	10	11	14	10	2	4	0	14.07	281.41
15	3	81 4 4	900	222	8	12	10	11	14	10	2	5	0	22.85	274.22
15	4	81 4 4	900	0	8	12	10	11	14	12	2	4	0	12.28	245.53
15	5	81 4 4	900	0	8	12	10	11	14	11	2	3	1	44.75	383.55
15	6	81 4 4	900	236	8	12	10	11	14	11	2	4	0	9.16	274.71
15	7	81 4 4	900	236	8	12	10	11	14	11	2	3	0	18.20	218.41
15	8	81 4 4	900	222	13	10	14	12	8	5	2	3	0	32.95	219.64
15	9	81 4 4	900	227	13	10	14	12	8	5	2	4	0	13.36	267.22
15	10	81 4 4	900	238	13	10	14	12	8	5	2	3	1	15.34	184.12
15	11	81 4 4	900	194	13	10	14	12	8	3	2	4	0	16.04	240.55
15	12	81 4 4	900	214	13	10	14	12	8	3	2	5	0	17.50	210.02
15	13	81 4 4	900	207	13	10	14	12	8	3	2	4	0	7.37	147.36
15	14	81 4 4	900	201	13	10	14	12	8	3	2	3	1	16.25	195.00
15	15	81 4 4	900	222	11	14	8	10	13	8	2	2	0	10.31	206.26
15	16	81 4 4	900	222	11	14	8	10	13	8	2	3	0	8.02	240.62
15	17	81 4 4	900	229	11	14	8	10	13	10	1	5	1	31.34	235.05
15	18	81 4 4	900	246	11	14	8	10	13	12	1	3	0	65.39	230.78
15	19	81 4 4	900	229	12	8	13	14	11	5	1	3	1	80.29	240.86
15	20	81 4 4	900	246	12	8	13	14	11	5	1	4	0	9.34	280.34
15	21	81 4 4	900	233	12	8	13	14	11	12	1	4	0	22.64	271.67
15	22	81 4 4	900	238	12	8	13	14	11	12	1	3	1	22.28	191.01
15	23	81 4 4	900	0	12	8	13	14	11	12	1	2	0	5.41	0.00
15	24	81 4 4	900	222	10	13	11	8	12	6	1	2	1	33.49	223.24
15	25	81 4 4	900	222	10	13	11	8	12	6	1	3	0	15.37	230.51
15	26	81 4 4	900	222	10	13	11	8	12	6	1	4	0	4.58	275.09
15	27	81 4 4	900	222	10	13	11	8	12	3	12	4	0	11.54	230.88
15	28	81 4 4	900	222	10	13	11	8	12	3	12	3	1	46.18	213.12
15	29	81 4 4	900	240	14	11	12	13	10	11	1	4	0	17.10	256.44
15	30	81 4 4	900	231	14	11	12	13	10	11	1	5	0	6.39	383.11
15	31	81 4 4	900	177	14	11	12	13	10	5	1	3	0	6.53	195.86
15	32	81 4 4	900	177	14	11	12	13	10	5	1	2	0	8.51	255.29
15	33	81 4 4	900	190	14	11	12	13	10	5	1	3	3	15.98	136.99

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
15	34	81 4 4	900	222	14	11	12	13	10	10	2	3	0	19.65	168.42
15	35	81 4 4	900	222	14	11	12	13	10	12	2	3	0	4.97	149.09
15	36	81 4 4	920	0	14	11	12	13	10	12	2	4	0	3.53	211.76
15	37	81 4 4	900	222	8	12	10	11	14	5	2	3	0	13.93	208.97
15	38	81 4 4	900	0	8	12	10	11	14	5	2	2	1	25.42	305.04
15	39	81 4 4	900	0	8	12	10	11	14	5	2	3	0	6.22	186.51
15	40	81 4 4	900	209	8	12	10	11	14	4	2	3	0	23.79	237.88
15	41	81 4 4	900	233	8	12	10	11	14	3	2	3	0	12.40	186.04
15	42	81 4 4	900	0	8	12	10	11	14	3	2	3	0	11.78	235.69
15	43	81 4 4	900	242	8	12	10	11	14	5	2	3	2	26.97	179.79
15	44	81 4 4	900	234	8	12	10	11	14	5	2	2	0	10.60	127.20
15	45	81 4 4	900	234	8	12	10	11	14	5	2	3	2	25.62	192.18
15	46	81 4 4	900	166	13	10	14	12	8	1	2	2	0	8.53	170.52
15	47	81 4 4	900	173	13	10	14	12	8	1	2	3	1	29.34	880.21
15	48	81 4 4	900	173	13	10	14	12	8	10	2	3	0	13.59	203.86
15	49	81 4 4	900	222	13	10	14	12	8	10	2	2	0	0.00	0.00
15	50	81 4 4	900	231	13	10	14	12	8	11	3	3	0	20.04	240.51
15	51	81 4 4	900	227	13	10	14	12	8	8	3	3	0	15.12	226.79
15	52	81 4 4	900	220	13	10	14	12	8	10	3	2	1	18.72	224.66
16	1	81 4 5	900	222	14	8	13	12	10	9	2	2	0	2.95	176.76
16	2	81 4 5	900	222	14	8	13	12	10	9	2	3	1	20.83	208.28
16	3	81 4 5	900	242	14	8	13	12	10	9	2	4	0	5.45	163.53
16	4	81 4 5	900	242	14	8	13	12	10	9	2	5	0	7.97	239.12
16	5	81 4 5	900	242	14	8	13	12	10	9	2	4	0	9.41	282.20
16	6	81 4 5	900	236	14	8	13	12	10	11	2	4	0	10.05	201.02
16	7	81 4 5	900	236	14	8	13	12	10	11	2	3	1	14.36	287.15
16	8	81 4 5	900	209	14	8	13	12	10	11	2	4	0	7.59	151.82
16	9	81 4 5	900	209	14	8	13	12	10	11	2	3	0	29.92	224.42
16	10	81 4 5	900	205	11	13	10	8	14	4	2	3	0	26.49	227.02
16	11	81 4 5	900	234	11	13	10	8	14	4	2	3	0	17.84	214.10
16	12	81 4 5	900	203	11	13	10	8	14	3	2	4	0	17.18	206.13
16	13	81 4 5	900	203	11	13	10	8	14	3	2	5	0	7.74	232.27
16	14	81 4 5	900	203	11	13	10	8	14	3	2	3	0	7.58	227.54

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
16	15	81 4 5	900	216	11	13	10	8	14	3	2	4	0	7.37	221.03
16	16	81 4 5	900	216	11	13	10	8	14	3	2	3	0	11.43	228.59
16	17	81 4 5	902	216	11	13	10	8	14	3	2	2	0	4.99	149.55
16	18	81 4 5	900	253	12	10	14	13	11	9	2	2	1	8.84	265.22
16	19	81 4 5	900	253	12	10	14	13	11	9	2	3	2	16.66	249.86
16	20	81 4 5	900	244	12	10	14	13	11	9	2	4	0	28.18	241.56
16	21	81 4 5	900	205	12	10	14	13	11	12	2	4	0	14.15	212.22
16	22	81 4 5	900	205	12	10	14	13	11	11	2	2	0	12.05	240.98
16	23	81 4 5	900	227	12	10	14	13	11	11	1	3	0	8.21	246.16
16	24	81 4 5	900	225	12	10	14	13	11	11	1	2	2	11.81	236.17
16	25	81 4 5	900	225	12	10	14	13	11	11	1	3	0	7.56	226.65
16	26	81 4 5	900	234	12	10	14	13	11	11	1	2	0	7.48	224.49
16	27	81 4 5	900	229	8	14	11	10	12	6	1	2	0	17.74	354.73
16	28	81 4 5	900	233	8	14	11	10	12	6	1	3	3	17.87	214.45
16	29	81 4 5	900	246	8	14	11	10	12	6	1	2	1	3.66	219.68
16	30	81 4 5	900	246	8	14	11	10	12	6	1	3	0	22.53	270.39
16	31	81 4 5	900	246	8	14	11	10	12	6	1	4	0	1.89	113.24
16	32	81 4 5	900	223	8	14	11	10	12	1	1	4	0	16.43	246.51
16	33	81 4 5	900	210	8	14	11	10	12	1	1	3	0	18.15	181.54
16	34	81 4 5	900	222	13	11	12	14	8	4	1	3	4	21.51	258.15
16	35	81 4 5	900	222	13	11	12	14	8	2	1	3	3	23.37	175.25
16	36	81 4 5	900	271	10	12	8	11	13	3	1	4	0	36.09	360.91
16	37	81 4 5	900	271	10	12	8	11	13	3	1	3	0	13.07	261.48
16	38	81 4 5	900	264	10	12	8	11	13	3	1	4	0	12.69	190.27
16	39	81 4 5	900	220	10	12	8	11	13	5	1	3	2	18.18	136.37
16	40	81 4 5	900	222	10	12	8	11	13	5	1	2	0	19.87	238.44
16	41	81 4 5	900	222	10	12	8	11	13	5	1	3	0	20.15	241.76
16	42	81 4 5	900	0	14	8	13	12	10	11	1	3	7	13.95	139.52
16	43	81 4 5	900	222	14	8	13	12	10	10	1	3	2	34.58	188.61
16	44	81 4 5	900	222	14	8	13	12	10	10	2	3	3	23.13	173.44
16	45	81 4 5	900	126	11	13	10	8	14	5	2	3	2	17.21	147.54

** INCLUDES ALL SCHOOLS DETECTED DURING EFFORT LEG.

Table 3. Searching effort, sun position, Beaufort number, and observer positions during each leg of flights 2 through 16 occurring outside the study area. Observer and Beaufort number codes defined in text. Cloudy conditions denoted by '0' horizontal and vertical sun position. Zero value for 'speed KM/HR' denotes data not recorded.

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
1	1	81 3 7	900	190	10	0	11	13	12	10	1	2	1	29.38	135.62
1	2	81 3 7	920	247	13	0	8	14	12	11	1	2	1	48.94	195.75
1	3	81 3 7	900	229	14	8	10	12	13	6	2	3	0	32.31	215.41
1	4	81 3 7	900	229	14	8	10	12	13	6	3	4	2	27.39	182.56
1	5	81 3 7	950	210	14	8	10	12	13	6	3	3	1	10.09	201.84
2	2	81 3 9	900	240	12	8	14	13	10	11	1	5	1	91.82	239.53
2	3	81 3 9	900	240	12	8	14	13	10	11	1	4	0	9.49	284.69
2	4	81 3 9	900	275	11	14	10	8	12	11	1	4	0	85.12	268.81
2	5	81 3 9	900	244	11	14	10	8	12	11	1	3	0	6.43	32.14
2	6	81 3 9	900	222	13	10	12	14	11	5	1	3	1	82.08	205.20
2	7	81 3 9	900	196	13	10	12	14	11	5	1	4	1	49.52	198.07
2	8	81 3 9	900	185	8	12	11	10	13	5	2	4	1	38.64	193.21
2	9	81 3 9	900	185	8	12	11	10	13	5	2	5	0	52.25	184.42
2	10	81 3 9	900	197	8	12	11	10	13	5	2	4	1	11.68	233.51
3	3	81 310	900	246	11	13	8	10	12	9	2	5	0	0.18	0.00
3	4	81 310	900	246	11	13	8	10	12	9	2	3	0	14.72	220.87
3	5	81 310	900	236	11	13	8	10	12	9	2	2	1	28.77	246.62
3	6	81 310	900	246	14	8	12	13	11	9	1	3	5	128.78	214.63
3	7	81 310	900	218	10	12	11	8	14	0	0	3	1	11.00	165.03
3	8	81 310	900	238	10	12	11	8	14	0	0	3	1	95.89	205.47
3	9	81 310	900	223	13	11	14	12	10	0	0	3	3	38.85	211.88
3	10	81 310	900	236	13	11	14	12	10	3	12	3	0	19.97	239.60
3	14	81 310	900	214	13	11	14	12	10	5	12	4	0	18.23	218.75
4	1	81 311	900	251	13	10	12	14	11	6	1	4	2	151.76	260.17
4	2	81 311	900	247	8	12	11	10	13	10	1	4	0	23.79	237.88
4	3	81 311	900	247	8	12	11	10	13	10	1	5	0	69.24	230.80
4	4	81 311	900	238	8	12	11	10	13	9	1	4	0	72.37	228.52
4	5	81 311	900	209	14	11	13	12	8	1	1	4	1	70.01	210.04
4	6	81 311	900	205	14	11	13	12	8	1	1	3	1	28.02	186.81
4	7	81 311	900	210	14	11	13	12	8	1	12	2	1	66.47	221.56
4	8	81 311	900	207	10	13	8	11	14	12	12	2	1	4.82	289.13
4	12	81 311	900	209	12	8	14	13	10	9	1	3	1	15.12	226.79

FLT	LEG	YRMODA	ALT. FEET	SPEED KM/HR	OBSERVER CODES BOW	MON.	LEFT	RIGHT	REC.	SUN POSITION HORZ.	VERT.	BEAUF. NUMBER	NUMBER** SIGHTINGS	KM	MEAN KM/HR IN LEG
4	13	81 311	900	222	12	8	14	13	10	9	1	4	0	22.10	189.42
4	14	81 311	900	247	12	8	14	13	10	3	2	4	0	37.75	377.52
4	19	81 311	900	194	13	10	12	14	11	8	1	4	0	36.83	220.96
4	20	81 311	900	255	13	10	12	14	11	3	1	4	0	30.94	265.19
4	27	81 311	900	222	14	11	13	12	8	8	2	4	0	40.00	171.43
4	28	81 311	900	240	14	11	13	12	8	3	2	4	0	37.57	250.45
5	1	81 312	900	222	8	14	10	11	13	4	2	3	0	14.55	218.20
5	2	81 312	900	212	8	14	10	11	13	3	2	5	0	22.28	222.80
5	3	81 312	900	246	8	14	10	11	13	10	1	4	1	33.15	221.03
5	4	81 312	900	240	8	14	10	11	13	10	1	3	0	2.22	133.03
5	10	81 312	900	234	11	13	8	10	12	9	1	4	1	36.83	200.89
5	11	81 312	900	216	11	13	8	10	12	9	2	4	0	31.88	239.07
5	12	81 312	900	246	11	13	8	10	12	10	2	5	0	8.86	265.66
5	20	81 312	900	222	10	12	11	8	14	3	1	4	0	36.83	220.97
5	21	81 312	900	222	10	12	11	8	14	3	1	3	0	9.91	148.64
5	22	81 312	900	233	10	12	11	8	14	11	1	4	0	34.43	229.56
5	23	81 312	900	251	10	12	11	8	14	11	1	3	0	1.12	0.00
5	27	81 312	900	236	8	14	10	11	13	3	12	3	1	18.41	200.88
5	28	81 312	900	214	8	14	10	11	13	8	1	3	0	18.41	184.13
9	14	81 317	900	231	12	11	13	14	8	6	1	2	0	6.61	198.38
9	15	81 317	900	223	12	11	13	14	8	4	1	2	2	56.27	225.09
9	16	81 317	900	216	10	13	8	11	12	11	1	2	2	57.29	245.54
9	17	81 317	900	216	10	13	8	11	12	11	1	3	0	4.30	257.83
9	18	81 317	900	231	10	13	8	11	12	12	1	2	0	2.24	134.47
12	40	81 321	900	234	8	12	10	11	13	0	0	3	0	28.91	216.84
12	41	81 321	900	220	8	12	10	11	13	3	1	3	0	9.03	541.81
12	44	81 321	900	210	14	10	13	12	8	8	1	2	0	2.95	196.80
12	45	81 321	900	231	14	10	13	12	8	8	1	3	0	33.95	226.36
12	46	81 321	900	236	11	13	8	10	14	3	1	3	0	38.33	209.07
12	51	81 321	900	240	12	8	14	13	11	9	2	3	0	37.01	277.59
13	6	81 322	900	0	11	12	8	10	14	5	1	2	1	14.71	220.69
13	7	81 322	900	227	11	12	8	10	14	11	1	2	0	22.28	148.54
13	9	81 322	900	222	13	8	14	12	11	5	1	2	0	19.35	290.31

FLT	LEG	YRMODA	ALT.	SPEED	OBSERVER CODES					SUN POSITION		BEAUF.	NUMBER**	KM	MEAN KM/HR
			FEET	KM/HR	BOW	MON.	LEFT	RIGHT	REC.	HORZ.	VERT.	NUMBER	SIGHTINGS		IN LEG
13	10	81 322	900	238	13	8	14	12	11	12	1	2	0	16.37	245.58
13	11	81 322	900	234	13	8	14	12	11	11	1	1	0	3.77	225.98
13	14	81 322	900	236	10	14	11	8	13	5	1	1	1	17.19	257.79
13	15	81 322	900	218	10	14	11	8	13	12	12	1	1	15.83	189.98
16	42	81 4 5	900	0	14	8	13	12	10	11	1	3	2	5.34	320.45

** INCLUDES ALL SCHOOLS DETECTED DURING EFFORT LEG.

Table 4. Dolphin schools, sun position, Beaufort number, observer detecting school and perpendicular distance, summarized by species codes, recorded during flights 1 through 16. School size estimates of zero denotes data not recorded. Schools detected during legs of effort occurring outside the study area denoted by '*'.

SIGHTINGS BY SPECIES

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

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
102	6	15	810313	5	1	2	8	0.6	9 48 N	85 40 W	75.0	59.0
201	9	10	810317	10	1	2	10	0.6	10 27 N	86 17 W	25.0	20.0
227	10	5	810319	10	1	2	14	0.4	10 27 N	86 4 W	739.8	559.8
229	10	5	810319	10	1	2	12	0.5	10 21 N	86 3 W	367.0	277.0
252	10	14	810319	12	12	2	8	0.0	10 10 N	85 58 W	225.0	175.0
257	10	19	810319	9	2	3	14	0.2	10 20 N	86 6 W	238.0	194.0

SIGHTINGS BY SPECIES

SPECIES: SPINNER DOLPHIN (STENELLA LONGIROSTRIS)

SPECIES CODE: 3

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN_POSITION HORZ.	SUN_POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN_SCHOOL_SIZE_EST BEST	MEAN_SCHOOL_SIZE_EST LOW
14	3	1	810310	9	2	3	10	1.6	10 18 N	86 7 W	533.0	400.0
156	7	17	810315	6	12	2	13	0.5	9 54 N	85 54 W	95.0	75.0
204	9	13	810317	12	1	2	11	1.0	9 48 N	85 47 W	108.5	92.5
231	10	5	810319	10	1	2	13	0.1	10 9 N	86 4 W	250.0	185.0
235	10	9	810319	3	1	2	11	0.9	10 8 N	86 3 W	633.0	500.0
274	12	31	810321	9	1	3	14	0.9	10 37 N	86 11 W	760.2	580.2
285	12	46	810321	3	1	3	8	1.7	10 31 N	86 10 W	400.0	300.0
312	14	11	810403	6	2	3	13	0.4	10 12 N	86 0 W	253.2	200.0
318	14	13	810403	7	2	3	10	3.1	10 12 N	86 4 W	225.2	180.0
350	16	29	810405	6	1	2	8	0.7	9 54 N	85 55 W	1325.0	1150.0

SIGHTINGS BY SPECIES

SPECIES: STRIPED DOLPHIN (S. COERULEOALBA)

SPECIES CODE: 13

OBS.#	FLIGHT	LEG	DATE	SUN POSITION		BEAUF.	DETECTED	PERP.	LATITUDE	LONGITUDE	MEAN SCHOOL SIZE EST	
			YRMODY	HORZ.	VERT.	NUMBER	BY	DIST.(NM)	DEG MIN	DEG MIN	BEST	LOW
296*	13	6	810322	5	1	2	11	0.0	10 37 N	86 24 W	225.0	150.0
298*	13	14	810322	5	1	1	8	0.7	10 34 N	86 24 W	97.0	87.0

SIGHTINGS BY SPECIES

SPECIES: RISSO'S DOLPHIN (GRAMPUS GRISEUS)

SPECIES CODE: 21

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
7*	2	2	810309	10	1	5	12	0.0	10 42 N	87 0 W	8.0	6.0
11*	2	10	810309	5	2	4	11	0.2	10 24 N	86 22 W	9.0	8.0
27	3	10	810310	3	12	3	14	0.4	9 43 N	86 11 W	5.0	5.0
32*	4	5	810311	1	1	4	13	0.4	9 30 N	87 13 W	4.0	4.0
33*	4	6	810311	1	1	3	13	0.5	9 30 N	86 40 W	4.0	4.0
42	4	15	810311	3	1	3	8	0.4	10 9 N	86 5 W	2.0	2.0
43	4	15	810311	3	1	3	11	0.0	10 5 N	86 5 W	9.0	9.0
44	4	15	810311	3	1	3	11	0.1	10 1 N	86 5 W	15.0	12.0
46	4	17	810311	8	1	3	8	0.4	10 13 N	86 10 W	6.0	6.0
47	4	18	810311	8	1	4	8	0.2	10 22 N	86 10 W	30.0	25.0
49	4	23	810311	3	1	2	8	0.2	10 10 N	86 14 W	10.0	8.0
51	4	25	810311	8	2	3	8	0.0	10 9 N	86 6 W	4.0	4.0
52	4	25	810311	8	2	3	8	0.0	10 12 N	86 7 W	17.6	16.0
62	5	15	810312	10	1	2	14	0.0	10 15 N	86 7 W	8.0	8.0
73	5	27	810312	3	12	3	8	0.2	9 43 N	85 59 W	20.0	12.0
74	5	27	810312	3	12	3	8	0.1	9 37 N	85 59 W	5.0	4.0
75	5	32	810312	2	1	3	13	0.1	10 3 N	86 10 W	6.0	6.0
76	5	33	810312	3	1	3	11	0.1	9 39 N	86 10 W	9.0	9.0
77	5	34	810312	9	2	3	11	0.1	9 31 N	86 10 W	8.0	8.0
79	5	35	810312	9	1	3	14	0.1	10 8 N	86 7 W	8.0	7.0
80	5	36	810312	9	1	3	14	0.0	10 12 N	86 7 W	3.0	2.0
81	5	36	810312	9	1	3	14	0.0	10 16 N	86 7 W	12.0	10.0
83	5	40	810312	3	2	3	11	0.2	9 38 N	86 2 W	5.0	5.0
84	5	40	810312	3	2	3	11	0.1	9 33 N	86 2 W	2.0	2.0

SIGHTINGS BY SPECIES

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

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
101	6	15	810313	5	1	2	11	0.1	9 46 N	85 38 W	1.0	1.0
127	6	36	810313	3	2	2	11	0.0	10 5 N	86 0 W	5.0	5.0
255	10	14	810319	12	12	2	8	0.1	10 26 N	85 58 W	16.0	16.0
299*	13	15	810322	12	12	1	10	0.0	10 35 N	86 22 W	23.0	18.0
309	14	7	810403	6	1	3	8	0.3	10 21 N	85 57 W	18.0	18.0

SIGHTINGS BY SPECIES

SPECIES: FALSE KILLER WHALE (PSEUDORCA CRASSIDENS)

SPECIES CODE: 33

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
99	6	14	810313	11	2	2	13	1.6	9 46 N	85 33 W	52.0	43.0
210*	9	16	810317	11	1	2	13	0.0	10 15 N	86 22 W	25.0	23.0
278	12	39	810321	6	12	2	10	0.1	10 29 N	86 16 W	19.0	18.0

SIGHTINGS BY SPECIES

SPECIES: BEAKED WHALE (ZIPHIID)

SPECIES CODE: 49

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
18*	3	6	810310	9	1	3	8	0.0	8 47 N	86 44 W	3.0	3.0
35*	4	8	810311	12	12	2	11	0.2	9 37 N	85 56 W	2.0	2.0
93	6	10	810313	4	2	2	8	0.1	10 1 N	85 57 W	2.0	2.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED DOLPHIN

SPECIES CODE: 77

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN_POSITION HORZ.	SUN_POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN_SCHOOL_SIZE_EST BEST	MEAN_SCHOOL_SIZE_EST LOW
1*	1	1	810302	10	1	2	11	0.3	10 49 N	86 5 W	290.0	205.0
2*	1	2	810307	11	1	2	14	0.8	10 50 N	86 48 W	430.0	317.0
5*	1	5	810307	6	3	3	12	0.8	10 45 N	86 5 W	80.0	70.0
6	2	1	810309	11	1	4	12	0.0	10 30 N	85 59 W	17.0	15.0
9*	2	7	810309	5	1	4	13	0.0	10 36 N	87 20 W	1.0	1.0
10*	2	8	810309	5	2	4	11	0.3	10 35 N	87 15 W	500.0	300.0
12	2	10	810309	5	2	4	8	0.0	10 23 N	86 11 W	8.0	6.0
13	3	1	810310	9	2	3	11	0.0	10 25 N	86 3 W	8.0	5.0
16*	3	5	810310	9	2	2	10	0.2	9 30 N	86 26 W	2.0	2.0
17*	3	6	810310	9	1	3	12	0.4	9 0 N	86 40 W	1.0	1.0
20*	3	6	810310	9	1	3	13	0.5	8 25 N	86 53 W	15.0	15.0
21*	3	6	810310	9	1	3	14	1.2	8 21 N	86 53 W	57.0	48.0
22*	3	7	810310	0	0	3	11	0.4	8 14 N	86 34 W	2.0	2.0
25*	3	9	810310	0	0	3	12	0.3	9 13 N	86 20 W	7.0	7.0
28	3	11	810310	3	12	4	12	1.5	10 8 N	86 3 W	5.0	2.0
29	3	13	810310	5	12	3	13	0.0	10 28 N	86 0 W	8.0	6.0
30*	4	1	810311	6	1	4	10	0.1	11 0 N	86 35 W	20.0	15.0
31*	4	1	810311	6	1	4	13	0.1	11 0 N	87 19 W	8.0	8.0
36	4	9	810311	6	12	3	10	0.1	9 57 N	85 50 W	40.0	33.0
37	4	9	810311	6	12	3	8	0.3	10 4 N	85 50 W	60.0	40.0
39*	4	12	810311	9	1	3	13	0.4	10 41 N	86 0 W	50.0	40.0
40	4	14	810311	3	2	4	12	0.0	10 37 N	86 4 W	10.0	8.0
41	4	15	810311	3	1	3	11	0.0	10 19 N	86 5 W	1200.0	983.0
45	4	17	810311	8	1	3	14	0.1	10 8 N	86 10 W	6.0	5.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED DOLPHIN

SPECIES CODE: 77

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN_POSITION HORZ.	SUN_POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN_SCHOOL_SIZE_EST BEST	MEAN_SCHOOL_SIZE_EST LOW
48	4	18	810311	8	1	4	11	1.5	10 30 N	86 10 W	90.0	50.0
52	4	25	810311	8	2	3	8	0.0	10 12 N	86 7 W	70.4	64.0
53	4	26	810311	8	2	3	8	0.1	10 18 N	86 7 W	20.0	15.0
54	4	28	810311	3	2	4	14	0.0	10 39 N	86 2 W	20.0	15.0
55*	5	3	810312	10	1	4	11	0.3	10 41 N	86 4 W	300.0	75.0
56	5	4	810312	10	1	3	11	0.1	10 36 N	86 4 W	12.0	8.0
57	5	4	810312	10	1	3	11	0.2	10 31 N	86 5 W	1000.0	300.0
58	5	5	810312	9	2	3	12	0.1	10 22 N	86 4 W	37.0	25.0
61	5	14	810312	10	1	3	14	0.0	10 25 N	86 7 W	19.0	28.0
63	5	19	810312	4	1	2	14	0.2	10 14 N	86 2 W	57.0	45.0
64	5	19	810312	4	1	2	14	0.1	10 18 N	86 2 W	33.0	28.0
65	5	19	810312	4	1	2	12	0.4	10 22 N	86 1 W	12.0	10.0
66	5	19	810312	4	1	2	12	0.1	10 28 N	86 2 W	50.0	40.0
67	5	20	810312	3	1	4	10	0.0	10 31 N	86 2 W	33.0	25.0
68	5	20	810312	3	1	4	11	0.2	10 32 N	86 2 W	28.0	21.0
69	5	20	810312	3	1	4	10	0.0	10 35 N	86 2 W	18.0	14.0
70	5	20	810312	3	1	4	8	0.3	10 37 N	86 2 W	35.0	30.0
72	5	26	810312	3	12	3	13	0.0	10 4 N	86 0 W	207.0	117.0
82	5	39	810312	3	2	3	14	0.0	10 5 N	86 2 W	1.0	1.0
85	5	43	810312	0	0	3	8	0.9	9 56 N	85 55 W	800.0	600.0
87	6	2	810313	9	2	2	14	0.0	10 5 N	85 54 W	2.0	2.0
89	6	3	810313	11	1	3	12	0.1	9 53 N	85 43 W	25.0	20.0
90	6	5	810313	11	2	3	11	0.3	9 51 N	85 39 W	20.0	15.0
91	6	8	810313	5	2	2	8	0.0	9 53 N	85 44 W	20.0	15.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED DOLPHIN

SPECIES CODE: 77

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
92	6	9	810313	4	2	3	10	0.0	9 58 N	85 54 W	25.0	15.0
94	6	11	810313	4	2	3	10	0.0	10 15 N	85 57 W	23.0	15.0
95	6	12	810313	10	2	2	13	0.4	10 28 N	85 59 W	6.0	4.0
96	6	13	810313	10	2	3	12	0.0	10 19 N	86 0 W	7.0	6.0
97	6	14	810313	11	2	2	13	0.7	9 51 N	85 43 W	8.0	8.0
104	6	16	810313	5	1	2	11	0.1	9 48 N	85 41 W	11.0	10.0
105	6	18	810313	4	2	2	11	0.6	10 12 N	86 3 W	875.0	650.0
106	6	19	810313	4	2	2	10	0.1	10 23 N	86 2 W	40.0	28.0
107	6	19	810313	4	2	2	10	1.0	10 26 N	86 3 W	5.0	5.0
108	6	21	810313	10	1	2	13	0.1	10 24 N	86 3 W	17.0	12.0
109	6	21	810313	10	1	2	14	0.2	10 13 N	86 4 W	710.0	563.0
110	6	23	810313	12	1	1	12	0.3	9 48 N	85 40 W	50.0	40.0
111	6	24	810313	6	12	2	8	0.1	9 45 N	85 42 W	2.0	2.0
112	6	24	810313	6	12	2	8	0.1	9 47 N	85 42 W	2.0	2.0
113	6	24	810313	6	12	2	11	0.3	9 48 N	85 46 W	150.0	100.0
114	6	24	810313	6	12	2	12	0.1	9 53 N	85 53 W	8.0	6.0
115	6	24	810313	6	12	2	11	0.7	9 59 N	86 4 W	400.0	200.0
116	6	25	810313	3	12	2	8	0.6	10 14 N	86 6 W	350.0	175.0
118	6	28	810313	3	12	2	8	0.3	10 12 N	85 55 W	12.0	8.0
119	6	31	810313	4	1	3	10	0.0	9 47 N	85 32 W	18.0	18.0
121	6	34	810313	8	1	2	13	0.4	10 4 N	85 56 W	6.0	6.0
122	6	34	810313	8	1	2	12	0.2	10 12 N	85 57 W	20.0	12.0
123	6	34	810313	8	1	2	12	0.1	10 12 N	85 57 W	15.0	15.0
124	6	34	810313	8	1	2	12	0.0	10 15 N	85 56 W	25.0	18.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED DOLPHIN

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OBS.#	FLIGHT	LEG	DATE	SUN_POSITION		BEAUF.	DETECTED	PERP.	LATITUDE	LONGITUDE	MEAN_SCHOOL_SIZE_EST	
			YRMODY	HORZ.	VERT.	NUMBER	BY	DIST.(NM)	DEG MIN	DEG MIN	BEST	LOW
125	6	35	810313	3	2	3	11	0.1	10 24 N	86 0 W	15.0	10.0
126	6	35	810313	3	2	3	11	0.0	10 19 N	85 59 W	40.0	20.0
128	6	37	810313	5	2	2	11	0.0	9 49 N	85 39 W	93.0	60.0
129	6	37	810313	5	2	2	11	0.0	9 49 N	85 38 W	2.0	2.0
130	6	37	810313	5	2	2	10	0.5	9 47 N	85 36 W	40.0	20.0
132	6	40	810313	9	1	1	14	0.4	10 9 N	86 2 W	813.0	600.0
134	6	40	810313	9	1	1	13	0.0	10 10 N	86 2 W	28.0	22.0
135	6	40	810313	9	1	1	12	1.1	10 15 N	86 12 W	16.0	14.0
136	6	41	810313	9	1	2	13	0.1	10 22 N	86 2 W	8.0	8.0
137	6	41	810313	9	1	2	12	0.0	10 21 N	86 3 W	25.0	16.0
139	6	42	810313	3	1	3	11	0.5	10 26 N	86 3 W	25.0	20.0
140	6	42	810313	3	1	3	8	0.0	10 22 N	86 3 W	2.0	2.0
141	6	42	810313	3	1	3	8	0.0	10 16 N	86 3 W	78.0	61.0
143	6	45	810313	9	2	1	8	0.1	10 1 N	86 6 W	20.0	17.0
144	6	46	810313	9	2	2	8	0.2	10 30 N	86 5 W	4.0	4.0
145	7	1	810316	9	2	3	8	0.2	10 6 N	85 55 W	18.0	16.0
146	7	4	810315	3	2	3	13	0.1	10 31 N	85 56 W	7.0	6.0
147	7	10	810315	6	1	1	13	0.3	9 55 N	85 55 W	85.0	45.0
148	7	10	810315	6	1	1	12	0.1	9 58 N	86 0 W	167.0	117.0
149	7	12	810315	3	1	3	13	0.4	10 52 N	86 3 W	35.0	25.0
150	7	12	810315	3	1	3	13	0.3	10 28 N	86 2 W	130.0	100.0
152	7	13	810315	10	1	3	10	0.1	10 27 N	86 4 W	150.0	100.0
153	7	14	810315	12	1	2	8	0.3	9 55 N	85 54 W	130.0	110.0
154	7	16	810315	6	12	1	12	0.3	9 42 N	85 33 W	24.0	20.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED DOLPHIN

SPECIES CODE: 77

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
157	7	20	810315	4	12	3	14	0.0	10 18 N	86 6 W	150.0	100.0
158	7	20	810315	4	12	3	14	0.1	10 27 N	86 6 W	30.0	25.0
159	7	21	810316	2	1	3	13	0.1	10 12 N	85 57 W	25.0	20.0
160	7	24	810315	5	1	3	13	0.7	9 45 N	85 28 W	13.0	13.0
161	7	25	810315	11	1	3	11	0.2	9 51 N	85 43 W	63.0	50.0
162	7	26	810315	9	1	3	10	0.3	10 3 N	85 59 W	118.0	87.0
163	7	26	810315	9	1	3	8	0.0	10 2 N	86 0 W	15.0	14.0
164	7	27	810315	2	1	3	13	0.4	10 3 N	86 1 W	147.0	87.0
165	7	28	810315	6	2	3	12	0.0	9 58 N	85 59 W	115.0	85.0
166	7	28	810315	6	2	3	14	0.3	9 45 N	85 31 W	60.0	47.0
167	7	29	810315	11	2	3	11	0.1	9 53 N	85 49 W	90.0	63.0
168	7	30	810315	8	2	3	10	0.3	10 4 N	86 4 W	115.0	84.0
169	7	30	810315	8	2	3	11	0.0	10 28 N	86 4 W	13.0	13.0
170	8	2	810316	9	2	2	13	0.2	10 18 N	86 8 W	19.0	18.0
171	8	2	810316	9	2	2	13	0.4	10 12 N	86 8 W	70.0	50.0
172	8	3	810316	9	2	3	13	0.9	10 5 N	86 9 W	55.0	45.0
173	8	6	810316	12	2	3	14	0.3	9 49 N	85 44 W	27.0	24.0
174	8	6	810316	12	2	3	13	0.1	9 48 N	85 44 W	20.0	20.0
175	8	7	810316	12	2	2	13	0.3	9 46 N	85 39 W	30.0	30.0
176	8	10	810316	3	2	3	11	0.5	10 7 N	86 7 W	6.0	6.0
177	8	11	810316	3	2	2	10	0.0	10 25 N	86 6 W	100.0	70.0
178	8	11	810316	3	2	2	11	0.1	10 25 N	86 6 W	45.0	35.0
179	8	12	810316	10	1	2	12	0.6	10 22 N	86 3 W	31.0	26.0
180	8	14	810316	12	1	3	12	0.6	9 58 N	85 59 W	155.0	113.0

SIGHTINGS BY SPECIES

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OBS.#	FLIGHT	LEG	DATE YRMODY	SUN_POSITION HORZ.	SUN_POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN_SCHOOL_SIZE_EST BEST	MEAN_SCHOOL_SIZE_EST LOW
182	8	19	810316	4	1	2	10	0.1	10 18 N	86 2 W	28.0	28.0
183	8	21	810316	9	12	1	12	0.5	10 26 N	86 0 W	63.0	53.0
184	8	21	810316	9	12	1	13	0.2	10 23 N	86 0 W	20.0	19.0
185	8	21	810316	9	12	1	14	0.1	10 20 N	86 0 W	32.0	28.0
186	8	21	810316	9	12	1	14	0.0	10 17 N	86 0 W	19.0	17.0
187	8	23	810316	12	12	2	14	0.0	9 56 N	85 52 W	49.0	41.0
188	8	23	810316	12	12	2	13	1.0	9 55 N	85 50 W	140.0	108.0
189	8	23	810316	12	12	2	14	0.0	9 54 N	85 58 W	58.0	45.0
190	8	24	810316	12	12	2	14	0.0	9 52 N	85 43 W	58.0	48.0
191	8	24	810316	12	12	2	14	0.1	9 49 N	85 38 W	33.0	28.0
192	8	24	810316	12	12	2	14	0.0	9 47 N	85 33 W	175.0	138.0
194	8	29	810316	3	12	3	11	0.1	10 8 N	85 58 W	93.0	70.0
196	9	2	810317	12	2	3	8	0.3	9 56 N	86 3 W	300.0	250.0
197	9	4	810317	12	2	3	11	0.0	9 48 N	85 47 W	130.0	100.0
198	9	6	810317	5	2	2	12	0.1	9 56 N	86 0 W	40.0	30.0
199	9	8	810317	3	2	3	14	0.6	10 2 N	86 10 W	33.0	23.0
200	9	8	810317	3	2	3	13	0.2	10 12 N	86 8 W	16.0	15.0
202	9	11	810317	10	1	3	8	0.3	10 0 N	86 15 W	63.0	29.0
203	9	13	810317	12	1	2	8	0.2	9 52 N	86 2 W	30.0	20.0
205	9	14	810317	6	1	2	14	0.6	9 50 N	85 59 W	80.0	70.0
206	9	14	810317	6	1	2	14	0.6	9 58 N	86 17 W	244.0	175.0
207*	9	15	810317	4	1	2	14	0.7	10 25 N	86 23 W	30.0	25.0
208*	9	15	810317	4	1	2	14	0.7	10 29 N	86 24 W	19.0	15.0
209*	9	16	810317	11	1	2	11	0.5	10 18 N	86 22 W	40.0	20.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED DOLPHIN

SPECIES CODE: 77

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN_POSITION HORZ.	SUN_POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN_SCHOOL_SIZE_EST BEST	MEAN_SCHOOL_SIZE_EST LOW
211	9	20	810317	6	12	3	13	0.2	9 49 N	85 57 W	400.0	300.0
212	9	20	810317	6	12	3	13	0.2	9 53 N	86 5 W	35.0	30.0
213	9	20	810317	6	12	3	13	0.7	9 52 N	86 8 W	20.0	15.0
214	9	23	810317	3	12	2	12	0.6	10 23 N	86 20 W	19.0	17.0
215	9	23	810317	3	12	2	13	0.2	10 30 N	86 20 W	30.0	30.0
216	10	1	810319	2	2	2	12	0.1	10 28 N	86 7 W	18.0	18.0
217	10	1	810319	2	2	2	12	0.1	10 25 N	86 7 W	23.0	18.0
218	10	2	810319	11	2	2	14	0.6	9 55 N	85 56 W	76.0	65.0
219	10	2	810319	11	2	2	14	0.2	9 53 N	85 53 W	105.0	90.0
220	10	2	810319	11	2	2	12	0.0	9 50 N	85 47 W	35.0	27.0
221	10	2	810319	11	2	2	12	0.1	9 47 N	85 41 W	17.0	17.0
222	10	3	810319	5	1	2	11	0.1	9 49 N	85 42 W	24.0	18.0
223	10	3	810319	5	1	2	8	0.3	9 55 N	85 56 W	100.0	80.0
224	10	3	810319	5	1	2	11	0.0	9 56 N	85 57 W	42.0	30.0
226	10	4	810319	3	1	2	8	0.1	10 28 N	86 6 W	18.0	15.0
227	10	5	810319	10	1	2	14	0.4	10 27 N	86 4 W	493.2	373.2
228	10	5	810319	10	1	2	13	0.1	10 22 N	86 4 W	170.0	140.0
232	10	6	810319	12	1	1	12	0.6	9 58 N	85 59 W	63.0	54.0
233	10	8	810319	6	1	2	10	0.2	9 55 N	85 51 W	25.0	19.0
234	10	8	810319	6	1	2	10	0.0	9 57 N	85 57 W	100.0	75.0
236	10	9	810319	3	1	2	11	0.3	10 9 N	86 2 W	40.0	35.0
237	10	9	810319	3	1	2	10	0.3	10 12 N	86 2 W	80.0	58.0
239	10	9	810319	3	1	2	8	0.3	10 20 N	86 2 W	150.0	100.0
240	10	9	810319	3	1	2	10	0.2	10 23 N	86 2 W	426.8	273.2

SIGHTINGS BY SPECIES

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OBS.#	FLIGHT	LEG	DATE YRMODY	SUN_POSITION HORZ.	SUN_POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN_SCHOOL_SIZE_EST BEST	MEAN_SCHOOL_SIZE_EST LOW
241	10	9	810315	3	1	2	10	0.1	10 26 N	86 1 W	9.0	9.0
242	10	10	810319	9	12	1	14	0.0	10 30 N	85 59 W	16.0	15.0
243	10	10	810319	9	12	1	13	0.1	10 22 N	86 0 W	40.0	40.0
244	10	10	810310	9	12	1	13	0.2	10 20 N	85 59 W	25.0	20.0
245	10	10	810319	9	12	1	13	0.6	10 10 N	85 59 W	183.0	137.0
246	10	11	810319	12	12	2	13	0.4	9 58 N	85 56 W	100.0	80.0
247	10	11	810319	12	12	2	14	0.2	9 57 N	85 54 W	63.0	55.0
248	10	11	810319	12	12	2	14	0.1	9 52 N	85 45 W	40.0	35.0
249	10	11	810319	12	12	2	13	0.6	9 49 N	85 37 W	30.0	20.0
250	10	13	810319	12	12	2	11	0.6	9 57 N	85 51 W	40.0	33.0
251	10	14	810319	12	12	2	10	0.5	10 2 N	85 58 W	150.0	100.0
253	10	14	810319	12	12	2	8	0.3	10 16 N	85 58 W	202.0	153.0
254	10	14	810319	12	12	2	8	0.0	10 19 N	85 58 W	80.0	60.0
256	10	19	810319	9	2	3	13	0.2	10 18 N	86 6 W	47.0	38.0
258	10	20	810319	3	2	3	8	0.7	10 11 N	86 5 W	30.0	23.0
259	10	21	810319	9	2	3	14	0.0	10 8 N	86 2 W	50.0	40.0
260	10	21	810319	9	2	3	13	1.0	10 17 N	86 2 W	450.0	300.0
261	11	5	810320	12	1	2	8	0.2	9 53 N	85 43 W	35.0	20.0
262	11	7	810320	6	1	3	14	0.2	9 45 N	85 32 W	17.0	15.0
263	11	7	810320	6	1	3	12	0.0	9 45 N	85 32 W	45.0	38.0
264	11	12	810320	10	12	4	8	0.3	10 24 N	86 0 W	150.0	100.0
265	11	13	810320	0	0	3	8	0.2	10 17 N	86 0 W	50.0	40.0
266	11	18	810320	0	0	2	14	0.0	9 51 N	85 46 W	23.0	18.0
267	12	15	810321	3	2	3	8	0.0	10 28 N	85 56 W	20.0	15.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED DOLPHIN

SPECIES CODE: 77

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
268	12	26	810321	5	1	2	11	0.0	9 54 N	85 58 W	19.0	19.0
269	12	30	810321	3	1	3	11	0.1	10 21 N	86 6 W	30.0	23.0
271	12	30	810321	3	1	3	11	0.2	10 28 N	86 7 W	50.0	30.0
273	12	30	810321	3	1	3	11	0.3	10 29 N	86 7 W	25.0	20.0
275	12	32	810321	9	1	2	13	0.6	10 24 N	86 11 W	125.0	95.0
276	12	32	810321	9	1	2	13	0.2	10 23 N	86 12 W	135.0	100.0
277	12	36	810321	0	0	2	11	0.9	9 41 N	85 41 W	1475.0	1150.0
279	12	41	810321	3	1	3	10	0.3	10 38 N	86 0 W	30.0	20.0
280	12	42	810321	3	1	2	11	0.3	10 21 N	86 0 W	30.0	25.0
281	12	44	810321	8	1	2	12	0.6	10 22 N	86 5 W	450.0	367.0
282	12	46	810321	3	1	3	8	0.2	10 34 N	86 10 W	30.0	20.0
283	12	46	810321	3	1	3	8	0.3	10 33 N	86 10 W	700.0	600.0
284	12	46	810321	3	1	3	11	0.0	10 32 N	86 10 W	20.0	16.0
286	13	1	810322	0	0	2	8	0.1	10 5 N	86 0 W	275.0	200.0
288	13	2	810322	0	0	2	10	0.2	9 51 N	85 51 W	40.0	30.0
289	13	4	810322	5	2	2	12	0.2	9 43 N	85 41 W	80.0	70.0
290	13	5	810322	0	0	1	12	0.2	10 15 N	85 55 W	23.0	20.0
291	13	6	810322	5	1	2	11	0.1	10 24 N	86 3 W	40.0	30.0
292	13	6	810322	5	1	2	11	0.4	10 30 N	86 5 W	60.0	30.0
293	13	6	810322	5	1	2	10	0.2	10 29 N	86 11 W	28.0	20.0
301	13	15	810322	12	12	1	11	0.4	10 27 N	86 8 W	419.0	313.0
302	14	1	810403	12	1	3	12	0.2	10 34 N	86 6 W	21.0	17.0
303	14	3	810403	5	1	3	14	0.3	10 3 N	86 0 W	20.0	15.0
304	14	3	810403	5	1	3	13	0.0	10 31 N	85 57 W	35.0	25.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED DOLPHIN

SPECIES CODE: 77

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN_POSITION HORZ.	SUN_POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN_SCHOOL_SIZE_EST BEST	MEAN_SCHOOL_SIZE_EST LOW
305	14	4	810403	12	1	3	14	0.3	10 28 N	86 3 W	500.0	333.0
306	14	5	810403	5	1	3	10	0.0	10 25 N	85 58 W	90.0	60.0
307	14	6	810403	12	1	3	11	0.5	10 23 N	86 2 W	26.0	26.0
308	14	7	810403	6	1	3	8	0.3	10 22 N	86 0 W	40.0	30.0
310	14	10	810403	12	2	3	14	0.2	10 14 N	86 1 W	28.0	20.0
311	14	11	810403	6	2	3	13	0.4	10 13 N	86 2 W	60.0	45.0
313	14	11	810403	6	2	3	13	0.3	10 12 N	85 59 W	19.0	19.0
314	14	11	810403	6	2	3	14	0.8	10 11 N	85 59 W	963.0	775.0
315	14	12	810403	12	2	3	14	0.3	10 9 N	85 59 W	800.0	700.0
316	14	12	810403	12	2	3	14	0.5	10 9 N	86 0 W	450.0	390.0
317	14	13	810403	7	2	3	10	0.9	10 8 N	86 3 W	433.0	327.0
318	14	13	810403	7	2	3	10	3.1	10 12 N	86 4 W	337.8	270.0
319	14	13	810403	7	2	3	11	0.0	10 3 N	85 49 W	21.0	19.0
320	14	14	810403	11	2	2	11	0.0	10 3 N	85 55 W	33.0	25.0
321	14	15	810403	11	2	3	11	0.0	10 12 N	86 2 W	900.0	800.0
322	15	5	810404	11	2	3	11	0.3	10 0 N	86 6 W	75.0	50.0
323	15	10	810404	5	2	3	14	0.5	9 58 N	85 59 W	417.0	333.0
326	15	19	810404	5	1	3	12	0.2	9 52 N	85 36 W	650.0	530.0
327	15	22	810404	12	1	3	13	0.8	9 59 N	85 54 W	400.0	317.0
328	15	24	810404	6	1	2	10	0.0	9 55 N	85 42 W	275.0	161.0
329	15	28	810404	3	12	3	10	0.2	10 24 N	85 59 W	88.0	60.0
330	15	33	810404	5	1	3	14	0.0	10 30 N	85 57 W	17.0	12.0
331	15	33	810404	5	1	3	13	0.3	10 29 N	85 51 W	20.0	18.0
332	15	33	810404	5	1	3	14	0.0	10 29 N	85 59 W	20.0	18.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED DOLPHIN

SPECIES CODE: 77

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
333	15	38	810404	5	2	2	10	0.1	10 31 N	85 59 W	45.0	25.0
334	15	43	810404	5	2	3	10	0.1	9 59 N	85 52 W	40.0	20.0
335	15	43	810404	5	2	3	8	0.2	9 53 N	85 42 W	32.0	23.0
336	15	45	810404	5	2	3	10	0.1	9 51 N	85 34 W	30.0	30.0
337	15	43	810404	5	2	3	8	0.0	9 51 N	85 33 W	40.0	30.0
338	15	47	810404	1	2	3	12	1.0	9 48 N	85 33 W	42.0	27.0
339	15	52	810404	10	3	2	13	0.1	10 18 N	85 54 W	25.0	15.0
340	16	2	810405	9	2	3	13	0.3	10 18 N	85 58 W	25.0	20.0
341	16	7	810405	11	2	3	13	0.6	9 57 N	85 52 W	100.0	60.0
342	16	18	810405	9	2	2	12	0.3	10 30 N	86 0 W	225.0	190.0
343	16	19	810405	9	2	3	13	0.4	10 22 N	86 1 W	110.0	75.0
344	16	19	810405	9	2	3	14	0.9	10 18 N	85 59 W	61.0	38.0
345	16	24	810405	11	1	2	14	0.2	9 52 N	85 43 W	25.0	20.0
346	16	24	810405	11	1	2	13	0.3	9 51 N	85 40 W	35.0	30.0
347	16	28	810405	6	1	3	10	0.5	9 49 N	85 40 W	100.0	50.0
348	16	28	810405	6	1	3	8	0.2	9 49 N	85 40 W	113.0	88.0
349	16	28	810405	6	1	3	11	0.7	9 51 N	85 48 W	150.0	100.0
351	16	34	810405	4	1	3	13	0.0	10 14 N	85 59 W	100.0	65.0
352	16	34	810405	4	1	3	12	0.7	10 16 N	86 2 W	600.0	500.0
353	16	34	810405	4	1	3	12	0.4	10 19 N	86 3 W	25.0	20.0
354	16	34	810405	4	1	3	12	0.9	10 24 N	86 8 W	175.0	133.0
355	16	35	810405	2	1	3	13	0.0	10 24 N	86 8 W	300.0	200.0
356	16	35	810405	2	1	3	12	0.7	10 23 N	86 7 W	1450.0	1125.0
357	16	35	810405	2	1	3	13	0.3	10 29 N	86 1 W	283.0	210.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED DOLPHIN

SPECIES CODE: 77

OBS.#	FLIGHT	LEG	DATE	SUN_POSITION		BEAUF.	DETECTED	PERP.	LATITUDE	LONGITUDE	MEAN_SCHOOL_SIZE_EST	
			YRMODY	HORZ.	VERT.	NUMBER	BY	DIST.(NM)	DEG MIN	DEG MIN	BEST	LOW
358	16	39	810405	5	1	3	10	0.0	9 58 N	85 49 W	25.0	20.0
359	16	39	810405	5	1	3	10	0.1	9 58 N	85 47 W	18.0	15.0
360*	16	42	810405	11	1	3	13	0.3	9 38 N	85 26 W	40.0	30.0
361*	16	42	810405	11	1	3	14	0.1	9 39 N	85 27 W	20.0	20.0
362	16	42	810405	11	1	3	12	0.5	9 40 N	85 30 W	40.0	30.0
363	16	42	810405	11	1	3	13	0.2	9 41 N	85 30 W	60.0	40.0
364	16	42	810405	11	1	3	14	0.2	9 42 N	85 31 W	25.0	18.0
365	16	42	810405	11	1	3	14	0.1	9 41 N	85 31 W	40.0	30.0
366	16	42	810405	11	1	3	13	0.4	9 41 N	85 30 W	20.0	20.0
367	16	43	810405	10	1	3	14	0.2	9 51 N	85 43 W	50.0	40.0
368	16	43	810405	10	1	3	12	0.8	9 49 N	85 43 W	525.0	400.0
369	16	44	810405	10	2	3	14	0.0	9 57 N	85 50 W	225.0	150.0
370	16	44	810405	10	2	3	13	0.3	9 56 N	85 48 W	55.0	0.0
371	16	44	810405	10	2	3	13	0.8	9 55 N	85 50 W	40.0	30.0
372	16	45	810405	5	2	3	11	0.7	9 50 N	85 50 W	350.0	275.0
373	16	45	810405	5	2	3	11	0.0	9 49 N	85 48 W	242.0	158.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED SMALL WHALE

SPECIES CODE: 78

OBS.#	FLIGHT	LEG	DATE	SUN_POSITION		BEAUF.	DETECTED	PERP.	LATITUDE	LONGITUDE	MEAN_SCHOOL_SIZE_EST	
			YRMODY	HORZ.	VERT.	NUMBER	BY	DIST.(NM)	DEG MIN	DEG MIN	BEST	LOW
15	3	1	810310	9	2	3	11	0.0	10 13 N	86 7 W	6.0	5.0
19*	3	6	810310	9	1	3	8	0.2	8 34 N	86 50 W	1.0	1.0
23*	3	8	810310	0	0	3	11	0.3	8 51 N	86 27 W	2.0	2.0
24*	3	9	810310	0	0	3	13	0.2	9 13 N	86 20 W	2.0	2.0
26*	3	9	810310	0	0	3	12	0.8	9 24 N	86 17 W	3.0	1.0
34*	4	7	810311	1	12	2	12	0.3	9 30 N	86 22 W	2.0	2.0
71	5	23	810312	11	1	3	8	0.3	10 34 N	85 57 W	15.0	10.0
78	5	35	810312	9	2	3	11	0.0	9 40 N	86 7 W	1.0	1.0
86	5	43	810312	0	0	3	12	0.0	9 57 N	85 56 W	4.0	3.0
88	6	2	810313	9	2	2	12	0.4	10 0 N	85 55 W	6.0	5.0
100	6	15	810313	5	1	2	10	0.1	9 44 N	85 32 W	23.0	23.0
103	6	15	810313	5	1	2	11	0.0	9 48 N	85 40 W	1.0	1.0
131	6	39	810313	11	1	1	12	0.3	10 0 N	86 1 W	6.0	5.0
142	6	43	810313	3	2	3	11	0.1	10 12 N	86 4 W	1.0	1.0
155	7	16	810315	6	12	1	13	0.4	9 46 N	85 40 W	115.0	95.0
181	8	16	810316	6	1	2	11	0.2	9 44 N	85 31 W	15.0	15.0
195	9	2	810317	12	2	3	10	1.4	10 0 N	86 8 W	20.0	15.0
225	10	4	810319	3	1	2	11	0.0	10 11 N	86 6 W	33.0	28.0
230	10	5	810319	10	1	2	13	0.1	10 14 N	86 4 W	48.0	40.0
238	10	9	810319	3	1	2	11	0.7	10 13 N	86 2 W	98.0	63.0
287	13	2	810322	0	0	2	11	0.2	9 55 N	85 51 W	19.0	15.0
294	13	6	810322	5	1	2	8	0.2	10 31 N	86 13 W	25.0	20.0
295	13	6	810322	5	1	2	11	0.0	10 31 N	86 14 W	40.0	30.0
297	13	13	810322	5	1	2	11	0.3	10 14 N	86 1 W	20.0	17.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED SMALL WHALE

SPECIES CODE: 78

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
300	13	15	810322	12	12	1	8	0.2	10 30 N	86 14 W	18.0	18.0
324	15	14	810404	3	2	3	14	0.2	10 23 N	86 1 W	30.0	25.0
325	15	17	810404	10	1	5	14	0.0	10 5 N	85 56 W	0.0	3.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED LARGE WHALE

SPECIES CODE: 79

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
8*	2	6	810309	5	1	3	12	0.4	10 49 N	88 15 W	1.0	1.0

SIGHTINGS BY SPECIES

SPECIES: SPOTTED DOLPHIN (STENELLA ATTENUATA)

SPECIES CODE: 90

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG	LATITUDE MIN		LONGITUDE DEG	LONGITUDE MIN		MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
3*	1	4	810307	6	3	4	14	0.2	10	45	N	86	28	W	750.0	0.0
4*	1	4	810307	6	3	4	14	0.0	10	44	N	86	15	W	675.0	0.0
38	4	12	810311	9	1	3	12	0.0	10	36	N	86	0	W	35.0	25.0
50	4	23	810311	3	1	2	8	0.2	10	7	N	86	14	W	400.0	300.0
59	5	9	810312	9	1	3	11	0.0	10	30	N	86	10	W	70.0	40.0
60*	5	10	810312	9	1	4	8	0.2	10	46	N	86	10	W	200.0	150.0
138	6	42	810313	3	1	3	8	0.0	10	29	N	86	3	W	32.0	30.0
151	7	13	810315	10	1	3	10	0.9	10	24	N	86	4	W	538.0	395.0
156	7	17	810315	6	12	2	13	0.5	9	54	N	85	54	W	95.0	75.0
193	8	26	810316	12	12	3	8	0.1	9	56	N	85	50	W	333.0	233.0
204	9	13	810317	12	1	2	11	1.0	9	48	N	85	47	W	108.5	92.5
240	10	9	810319	3	1	2	10	0.2	10	23	N	86	2	W	640.2	409.8
270	12	30	810321	3	1	3	8	0.2	10	23	N	86	8	W	150.0	100.0
272	12	30	810321	3	1	3	11	0.1	10	29	N	86	7	W	25.0	20.0
274	12	31	810321	9	1	3	14	0.9	10	37	N	86	11	W	506.8	386.8
312	14	11	810403	6	2	3	13	0.4	10	12	N	86	0	W	379.8	300.0

SIGHTINGS BY SPECIES

SPECIES: UNIDENTIFIED CETACEAN

SPECIES CODE: 96

OBS.#	FLIGHT	LEG	DATE YRMODY	SUN POSITION HORZ.	SUN POSITION VERT.	BEAUF. NUMBER	DETECTED BY	PERP. DIST.(NM)	LATITUDE DEG MIN	LONGITUDE DEG MIN	MEAN SCHOOL SIZE EST BEST	MEAN SCHOOL SIZE EST LOW
98	6	14	810313	11	2	2	13	0.2	9 49 N	85 39 W	1.0	1.0
117	6	26	810313	3	12	3	11	0.4	10 30 N	86 5 W	30.0	20.0
120	6	32	810313	11	1	3	13	0.2	9 56 N	85 50 W	2.0	2.0
133	6	40	810313	9	1	1	13	0.0	10 9 N	86 2 W	8.0	6.0

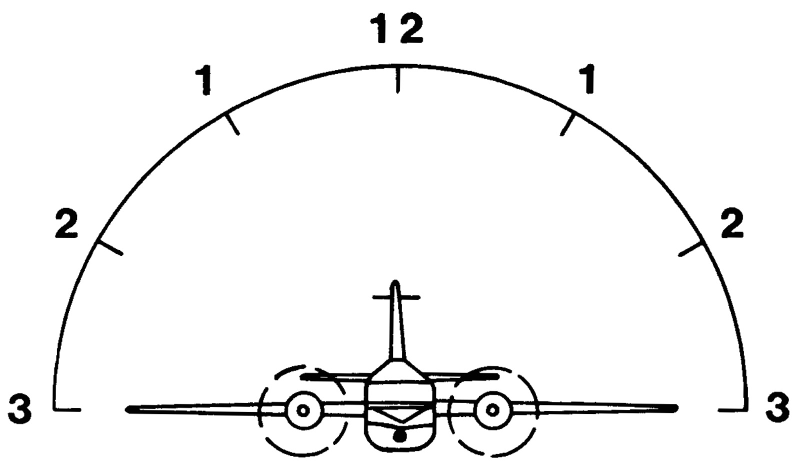
* - Detected outside study area

SIGHTING SUMMARY

SPECIES NAME (SCIENTIFIC NAME)	SPECIES CODE	SPECIES TOTAL	SIGHTINGS PURE	SIGHTINGS MIXED	ESTIMATED-AVERAGED-TOTAL-NUMBERS LOW / N	HIGH / N	BEST / N
SPINNER DOLPHIN (STENELLA LONGIROSTRIS)	3	10	5	5	366.27(10)	580.71(10)	458.31(10)
COASTAL SPOTTED DOLPHIN (S.A. GRAFFMANI)	6	6	5	1	214.13(6)	350.63(6)	278.30(6)
STRIPED DOLPHIN (S. COERULEOALBA)	13	2	2	0	118.50(2)	238.50(2)	161.00(2)
RISSO'S DOLPHIN (GRAMPUS GRISEUS)	21	29	28	1	8.28(29)	10.31(29)	9.40(29)
UNIDENTIFIED DOLPHIN	77	280	276	4	92.52(279)	176.47(278)	124.69(280)
SPOTTED DOLPHIN (STENELLA ATTENUATA)	90	16	11	5	182.65(14)	327.79(14)	308.64(16)
TOTALS		343	327	16			

SIGHTING SUMMARY

SPECIES NAME (SCIENTIFIC NAME)	SPECIES CODE	SPECIES TOTAL	SIGHTINGS PURE	MIXED	ESTIMATED-AVERAGED-TOTAL-NUMBERS LOW / N	HIGH / N	BEST / N
FALSE KILLER WHALE (PSEUDORCA CRASSIDENS)	33	3	3	0	28.00(3)	39.33(3)	32.00(3)
BEAKED WHALE (ZIPHIID)	49	3	3	0	2.33(3)	2.33(3)	2.33(3)
UNIDENTIFIED SMALL WHALE	78	27	27	0	16.52(27)	31.12(26)	21.31(26)
UNIDENTIFIED LARGE WHALE	79	1	1	0	1.00(1)	1.00(1)	1.00(1)
UNIDENTIFIED CETACEAN	96	4	4	0	7.25(4)	13.25(4)	10.25(4)
TOTALS		38	38	0			
GRAND TOTALS		381	365	16			



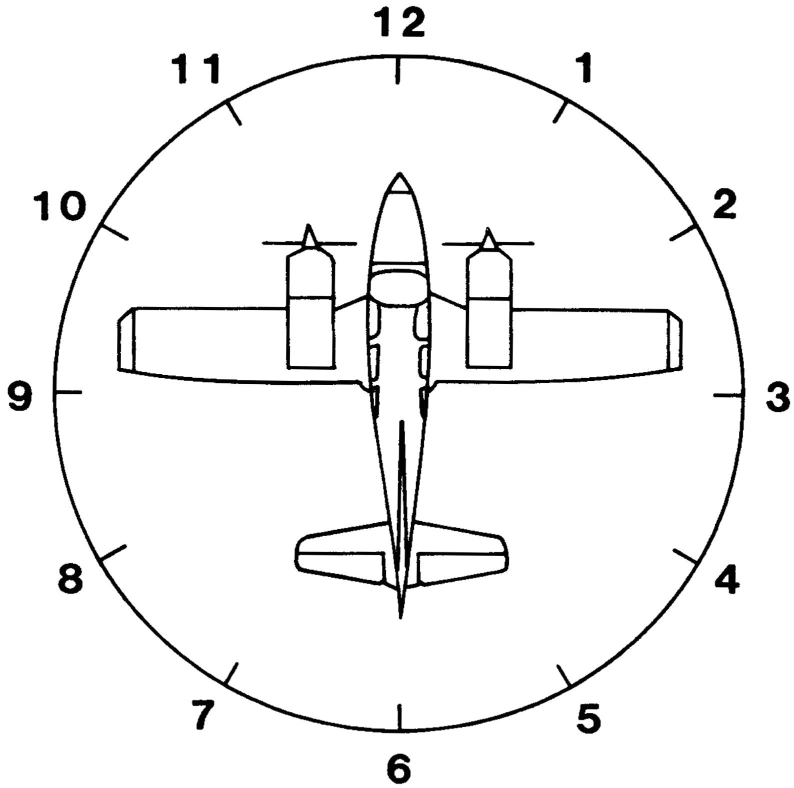


Figure 1. Vertical (top) and horizontal (bottom) sun positions. Cloudy conditions denoted by zero horizontal and vertical position.

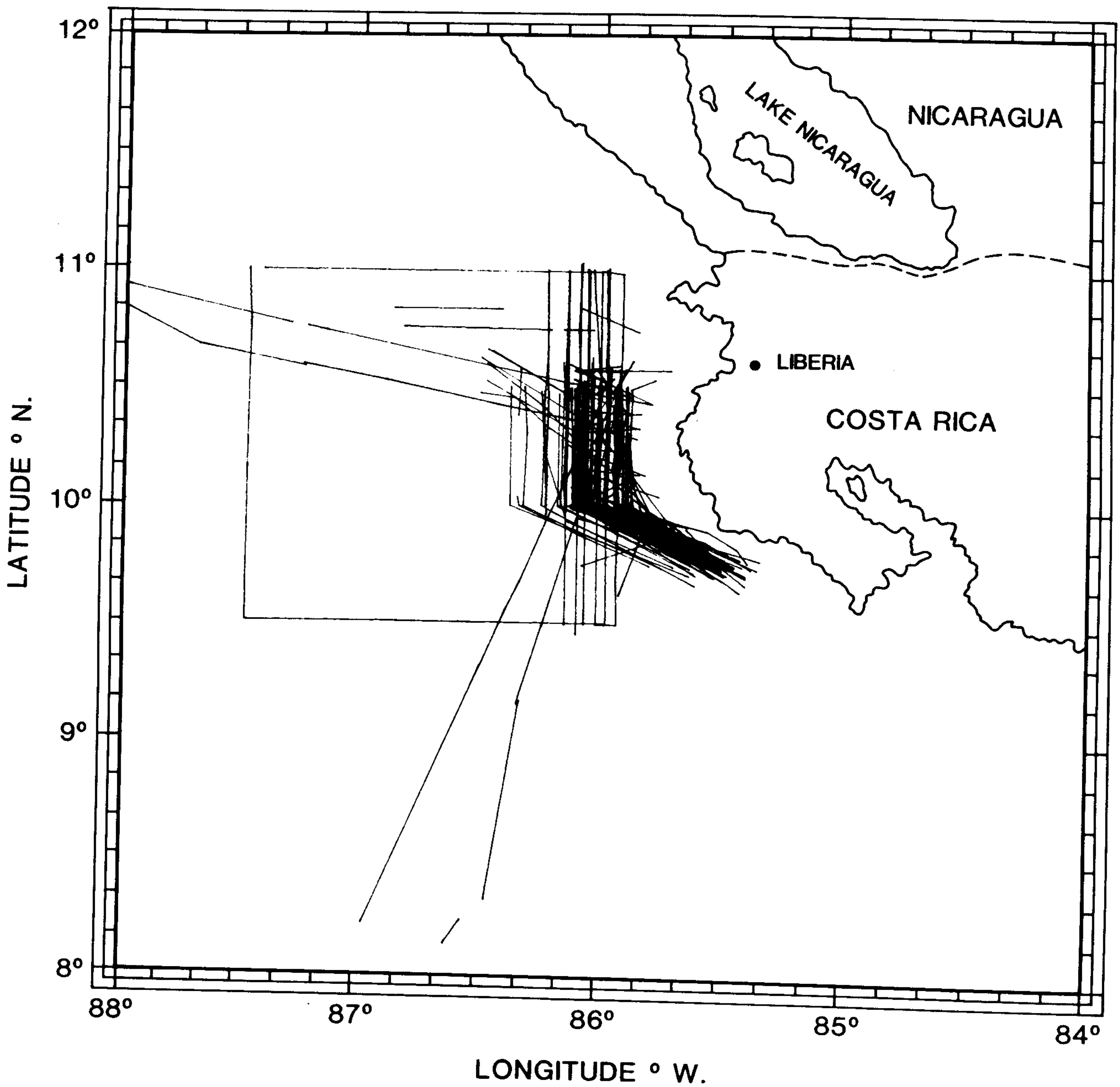


Figure 2. Tracklines flown from the airplane during flights 1 through 16.

AERIAL SURVEY TRANSECT RECORD

FLIGHT: ______________ LEG ______________ DATE: ______________

FROM ______________ TO. ______________

BLANK	FLIGHT NO.	LEG NO.	DATE YR	MO	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.	VERT	BEAUFORT NO.

REASON FOR POSITION

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

LATITUDE DEG.	MIN.	N/S	LONGITUDE DEG.	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

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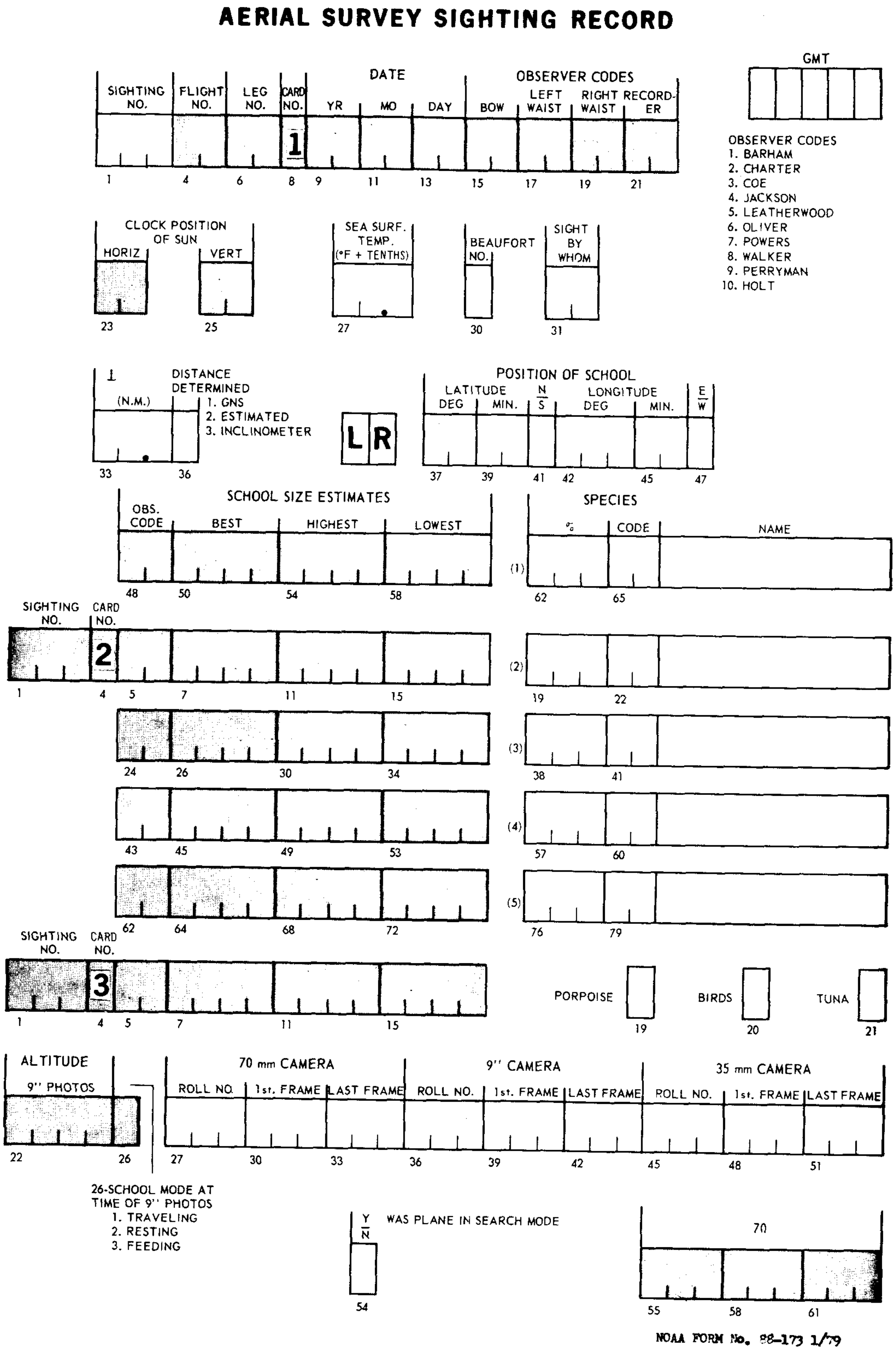
Figure 3. Aerial survey transect record.


AERIAL SURVEY SIGHTING RECORD

SIGHTING NO. | FLIGHT NO. | LEG NO. | CARD NO. 1 | DATE: YR, MO, DAY | OBSERVER CODES: BOW, LEFT WAIST, RIGHT WAIST, RECORDER

1 4 6 8 9 11 13 15 17 19 21

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 (23), VERT (25) | SEA SURF. TEMP. (°F + TENTHS) (27) | BEAUFORT NO. (30) | SIGHT BY WHOM (31)

⊥ (N.M.) (33) | DISTANCE DETERMINED (36): 1. GNS 2. ESTIMATED 3. INCLINOMETER | L R

POSITION OF SCHOOL: LATITUDE DEG, MIN. | N/S | LONGITUDE DEG, MIN. | E/W

37 39 41 42 45 47

SCHOOL SIZE ESTIMATES: OBS. CODE | BEST | HIGHEST | LOWEST

48 50 54 58

SPECIES: % | CODE | NAME

(1) 62 65

SIGHTING NO. | CARD NO. 2

1 4 5 7 11 15

(2) 19 22

24 26 30 34 (3) 38 41

43 45 49 53 (4) 57 60

62 64 68 72 (5) 76 79

SIGHTING NO. | CARD NO. 3

1 4 5 7 11 15

PORPOISE (19) BIRDS (20) TUNA (21)

ALTITUDE 9" PHOTOS (22, 26)

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

70 mm CAMERA: ROLL NO. | 1st. FRAME | LAST FRAME (27, 30, 33)
9" CAMERA: ROLL NO. | 1st. FRAME | LAST FRAME (36, 39, 42)
35 mm CAMERA: ROLL NO. | 1st. FRAME | LAST FRAME (45, 48, 51)

Y/N WAS PLANE IN SEARCH MODE (54)

70 (55, 58, 61)

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Figure 4. Aerial survey sighting record.

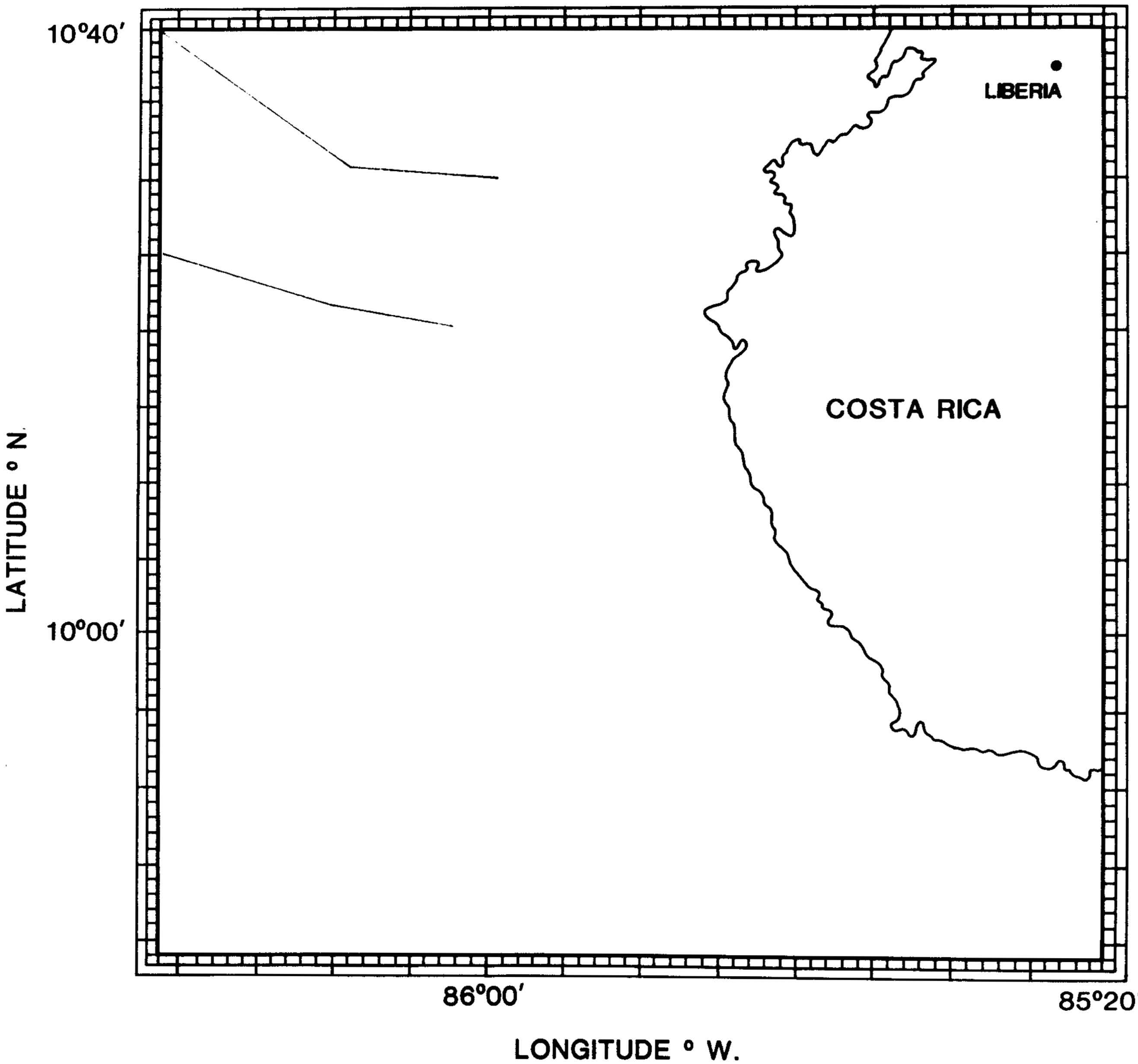

Figure 5. Tracklines flown in the study area during flight 2. Study area defined in text.

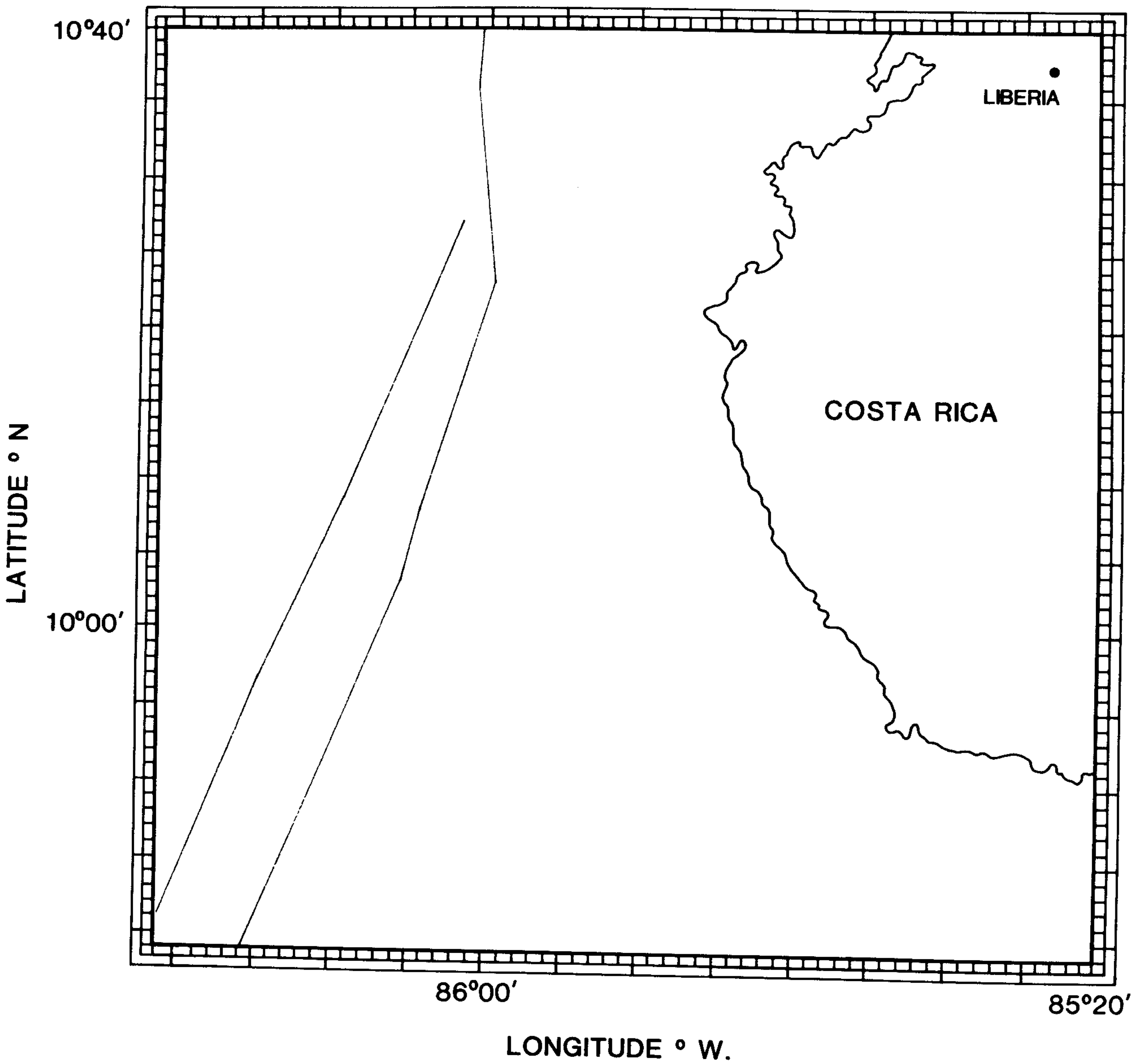

Figure 6. Tracklines flown in the study area during flight 3. Study area defined in text.

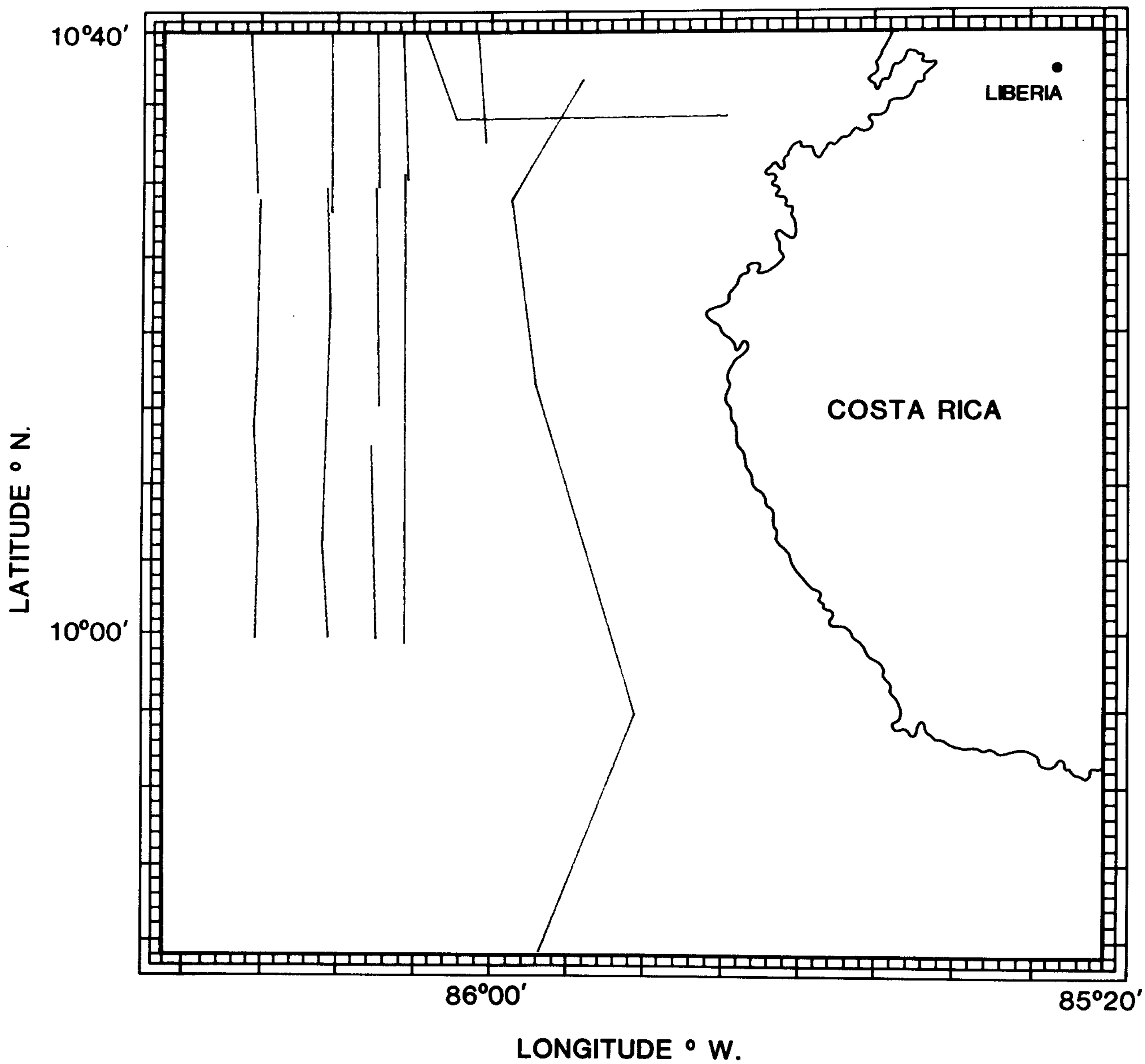

Figure 7. Tracklines flown in the study area during flight 4. Study area defined in text.

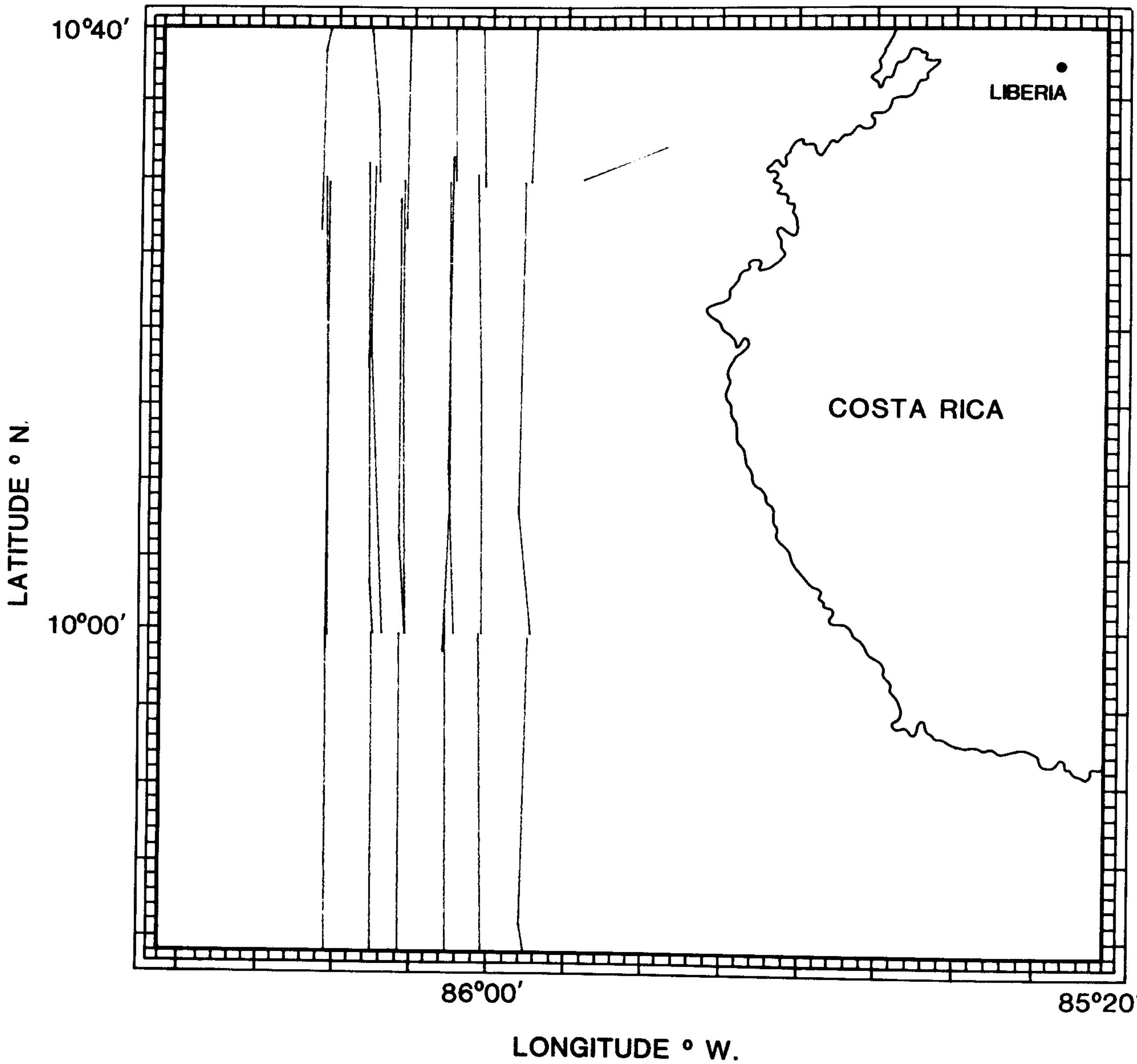

Figure 8. Tracklines flown in the study area during flight 5. Study area defined in text.

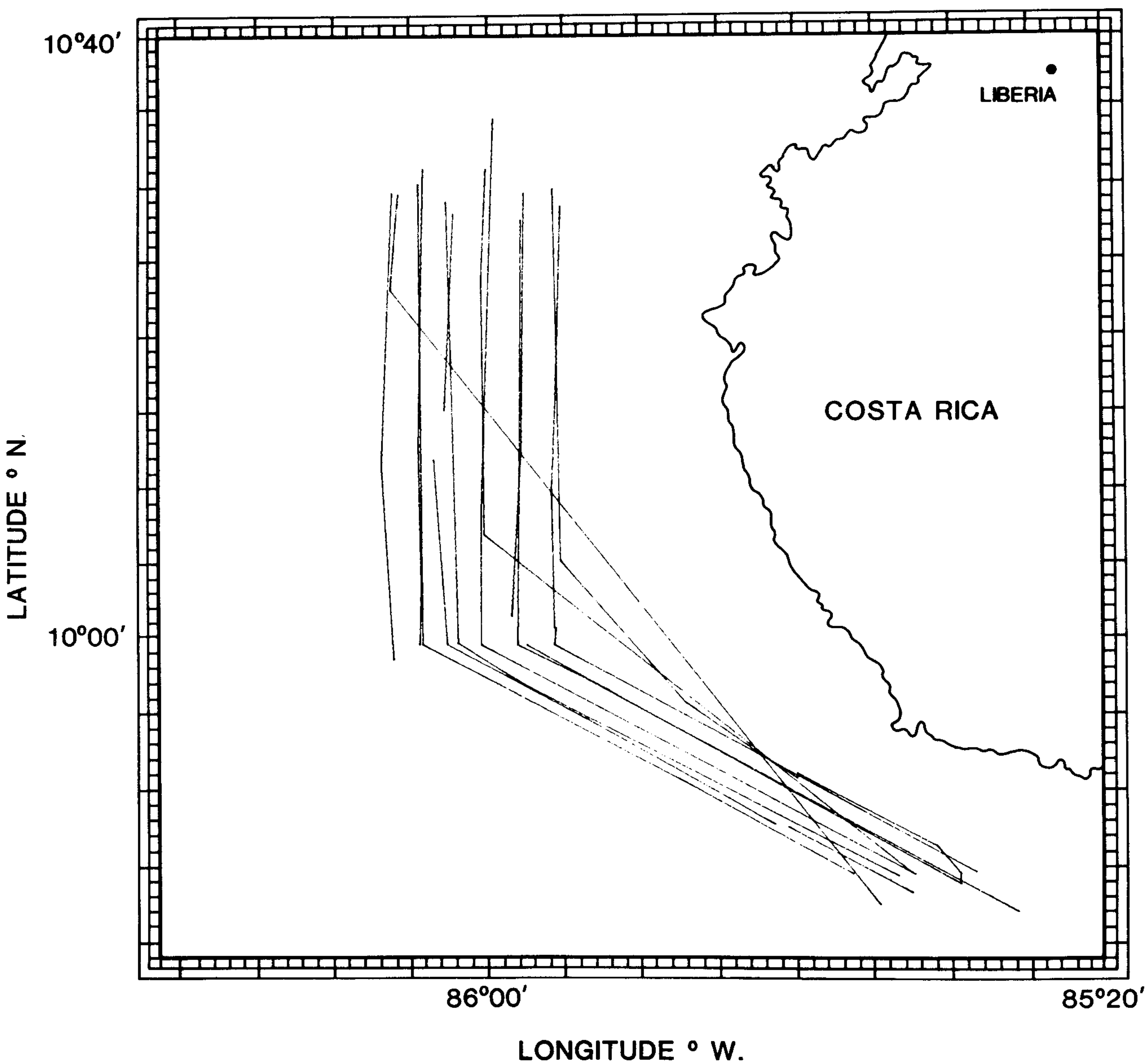

Figure 9. Tracklines flown in the study area during flight 6. Study area defined in text.

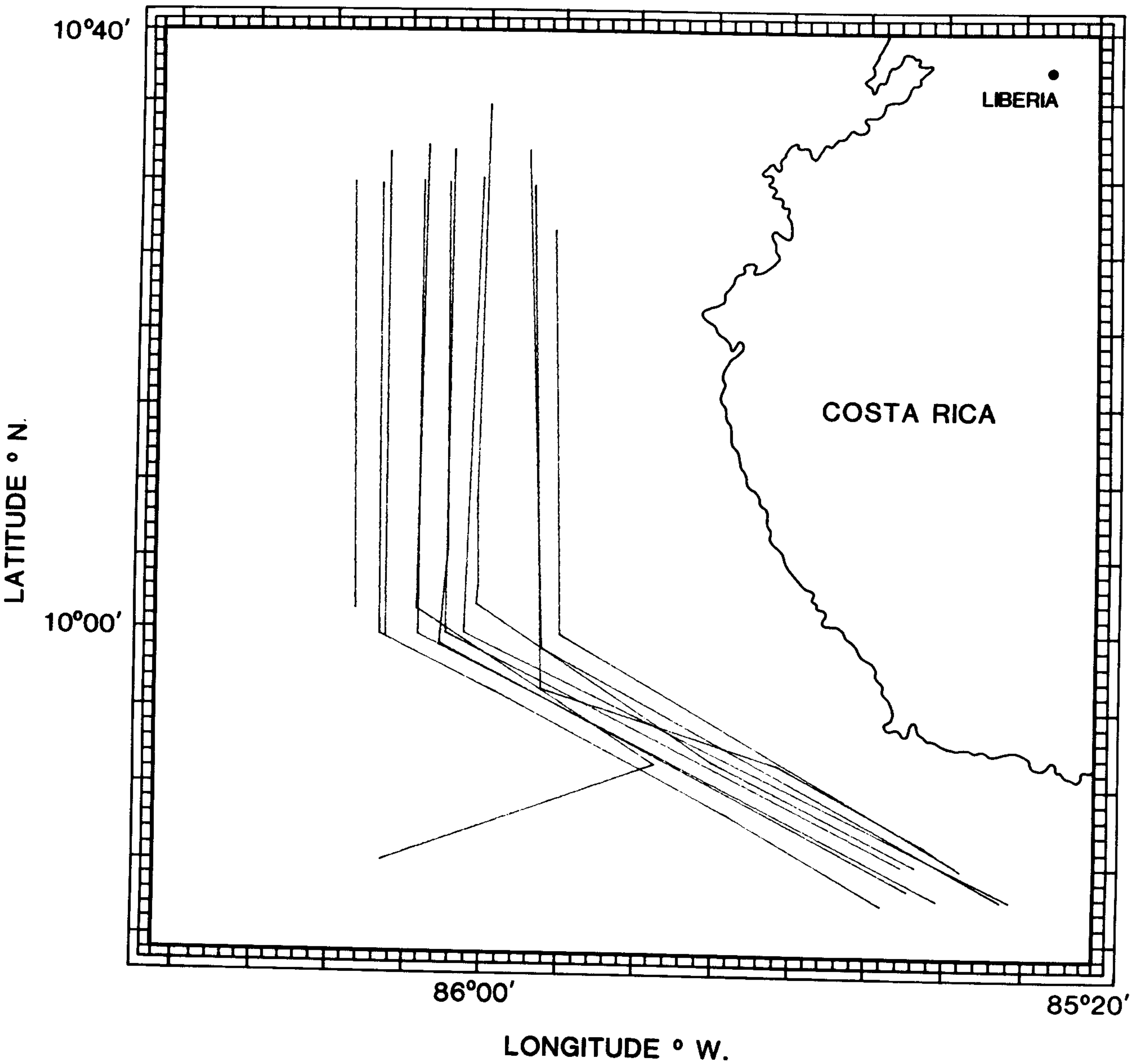

Figure 10. Tracklines flown in the study area during flight 7. Study area defined in text.

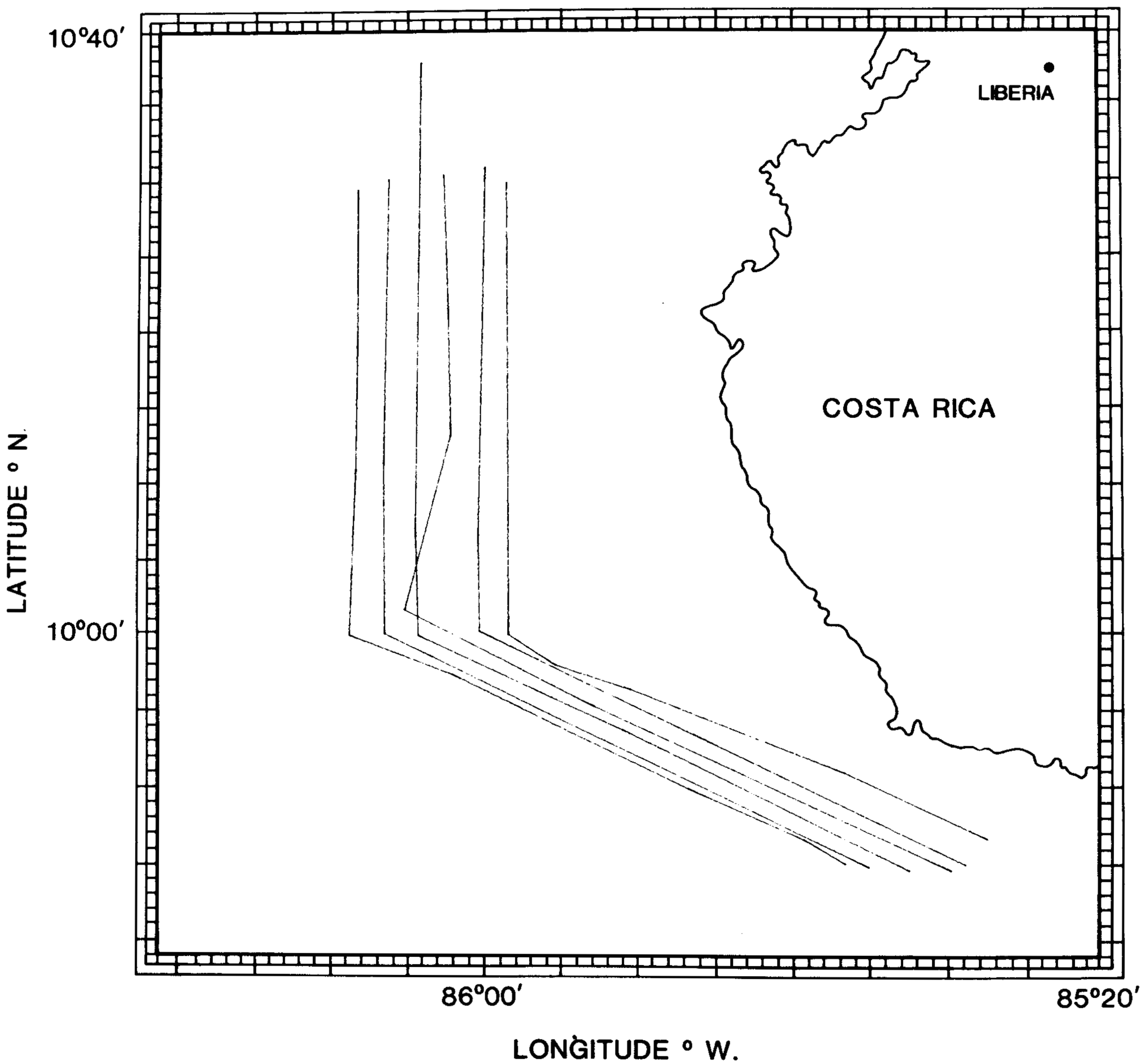

Figure 11. Tracklines flown in the study area during flight 8. Study area defined in text.

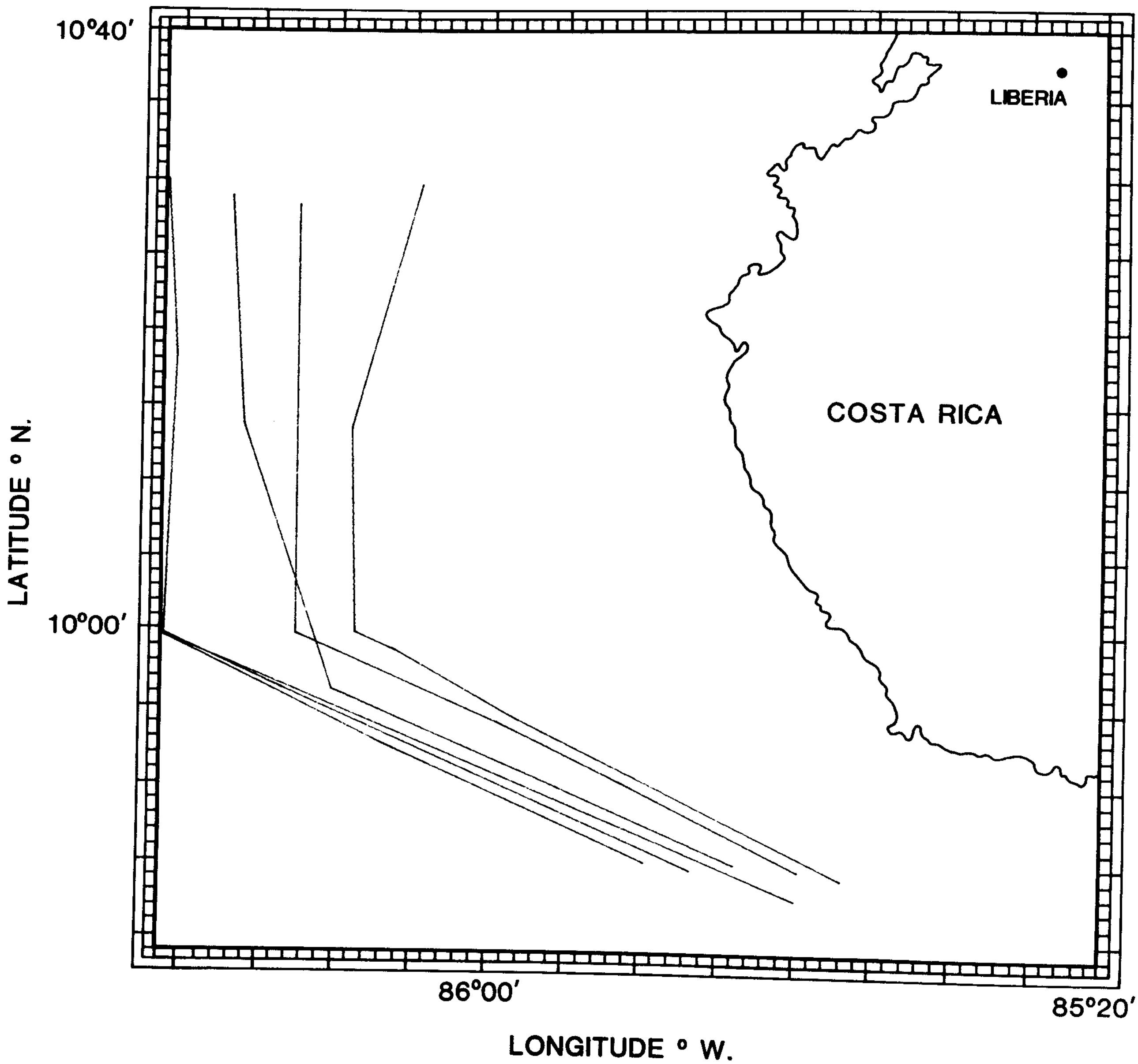

Figure 12. Tracklines flown in the study area during flight 9. Study area defined in text.

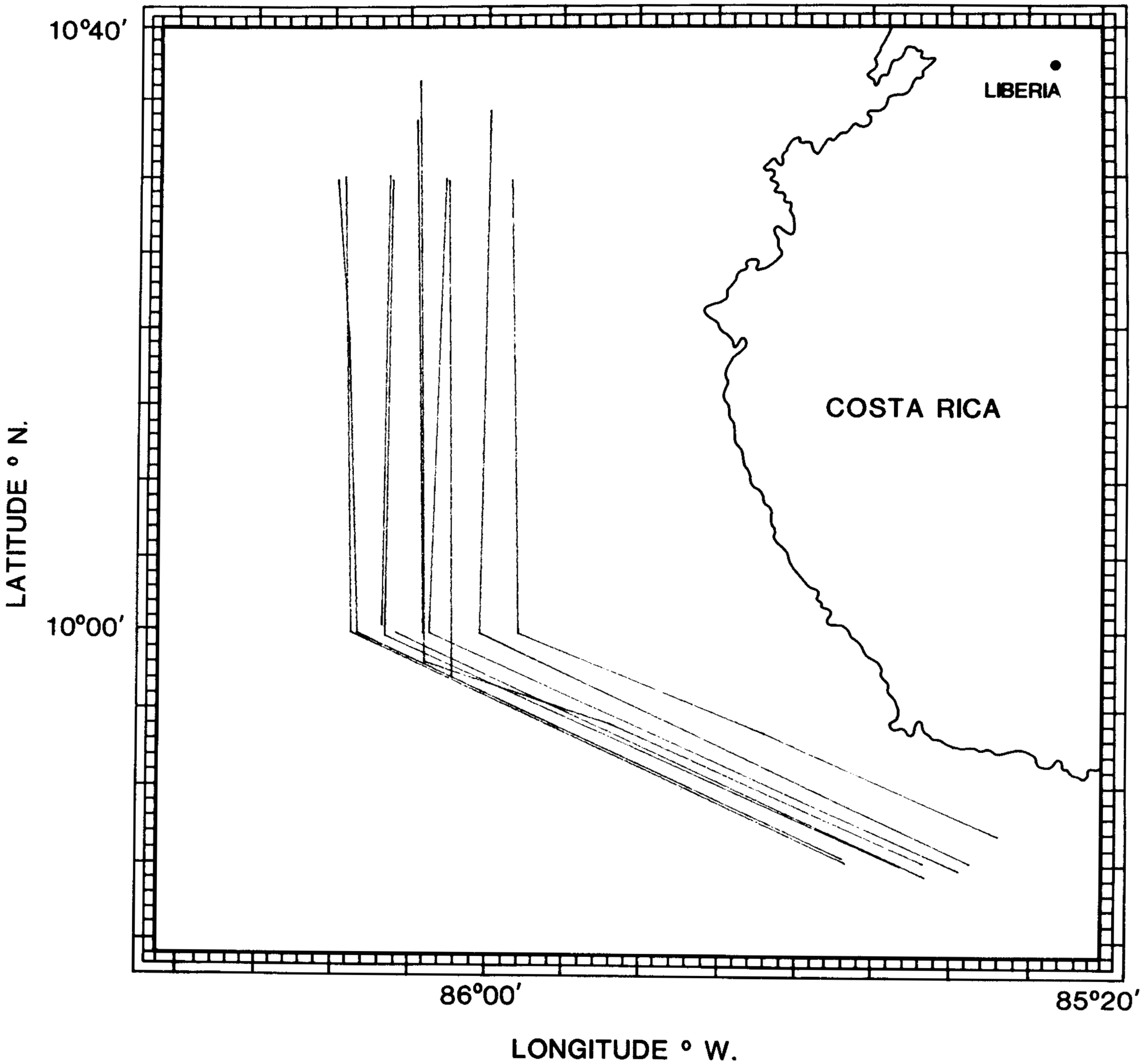

Figure 13. Tracklines flown in the study area during flight 10. Study area defined in text.

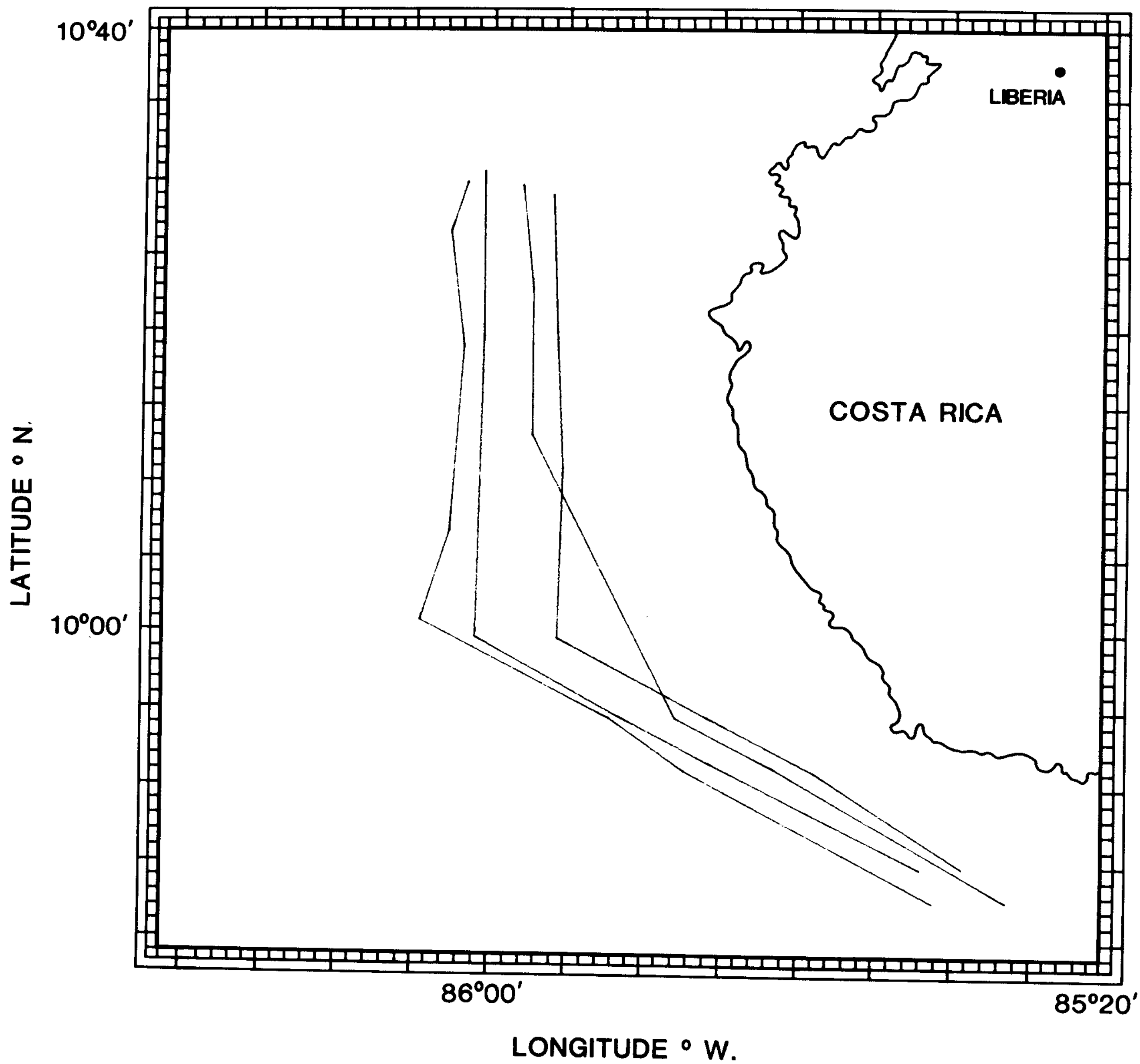

Figure 14. Tracklines flown in the study area during flight 11. Study area defined in text.

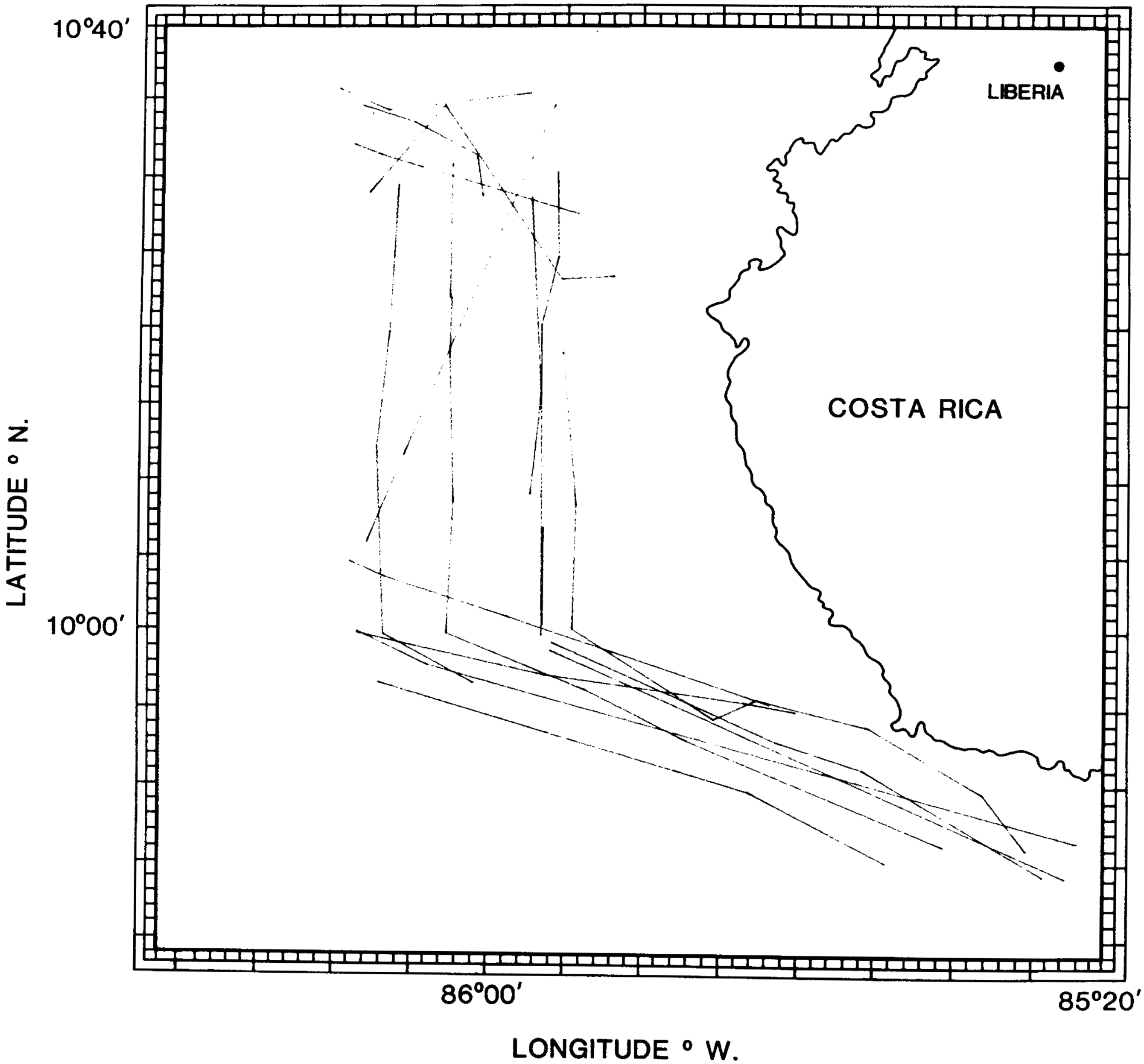

Figure 15. Tracklines flown in the study area during flight 12. Study area defined in text.

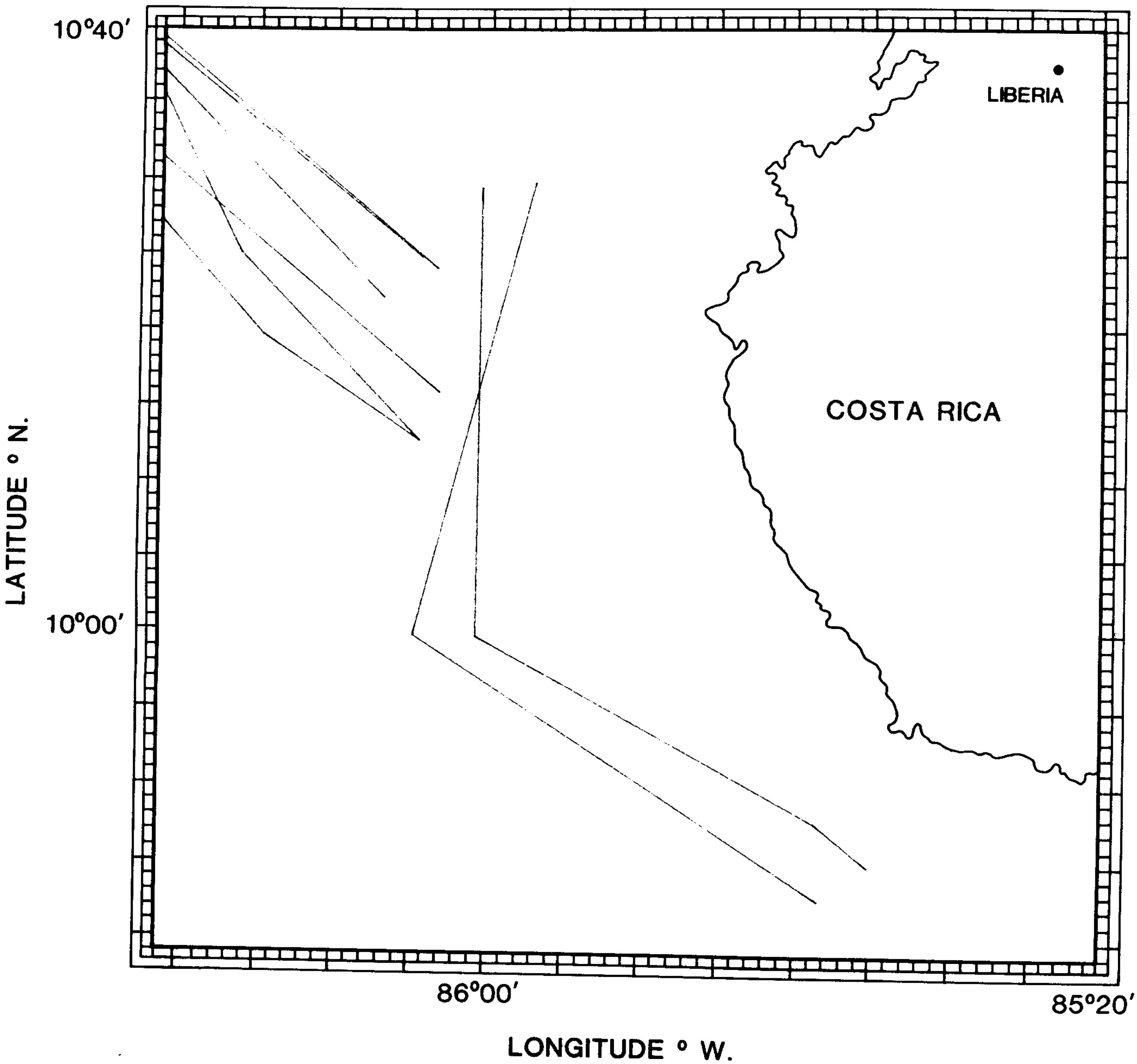

Figure 16. Tracklines flown in the study area during flight 13. Study area defined in text.

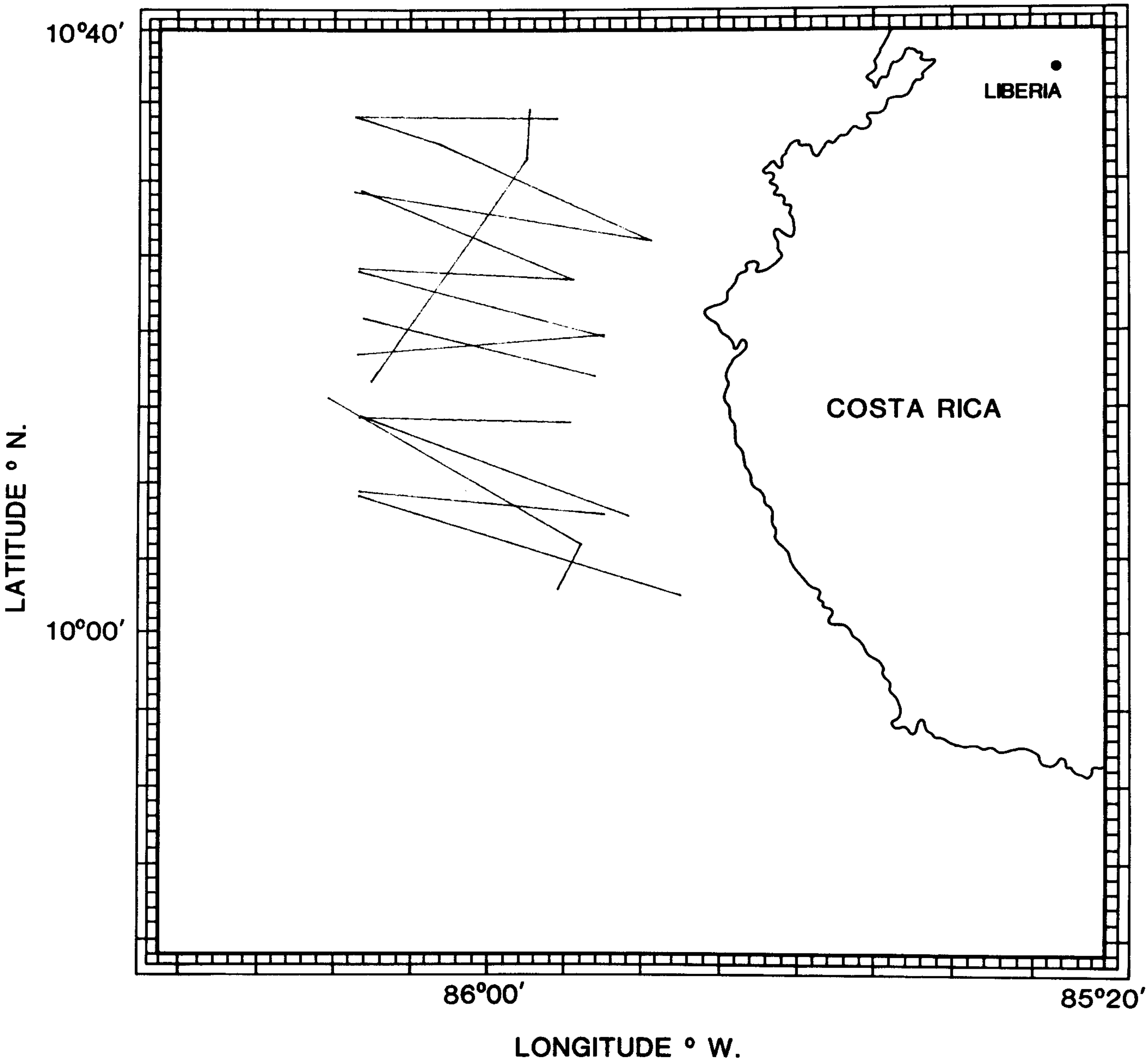

Figure 17. Tracklines flown in the study area during flight 14. Study area defined in text.

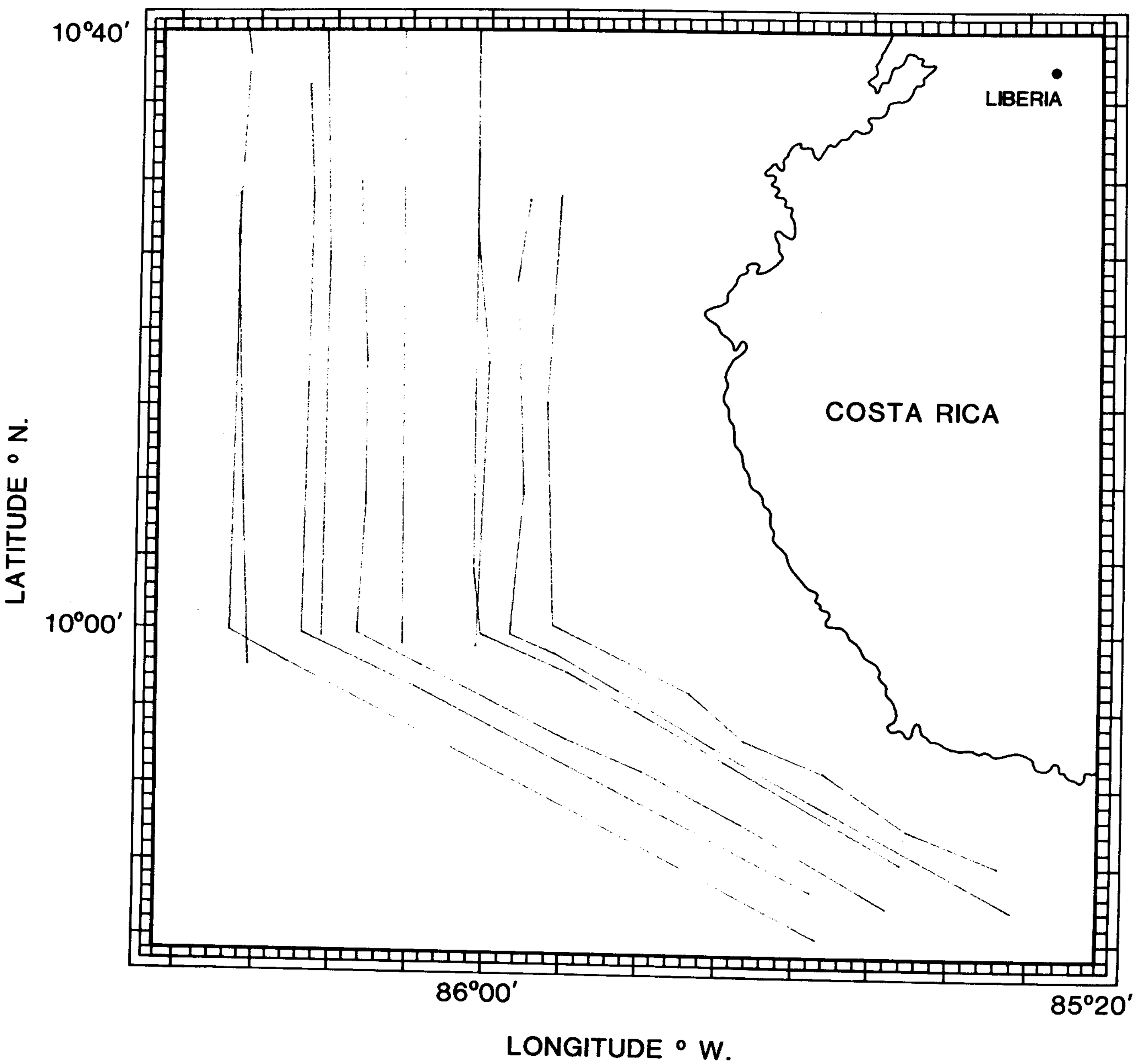

Figure 18. Tracklines flown in the study area during flight 15. Study area defined in text.

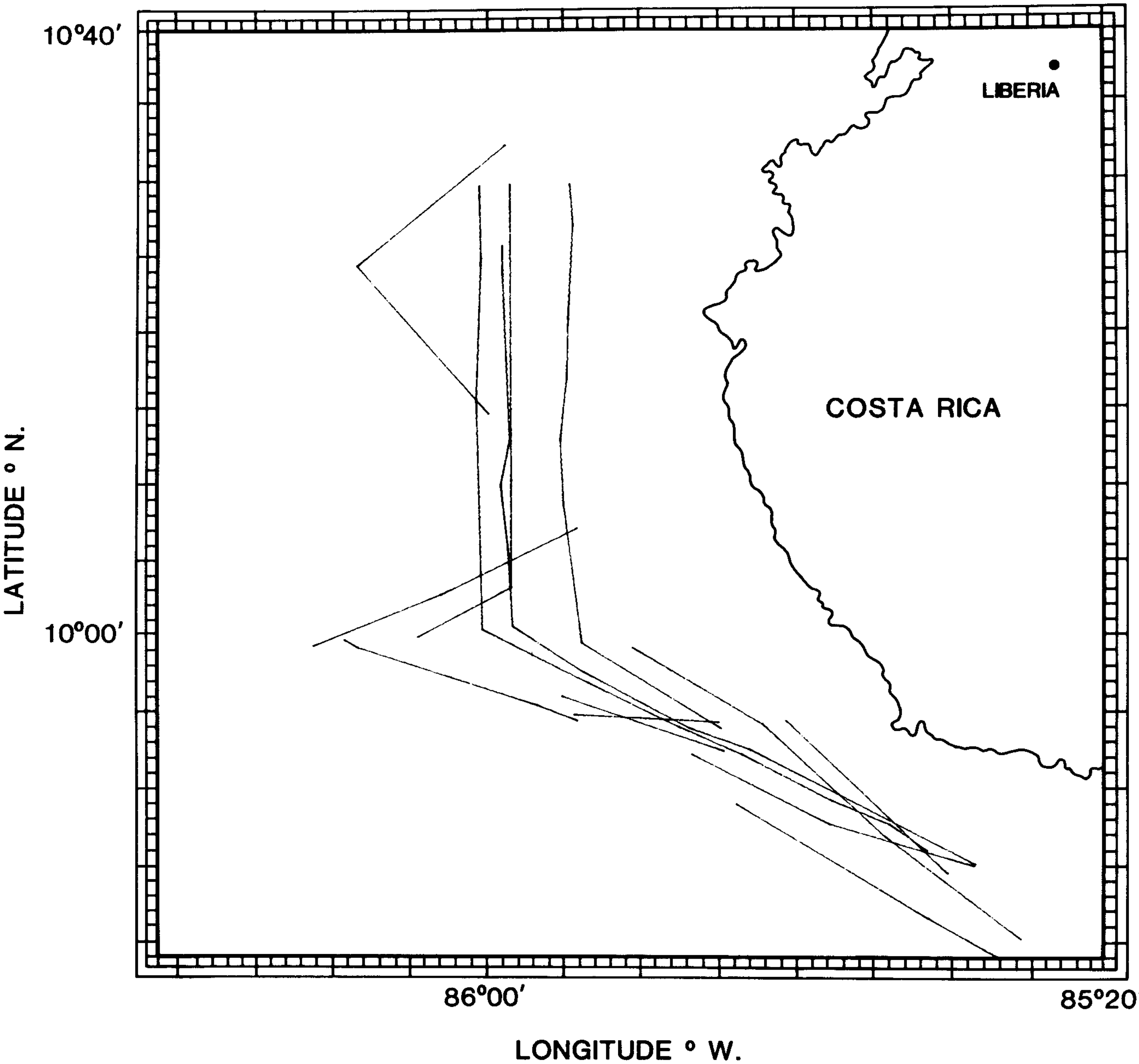

Figure 19. Tracklines flown in the study area during flight 16. Study area defined in text.

APPENDIX I

The experimental design required that the study area be surveyed approximately uniformly for all variables. Data encountered during the various sun glare conditions were partially selected by manipulating the direction of travel of the plane during each flight. Data encountered during the various sea state conditions could not be selected but were recorded as encountered. During the survey, Flight 1, a training flight, and Flights 2, 3, and 4 were used to determine an area where sea state conditions were uniform. It was perceived empirically that the northern, southern and far offshore regions covered by these flights had higher sea states than the more inshore region, therefore, the majority of the subsequent flights were conducted closer inshore. Inspection of the spatial distribution of effort conducted during good (Beauforts 0-2) and poor (Beauforts 3-6) conditions (Figures A1-1 and A1-2) confirmed the empirical observations. The study area was defined from 9° 41' to 10° 40'N latitude and from 85° 20' to 86° 21'W longitude. The location of the western boundary was placed conservatively to insure sea state conditions were spatially distributed in the study area and to reduce the inclusion of bias owing to onshore-to-offshore density gradients.

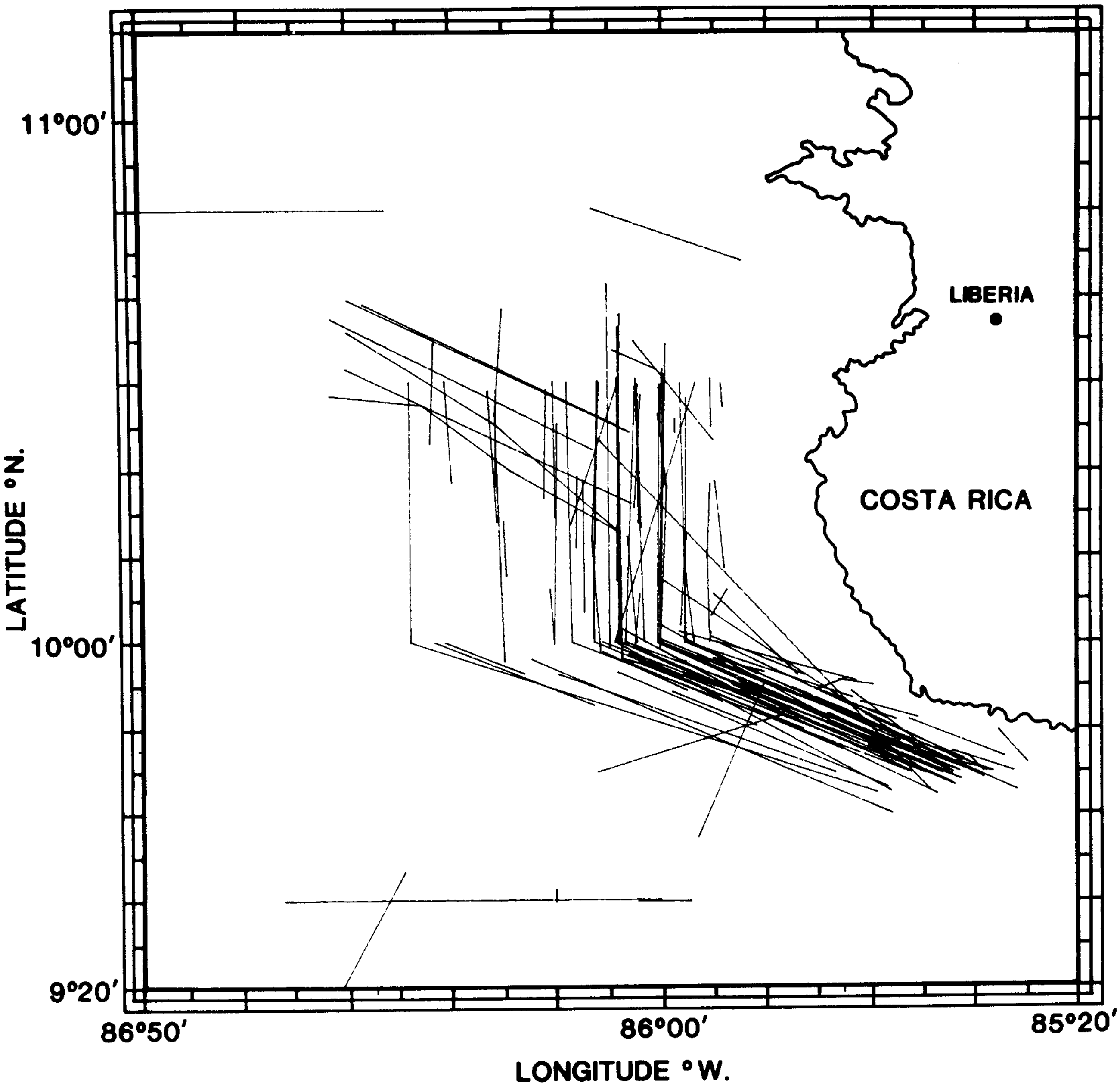

Figure AI-1. Tracklines surveyed with good sea state conditions (Beauforts 0-2) during flights 2-16.

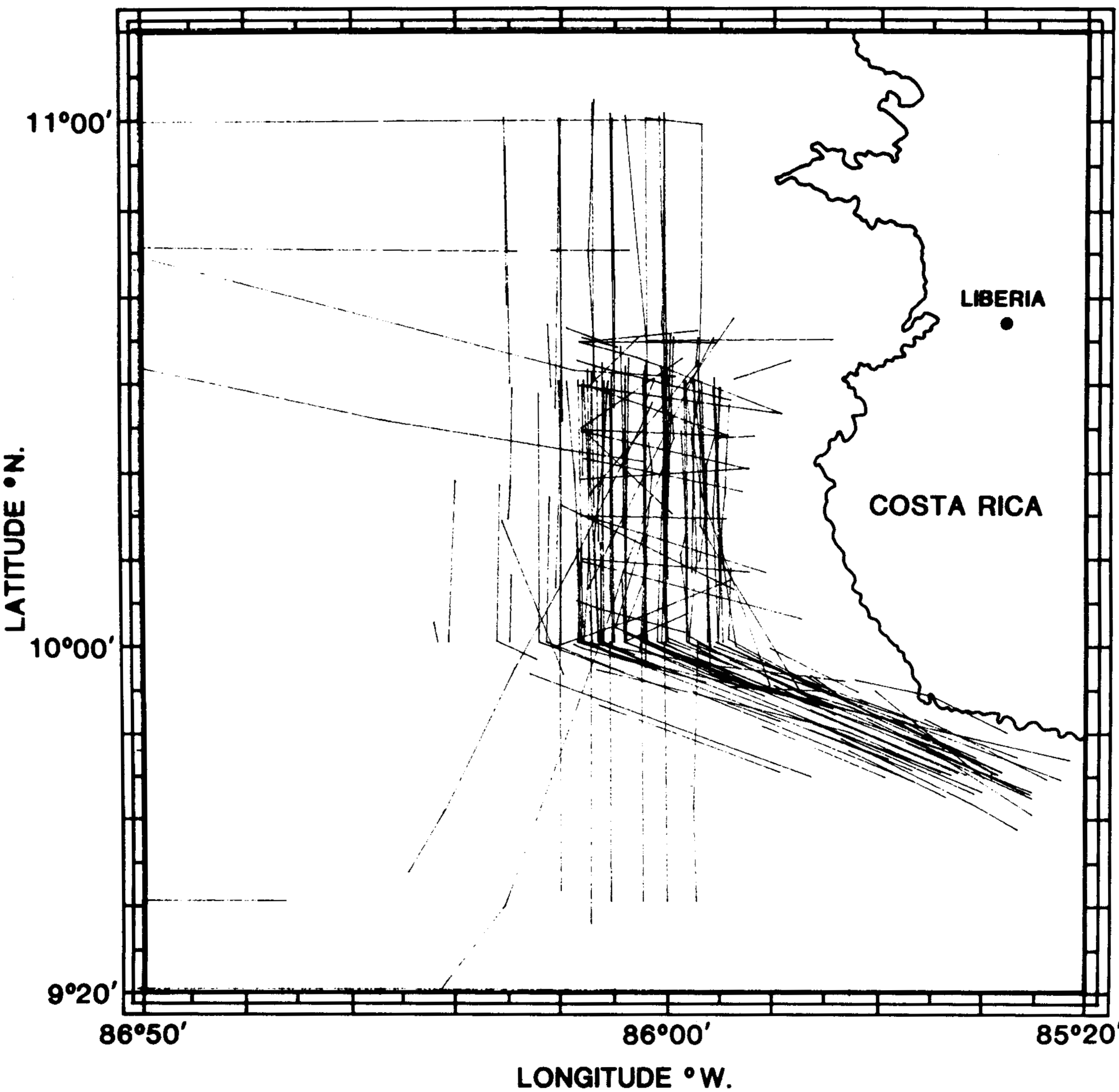

Figure AI-2 Tracklines surveyed with poor sea state conditions (Beauforts 3-6) during flights 2-16.

APPENDIX II
Summary of Time-Lost Problems

The major time lost occurred prior to the outset of the survey. The survey was originally scheduled to begin January 2; however, delays, including an engine fire, encountered by the contractor while completing an earlier project forced the scheduled departure to January 12.

On January 12 the plane took off from the contractor's home office in Groton, Connecticut to ferry to Naples, Florida, the designated home base for the survey. Immediately after take off the landing gear malfunctioned and could not be lowered into the landing position. The plane was forced to complete a wheels-up landing at the Groton airport. Damage to the aircraft's frame was minimal. However, both engines had to be replaced. The plane was repaired and was flown to Naples, Florida on February 12 after a lapse of 31 days.

The scientific crew departed San Diego for Costa Rica via commercial airline on February 13, but the survey airplane, which had departed Naples for Costa Rica, encountered rough weather and had to return to Naples. Additionally a mechanical problem with the landing gear was found. The plane finally arrived in San Jose, Costa Rica on February 22 after a delay of 10 days.

During the next few days several problems were encountered: an aerial photography camera which had been air "expressed" to San Jose did not arrive for two weeks, and then was impounded by customs; one additional aircraft seat for the observer team was required; and camera mounts had to be custom made and installed. However, the most serious problem was a continuous 30-40 knot crosswind blowing across the single runway at the San Jose airport. The AT-11 airplane has a tail landing wheel, which makes the plane very difficult to control on landing in crosswinds greater than 20 knots. An alternate airport at Liberia, Costa Rica was located. Aviation fuel was not available at the airport, but arrangements were completed for fuel to be trucked to Liberia, and the base of operatons was moved to Liberia on March 6 after a delay of 13 days.

Flight 1 occurred on March 7. The tachometer broke inflight, and a replacement was flown to San Jose from Naples. The part was installed and flight 2 was made on March 9 after a delay of 1 day.

The morning segment of flight 3 was completed on March 10, however, electrical power to the gas pump used to refuel the airplane had been disconnected and the afternoon segment was cancelled.

Flights 4 through 7 were made on schedule. The morning segment of flight 8 was made but the afternoon segment was cancelled because of a lack of fuel. Additional fuel was obtained and flights 9-13 were made on schedule.

The flight crew began a required scheduled 100-hour maintenance check of the aircraft on March 24. Several needed repairs were identified, including a dead battery, faulty propellor governor, and a cracked cylinder head. Replacment parts were obtained and on March 31 flight 14 was attempted, however, the ONS failed. A replacement was obtained and flight 14 was finally made on April 3 after a delay of 13 days.

Flight 15 was made on April 4 and flight 16 on April 5. The operation of the ONS during off-track circling was intermittent and finally completely malfunctioned. The decision was then made to terminate the study and the scientific crew returned to San Diego on April 7.

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