SOUTHWEST FISHERIES CENTER

NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES CENTER
P.O. BOX 271
LA JOLLA, CA 92038

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REPORT OF MULTISPECIES ASSESSMENT TASK RESEARCH CRUISE IN THE EASTERN/CENTRAL TROPICAL PACIFIC OCTOBER 6 - DECEMBER 6, 1983 (CRUISE NO. RP-9-DI-84, NOAA SHIP *DISCOVERER*)

By

Robert Pitman

ADMINISTRATIVE REPORT LJ-84-43

REPORT OF MULTISPECIES ASSESSMENT TASK RESEARCH CRUISE IN THE EASTERN/CENTRAL TROPICAL PACIFIC October 6 to December 6, 1983 (Cruise No. RP-9-DI-84, NOAA Ship Discoverer)

Robert Pitman

Southwest Fisheries Center
National Marine Fisheries Service, NOAA
La Jolla, California 92038

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Administrative Report LJ-84-43

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The Southwest Fisheries Center (SWFC), National Marine Fisheries Service, has been investigating biological properties of the eastern tropical Pacific for many years. These studies have been primarily related to the distribution, abundance and other ecological aspects of commercialy-caught tunas, and dolphins captured incidentally during tuna fishing operations. To gain a better understanding of factors affecting population processes for tunas and dolphins, a small scale research effort was begun, that focused on related but non-target species. Examples of such related species are squids, which tunas and dolphins both consume, and sea birds, which accompany co-schooled tunas and dolphins. Both squids and seabirds also consume epipelagic prey, as do tunas and dolphins.

Existing field research programs within the National Oceanographic and Atmospheric Association (NOAA), afford the opportunity for SWFC biologists to collect data and specimens related to the studies outlined above. Especially important in this regard is the Eastern Pacific Ocean Climate Studies (EPOCS) program which has a long term commitment to making regular research cruises in the eastern and central tropical Pacific.

OBJECTIVES

The primary objective of NOAA ship Discoverer Cruise No. RP-9-DI-84 was to continue on-going studies of equatorial ocean currents in the eastern tropical Pacific under the auspices of Pacific Marine Environmental Laboratory (PMEL). A complete list of cruise objectives is given in Cruise Project Instructions, (Appendix B). I was permitted to join the cruise on the condition that my studies did not interfere with the objectives of the cruise. The objectives of my study included:

1. Testing logistics of collecting specimens of cephalopods with an automatic jigging machine aboard a NOAA ship.

2. Collecting visual sightings data on marine birds and mammals using 25 power binoculars, along with pertinent oceanographic data,

3. Obtaining information for comparing two different seabird census methodologies, and

4. Collecting seabirds for gut content analyses.

SCIENTIFIC PERSONNEL

Scientific personnel onboard for accomplishing the objectives outlined above consisted of Robert L. Pitman (biological technician, Southwest Fisheries Center, La Jolla, California) and Larry Spear from Point Reyes Bird Observatory (PRBO). The remainder of the scientific personnel are listed in the Cruise Project Instructions (Appendix B).

MATERIALS AND METHODS

Itinerary

The NOAA Ship Discoverer traversed a predetermined trackline in the eastern and central tropical Pacific from October 6 to December 6 with one port call in Manzanillo, Mexico (see Figure 1).

The cruise comprised two legs:

Leg 83-I (33 days)	The ship departed from Seattle, Washington, on October 6, 1983, and arrived in Manzanillo, Mexico, on November 7, 1983.
Leg 83-II (27 days)	The ship left Manzanillo, Mexico on November 10, 1983 and, arrived in Seattle, Washington, on December 6, 1983.

Cephalopod Sampling

A Hamade* electric powered squid-jigging machine was installed aft on the starboard rail 6m above the water. Lighting for attracting squid at night was mounted above the machine and consisted of six, 100-watt mercury vapor lamps mounted on a frame. Lights were focused on the sea surface near the point where the jigging lines entered the water.

The machine controlled two eccentric drums from which jig lines were let down. Each line consisted of a 100 m, 150 lb test nylon monofilament leader, a swivel, 30 squid jigs (tied 1 m apart). Each line was weighted with a 0.9 kg lead weight on a swivel. The machine was operated by dialing a depth between 0 and 150 m; lines were released to the dialed depth and retrieved automatically and continuously once the machine was turned on.

* Reference to trade names does not imply endorsement by National Marine Fisheries Service, NOAA

The machine was used whenever the ship stopped at night, as long as it did not interfere with the main scientific objectives of the cruise. Standard data forms were provided for recording sampling effort and results (Figures 2a and b).

Bird and Mammal Survey

Two pairs of pedestal-mounted 25 power Fuji binoculars were installed port and starboard on the flying bridge of the R/V Discoverer (height from sea surface to eye level: 14.1 m). Near continuous observations were maintained during most daylight hours while the ship was underway. The side of the ship that afforded the best sighting conditions determined which pair of binoculars was used.

All birds sighted were recorded during half-hour intervals on standard field data forms (Figure 3). Additional notes (e.g. plumage descriptions, behaviors, etc.) were kept on separate blank sheets. At the end of each day, field sighting data were transcribed onto hourly summary forms (Figure 4), along with a variety of oceanographic information collected by the ship's Survey Department. (These data included hourly positions, vessel speed and direction, sea surface temperature and salinity, weather conditions, etc.)

Marine mammal sightings were recorded incidentally and reported on standard sighting forms during half-hour intervals (Figure 5). Since I was the only trained observer for marine mammals aboard, the emphasis of the sightings was seabird census, rather than for marine mammals. The marine mammal effort log, which is usually completed on regular NMFS/SWFC porpoise surveys was therefore not used. All remaining standard sighting data for mammals were collected however.

Methodology Comparison

Two seabird survey techniques were used during the course of the cruise. Larry Spear (PRBO) used hand-held binoculars and censused only birds that occurred within a 300 m wide band on one side of the bow, while I conducted surveys using mounted 25 power binoculars and recorded all birds seen.

Comparative censuses were run with both of us present, standing nearly side-by-side, and on the same side of the ship for 1/2 hour periods. Each person maintained separate notes and did not discuss their sightings in order to keep observations independent. These data were entered separately on hourly summary forms (Figure 4) to facilitate later analyses.

Seabird Feeding Study

During daylight hours when the ship was stopped for more than one hour at a time, both observers were usually allowed to go over the side in a launch to collect seabirds and make additional observations. Collected birds were injected with alcohol and put into an ice chest. Aboard the ship, the birds were frozen (or skinned) after their stomachs had been removed and preserved in alcohol and frozen.

RESULTS

During the cruise no data on cephalopod distribution and abundance were collected because of equipment/logistic problems associated with using the squid jigging machines. Our efforts in obtaining information for seabird census methodology comparisons and in collecting seabirds for at-sea food habit studies were quite successful.

Squid Sampling

Attempts to sample squid using the automatic jigging machine were unproductive during this cruise. Following recommendations by ship's personnel, the squid jigging machine was mounted on the side of the vessel where we had hoped to run it primarily during Conductivity-Temperature-Depth (CTD) operations at night. An unexpectedly brisk current encountered on the equator meant the ship had to be underway during CTD drops in order to maintain a constant position over the bottom. As a result, jig lines ran out aft of the ship into the ship's propellers and CTD wire and were stripped from the machine. Permission was obtained to move the jigging machine to the fantail, but it was decided that this would interfere with mooring deployments. The apparatus was not moved and was largely unused throughout most of the cruise.

Bird and Mammal Survey

Over 9700 individual seabirds were sighted on this cruise, representing a minimum of 63 species, and 224 observation hours were logged. Daily summaries of survey effort and results are given in Table 1. In addition, a further breakdown of observations by 1/2 hour interval has been coded and edited and awaits further analyses.

A total of 134 cetacean sightings was recorded that included at least 21 species of whales and porpoise (see Tables 2 and 3).

Methodology Comparison

During the cruise, 352 simultaneous half-hour seabird censuses were conducted by the PRBO/SWFC observers. These data have been transcribed onto code forms and are awaiting analysis.

Seabird Feeding

A total of 118 birds were collected for gut content analysis (see Table 4). The preserved stomachs are at Los Angeles County Museum of Natural History (LACM) to be analyzed at a later date; specimen skins and skeletons will eventually be permanently housed at LACM or University of California, Davis. Judging from cursory examination of the stomach contents, it appears that the seabirds are a source for samples of squids.

DISCUSSION

Should the squid jigging machine be used in the future, consideration will need to be given to planned ships operations before determining where it is to be mounted on the vessel. If the ship is going to be drifting at night, a side mount would be preferable. If the vessel is going to be making headway, even as little as 1-2 knots, it is essential that the machine be installed aft so lines can pay out behind the ship's propellers.

Analyses in progress comparing seabird census methods should provide important information on ways of utilizing existing, large data sets on bird sightings for quantitative analyses. This study should also indicate a preferred censusing methodology for future investigations of pelagic tropical seabird abundance and distribution. Bird and mammal sighting localities are being added to existing data bases to expand our knowledge of their pelagic distributions. Stomach contents collected will be compared with better known food habits of island-based breeding birds to fill important gaps in our knowledge of prey consumed by pelagic seabirds.

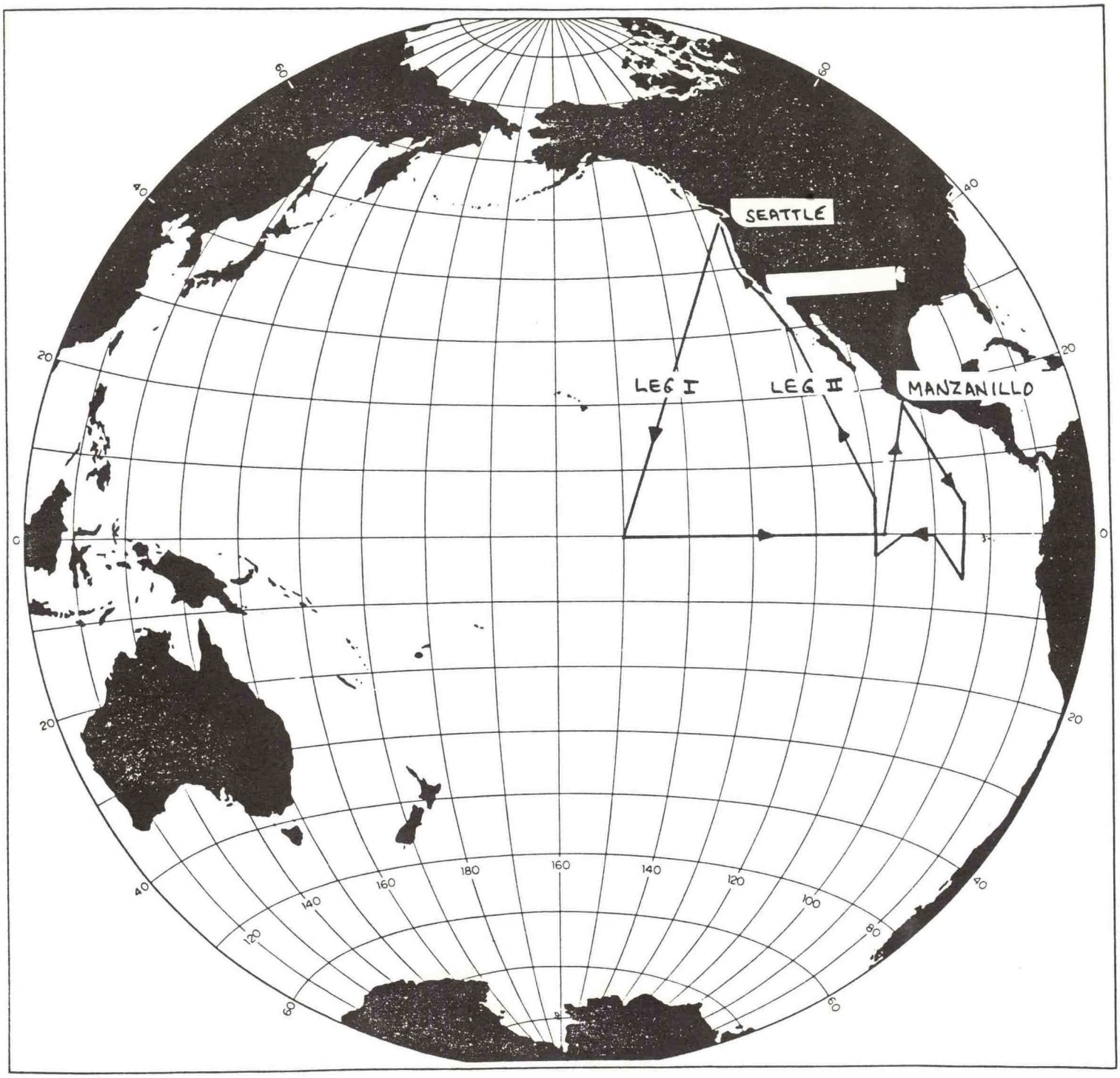

Figure 1. Nominal cruise track of the R/V Discoverer, during EPOCS legs 83-I and 83-II, October 6, 1983 to December 6, 1983.

SQUID DATA (GENERAL)

Sample Number [ ][ ][ ][ ] Operator [ ][ ] Vessel [ ][ ]

Date [ ][ ] [ ][ ] [ ][ ] (Mo) (Day) (Yr) Location [ ][ ]° [ ][ ].[ ]' [ ] [ ][ ][ ]° [ ][ ].[ ]' [ ] (Latitude) (N/S) (Longitude) (E/W)

Time Zone [ ] [ ][ ] (+/-) Sunset [ ][ ][ ][ ] (LMT) Sunrise [ ][ ][ ][ ] (LMT) Vessel [ ][ ][ ]° Heading

SS Temp [ ][ ].[ ] (degrees C) SS Sal [ ][ ].[ ][ ] (ppt) MLD [ ][ ][ ] (m) Therm Slope [ ].[ ][ ] (degrees/m)

Chlorophyll a [ ][ ].[ ][ ] (ug/l) Beaufort Force [ ] Swell Height [ ].[ ] (m)

Wind Speed [ ][ ] (Knots) Wind Direction [ ][ ][ ]°

Light Conditions

Cover [ ] (Overcast=1, Partial Clouds=2, Clear=3) Moon [ ] (Full=1, Half=2, Quar=3, No=4)

Time Lights On [ ][ ][ ][ ] (LMT) Light Meter [ ][ ][ ][ ] (footcan) Meter Height [ ][ ].[ ] (m)

Height of Lights Above Sea [ ][ ].[ ] (m)

Jigging

Jigs/Line [ ][ ] (Port) [ ][ ] (Strbd) Squid Aggregations? [ ] (Yes=1, No=Ø)

Jigging Begins [ ][ ][ ][ ] (LMT) Jigging Ends [ ][ ][ ][ ] (LMT) Results? [ ] (Yes=1, No=Ø)

Comments (Jig Types, Associated Species, etc.):

Figure 2a. Data forms for recording information on squids collected by automatic jigging machines.

PAGE [ ][ ] OF [ ][ ]

SQUID DATA (RESULTS)

Sample Number [ ][ ][ ][ ]

Type [ ][ ]

Quantity Caught [ ][ ][ ][ ]

Dorsal Mantle Length (cm)

Quantity Preserved [ ][ ]

1 [ ][ ][ ].[ ]
2 [ ][ ][ ].[ ]
3 [ ][ ][ ].[ ]
4 [ ][ ][ ].[ ]
5 [ ][ ][ ].[ ]
6 [ ][ ][ ].[ ]
7 [ ][ ][ ].[ ]
8 [ ][ ][ ].[ ]
9 [ ][ ][ ].[ ]
10 [ ][ ][ ].[ ]

Photos [ ] (Yes=1, No=Ø)

Comments (Coloration, etc.):

Type [ ][ ]

Quantity Caught [ ][ ][ ][ ]

Dorsal Mantle Length (cm)

Quantity Preserved [ ][ ]

1 [ ][ ][ ].[ ]
2 [ ][ ][ ].[ ]
3 [ ][ ][ ].[ ]
4 [ ][ ][ ].[ ]
5 [ ][ ][ ].[ ]
6 [ ][ ][ ].[ ]
7 [ ][ ][ ].[ ]
8 [ ][ ][ ].[ ]
9 [ ][ ][ ].[ ]
10 [ ][ ][ ].[ ]

Photos [ ] (Yes=1, No=Ø)

Comments (Coloration, etc.):

Type [ ][ ]

Quantity Caught [ ][ ][ ][ ]

Dorsal Mantle Length (cm)

Quantity Preserved [ ][ ]

1 [ ][ ][ ].[ ]
2 [ ][ ][ ].[ ]
3 [ ][ ][ ].[ ]
4 [ ][ ][ ].[ ]
5 [ ][ ][ ].[ ]
6 [ ][ ][ ].[ ]
7 [ ][ ][ ].[ ]
8 [ ][ ][ ].[ ]
9 [ ][ ][ ].[ ]
10 [ ][ ][ ].[ ]

Photos [ ] (Yes=1, No=Ø)

Comments (Coloration, etc.):

Type [ ][ ]

Quantity Caught [ ][ ][ ][ ]

Dorsal Mantle Length (cm)

Quantity Preserved [ ][ ]

1 [ ][ ][ ].[ ]
2 [ ][ ][ ].[ ]
3 [ ][ ][ ].[ ]
4 [ ][ ][ ].[ ]
5 [ ][ ][ ].[ ]
6 [ ][ ][ ].[ ]
7 [ ][ ][ ].[ ]
8 [ ][ ][ ].[ ]
9 [ ][ ][ ].[ ]
10 [ ][ ][ ].[ ]

Photos [ ] (Yes=1, No=Ø)

Comments (Coloration, etc.):

Figure 2b. Data forms for recording information on squids collected by automatic jigging machines.

MARINE BIRD SIGHTING LOG

Ship _____ Date _____

Time off _____ Total Obs. Time _____

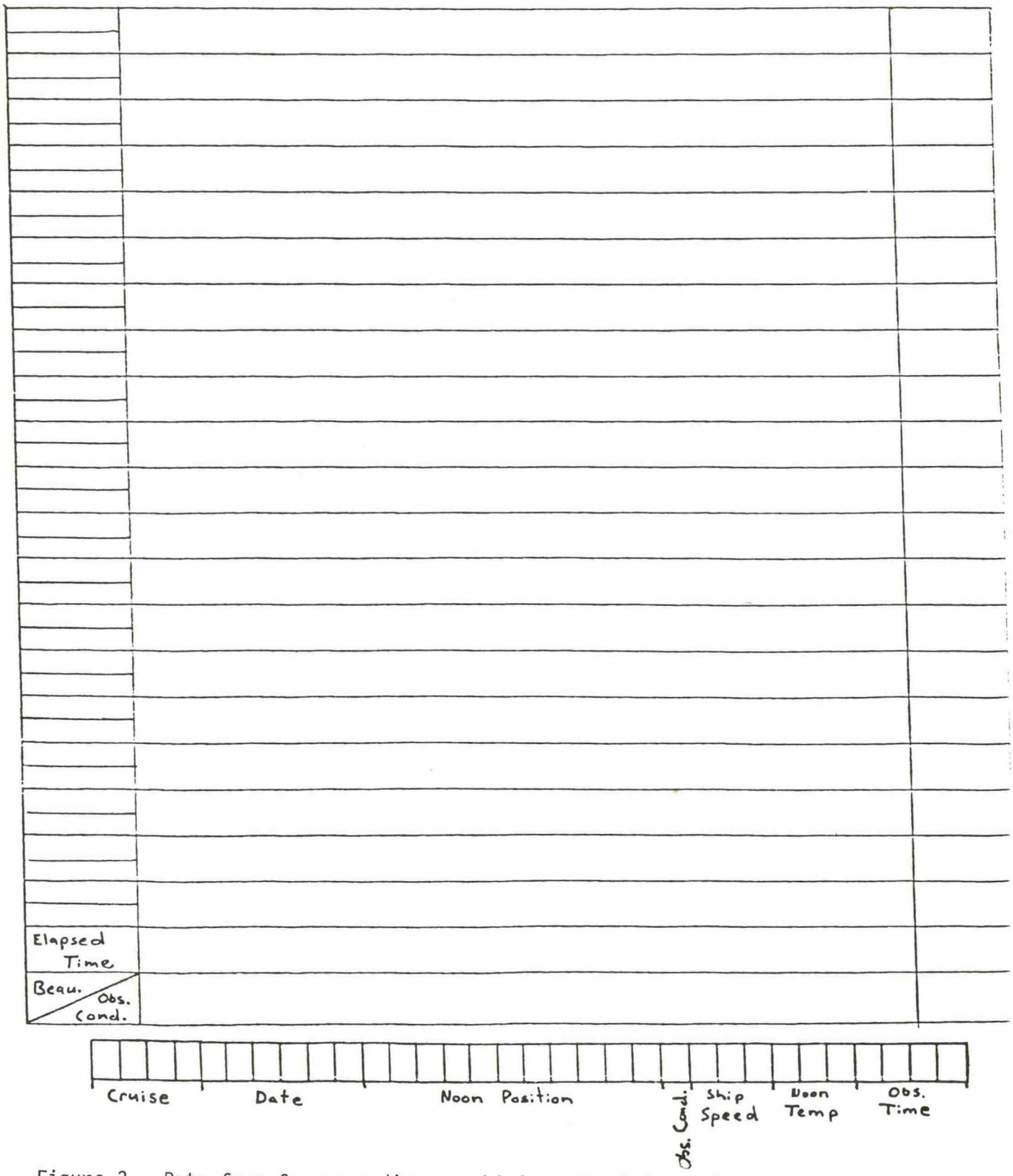

Figure 3. Data form for recording sea bird census information.

Cruise _____

Cruise	Date	Time	Elapsed Time	Mid-Latitude	Mid-Longitude	Vessel Speed
m m y y	y y m m d d	h h m m	whole minutes	d d m m N/S	d d d m m E/W	Kts.t

Obs. Cond.	Beau	S.S. Temp.	S.S. Sal.	Air Temp	Wind Direction	Wind Speed	Swell Height	Bottom Depth	Thermocline Depth
		°C.t	ppt.h	°C.t			m.t	Whole m	Whole m

Thermocline Slope	Distance to Nearest Land	Ht. of Obs.
°/m.t	whole km	whole m

Species	Number	Comments	Descrip. Y/N	Age Y/N	Molt Y/N	Behavior Y/N	Assoc.	Other Comments

Species	Number	Comments	Descrip. Y/N	Age Y/N	Molt Y/N	Behavior Y/N	Assoc.	Other Comments

Comments _____

Figure 4. Hourly sighting summary form for marine birds and mammals, and oceanographic data.

CRUISE =	DATE YEAR	MONTH	DAY	SIGHT =	SERIES =	LEG =	OBS. CODE
1	4	6	8	10	12	14	16

SCHOOL SIZE
BEST HIGH. LOW.

LIST ALL DIAGNOSTIC FEATURES OBSERVED
(INCLUDING ESTIMATED BODY LENGTH)

SKETCH FEATURES OF ANIMALS SIGHTED

SPP. & STOCK COMP.
NAME %

BEHAVIOR – (DESCRIBE AGGREGATION, MOVEMENT, BOW AND STERN RIDING, BLOWS, ETC.)

SCHOOL MOVEMENT
SPEED DIRECTION

ASSOCIATED ANIMALS – (INCLUDE NUMBER AND SPECIES OF BIRDS)

PHOTOS: ROLL = _____

FRAME(S) = _____

TOTAL TIME OF OBSERVATION	_____	ENVIR. COND. (RAIN, OVERCAST, FOG, CHOPPY)	_____	CLOSEST DISTANCE OF OBSERVATION	_____
AMT. OF TIME AT CLOSEST DISTANCE	_____	TAGS ASSOCIATED WITH SIGHTING	_____	METHOD OF OBSERVATION (EYE, 7x, 10x, 25x)	_____

Figure 5. Data form for recording marine mammal sightings.

Table 1. Seabird survey results: a summary of survey data with species and numbers of birds encountered in the Eastern and Central Tropical Pacific during October 7 through December 4, 1983. Date and noon position are given for each day of observation; key for Observation Conditions code is given below; Vessel Speed is in knots and tenths; Water Temperature is from noon position and is in °C and tenths. The key to the Species Code is given in the Appendix; for Number of Birds--"0000" = species present; "(blank)" = species possibly present.

Obs. Condition (Observation Conditions)
1 = Bad
2 = Poor
3 = Fair
4 = Good
5 = Very Good
6 = Excellent
7 = Unknown or Other
8 = 2/3 (i.e. fair/poor)

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
83	10	07	46	31	1	126	11	2	3	148	159	4239	0001
												4204	0001
												4300	0003
												7394	0004
												7525	0002
												4233	0001
												4260	
												4111	0001
												4372	
												9500	0001
83	10	08	42	21	1	128	49	2	5	150	165	4111	0007
												4300	0396
												4239	0015

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												7210	0022
												7346	0003
												7101	0005
												7500	0008
												7394	0004
												7200	
												4372	0031
												4391	0031
												7211	0002
												7100	0017
												4204	0007
												7212	0002
												7360	0006
												7525	0001
												7214	0001
												6000	0074
83	10	09	35	48	1	132	24	2	2	136	186	4111	0001
												4300	0006
												7360	0000
												4239	0004
												5100	0000
												4293	0003
												4270	0002
												4204	0001
												4372	0000
												4391	0000
												7100	0001
												7212	0001
												5102	

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
83	10	10	32	57	1	134	30	2	4	146	200	4111	0013
												4300	0054
												4372	0003
												4391	0003
												7212	0001
												4233	0001
												5100	0003
												4239	0018
												4270	0001
												4293	0001
												7211	0001
												5102	0003
												7210	0001
83	10	11	26	20	1	137	24	2	4	147	221	4111	0002
												5102	0002
												4239	0013
												4372	0001
												4391	0001
												7212	0001
												5103	0001
												4233	0001
												4270	0001
												4300	0001
												7211	0001
												4293	0001
												5100	0001
												4257	0001

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
83	10	12	21	34	1	141	46	2	3	153	232	4239	0033
												4293	0002
												4300	0004
												4247	0001
												4251	0001
												4292	0022
												4259	
												4271	0003
												4253	0001
												5103	0001
												4285	0001
												7210	0002
												4260	0006
												4289	
												4372	0001
												4391	0001
												7373	0002
												4270	
												4245	
												9100	0001
83	10	13	16	44	1	145	54	2	3	157	248	4292	0186
												4271	0042
												4260	0002
												4285	0002
												4283	0007
												4251	0011
												4247	0012
												7211	0002
												5102	0006

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												7373	0105
												5100	0001
												4259	0001
												4289	
												4300	0002
												5103	0001
												4253	0001
												9100	0003
												4286	0002
												7392	0010
												7210	0001
												4252	0001
83	10	14	10	51	1	147	15	2	3	145		4247	0031
												4252	0007
												4251	0024
												4292	0062
												4271	0023
												4294	0005
												4253	0002
												7373	0002
												4293	0004
												4283	0006
												4279	
												4372	0001
												4391	0001
												4300	0002
												5102	0002
												5312	
												4259	0001

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4270	0001
												7212	0001
												4269	0001
												4285	
												7392	0001
83	10	15	05	06	1	148	47	2	3	153	259	4288	0002
												4294	0015
												7373	0243
												4293	0012
												4283	0010
												4258	0005
												4245	0005
												4251	0019
												4292	0003
												4271	0002
												4270	0001
												4239	0006
												5600	0039
												4278	
												5102	0001
												4260	0001
												4252	0002
												4247	0021
												7392	0002
												4370	0001
												4233	0001

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
83	10	16	00	03	1	149	38	2	5	110	221	5102	0001
												5312	0001
												4251	0004
												4247	0005
												7373	0009
												4294	0008
												5600	0001
												4270	0001
												4239	0003
												4252	0001
												4288	0003
												7212	0001
												4293	0002
												4285	0001
83	10	17	00	03	2	145	08	2	4	140	244	4293	0024
												4294	0010
												7373	0019
												5100	0001
												4283	0002
												5312	0001
												4270	0001
												4239	0006
												4279	
												4292	0001
												4271	0001
												4391	0006
												4372	0006
												4370	0009
												4300	0012

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4258	0011
												4235	0001
												4278	
												7212	0001
83	10	18	00	04	2	141	48	2	5	145	261	7373	0012
												4293	0004
												4279	
												4294	0002
												5100	0001
												4292	0002
												4370	0000
												4372	0000
												4391	0000
												5312	0000
												7212	0000
83	10	19	00	00	0	140	03	2	7	000	254	4370	0000
												4372	0000
												4391	0000
												4288	0000
												4278	0000
												4290	0000
												4340	0000
												7373	0000

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
83	10	20	01	09	1	140	03	2	3	140	252	7373	0017
												4294	0001
												4285	0001
												4292	0004
												4283	0002
												4278	0001
												4293	0005
												7212	0000
												4370	0000
												5312	0000
83	10	21	00	00	0	141	11	2	3	140		4294	0006
												4293	0012
												4292	0003
												7373	0014
												4300	0002
												4288	0003
												4278	0002
												4370	0003
												4391	0001
												4372	0001
												4283	0003
												4239	0001
												5312	0001
83	10	22	01	29	2	140	28	2	7	000		4370	0000
												7373	0000
												4283	0000
												4278	0000

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4271	0000
												4288	0000
												4297	0000
												4340	0000
83	10	23	00	00	0	138	27	2	3	140		4283	0002
												4278	0004
												4294	0013
												4300	0005
												4293	0011
												7373	0011
												4239	0004
												4370	0002
												4270	
												4292	0012
												5313	0001
												4288	0003
												7212	0001
												4251	0001
												4271	0007
												4252	0001
												4247	0002
												4391	0000
												4372	0000
83	10	24	00	00	0	134	03	2	3	120		4292	0013
												4271	0003
												4288	0001
												4294	0003

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4258	0001
												4283	0001
												4251	0001
												7373	0002
												4247	0001
												4391	0000
												4372	0000
												4370	0000
83	10	25	00	02	1	133	02	2	4	110		4292	0036
												4294	0012
												7373	0009
												7210	0002
												4293	0002
												4271	0013
												5312	0001
												4288	0003
												4252	0001
												4247	0001
												4258	0001
												7212	0001
												4278	
83	10	26	00	03	1	129	16	2	3	120		4292	0086
												4271	0027
												4300	0003
												4370	0014
												4294	0003
												4278	0003

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4283	0001
												7373	0004
												7210	0001
												4293	0003
												4260	0001
												5312	0000
												4372	
83	10	27	00	01	2	125	17	2	4	122		4300	0014
												4271	0001
												4292	0003
												4290	
												4394	0009
												4258	0001
												4370	0002
												5312	0000
												4372	
83	10	28	00	01	1	124	19	2	7	000		4370	0000
												4288	0000
												9500	0001
83	10	29	00	01	1	122	36	2	5	142		4271	0006
												4292	0020
												4300	0014
												4294	0005
												4391	0004
												4372	0004

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												7211	0001
												4394	0007
												4370	0014
												5313	0001
												5312	0001
												7373	0004
												9500	0001
83	10	30	00	02	2	118	06	2	4	134		4300	0055
												4394	0008
												4370	0013
												4292	0002
												7210	0001
												4290	
												4391	0004
												4372	0004
												4251	0001
												4247	0001
												4271	0002
												4260	0003
												5312	0002
												9500	0002
83	10	31	00	02	2	113	58	2	5	135		4271	0001
												7210	0003
												4300	0083
												5312	0008
												4394	0007
												7373	0002

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4370	0004
												4292	0002
												4290	
												7211	0001
												4391	0007
												4372	0007
												7212	0001
												9500	0002
83	11	01	00	01	2	109	23	2	8	133		4370	0001
												4300	0002
												7360	0002
												4391	0000
												4372	0000
												4259	0001
83	11	02	00	01	2	108	13	2	3	133		5300	0002
												4300	0010
												4394	0003
												4292	
												5312	0003
												4370	0002
83	11	03	00	21	1	108	06	2	3	135		4391	0003
												4372	0003
												5312	0003
												4300	0014
												4370	0001

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4292	0002
												4371	
												5313	0001
												4286	0001
												7101	0001
												4394	0003
												7392	
												5102	
												7373	
83	11	04	03	45	1	107	40	2	4	138		7373	0690
												5600	0019
												4300	0031
												4292	0003
												5312	0003
												4370	
												5313	0002
												7392	0141
												4394	0004
												4293	0003
												4391	0003
												4252	0169
												7210	0016
												7212	0002
												4270	
												4247	0326
												5604	0001
												4234	0001
												4254	0001
												4251	0010

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4285	
												4271	0001
												4372	0003
83	11	05	09	23	1	106	47	2	4	150		4288	0001
												4252	0015
												4251	0002
												4247	0017
												4300	0070
												4394	0019
												4271	0001
												4391	0021
												4372	0021
												5312	0038
												5600	0002
												7210	0001
												4244	0001
												4370	0003
												4294	0006
												5314	0006
												9500	0002
83	11	06	15	36	1	105	08	2	5	145		4370	0003
												5101	0000
												5313	0022
												4300	0099
												4294	0002
												4252	0003
												4247	0003

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4391	0028
												4372	0028
												4394	0009
												4235	0003
												7211	0001
												5314	0004
												7373	0004
												5312	0007
												7100	0005
												7210	0006
												7353	
												7212	0001
												9100	0001
83	11	10	18	18	1	104	00	2	5	131		7353	0208
												7327	0000
												5314	0033
												7101	0015
												4381	0061
												4390	0069
												4377	
												5603	0000
												5201	0000
												7348	0000
												7212	0001
												4300	0012
												4252	0014
												4247	0014
												4246	
												7210	0009

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4232	0032
												7211	0006
												7359	
												7100	0081
												4370	0001
												4372	0001
												7346	0004
												5313	0001
												7373	0014
												5312	0001
												7103	
												9500	0002
83	11	11	14	17	1	101	03	2	3	131		5314	0002
												4300	0024
												7210	0005
												4394	0005
												5312	0006
												7100	0010
												7211	0001
												4252	0009
												4247	0010
												7373	0002
												4251	0001
												5313	
												4391	0001
												4372	0001
												5101	0001
												4370	

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
83	11	12	09	33	1	097	53	2	5	141		7100	0003
												4300	0046
												4288	0002
												4394	0016
												4294	0007
												7360	0002
												4247	0013
												4252	0013
												7210	0005
												4370	0012
												4391	0007
												4372	0007
												5101	0002
												7211	0001
												5313	0007
												5312	0002
												5314	0001
83	11	13	04	46	1	095	00	2	3	120		5312	0007
												4300	0022
												4394	0005
												4239	0002
												4252	0011
												4247	0011
												5600	0020
												5313	0059
												5300	0005
												7211	0002
												4370	0001

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												7373	0091
												7210	0004
												7392	0012
												9100	0001
83	11	14	02	48	1	095	00	2	0	000		4370	0000
												4372	0000
												4391	0000
												5604	0000
												5312	0000
												5313	0000
												7345	0000
83	11	15	02	12	1	095	02	2	3	100		4300	0014
												4394	0003
												5312	0002
												5313	0039
												7373	0111
												5600	0005
												5604	0001
												4244	0001
												4391	0001
												4372	0001
												7210	0002
												4371	
												7345	0000

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
83	11	16	00	40	1	095	05	2	8	085		4300	0021
												4370	0005
												4394	0003
												4391	0001
												4279	
												5600	0001
												7210	0001
												5312	0003
												5313	0002
												5102	0000
												7373	
												7345	0000
												9100	0001
												4372	0001
83	11	17	00	00	0	094	55	2	4	090		4300	0018
												5312	0003
												4370	0002
												4109	0001
												5101	0001
												4244	0001
												4394	0001
83	11	18	02	00	2	094	58	2	5	106		4391	0021
												4372	0021
												4370	0018
												4300	0206
												4394	0025
												7100	0035

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												7101	0007
												7210	0002
												4371	0000
83	11	19	03	11	2	095	00	2	4	115		7345	0001
												5101	0001
												4285	0001
												4370	0008
												4391	0010
												4372	0010
												4300	0064
												4394	0010
												7100	0001
												7210	0001
												5600	0001
83	11	20	03	22	2	097	26	2	4	160		4300	0063
												4370	0014
												4391	0017
												4372	0017
												4394	0022
												7212	0003
												7100	0004
												7101	0001
												7210	0005
												5101	0002
												4239	0001
												7211	0001
												7360	

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
83	11	21	03	01	2	103	35	2	4	155		4391	0005
												4372	0005
												4300	0048
												4370	0001
												4394	0005
												4371	
												4270	0001
83	11	22	02	00	2	108	00	2	5	113		4300	0059
												4394	0012
												4370	0005
												4391	0008
												4372	0008
												4239	0001
												7331	0001
83	11	23	00	04	1	107	52	2	0	000		4372	0000
												4391	0000
83	11	24	01	30	1	108	00	2	4	120		4300	0038
												4394	0015
												4391	0012
												4372	0012
												4370	0008
												5312	0003
												4239	0003
												7373	0002
												5101	0001

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4371	
												5313	0005
83	11	25	03	00	1	108	00	2	5	121		4300	0035
												5312	0009
												4394	0002
												4370	0003
												5604	0000
												4247	0001
												4239	0003
												5600	0015
												4391	0004
												4372	0004
												4293	0001
												7373	0012
												7392	0001
												5313	0003
												4292	
83	11	26	06	47	1	108	19	2	4	121		4252	0022
												4247	0022
												7373	0074
												7392	0047
												5313	0003
												5312	0009
												5600	0011
												4300	0027
												4254	0001
												4235	0001

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												5604	0001
												4391	0004
												4372	0004
												4394	0005
												4294	0007
												7100	0001
												4239	0002
												4292	0002
												7101	0001
												9100	0010
												9500	0003
												4288	0001
												5102	0001
83	11	27	11	32	1	109	44	2	4	150		4247	0004
												4252	0003
												7389	0001
												4300	0018
												5600	0001
												5314	0194
												5312	0913
												7100	0001
												4394	0013
												7210	0001
												7373	
												4391	0013
												4392	0001
												4372	0014
												5313	0001
												7211	0002

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4235	0001
												4370	
												4239	0003
												4254	0001
												7360	0001
												4251	0001
83	11	28	16	52	1	112	19	2	8	150		5312	0004
												4254	0019
												4391	0015
												4372	0021
												4392	0006
												4300	0056
												7212	0002
												7210	0003
												7373	0016
												4239	0001
												4235	0001
												7211	0001
												5313	0001
												5101	0001
												4252	0001
												4247	0001
												5600	0001
83	11	29	22	27	1	115	07	2	5	146		4300	0093
												4391	0019
												4392	0007
												4372	0027

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4370	0001
												5600	0002
												4293	
												4204	0001
												9500	0001
83	11	30	27	19	1	117	36	2	4	115		4300	0102
												4372	0040
												4391	0029
												4392	0008
												7212	0003
												7100	0003
												7210	0006
												4204	0004
												4250	0001
												4239	0001
												9500	0004
83	12	01	31	29	1	119	52	2	3	115		7314	0008
												7323	0002
												4300	0026
												7100	0056
												4372	0009
												4391	0008
												4392	0001
												7525	0006
												4270	0003
												4204	0010
												4239	0001

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												7210	0004
												5101	0001
												7101	0005
												7211	0003
												9200	0002
												9100	0003
83	12	02	35	40	1	122	16	2	8	110		4300	0023
												4204	0068
												4255	0001
												7314	0021
												7525	0067
												7210	0001
												4239	0002
												7540	0004
												7100	0036
												4111	0004
												7300	0001
												7101	0002
												7319	0001
												4101	0001
												7343	0001
												2000	0001
												7323	0002
												7211	0001
												4377	
83	12	04	43	44	1	124	47	2	4	115		4108	0002
												4111	0020

Table 1. - Continued

YEAR	MONTH	DAY	LATD	LATM	N OR S	LONGD	LONGM	E OR W	OBS CONDITION	VESSEL SPEED	WATER TEMP	SPECIES CODE	NUM BIRDS
												4239	0000
												4204	0077
												7525	0009
												7540	0043
												7314	0030
												7323	0011
												7505	0028
												7338	0001
												7313	0002
												4250	0013
												4234	0001
												2000	0001
												7343	0012
												7319	0002
												7100	0002
												2000	0004
												7300	0150
												7211	0001
												7210	0001

Table 2. Cetacean sightings classified by species code groups, encountered in the eastern tropical Pacific from October 6 to December 6, 1983.

Sighting #	Date YRMODY	Latitude Deg Min	Longitude Deg Min	School Size Estimate Best	High	Low	Proportion (% of school)
Species: Bryde's whale (*Balaenoptera edeni*)							Species Code:72
101	831121	03 02S	104 24W	1	1	1	100.0
Species: Unidentified rorqual (*Balaenoptera* sp.)							Species Code:70
33	831026	00 02N	129 39W	1	1	1	100.0
60	831104	05 07N	107 37W	1	1	1	100.0
79[1]	831117	00 01N	95 20W	2	2	2	100.0
84[1]	831118	01 40S	95 00W	2	2	2	100.0
98	831121	03 01S	104 03W	1	1	1	100.0
120	831128	16 45N	112 15W	1	1	1	100.0
127	831129	22 20N	115 04W	2	2	2	100.0
Species: Sperm whale (*Physeter macrocephalus*)							Species Code:46
5	831007	46 54N	125 57W	1	1	1	100.0
6	831007	46 52N	125 54W	1	1	1	100.0
30	831017	00 02S	145 26W	2	3	2	100.0
31	831017	00 07S	144 51W	1	1	1	100.0
41	831029	00 01N	122 18W	2	3	2	100.0
43	831029	00 01N	121 51W	1	2	1	100.0
57	831101	00 02N	109 08W	2	3	2	100.0
61	831106	14 56N	105 20W	8	12	6	100.0

[1]*Balaenoptera borealis* or *B. edeni*

Table 2. - Continued

Sighting #	Date YRMODY	Latitude Deg Min	Longitude Deg Min	School Size Estimate Best	High	Low	Proportion (% of school)
72	831112	09 54N	98 08W	15	20	12	100.0
102	831122	02 07S	108 01W	10	12	8	100.0
103	831122	01 53S	108 00W	5	7	4	100.0
108	831125	02 52N	108 04W	2	2	2	100.0
119	831127	12 38N	110 13W			3	100.0
Species: Dwarf or Pygmy sperm whale (*Kogia* sp.)							Species Code:47/48
111	831125	03 22N	108 04W	1	1	1	100.0
Species: Cuvier's beaked whale (*Ziphius cavirostris*)							Species Code:61
24	831015	05 47N	148 36W	1	1	1	100.0
92	831120	03 22S	97 15W	3	3	3	100.0
113	831125	03 24N	108 04W	1	1	1	100.0
122	831128	17 25N	112 35W	1	1	1	100.0
124	831129	21 52N	114 49W	1	1	1	100.0
126	831129	22 07N	114 57W	1	1	1	100.0
129	831130	27 57N	117 59W	3	4	3	100.0
Species: Unidentified small beaked whale (*Mesoplodon* sp. or *Ziphius cavirostris*)							Species Code:49
9[2]	831008	43 18N	128 18W	3	3	3	100.0

[2]*Mesoplodon* sp.

Table 2. - Continued

Sighting #	Date YRMODY	Latitude Deg Min	Longitude Deg Min	School Size Estimate Best	High	Low	Proportion (% of school)
14[2]	831008	42 35N	128 42W	2	2	2	100.0
15[2]	831008	42 09N	128 55W	1	1	1	100.0
22	831013	15 54N	146 05W	1	1	1	100.0
27[2]	831015	04 31N	148 55W	1	1	1	100.0
36	831029	00 00	123 10W	3	4	3	100.0
44[2]	831030	00 00	118 50W	3	4	3	100.0
46[2]	831030	00 00	118 24W	1	1	1	100.0
63[2]	831106	15 52N	105 06W	1	2	1	100.0
90	831120	03 24S	96 50W	1	1	1	100.0
Species: Dall's porpoise (Phocoenoides dalli)							Species Code:44
1	831007	48 12N	125 04W	5	6	4	100.0
2	831007	48 03N	125 14W	10	12	8	100.0
3	831007	48 01N	125 11W	6	10	5	100.0
4	831007	47 29N	125 32W	2	2	2	100.0
8	831008	43 18N	128 18W	2	4	2	100.0
11	831008	43 05N	128 26W	4	6	4	100.0
12	831008	43 02N	128 27W	1	1	1	100.0
16	831008	41 46N	129 07W	5	6	3	100.0
133	831205	47 08N	124 54W	36	50	25	17.0
134	831205	47 20N	124 53W	24	35	15	17.0
Species: Killer whale (Orcinus orca)							Species Code:37
59	831104	04 46N	107 36W	7	12	6	100.0

[2]Mesoplodon sp.

Table 2. - Continued

Sighting #	Date YRMODY	Latitude Deg Min	Longitude Deg Min	School Size Estimate Best	High	Low	Proportion (% of school)
Species: Pacific White-sided Dolphin (Lagenorhyncus obliquidens)							Species Code:22
133	831205	47 08N	124 54W	36	50	25	83.0
134	831205	47 20N	124 53W	24	35	15	83.0
Species: Fraser's Dolphin (Lagenodelphis hosei)							Species Code:26
39	831029	00 01N	122 37W	85	100	60	75.0
Species: Northern Right Whale Dolphin (Lissodelphis borealis)							Species Code:27
7	831007	46 35N	126 09W	30	50	20	100.0
10	831008	43 16N	128 19W	200	300	150	100.0
Species: Risso's Dolphin (Grampus griseus)							Species Code:21
21	831012	20 29N	142 55W			min. 4	100.0
34	831027	00 01S	124 57W	8	10	6	100.0
37	831029	00 01N	122 44W	22	27	17	100.0
40	831029	00 01N	122 23W	8	12	6	100.0
49	831031	00 02S	114 11W	15	20	12	100.0
54	831031	00 01S	113 08W	2	5	2	100.0

Table 2. - Continued

Sighting #	Date YRMODY	Latitude Deg Min	Longitude Deg Min	School Size Estimate Best	High	Low	Proportion (% of school)
Species:	False killer whale (*Pseudorca crassidens*)						Species Code:33
28	831016	00 03N	149 40W			7	100.0
Species:	Pygmy killer whale (*Feresa attenuata*)						Species Code:32
69	831110	17 52N	103 47W			30	100.0
Species:	Electra dolphin (*Peponocephala electra*)						Species Code:31
39	831029	00 01N	122 37W	85	100	60	25.0
Species:	Pilot whale (*Globicephala* sp.)						Species Code:34
25	831015	05 26N	148 42W			2	100.0
26	831015	05 22N	148 43W			2	100.0
35	831029	00 01S	123 38W			13	76.9
42	831029	00 01N	121 57W	35	50	25	100.0
47	831030	00 02S	117 30W	44	61	36	56.8
81	831117	00 22S	95 04W	20	30	15	100.0
87	831120	03 25S	96 25W	12	16	8	100.0
109	831125	02 56N	108 02W			6	100.0

Table 2. - Continued

Sighting #	Date YRMODY	Latitude Deg Min	Longitude Deg Min	School Size Estimate Best	High	Low	Proportion (% of school)
Species:	Bottlenosed dolphin (*Tursiops* sp.)						Species Code:18
35	831029	00 01S	123 38W			3	23.1
47	831030	00 02S	117 30W	44	61	36	02.3
68	831110	18 05N	103 42W	5	6	4	100.0
99	831121	03 01S	104 03W			6	100.0
117	831127	10 17N	109 09W	25	30	20	100.0
Species:	Rough-toothed dolphin (*Steno bredanensis*)						Species Code:15
62	831106	15 51N	105 06W	8	12	6	100.0
67	831110	18 49N	104 15W	2	2	2	100.0
Species:	Common dolphin (*Delphinus delphis*)						Species Code:05
17	831008	41 02N	129 31W	400	600	300	100.0
73	831112	09 20N	97 42W	50	100	35	100.0
74	831112	08 45N	97 16W	200	300	150	100.0
75	831112	08 41N	97 14W	85	100	75	100.0
76	831112	08 28N	97 06W	150	250	75	100.0
80	831117	00 20S	95 05W	75	100	60	100.0
85	831118	02 10S	95 03W	150	200	100	90.0
89	831120	03 24S	96 35W	200	300	100	100.0
93	831120	03 21S	97 49W	40	60	30	100.0
100	831121	03 02S	104 24W	200	300	100	100.0
123	831129	21 27N	114 37W	100	150	75	100.0

Table 2. - Continued

Sighting #	Date YRMODY	Latitude Deg Min	Longitude Deg Min	School Size Estimate Best	High	Low	Proportion (% of school)
125	831129	22 03N	114 55W	30	50	25	100.0
128	831129	23 01N	115 24W	120	150	75	100.0
130	831201	31 52N	120 05W	40	60	25	100.0
131	831201	32 12N	120 17W	35	45	30	100.0
Species:	Striped dolphin (Stenella coeruleoalba)						Species Code:13
53	831031	00 02S	113 27W	30	50	25	100.0
55	831031	00 00	112 40W	30	40	20	100.0
82	831117	00 27S	95 02W	50	60	40	100.0
83	831118	01 36S	95 00W	8	10	6	100.0
91	831120	03 24S	96 53W	40	60	30	100.0
95	831121	03 03S	102 58W	15	25	10	100.0
96	831121	03 03S	103 01W	30	40	20	100.0
97	831121	03 02S	103 18W	200	250	150	100.0
104	831124	01 10N	108 00W	25	30	20	100.0
Species:	Spinner dolphin (Stenella longirostris)						Species Code:03
23[3]	831013	15 23N	146 12W	75	125	60	100.0
66[4]	831110	18 51N	104 16W	150	200	100	100.0
70[4]	831110	17 49N	103 31W			15	100.0
85[3]	831118	02 10S	95 03W	150	200	100	10.0
86[3]	831119	03 18S	94 58W	200	400	100	100.0
94[3]	831121	03 04S	102 49W	250	500	150	85.0
118[4]	831127	12 18N	110 03W	100	125	75	100.0

[3]White bellied form - Species Code:11
[4]Eastern form - Species Code:10

Table 2. - Continued

Sighting #	Date YRMODY	Latitude Deg Min	Longitude Deg Min	School Size Estimate Best	High	Low	Proportion (% of school)
Species:	Spotted dolphin (Stenella attenuata)						Species Code:90
19	831012	22 24N	140 58W	45	65	30	100.0
20	831012	21 27N	141 53W	30	40	20	100.0
64	831106	16 13N	104 57W	30	75	20	100.0
65	831110	19 03N	104 18W	10	25	8	100.0
94	831121	03 04S	102 49W	250	500	150	15.0
Species:	Unidentified dolphin						Species Code:77
13	831008	42 51N	128 34W	100	150	75	100.0
18	831010	31 36N	134 39W	200	300	100	100.0
29	831016	00 04N	149 34W			15	100.0
38	831029	00 01N	122 40W			20	100.0
47	831030	00 02S	117 30W	44	61	36	40.9
48	831030	00 01S	117 22W			1	100.0
50	831031	00 02S	113 45W			10	100.0
56	831101	00 02S	109 30W	20	30	15	100.0
71	831112	09 56N	98 09W	12	20	10	100.0
77	831113	04 35N	94 59W			1	100.0
78	831116	00 36N	95 04W			150	100.0
88	831120	03 25S	96 28W	8	12	6	100.0
105	831124	01 14N	108 00W			20	100.0
106	831124	01 20N	108 00W			5	100.0
107	831125	02 37N	108 04W	300	400	200	100.0
112	831125	03 22N	108 04W			20	100.0
114	831125	03 30N	108 03W	150	200	100	100.0
115	831126	05 53N	108 07W	8	12	6	100.0
116	831126	06 44N	108 18W			12	100.0
121	831128	16 53N	112 19W			1	100.0

Table 2. - Continued

Sighting #	Date YRMODY	Latitude Deg Min	Longitude Deg Min	School Size Estimate Best	High	Low	Proportion (% of school)
Species: Unidentified cetacean							Species Code:96
32	831023	00 01N	137 52W	2	2	2	100.0
45	831030	00 00	118 39W	1	1	1	100.0
51	831031	00 02S	113 40W	1	1	1	100.0
52	831031	00 02S	113 35W	1	1	1	100.0
58	831104	04 31N	107 43W	1	1	1	100.0
110	831125	03 06N	108 00W	1	2	1	100.0
132	831202	35 58N	122 28W			1	100.0

Table 3. Summary of cetacean sightings encountered in the eastern tropical Pacific from October 6 to December 6, 1983.

Species Name	Species code	Total	Pure	Mixed	Estimated Mean School Size Best(N)	High(N)	Low(N)
Common dolphin (*Delphinus* sp.)	05	15	14	1	124.00(15)	183.00(15)	83.00(15)
Eastern spinner dolphin (*Stenella longirostris*)	10	3	3	0	125.00(2)	162.50(2)	63.33(3)
Whitebelly spinner dolphin (*Stenella longirostris*)	11	4	2	2	125.62(4)	242.50(4)	74.38(4)
Striped dolphin (*Stenella coeruleoalba*)	13	9	9	0	47.56(9)	62.78(9)	35.67(9)
Rough-toothed dolphin (*Steno bredanensis*)	15	2	2	0	5.00(2)	7.00(2)	4.00(2)
Bottlenosed dolphin (*Tursiops* sp.)	18	5	3	2	10.33(3)	12.33(3)	6.40(5)
Risso's dolphin (*Grampus griseus*)	21	6	6	0	11.00(5)	14.80(5)	7.83(6)
Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)	22	2	0	2	24.90(2)	35.28(2)	16.60(2)
Fraser's dolphin (*Lagenodelphis hosei*)	26	1	0	1	63.75(1)	75.00(1)	45.00(1)
Northern right whale dolphin (*Lissodelphis borealis*)	27	2	2	0	115.00(2)	175.00(2)	85.00(2)
Dall's porpoise (*Phocoenoides dalli*)	44	10	8	2	4.50(10)	6.20(10)	3.6(10)
Unidentified dolphin	77	20	19	1	93.56(9)	127.67(9)	39.10(20)
Spotted dolphin (*Stenella attenuata*)	90	5	4	1	30.60(5)	56.00(5)	20.00(5)
Electra dolphin (*Peponocephala electra*)	31	1	0	1	21.25(1)	25.00(1)	15.00(1)
Pygmy killer whale (*Feresa attenuata*)	32	1	1	0			30(1)
False killer whale (*Pseudorca crassidens*)	33	1	1	0			7(1)
Pilot whale (*Globicephala* sp.)	34	8	6	2	23.00(4)	32.75(4)	11.38(8)

Table 3. - Continued

Species Name	Species code	Total	Pure	Mixed	Estimated Mean School Size Best(N)	High(N)	Low(N)
Killer whale (Orcinus orca)	37	1	1	0	7.00(1)	12.00(1)	6.00(1)
Sperm whale (Physeter macrocephalus)	46	13	13	0	4.17(12)	5.58(12)	3.46(13)
Dwarf sperm whale (Kogia simus)	48	1	1	0	1.00(1)	1.00(1)	1.00(1)
Unidentified beaked whale (Ziphius/Mesoplodon sp.)	49	10	10	0	1.70(10)	2.00(10)	1.70(10)
Cuvier's beaked whale (Ziphius cavirostris)	61	7	7	0	1.57(7)	1.71(7)	1.57(7)
Unidentified rorqual (Balaenoptera sp.)	70	7	7	0	1.43(7)	1.43(7)	1.43(7)
Bryde's whale (Balaenoptera edeni)	72	1	1	0	1.00(1)	1.00(1)	1.00(1)
Unidentified cetacean	96	7	7	0	1.17(6)	1.33(6)	1.14(7)
Total		142	127	15			

Table 4. Bird specimens collected in the eastern tropical Pacific from October 6 to December 6, 1983.

DSJ #	Species	Date	Position	Collector #
01	Sula dactylatra	10-16-83	00°00'N 149°49'W	LS#1
02	"	"	"	LS#2
03	"	"	"	LS#3
04	Oceanodroma tethys	10-17-83	00°07'S 144°51'	LS#4
05	"	"	"	RLP1104
06	"	"	"	RLP1105
07	"	"	"	RLP1106
08	Oceanodroma leucorhoa	10-18-83	00°01'S 141°56'W	LS#5
09	Nesofregetta fuliginosa	10-19-83	00°01'S 140°05'W	LS#6
10	Oceanodroma tethys	"	"	LS#7
11	Pterodroma rostrata	"	"	LS#8
12	" ultima	"	"	RLP1108
13	" leucoptera	"	"	RLP1109
14	" "	"	"	RLP1110
15	" "	"	"	RLP1111
16	Stercorarius parasiticus	10-18-83	00°01'S 141°56'W	RLP1107
17	" "	10-20-83	01°27'N 140°19'W	RLP1112
18	Pterodroma leucoptera	10-22-83	01°30'S 140°00'W	RLP1114
19	" "	"	"	RLP1115
20	Sterna fuscata	"	"	LS#9
21	Pterodroma leucoptera	"	"	LS#10
22	Pterodroma rostrata	"	"	RLP1116
23	" "	"	"	LS#11
24	Pterodroma leucoptera	"	"	RLP1118
25	" "	"	"	LS#12
26	Pterodroma nigripennis	"	"	RLP1113
27	Pterodroma externa	"	"	RLP1117
28	" "	"	"	RLP1118
29	Bulweria bulweri	"	"	LS#13
30	" "	"	"	RLP1119
31	Oceanodroma tethys	"	"	LS#14
32	" "	"	"	LS#15
33	" "	"	"	RLP1120

Table 4. - Continued

DSJ #	Species	Date	Position	Collector #
34	Oceanodroma tethys	10-22-83	01°30'S 140°00'W	RLP1121
35	" "	10-24-83	00°03'S 133°56'W	LS#16
36	" "	"	"	RLP1122
37	Oceanodroma leucorhoa	"	"	RLP1123
38	Puffinus pacificus	"	"	LS#17
39	Oceanodroma tethys	10-26-83	"	RLP1124
40	" "	"	"	LS#18
41	" "	10-27-83	00°04'S 124°02'W	RLP1125
42	" "	10-28-83	00°00' 124°22'W	RLP1128
43	" "	"	"	LS#19
44	" "	"	"	RLP1126
45	Pterodroma rostrata	"	"	RLP1127
46	Oceanodroma tethys	11-1-83	00°02'N 109°10'W	RLP1128
47	" "	"	"	RLP1129
48	" "	"	"	RLP1130
49	" "	"	"	RLP1131
50	Oceanodroma leucorhoa	"	"	RLP1132
51	Sula sula	11-13-83	05°00'N 095°00'W	LS#20
52	Sula sula	"	"	LS#21
53	Oceanodroma tethys	"	"	RLP1133
54	Oceanodroma leucorhoa	"	"	RLP1134
55	" "	"	04°00'N 095°00'W	RLP1135
56	Sula sula	11-14-83	02°47'N 095°00'W	LS#22
57	" "	"	"	RLP1136
58	" "	"	"	RLP1137
59	" "	"	"	RLP1138
60	Oceanodroma tethys	"	"	RLP1139
61	Fregata minor	"	02°49'N 095°00'W	LS#23
62	Oceanodroma tethys	"	"	RLP1140
63	" "	"	"	RLP1141
64	" "	"	"	RLP1142
65	Oceanodroma leucorhoa	"	"	RLP1143
66	" "	"	"	RLP1144

Table 4. - Continued

DSJ #	Species	Date	Position	Collector #
67	Fregata minor	11-15-83	02°01'N 095°00'W	LS#24
68	Stercorarius pomarinus	"	"	RLP1145
69	Sterna fuscata	"	"	LS#25
70	" "	"	"	LS#26
71	" "	"	"	RLP1146
72	" "	"	"	LS#27
73	" "	"	"	LS#28
74	Oceanodroma leucorhoa	"	"	RLP1147
75	"	11-16-83	00°51'N 95°00'W	LS#29
76	"	"	"	RLP1148
77	"	"	"	RLP1149
78	Oceanodroma tethys	"	"	LS#30
79	"	"	"	RLP1150
80	"	"	"	RLP1151
81	"	"	"	RLP1152
82	"	"	"	RLP1153
83	Fregata minor	"	"	RLP1154
84	Oceanodroma tethys	11-17-83	00°00' 94°55'W	RLP1155
85	"	"	"	RLP1156
86	"	"	"	RLP1157
87	"	"	"	RLP1158
88	"	"	"	RLP1159
89	"	"	"	RLP1160
90	Oceanodroma castro	11-18-83	01°30'S 95°00'W	RLP1161
91	" leucorhoa	"	"	LS#31
92	" "	"	"	RLP1162
93	Larus pipixcan	"	"	LS#32
94	Oceanodroma leucorhoa	"	02°00'S 95°00'W	LS#33
95	"	"	"	RLP1163
96	"	"	"	RLP1164
97	"	"	"	RLP1165
98	"	"	"	RLP1166
99	"	"	"	RLP1167

Table 4. - Continued

DSJ #	Species	Date	Position	Collector #
100	Larus pipixcan	11-22-83	2°00'S 108°00'W	LS#34
101	Oceanodroma leucorhoa	"	"	RLP1168
102	"	"	"	RLP1169
103	"	"	"	RLP1170
104	"	"	"	RLP1171
105	"	"	1°30'S 108°00'W	RLP1172
106	"	"	"	RLP1173
107	"	"	"	RLP1174
108	"	"	"	RLP1175
109	"	"	"	RLP1176
110	"	"	"	RLP1177
111	"	"	"	RLP1178
112	Oceanodroma leucorhoa	11-23-83	"	RLP1179
113	Oceanodroma tethys	11-24-83	1°30'N 108°00'W	RLP1180
114	"	"	"	RLP1181
115	"	"	"	RLP1182
116	"	"	"	RLP1183
117	"	"	"	RLP1184
118	Fregata minor	11-25-83	03°00'N 108°00'	RLP1185

Appendix A. Key to Bird Species Code.

2000 unid. loon (*Gavia* sp.)

4101 Short-tailed Albatross (*Diomedea albatrus*)

4108 Laysan Albatross (*D. immutabilis*)

4109 Waved Albatross (*D. irrorata*)

4111 Black-footed Albatross (*D. nigripes*)

4204 Northern Fulmar (*Fulmarus glacialis*)

4232 Townsend's Shearwater (*Puffinus auricularis*)

4233 New Zealand Shearwater (*P. bulleri*)

4234 Flesh-footed Shearwater (*P. carneipes*)

4235 Pink-footed Shearwater (*P. creatopus*)

4239 Sooty Shearwater (*P. griseus*)

4244 Audubon's Shearwater (*P. lherminieri*)

4245 Christmas Shearwater (*P. nativitatus*)

4246 Black-vented Shearwater (*P. opisthomelas*)

4247 Wedge-tailed Shearwater (*P. pacificus*)

4250 Slender-billed Shearwater (*P. tenuirostris*)

4253 Newell's Shearwater (*P. newelli*)

4254 unid. black and white shearwater (*Puffinus* sp.)

4255 Sooty/Slender-billed Shearwater (*Puffinus griseus/tenuirostris*)

4257 Cook's/Stejneger's Petrel (*Pterodroma cookii/longirostris*)

4258 Stejneger's/White-winged Petrel (*Pterodroma longirostris/leucoptera*)

4259 Kermadec/Herald Petrel (*Pterodroma neglecta/heraldica*)

4260 unid. petrel (*Pterodroma* sp.)

4269 White-necked Petrel (*Pt. externa cervicalis*)

4270 Cook's Petrel (*Pt. cookii*)

4271 Juan Fernandez Petrel (Pt. externa externa)

4278 White-winged Petrel (Pt. leucoptera)

4279 Stejneger's Petrel (Pt. longirostris)

4283 Black-winged Petrel (Pt. nigripennis)

4285 Dark-rumped Petrel (Pt. phaeopygia)

4286 Kermadec Petrel (Pt. neglecta)

4288 Tahiti Petrel (Pt. rostrata)

4289 Solander's Petrel (Pt. solandri)

4290 Murphy's Petrel (Pt. ultima)

4292 Juan Fernandez/White-necked Petrel (Pt. externa externa/e. cervicalis)

4293 unid. cookilaria (small Pterodroma sp.)

4294 Tahiti/Phoenix Petrel (Pt. rostrata/alba)

4297 Bulwer's Petrel (Bulweria bulweri)

4300 unid. storm-petrel (Oceanodroma sp.)

4340 White-throated Storm-petrel (Nesofregetta fulignosus)

4370 Galapagos Storm-petrel (Oceanodroma tethys)

4371 Harcourt's Storm-petrel (O. castro)

4372 Leach's Storm-petrel (O. lencorhoa)

4377 Ashy Storm-petrel (O. homochroa)

4381 Black Storm-petrel (O. melania)

4390 Least Storm-petrel (Halocyptena microsoma)

4394 Leach's/Harcourt's Storm-petrel (Oceanodroma lencorhoa/castro)

5100 unid. tropicbird (Phaethon sp.)

5101 Red-billed Tropicbird (Ph. aethereus)

5102 Red-tailed Tropicbird (Ph. rubricanta)

5103 White-tailed Tropicbird (Ph. lepturus)

5201 Brown Pelican (Pelecanus occidentalis)

5300 unid. booby (Sula sp.)

5312 Masked Booby (S. dactylatra)

5313 Red-footed Booby (S. sula)

5314 Brown Booby (S. lencogaster)

5600 unid. frigatebird (Fregata sp.)

5603 Magnificent Frigatebird (F. magnificens)

5604 Great Frigatebird (F. minor)

6000 unid. duck (anseriform sp.)

7100 unid. phalarope (Phalaropus sp.)

7101 Red Phalarope (P. fulicarius)

7103 Northern Phalarope (P. lobatus)

7200 unid. Skua (Catharacta sp.)

7210 unid. jaeger (Stercorarius sp.)

7211 Pomarine Jaeger (S. pomarinus)

7212 Parasitic Jaeger (S. parasiticus)

7214 Parasitic/Long-tailed Jaeger (S. parasiticus/longicaudus)

7300 unid. gull (Larus sp.)

7313 Mew Gull (L. canus)

7314 Herring Gull (L. argentatus)

7319 Western Gull (L. occidentalis)

7323 Glaucous-winged Gull (L. glaucouscens)

7327 Laughing Gull (L. atricilla)

7331 Franklin's Gull (L. pipixcan)

7338 Bonaparte's Gull (L. philadelphia)

7343 Black-legged Kittiwake (Rissa tridactyla)

7345 Swallow-tailed Gull (Creagrus furcatus)

7346 Sabine's Gull (Xema sabini)

7348	Yellow-legged Gull (Larus
7353	Black Tern (Chlidonias niger)
7359	Common Tern (Sterna hirundo)
7360	Arctic Tern (S. paradisaea)
7373	Sooty Tern (S. fuscata)
7389	Brown Noddy (Anous stolidus)
7392	White Tern (Gygis alba)
7394	Common/Arctic Tern (Sterna hirundo/paradisaea)
7500	unid. alcid (alcidae sp.)
7505	Common Murre (Uria aalgae)
7525	Cassin's Auklet (Ptychoramphus aleuticus)
7540	Rhinoceros Auklet (Cerorhinca monocerata)
9100	non-passerine, non-seabird
9200	unid. passerines
9500	unid. sea turtle

Appendix B. Project Instructions NOAA Ship Discoverer Cruise No. RP-9-DI-84.
EPOCS LEGS 83-I and 83-II

1.0 INTRODUCTION

1.1 EPOCS is a large NOAA sponsored program intended to further man's understanding of the role of the ocean in the world's climate. The primary goal of the EPOCS project is the investigation of the dominant mechanisms producing variations of the sea surface temperature in the equatorial region of the Pacific Ocean. It is believed that equatorial sea surface temperature variations are linked to perturbations in the midlatitude atmospheric pressure field and hence to weather. Ocean currents play an important role in determining the local temperature changes through heat advection. Because of this, an associated goal of the program is to study the horizontal, vertical and temporal variations of the currents and how these are affected by changes in the wind field.

1.2 Principal Investigators associated with LEGS 83-1 and 83-II are:

Dr. E. Bernard (Pacific Marine Environmental Laboratory - PMEL: FTS 399-0199)
Dr. C. Eriksen (Massachusetts Institute of Technology-MIT: 617-253-5738)
Dr. D. Halpern (PMEL: FTS 399-7714)
Dr. S. Hayes (PMEL: FTS 399-4850)
Dr. R. Knox (Scripps Institution of Oceanography-SIO: 619-452-2094)
Dr. P. Niiler (SIO: 619-452-4100)
Dr. B. Taft (PMEL: FTS 399-4850)
Dr. R. Watts (University of Rhode Island-URI: 401-792-6511)
Dr. S. Reilly (SWFC: 619-453-2820)

For information concerning these project instructions, contact Dr. Halpern.

2.0 SCHEDULE

A. LEG 83-I (33 days)

6 Oct 83	Depart Seattle, WA
7 Nov 83	Arrive Manzanillo, Mexico

B. LEG 83-II (27 days)

10 Nov 83	Depart Manzanillo, Mexico
6 Dec 83	Arrive Seattle, WA

3.0 PERSONNEL

A. LEG 83-I

Mr. Paul Freitag (M/US)	Chief Scientist	PMEL
Mr. Andrew Shepherd (M/US)		PMEL
Mr. Scott Newell (M/US)		PMEL
Mr. Douglas Fenton (M/US)		SeaMarTec
Dr. Robert Knox (M/US)		SIO
Mr. Rick Miller (M/US)		U. Washington
Mr. Mike Stapp (,/US)		PMEL
Mr. Jim Dufour (M/US)		SIO
Dr. Charles Eriksen (M/US)		MIT
Mr. Robert Reid (M/US)		Draper Lab

Mr. John Dolin (M/US)		Draper Lab
Dr. Richard Payne (M/US)		WHOI
TBA		U. Miami
Ms. Germana Peggion (F/Italy)		Florida State U.
Ms. Patricia Pullen (F/US)		PMEL
Mr. Robert Pitman (M/US)		SWFC
Mr. Larry Spears (M/US)		PRBO

B. LEG 83-II

Ms. Linda Mangum (F/US)	Chief Scientist	PMEL
Dr. Bruce Taft (M/US)		PMEL
Dr. Kathleen O'Neill (F/US)		PMEL
Dr. Francisco Brito (M/Chile)		U. Chile
Mr. Patrick McLain (M/US)		PMEL
Mr. Douglas Fenton (M/US)		SeaMarTec
Mr. William Kesler (M/US)		U. Washington
Mr. Dennis Holzer (M/US)		PMEL
TBA		URI
Ms. Rosalie Breshears (F/US)		SeaMarTec
Mr. Robert Pitman (M/US)		SWFC
Mr. Larry Spears (M/US)		PRBO

4.0 AREA OF OPERATION

The area of operations for LEGS 83-I and II are shown in Figures 1 and 2.

5.0 OPERATIONS

The schedules of operations are outlined in Tables 1 and 2.

5.1 LEG 83-I

To ensure fulfillment of all scientific objectives the ship will steam at 14 knots.

5.1.1 Moorings

Mooring diagrams are shown in Appendix A. The weight of each item stored on the ship will be less than 3200 pounds. Total weight of scientific equipment loaded in Seattle will be approximately 130,000 pounds.

(a) Recover 3 surface moorings:
- 0°, 140°W (T-35: Halpern)
- 0°, 110°W (T-34: Halpern)
- 0°, 108°W (T-32: Halpern)

(b) Deploy 7 surface moorings:
- 0°, 140°W (T-36: Halpern)
- 1°30'S, 140°W (Knox)
- 1°30'N, 140°W (Knox)
- 0°, 134°W (Knox)
- 0°, 124°W (T-37: Halpern)
- 0°, 110°W (T-38: Halpern)
- 0°, 108°W (T-39: Halpern)

(c) Deploy 1 subsurface mooring:
0°, 143°W (Eriksen); uppermost flotation is located 15-20 m below the surface; requires flat bottom and echo sounder accurate to ±5 ms travel time. Detailed bathymetric survey will be made. ATNAV system will be used during deployment.

(d) Deploy 3 bottom moorings:
0°, 143°W (Bernard)
1°30'S, 140°W (Bernard)
1°30'N, 140°W (Bernard)

5.1.2. Intercomparison of meteorological observations (PI: Payne)

A calibration comparison between meteorological instruments mounted on several of the surface moorings and instruments installed on a special mast mounted vertically near the bow of the ship will be made for at least 6-hour periods at 0°, 140°W; 1°30'N, 140°W; 1°30'S, 140°W; and, 0°, 134°W. Requires fabrication and installation of a special mast to locate instruments 10 m above the deck near the bow, instrument tie-in to the ship's navigation gyro, instrument tie-in to the Loran system, and mount a small antenna on the rail. Requires a sheltered area with 6-8 feet of bench space for electronic equipment within 100 feet of the instrumented mast. During at-sea calibration, ship maintains station within 0.5 nm of the buoy.

5.1.3 XBT Measurements (PI: Halpern)

T-4 XBT measurements at 0.25° longitude will be made along the equator and every 0.5° from 20°N to 0° along track line. The XBT recording system and XBTs for LEG 83-I will be supplied by scientific party. The ship's XBT recorder will be used as a backup. For each XBT cast the following information must be recorded on sheets provided by the scientific party: wind direction and speed, barometric pressure, air temperature, bucket temperature, intake temperature, time and position.

5.1.4 Drifting Buoys (PI: Niiler)

Drifting buoys will be deployed along the equator at approximately 115°W, 120°W, 125°W, 130°W, 133°W, 137°W, 140°W and 143°W.

5.1.5 CTD Measurements (PI: Hayes)

CTD measurements to 1000 m will be made at 5° longitude intervals along the equator. At each mooring site, CTD measurements will be made to within 200 m of the bottom (~ 5000 m water depth). On each cast 4 to 6 water samples will be collected using a rosette sampler for salinity, temperature and oxygen calibration. PMEL's (Hayes) NBIS CTD system will be used, with the ship's Plessey system as a backup.

5.1.6 TOPS Measurements (PI: Hayes)

TOPS measurements will be made to 1000 m at 5° longitude intervals along the equator. TOPS will be recovered using the ship's ZODIAC.

5.2 LEG 83-II

5.2.1 To ensure arrival on 9 December, the ship will steam at 14 knots for a portion of this LEG.

5.2.2 Moorings

Mooring diagrams are shown in Appendix A. The weight of each item stored on the ship will be less than 3200 pounds.

Recover two surface moorings at the following locations:
0°00.7'N 95°02.6'W (T-33: Halpern)
3°37.8'S 95°03.0'W (ATLAS 2: Hayes)

Deploy one surface mooring at the following location:
2°N 110°W (ATLAS 3: Hayes)

5.2.3 Inverted Echo Sounders (IES) (PI: Watts)

Recover two IES at the following locations:
2°51.6'N 94°54.9'W
3°30.1'S 95°01.3'W

5.2.4 Bottom Pressure Recorders (BPR) (PI: Bernard)

Recover one BPR at the following location:
2°53.6'S 95°00.8'W

5.2.5 TOPS Measurements (PI: Hayes)

TOPS, a free-falling current profiler, will be used to conduct current profiling transects from 5°N to 3°S along 95°W and 110°W as shown in Figure 2. Deep tracked TOPS/CTD drops to 3000 m will be made at 5 locations along 95°W (3°N, 1°N, 0°, 1°S, 3°S) and at 3 locations along 110°W (2°S, 0°, 2°N). Existing ATNAV transponder nets will be occupied at these locations with the exception of nets at 3°N and 1°N along 95°W, where previous transponder failures will require the deployment and surveying of new nets using recoverable transponders. Relative drops to 1000 m will be made at 30 nmile spacing elsewhere along 95°W and 110°W; in addition, relative drops will be made every 5° along 0° between 95°W and 110°W. A total of 8 tracked drops to 3000 m and 28 relative drops to 1000 m are expected. TOPS will be recovered using the ship's ZODIAC.

5.2.6 CTD Measurements (PI: Hayes)

CTD casts will be taken every .5 from 5°N to 3°S in conjunction with TOPS and mooring work as shown in Figure 2. Deep CTD casts to 200 m off the bottom will be made at the location of transponder nets, IES sites and mooring sites. 500 m CTDs will be taken during relative TOPS drops. On each cast 4 to 6 water samples will be collected for salinity temperature and oxygen calibration purposes, using a rosette sampler. Approximately 40 casts are anticipated. PMEL's NBIS CTD system will be used, with the ship's Plessey system as a backup.

5.2.7 XBT Measurements (PI: Hayes)

XBTs will be taken every 30 nmiles from Manzanillo to 5°N, 95°W; from 3.5°S, 95°W to 2.5°S, 110°W; and from 5°N, 110°W to 15°N on transect to San Diego. The XBT data are to be recorded by the ship's Data Acquisition System in analog and digital format. For each XBT cast, the sea, wind, and swell conditions will be recorded along with time, latitude and longitude. In addition, surface bucket temperatures and salinity samples will be made at the time of each measurement. XBTs for LEG 83-II will be supplied by the ship.

5.3 LEGS 83-I and 83-II

5.3.1 Continuous Sea Surface Temperature Recordings

Sea surface temperatures will be recorded continuously. The recorder shall be annotated each hour by the date/time group and the most recent bucket temperature.

5.3.2 Activities near moorings

XBTs, CTDs and recreational fishing will be conducted at least one nautical mile from a surface mooring.

5.3.3 ATS Radio Equipment

The ATS radio equipment will be installed aboard the ship and will be available to the Chief Scientist for daily communication to PMEL.

5.3.4 Doppler Current Profiles (PI: Taft)

The Ametek-Straza doppler current profiler system will be operated during LEGS 83-I and 83-II. The scientific party will be responsible for data acquisition.

6.0 EQUIPMENT

6.1 All equipment and instrumentation will be provided by the project except as noted in 6.2.

6.2 The ship will provide:

a) XBT launcher and 750 m recorder
b) 200 XBT T-4 probes
c) Hydrowinch with slip rings
d) Conductor cable for NBIS CTD
e) Niskin bottles
f) Rosette sampler with calibrated thermometers
g) Copenhagen standard water
h) Recently calibrated CTD system with 1500 m and 6000 m sensors
i) Recently calibrated reversing thermometers
j) Navigation equipment including satellite and Omega systems
k) OAR VHF synthesized RDF receiver
l) Recently calibrated salinometer

7.0 MISCELLANEOUS

7.1 Modification of details in these instructions may be made in the field as appropriate by the Chief Scientist with the concurrence of the Commanding Officer.

7.2 Any other oceanographic work done during this project will be accomplished with the concurrence of the Chief Scientist and on a not to interfere basis with the programs described in these instructions.

7.3 The Chief Scientist shall furnish the ship an inventory of all data gathered by visiting scientists showing the type of and quantity of such data. A copy of the inventory shall be forwarded to the Chief, Data Control branch (N/CG243).

7.4 The Director, PMEL will be responsible for the release of any data to those requesting it. Upon his request, the ship shall furnish copies of any data gathered to any other scientist aboard if these copies can be made conveniently. The Chief Scientist, for the Director, PMEL, is responsible for the final disposition of data OSS Sheets and DR Abstracts will be copied for the Marine Chart Division prior to their release to the laboratories. The Chief Scientist shall submit a ROSCOP II form within 30 days through the EDIS Liaison Officer. In addition, a letter transmitting field records shall be prepared by the ship and receipted by the Chief Scientist. A copy of the receipt transmittal shall be forwarded to the Chief, Data Control Branch (N/CG243).

7.5 A progress sketch shall be submitted on an appropriate scale. Report accomplishments on NOAA Form 12-8b under Work Identification Code 0133053 (Ocean Investigations).

7.6 Primary navigation will be provided by the Satellite-Omega navigator.

7.7 All observations and fixes shall be identified by a date-time group. In addition, XBT, CTD and current profiles shall each be given a number, starting at one, and numbered consecutively throughout the cruises.

7.8 On this project there is no requirement for standard soundings. However, the EDO unit will be used extensively during mooring and acoustic dropsonde operations.

7.9 Ancillary projects may be conducted on a not to interfere basis in accordance with PMC OpOrder.

7.10 Synoptic weather reports using NOAA Forms 72-1 and 72-4 will be made every six hours in accordance with NOAA guidelines and PMC OpOrder.

7.11 All XBT data should be transmitted in concurrence with PMC OpOrder - Integrated Global Ocean Station System (IGOSS), Bathythermograph.

7.12 Some scientific equipment is sensitive to radio frequency interference. If interference with this or other equipment occurs, it may be necessary for the Chief Scientist and Commanding Officer to adjust operations and transmission times or take other steps to electronically isolate the equipment.

7.13 All scuba diving, if conducted, shall be in conformance with NOAA, NOS, and PMC Directives.

7.14 In compliance with NOAA Directive 17-17, a cruise report will be prepared by the Chief Scientist and Commanding Officer and submitted to N/MO11 within 30 days following the end of the cruise.

7.15 Receipt of these instructions shall be acknowledged.

Table 1. Schedule, LEG 83-I (Seattle - Manzanillo). Transit speed is 14 knots.

6 October	Depart Seattle
	Transit to 0°, 150°W
	Arrive at 0°, 150°W
	CTD/TOPS Station at 0°, 150°W (4 hours)
	Transit along equator to 0°, 145°W (XBT casts)
	CTD/TOPS Station at 0°, 145°W (4 hours)
	Transit along equator to 0°, 143°W (XBT casts)
	Deploy 2 moorings at 0°, 143°W (24 hours)
	Deploy drifter buoy at 0°, 143°W
	Transit along equator to 0°, 140°W (XBT casts)
	Recover mooring at 0°, 140°W (8 hours)
	Deploy mooring at 0°, 140°W (12 hours)
	CTD/TOPS Station at 0°, 140°W (4 hours)
	Intercomparison of wind sensors (6 hours)
	Deploy drifter buoy at 0°, 140°W
	Transit to 1°30'N, 140°W (XBT casts)
	Deploy 2 moorings at 1°30'N, 140°W (24 hours)
	Intercomparison of meteorological sensors (6 hours)
	Transit to 1°30'S, 140°W (XBT casts)
	Deploy 2 moorings at 1°30'S, 140°W (24 hours)
	Intercomparison of meteorological sensors (6 hours)
	Transit to 0°, 139°W
	Transit along equator to 0°, 137°W (XBT casts)
	Deploy drifter buoy at 0°, 137°W (1 hour)
	Transit along equtor to 0°, 134°W (XBT casts)
	CTD/TOPS Station at 0°, 134°W (4 hours)
	Deploy mooring at 0°, 134°W (20 hours)
	Intercomparison of meteorological sensors (6 hours)
	Transit along equator to 0°, 133°W
	Deploy drifter buoy at 0°, 133°W (1 hour)
	Transit along equator to 0°, 130°W (XBT casts)
	CTD/TOPS Station at 0°, 130°W (4 hours)
	Deploy drifter buoy at 0°, 130°W
	Transit along equator to 0°, 125°W (XBT casts)
	CTD/TOPS Station at 0°, 125°W (4 hours)
	Deploy drifter buoy at 0°, 125°W
	Transit along equator to 0°, 124°W (XBT casts)
	Deploy mooring at 0°, 124°W (20 hours)
	Transit along equator to 0°, 120°W
	CTD/TOPS Station at 0°, 120°W (4 hours)
	Deploy drifter buoy at 0°, 120°W
	Transit along equator to 0°, 115°W (XBT casts)
	CTD/TOPS Station at 0°, 115°W (4 hours)
	Deploy drifter buoy at 0°, 115°W
	Transit along equator to 0°, 110°W (XBT casts)
	CTD/TOPS Station at 0°, 110°W (4 hours)
	Recover mooring at 0°, 110°W (6 hours)
	Deploy mooring at 0°, 110°W (6 hours)
	Transit along equator to 0°, 108°W (XBT casts)
	Recover mooring at 0°, 108°W (6 hours)
	Deploy mooring at 0°, 108°W (6 hours)
	Transit to Manzanillo, Mexico
7 November	Arrive Manzanillo

Table 2. Schedule, LEG 83-II (Manzanillo - Seattle). Transit speeds are 14 knots when appropriate; otherwise 12 knots.

10 November	Depart Manzanillo
	Transit to 5°N, 95°W
	CTD/TOPS section and moorings along 95°W
	12 stations @ 2 hours (24 hours)
	5 stations @ 4 hours (20 hours)
	Deploy transponder nets at 3°N, 1°N (12 hours)
	Recover IES at 3°N, 95°W and 3.5°S, 95°W (6 hours)
	Recover surface mooring T-33 at 0°, 95°W (8 hours)
	Recover BPR at 2.9°S, 95°W (3 hours)
	Recover surface mooring ATLAS-2 at 3.6°S, 95°W (6 hours)
	Transit from 3.6°S, 95°W to 0°, 100°W
	CTD/TOPS station at 0°, 100°W (2 hours)
	Transit along equator to 0°, 105°W
	CTD/TOPS station at 0°, 105°W (2 hours)
	Transit to 2.5°S, 110°W
	CTD/TOPS section and moorings along 110°W
	13 stations @ 2 hours (26 hours)
	3 stations @ 4 hours (12 hours)
	Deploy ATLAS-3 surface mooring at 2°N, 110°W (8 hours)
	Transit from 5°N, 110°W to Seattle
6 December	Arrive Seattle