part of the rise. Here the sediments are mainly pelagic clay with Middle to Late Miocene basal ages, overlain by marly foraminiferal ooze, as found in cores 20 and 21 on traverse B–B′ and in core 26 on traverse C–C′. Except for core 25, the rest of the cores on the continental rise are Early Pliocene to Quaternary in basal ages and consist of mud and sand. We can conclude from their distribution that these clastics are probably distributed by the bottom current from the Weddell Sea. Only cores 25 and 37 contain a significant amount of diatoms. Core 37 contains abundant manganese-coated pebbles of glacial origin. The lithology of core 25 is unusual for a core so close to the continent. Although it is close to core 24, the only resemblance is in the top part, which consists of marly foraminiferal ooze. Underlying this ooze is a sequence of oozes rich in diatoms and nannofossils. The basal age of this core is Middle Miocene.

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Sediment ages of ARA *Islas Orcadas* cruise 15 piston cores

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ARA *Islas Orcadas* cruise 15 was the fourth of five multidisciplinary (marine geology, geophysics, and physical oceanography) cruises made by this vessel to the South Atlantic sector of the Southern Ocean. We present here the results of our attempts to obtain the basal sediment ages of the 58 piston cores recovered on this cruise (see accompanying figure).

Islas Orcadas coring activities were concentrated in the region of the Weddell Sea and Scotia Sea. One of the primary coring objectives on this cruise was to obtain a broad distribution of cores in the region for paleooceanographic studies. It was hoped that studies of these cores would provide valuable information on the history of sea ice fluctuations and antarctic bottom water formation in the Weddell Sea area.

Another major coring objective was to recover a large number of cores in close proximity to the Antarctic continental margin (inset of figure). Dr. Anderson (Rice University), chief geologist on this cruise, and others are also interested in studying the sedimentology of these cores to further elucidate the nature of glacial marine sedimentary processes and their relationship to the climatic and glacial conditions of Antarctica. An additional objective was to obtain early to mid-Tertiary cores from this high-latitude region that may yield data on the Tertiary growth of the Antarctic Ice Sheet.

Of the 58 successful piston coring attempts, 51 recovered sediment that at least partially filled the core liner with undisturbed sediment. Initially, samples for micropaleontological analyses, were taken within 10 centimeters of most cores. Piston cores with disturbed basal sedimentary sequences were sampled not at the base of the core but immediately above (within a few centimeters of) the disturbed sequence.

Micropaleontological analyses of the initial samples from these 51 cores revealed that 32 were either barren of microfossils or contained a microfossil assemblage insufficient for reliable age determination. An average of 4 additional samples were taken from these 32 cores for micropaleontological study. Because of the largely nonbiogenic nature of most core sediments, the additional samples were not taken from fixed intervals in the cores but were instead taken from positions in the cores where the sediment lithology appeared most favorable for the preservation of microfossils. Unfortunately, analyses of the additional 110 samples taken from these 32 cores yielded reliable age information on only 8 additional cores.

Sediment recovery in 6 piston cores was limited to either a few centimeters of disturbed sediment in the bottom of the core liner or to the piston core cutter and/or catcher (or both). Cores IO–1578-21, 54, and 54A recovered sediments in the core liner and core cutter and/or catcher. These samples are stored in bags, with the liner sediments being stored separately from the

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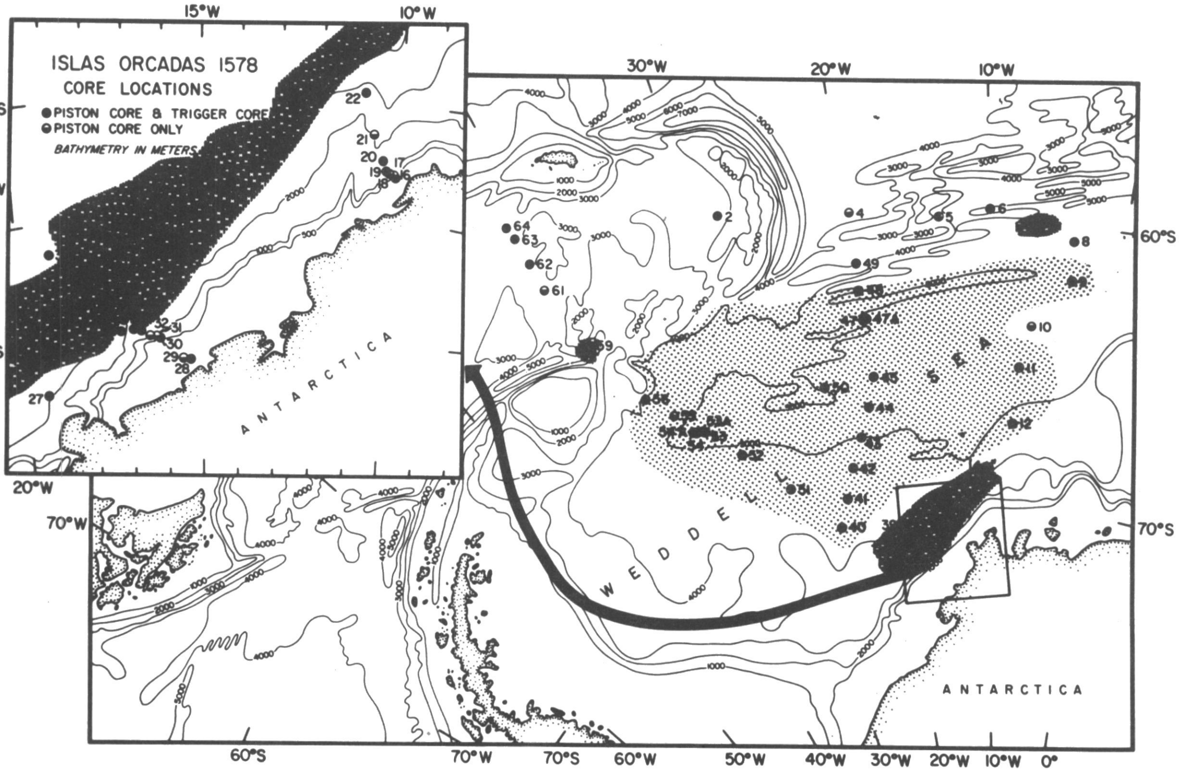

Locations of ARA *Islas Orcadas* cruise 1578 piston and trigger cores. Samples examined from piston cores in shaded area all barren or contained insufficient microfossils for age determination. Bathymetry after American Geographical Society Antarctic Map Folio Series, folio 16, plate 1, and Pergamon Press World Map Series, sheets 222 and 230 (inset).

core cutter and catcher samples. Only the core cutter and/or catcher sediments of these three cores were sampled for age-dating purposes. Bag sample sediments from the core liners of cores IO–1578-51 and 53A and from the core catcher of core IO–1578-53 were also sampled for study. These samples represent the only sediment recovered from these cores. Core IO–1578-17 recovered 185 centimeters of sediment that is stored in bags; however, only the core cutter and catcher of this core was sampled for analysis.

The primary purpose of presenting these sediment ages is to aid other investigators in selecting piston cores suitable for their own particular research interests. All piston core ages are based on the microfossil assemblage present in only one or two samples. Piston core age determinations usually were based upon the presence of just a few age-diagnostic microfossil species. In addition, microfossils were generally rare and very poorly preserved. A considerable number of allochthonous microfossils also were present and made accurate age determinations difficult. For these reasons, individuals whose research requires precise age determinations may wish to obtain additional confirmation of the age dates provided here. Investigators seeking basal sediment ages for piston cores from *Islas Orcadas* cruises 7, 11, and 12 are referred to Ciesielski and Wise (1977), Ciesielski, Kharoeddin, and Cassidy (1978), and DeFelice (1978), respectively.

In the laboratory, two smear slide preparations were examined from each sample for their calcareous nannofossil, diatom, and silicoflagellate content. Two cores, IO–1578-24 and 59, contained only calcareous nannofossils and were age-dated utilizing the calcareous nannofossil zonation of Wise and Wind (1977). All other cores were age-dated using the high-latitude silicoflagellate zonation of Ciesielski (1975) and the diatom zonation of McCollum (1975). Weaver's (1976) modifications of the Early Pliocene portion of McCollum's (1975) zonation were employed.

The results of the micropaleontological analysis of *Islas Orcadas* cruise 15 piston core sediments are presented in the table. Sediment ages are given for 27 of 58 piston cores recovered on cruise 15, and basal sediment ages are assigned to 21 of these 27 cores. Six other cores (marked in the table by a single asterisk) had barren basal sediments but contained sufficient microfossils in other samples taken up-core to make an age assignment.

Samples examined from more than half of the cruise 15 cores (31 of 58 cores) were either barren or contained insufficient microfossils to make an age determination. Of these samples, 15 contained some microfossils but could not be reliably age-dated for one or more of the following reasons: (a) microfossils were not age diagnostic, (b) diagnostic microfossils were too rare to assure that they were autochthonous and not allochthonous, and (c) guide fossils from a number of biostratigraphic zones were present in nearly equal numbers, thereby making it difficult to identify the autochthonous microfossil component from the allochthonous component. These piston cores are identified in the age column of the table by the abbreviation NADP ("no age date possible"). The only sample intervals listed in the table for

Core Number	Latitude (S)	Longitude (W)	Core Length (cm)	Water Depth (m)	Sample Interval (cm)	Sediment Lithology	Age
18*	49 43.4'	47 17.3'	174	2345	166-174 (Bag Sample)	diatomaceous mud	Early Pliocene
19*	50 11.1'	46 53.0'	447	2725	316-317;C/C	diatomaceous ooze	Late Oligocene
20*	50 17.0'	46 40.1'	143	2498	142-143	siliceous mud	Eocene to Early Oligocene
21	50 21.2'	46 31.9'	533	2262	C/C	diatomaceous-nanno ooze	Middle to Late Miocene
22*	50 31.1'	46 43.6'	563	2420	446-447;C/C	diatomaceous ooze	Early Pliocene
23*	50 42.0'	47 03.3'	89	2520	88-89	sand; highly disturbed	Quaternary
24*	50 45.1'	47 14.2'	20	2505	19-20	muddy, foraminiferal ooze	Quaternary
25	50 52.6'	47 26.5'	535	2573	C/C	diatomaceous ooze	Middle to Late Miocene
26	51 18.6'	46 59.2'	284	2703	C/C	muddy, diatomaceous ooze	Late Miocene
27*	51 22.4'	45 43.8'	378	2264	377-378 (Bag Sample)	zeolitic clay	No Determination
28*	51 14.2'	45 43.4'	205	2557	196-205 (Bag Sample)	glauconitic sand	Late Oligocene
29*	51 00.3'	45 41.9'	50	2182	49-50 (Bag Sample)	zeolitic clay	No Determination
30*	50 56.6'	45 41.6'	373	2012	372-373 (Bag Sample)	diatomaceous-nanno ooze	Middle to Late Miocene
31*	49 53.7'	46 00.6'	570	3091	460-461;C/C	muddy, diatomaceous ooze	Late Pliocene
32*	50 08.4'	46 00.1'	106	2771	84-85;C/C	nanno ooze	Oligocene
33*	50 13.9'	45 59.9'	519	2465	306-307; C/C	diatomaceous, nanno ooze	Middle to Late Miocene
34*	50 09.9'	45 54.0'	280	2769	C/C	diatomaceous-nanno ooze	Middle to Late Miocene
35*	50 15.0'	45 22.5'	315	2429	C/C	radiolarian, calcareous ooze	Late Paleocene
36*	50 13.4'	45 25.8'	491	2622	C/C	zeolitic clay	No Determination
37*	50 21.8'	44 32.6'	415	1580	51-52;C/C	nanno ooze	Late Paleocene
38*	50 18.1'	44 18.3'	309	1595	228-229;C/C	foraminiferal, nanno ooze	Late Paleocene
39*	50 10.6'	43 44.8'	500	1840	210-211;C/C	nanno ooze	Late Paleocene
40***	50 12.8'	43 44.0'	NR	1820		no recovery	No Recovery
41*	50 14.6'	43 35.8'	213	1655	33-34;C/C	foraminiferal, nanno ooze	Late Paleocene
42***	50 00.2'	43 00.9'	NR	1847		no recovery	No Recovery
43*	49 57.3'	42 43.6'	188	1706	C/C	diatomaceous, nanno ooze	Late Eocene
44*	49 58.7'	42 38.4'	257	1677	46-47;C/C	diatomaceous-nanno ooze	Middle to Late Eocene
45*	50 02.5'	42 38.3'	74	1624	73-74	diatomaceous, nanno ooze	Late Eocene
46*	50 00.2'	42 10.7'	27	1693	26-27 (Bag Sample)	nanno ooze	Middle Eocene
47*	49 59.4'	41 47.0'	270	1529	72-73;C/C	nanno-diatomaceous ooze	Late Oligocene
48*	49 58.3'	41 44.8'	532	1598	51-52;C/C	diatomaceous-nanno ooze	Late Oligocene
49*	49 47.5'	41 41.4'	99	1708	36-37;C/C	nanno ooze	Late Paleocene
50*	49 43.2'	41 43.0'	26	1726	C/C	muddy, diatomaceous ooze	Middle to Late Miocene
51*	49 43.0'	41 36.2'	27	1792	C/C	sandy gravel	Quaternary
52	50 37.4'	39 43.0'	1779	3936	C/C	diatomaceous ooze	Quaternary
55*	51 45.4'	34 01.5'	280	2533	C/C	diatomaceous ooze	Early Pliocene
56*	51 50.2'	33 54.4'	778	2374	C/C	diatomaceous ooze	Early Pliocene
57*	51 53.2'	33 48.4'	285	2185	C/C	diatomaceous ooze	Quaternary
63	54 52.4'	25 00.3'	837	4389	C/C	diatomaceous ooze	Quaternary
64	54 00.5'	24 11.7'	684	4515	668-684 (Bag Sample)	diatomaceous ooze	Quaternary
65	53 05.1'	22 57.3'	1103	4331	C/C	diatomaceous ooze	Quaternary
66	51 59.6'	21 42.1'	1091	4422	C/C	diatomaceous ooze	Quaternary
67	51 26.4'	22 53.4'	155	4588	C/C	diatomaceous ooze	Early Pliocene
68	51 04.3'	20 38.8'	1746	4422	C/C	diatomaceous ooze	Quaternary
70	49 59.8'	19 25.5'	1113	4214	C/C	diatomaceous ooze	Quaternary
72	49 01.5'	18 23.1'	BAG	4042	C/C	Mn crust	No Determination
73	48 24.6'	17 55.1'	1032	3877	C/C	diatomaceous ooze	Quaternary
76	47 10.1'	16 17.6'	1150	3312	C/C	diatomaceous ooze	Quaternary
80	47 57.0'	13 01.4'	1168	3102	C/C	diatomaceous ooze	Quaternary
81	48 59.9'	13 20.2'	1021	3464	C/C	diatomaceous ooze	Quaternary
83	50 56.8'	14 03.4'	1721	3742	C/C	diatomaceous ooze	Quaternary
84	51 57.5'	14 25.2'	1053	3952	C/C	diatomaceous ooze	Quaternary
87	55 11.9'	15 50.6'	1761	3738	C/C	diatomaceous ooze	Quaternary
89	57 03.6'	18 32.4'	1715	4285	C/C	diatomaceous ooze	Quaternary
90	57 30.8'	17 22.7'	1735	4545	C/C	muddy, diatomaceous ooze	Early Pliocene
91	58 09.9'	17 48.5'	1747	3954	1746-1747	muddy, diatomaceous ooze	Quaternary
95***	60 53.8'	21 04.4'	NR	4005		no recovery	No Recovery
96	60 27.9'	21 37.1'	854	4177	C/C	volcanic ash	Quaternary
98	59 50.3'	23 25.9'	1159	4631	C/C	diatomaceous ooze	Quaternary
103*	51 30.5'	25 11.9'	1036	3028	486-487;C/C	diatomaceous ooze	Early Pliocene
104*	51 29.5'	25 27.7'	663	2999	79-80;C/C	nanno ooze	Early Oligocene
105*	51 31.2'	25 30.4'	220	3122	219-220;C/C	diatomaceous ooze	Early Pliocene
106*	51 31.3'	25 28.0'	47	3091	46-47	sandy, siliceous ooze	Quaternary
107*	51 31.3'	25 25.9'	401	2986	C/C	diatomaceous ooze	Early Pliocene
108*	51 31.6'	25 43.5'	442	2772	C/C	diatomaceous ooze	Early Pliocene
109*	50 46.3'	26 04.1'	1083	2999	265-266;C/C	nanno, diatomaceous ooze	Middle to Late Miocene
111	48 59.9'	26 57.6'	1797	4331	C/C	muddy, diatomaceous ooze	Quaternary
112	48 09.3'	27 58.7'	1779	4374	C/C	muddy, diatomaceous ooze	Quaternary
114	46 40.9'	30 07.4'	1790	4717	1789-1790	diatomaceous mud	Quaternary
115	46 00.6'	31 05.8'	1815	5047	C/C	diatomaceous mud	Quaternary
116	44 59.9'	32 06.5'	1807	5044	C/C	diatomaceous mud	Quaternary
117	44 01.2'	33 05.3'	1797	5201	C/C	diatomaceous mud	Quaternary
120**	38 10.0'	46 03.6'	144	5024	143-144 (Bag Sample)	pelagic clay	Quaternary

*Cores open at the time of this report.

**Returned to Argentina.

**Not shown on core location map.

***Islas Orcadas* cruise 16 piston and trigger core locations.**

these cores are those that did contain microfossils.

Smear slides examined from 16 other cores were found to be completely barren of microfossils. The two sample intervals given in the table for those found to be barren represent the lower and uppermost sample intervals examined for microfossils. Only one smear slide sample was examined from those barren cores with only one listed sample interval.

The ages of the cruise 15 cores range from Late Eocene to Quaternary; sediments from 14 cores are Pliocene or older. The age distribution of these cores (by epoch) is as follows: 13 Quaternary, 3 Pliocene, 9 Miocene, 1 Oligocene, and 1 Eocene-Oligocene.

All 32 piston cores described as barren or as containing too few microfossils for a reliable age designation are located on the Weddell Sea abyssal plain or are on or near the Antarctic continental rise or slope (figure). Twenty-one of the piston cores that could not be age-dated are located on the Weddell Sea abyssal plain (shaded area of figure). The poor preservation of microfossils or the barren nature of the samples examined from this area is partially attributed to the mechanical breakage and chemical dissolution of microfossils by high-velocity antarctic bottom water. The presence of ephemeral pack ice throughout this region has also inhibited primary productivity and resulted in a much-reduced supply of skeletal debris to the sea floor. Sediments in this region are primarily pelagic clays and muds.

The largest occurrence of cruise 15 pre-Pliocene cores is located on the continental slope or on or near the continental rise of the Princess Martha Coast (inset of figure). These cores represent nine of the eleven pre-Pliocene cores recovered on this cruise. Strong contour currents along the continental rise and lower continental slope may be responsible for the apparent low rates of sediment deposition and/or the erosion of Quaternary to Miocene sediments in this region.

Most of the sediments examined in this study were pelagic clays, muds, gravels, and sands. Detailed lithologic descriptions of all cruise 15 piston cores are in preparation (staff of Antarctic Marine Geology Research Facility).

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Basal sediment ages of ARA *Islas Orcadas* cruise 16 piston cores

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ARA *Islas Orcadas* cruise 16 was the last of five United States-sponsored, multidisciplinary cruises to conduct an extensive coring program in the South Atlantic sector of

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