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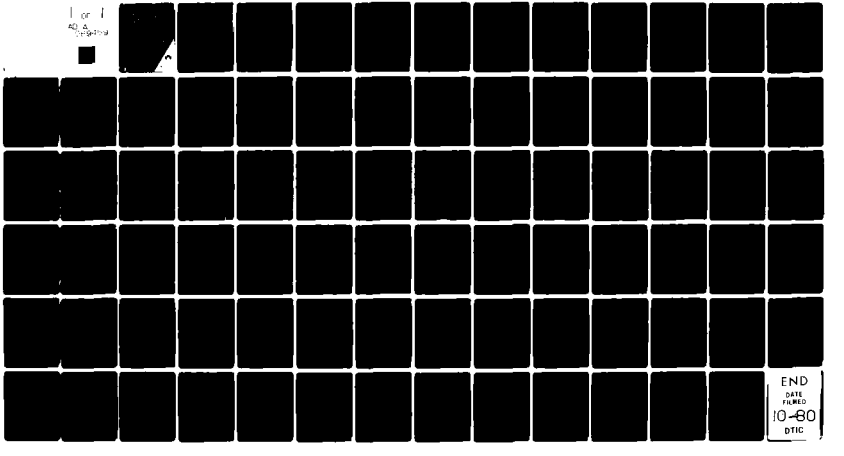

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INDIAN OCEAN GEOLOGICAL, GEOPHYSICAL, AND OCEANOGRAPHIC DATA CATALOG USNS WILKES 1977-1979

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AUGUST 1980

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FOREWARD

The Indian Ocean remains as one of the critical areas to the free world. During the period of May 1977 to December 1979, the USNS WILKES conducted geological, geophysical and oceanographic surveys throughout the Indian Ocean. These survey efforts have enhanced our knowledge of the environment and strengthened the Navy's ability to operate in this region. This report summarizes the type, amount, and location of the environmental data and provides a useful reference for the data base.

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Captain, USN
Commanding Officer
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
During the period of May 1977 to December 1979, the U. S. Naval Oceanographic Office conducted geological, geophysical, and oceanographic surveys in the Indian Ocean from the USNS WILKES. The report summarizes the type, amount, and location of underway and on-station data. Underway data consists of seismic profiles, narrow beam bathymetry, 3.5 kHz subbottom profiles, total magnetic intensity, and sea surface temperature measurements. On-station data includes sediment interval velocity measurements made by using wide angle bottom reflectivity techniques, bottom sediment cores and oceanographic stations.

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I. BACKGROUND

Recent events have focused attention on the need for more detailed oceanographic and geological/geophysical information for the Indian Ocean to support fleet units assigned there. Requirements for environmental data originating at CINCPACFLT, COMINEWARCOM and the Defense Mapping Agency (DMA) were validated in 1973, 1974 and 1976 by the Oceanographer of the Navy (OCEANAV) and assigned to the Naval Oceanographic Office (NAVOCEANO) for fulfillment. Accordingly, NAVOCEANO assigned the USNS WILKES to the Indian Ocean in early 1977 for surveying which continued through 1979 when WILKES was recalled to CONUS for major yard maintenance. The WILKES surveys were generally conducted according to a two-year reconnaissance plan (ref. a) designed to provide data from major physiographic and oceanographic provinces and to form the framework for more detailed survey work in the future. These WILKES surveys represent NAVOCEANO's major shipboard survey effort in the Indian Ocean to date.

This report summarizes the portion of the WILKES' Indian Ocean data collection taken by the Ocean Projects Division (Code 7200). These data consist of the geological/geophysical and oceanographic measurements representing the bulk of data collected on 17 survey operations (31 survey legs). Data not summarized in this report include acoustic station data obtained by the Acoustic Projects Division (Code 7300) and a limited amount of underway gravity measurements (Code 8300). The positions of 6-hour synoptic expendable bathythermograph (XBT) observations are not tabulated nor are those of numerous additional XBTs taken during a Somali Current frontal study by the Tactical Analysis Division (Code 9100).

II. INTRODUCTION

A. SURVEY TRACKS

The USNS WILKES' Indian Ocean survey tracks are shown in figure 1 and the survey dates and ports are given in table I. Generalized bathymetry and physiography of the region are provided for convenient reference in figures 2 and 3. Each survey was assigned an operation number and each port-to-port period was designated by a specific leg number. Survey leg numbers essentially agree with those designated in the U. S. Naval Oceanographic Office Survey Plan for the Indian Ocean, 1977 - 1979 (ref. a). Variations from the original plan reflect changes in the emphasis of survey objectives or the impact of logistics requirements as well as the effect of ship or survey equipment casualties. There was no attempt to conduct originally planned survey legs in the numbered sequence of the original plan and additional survey leg number designations were added whenever a survey leg did not correspond to one originally planned.

B. MEASUREMENTS

Data collected by the USNS WILKES is categorized as either underway or station data. Data collected routinely while underway, along the survey tracks shown in figure 1, includes narrow beam bathymetry (NBES), 3.5 kHz shallow subbottom profiles, seismic reflection profiles, total magnetic intensity and seasurface temperature. Station data includes sediment interval velocity measurements made by using wide angle bottom reflectivity (WABR) techniques, cores, sound velocity-salinity-temperature-depth measurements (SVSTD), and expendable

TABLE I. Survey Dates and Ports
USNS WILKES Indian Ocean Surveys, April 1977 - December 1979

OPERATION NUMBER	LEG NO.	DEPARTURE AND ARRIVAL DATES (JULIAN DAY)	PORTS
343719	1	11 Apr (101) - 30 Apr (120) 1977	Mombasa, Kenya - Port Louis, Mauritius
343719	2	9 May (129) - 28 May (148) 1977	Port Louis - Port Louis
343728	3	3 Jun (154) - 25 Jun (176) 1977	Port Louis - Mombasa
343728	4	13 Jul (194) - 27 Jul (208) 1977	Mombasa - Mombasa
343728	5	30 Jul (211) - 5 Aug (217) 1977	Mombasa - Victoria, Seychelles
		9 Aug (221) - 30 Aug (242) 1977	Victoria - Port Louis
343731	6	5 Sep (248) - 27 Sep (270) 1977	Port Louis - Mombasa
343731	7	7 Oct (280) - 20 Oct (293) 1977	Mombasa - Diego Garcia
		21 Oct (294) - 30 Oct (303) 1977	Diego Garcia - Karachi, Pakistan
343802	8	5 Nov (309) - 27 Nov (331) 1977	Karachi - Karachi
343806	22	2 Dec (336) - 20 Dec (354) 1977	Karachi - Singapore
343811	18	4 Jan (004) - 29 Jan (029) 1978	Singapore - Singapore
343811	26	2 Feb (033) - 25 Feb (056) 1978	Singapore - Singapore
343815	17	7 Mar (066) - 25 Mar (084) 1978	Singapore - Colombo, Sri Lanka
		25 Mar (084) - 27 Mar (086) 1978	Colombo - Male, Maldive Republic
		29 Mar (088) - 31 Mar (090) 1978	Male - Colombo
343815	20	5 Apr (095) - 27 Apr (117) 1978	Colombo - Singapore
343821	27	26 Jun (177) - 13 Jul (194) 1978	Singapore - Colombo
343821	10	19 Jul (200) - 29 Jul (210) 1978	Colombo - Karachi
343821	9	3 Aug (215) - 24 Aug (236) 1978	Karachi - Karachi
343827	11	3 Sep (246) - 19 Sep (262) 1978	Karachi - Colombo
343827	12	24 Sep (267) - 28 Sep (271) 1978	Colombo - Diego Garcia
		30 Sep (273) - 17 Oct (290) 1978	Deigo Garcia - Colombo
343828	15	23 Oct (296) - 11 Nov (315) 1978	Colombo - Colombo
343828	13	18 Nov (322) - 7 Dec (341) 1978	Colombo - Singapore
343901	14	8 Jan (008) - 29 Jan (029) 1979	Singapore - Colombo
343901	21	7 Feb (038) - 24 Feb (055) 1979	Colombo - Colombo

TABLE I. (Cont.) Survey Dates and Ports
USNS WILKES Indian Ocean Surveys, April 1977 - December 1979

OPERATION NUMBER	LEG NO.	DEPARTURE AND ARRIVAL DATES (JULIAN DAY)	PORTS
343907	23	22 Mar (081) - 29 Mar (088) 1979	Colombo - Victoria
343907	24	3 Apr (093) - 27 Apr (117) 1979	Victoria - Colombo
343908	16	Part I	
		6 May (126) - 14 May (134) 1979	Colombo - Diego Garcia
343908		Hydrographic Survey	
		16 May (136) - 1 Jun (152) 1979	Diego Garcia - Diego Garcia
343908	16	Part II	
		2 Jun (153) - 6 Jun (157) 1979	Diego Garcia - Colombo
343908	25	19 Jun (170) - 20 Jun (171) 1979	Colombo - Colombo
		30 Jun (181) - 7 Jul (188) 1979	Colombo - Singapore
343915	38	20 Jul (201) - 5 Aug (217) 1979	Singapore - Victoria
343916	29	16 Aug (228) - 5 Sep (248) 1979	Victoria - Victoria
343916	30	13 Sep (256) - 3 Oct (276) 1979	Victoria - Mombasa
343920	31	8 Oct (281) - 29 Oct (302) 1979	Mombasa - Victoria
343921	32	5 Nov (309) - 24 Nov (328) 1979	Victoria - Victoria
343921	33*	29 Nov (333) - 17 Dec (351) 1979	Victoria - Gulf of Aden

* WILKES transited through Red Sea and Mediterranean to end Leg 33 at Agusta Bay, Sicily on 17 Dec (351), 1979.

bathythermograph data. The amount and types of underway and station data are summarized in table II for each operation and leg number. The table is arranged by leg number sequence which is not the chronological sequence in which the data were obtained. Each type of measurement is treated individually in the subsequent sections of this report. Station location figures are presented for the core data, sediment interval velocity measurements (WABR), and oceanographic stations. Tables which provide station positions and other relevant information are cross-referenced to the figures and appear in the appendices.

C. DATA ACQUISITION

The WILKES is equipped with the Oceanographic Data Acquisition System (ODAS) which consists of the computers and peripherals necessary for (1) collecting digital data on magnetic tape in real-time and for (2) post-processing these data aboard ship. The ODAS system was used for real-time underway data acquisition of bathymetry (NBES), total magnetic intensity and sea surface temperature. Although oceanographic station data were recorded digitally on a separate data logger, both underway and oceanographic station data were processed on the ODAS computers.

1. Underway Data - During ODAS processing, underway data are edited and emended to remove spikes and to correct errors. The digital data files were supplemented with independently compiled information obtained from analog records using a table digitizer whenever it was necessary to fill ODAS acquisition data gaps or to replace unacceptable digital acquisition data. The underway acquisition data were acquired at a 10-second sample rate but after processing represents average values for every minute of data collection time. These 1-minute average

TABLE II. Underway and Station Data Summary
USNS WILKES Indian Ocean Surveys, April 1977 - December 1979

LEG	OPERATION	UNDERWAY DATA (nautical miles)					STATION DATA (no. of stations)			
NO.	NUMBER	NBES	3.5 kHz	Seismic	Magnetic	Sea Temp.	WABR	Cores	XBT	SVSTD
1	343719	2780	2680	2375	2270	2780	0	8	35	12
2	343719	2900	2885	2550	2655	2900	0	8	25	11
3	343728	2975	2975	2935	2935	2975	6	8	26	11
4	343728	1815	1535	1780	1425	1815	4	6	103	8
5	343728	4090	4090	3760	3760	4090	0	7	20	12
6	343731	3900	3900	3800	3800	3900	12	8	81	13
7	343731	4270	4270	4000	4000	4270	8	5	82	8
8	343802	2905	2905	2905	2905	2905	5	12	72	25
9	343821	3216	1337	3074	3094	3216	3	4	372	0
10	343821	1412	1412	1371	1390	1412	0	6	31	12
11	343827	2698	0	2596	2596	2659	0	6	33	11
12	343827	3813	0	3573	3573	3742	1	3	169	6
13	343828	3708	0	2751	2737	3708	7	6	59	8
14	343901	3601	3601	3601	3380	3380	10	7	73	10
15	343828	3115	0	3087	3122	3141	8	8	66	11
16	343908	2441	2438	2322	918	2432	3	2	234	5
*	343908	1136	1136	0	0	1136	0	0	64	20
17	343815	3319	3319	2898	3289	3319	10	6	64	10
18	343811	2450	3023	1996	2023	3023	7	10	51	11
19	(No Survey Leg 19)									
20	343815	3122	2932	2920	2932	3122	2	7	94	14
21	343901	2744	2744	2744	2703	2703	4	4	62	9
22	343806	3460	3460	3300	3300	3460	11	11	53	11
23	343907	1572	1495	1191	1188	1568	0	0	22	0
24	343907	3467	3596	3132	2947	3463	2	0	53	40**
25	343908	1599	1599	1063	1546	1885	1	0	25	0
26	343811	2727	2652	2589	2494	2727	4	6	34	13
27	343821	2569	2228	2164	2212	2627	0	5	60	10
28	(No Survey Leg 28)									

TABLE II. (Cont.) Underway and Station Data Summary
USNS WILKES Indian Ocean Surveys, April 1977 - December 1979

LEG	OPERATION	UNDERWAY DATA (nautical miles)					STATION DATA (no. of stations)			
NO.	NUMBER	NBES	3.5 kHz	Seismic	Magnetic	Sea Temp.	WABR	Cores	XBT	SVSTD
29	343916	3810	3810	0	18	3798	0	0	407	27
30	343916	2964	2644	2881	2907	2961	37	7	260	10
31	343920	3655	3544	3627	3307	3653	23	7	141	11
32	343921	3098	3010	3024	3013	3099	13	9	174	12
33***	343921	1753	1707	544	1250	1753	3	0	30	0
34-37	(No Survey Legs 34 through 37)									
38	343915	2568	2495	2068	2050	2570	15	0	56	0
TOTALS		95652	79456	82621	81739	96192	199	176	3131	361

* Leg 16 was interrupted for a hydrographic survey near Diego Garcia which is tabulated separately here.

** CTD (Conductivity, Temperature, Depth) stations were collected on Leg 24 in lieu of the standard SVSTD station measurements.

*** Leg 33 began at the Seychelles and ended at Agusta Bay, Sicily. Only mileages and stations collected in the Indian Ocean (including the Gulf of Aden) are included here.

ABBREVIATIONS:

NBES.....Narrow Beam Echo Sounder
3.5 kHz.....Shallow Subbottom Profiler
Seismic.....Sparker Seismic Reflection Profiler
Magnetic....Total Magnetic Intensity
WABR.....Wide Angle Bottom Reflectivity (Sediment Interval Velocity Measurements)
Sea Temp....Continuous Sea Surface Temperature
XBT.....Expendable Bathythermograph
SVSTD.....Sound Velocity, Salinity, Temperature, Depth System.

data were merged with digital smoothed navigation and stored on magnetic tape. Prior to merge, navigation on punched cards were ODAS processed to obtain 1-minute positions based on straight line interpolation between accepted navigation fixes. From the underway merged data tapes, various plots, profiles and listings were made for final digital data verification and for reference during conduct of the surveys.

Besides ODAS real time digital data acquisition, all underway data were collected in analog chart form. Analog records of bathymetry, total magnetic intensity and sea surface temperature were used to verify ODAS data during shipboard processing and were saved as hard copy backup for the final data on magnetic tape. Analog records only were collected showing 3.5 kHz profiles and seismic-reflection profiles. Wide angle bottom reflection (WABR) data for sediment interval velocity determination were collected only in analog form on the seismic recorders until Leg 30 when these data were also recorded on magnetic tape.

2. Oceanographic Station Data - ODAS processing of oceanographic station data paralleled the procedures for underway data. The measured sensor values of sound velocity, salinity, temperature and depth (pressure), which were recorded at a 0.5-second sample rate on a digital data logger, were processed to obtain average values for each 1-meter depth increment. From these, computed values of sound velocity were determined as were values of sigma-t, specific volume anomaly and true depth. A detailed history was maintained on the performance of the SVSTD sensors in order to maintain operation within accepted specifications. To facilitate this, a Rosette water sampler with both protected and unprotected reversing thermometers was used to collect samples at selected

depths at nearly every station. Salinity, temperature and depth values determined from these samples were used for comparison with the electronic sensors values. Calibration and field-derived corrections, if necessary, were applied during the course of ODAS processing. From final digital data tapes, listings, plots and profiles were made aboard ship for each station. XBT data were all collected as graphic analog records.

D. NAVIGATION

The Navy's transit navigation satellite system was used exclusively for positioning control on WILKES during the Indian Ocean surveys because there was no loran coverage in the area and the Omega navigation network was inadequately developed for survey positioning accuracy. WILKES was outfitted with two Magnavox 706 model satellite receivers which were simultaneously used to monitor the 4 to 5 satellites then in operation. The one exception to this occurred during the last 9 days of Leg 29 (from 1600Z 28 Aug 1980) when both satellite receivers were inoperable. Navigation was then by celestial and dead reckoning (DR).

Because of the equatorial location of the Indian Ocean survey area and the N-S orbits of the satellites it was not unusual to experience one or two 4 to 5-hour periods each day when good fixes were unobtainable. Usually 14 to 16 acceptable satellite fixes were recorded in a 24-hour period and from these the DR positions were computed for intervening course and speed changes and station locations. The rather long straight reconnaissance tracks minimized the number of maneuvers between fixes so that it is reasonable to assume that the average position accuracy is within 900 meters although errors up to a few kilometers possibly exist under worst case conditions.

III. UNDERWAY DATA

A. SEISMIC-REFLECTION PROFILES

Continuous profiles showing deep penetration into the sediment section of the ocean bottom were collected routinely along almost all survey track lines except for leg 29 and leg 33 (fig. 1, table II). Penetration of the sediment section to acoustic basement was usually observed when sediment thickness was less than 2 seconds (two-way travel time). In thicker sediments, deep reflectors down to 2.5 seconds of penetration were often observed.

Seismic-reflection profiles were collected at ship speeds generally between 8 and 10 knots using a Teledyne SSP (seismic subbottom profile) system. Most of the seismic profiles were collected using 60 kJ (kilojoules) of electrical energy output for the spark discharge from two electrode pairs towed approximately 60 m aft of the ship. A 90 kJ output was sometimes used in areas of thick sediment cover.

A single hydrophone streamer, to receive the bottom and subbottom reflected signals, was towed with its trailing end approximately 240 m astern of the ship; only the outermost 60 m contained the active section which consists of 100 piezoelectric pressure sensing hydrophone elements. Output from the hydrophone streamer elements were combined into a single channel, then amplified, filtered and conditioned for input to facsimile recorders. Typical low and high cut filter settings were 40 and 125 Hz, respectively. The hydrophone streamer was usually towed at depths varying between 6 and 9 meters depending on the influence of ship's speed and heading under various sea conditions.

Seismic-reflection profiles were collected only in analog record form using Raytheon facsimile recorders (Model PSR-1910 through December 1978 and LSR-1811 thereafter). The primary records were collected using a 10-second sweep rate. Simultaneously, on a slave recorder in delayed sweep stop-start mode, 4-second sweep recordings were also obtained in order to provide expanded detail.

B. 3.5 kHz SHALLOW SUBBOTTOM PROFILES

An Edo Model 240 Bottom Reflectivity System was used for continuous profiling of the sedimentary layers just below the water-sediment interface. This 3.5 kHz shallow subbottom profiling system used a signal output of about 120 dB (30° conical beam width) transmitted at a 1-second repetition rate and having a 2 ms pulse width. Full chart scale on the resulting records is 750 meters. All records are scaled in meters representing uncorrected depths based on a nominal sound velocity in sea water of 1500 m/s. The penetration observed on the 3.5 kHz shallow subbottom profiles from the Indian Ocean commonly ranged from none to about 50 meters below the sediment water interface depending on bottom sediment characteristics.

Although 3.5 shallow subbottom profiles were routinely collected when underway (fig. 1, table II), partial data were collected on leg 9 and no data were obtained on legs 11, 12, 13, 15. The 3.5 kHz transducer was damaged on leg 17, finally failed on leg 9 and was not repaired until drydocking after leg 13.

C. TOTAL MAGNETIC INTENSITY

Measurements of the earth's total magnetic field intensity, expressed in gammas, were recorded on WILKES using a Geometrics Model G 801 Marine Proton Magnetometer towed approximately 250 meters behind the ship. The magnetometer system is designed to have an accuracy of + 0.5 gamma.

Analog chart recordings (6-second sample rate) were made using a full chart scale of 100 gammas. Digital data in final ODAS merged format provide position and 1-minute values on magnetic tape. The final ODAS data also contain residual magnetic field data computed using the International Geomagnetic Reference Field (IGRF) of 1965. There was no attempt to correct for diurnal variations. Total magnetic field data were collected on almost all Indian Ocean survey tracks (fig. 1, table II) except for the Colombo to Diego Garcia portion of leg 16, and leg 29 because of interference of the towed sensor with extensive XBT collection on that survey.

D. BATHYMETRY

Bathymetric soundings were recorded along all survey tracks (fig. 1, table II) using a Harris Model 853D Narrow Beam Echo Sounder (NBES) manufactured by General Instruments Corp. This elaborate system has a crossed configuration of separate multiple element projector and receiver arrays designed to produce a beam pattern having a beam angle of 2-2/3 degrees. The acoustic signal is transmitted for 7 ms at 4 kw on a frequency of 12 kHz. Pitch and roll stabilization for the NBES system is provided electronically using the ship's Mark 19 gyrocompass

for stable reference. The sounding accuracy of this system is considered to be + 2 meters at a water depth of 7500 meters.

E. SEA SURFACE TEMPERATURE

Sea surface temperature (SST) was recorded continuously while underway along all survey tracks (fig. 1, table II) using a Hewlett-Packard Model 2801A quartz crystal thermometer with the probe mounted through the ship's hull about 60 centimeters below the water line. The water temperature was measured to the nearest hundredth of a degree Celsius and digitally sampled every 10 seconds by the ODAS computer.

IV. STATION DATA

A. BOTTOM SEDIMENT CORES

Linered cores were obtained using a 900 kg modified Ewing corer which was generally equipped with a 6-meter core barrel. All cores were collected as gravity cores, i.e., neither piston nor tripping arm was used. Recovered cores were sectioned into lengths not exceeding 1.5 meters and stored in the scientific chill box until shipboard analyses were performed. Shipboard analyses consisted of taking radiographs, making visual descriptions and measuring transverse sediment sound velocity through the linered core. Cores were then longitudinally sectioned and vane shear measurements made at pre-selected intervals based on radiograph and visual inspections. Samples of the core were returned to NAVOCEANO for analyses of engineering properties. Samples of all cores are retained in the NAVOCEANO core repository.

The location of cores taken from WILKES are shown in figure 4 and listed in Appendix A which also provides information about the amount of core recovery, the water depth and the physiographic province in which each core is located. Cores are numbered to indicate leg number and the sequential core number on a specific leg (Core 2-04 is the fourth core taken on leg 2). All sequence numbers are accounted for even though no core, or no recovery was obtained in some cases. In a few instances core attempts were made but because of no recovery they were not assigned a core number. In some of these instances useful information was obtained, and these core attempts have been inserted in the listing with a sequence number '00'. For example, no recovery was made at core

location 6-00, but the fact that some coral chips were retrieved and the core cutter was dented is considered significant information.

Wherever possible the WILKES' survey tracks were designed to cross the Deep Sea Drilling Project (DSDP) core locations and to collect cores at these locations for comparative purposes. The DSDP locations are shown in figure 4 and the proximity of the WILKES' cores to them are given in the remarks column of Appendix A.

B. WIDE ANGLE BOTTOM REFLECTION (WABR) STATIONS

Sediment interval velocity measurements were obtained using wide angle bottom reflectivity techniques (WABR). The objective of the measurements is to obtain travel time information within the sedimentary layers so that average compressional wave velocities can be computed for each of the sediment intervals. Average compressional wave velocities are required to compute true sedimentary thicknesses and to generate velocity-depth functions for geoacoustic modeling. The measurements are made by a special adaptation of the seismic-reflection profile system, using the sparker as an acoustic source and sonobuoys as acoustic receivers (ref. b).

The locations of the WABR stations are shown in figures 5 and 6. Stations which have been reported in reference b are identified. Additional stations have been reported in reference c. Not all of the unreported stations will be processable as the required environmental conditions for useful data are not always met. For the data to be acceptable the ocean bottom must consist of horizontally layered sediment. Appendix B lists the WABR station number, cruise number, position, Julian date and physiographic province for each station. The WABR station number consists of the survey leg number and a serialized identifier.

C. OCEANOGRAPHIC STATIONS

Oceanographic measurements were obtained on all survey legs and the station locations are shown on figure 7. Figures 8 through 11 show the seasonal distribution of the stations for the winter monsoon, summer monsoon and transition periods. In these figures the SVSTD stations are identified as being either shallow or deep. Shallow stations were usually made to 2500 meters, and deep stations are those where data were collected to within 100 meters of the ocean bottom.

On all survey legs, except for leg 24, the oceanographic station data were collected using a Bissett-Berman (Plessey) Model 9040 SVSTD system to which a General Oceanics Rosette Multi-Bottle Array was mounted for taking water samples. The accuracies of this system are: temperature, + 0.02°C; salinity, + 0.02°%; depth, + 0.25%; and computed sound velocity (corrected for in situ density), + 0.3 m/s. On leg 24, all oceanographic station data were collected using a conductivity, temperature, depth (CTD) system provided by Woods Hole Oceanographic Institute (WHOI). The CTD stations were all deep measurements and the data from them will be available to NAVOCEANO when processing has been completed by WHOI.

Appendix C lists the stations by cruise, leg and station number; and also contains the geographic position and the depth to which data were obtained. The "corrected cast depth" is the computed sensor depth corrected for actual in situ density, whereas, "corrected sonic depth" is the bottom depth derived by applying Matthews' table corrections to the uncorrected bathymetric depth at the station (discrepancies are expected between these two values).

D. EXPENDABLE BATHYTHERMOGRAPHS (XBTs)

In compliance with the requirement to transmit temperature-depth data to Fleet Numerical Oceanography Central, Monterey, WILKES collected expendable bathythermograph data at 6-hour intervals whenever the ship was underway. On survey legs 29, 30 and 31, many additional XBTs were taken in conjunction with studies of the Somali current. If the positions of the 3,131 XBT stations were to be plotted, the resulting plot would be identical to the survey track shown in figure 1.

The XBT data were collected in analog chart form using a Sippican Mark 2A recorder and either XBT T-7 probes (750-meter depth range) or T-4 probes (450-meter depth range).

REFERENCES

a. NAVOCEANO unpublished Confidential report, U. S. Naval Oceanographic Office Survey Plan for the Indian Ocean, 1977-1979 (U).

b. NAVOCEANO Technical Note TN 3432-02-78, Sediment Interval Velocity Measurement From the USNS WILKES Surveys in the Indian Ocean, 1977-1978, December 1978.

c. NAVOCEANO Technical Note TN 7220-01-80, Sediment Interval Velocity Measurements in the Indian Ocean (Stations 24-37), June 1980.

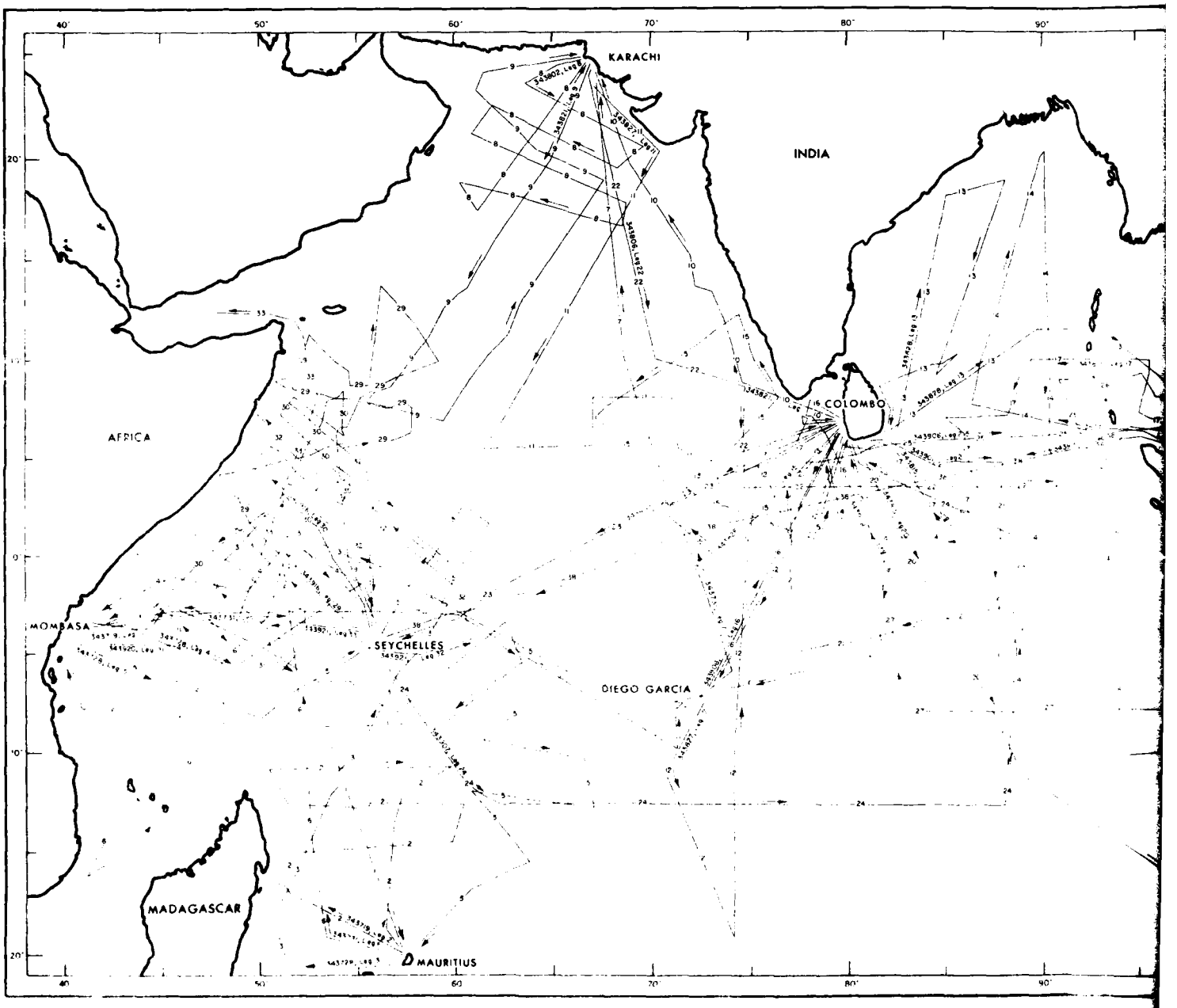
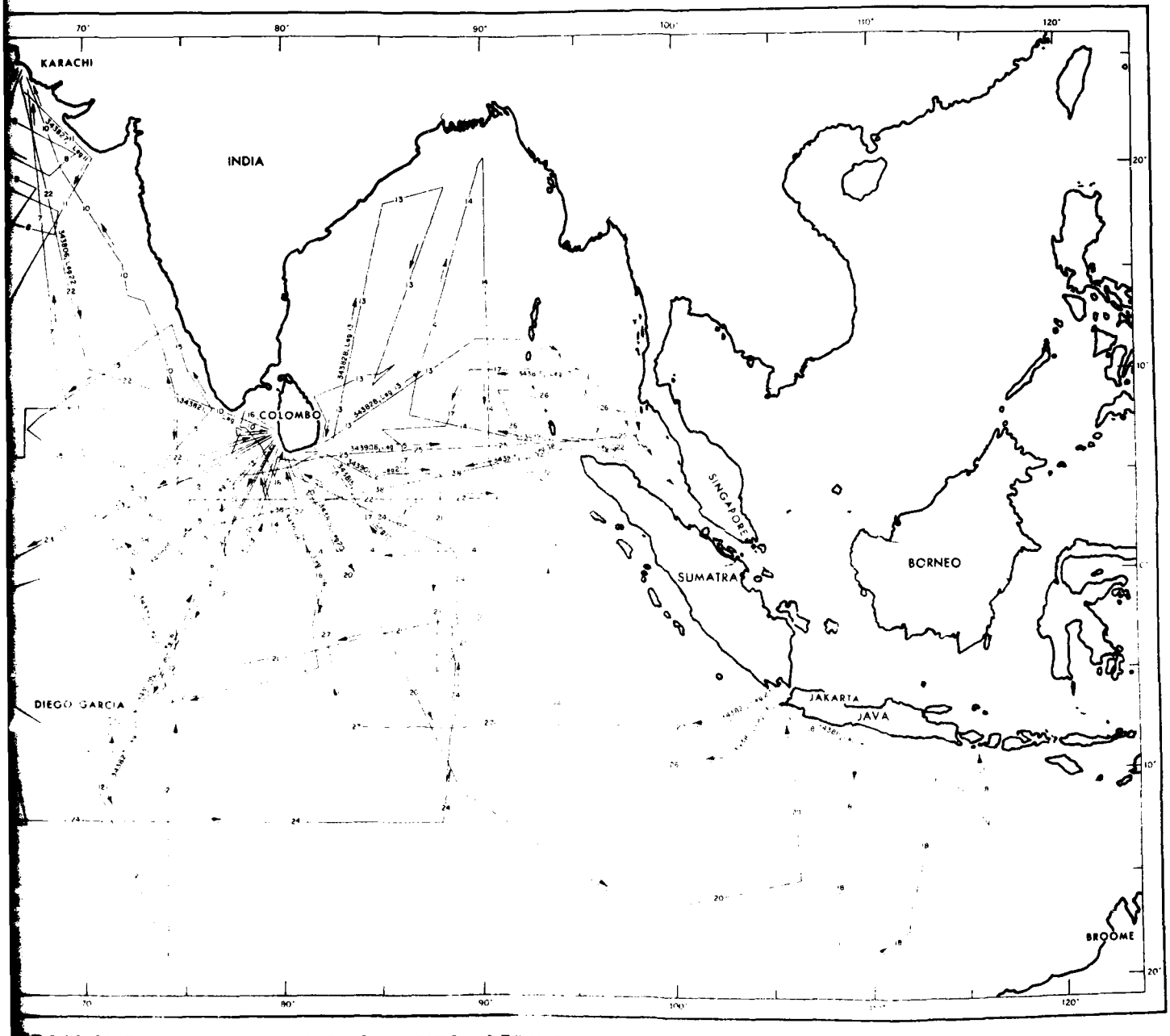


FIGURE 1 INDIAN OCEAN SURVEY TRACKS, USNS WILKES—APRIL 197

Survey operation numbers are shown with arrows indicating direction of ship tra track is designated by an Indian Ocean survey leg number. A survey operation 3 survey legs.



EAN SURVEY TRACKS, USNS WILKES—APRIL 1977-DECEMBER 1979

n numbers are shown with arrows indicating direction of ship travel. Each port-to-port
ed by an Indian Ocean survey leg number. A survey operation may include from 1 to

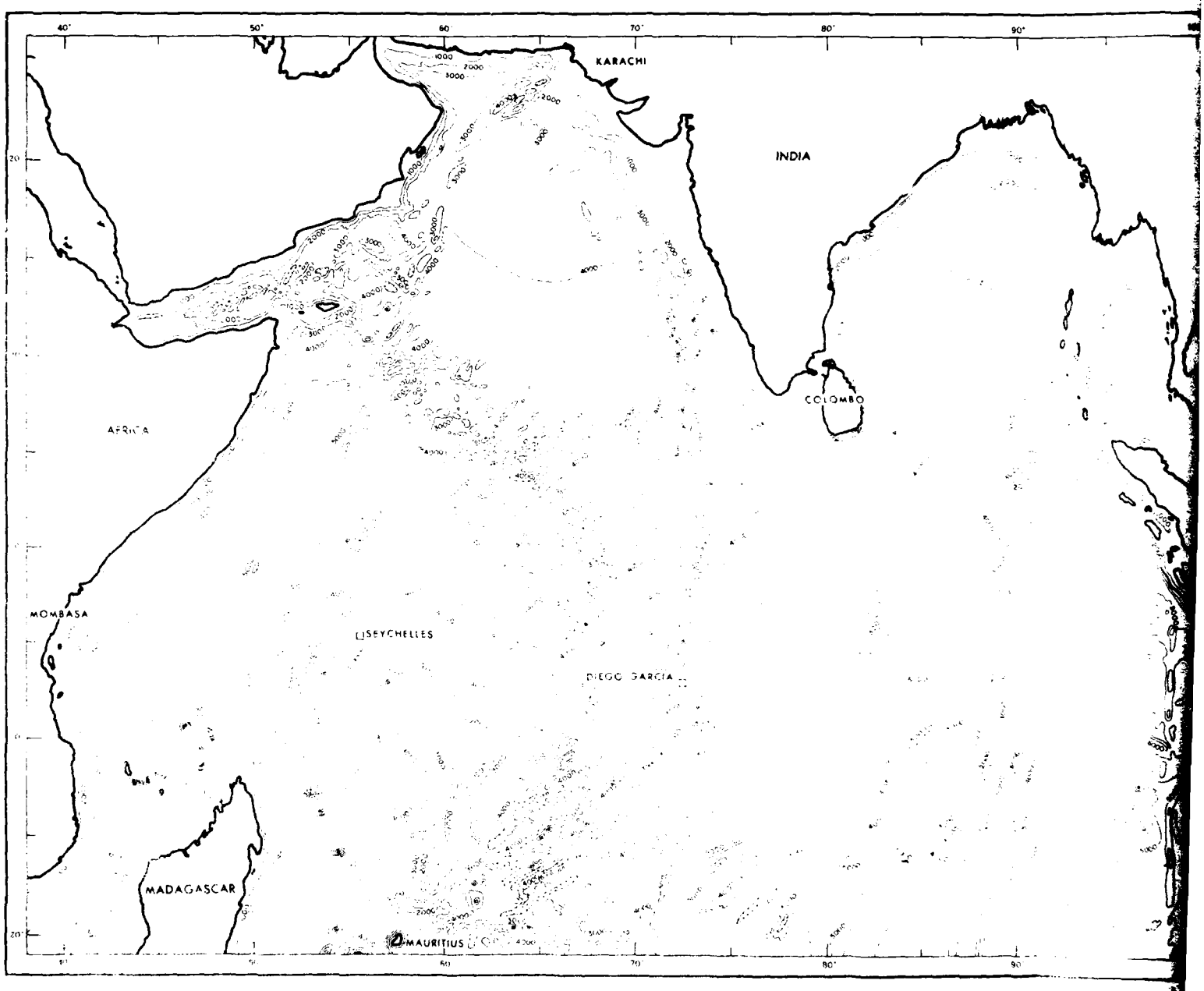
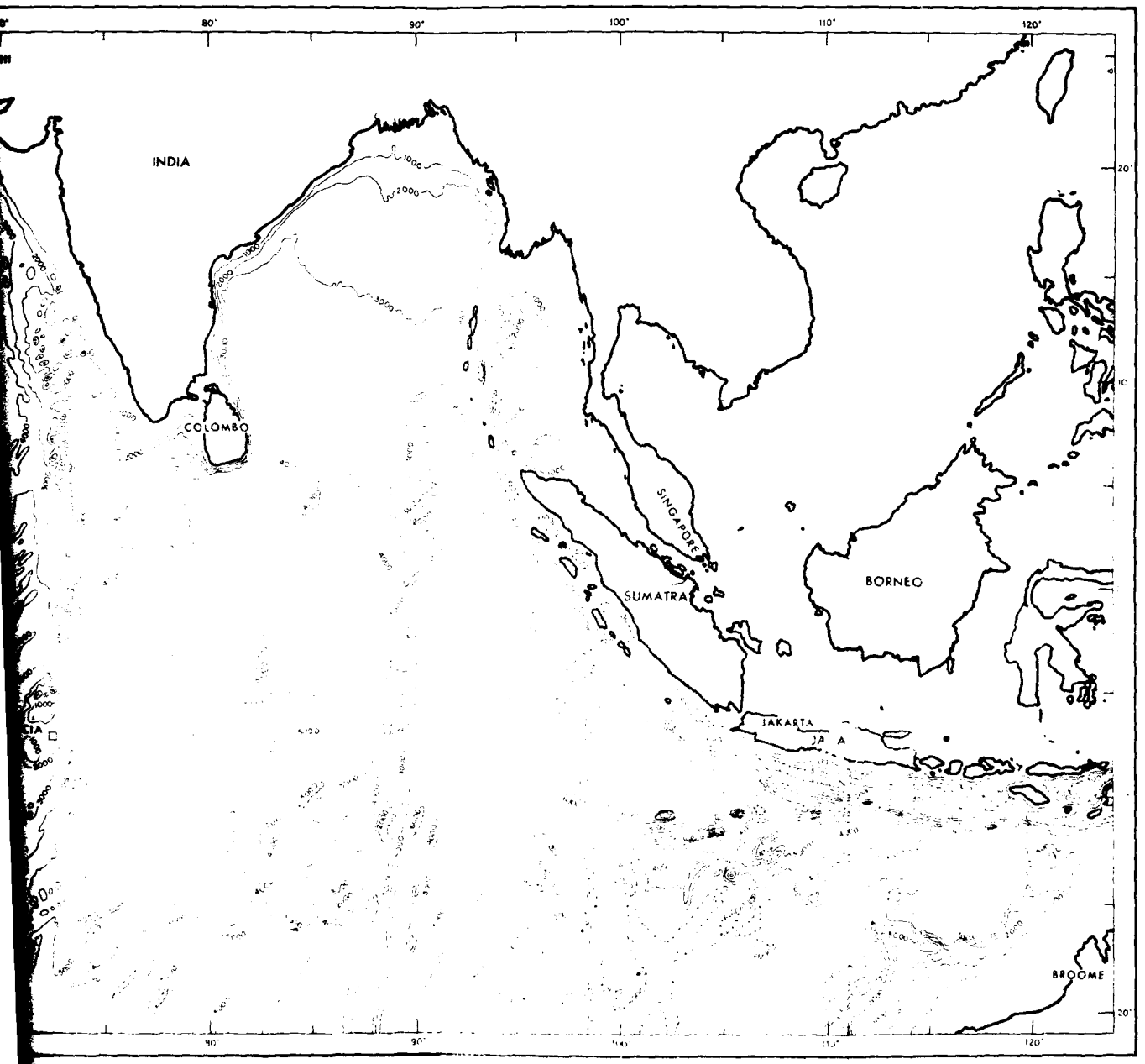


FIGURE 2 GENERALIZED INDIAN OCEAN BATHYMETRY

Contour interval = 1000 meters (1500 m/sec uncorrected)



ENERALIZED INDIAN OCEAN BATHYMETRY

tour interval = 1000 meters (1500 m/sec uncorrected)

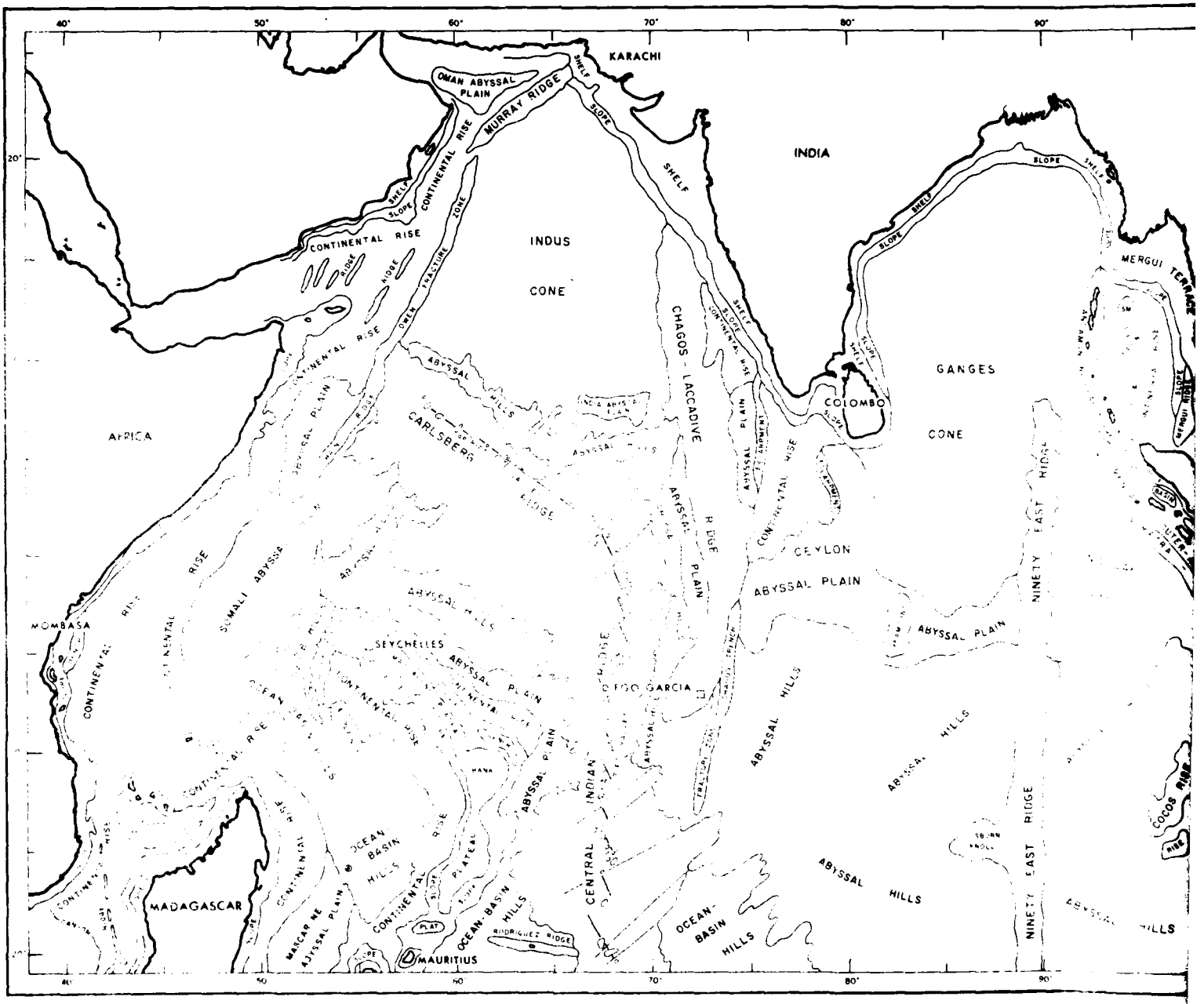
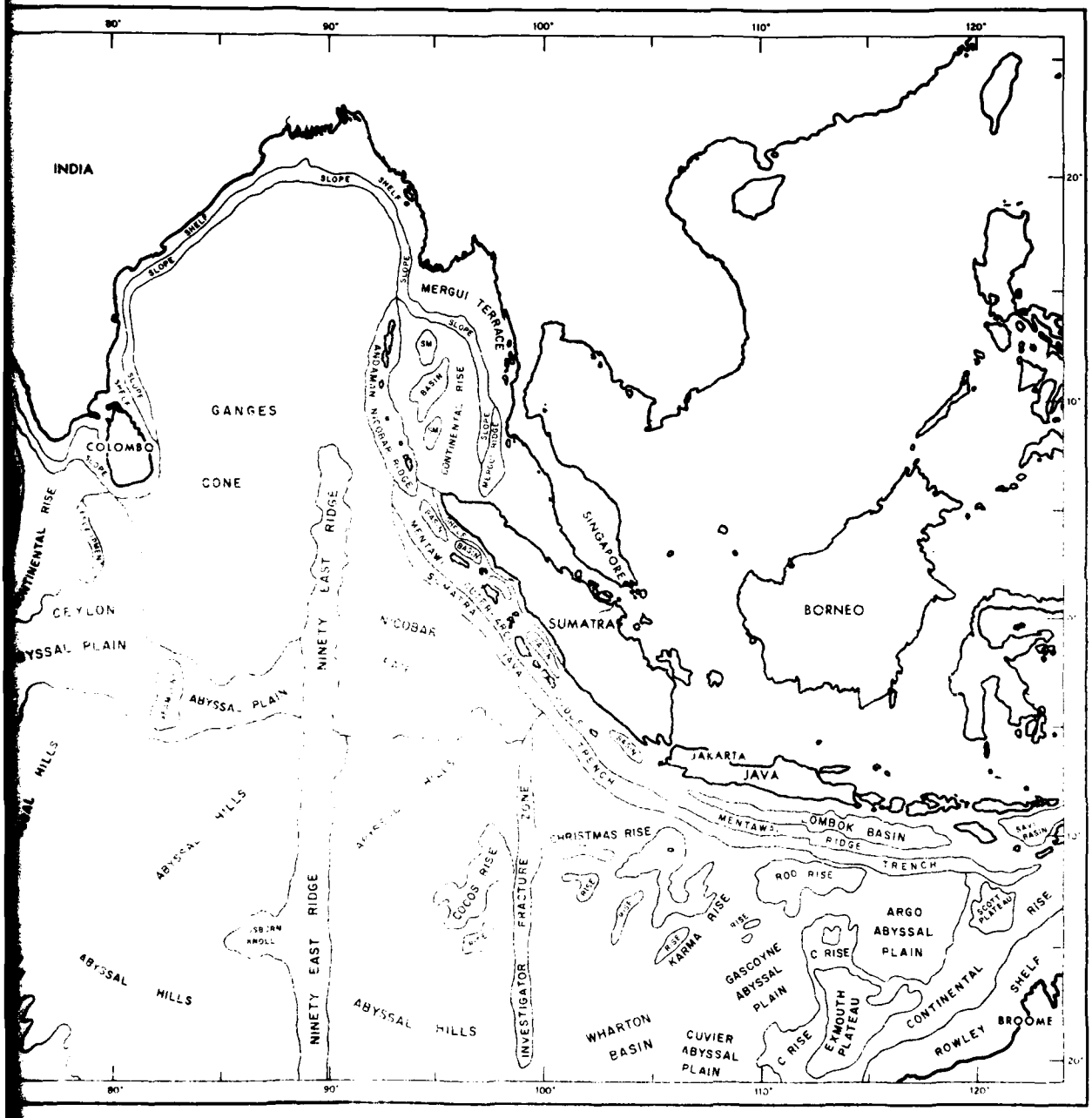


FIGURE 3 GENERALIZED PHYSIOGRAPHY OF THE INDIAN O



PHYSIOGRAPHY OF THE INDIAN OCEAN

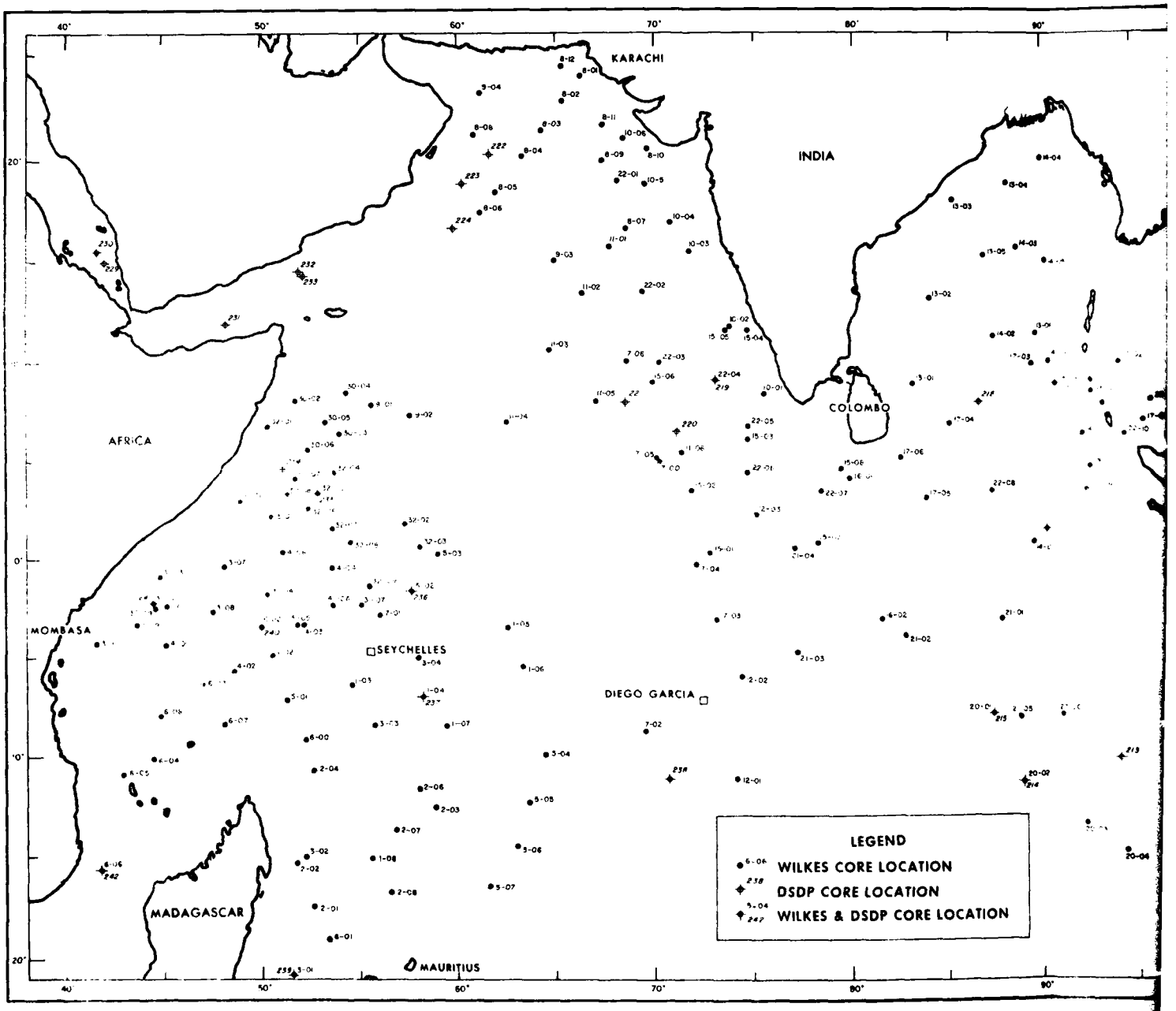
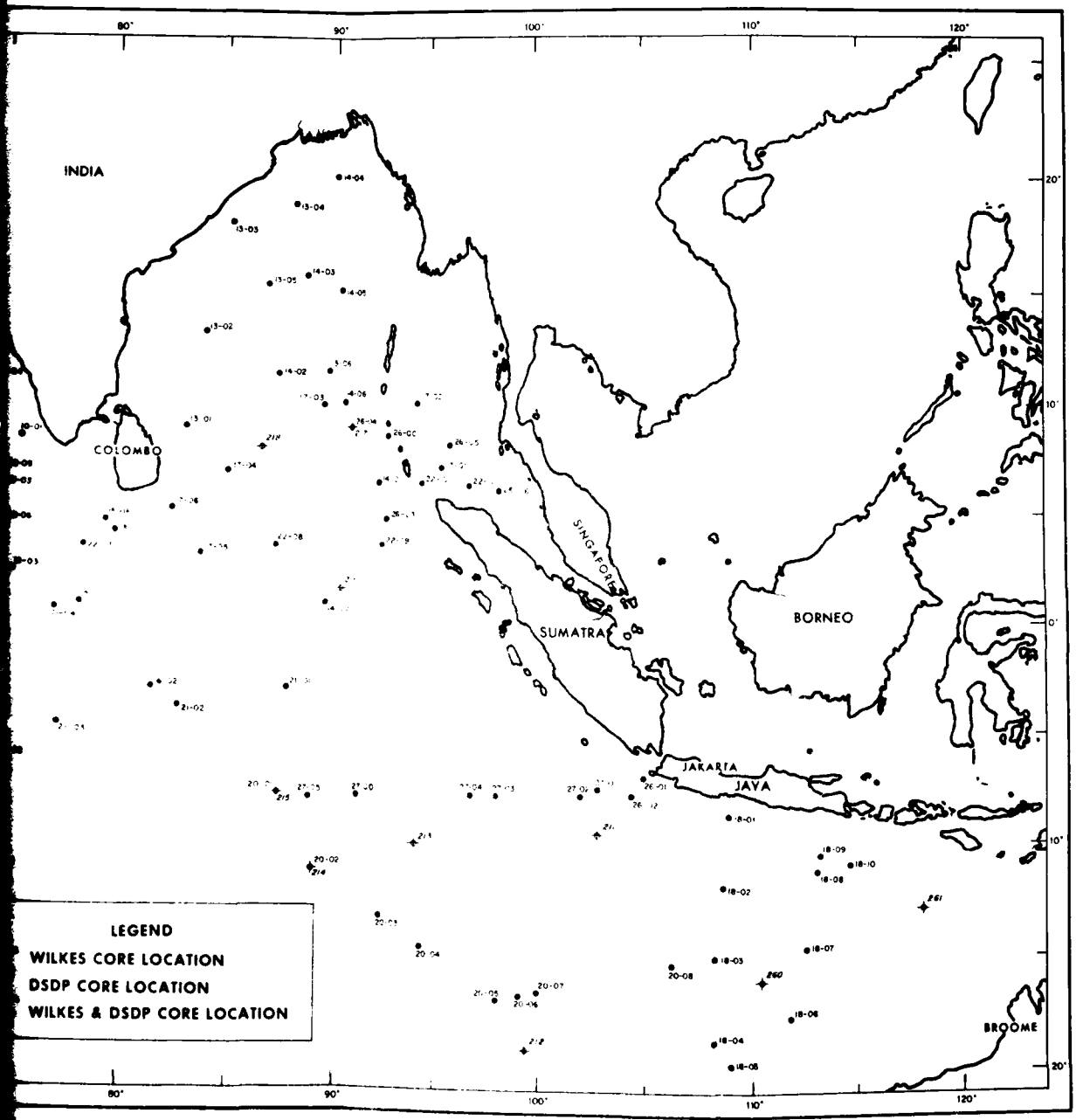


FIGURE 4 BOTTOM SEDIMENT CORE LOCATIONS, USNS WILKES INDIAN OCEAN SU

Core locations are keyed to WILKES survey leg numbers; e.g., core location 6-06 is leg 6, core 6. De shown for reference.



USNS WILKES INDIAN OCEAN SURVEYS—APRIL 1977-DECEMBER 1979

e.g., core location 6-06 is leg 6, core 6. Deep Sea Drilling Project (DSDP) core locations are

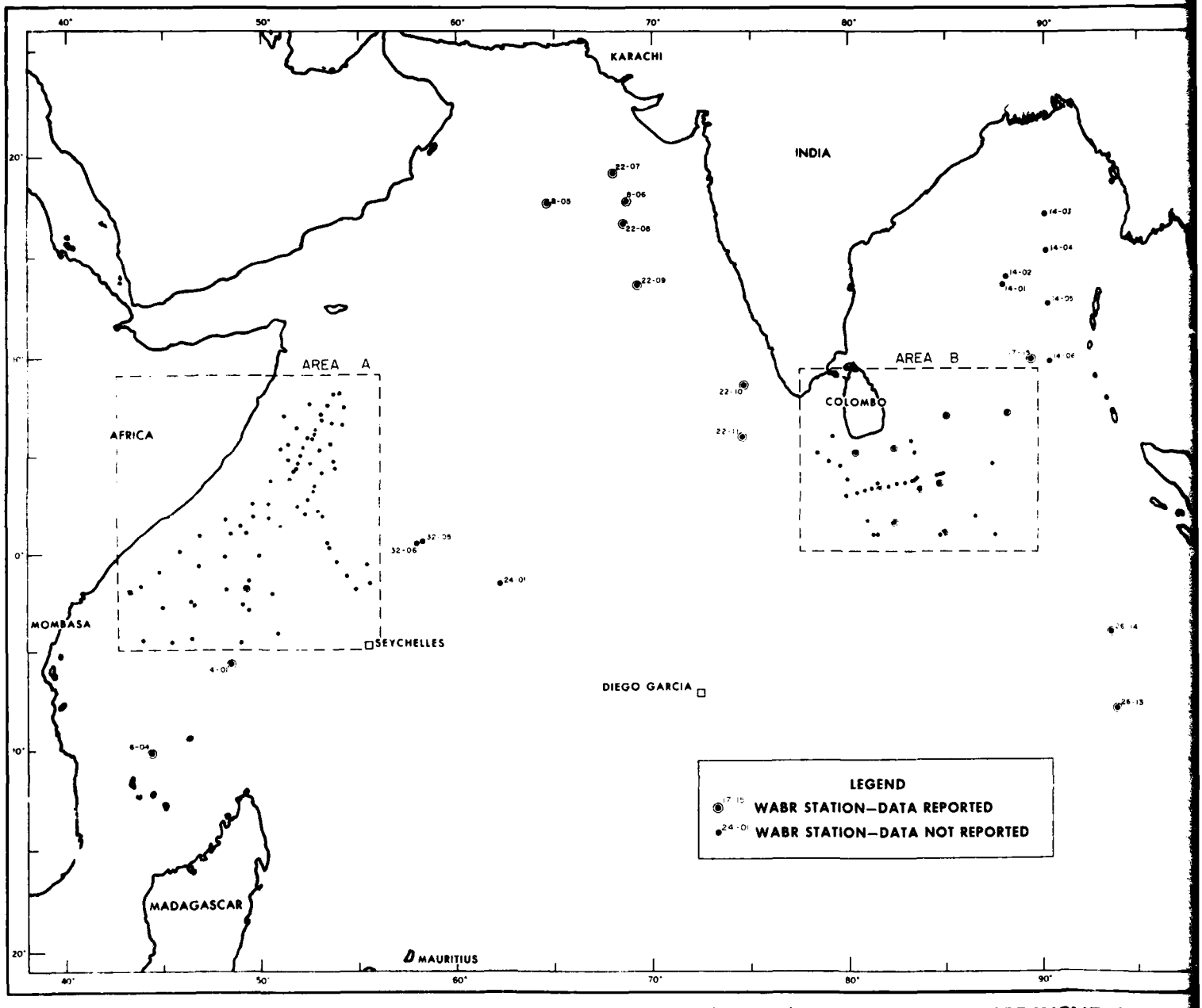
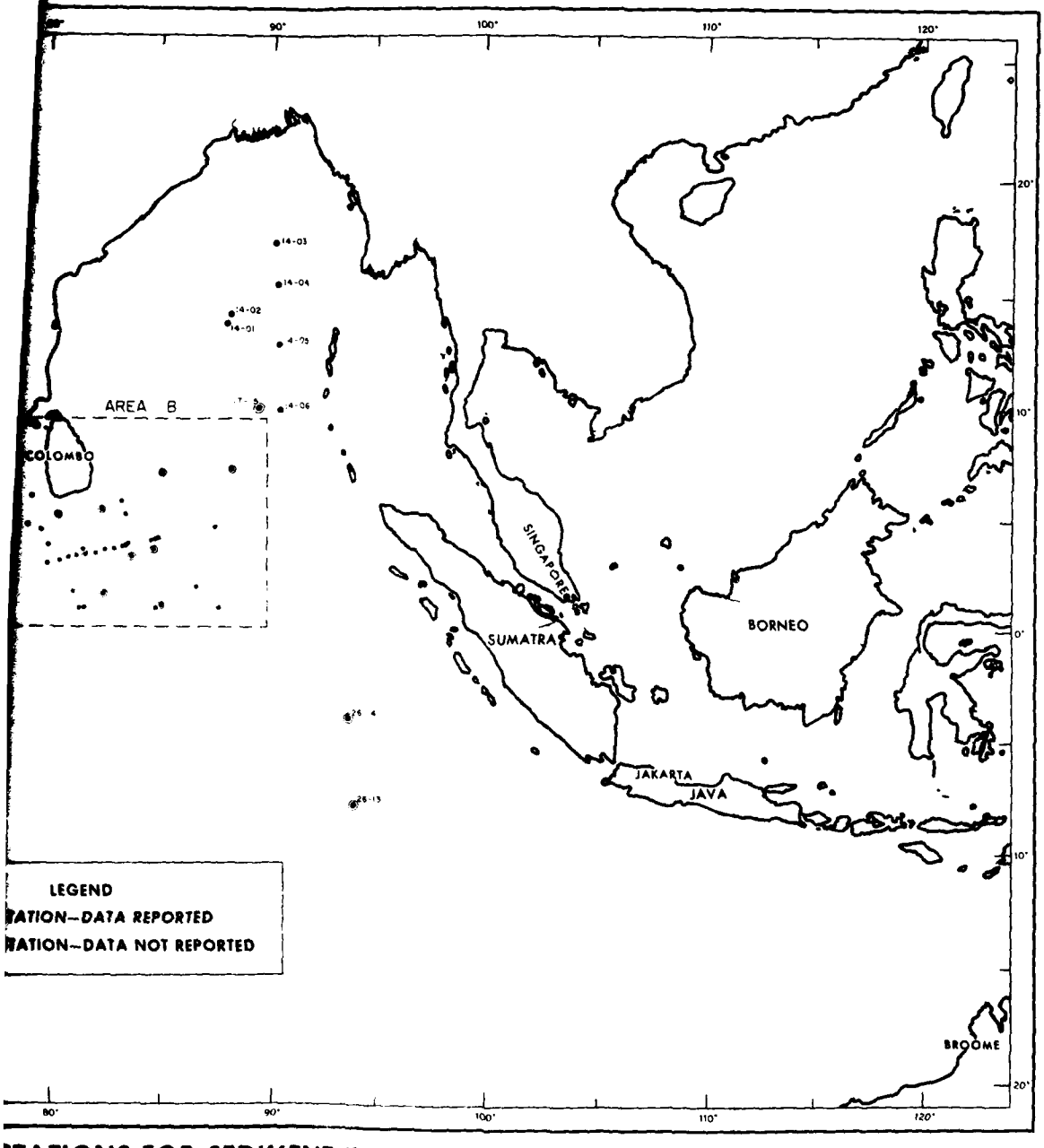


FIGURE 5 WIDE ANGLE BOTTOM REFLECTION (WABR) STATIONS FOR SEDIMENT INTERV USNS WILKES INDIAN OCEAN SURVEYS—APRIL 1977-DECEMBER 1979

WABR *stations are keyed* to survey leg numbers; e.g., location 24-01 is leg 24, WABR 1. Sub-areas A and



STATIONS FOR SEDIMENT INTERVAL VELOCITY DETERMINATION, APRIL 1977-DECEMBER 1979

n 24-01 is leg 24, WABR 1. Sub-areas A and B are expanded in Figure 6.

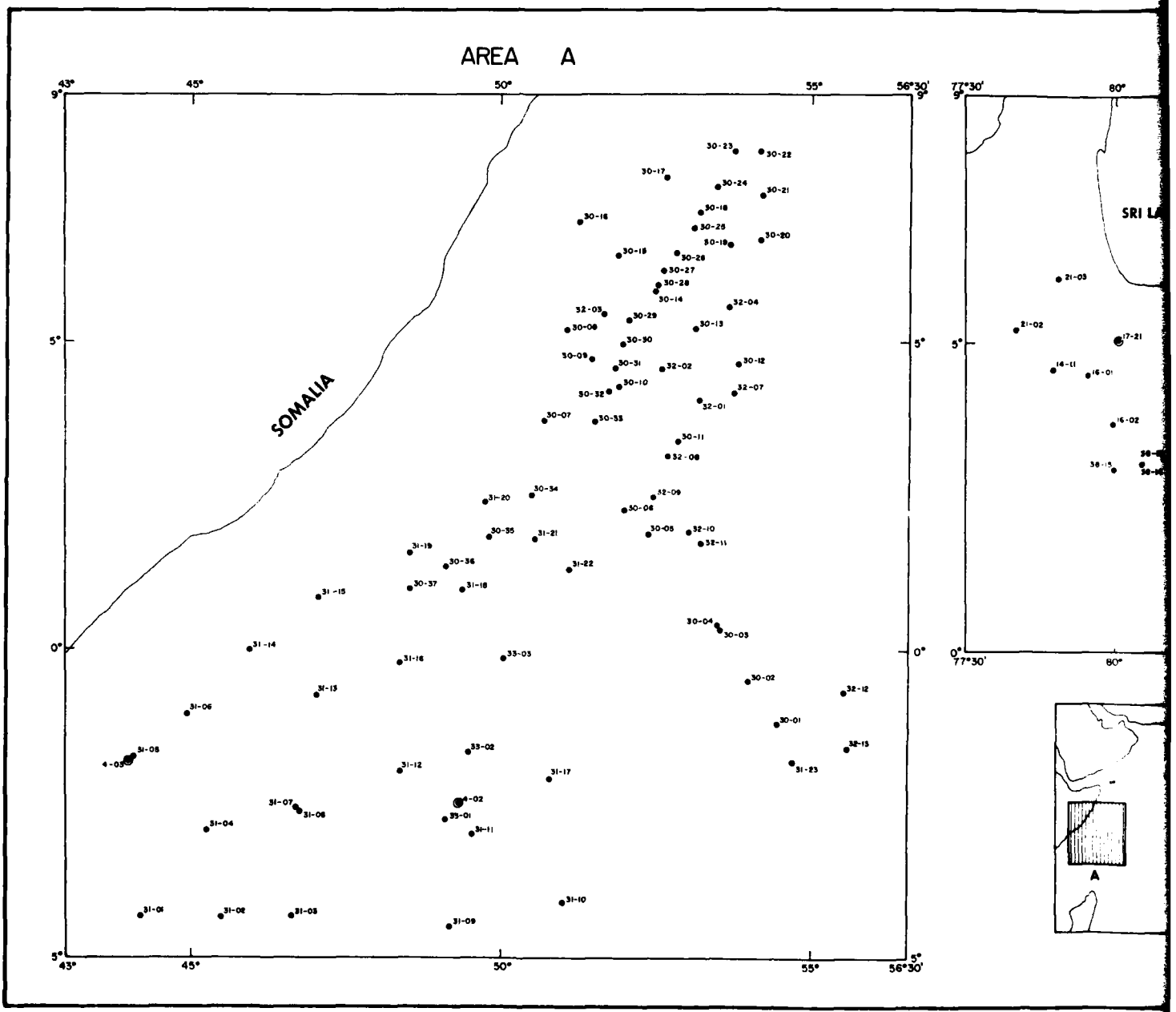
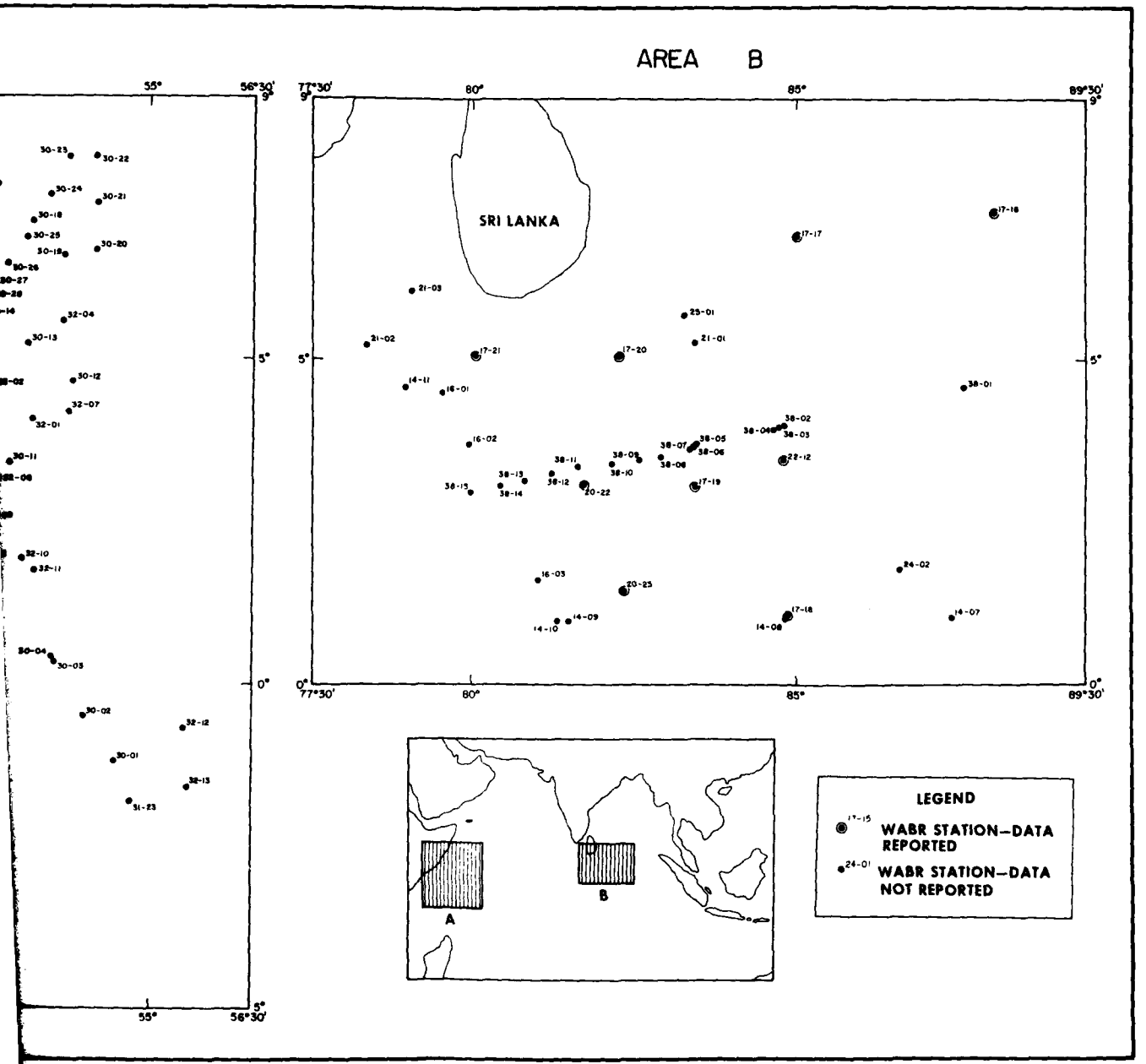


FIGURE 6 WIDE ANGLE BOTTOM REFLECTION (WABR) STATIONS FOR SEDIMENT INT
USNS WILKES INDIAN OCEAN SURVEYS—APRIL 1977-DECEMBER 1979



N (WABR) STATIONS FOR SEDIMENT INTERVAL VELOCITY DETERMINATION,
RVEYS—APRIL 1977-DECEMBER 1979

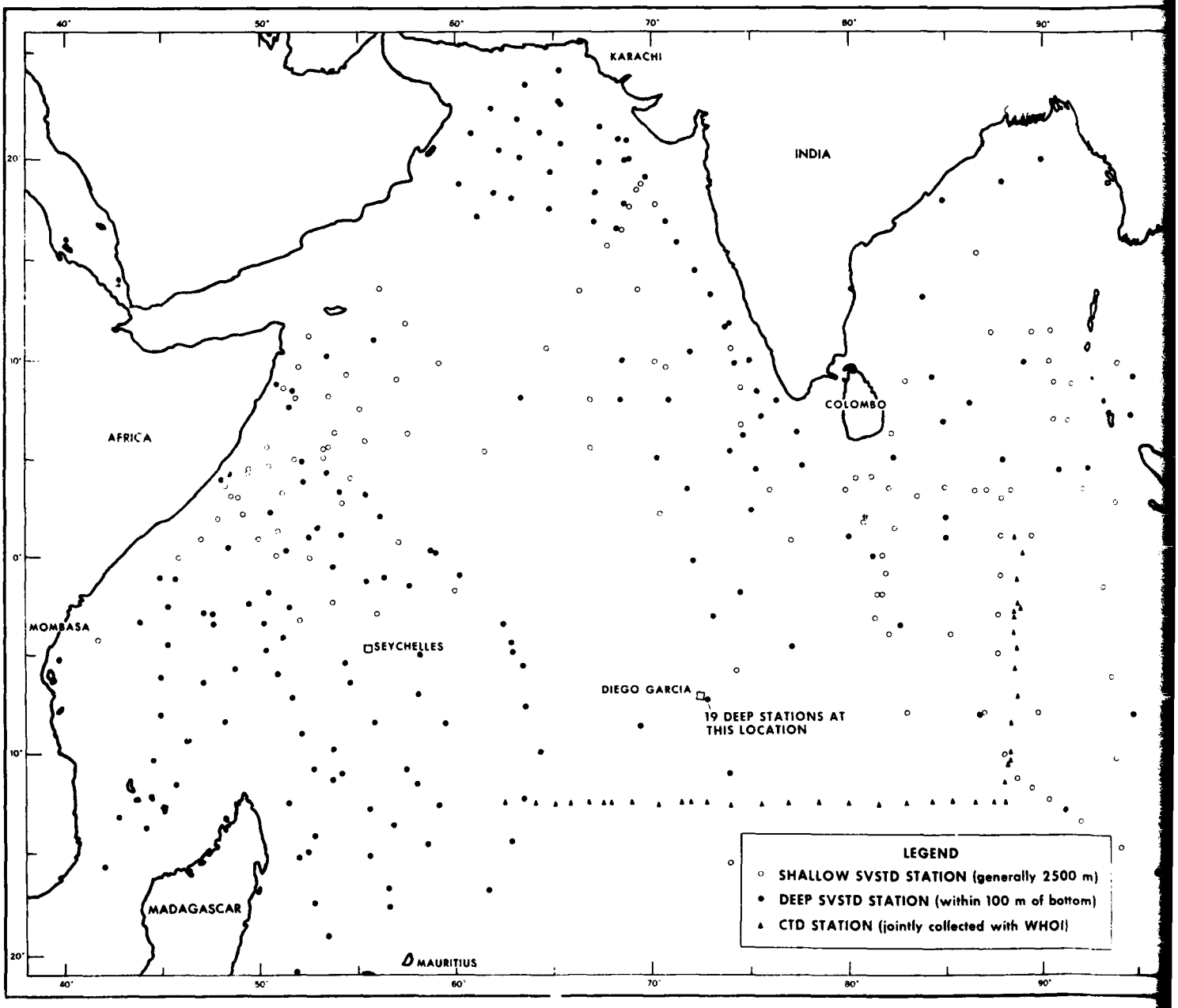
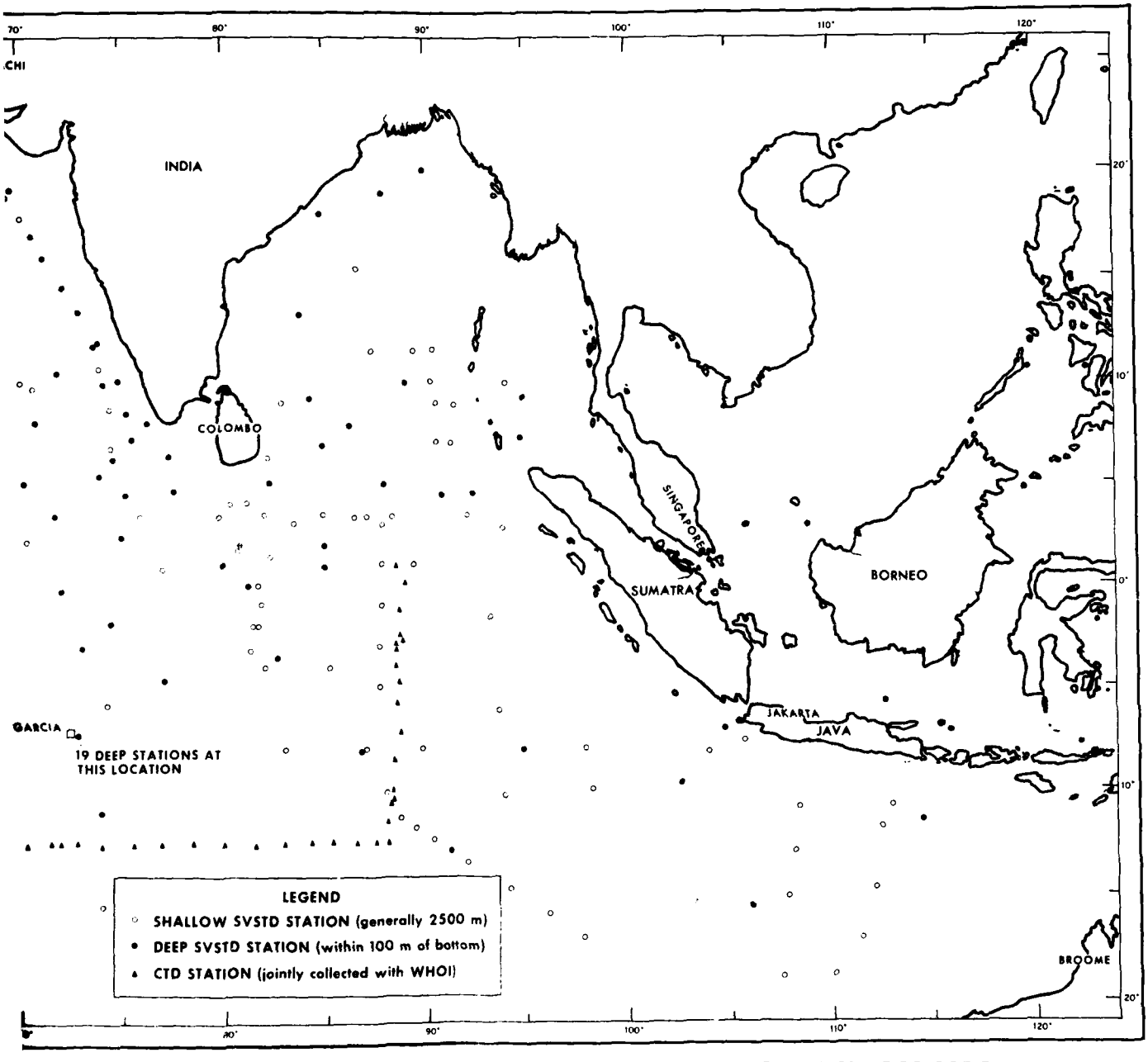


FIGURE 7 OCEANOGRAPHIC STATION COMPOSITE, USNS WILKES INDIAN OCEAN SU



)MPOSITE, USNS WILKES INDIAN OCEAN SURVEYS—APRIL 1977-DECEMBER 1979

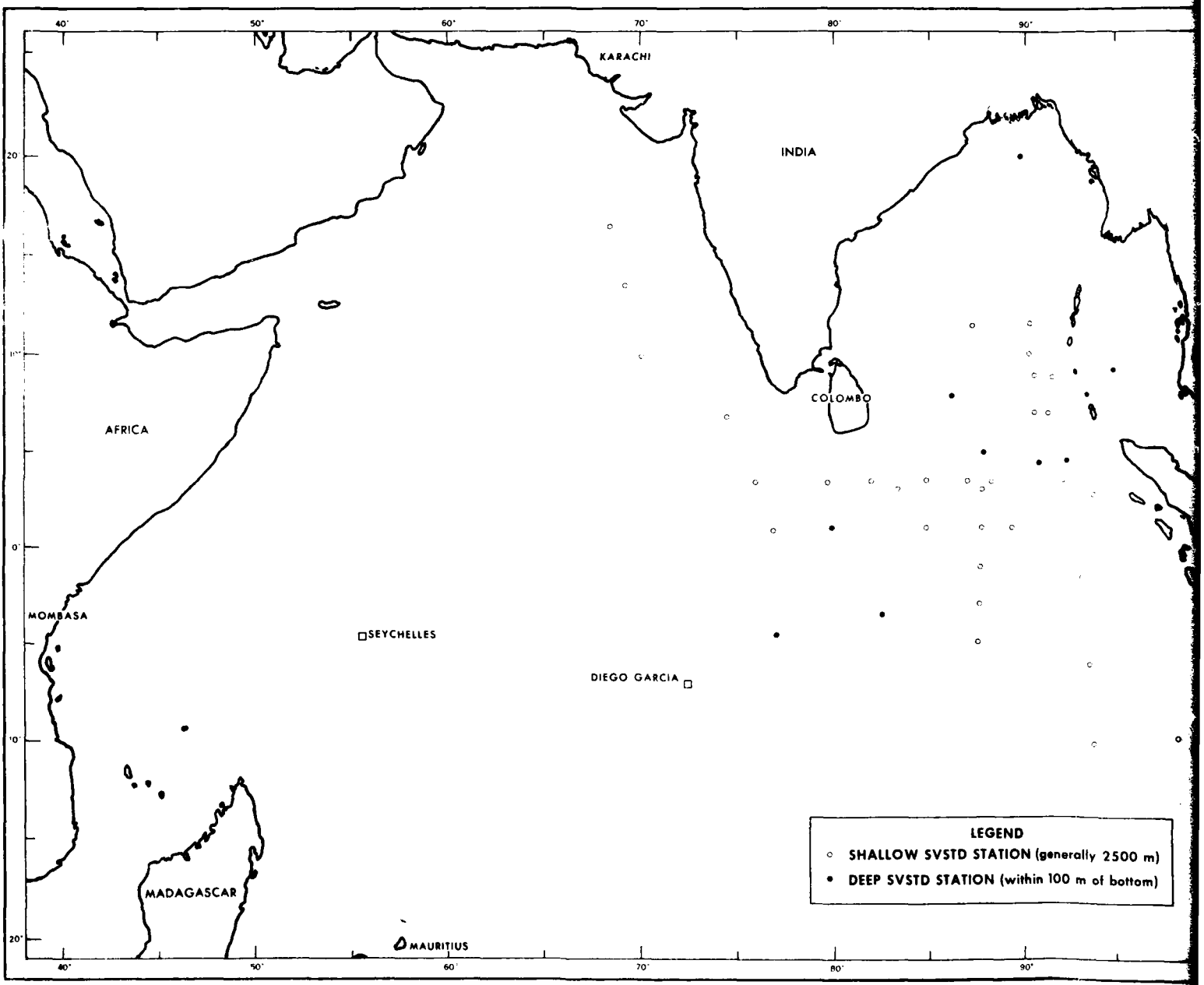
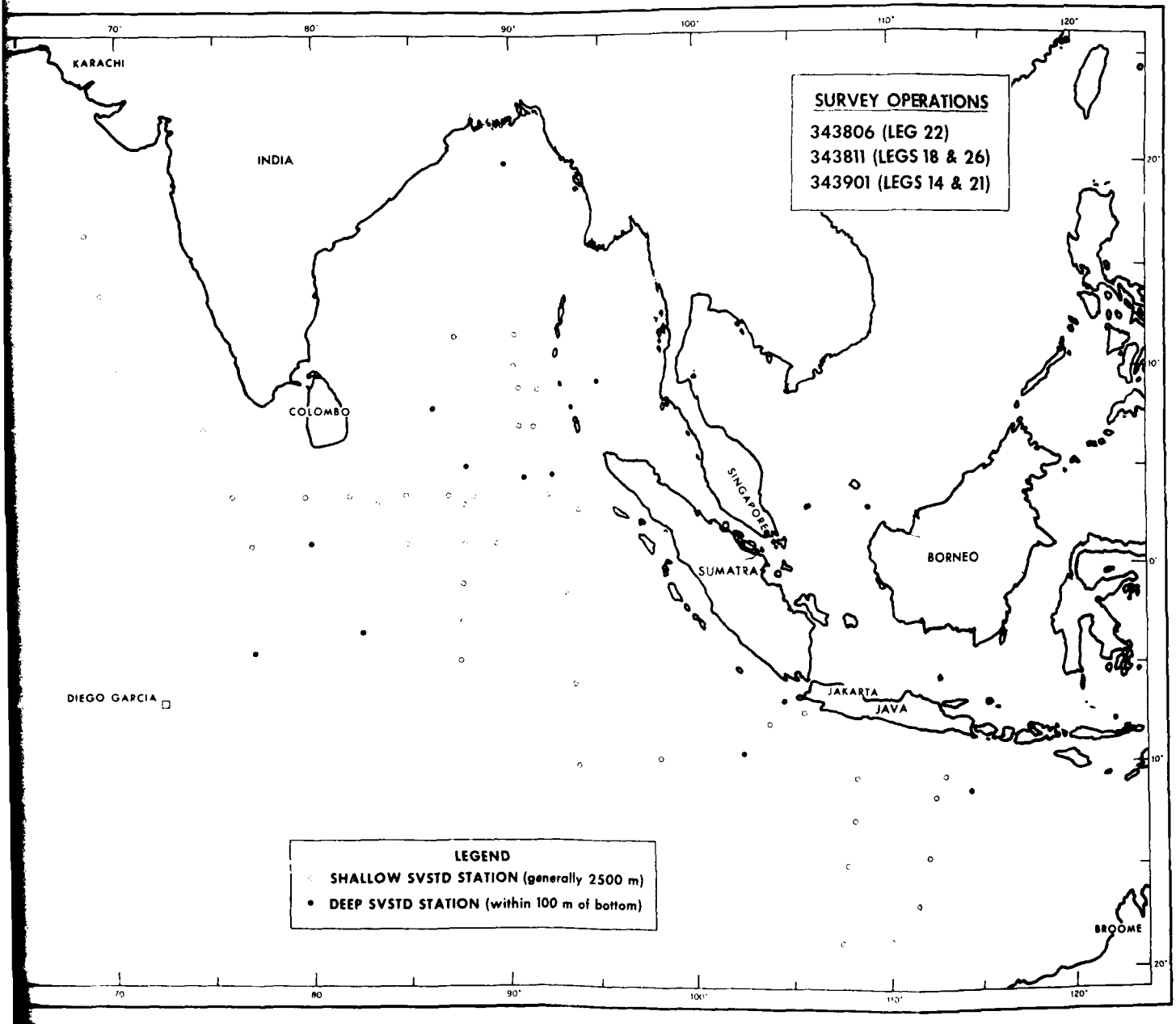


FIGURE 8 OCEANOGRAPHIC STATIONS, WINTER MONSOON (DECEMBE
USNS WILKES INDIAN OCEAN SURVEYS—APRIL 1977-DECEM



NOGRAPHIC STATIONS, WINTER MONSOON (DECEMBER-FEBRUARY), WILKES INDIAN OCEAN SURVEYS—APRIL 1977-DECEMBER 1979

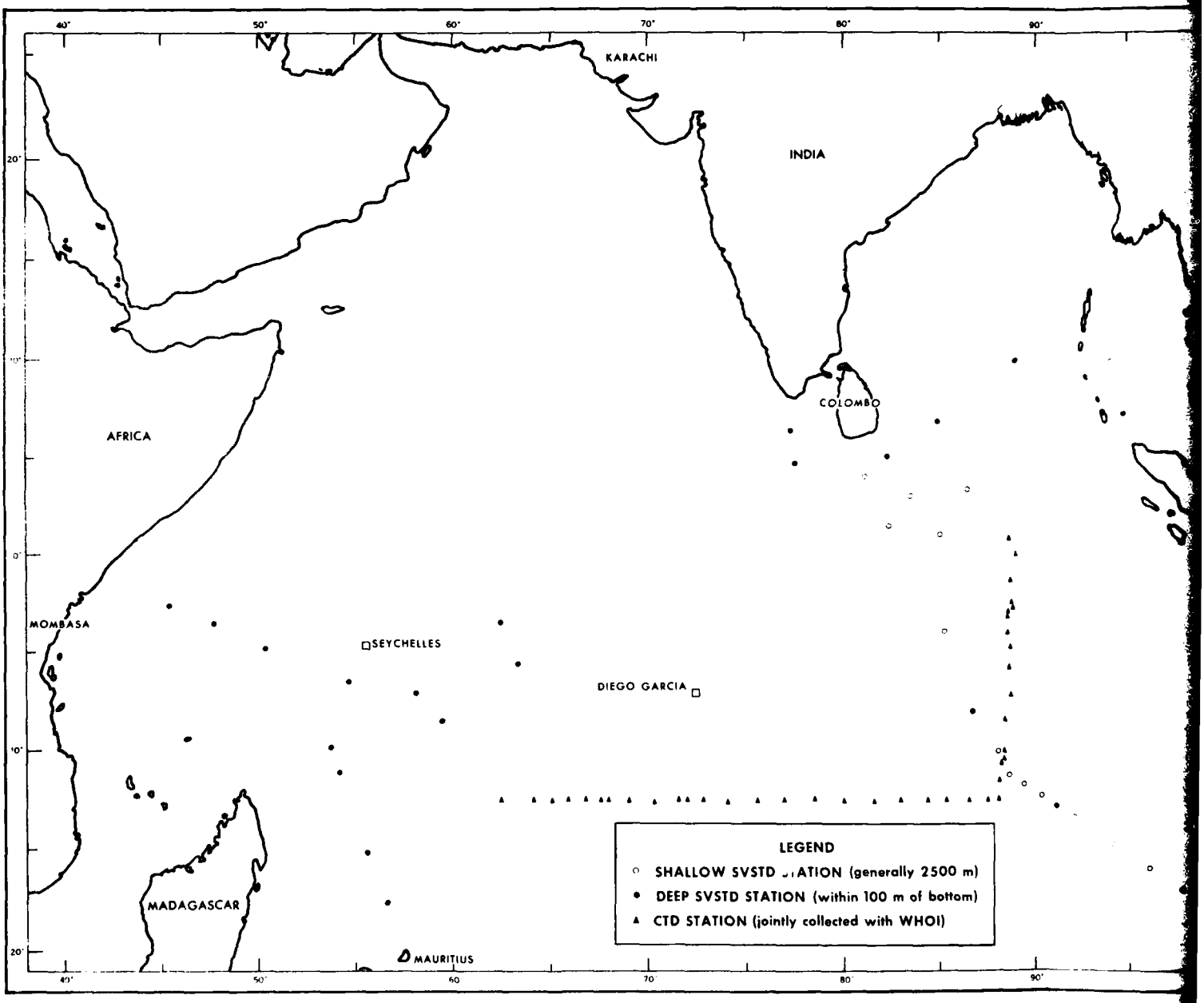
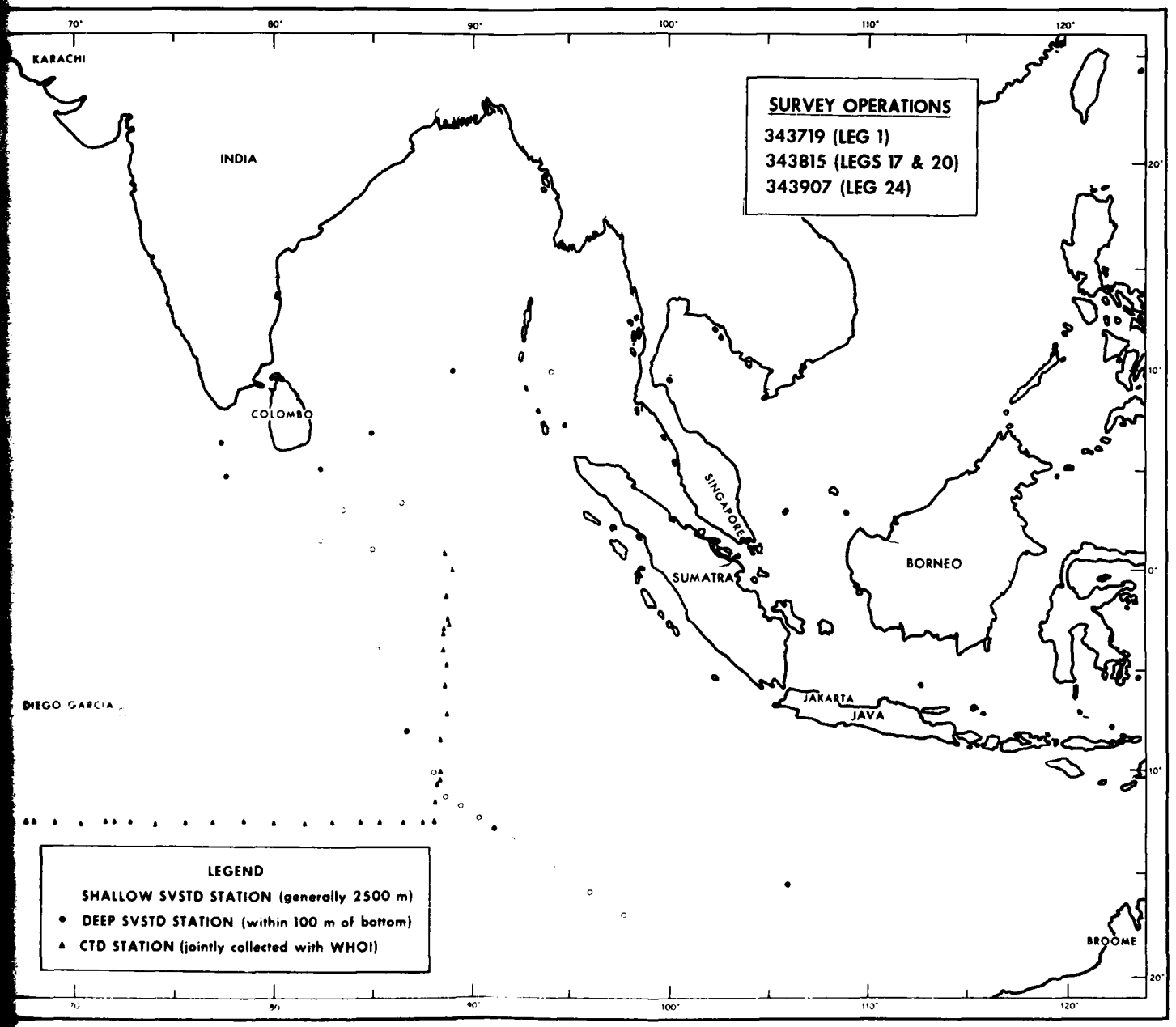


FIGURE 9 OCEANOGRAPHIC STATIONS, SPRING TRANSITION (MA
USNS WILKES INDIAN OCEAN SURVEYS—APRIL 1977-DE



NOGRAPHIC STATIONS, SPRING TRANSITION (MARCH-APRIL), WILKES INDIAN OCEAN SURVEYS—APRIL 1977-DECEMBER 1979

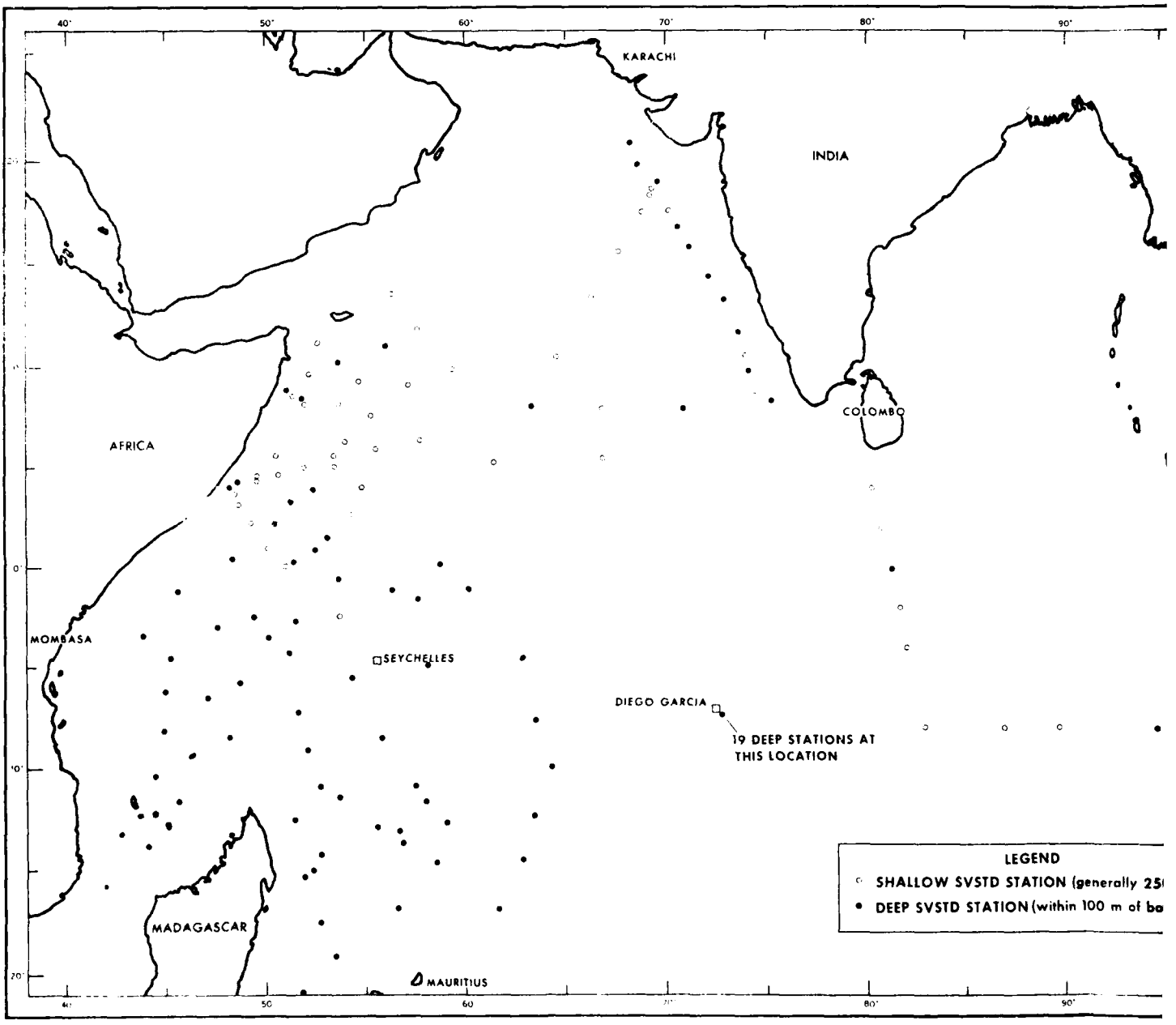
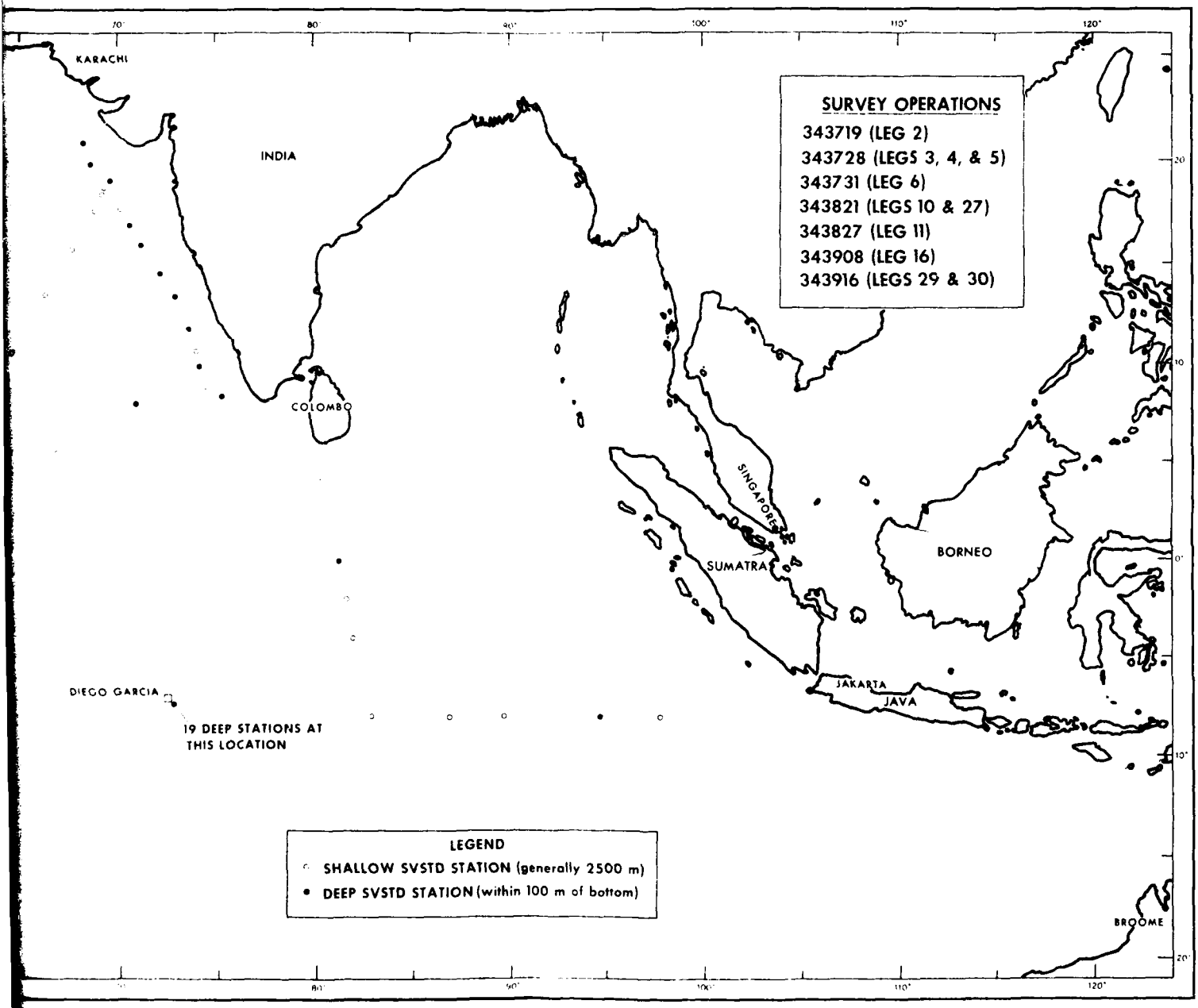


FIGURE 10 OCEANOGRAPHIC STATIONS, SUMMER MONSOON (
USNS WILKES OCEAN SURVEYS—APRIL 1977-DECEMB



ANOGRAPHIC STATIONS, SUMMER MONSOON (MAY-SEPTEMBER),
S WILKES OCEAN SURVEYS—APRIL 1977-DECEMBER 1979

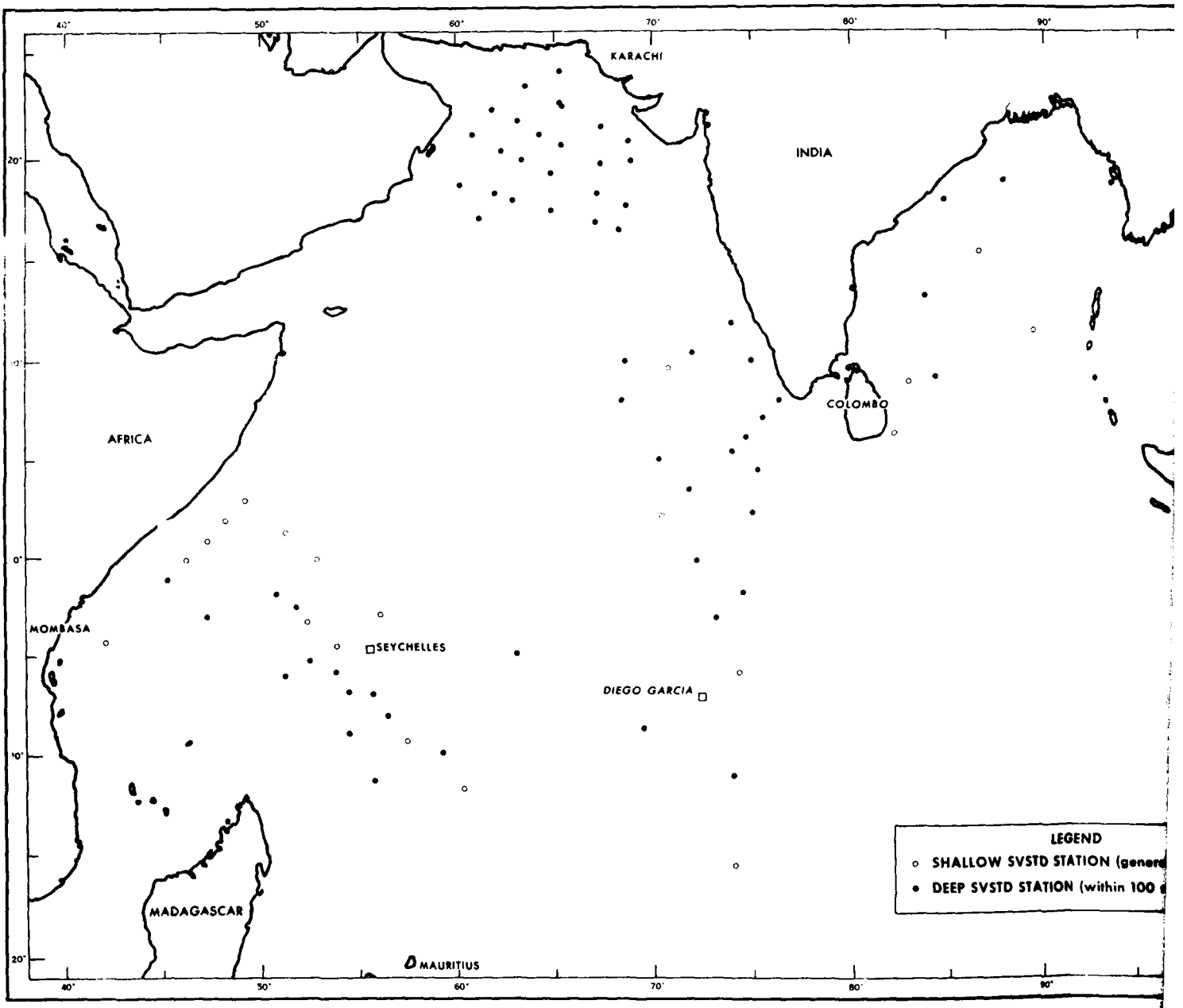
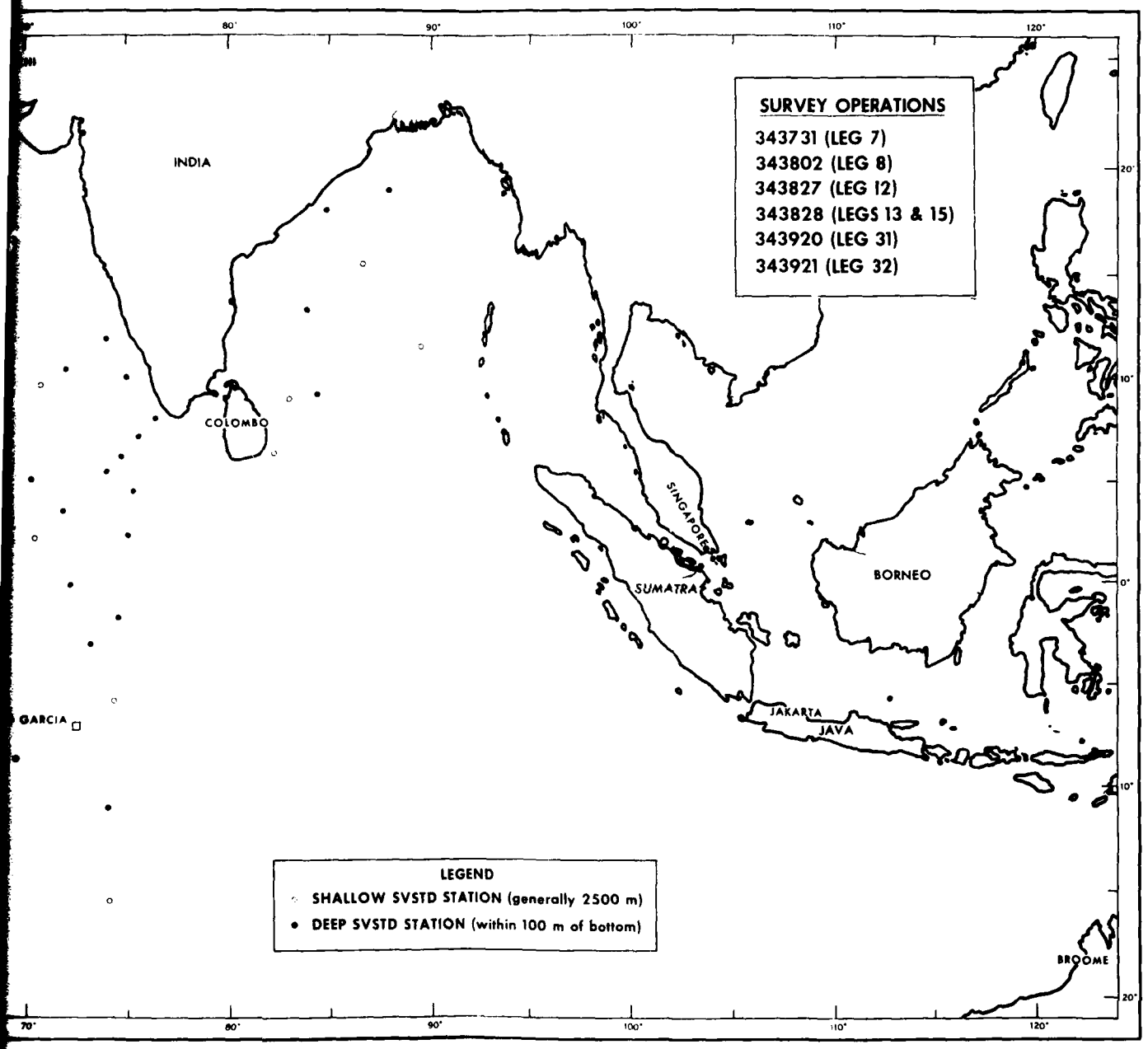


FIGURE 11 OCEANOGRAPHIC STATIONS, FALL TRANSITION (OCTO
USNS WILKES INDIAN OCEAN SURVEYS—APRIL 1977-DE



APHIC STATIONS, FALL TRANSITION (OCTOBER-NOVEMBER),
S INDIAN OCEAN SURVEYS—APRIL 1977-DECEMBER 1979

APPENDIX A

BOTTOM SEDIMENT CORE LOCATIONS

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
1-01	343719	02°37.2'S 045°17.1'E	422	4335	Continental Rise, Somali Basin	
1-02	343719	05°05.8'S 050°20.9'E	406	5051	Abyssal Floor, Somali Basin	
1-03	343719	06°30.0'S 054°31.5'E	389	3693	Rise, Mascarene Basin So. of Seychelles Bank	
1-04	343719	07°07.7'S 057°57.8'E	543	1630	Mascarene Plateau	Approx. 10 nm WSW of DSDP Hole 237
1-05	343719	03°30.3'S 062°22.6'E	430	4042	Abyssal Hills between Carlsberg Ridge & Mascarene Plat.	
1-06	343719	05°31.8'S 063°18.0'E	356	4220	Abyssal Hills between Carlsberg Ridge & Mascarene Plat.	
1-07	343719	08°31.0'S 059°18.7'E	73	1467	Mascarene Plateau	
1-08	343719	15°11.4'S 055°29.0'E	308	4175	Abyssal Floor, Mascarene Basin	
2-01	343719	17°34.3'S 052°35.4'E	339	4788	Abyssal Plain Mascarene Basin	
2-02	343719	15°03.5'S 052°14.9'E	310	4360	Continental Rise east of Madagascar	
2-03	343719	12°44.1'S 058°46.1'E	519	4120	Abyssal Floor, Mascarene Basin	
2-04	343719	10°56.3'S 052°36.0'E	377	4560	Abyssal Floor, Mascarene Basin	
2-05	343719					Core attempt aborted Winch problems.
2-06	343719	11°38.0'S 057°56.0'E	284	4232	Abyssal Floor Mascarene Basin	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
2-07	343719	13°41.3'S 056°41.7'E	Catcher Sample	4315	Abyssal Floor, Mascarene Basin	Rock fragments in catcher only
2-08	343719	16°50.0'S 056°29.0'E	420	4410	Abyssal Floor, Mascarene Basin	
3-01	343728	21°21.1'S 051°39.4'E	307	4945	Mascarene Abyssal Plain	3.5 nm SSW of DSDP Hole 329
3-02	343728	15°22.9'S 051°51.0'E	384	4170	Continental Rise east of Madagascar	
3-03	343728	08°31.5'S 055°48.3'E	532	3448	Continental Rise west of Mascarene Plateau	
3-04	343728	04°46.9'S 058°03.8'E	426	4000	Abyssal Floor, east of Seychelles Bank	
3-05	343728					Core lost due to mechanical problems
3-06	343728	02°15.2'N 050°44.8'E	552	5080	Somali Abyssal Plain	
3-07	343728	00°23.0'S 048°07.1'E	474	4743	Continental Rise, Somali Basin	
3-08	343728	02°57.6'S 047°28.2'E	212	4839	Somali Abyssal Plain	
3-09	373728	03°29.4'S 043°41.9'E	477	3855	Continental Rise, Somali Basin	
4-01	343728	04°33.1'S 045°06.1'E	587	4590	Continental Rise, Somali Basin	Bent barrel on 1st attempt, 2nd try O.K.
4-02	343728	05°50.2'S 048°36.2'E	436	4810	Somali Abyssal Plain	
4-03	343728	04°14.7'S 051°04.9'E	477	5060	Somali Abyssal Plain	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
4-04	343728	00°31.3'S 053°31.7'E	511	4810	Abyssal Hills, Somali Basin	
4-05, 06,07	343728					No core attempts for these numbers
4-08	343728	00°18.1'N 051°07.5'E	208	5068	...mali Abyssal Plain	Bent barrel on 1st attempt, 2nd try O.K.
4-09	343728					No core attempt.
4-10A	343728	02°26.6'S 053°36.9'E	551	4190	Abyssal Hills, Somali Basin	No core attempt for 4-10.
5-01	343728	07°17.5'S 051°32.6'E	476	4435	Abyssal Floor, Somali Basin	
5-02	343728	01°38.4'S 057°34.9'E	567	4420	Abyssal Hills, NE of Seychelles Bank	4.5nm NW of DSDP Hole 236
5-03	343728	00°19.5'N 058°57.6'E	518	4675	SW Flank of Carlsberg Ridge, Somali Basin	
5-04	343728	10°00.0'S 064°17.0'E	389	3875	Abyssal Plain between Mascerene Plat. & Cent. Indian Ridge	
5-05	343728	12°24.7'S 063°28.0'E	377	4020	Same as 5-04	
5-06	343728	14°31.5'S 062°50.3'E	483	3823	Same as 5-04	
5-07	343728	16°55.1'S 061°37.9'E	Catcher Sample	1870		Small amount of volcanic ash.
6-00	343731	09°09.0'S 052°06.0'E	Catcher Sample	4025	Abyssal Floor, Mascerene Basin	Not a core of record. Recovered coral chips. Cutter dented.
6-01	343731	19°09.1'S 053°19.9'E	223	4865	Mascerene Abyssal Plain	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
6-02	343731	03°29.4'S 050°02.0'E	582	5035	Somali Abyssal Plain	1.5 nm. W of DSDP Hole 240
6-03	343731	06°26.6'S 047°00.2'E	574	4573	Somali Abyssal Plain	
6-04	343731	10°25.9'S 044°26.6'E	286	3540	Continental Rise, Southern Somali Basin	
6-05	343731	10°19.2'S 042°38.2'E	195	3319	Same as 6-04	
6-06	343731	15°48.8'S 041°48.2'E	313	2237	Continental Rise, *Mozambique* Channel	2 nm NW of DSDP Hole 242
6-07	343731	08°29.2'S 048°01.6'E	527	4480	Somali Abyssal Plain	
6-08	343731	08°11.2'S 044°49.4'E	380	1446	Continental Rise, Somali Basin	
7-00	343731	05°01.5'N 070°13.1'E	None	3875	Abyssal Hills, South of Indus Cone	Not a core of record No recovery Cutter badly damaged.
7-01	343731	02°57.8'S 055°57.1'E	561	3665	Continental Rise, north of Seychelles Bank	
7-02	343731	08°43.7'S 069°22.9'E	550	3855	Central Indian Ridge Eastern Flank	
7-03	343731	03°03.9'S 073°03.6'E	598	3142	Slope, Chagos-Laccadive Ridge	
7-04	343731	00°10.1'S 072°02.7'E	Catcher Sample	4200	Abyssal floor between Chagos-Laccadive & Cent. Indian Ridges	
7-05	343731	05°03.9'N 070°16.7'E	541	4045	Abyssal Hills South of Indus Cone.	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
7-06	343731	10°01.1'N 068°28.2'E	133	4473	Indus Cone	
8-01	343802	23°49.5'N 066°15.0'E	588	150	Continental Shelf, vicinity of Murray Ridge	
8-02	343802	22°35.0'N 065°17.6'E	344	2340	Indus Cone	
8-03	343802	21°12.9'N 064°11.4'E	402	3340	Indus Cone	
8-04	343802	19°58.7'N 063°13.9'E	402	3389	Indus Cone	
8-05	343802	18°18.8'N 061°52.0'E	455	3693	Indus Cone	
8-06	343802	17°09.2'N 061°03.5'E	479	3910	Indus Cone	
8-07	343802	16°31.0'N 068°38.4'E	491	3653	Indus Cone	
8-08	343802	21°04.5'N 060°44.2'E	264	3305	Continental Rise	
8-09	343802	19°45.3'N 067°13.5'E	359	2919	Indus Cone	
8-10	343802	20°25.6'N 069°29.5'E	139	96	Continental Shelf	
8-11	343802	21°28.6'N 067°13.6'E	279	2096	Indus Cone	
8-12	343802	24°08.1'N 065°11.1'E	294	2291	Continental Slope, Oman Basin	
9-01	343821	07°45.8'N 055°18.8'E	217	4500	Chain Ridge	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
9-02	343821	07°14.5'N 057°29.0'E	418	3900	Carlsberg Ridge Flank	
9-03	343821	15°13.0'N 065°07.0'E	141	3815	Indus Cone	
9-04	343821	23°01.0'N 061°05.0'E	198	3340	Oman Abyssal Plain	
10-01	343821	08°23.0'N 075°20.5'E	225	2040	Continental Rise, Laccadive Basin	
10-02	343821	11°44.4'N 073°40.8'E	230	2055	Continental Rise, Laccadive Basin	
10-03	343821	15°11.2'N 071°15.0'E	252	2060	Indian Continental Slope	
10-04	343821	16°54.7'N 070°38.3'E	597	3080	Indus Cone	
10-05	343821	18°43.0'N 069°22.1'E	250	3080	Indus Cone	
10-06	343821	20°55.2'N 068°15.7'E	286	2600	Indus Cone	
11-01	343827	15°44.2'N 067°37.6'E	289	3794	Indus Cone	
11-02	343827	13°29.5'N 066°14.3'E	78	4025	Indus Cone	
11-03	343827	10°32.6'N 064°37.7'E	134	4359	Indus Cone	
11-04	343827	06°55.8'N 062°26.1'E	516	4532	Abyssal Hills South of Indus Cone	
11-05	343827	07°58.5'N 066°50.1'E	100	4598	Abyssal Hills South of Indus Cone	Core barrel bent.

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
11-06	343827	05°27.6'N 071°11.6'E	65	3970	Abyssal Hills west of Chagos-Laccadive Ridge	
12-01	343827	11°04.6'S 073°56.3'E	329	5070	Abyssal Hills, Central Indian Basin	
12-02	343827	05°53.4'S 074°13.1'E	322	4730	Abyssal Hills, Central Indian Basin	
12-03	343827	02°18.0'N 075°00.3'E	471	2350	Abyssal Hills, Central Indian Basin	
13-01	343828	08°58.0'N 082°55.0'E	161	3735	Ganges Cone	
13-02	343828	13°14.0'N 083°51.0'E	54	3296	Ganges Cone	
13-03	343828	17°58.0'N 084°52.0'E	516	2413	Ganges Cone	
13-04	343828	18°54.5'N 087°53.6'E	335	2240	Ganges Cone	
13-05	343828	15°23.3'N 086°34.6'E	43	2850	Ganges Cone	
13-06	343828	11°28.5'N 089°29.1'E	210	3167	Ganges Cone	
14-01	343901	06°27.2'N 092°19.7'E	72	4280	Nicobar Fan	Core barrel bent
14-02	343901	11°19.5'N 087°15.2'E	17	3303	Ganges Cone	
14-03	343901	15°37.8'N 088°35.7'E	215	2658	Ganges Cone	
14-04	343901	19°59.9'N 089°58.2'E	234	1352	Ganges Cone	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
14-05	343901	15°09.5'N 090°16.1'E	228	2680	Ganges Cone	
14-06	343901	10°00.2'N 090°24.0'E	187	3320	Ganges Cone	
14-07	343901	01°01.2'N 089°27.4'E	305	3030	Slope, Ninetyeast Ridge	
15-01	343828	00°24.2'N 072°41.6'E	141	2944	Slope, Chagos-Laccadive Ridge	
15-02	343828	03°29.3'N 071°44.6'E	448	3975	Abyssal Plain - West of Chagos-Laccadive Ridge	
15-03	343828	06°09.9'N 074°38.7'E	263	2750	Laccadive Abyssal Plain	
15-04	343828	11°31.4'N 074°30.3'E	256	1490	Continental Slope	
15-05	343828	11°39.0'N 073°34.0'E	242	2010	Continental Rise, Laccadive Basin	
15-06	343828	08°34.0'N 069°63.0'E	257	4613	Indus Cone	
15-07	343828	00°46.0'N 078°04.0'E	320	4730	Ceylon Abyssal Plain	
15-08	343828	04°33.0'N 079°07.0'E	158	4750	Ceylon Abyssal Plain	
16-01	343908	04°09.8'N 079°36.4'E	185	4275	Ceylon Abyssal Plain	
16-02	343908	03°01.0'S 081°21.6'E	431	5011	Ceylon Abyssal Plain	
17-01	343815	07°00.4'N 095°23.1'E	272	1745	Rise, east side Andaman-Nicobar Ridge	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
17-02	343815	09°56.1'N 094°09.5'E	210	3110	Abyssal Floor, Andaman Basin	
17-03	343815	09°58.3'N 089°02.8'E	134	3365	Ganges Cone	
17-04	343815	06°52.5'N 084°52.8'E	209	3865	Ganges Cone	
17-05	343815	03°02.0'N 083°29.0'E	22	4235	Ganges Cone	
17-06	343815	05°03.9'N 082°19.1'E	197	4150	Ganges Cone	
18-01	343811	08°48.7'S 108°48.7'E	283	3565	Java Trench Slope	
18-02	343811	12°00.8'S 108°24.2'E	402	5250	Abyssal Floor, Wharton Basin	
18-03	343811	15°10.8'S 108°02.6'E	264	5620	Gascoyne Abyssal Plain, Wharton Basin	
18-04	343811	18°58.9'S 107°43.6'E	458	5553	Gascoyne Abyssal Plain, Wharton Basin	
18-05	343811	19°55.9'S 108°45.6'E	424	4835	Abyssal Floor, Wharton Basin	
18-06	343811	17°45.9'S 111°36.9'E	410	5015	Abyssal Floor, Wharton Basin	
18-07	343811	14°46.5'S 112°20.9'E	376	4285	Abyssal Floor, Wharton Basin	
18-08	343811	11°19.5'S 112°53.9'E	526	3613	Abyssal Floor South of Java Trench	
18-09	343811	10°35.3'S 112°59.5'E	466	4970	Java Trench	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
18-10	343811	10°54.8'S 114°25.1'E	306	5015	Java Trench	
20-01	343815	08°06.4'S 086°47.5'E	319	5271	Abyssal Hills, Central Indian Basin	1 nm North of DSDP Hole 215
20-02	343815	11°20.0'S 088°42.5'E	28	1660	Top Ninetyeast Ridge	
20-03	343815	13°29.1'S 092°11.6'E	Catcher Sample	5048	Abyssal Hills, Cocos Basin	
20-04	343815	14°46.2'S 094°16.4'E	443	5798	Abyssal Hills, Cocos Basin	
20-05	343815	17°04.5'S 097°54.4'E	240	5140	Abyssal Hills, West Australia Basin	
20-06	343815	16°54.5'S 099°00.0'E	Catcher Sample	4585	Investigator Fracture Zone, West Australia Basin	Solid plug in Catcher & Cutter
20-07	343815	16°44.7'S 099°50.8'E	351	5483	Abyssal Hills, West Australia Basin	
20-08	343815	15°32.9'S 106°09.8'E	492	6140	Abyssal Floor, West Australia Basin	
21-01	343901	03°02.9'S 087°45.3'E	116	4835	Ganges Cone	
21-02	343901	03°33.5'S 082°36.8'E	354	3625	West Flank Afanasit Seamount	
21-03	343901	04°35.6'S 077°06.8'E	167	4830	Abyssal Hills South of Ceylon Abyssal Plain	
21-04	343901	00°44.7'N 077°04.0'E	374	4605	Rise, east of Maldive Is.	
22-01	343806	18°54.6'N 067°55.6'E	341	3275	Indus Cone	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
22-02	343806	13°31.3'N 069°12.2'E	500	4165	Indus Cone	
22-03	343806	09°55.5'N 070°06.4'E	572	4530	Indus Cone	
22-04	343806	08°59.6'N 072°52.0'E	444	1820	Chagos-Laccadive Ridge	2.3 nm North of DSDP Hole 219
22-05	343806	06°44.9'N 074°32.3'E	454	2757	Abyssal Floor, Laccadive Basin	
22-06	343806	04°25.3'N 074°31.5'E	500	2643	Abyssal Floor, Laccadive Basin	
22-07	343806	03°25.0'N 078°12.8'E	540	3189	Continental Rise, Central Indian Basin	
22-08	343806	03°23.7'N 087°01.0'E	54	4165	Indus Cone	
22-09	343806	03°29.5'N 092°12.3'E	175	4143	Nicobar Fan	
22-10	343806	06°21.1'N 094°13.9'E	288	1628	Continental Rise, Andaman Basin	
22-11	343806	05°58.8'N 096°36.1'E	73	1338	Slope, east side Andaman Basin	
26-00	343811	08°23.8'N 092°40.9'E	Catcher Sample	1250	Andaman Nicobar Ridge	No core for record. Rock chips only.
26-01	343811	07°04.2'S 104°54.8'E	233	2095	Trough, Landward side of Java Trench	
26-02	343811	07°25.8'S 104°16.8'E	170	6250	Java Trench	
26-03	343811	04°32.6'N 092°28.5'E	267	4240	Nicobar Fan	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
26-04	343811	08°55.1'N 090°39.7'E	408	3225	Ninetyeast Ridge	5.4 nm East of DSDP Hole 217
26-05	343811	08°04.7'N 095°39.3'E	344	1573	Slope, east side of Andaman Basin	
26-06	343811	05°56.3'N 097°56.7'E	176	113	Continental Shelf, Andaman Basin	
27-00	343821	07°57.3'N 090°59.4'E	None	5205	Abyssal Floor, Wharton Basin	No core for record. Cutter dented.
27-01	343821	07°37.5'S 102°44.9'E	220	6000	Java Trench	
27-02	343821	07°57.8'S 101°59.0'E	56	5530	Abyssal Floor, Wharton Basin	
27-03	343821	07°57.1'S 097°57.9'E	109	4797	Abyssal Floor, Wharton Basin	
27-04	343821	08°00.8'S 096°45.8'E	30	4810	Abyssal Floor, Wharton Basin	
27-05	343821	07°59.8'S 088°43.5'E	402	3225	Slope, west side Ninetyeast Ridge	
30-01	343916					No core.
30-02	343916	08°09.4'N 051°47.1'E	None	4843	Continental Rise, Somali Basin	No recovery, mechanical problems.
30-03	343916	06°21.5'N 053°58.0'E	384	5068	Somali Abyssal Plain	
30-04	343916	08°26.1'N 054°19.1'E	223	5050	Somali Abyssal Plain	
30-05	343916	06°58.0'N 053°11.1'E	273	5050	Somali Abyssal Plain	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
30-06	343916	05°36.5'N 052°17.1'E	244	5063	Somali Abyssal Plain	
30-07	343916	03°58.0'N 051°41.2'E	506	5070	Somali Abyssal Plain	
30-08	343916	03°23.7'N 051°20.5'E	603	4950	Somali Abyssal Plain	
30-09	343916	02°22.0'S 044°36.1'E	363	4015	Rise, Somali Basin	
31-01	343920	04°14.9'S 041°46.8'E	322	2932	Rise, western Somali Basin	
31-02	343920	02°23.2'S 044°38.7'E	321	4030	Rise, western Somali Basin	4.8 nm NW of DSDP Hole 4030
31-03	343920	01°02.3'S 044°58.5'E	282	3835	Rise, western Somali Basin	
31-04	343920	01°50.7'S 050°29.6'E	368	5048	Rise, western Somali Basin	
31-05	343920	03°11.0'S 052°06.6'E	292	5033	Rise, western Somali Basin	
31-06	343920	03°00.9'N 048°58.5'E	344	3847	Rise, western Somali Basin	
31-07	343920	02°39.5'S 055°04.8'E	Catcher Sample	2880	Ridge adjacent to Seychelles Platform	
32-01	343921	06°35.9'N 050°30.3'E	433	2315	Continental Rise, Somali Basin	
32-02	343921	01°35.2'N 057°16.8'E	540	4550	Abyssal Hills, Somali Basin	
32-03	343921	00°29.9'N 058°03.8'E	566	4712	Abyssal Floor, Somali Basin	

APPENDIX A. BOTTOM SEDIMENT CORE LOCATIONS (Cont.)

CORE NO.	SURVEY NO.	POSITION	RECOVERY (cm.)	WATER DEPTH (m.)	PHYSIOGRAPHIC PROVINCE	REMARKS
32-04	343921	04°17.9'N 053°32.7'E	597	5090	Somali Abyssal Plain	
32-05	343921	03°14.2'N 052°42.4'E	552	5092	Somali Abyssal Plain	
32-06	343921	02°23.5'N 052°23.1'E	451	5087	Somali Abyssal Plain	
32-07	343921	01°26.3'N 053°40.7'E	593	5080	Somali Abyssal Plain	
32-08	343921	00°52.3'N 054°40.5'E	520	4760	Abyssal Floor, eastern Somali Basin	
32-09	343921	01°17.5'S 055°30.0'E	427	4568	Abyssal Floor, eastern Somali Basin	

APPENDIX B

WIDE ANGLE BOTTOM REFLECTION STATION LOCATIONS

APPENDIX B. WIDE ANGLE BOTTOM REFLECTION STATION LOCATIONS

WABR NO.	SURVEY NO.	POSITION LAT.	POSITION LONG.	JULIAN DAY	Z-TIME	PHYSIOGRAPHIC PROVINCE
04-01*	343728	05°43'S	048°44'E	198		Somali Basin
04-02*	343728	02°28'S	049°18'E	204		Somali Basin
04-03*	343728	01°48'S	043°59'E	206		Somali Basin
06-04*	343731	10°26'S	044°27'E	259		Somali Basin
08-05*	343802	17°33'N	064°40'E	316		Indus Cone
08-06*	343802	17°37'N	068°36'E	318		Indus Cone
14-01	343901	13°50'N	088°00'E	015	1238	Ganges Cone
14-02	343901	14°01'N	088°01'E	015	1518	Ganges Cone
14-03	343901	17°03'N	090°08'E	018	1656	Ganges Cone
14-04	343901	15°19'N	090°14'E	019	0440	Ganges Cone
14-05	343901	12°48'N	090°24'E	020	0308	Ganges Cone
14-06	343901	09°52'N	090°25'E	021	0839	Ganges Cone
14-07	343901	01°03'N	087°26'E	024	1727	Ganges Cone
14-08	343901	01°02'N	084°49'E	025	1246	Ganges Cone
14-09	343901	00°59'N	081°31'E	026	0902	Ceylon Abyssal Plain
14-10	343901	00°59'N	081°20'E	026	1025	Ceylon Abyssal Plain
14-11	343901	04°34'N	078°58'E	028	0358	Ceylon Abyssal Plain
16-01	343908	04°30'N	079°32'E	127	1730	Ceylon Abyssal Plain
16-02	343908	03°42'N	079°58'E	128	0456	Ceylon Abyssal Plain
16-03	343908	01°37'N	081°02'E	128	2125	Ceylon Abyssal Plain
17-15*	343815	09°54'N	088°58'E	072		Ganges Cone
17-16*	343815	07°16'N	088°04'E	073		Ganges Cone
17-17*	343815	06°55'N	085°00'E	074		Ganges Cone
17-18*	343815	01°02'N	084°50'E	077		Ganges Cone
17-19*	343815	03°03'N	083°26'E	078		Ganges Cone
17-20*	343815	05°03'N	082°16'E	079		Ganges Cone
17-21*	343815	05°04'N	080°03'E	080		Ganges Cone

APPENDIX B. WIDE ANGLE BOTTOM REFLECTION STATION LOCATIONS (Cont.)

WABR NO.	SURVEY NO.	POSITION LAT.	LONG.	JULIAN DAY	Z-TIME	PHYSIOGRAPHIC PROVINCE
20-22*	343815	03°04'N	081°44'E	097		Ganges Cone
20-23*	343815	01°27'N	082°22'E	097		Ganges Cone
21-01	343901	05°17'N	083°2[illegible]'E	039	1726	Ganges Cone
21-02	343901	05°14'N	078°21[illegible]	053	2232	Rise, North of Ceylon Abyssal Plain
21-03	343901	06°04'N	079°03'E	054	0708	Rise, North of Ceylon Abyssal Plain
22-07*	343806	18°52'N	067°55'E	338		Indus Cone
22-08*	343806	16°28'N	068°25'E	338		Indus Cone
22-09*	343806	13°29'N	069°11'E	339		Indus Cone
22-10*	343806	08°29'N	074°35'E	342		Laccadive Basin
22-11*	343806	05°57'N	074°30'E	343		Laccadive Basin
22-12*	343806	03°29'N	084°48'E	347		Ganges Cone
24-01	343907	01°33'S	062°20'E	086	0948	Somali Basin
24-02	343907	01°47'N	086°38'E	115	0450	Ganges Cone
25-01	343908	05°41'N	083°16'E	182	0700	Ganges Cone
26-13*	343811	08°10'S	093°59'E	041		Wharton Basin
26-14*	343811	04°01'S	093°22'E	043		Nicobar Fan
30-01	343916	01°11'S	054°27'E	257	1152	Somali Basin
30-02	343916	00°30'S	053°59'E	257	1822	Somali Basin
30-03	343916	00°21'N	053°31'E	258	0157	Somali Basin
30-04	343916	00°25'N	053°29'E	258	0812	Somali Basin
30-05	343916	01°54'N	052°22'E	258	2239	Somali Basin
30-06	343916	02°17'N	051°59'E	259	0356	Somali Basin
30-07	343916	03°44'N	050°41'E	259	2347	Somali Basin
30-08	343916	05°13'N	051°03'E	261	0323	Somali Basin
30-09	343916	04°44'N	051°27'E	261	0844	Somali Basin
30-10	343916	04°17'N	051°53'E	261	1328	Somali Basin
30-11	343916	03°24'N	052°50'E	262	0253	Somali Basin
30-12	343916	04°40'N	053°49'E	263	1115	Somali Basin
30-13	343916	05°14'N	053°07'E	263	2101	Somali Basin

APPENDIX B. WIDE ANGLE BOTTOM REFLECTION STATION LOCATIONS (Cont.)

WABR NO.	SURVEY NO.	POSITION LAT.	LONG.	JULIAN DAY	Z-TIME	PHYSIOGRAPHIC PROVINCE
30-14	343916	05°50'N	052°29'E	264	0316	Somali Basin
30-15	343916	06°24'N	051°53'E	264	0933	Somali Basin
30-16	343916	06°58'N	051°15'E	264	1610	Somali Basin
30-17	343916	07°40'N	052°39'E	265	1429	Somali Basin
30-18	343916	07°06'N	053°12'E	265	2024	Somali Basin
30-19	343916	06°36'N	053°41'E	266	0151	Somali Basin
30-20	343916	06°40'N	054°10'E	266	1912	Somali Basin
30-21	343916	07°23'N	054°12'E	267	0152	Somali Basin
30-22	343916	08°06'N	054°09'E	267	0852	Somali Basin
30-23	343916	08°06'N	053°45'E	268	0154	Somali Basin
30-24	343916	07°31'N	053°30'E	268	0755	Somali Basin
30-25	343916	06°52'N	053°06'E	268	1818	Somali Basin
30-26	343916	06°27'N	052°48'E	268	2338	Somali Basin
30-27	343916	06°10'N	052°37'E	269	0230	Somali Basin
30-28	343916	05°56'N	052°31'E	269	0542	Somali Basin
30-29	343916	05°23'N	052°04'E	269	1739	Somali Basin
30-30	343916	04°58'N	051°57'E	269	2154	Somali Basin
30-31	343916	04°36'N	051°49'E	270	0132	Somali Basin
30-32	343916	04°12'N	051°43'E	270	0506	Somali Basin
30-33	343916	03°43'N	051°30'E	270	1524	Somali Basin
30-34	343916	02°31'N	050°30'E	271	0649	Somali Basin
30-35	343916	01°50'N	049°48'E	271	1356	Somali Basin
30-36	343916	01°22'N	049°06'E	271	2108	Somali Basin
30-37	343916	01°00'N	048°31'E	272	0241	Somali Basin
31-01	343920	04°20'S	044°11'E	283	1017	Somali Basin
31-02	343920	04°21'S	045°29'E	283	1933	Somali Basin
31-03	343920	04°20'S	046°37'E	284	0907	Somali Basin
31-04	343920	02°56'S	045°15'E	284	2216	Somali Basin
31-05	343920	01°44'S	044°03'E	285	1212	Somali Basin

APPENDIX B. WIDE ANGLE BOTTOM REFLECTION STATION LOCATIONS (Cont.)

WABR NO.	SURVEY NO.	POSITION LAT.		LONG.	JULIAN DAY	Z-TIME	PHYSIOGRAPHIC PROVINCE
31-06	343920	01°03'S	-	044°55'E	286	2130	Somali Basin
31-07	343920	02°33'S	-	046°41'E	287	1410	Somali Basin
31-08	343920	02°36'S	-	046°45'E	287	1523	Somali Basin
31-09	343920	04°30'S	-	049°10'E	288	0936	Somali Basin
31-10	343920	04°05'S	-	051°00'E	289	2315	Somali Basin
31-11	343920	03°00'S	-	049°32'E	290	1311	Somali Basin
31-12	343920	01°58'S	-	048°23'E	291	0036	Somali Basin
31-13	343920	00°44'S	-	047°01'E	291	1309	Somali Basin
31-14	343920	00°00'N	-	045°56'E	292	0154	Somali Basin
31-15	343920	00°52'N	-	047°03'E	293	0419	Somali Basin
31-16	343920	00°13'S	-	048°22'E	293	1542	Somali Basin
31-17	343920	02°06'S	-	050°47'E	294	1944	Somali Basin
31-18	343920	00°59'N	-	049°23'E	296	2111	Somali Basin
31-19	343920	01°35'N	-	048°32'E	297	0638	Somali Basin
31-20	343920	02°25'N	-	049°44'E	298	1428	Somali Basin
31-21	343920	01°48'N	-	050°32'E	298	2347	Somali Basin
31-22	343920	01°19'N	-	051°05'E	299	0839	Somali Basin
31-23	343920	01°45'S	-	054°45'E	300	2108	Somali Basin
32-01	343921	04°05'N	-	053°11'E	314	1312	Somali Basin
32-02	343921	04°34'N	-	052°35'E	314	1920	Somali Basin
32-03	343921	05°28'N	-	051°39'E	315	0935	Somali Basin
32-04	343921	05°35'N	-	053°40'E	318	0443	Somali Basin
32-05	343921	00°34'N	-	058°23'E	320	1117	Somali Basin
32-06	343921	00°31'N	-	058°04'E	321	1857	Somali Basin
32-07	343921	04°11'N	-	053°45'E	323	1152	Somali Basin
32-08	343921	03°09'N	-	052°41'E	324	1028	Somali Basin
32-09	343921	02°29'N	-	052°27'E	324	1625	Somali Basin
32-10	343921	01°56'N	-	053°02'E	325	0330	Somali Basin
32-11	343921	01°45'N	-	053°13'E	325	0547	Somali Basin

APPENDIX B. WIDE ANGLE BOTTOM REFLECTION STATION LOCATIONS (Cont.)

WABR NO.	SURVEY NO.	POSITION LAT.	LONG.	JULIAN DAY	Z-TIME	PHYSIOGRAPHIC PROVINCE
32-12	343921	00°40'S	055°32'E	326	1616	Somali Basin
32-13	343921	01°42'S	055°36'E	327	0605	Somali Basin
33-01	343921	02°45'S	049°06'E	335	0737	Somali Basin
33-02	343921	01°40'S	049°30'E	335	1523	Somali Basin
33-03	343921	00°08'S	050°02'E	336	0143	Somali Basin
38-01	343915	04°36'N	087°36'E	206	0644	Ganges Cone
38-02	343915	04°00'N	084°48'E	207	0350	Ganges Cone
38-03	343915	03°59'N	084°43'E	207	0540	Ganges Cone
38-04	343915	03°56'N	084°38'E	207	0816	Ganges Cone
38-05	343915	03°43'N	083°28'E	207	1900	Ganges Cone
38-06	343915	03°40'N	083°25'E	207	2128	Ganges Cone
38-07	343915	03°38'N	083°22'E	207	2351	Ganges Cone
38-08	343915	03°31'N	082°55'E	208	0537	Ganges Cone
38-09	343915	03°28'N	082°35'E	208	1011	Ganges Cone
38-10	343915	03°24'N	082°11'E	208	1428	Ganges Cone
38-11	343915	03°21'N	081°39'E	208	1933	Ganges Cone
38-12	343915	03°15'N	081°15'E	208	2343	Ganges Cone
38-13	343915	03°09'N	080°49'E	209	0340	Ceylon Abyssal Plain
38-14	343915	03°04'N	080°26'E	209	0735	Ceylon Abyssal Plain
38-15	343915	02°58'N	080°00'E	209	1216	Ceylon Abyssal Plain

* Data from these stations have been reported in NAVOCEANO technical note, TN-3432-02-78, "Sediment Interval Velocity Measurement from the USNS WILKES Surveys in the Indian Ocean, 1977-78".

APPENDIX C

OCEANOGRAPHIC STATION LOCATIONS

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343719	01	001201	02°38.3'S	045°10.1'E	4253	4291	4/12/77
		003002	03°27.0'S	047°30.9'E	2409	4870	4/14/77
		004003	04°55.1'S	050°13.0'E	5067	5081	4/15/77
		005004	06°31.6'S	054°30.9'E	3692	3707	4/17/77
		006005	07°05.8'S	058°00.1'E	1577	1582	4/18/77
		007006	03°30.0'S	062°21.8'E	4033	4056	4/20/77
		008007	05°33.3'S	063°14.7'E	4007	4039	4/22/77
		009008	08°31.6'S	059°21.2'E	1291	1318	4/23/77
		011010	09°55.7'S	053°37.8'E	4386	4420	4/26/77
		012011	11°07.7'S	054°03.7'E	4495	4519	4/27/77
		013012	15°12.7'S	055°30.5'E	4046	4087	4/29/77
		014013	17°44.5'S	056°31.2'E	4332	4356	5/01/77
343719	02	201001	17°35.0'S	052°39.6'E	4759	4856	5/10/77
		202002	15°04.2'S	052°15.8'E	4327	4373	5/12/77
		203003	14°39.2'S	058°30.0'E	4113	4193	5/13/77
		204004	12°42.7'S	059°01.5'E	3965	4017	5/16/77
		205005	12°55.1'S	055°29.3'E	4397	4418	5/17/77
		206006	12°36.0'S	051°21.0'E	4229	4278	5/18/77
		207007	10°56.2'S	052°39.5'E	4427	4402	5/20/77
		208008	10°50.0'S	057°24.3'E	4102	4254	5/22/77
		209009	11°38.8'S	057°56.8'E	4182	4242	5/24/77
		210010	13°41.9'S	056°45.6'E	4202	4274	5/26/77
		211011	16°51.6'S	056°31.6'E	4371	4466	5/27/77
343728	03	001001	21°19.8'S	051°40.1'E	4909	4975	6/05/77
		002002	15°21.0'S	051°48.4'E	4096	4181	6/08/77

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343728	03	003003	11°24.8'S	053°37.4'E	4686	4855	6/10/77
(Cont.)		004004	08°32.7'S	055°42.7'E	3431	3495	6/11/77
		005005	04°45.4'S	058°04.5'E	3960	4007	6/13/77
		006006	01°05.0'S	056°15.8'E	4536	4581	6/15/77
		007007	00°57.6'N	052°26.4'E	5064	5116	6/16/77
		008008	02°12.5'N	050°24.6'E	5016	5051	6/18/77
		009009	00°22.0'N	048°07.0'E	4710	4765	6/20/77
		010010	02°59.2'S	047°28.0'E	4804	4856	6/21/77
		011011	03°25.4'S	043°41.9'E	3799	3765	6/23/77
343728	04	201001	04°33.7'S	045°08.8'E	4586	4609	7/15/77
		202002	05°48.1'S	048°35.8'E	4815	4835	7/17/77
		203003	04°14.8'S	051°04.4'E	5061	5091	7/18/77
		210004	02°24.7'S	053°35.7'E	3022	4303	7/19/77
		204005	00°27.9'S	053°32.5'E	4908	4921	7/20/77
		208006	00°17.5'N	051°11.2'E	5074	5097	7/21/77
		211007	02°29.2'S	049°19.6'E	5014	5016	7/23/77
		212008	01°12.2'S	045°24.1'E	4184	4195	7/24/77
343728	05	501009	06°09.6'S	044°46.9'E	4358	4374	8/01/77
		502010	07°16.3'S	051°32.3'E	4622	4627	8/03/77
		503011	05°31.1'S	054°15.4'E	3380	3405	8/04/77
		504012	01°33.1'S	057°32.5'E	4457	4489	8/10/77
		505013	00°17.3'N	058°49.1'E	4627	4650	8/12/77
		506014	00°59.7'S	060°07.2'E	4457	4469	8/14/77
		507015	04°31.1'S	062°48.3'E	4398	4402	8/17/77
		508016	07°40.7'S	063°28.2'E	4019	4038	8/19/77
		509017	10°00.0'S	064°14.9'E	3805	3972	8/22/77

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343728	05	510018	12°21.5'S	063°23.2'E	3953	3975	8/25/77
(Cont.)		511019	14°30.5'S	062°48.8'E	3384	3456	8/27/77
		512020	16°54.0'S	061°36.8'E	1909	1750	8/29/77
343731	06	601001	19°11.8'S	053°21.3'E	4900	4883	9/06/77
		602002	14°16.4'S	052°40.3'E	4597	4599	9/08/77
		603003	09°06.2'S	052°01.4'E	3969	3977	9/09/77
		604004	02°39.5'S	051°25.0'E	5094	5094	9/11/77
		605005	03°30.5'S	050°03.5'E	5069	5072	9/13/77
		606006	06°29.5'S	046°59.7'E	4589	4592	9/14/77
		607007	10°25.3'S	044°22.9'E	3533	3533	9/16/77
		608008	13°17.6'S	042°37.2'E	3328	3337	9/17/77
		609009	15°50.2'S	041°50.9'E	2349	2353	9/19/77
		610010	13°51.9'S	044°01.2'E	3528	3529	9/20/77
		611011	11°40.2'S	045°32.9'E	3421	3420	9/21/77
		612012	08°30.2'S	048°04.8'E	4509	4502	9/23/77
		613013	08°09.6'S	044°46.4'E	4144	4144	9/24/77
343731	07	701014	02°57.0'S	046°59.9'E	4815	4817	10/09/77
		702015	02°56.2'S	055°53.1'E	3370	3752	10/12/77
		703016	04°54.5'S	062°50.5'E	4172	4203	10/14/77
		704017	08°42.6'S	069°21.6'E	3698	3711	10/16/77
		705018	03°04.0'S	073°05.4'E	3187	3177	10/22/77
		706019	00°11.3'S	072°04.9'E	4209	4214	10/23/77
		707020	05°02.6'N	070°14.8'E	4167	4176	10/25/77
		708021	10°00.9'N	068°28.9'E	4486	4487	10/27/77

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343802	08	028001	22°34.8'N	065°18.2'E	2332	2340	11/06/77
		027002	21°12.6'N	064°11.9'E	3353	3338	11/07/77
		026003	19°57.7'N	063°14.9'E	3370	3395	11/08/77
		025004	18°20.1'N	061°51.7'E	3709	3807	11/09/77
		024005	17°08.5'N	061°04.2'E	3917	3912	11/09/77
		023006	18°14.0'N	060°03.8'E	3628	3642	11/10/77
		022007	18°01.6'N	062°46.2'E	3647	3642	11/11/77
		021008	17°30.5'N	064°44.2'E	3517	3520	11/12/77
		020009	16°53.0'N	066°58.6'E	3608	3666	11/13/77
		019010	16°33.4'N	068°14.6'E	3587	3596	11/14/77
		018011	17°44.5'N	068°37.6'E	3463	3470	11/14/77
		017012	18°18.1'N	067°05.8'E	3402	3409	11/15/77
		016013	19°17.6'N	064°45.8'E	3204	3208	11/16/77
		015014	20°21.7'N	062°11.8'E	3494	3502	11/17/77
		014015	21°10.5'N	060°43.5'E	3326	3347	11/18/77
		013016	22°21.7'N	061°47.5'E	3130	3149	11/18/77
		012017	21°41.9'N	063°02.6'E	3133	3128	11/19/77
		011018	20°41.8'N	065°17.2'E	2874	2901	11/20/77
		010019	19°46.5'N	067°15.1'E	2920	2936	11/21/77
		008020	19°51.8'N	068°47.4'E	2886	2891	11/22/77
		006021	20°30.7'N	068°40.5'E	2209	2218	11/23/77
		005022	21°30.5'N	067°18.2'E	2168	2155	11/24/77
		004023	22°39.5'N	065°08.8'E	2359	2359	11/24/77
		003024	23°26.1'N	063°29.5'E	2402	2412	11/25/77
		002025	24°08.4'N	065°11.5'E	2278	2304	11/26/77

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343806	22	004001	16°32.1'N	068°26.0'E	2491	3657	12/04/77
		005002	13°32.5'N	069°14.2'E	2493	4128	12/05/77
		006003	09°55.5'N	070°06.4'E	2491	4551	12/07/77
		009004	06°44.8'N	074°32.4'E	2504	2757	12/09/77
		012005	03°26.0'N	075°57.8'E	2468	3246	12/10/77
		014006	03°24.3'N	079°46.1'E	2490	4346	12/12/77
		015007	03°28.6'N	082°00.7'E	2488	4272	12/12/77
		016008	03°29.4'N	084°51.0'E	2489	4195	12/13/77
		017009	03°24.1'N	087°02.1'E	2488	4121	12/14/77
		018010	03°24.7'N	088°19.8'E	2490	4171	12/15/77
		019011	03°27.3'N	092°13.5'E	2490	4152	12/16/77
343811	18	001001	07°38.1'S	105°53.4'E	2509	2613	1/07/78
		003002	10°54.0'S	108°33.0'E	2527	5273	1/09/78
		005003	12°57.5'S	108°19.5'E	3968	4271	1/10/78
		006004	15°09.0'S	108°01.8'E	2551	5678	1/11/78
		007005	18°55.3'S	107°42.7'E	5539	5558	1/14/78
		009006	18°48.2'S	110°16.8'E	2525	4219	1/15/78
		011007	17°05.5'S	111°43.2'E	2515	4813	1/16/78
		012008	14°44.1'S	112°22.0'E	2516	4241	1/17/78
		013009	11°50.5'S	112°44.7'E	2533	3533	1/18/78
		015010	10°50.0'S	113°14.2'E	2518	5533	1/19/78
		018011	11°30.9'S	114°47.8'E	4110	4134	1/20/78
343811	26	001012	07°03.0'S	104°52.4'E	2090	2113	2/04/78
		004013	08°11.3'S	104°04.8'E	2555	6203	2/05/78
		005014	09°40.5'S	102°42.6'E	5497	5508	2/06/78

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343811	26	006015	09°58.9'S	098°23.0'E	2522	5151	2/07/78
(Cont.)		007016	10°17.6'S	094°81.9'E	2488	5648	2/09/78
		008017	06°08.2'S	093°45.2'E	2522	5114	2/11/78
		009018	01°35.7'S	093°20.2'E	4635	4643	2/13/78
		011019	02°48.1'N	093°59.3'E	2516	4675	2/14/78
		013020	04°30.8'N	092°28.0'E	4231	4236	2/16/78
		014021	07°00.7'N	091°22.9'E	2524	3669	2/17/78
		015022	08°55.1'N	090°39.3'E	2546	3219	2/18/78
		016023	08°50.2'N	019°39.1'E	2507	3370	2/19/78
		018024	09°14.8'N	095°01.6'E	1982	1993	2/20/78
343815	17	012001	07°15.0'N	094°49.0'E	2644	2645	3/10/78
		010002	09°56.1'N	094°09.5'E	2516	3116	3/11/78
		009003	09°57.8'N	089°01.3'E	3344	3375	3/13/78
		007004	06°51.3'N	084°51.8'E	3851	3870	3/15/78
		006005	03°21.5'N	086°26.5'E	2529	4179	3/16/78
		005006	01°03.1'N	084°59.4'E	4449	4479	3/18/78
		004007	03°01.8'N	083°27.8'E	2527	4235	3/19/78
		003008	05°03.0'N	082°18.5'E	4145	4158	3/20/78
		002009	04°41.0'N	077°34.4'E	2751	2749	3/22/78
		001010	06°22.3'N	077°21.9'E	2277	2288	3/23/78
343815	20	016011	04°06.3'N	081°10.3'E	2472	4300	4/06/78
		015012	01°27.3'N	082°21.1'E	2494	4409	4/07/78
		014013	03°59.3'S	085°14.3'E	2507	4856	4/09/78
		013014	08°05.3'S	086°46.3'E	5298	5425	4/11/78
		012015	10°06.8'S	088°02.9'E	2501	4900	4/12/78
		011016	11°19.9'S	088°42.3'E	1639	1660	4/13/78

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343815	20	010017	11°47.8'S	089°29.1'E	2512	5365	4/13/78
(Cont.)		009018	12°24.0'S	090°23.4'E	2435	5473	4/13/78
		008019	12°54.9'S	091°17.2'E	5832	5834	4/13/78
		007020	13°28.8'S	092°11.2'E	2508	5063	4/15/78
		206021	14°46.1'S	094°15.9'E	2517	5838	4/16/78
		205022	15°59.4'S	096°10.2'E	2529	5373	4/17/78
		204023	17°04.5'S	097°54.1'E	2532	5233	4/18/78
		201024	15°33.6'S	106°10.3'E	6028	6112	4/21/78
343821	27	003002	08°00.3'S	097°59.8'E	3012	4943	7/01/78
		005003	08°01.7'S	094°55.9'E	4842	5108	7/03/78
		007004	07°58.1'S	089°49.1'E	2513	5183	7/05/78
		009005	08°00.0'S	086°57.5'E	2532	5193	7/06/78
		010006	08°00.1'S	082°59.2'E	2584	5126	7/07/78
		012008	01°59.4'S	081°41.9'E	2548	4785	7/10/78
		013009	00°00.2'S	081°10.5'E	4605	4598	7/10/78
		014010	02°02.6'N	080°48.8'E	2569	4484	7/11/78
		015011	04°00.4'N	080°21.5'E	2563	4344	7/12/78
		011007	04°00.2'S	082°02.2'E	2606	4947	7/09/78
343821	10	001012	08°23.6'N	075°20.4'E	2026	2032	7/21/78
		002013	08°37.9'N	074°30.1'E	2553	2755	7/21/78
		003014	09°53.3'N	074°10.9'E	2470	2474	7/22/78
		004015	10°39.4'N	073°58.2'E	2216	2229	7/22/78
		005016	11°44.7'N	073°40.7'E	2067	2064	7/23/78
		006017	13°20.6'N	072°55.2'E	1870	1864	7/23/78
		007018	14°31.2'N	072°10.6'E	2067	2065	7/24/78
		009019	15°55.2'N	071°12.4'E	2473	2472	7/25/78
		010020	16°54.9'N	070°40.2'E	3027	3037	7/25/78

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343821 (Cont.)	10	011021	17°44.4'N	070°04.0'E	2648	2936	7/26/78
		012022	18°43.3'N	069°22.1'E	2843	3094	7/26/78
		013023	19°51.1'N	068°36.3'E	3071	3082	7/27/78
		014024	20°54.4'N	068°14.3'E	2589	2602	7/27/78
343827	11	001001	19°03.3'N	069°37.4'E	1364	1372	9/05/78
		002002	18°26.0'N	069°12.2'E	2519	3167	9/05/78
		003003	17°39.3'N	068°50.1'E	2514	3483	9/06/78
		004004	15°45.5'N	067°39.9'E	2[illegible]	3810	9/07/78
		005005	13°28.8'N	066°14.3'E	2[illegible]	4036	9/08/78
		006006	10°33.3'N	064°34.4'E	2533	4371	9/09/78
		007007	08°05.9'N	063°03.9'E	4384	4403	9/10/78
		008008	05°21.2'N	061°25.4'E	2618	3041	9/11/78
		009009	05°32.2'N	066°49.7'E	2501	3404	9/13/78
		010010	07°59.1'N	066°50.0'E	2503	4614	9/14/78
		011011	07°59.7'N	070°56.2'E	4122	4126	9/15/78
343827	12	012012	15°35.0'S	073°57.8'E	2514	4908	10/06/78
		013013	11°03.2'S	073°58.6'E	5083	5084	10/07/78
		014014	05°52.5'S	074°12.6'E	2509	4601	10/09/78
		015015	01°52.6'S	074°31.2'E	4850	4750	10/10/78
		016016	02°18.5'N	075°01.1'E	2341	2336	10/12/78
		017017	04°27.5'N	075°16.0'E	2389	2397	10/12/78
343828	15	001001	02°08.5'N	070°21.0'E	2523	4109	10/27/78
		002002	03°28.8'N	071°44.0'E	3965	3987	10/28/78
		003003	05°23.5'N	073°56.0'E	2509	2521	10/29/78
		004004	06°10.0'N	074°38.2'E	2745	2748	10/29/78

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343828 (Cont.)	15	005005	07°09.2'N	075°30.5'E	1754	1733	10/29/78
		006006	08°00.1'N	076°21.7'E	1183	1205	10/30/78
		007007	10°01.7'N	074°55.9'E	2197	2204	10/31/78
		008008	11°53.9'N	073°55.3'E	1957	1962	11/01/78
		009009	10°28.7'N	071°54.8'E	1865	1876	11/03/78
		010010	09°38.1'N	070°40.6'E	2528	4317	11/03/78
		011011	08°01.5'N	068°19.7'E	4643	4696	11/04/78
343828	13	012012	06°17.4'N	082°12.7'E	2539	4021	11/19/78
		013013	08°56.4'N	082°34.3'E	2510	3745	11/20/78
		014014	13°13.6'N	083°47.6'E	3294	3301	11/21/78
		015015	17°58.9'N	084°48.2'E	2339	2408	11/23/78
		016016	18°56.1'N	087°52.9'E	2239	2248	11/24/78
		017017	15°23.4'N	086°34.9'E	2501	2856	11/25/78
		018018	09°09.0'N	084°18.0'E	3658	3666	11/27/78
		019019	11°27.8'N	089°28.5'E	2501	3168	12/03/78
343901	14	104001	07°51.7'N	086°13.8'E	3745	3756	1/12/79
		105002	11°26.6'N	087°20.0'E	2519	3298	1/14/79
		107003	20°00.0'N	089°57.9'E	1308	1325	1/17/79
		100004	11°34.3'N	090°26.4'E	2523	3158	1/20/79
		111005	10°01.1'N	090°24.0'E	2515	3335	1/21/79
		113006	07°02.3'N	090°40.1'E	2520	2900	1/22/79
		114007	04°22.6'N	090°53.7'E	2429	2439	1/22/79
		116008	01°01.2'N	089°27.9'E	2492	3046	1/24/79
		117009	01°01.4'N	084°57.9'E	2515	4484	1/25/79
		118010	01°01.8'N	080°00.6'E	4607	4566	1/26/79

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343901	21	205011	04°57.8'N	087°58.0'E	3987	3989	2/10/79
		206012	02°59.4'N	087°51.2'E	2514	4216	2/11/79
		207013	01°00.3'N	087°48.2'E	NR	4411	2/11/79
		208014	01°00.3'S	087°48.7'E	NR	4641	2/12/79
		209015	03°01.2'S	087°43.5'E	2527	4792	2/13/79
		210016	04°59.7'S	087°46.5'E	NR	5060	2/14/79
		224017	03°31.4'S	082°38.2'E	3553	3550	2/17/79
		220018	04°36.8'S	077°07.1'E	4773	4773	2/19/79
		220019	00°44.2'N	077°01.9'E	4404	4285	2/21/79
343907	24	015003	12°29.2'S	062°29.4'E			4/06/79
		016004	12°29.3'S	064°06.4'E			4/07/79
		017005	12°29.9'S	065°03.0'E			4/07/79
		018006	12°29.1'S	065°53.9'E			4/08/79
		019007	12°27.9'S	066°45.0'E			4/08/79
		020008	12°28.8'S	067°33.2'E			4/09/79
		021009	12°29.2'S	067°58.5'E			4/09/79
		022010	12°28.6'S	068°59.0'E			4/09/79
		023011	12°33.2'S	070°18.5'E			4/10/79
		024012	12°28.1'S	071°31.3'E			4/10/79
		025013	12°29.3'S	071°59.9'E			4/11/79
		026014	12°29.4'S	072°46.4'E			4/11/79
		027015	12°34.2'S	074°01.6'E			4/12/79
		032016	12°34.4'S	075°33.8'E			4/12/79
		033017	12°29.6'S	076°56.9'E			4/13/79
		034018	12°28.5'S	078°29.8'E			4/14/79
		035019	12°31.5'S	080°01.0'E			4/14/79
		036020	12°33.3'S	081°31.6'E			4/15/79

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343907 (Cont.)	24	037021	12°31.0'S	082°54.7'E			4/15/79
		038022	12°28.0'S	084°15.6'E			4/16/79
		039023	12°29.2'S	085°15.4'E			4/16/79
		040024	12°29.9'S	086°27.7'E			4/17/79
		041025	12°29.7'S	087°23.3'E			4/17/79
		042026	12°29.2'S	087°59.0'E			4/18/79
		043027	11°31.0'S	087°59.9'E			4/18/79
		044028	10°19.7'S	088°18.7'E			4/18/79
		045029	09°59.3'S	088°18.0'E			4/19/79
		045030	10°33.6'S	088°09.5'E			4/19/79
		046031	08°28.1'S	088°19.5'E			4/20/79
		048032	07°04.9'S	088°37.8'E			4/20/79
		049033	05°41.1'S	088°31.7'E			4/21/79
		050034	04°37.8'S	088°36.5'E			4/21/79
		051035	03°54.7'S	088°25.7'E			4/22/79
343907	25	052036	03°02.9'S	088°28.0'E			4/22/79
		053037	02°51.0'S	088°29.9'E			4/22/79
		054038	02°36.2'S	088°47.1'E			4/22/79
		054039	02°22.4'S	088°39.9'E			4/22/79
		055040	01°11.0'S	088°37.2'E			4/23/79
		056041	00°10.0'N	088°55.9'E			4/24/79
		057042	01°00.0'N	088°31.3'E			4/24/79
343908	16	006001	01°58.9'N	080°45.3'E	2493	4486	5/08/79
		007002	00°08.6'N	081°40.5'E	2502	4587	5/09/79
		008003	00°57.9'S	081°50.0'E	2507	4697	5/09/79
		009004	01°58.7'S	081°25.6'E	2494	4804	5/10/79

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343908 (Cont.)	16	010005	03°00.7'S	081°24.0'E	2923	5025	5/10/79
		020006	07°15.2'S	072°32.6'E	1045	1548	5/28/79
		020007	07°19.7'S	072°33.0'E		1079	5/28/79
		020008	07°19.0'S	072°38.0'E	2279	2237	5/28/79
		020009	07°20.1'S	072°35.9'E	1974	2077	5/28/79
		020010	07°23.9'S	072°32.7'E	1392	1385	5/29/79
		020011	07°20.4'S	072°36.9'E	2198	2197	5/29/79
		020012	07°19.5'S	072°37.3'E	2283	2283	5/29/79
		020013	07°23.6'S	072°37.2'E	2291	2243	5/29/79
		020014	07°23.6'S	072°41.7'E	2870	2957	5/30/79
		020015	07°20.3'S	072°35.5'E	1774	1798	5/30/79
		020016	07°19.5'S	072°37.7'E	2299	2306	5/30/79
		020018	07°14.8'S	072°41.1'E	2324	2329	5/30/79
		020019	07°15.5'S	072°37.0'E	2140	2189	5/31/79
		020020	07°17.0'S	072°38.4'E	2335	2218	5/31/79
		020021	07°20.3'S	072°32.0'E	2216	2208	5/31/79
		020022	07°20.6'S	072°36.5'E	2182	2170	5/31/79
		020023	07°21.5'S	072°36.0'E	2107	2100	5/31/79
		020024	07°21.9'S	072°40.0'E	2260	2227	5/31/79
		020025	07°17.7'S	072°34.6'E	1863	1859	5/31/79
343916	29	101001	00°04.0'N	050°54.1'E	1500	5088	8/18/79
		102002	00°56.7'N	050°01.9'E	1500	5075	8/18/79
		103003	02°13.4'N	049°11.1'E	1504	4494	8/18/79
		104004	03°08.0'N	048°34.1'E	1510	3414	8/19/79
		105005	03°36.3'N	048°21.8'E	1500	3173	8/19/79
		106006	03°57.3'N	048°08.4'E	0854	0865	8/19/79

APPENDIX C. OCEANOGRAPHIC STATION LOCATIONS (Cont.)

OPERATION NO.	LEG NO.	SVSTD STATION NO.	POSITION LATITUDE	POSITION LONGITUDE	CORRECTED CAST DEPTH (m)	CORRECTED SONIC DEPTH (m)	DATE
343916	29	107007	04°14.6'N	048°33.1'E	1311	1382	8/20/79
(cont.)		108008	04°20.9'N	049°29.3'E	1510	2953	8/20/79
		109009	04°40.5'N	050°31.0'E	1510	4468	8/20/79
		110010	05°00.8'N	051°52.6'E	1514	5094	8/21/79
		111011	05°33.3'N	053°20.5'E	1510	5027	8/21/79
		112012	05°55.6'N	055°27.6'E	1500	4659	8/22/79
		113013	06°18.5'N	057°39.4'E	1506	4264	8/22/79
		114014	08°21.9'N	053°35.4'E	1500	5037	8/24/79
		115015	08°27.1'N	051°43.7'E	4497	4422	8/25/79
		116016	08°37.8'N	051°17.6'E	1502	3818	8/26/79
		117017	08°52.2'N	050°57.3'E	0948	0988	8/26/79
		118018	09°43.7'N	052°05.1'E	1506	3858	8/27/79
		119020	11°15.5'N	052°31.6'E	1505	2253	8/27/79
		120021	10°16.2'N	053°30.6'E	4176	4201	8/28/79
		121022	09°20.0'N	054°31.7'E	1502	4739	8/28/79
		122023	11°04.8'N	055°54.2'E	4204	4220	8/29/79
		123026	13°39.4'N	056°11.1'E	1512	3450	8/30/79
		124027	11°54.3'N	057°31.1'E	1507	3073	8/30/79
		125028	09°54.9'N	059°14.9'E	1528	4027	8/31/79
		126029	09°07.3'N	057°03.0'E	1505	3910	9/01/79
		127030	07°34.6'N	055°10.3'E	1501	5107	9/01/79
393916	30	201001	01°29.2'N	052°57.2'E	5109	5113	9/15/79
		202002	03°16.6'N	051°10.9'E	2507	5154	9/16/79
		203003	04°33.6'N	049°32.2'E	2501	3125	9/17/79
		204004	05°38.0'N	050°29.1'E	2492	4764	9/17/79
		205005	03°51.4'N	052°20.0'E	5099	5107	9/18/79
		206006	02°42.5'N	054°14.0'E	2463	5044	9/19/79