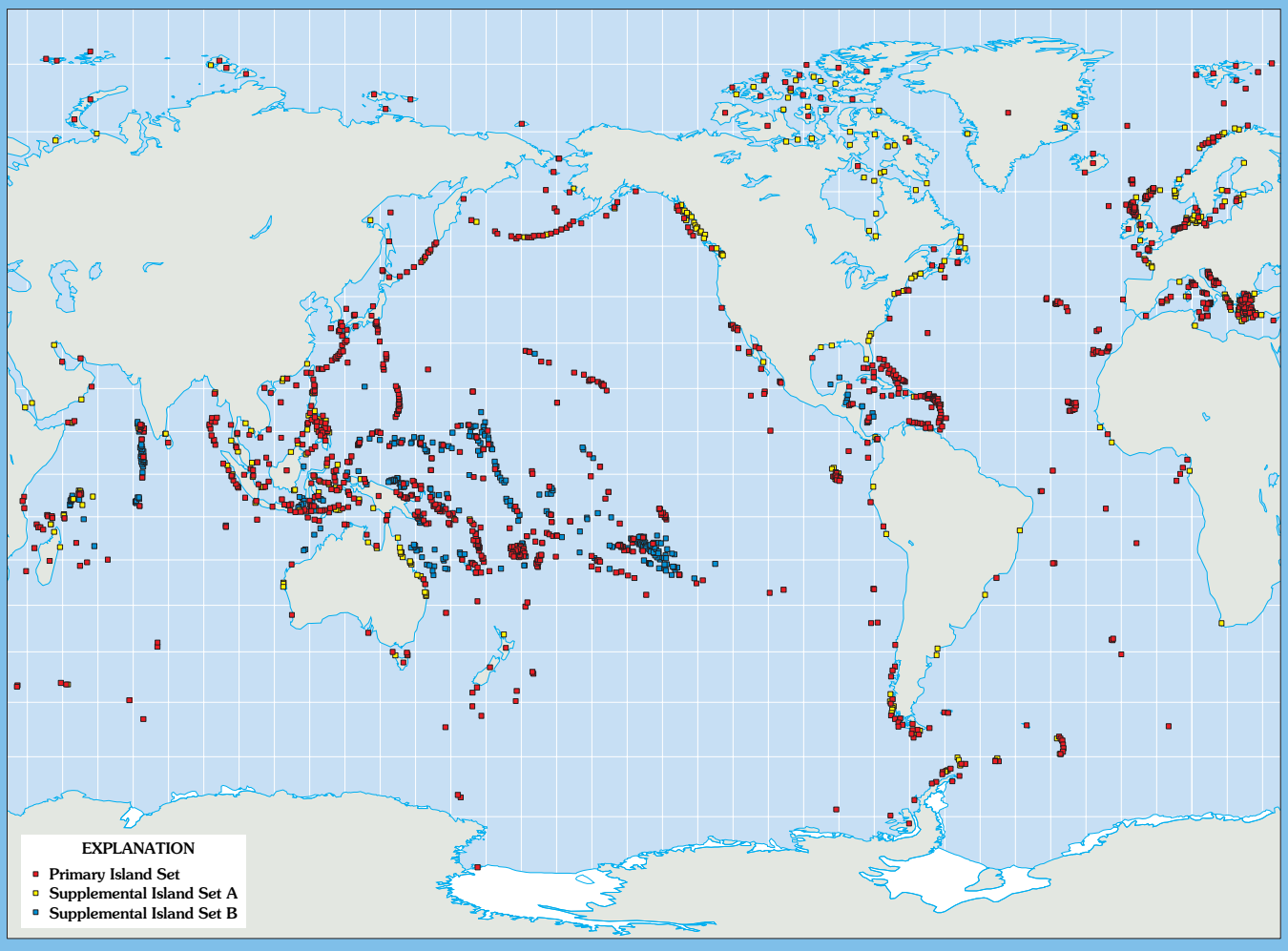
USGS
science for a changing world

Habitat and Environment of Islands—Primary and Supplemental Island Sets

Professional Paper 1590



U.S. Department of the Interior
U.S. Geological Survey

HABITAT AND ENVIRONMENT OF ISLANDS
Primary and Supplemental Island Sets

By N.C. Matalas and Bernardo F. Grossling

U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1590

U.S. Department of the Interior

GALE A. NORTON, Secretary

U.S. GEOLOGICAL SURVEY

Charles G. Groat, Director

Reston, Virginia 2002

Library of Congress Cataloging-in-Publication Data

Matalas, Nicholas C., 1930–
Habitat and environment of islands : primary and supplemental island sets / by N.C. Matalas and Bernardo F. Grossling.
p. cm. — (U.S. Geological Survey professional paper ; 1590)
Includes bibliographical references (p.).
ISBN 0-607-99508-4
1. Island ecology. 2. Habitat (Ecology) I. Grossling, Bernardo F., 1918– II. Title. III. Series.

QH541.5.I8 M27 2002
577.5'2—dc21

2002035440

For sale by the U.S. Geological Survey Information Services
Box 25286, Federal Center,
Denver, CO 80225

PREFACE

The original intent of the study was to develop a first-order synopsis of island hydrology with an integrated geologic basis on a global scale. As the study progressed, the aim was broadened to provide a framework for subsequent assessments on large regional or global scales of island resources and impacts on those resources that are derived from global changes.

Fundamental to the study was the development of a comprehensive framework — a wide range of parameters that describe a set of "saltwater" islands sufficiently large to

- Characterize the spatial distribution of the world's islands;
- Account for all major archipelagos;
- Account for almost all oceanically isolated islands, and
- Account collectively for a very large proportion of the total area of the world's islands whereby additional islands would only marginally contribute to the representativeness and accountability of the island set.

The comprehensive framework, which is referred to as the "Primary Island Set," is built on 122 parameters that describe 1,000 islands. To complement the investigations based on the Primary Island Set, two supplemental island sets, Set A – Other Islands (not in the Primary Island Set) and Set B – Lagoonal Atolls, are included in the study.

The Primary Island Set, together with the Supplemental Island Sets A and B, provides a framework that can be used in various scientific disciplines for their island-based studies on broad regional or global scales.

The study uses an informal, coherent, geophysical organization of the islands that belong to the three island sets. The organization is in the form of a global island chain, which is a particular sequential ordering of the islands referred to as the "Alisida."

The Alisida was developed through a trial-and-error procedure by seeking to strike a balance between "minimizing the length of the global chain" and "maximizing the chain's geophysical coherence." The fact that an objective function cannot be minimized and maximized simultaneously indicates that the Alisida is not unique. Global island chains other than the Alisida may better serve disciplines other than those of hydrology and geology.

CONTENTS

FIGURES

PLATES (in back pocket)

BOOKLET (in back pocket)

TABLES

CONVERSION FACTORS

Multiply	by	to obtain
meter (m)	3.2808	foot
kilometer (km)	0.6214	mile
square meter (m^2)	10.76	square feet
square meter (m^2)	0.0002471	acre
square kilometer (km^2)	0.3861	square mile
degree Celcius (°C)	°F=1.8 temp °C + 32	degree Fahrenheit (°F)

CONTENTS of COMPANION COMPACT DISC

FIGURES

TABLES

ACKNOWLEDGMENTS

For many of the islands in the study, the literature was of little help for obtaining information about certain characteristics of the islands. This was particularly so in relation to hydrologic and geometric characteristics. Much of the short-fall of the hydrologic literature was overcome through contacts with technical personnel who had first-hand hydrologic knowledge about the islands. Establishment of the contacts was undertaken with the encouragement and support of the British Geological Survey, Wallingford, United Kingdom.

The following individuals helped provide the hydrologic characterizations of the islands as formulated in the study:

JOHN S. BADER, U.S. Geological Survey, Menlo Park, California

MAX BERAN, Institute of Hydrology, Wallingford, United Kingdom

S.K. BOOTH, Office of Mineral Development, Suva, Fiji

BENEDITO P.F. BRAGA, University of Sao Paulo, Sao Paulo, Brazil

J.T. CALLAHAN, U.S. Geological Survey (retired), Glendale, Arizona

WILLIAM J. CAMPBELL, U.S. Geological Survey (deceased), Tacoma, Washington

JESUS CARRERA, Universitat Politecnica de Catalunya, Barcelona, Spain

FI-JOHN CHANG, National University of Taiwan, Taiwan

C.S. CHENEY, Geology, Mines and Rural Water Supply, Port Vila, Vanuatu

C-L CHIU, University of Pittsburgh, Pittsburgh, Pennsylvania

K.C. ANDER CHOW, Atria Engineering Hydraulics, Inc., Mississauga, Ontario, Canada

EMILIO CUSTODIO, Universitat Politecnica de Catalunya, Barcelona, Spain

TRIGO D'ABREU, Instituto de Estudos Para o Desenvoirimento, Lisboa, Portugal

ELIAS DAVIDSEN, E.D. Verkfrodi, Torshavn, Faroe Islands

DAN DAVIS, U.S. Geological Survey (deceased), Honolulu, Hawaii

JAOQUIM DELGADO, Sao Vincente, Cape Verde

PEDRO L. DIAZ, U.S. Geological Survey, San Juan, Puerto Rico

THORLEIFUR EINARSSON, University of Iceland, Reykjavik, Iceland

TONY FALKLAND, Minister for Housing and Urban Services, Australian Capital Territory, Canberra, Australia

JEAN-CHARLES FONTES, Universite Paris-Sud, Orsay-Cedex, France

DEO YIN FOO, Northern Territory Power and Water Authority, Darwin, Australia

PHILIPPE FREY, Parc de la Providence, Reunion Island, France

IAN N. GALE, British Geological Survey, Wallingford, United Kingdom

ROBERT W. GATLIFF, Ministry of Lands, Survey and Natural Resources, Nukualofa, Tonga

E.V. GIUSTI, Compagnia Generale Ripreseaeree, Parma, Italy

GYLFI MAR GUDBERGSSON, University of Iceland, Reykjavik, Iceland

NILGUN HARMANCIOGLU, Dokuz Eylul University, Izmir, Turkey

LINDA HARRIS, U.S. Geological Survey, Anchorage, Alaska

MICHAEL HAWKINS, Ministry of Natural Resources, Geology Division, Honiara, Solomon Islands

JESSE N. JASPER, Environment Canada, Inland Waters, Yellowknife, Northwest Territories, Canada

J. JOHANSSON, Swedish Natural Science Research Council, Stockholm, Sweden

PAUL JOHNSON, Imperial College, London, United Kingdom

CLAUS KERN-HANSEN, Greenland Technical Survey, Hydro-Technical Division, Copenhagen, Denmark

JAN-TAI KUO, National Taiwan University, Taipei, Taiwan

SADI LAPORTE, Instituto Costarricense de Electricidad, San Jose, Costa Rica

ANDREW LIVINGSTON, Tasmanian Hydro Electric Commission, Hobart, Australia

THOMAS MADDOCK III, University of Arizona, Tucson, Arizona

NICHOLAS MARGARIS, University of the Aegean, Athens, Greece

TERRY MARSH, Institute of Hydrology, Wallingford, United Kingdom

JOHN MCALPINE, Commonwealth Scientific and Industrial Research Organization, St. Lucia, Australia

M.P. MOSLEY, Department of Scientific and Industrial Research, Wellington, New Zealand

HREGGVIDUR NORDDAHL, University of Iceland, Reykjavik, Iceland

TERRENCE O'DONNELL, Journal of the International Association of Hydrologic Sciences, Editor, Wallingford, United Kingdom

A.R. PERKS, Environment Canada, Quebec, Canada

ERIC PLATTE, University of Karlsruhe, Karlsruhe, Germany

A.R. RAO, Purdue University, West Lafayette, Indiana

K.S. RAO, Indian Institute of Science, Bangalore, India

HUGH RIDDLE, Metropolitan Washington Airport Authority (deceased), Alexandria, Virginia

N.S. ROBINS, British Geological Survey, Wallingford, United Kingdom

ROBERT ROWLAND, U.S. Geological Survey (retired), Reston, Virginia

ZHENG RUGANG, Ministry of Water Resource, Beijing, People's Republic of China

MAMDOUH SHAHIN, International Institute for Hydraulic and Environmental Engineering (retired), Delft, The Netherlands

SABINE SEIERT, University of Karlsruhe, Karlsruhe, Germany

I.A. SHIKLOMANOV, State Hydrological Institute, Leningrad, Russia

ENG BAN SHUY, Nanyang Technological University, Singapore

COSTAS SOPHOULIS, University of the Aegean, Athens, Greece

BRUCE STEWART, Bureau of Meteorology, Melbourne, Australia

KUNIYOSHI TAKEUCHI, Yamanashi University, Kofu, Japan

TOM TAYLOR, U.S. Geological Survey, Anchorage, Alaska

M.R.A. THOMSON, British Antarctic Survey, Cambridge, United Kingdom

ARTURO E. TORRES, U.S. Geological Survey, San Juan, Puerto Rico

BRANKO VUJASINOVIC, Zagreb, Croatia

RICHARD S. WILLIAMS, U.S. Geological Survey, Reston, Virginia

BJORN WOLD, Norwegian Water Resources and Energy Administration, Oslo, Norway

Several members of the U.S. Geological Survey provided research assistance and contributed to the production of this report. CASSIE PUFNOCK, Reston, Virginia, assisted in the extensive and detailed library research and in the development and maintance of the computerized data files. PATRICIA J. SHADE and PATRICIA S. FUJII, Honolulu, Hawaii, handled all matters that related to the digitization of the mapped coastlines for 268 islands. JANE RUSSELL, Reston, Virginia, provided technical guidance on developing the graphics. The production of the world maps that depict the global distributions of island characteristics is due to the efforts of THOMAS L. JOHNSON and GREG BAIER.

To all those named above, we express our deep appreciation. Any errors of omission or commission are, of course, those of the authors.

Habitat and Environment of Islands: Primary and Supplemental Island Sets

by N.C. Matalas and Bernardo F. Grossling

OVERVIEW

Islands have long been an object of scientific interest. Notably Charles Darwin, while on the round-the-world voyage of the Beagle (1831–1836), developed his ideas on biological evolution following his speculations on the isolation of various species on the Galapagos Islands in the Pacific Ocean and on the biophysical evolution of coral atolls upon visiting the island of Cocos-Keeling in the Indian Ocean. In the succeeding years, a large body of literature on islands has developed, primarily within the disciplines of geology and biology. The summary account by MacArthur and Wilson (1967) remains an excellent introduction to biogeographic theory of islands. Menard (1986) provided a summary account of the geologic evolution and demise of islands, particularly oceanic islands and islands in island arcs. Nunn (1994) placed island studies within the context of current interest in global change. Island-based studies can provide a framework approximating natural, controlled scientific experiments — the isolation of various properties of islands to study the effects on those properties through the relations of other properties, endogenous or exogenous, to the islands — a process referred to in engineering as "defining a free-body cut."

To develop an island framework useful for interdisciplinary island-based studies, a general synthesis along multidisciplinary lines of the world's "saltwater" islands was undertaken on the basis of a Primary Island Set of 1,000 specific islands characterized by 122 parameters. The suitability of the synthesis is enhanced by including information on islands that belong to two Supplemental Island Sets — A, which consists of 386 islands characterized by 14 parameters, and B, of 368 islands characterized by 17 parameters. A detailed description of the parameters, their coverages of the islands, and the values of the parameters structured for various disciplines follows.

The sample space for selecting islands to form the Primary Island Set was bound as follows:

- Excluded from the sample space were islands within freshwater bodies, lakes, and rivers, and (or) on continents or on islands, as well as islands that are parts of the deltas of rivers that discharge to the sea;
- Grønland (Greenland), which is generally considered to be the world's largest island, was preselected, thereby fixing the upper bound on the areal size of any island;
- No limit was imposed on the lower bound of the areal size of an island;
- Dry-lagoon atolls, particularly raised atolls, and islets of atolls, but not atolls per se, were considered to be within the sample space;
- In the case of two islands separated by a "narrow" and "shallow" channel, if one island was selected, then the other also was selected — this conditional selection avoided the establishment of accurate criteria on the width and depth of channels for judging whether two islands were considered to be effectively one, information that in some cases would be difficult to obtain;
- Along continental margins, islands that mark the outer oceanic extent of archipelagos were considered, but allowing for the selection of an exceptionally large "interior" island whose area makes up a large proportion of the total area of the archipelago, and

- On the basis of prior information, certain islands were, in effect, preselected because of their scientific, social, or historical significance.

Given the sample space, no rigorous criteria were imposed upon the selection of islands. However, for an island to be a member of the Primary Island Set, values of its area and the elevation of its highest peak had to be ascertained. The islands that make up the Primary Island Set were selected in a systematic manner to assure that the following conditions were met:

- Almost all geographically recognized archipelagos were well represented;
- The total areas of the selected islands were large proportions of the total areas of the archipelagos themselves;
- Almost all isolated islands, regardless of their areal size, were included in the Primary Island Set;
- The "linear" extent of the emerged portions of oceanic mountain chains were well delineated, and
- In the aggregate, the selected islands provided, albeit subjectively assessed, a high degree of representativeness relative to the geographic distribution, and hence the climatic setting, of the world's saltwater islands.

In the process of developing the Primary Island Set, more than 1,000 islands were taken into consideration. The Primary Island Set was refined several times; that is, on several occasions, various islands were extracted and replaced by other islands to satisfy the above conditions "better." The islands that were extracted, as well as other islands that were considered, but never included in a tentative makeup of the Primary Island Set, form the Supplemental Island Set A, which consists of 386 islands.

To provide a representative geographic coverage of the world's atolls and to allow for discussion at the individual island level, a few atoll islets were included in the Primary Island Set. A more detailed geographic coverage of the world's atolls is provided by the 368 lagoonal atolls that form the Supplemental Island Set B.

In a sense, the three island sets are not mutually exclusive — some atoll islets in the Primary Island Set and in the Supplemental Island Set A correspond to atolls in the Supplemental Island Set B. The redundancy is transparent by means of certain parameters that identify the islands and mark their geographic locations, and, therefore the redundancy can be readily eliminated by extracting the particular islands from their respective sets, thereby slightly reducing the size of the sets; that is, the number of islands forming the sets.

The parameters that belong to the three island sets may be grouped into eight categories. For the primary islands, their parameters are distributed over each of the islands, whereas for the Supplemental Island Sets A and B islands, their parameters are distributed over five of the eight categories; the three empty categories are the same for the two sets (table 1).

The parameters assume either alpha or numeric values that were obtained by one or more of the following basic means:

- L — Review of scientific publications, government reports and maps, atlases, and geographic gazetteers;
- N_1 — Use of definitions and concepts developed in the study;
- N_2 — Use of established formulas, algorithms, and logical operations, and
- N_3 — Personal communication with colleagues who have first-hand pertinent knowledge of specific islands.

For some islands, values of the parameters could not be given for various reasons. If for a particular island, the alphanumeric value that relates to a specific parameter could not be ascertained, then one of four symbols is used to indicate the reason why a specific alphanumeric value is not given. The four symbols and their interpretations are as follows:

- † — A specific value for the parameter is not applicable;
- * — The parameter value could not be determined owing to limited resources of the study;
- ‡ — Search for the parameter value was unsuccessful, and
- # — Information sources were not adequate to ascertain further detail as to the parameter value.

At most, the island coverage by a parameter is 1,000 islands relative to the Primary Island Set, 386 relative to the Supplemental Island Set A, and 368 relative

Table 1. Distribution of parameters, by category

[f, frequency; cf, cumulative frequency]

Count	Category	Number of parameters					
		Primary Island Set		Supplemental Island Set A		Supplemental Island Set B	
		f	cf	f	cf	f	cf
1	Identification	2	2	2	2	2	2
2	Historical	8	10	0	2	0	2
3	Geographic	22	32	5	7	6	8
4	Physiographic	19	51	2	9	5	13
5	Geologic	15	66	2	11	1	14
6	Hydrologic	9	75	0	11	0	14
7	Economic	30	105	1	12	1	15
8	Environmental	17	122	0	12	0	15

to the Supplemental Island Set B. In those cases where specific alphanumeric values could not be ascertained for particular parameters, the island coverages by those parameters are accordingly limited.

Descriptions of the parameters and their island coverages are accompanied by maps that show the global distribution of the alphanumeric values for various parameters. Each map is based on a Gall's Stereographic Cylindrical projection at an approximate scale of 1:175,000,000 and is structured such that the map is centered on the Pacific Ocean wherein the largest share of the world's islands is concentrated. In these maps, longitude "begins" (left side of map) at 35° and "ends" (right side of map) at 35°. To show the full extent of the Earth's dry-land surface, each map extends from latitude -87° (south) to latitude 87° (north).

Alphanumeric values of the parameters are viewed, so to speak, through 13 "windows" on the Primary Island Set — each window being a datafile that provides a distinct description of the islands conditioned by a specific subset of the parameters. Because the islands in the Supplemental Island Sets A and B are described by fewer parameters, the alphanumeric values of their parameters are "viewed" through only two windows, one for each of the Supplemental Island Sets.

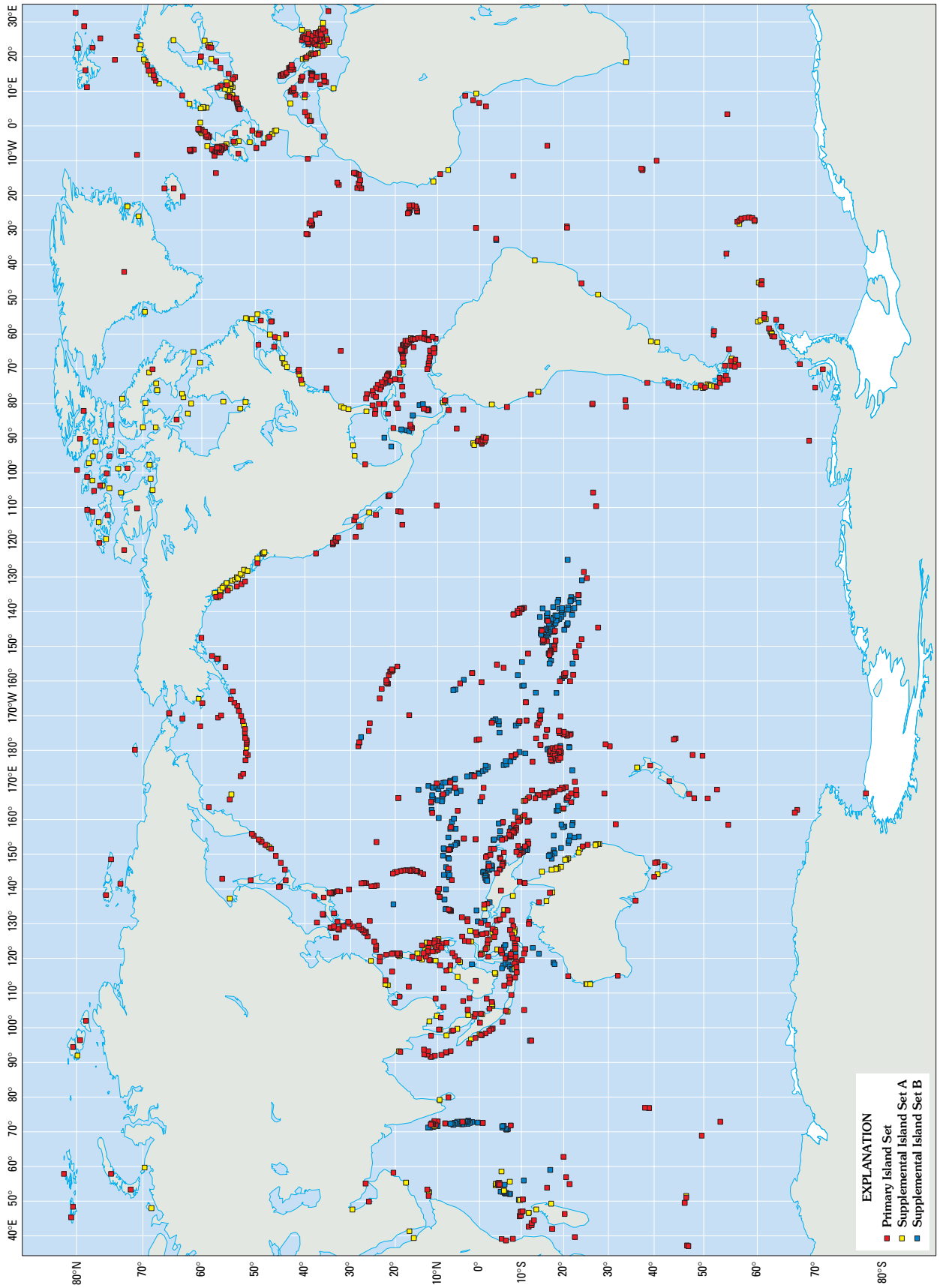
The general distribution over the Earth's surface of the islands that belong to the Primary Island Set and to the Supplemental Island Sets A and B is illustrated in figure 1. How the world would appear if the continents, but not the islands, or if the islands, but not the continents, existed is illustrated by figures 2 and 3, respectively. The global distributions of the three sets of islands are shown separately in Appendix E.

PRIMARY ISLAND SET

The 1,000 islands that belong to the Primary Island Set are described by 122 parameters distributed over the eight-parameter categories. Under each category, the parameters, the island coverages of the parameters, and the information sources from which the alphanumeric values of the parameters were obtained are given in table 2; for those parameters whose alphanumeric values were obtained from more than one source, the primary source is noted first.

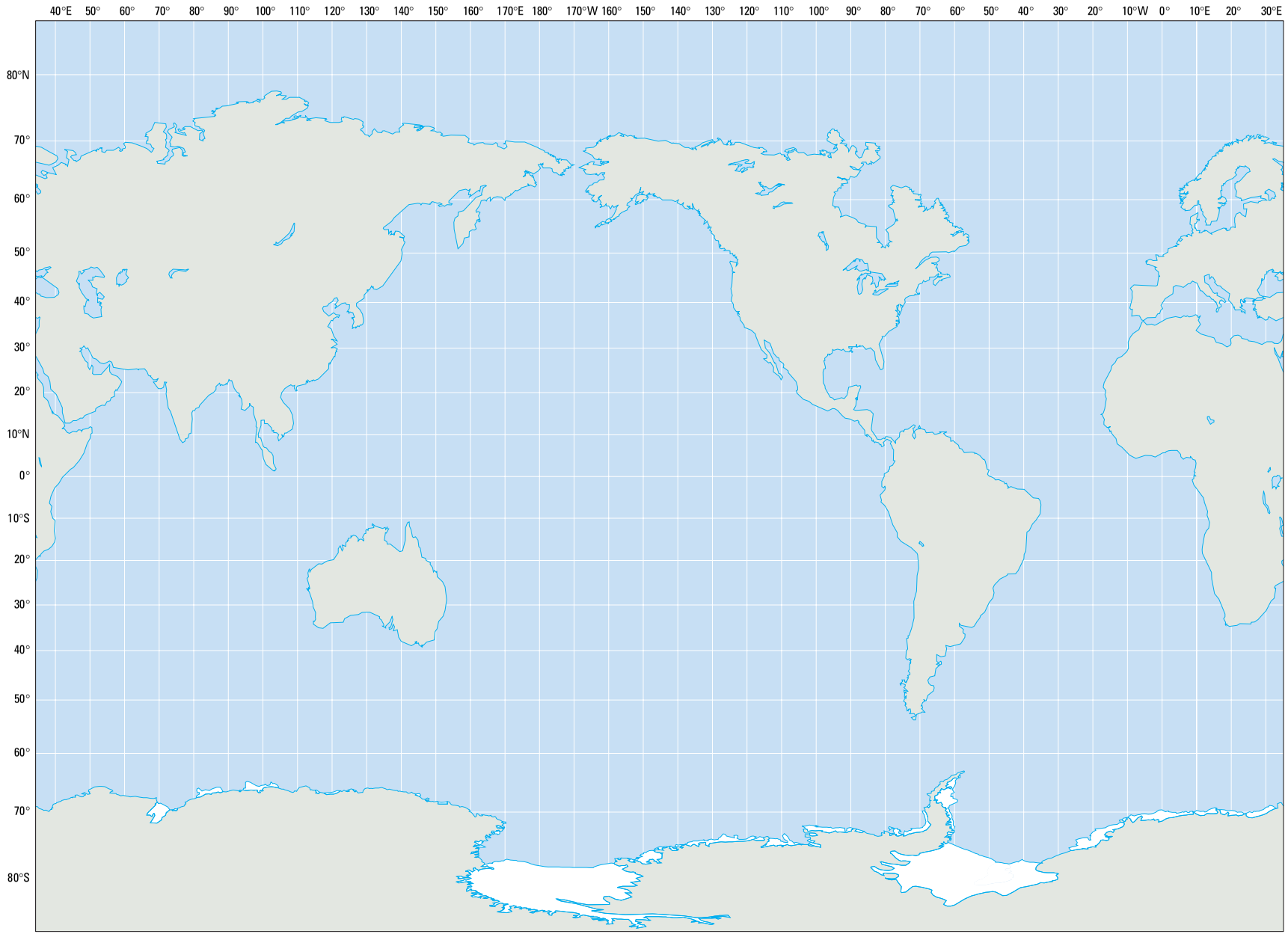
The Primary Island Set may be viewed as a matrix that consists of 1,000 rows (islands) and 122 columns (parameters), the total number of cells being 122,000. The grand coverage of islands by the 122 parameters, which is given by the total number of cells that contain specific alphanumeric values or the symbol † that denotes that a specific alphanumeric value is not applicable, may be expressed in a normalized form as the grand average number of islands covered by the parameter; that is, as the ratio of the grand coverage to the total number of parameters.

The parameter coverages of the islands in terms of primary information sources and categories are given in table 3.



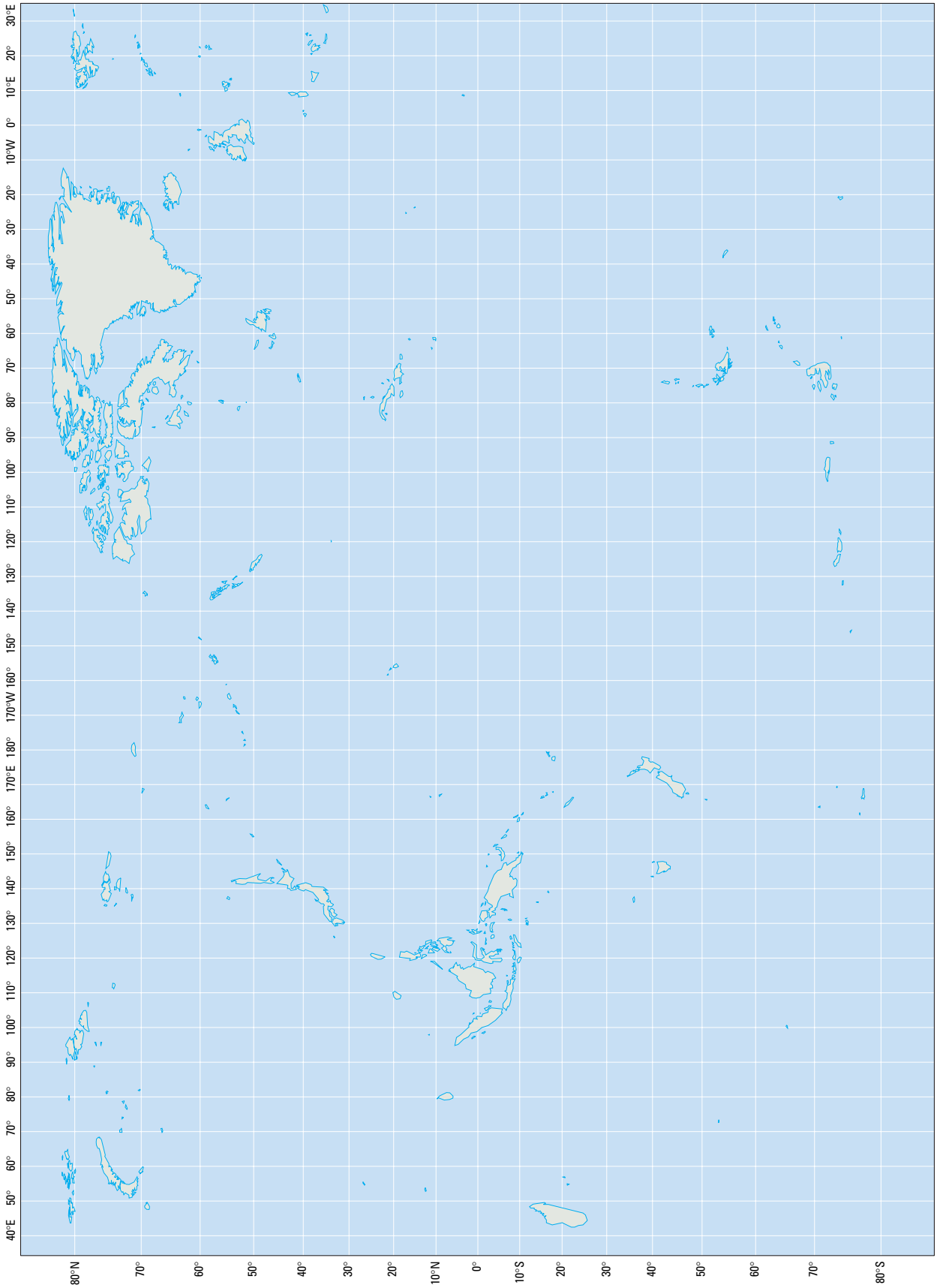
Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 1. Global distribution of the Primary Island Set and Supplemental Island Sets A and B.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 2. The world without islands.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 3. The world without continents.

Table 2. Parameters of the islands that belong to the Primary Island Set

[L, review of scientific publications, government reports and maps, atlases, and geographic gazetteers; N_1, definitions or concepts developed in the study; N_2, established formulas, algorithms, and logical operations; N_3, personal communication of colleagues; ID, identification.]

Count		Parameter descriptions	Islands covered	Information source
Cumulative	Category			
		Identification		
1	1	Island name	1,000	L
2	2	Island ID number per a specific geophysically based sequential order of the islands	1,000	N_1
		Historical		
3	1	Code that identifies islands that are within or outside the domain of earliest European contact after A.D. 1400	1,000	L
4	2	Year of earliest European contact with a specific island	750	L
5	3	Captain of European expedition that made earliest contact with a specific island	749	L
6	4	European nation that sponsored expedition that made earliest contact with a specific island	747	L
7	5	Name given to island upon its earliest European contact	520	L
8	6	Conventional name of island	1,000	L
9	7	Other name of island	1,000	L
10	8	Code that indicates historical context of an island's alternate/former name	1,000	L
		Geographic		
11	1	Latitude of island reference point	1,000	L
12	2	Longitude of island reference point	1,000	L
13	3	Oceanic region in which island is located	1,000	N_1
14	4	Oceanic subregion in which island is located	1,000	N_1
15	5	Island group to which an island belongs	1,000	L
16	6	Code that indicates whether or not group name was taken from geographic literature	1,000	L
17	7	Island group ID per specific sequential order of the islands	1,000	N_1
18	8	Island subgroup to which an island belongs	1,000	L
19	9	Interisland positional distance relative to a specific sequential order of the islands	1,000	N_2
20	10	Cumulative interisland positional distances relative to a specific sequential order of the islands	1,000	N_2
21	11	Name of the island nearest to a specific island	1,000	N_2
22	12	ID number of the island nearest to a specific island	1,000	N_2
23	13	Positional distance of the nearest island to a specific island	1,000	N_2
24	14	Virtual distance of the nearest island to a specific island	1,000	N_2
25	15	Name of the island farthest from a specific island	1,000	N_2

Table 2. Parameters of the islands that belong to the Primary Island Set—Continued

[L, review of scientific publications, government reports and maps, atlases, and geographic gazetteers; N_1, definitions or concepts developed in the study; N_2, established formulas, algorithms, and logical operations; N_3, personal communication of colleagues; ID, identification.]

Count		Parameter descriptions	Islands covered	Information source
Cumulative	Category			
26	16	ID number of the island farthest from a specific island	1,000	N_2
27	17	Region of the island farthest from a specific island	1,000	N_1
28	18	Positional distance to the island farthest from a specific island	1,000	N_2
29	19	Latitude of an island's antipode	1,000	N_2
30	20	Longitude of an island's antipode	1,000	N_2
31	21	Ocean in which an island's antipode is located	1,000	N_2
32	22	Continent on which an island's antipode is located	1,000	N_2
		Physiographic		
33	1	Area of island	1,000	L
34	2	Name of island's highest peak	552	L
35	3	Elevation of highest peak	1,000	L
36	4	Latitude of highest peak	740	L, N_3
37	5	Longitude of highest peak	740	L, N_3
38	6	Number of islands in group containing a specific island	1,000	N_1
39	7	Area of island group	1,000	N_1
40	8	Percentage of island area relative to island group area	1,000	N_2
41	9	Topographic type of island	660	N_1
42	10	Shape type of island	997	N_1
43	11	Length of island	734	L
44	12	Width of island	734	L
45	13	Radius of effective circle	1,000	N_2
46	14	Radius of gyration	267	N_2
47	15	Perimeter of island	318	L, N_2
48	16	Fractal dimension of an island's coastline	267	N_2
49	17	Compactness of an island as a function of length and width	734	N_2
50	18	Compactness of an island as a function of area and perimeter	267	N_2
51	19	Compactness of an island as a function of area and moment of inertia	267	N_2
		Geologic		
52	1	Lithospheric plate on which island is located	1,000	N_1
53	2	Quipu	1,000	N_1
54	3	Geologic type of an island	1,000	N_1
55	4	Geologic class of an island group containing a specific island	1,000	N_1
56	5	Volcanism	1,000	L

Table 2. Parameters of the islands that belong to the Primary Island Set—Continued

[L, review of scientific publications, government reports and maps, atlases, and geographic gazetteers; N_1, definitions or concepts developed in the study; N_2, established formulas, algorithms, and logical operations; N_3, personal communication of colleagues; ID, identification.]

Count		Parameter descriptions	Islands covered	Information source
Cumulative	Category			
57	6	Interisland geologic distance relative to a specific sequential order of the islands	1,000	N_1
58	7	Name of nearest type C island from a specific island	1,000	N_1
59	8	ID number of nearest type C island from a specific island	1,000	N_1
60	9	Distance to nearest type C island from a specific island	1,000	N_1
61	10	Name of nearest type A island from a specific island	1,000	N_1
62	11	ID number of nearest type A island from a specific island	1,000	N_1
63	12	Distance to nearest type A island from a specific island	1,000	N_1
64	13	Name of nearest type O island from a specific island	1,000	N_1
65	14	ID number of nearest type O island from a specific island	1,000	N_1
66	15	Distance to nearest type O island from a specific island	1,000	N_1
		Hydrologic		
67	1	Code that indicates extent of completeness of an island's hydrologic sketch	1,000	N_3
68	2	Presence or absence of perennial rivers on island	794	N_3
69	3	Presence or absence of seasonal rivers on island	784	N_3
70	4	Presence or absence of perennial springs on island	776	N_3
71	5	Presence or absence of seasonal springs on island	727	N_3
72	6	Presence or absence of wetlands on island	715	N_3
73	7	Presence or absence of freshwater lakes on island	815	N_3
74	8	Presence or absence of brackish water lakes on island	690	N_3
75	9	Presence or absence of surface reservoirs on island	812	N_3
		Economic		
76	1	Sovereignty of an island	1,000	L, N_3
77	2	Sovereignty ID per rank order of number islands under specific sovereinty	1,000	L, N_2
78	3	Code that indicates whether or not an island is permanently inhabited	964	L, N_3
79	4	Census of island's population	759	L, N_3
80	5	Year of census	729	L, N_3
81	6	Population density of an island	759	N_2
82	7	Code that indicates whether or not an island has a principal center	752	L
83	8	Name of principal center	749	L
84	9	Census of principal center's population	340	L
85	10	Year of census	338	L

Table 2. Parameters of the islands that belong to the Primary Island Set—Continued

[L, review of scientific publications, government reports and maps, atlases, and geographic gazetteers; N_1, definitions or concepts developed in the study; N_2, established formulas, algorithms, and logical operations; N_3, personal communication of colleagues; ID, identification.]

Count		Parameter descriptions	Islands covered	Information source
Cumulative	Category			
86	11	Type of principal center	750	L, N_1
87	12	Latitude of principal center	690	L, N_2
88	13	Longitude of principal center	690	L, N_2
89	14	Concentration of an island's population at the principal center	323	L
90	15	Code that indicates whether or not the island has a port	1,000	L
91	16	Name of principal port	1,000	L
92	17	Latitude of principal port	998	L
93	18	Longitude of principal port	998	L
94	19	Code that indicates whether or not customs may be cleared at principal port	835	L
95	20	Type of principal port	998	L
96	21	Size of principal port	998	L
97	22	Code that indicates whether or not an island has a principal airport	1,000	L
98	23	Name of principal airport	1,000	L
99	24	Code letters that identify principal airport	980	L
100	25	Latitude of principal airport	808	L
101	26	Longitude of principal airport	808	L
102	27	Code that indicates whether or not customs may be cleared at principal airport	1,000	L
103	28	Elevation of principal airport	767	L
104	29	Length of longest runway at principal airport	793	L
105	30	International time zone at island	1,000	L
		Environmental		
106	1	Code that indicates types of meteorologic information on an island	1,000	L
107	2	Elevation of station for recording precipitation on an island	184	L
108	3	Length of precipitation record at the station	224	L
109	4	Mean annual precipitation at the station	418	L
110	5	Elevation of station for recording temperature on an island	237	L
111	6	Length of temperature record at the station	243	L
112	7	Annual mean temperature at the station	331	L
113	8	Presence or absence of mangroves on an island	690	L, N_2
114	9	Presence or absence of coral reefs at an island	979	L, N_3
115	10	Presence or absence of tropical peat on an island	995	L, N_3

Table 2. Parameters of the islands that belong to the Primary Island Set—Continued

[L, review of scientific publications, government reports and maps, atlases, and geographic gazetteers; N_1, definitions or concepts developed in the study; N_2, established formulas, algorithms, and logical operations; N_3, personal communication of colleagues; ID, identification.]

Count		Parameter descriptions	Islands covered	Information source
Cumulative	Category			
116	11	Presence or absence of palms on an island	984	L, N_3
117	12	Presence or absence of seasonal snow/ice on an island	948	N_3
118	13	Presence or absence of sphagnum peat on an island	953	N_3
119	14	Presence or absence of permafrost on an island	981	N_3
120	15	Presence or absence of permanent snow/ice on an island	989	N_3
121	16	Classification of island glaciation	963	N_1
122	17	Hydrologic class that marks general degree of wetness/dryness of an island	648	N_1

The primary coverage of the islands in terms of primary information sources are given in table 3. From table 3, the following is noted:

- The grand coverage over all information sources over all categories exceeds 102,000, and correspondingly, the grand average island coverage per parameter exceeds 840 islands;
- The alphanumeric values for more than one-half of the 122 parameters are based on information source L, and correspondingly, about one-half of the cells that contain either alphanumeric values or the symbol "†" are accounted for by the L-based parameter values;
- Relative to the information sources, the smallest average coverage occurs with the N_3-based parameter values and the largest average coverage, with the N_1-based parameter values, and
- Relative to the categories, the smallest average coverage occurs with the Environmental parameters and the largest average coverage, with the Identification, Geographic, and Geologic parameters — values for 14 of the 15 Geologic parameters are N_1-based.

Descriptions of the 122 parameters and more detailed accounts of their island coverages follow. Accompanying maps are in reference to only the Primary Island Set.

Table 3. Parameter coverages of islands by information source and category

[L, review of scientific publications, government reports and maps, atlases, and geographic gazetteers; N_1,definitions or concepts developed in the study; N_2, established formulas, algorithms, and logical operations; N_3, personal communication of colleagues.]

Parameter cluster	Parameters	Coverage	
		Total	Average
Primary information source			
L	67	53,933	805
N_1	26	25,301	973
N_2	20	16,565	828
N_3	9	7,113	790
All sources	122	102,912	844
Category			
Identification	2	2,000	1,000
Historical	8	6,766	846
Geographic	22	22,000	1,000
Physiographic	19	13,425	707
Geologic	15	15,000	1,000
Hydrologic	9	7,113	790
Economic	30	24,830	828
Environmental	17	11,778	693
All categories	122	102,912	844

Identification Parameters

The islands are identified by two parameters — a specific name and a specific number.

The names of the islands are the official names reported by the U.S. Board on Geographic Names. Diacritical marks, where appropriate, are retained in the spelling of the names. For those islands where two or more nations have sovereignty over parts of the islands, the conventional names reported by the U.S. Board on Geographic Names of the islands are given.

The islands also are identified by specific numbers that effectively substitute for the names of the islands. The numbers, which are referred to as "identification (ID) numbers," range from 1 through 1,000. The particular number assigned to an island corresponds to the order number along the geophysically based sequential arrangement of the 1,000 islands referred to as the "Alisida" (Alisida being the English transliteration of the Greek word, αλυσιδα, for chain) which is a benchmark arrangement of the islands against which other sequential arrangements of the islands may be compared.

The 1,000 islands of the Primary Island Set may be ordered in several ways; each arrangement is referred to as an "island chain." For general reference purposes, the most useful ordering, perhaps, is alphabetic. For some scientific purposes, however, an ordering that reflects a high degree of geophysical coherence is apt to be more useful. An island chain is not unique because various factors that relate to the islands (for example, location, geologic setting, geologic type, island grouping, and chain length) may be given different degrees of importance. It is difficult to design a search for an optimum chain as a straight forward procedure like that for finding the extreme values of a function. The search for an optimum geophysical chain entails scientific judgment in balancing the relative importance of the various factors governing the topology of the chain.

A particular island chain was found to have special significance. The particular chain, which has been developed through an extensive trial and error procedure, serves as a benchmark for assessing the geophysical significance of other island chains. The procedure used to develop this chain consisted of testing numerous chain variations in terms of the trade-off between enhancement of the geologic compactness of the chain (that is, track continuity on continental margins and on major features of the ocean floor) and increases in the physical length of the chain. The aim was to achieve a high degree of geologic coherence while maintaining a minimal chain length under the following constraints:

- The chain passes once and only once through each region and subregion in which the Earth's oceanic surface is partitioned;
- The number of times the chain loops over itself and crosses a continent are both minimal;
- In the case of an archipelago that reveals little in the way of geologic structure, the chain tracks through the archipelago on a nearest-neighbor basis, such that the last island in the archipelago is the nearest neighbor to the first island in the next archipelago, nearness being subjectively judged, and
- In the case of an archipelago that exhibits a well-defined geologic trend (for example, a chain of aligned mountains or multiple structures that comprise a unique physiographic feature, such as segments of inner and outer island arcs) the chain tracks along the trends and structures sequentially.

A general description of the topology of the Alisida as an open chain, which begins with one island and ends with another, over the surface of the Earth is as follows:

1. The Alisida begins with the island Åland (ID–1) near the entrance to the Gulf of Bothnia at the eastern end of the Baltic Sea;
2. It passes through the Baltic Sea and the English Channel to the island Berlenga (ID–26) off the west coast of Portugal in the North Atlantic Ocean east of the Mid-Atlantic Ridge and then northward — tracking 36 islands — to Eysturoy (ID–62), one of the Faroe Islands;
3. It then passes eastward around the rim of the Arctic Ocean — tracking 54 islands — to the Icelandic island Heimaey (ID–116) and then reenters the North Atlantic Ocean west of the Mid-Atlantic Ridge;
4. It then passes southward along the Atlantic margin of North America — tracking 12 islands — to the island Bermuda (ID–128);
5. It then passes to the southern margin of the Bahama Banks, after which it passes northwest-

ward through the Banks — tracking 5 islands — where it reaches the island Great Inagua (ID–133);

6. It continues through the Bahama Banks and then passes westward through the Straits of Florida — tracking 17 islands — to the island Garden Key (ID–150);
7. It then loops through the Gulf of Mexico and the Caribbean Basin — tracking 59 islands — to the island Barbados (ID–209), after which it passes southward along the Atlantic margin of South America — tracking 8 islands — to the Falkland Plateau;
8. It then crosses the Atlantic–Indian Ridge and passes northward in the Atlantic Ocean — tracking 7 islands — where, near the southern margin of the Gulf of Guinea, it reaches the island Pagulu (ID–224);
9. It then continues northward — tracking 25 islands — to the island Porto Santo (ID–249) in the Madeira Islands, after which it passes westward to the island Flores (ID–250) in the Azores Archipelago near the crest of the Mid-Atlantic Ridge and then eastward, passing through the Strait of Gibraltar into the Mediterranean Basin — tracking 9 islands — to the island Alborán (ID–259);
10. It then passes eastward through the Mediterranean Basin — tracking 83 islands — to the island Cyprus (ID–342), after which it crosses the northern part of the Arabian Peninsula and then passes down the Persian Gulf — tracking 2 islands — to the island Qeshm (ID–344);
11. It then enters the Indian Ocean and passes southwestward to the Crozet Plateau — tracking 33 islands — where it reaches the island Possession (ID–377);
12. It then passes eastward to the Kerguelen Ridge — tracking 2 islands — to the island Heard (ID–379), after which it passes northward to the upper end of the Maldive–Laccadive Ridge — tracking 13 islands — to the island Chelat (ID–392) and then southeastward to the eastern edge of Christmas Rise — tracking 3 islands — to the island Christmas (ID–395);
13. It then passes in a counterclockwise manner around the continental margin of Australia through the Torres Strait and the Arafura Sea — tracking 17 islands — to the island Trangan (ID–412) in the Aru Archipelago;
14. It then passes through the Sunda–Banda Shelf along the various arcs, sequentially — tracking 54 islands — where, on the outer arc of the Indonesian archipelago, it reaches the island Pagi-Seletan (ID–466);
15. It continues along the outer arc of the Indonesian Archipelago, after which it passes along the Andaman–Nicobar Ridge — tracking 15 islands — to the island North Andaman (ID–481);
16. It then passes through the Western Andaman Sea — tracking 2 islands — to the island Narcondam (ID–483), after which it passes northward into the Bay of Bengal to the island Cheduba (ID–484) off the coast of Burma;
17. It then passes along the western coast of the Malay Peninsula — tracking 5 islands — to the island Singapore (ID–489), after which it loops through the Gulf of Thailand and the South China Sea — tracking 13 islands — to the island Spratly (ID–502);
18. It then passes northward through the Philippine Archipelago — tracking 33 islands — to the island Itbayat (ID–535) in the Batan Islands, after which it passes along the Pacific margin of Asia — tracking 8 islands — to the island Taiwan (ID–543);
19. It then passes through the Ryukyu Islands (Nansei Shoto) — tracking 15 islands — to Tanega Sima (ID–558), after which it passes through the Korea Strait — tracking 5 islands — to the island Ullung Do (ID–563) off the coast of South Korea in the Sea of Japan;
20. It then passes through the Japan Archipelago — tracking 15 islands — to the island Rebun To (ID–578), after which it passes around the Sea of Okhotsk — tracking 2 islands — to the island Suyatoy Iony (ID–580);
21. It then passes along the Kuril Trench — tracking 9 islands — to the island Shumshu (ID–589) after which it passes northward into the Bering Sea to the island Karaginskiy (ID–590) off the Siberian coast;
22. It then loops through the Bering Sea — tracking 28 islands — where, along the Aleutian Trench, it reaches the island Montague (ID–618);

23. It continues along the Aleutian Trench and then passes southward along the Pacific margins of North and South America — tracking 44 islands — to the island Tierra del Fuego (ID–662), after which it passes along the South Sandwich Trench, the Scotia Ridge, and the Pacific margin of Antarctica to Macquarie Ridge — tracking 29 islands — to the island Macquaire (ID–691);
24. It then passes northward along Lord Howe Rise to the southern margin of the Coral Sea and then southward along the Norfolk Island Ridge — tracking 9 islands — where it reaches the island Campbell (ID–706);
25. It then passes northward along the Kermadec and the Tonga Trenches to the Fiji Archipelago — tracking 46 islands —to the island Kadavu (ID–752);
26. It then passes around the Hunter, the New Hebrides, and the Solomon Ridges, after which it loops around the Bismarck Sea — tracking 60 islands — to the island Unea (ID–812), one of the Witu Islands of Papua New Guinea;
27. It then passes westward to the West Caroline Basin, after which it passes northward along the Yap Ridge and the Mariana and the Bonin Trenches — tracking 45 islands — to O Shima (ID–867), in the Nampo Shoto (archipelago);
28. It then passes westward into the broad expanse of the Mid-Pacific Basin — tracking 24 islands — where, in the Marshall Islands, it reaches the island Bikini (ID–889);
29. It then continues eastward in the Mid-Pacific Basin through the various archipelagos and isolated islands in a sequential manner — tracking 89 islands — to the island of Hawaii (ID–978);
30. It then passes eastward into the eastern sector of the Pacific Ocean — tracking 6 islands — where it reaches the island Cocos (ID–984);
31. It then passes southward through the eastern sector of the Pacific Ocean — tracking 16 islands — where, near the junction of the East Pacific Ridge and the Easter Island Fracture Zone, the Chain ends at the island Pascua [Easter Island (ID–1,000)].

The general track of the Alisida is depicted in figure 4. A more detailed depiction is given in Appendix F and on Plate 1.

The identification numbers linked to the Alisida uniquely identify the islands, in contrast to the island names. Duplicate names are associated with 37 of the 1,000 islands (table 4).

The islands named Montague (ID–618) and Montagu (ID–669) have been included among the list of duplicate island names though the spellings of the islands' names differ only in terms of the inclusion and exclusion of the letter "e," respectively. Had the English language names of the islands been given São Paulo (ID–210), which is Portuguese for Saint Paul and is located in the Atlantic Ocean off the coast of Brazil, would have been included in the list of duplicate island names.

Historical Parameters

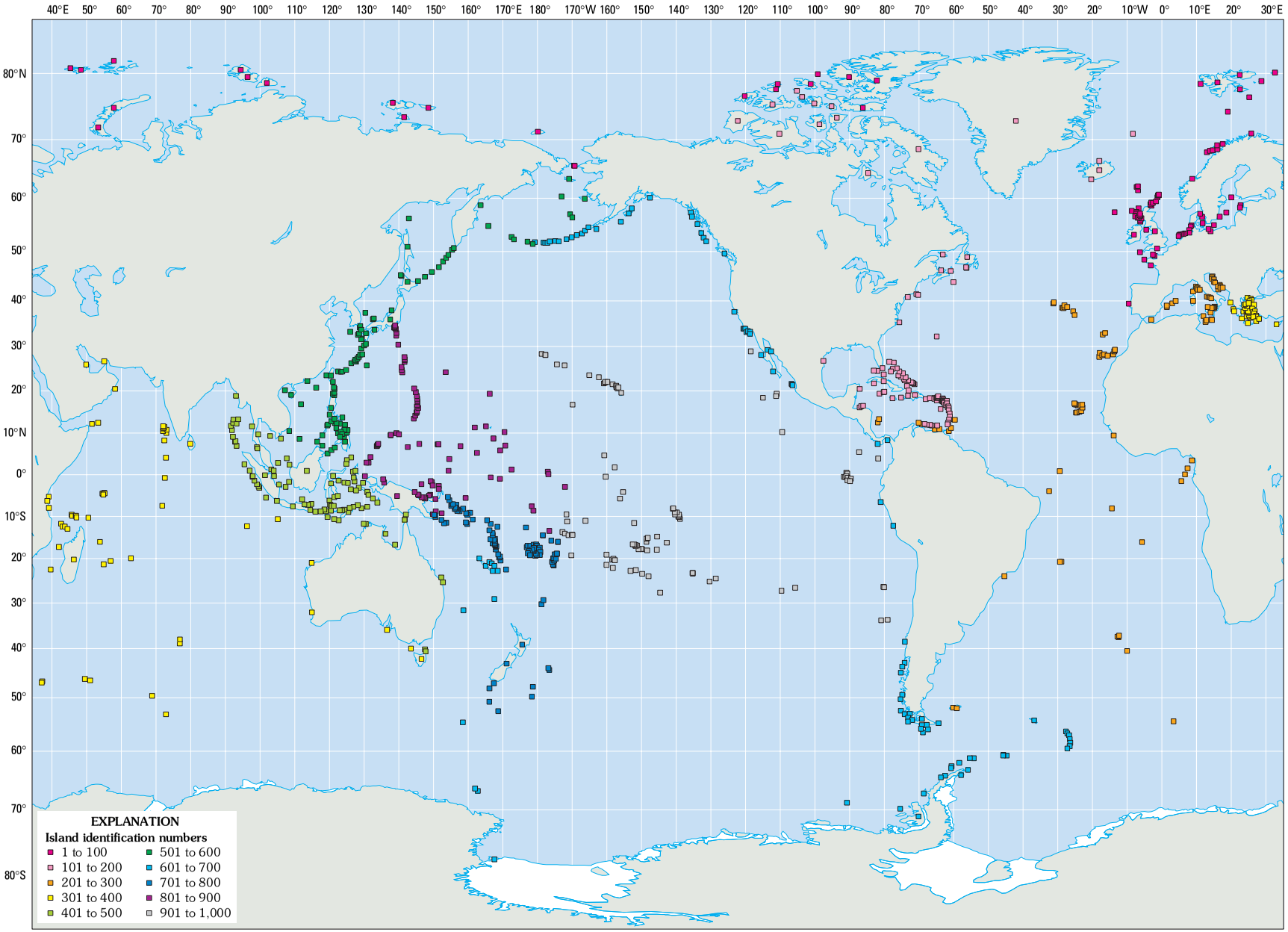
The social history of islands is only tangential to a study of the geology and hydrology of islands in relation to current environmental issues; for example, climate change and related rises in sea level, population growth, and sustainable economic development. Nonetheless, the study of islands within any context is difficult without touching upon their histories, at least in reference to their first European contacts. Vestiges of those contacts remain that bear on the current geopolitical setting of the islands that, in turn, bear upon the potential future economic development of the islands. Thus, a cursory view through eight parameters is taken of the first European contacts with the islands.

The eight historical parameters may be partitioned into the following sets:

- Those that provide details about the first European contacts with specific islands, and
- Those of names, other than the official names, of the islands.

First European Contact

An historical account of the first European contacts with islands is limited to contacts established after AD. 1400. Islands on the continental margins of Africa and Eurasia, except along the northern rim of Eurasia,



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 4. Track of the Alisida per 100 island segments.

Table 4. Duplicate island names

Count	Island		
	Name	Identification parameter (ID)	General location
1	Andros	146	Atlantic Ocean — Bahama Islands
2	"	321	Mediterranean Basin — Aegean Islands
3	Bathurst	102	Arctic Ocean — Canadian Arctic Archipelago
4	"	411	Indian Ocean — off the northwest coast of Australia
5	Camiguin	507	Pacific Ocean —southern part of Philippine Islands
6	"	531	Pacific Ocean — northern part of Philippine Islands
7	Clarence	655	Pacific Ocean — off the coast of Chile
8	"	675	Pacific / Atlantic Oceans — between South America and Antarctica
9	Flores	250	Atlantic Ocean — Azores
10	"	452	Pacific Ocean — Indonesian Islands
11	Graciosa	246	Atlantic Ocean — Canary Islands
12	"	255	Atlantic Ocean — Azores
13	Long	126	Atlantic Ocean — off the coast of United States (New York)
14	"	138	Atlantic Ocean — Bahama Islands
15	"	816	Pacific Ocean — off the northeast coast of New Guinea
16	Mainland	51	Atlantic Ocean — Orkney Islands
17	"	55	Atlantic Ocean — Shetland Islands
18	Melville	105	Arctic Ocean — Canadian Arctic Archipelago
19	"	410	Indian Ocean — off the northwest coast of Australia
20	Montague	618	Pacific Ocean — off the south coast of Alaska
21	Montagu	669	Pacific / Atlantic Oceans — between South America and Antarctica
22	North	362	Indian Ocean — Seychelles Islands
23	"	701	Pacific Ocean — New Zealand Archipelago
24	Prince Edward	121	Atlantic Ocean — off the coast of Nova Scotia
25	"	374	Indian Ocean — Prince Edward Islands
26	Prince of Wales	108	Arctic Ocean — Canadian Arctic Archipelago
27	"	407	Indian / Pacific Oceans — off the north coast of Australia
28	"	621	Pacific Ocean — off the southwest coast of Alaska
29	Saint Paul	380	Indian Ocean
30	"	594	Pacific Ocean — Bering Sea
31	San Cristobal	777	Pacific Ocean — Solomon Islands
32	"	992	Pacific Ocean — Galapagos Islands
33	Santa Cruz	629	Pacific Ocean — off the west coast of California
34	"	991	Pacific Ocean — Galapagos Islands
35	South	355	Indian Ocean — Aldabra Atoll
36	"	360	Indian Ocean — Seychelles Islands (Farquhar Group)
37	"	702	Pacific Ocean — New Zealand Archipelago

were considered to be outside the domain of contact. Four archipelagos also were considered to be outside the domain of first contact — the Canary Islands off the northwest coast of Africa, the Philippine Islands and the Japanese Islands in the western Pacific Ocean, and the Malay Archipelago, which extends along the margin of the Indian and the Pacific Oceans from the Malay Peninsula eastward to the large island of New Guinea (ID–820). Most of the islands inside the contact domain are located in the Caribbean Basin, the Pacific Ocean, and the north and south polar regions.

Of the 1,000 islands:

- 629 are coded as "Y" to indicate that they are inside the domain of contact, and
- 371 (the balance of 1,000-629) are coded as "N" to indicate otherwise (figure 5).

For many of the islands, particularly those in the Pacific Ocean, historians are not in agreement as to when the first European contact was established and as to who established that contact. In the case of the Pacific islands, information about first European contact in terms of the year contact was made, the captain of the European expedition that established that contact, the name given to the island following first contact, and the nation that sponsored the expedition follows Sharp's (1985) account of "firm evidence" of first contact. Enhancement of historical agreement regarding the first European contact is outside the scope of this study.

Of the 629 islands inside the domain of first contact:

- The year of first contact is given for 379 of the islands;
- The name of the captain of the expedition that made that first contact, for 378 of the islands;
- The name given to the island following first contact, for 149 of the islands, and
- Sponsorship of the expedition that made first contact, for 376 of the islands.

A global perspective on the temporal distribution of first European contact with islands is shown in figure 6.

To each of these island counts, the value 371 must be added to obtain the island coverages of the parameters noted in table 2 — 371 being the number of islands that are outside the domain of first contact, and, therefore, the islands for which specific values of the parameters are not applicable (†). Sponsorships of the expeditions that made first contact with the islands that are accounted for in this study are American (AM), British (BR), Canadian (CA), Dutch (DU), French (FR), Norwegian (NO), Portuguese (PO), Russian (RU), and Spanish (SP).

A general account of the islands by expedition sponsorship is shown in figure 7.

Other Names of the Islands

Over time, many of the island names and their spellings have undergone a number of changes as geographers, cartographers, and others sought to draw a more exacting picture of the Earth's surface and as the jurisdiction over islands changed hands. Many of the older names are corruptions of native names adopted by early explorers that have found their way into western literature. Where name changes have been most prevalent is within the Pacific region. For a very extensive list of alternate/former names of Pacific islands, see Motteler (1986).

In recent years, some of the newly emerged island nations have renamed their islands to reflect their own language and culture. For example, the islands of Mwali, Njazidja and Nzwani, which form the sovereign state of the Comoros Islands, were formerly named Moheli, Grande Comore, and Anjouan. For many other islands, their names have remained unchanged for centuries, and to ascertain if those islands were once known by other names is difficult.

To facilitate the search of the literature, particularly the older literature, other names of the islands, beside the official names, are given. Collectively, the names are coded to indicate that the names are of one of the following classes of names:

- Official name as reported by the U.S. Board on Geographic Names — coded "ON";
- Conventional name as reported by the U.S. Board on Geographic Names — coded "CN";
- Historical name; that is, the name given or adopted following first European contact — coded "HN," and
- Former name; that is, name other than official, conventional or historical, an island acquired over time — coded "FN."

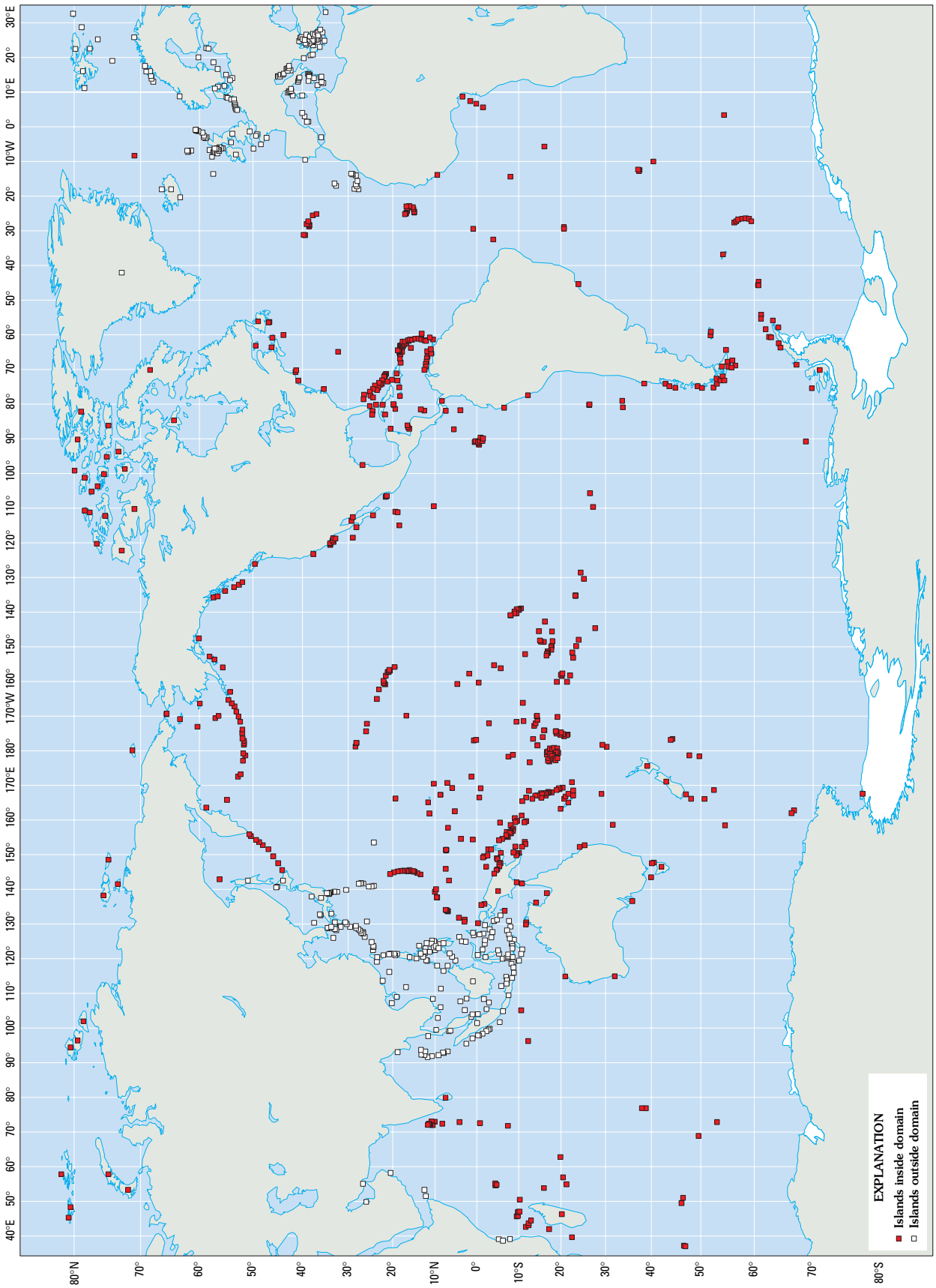
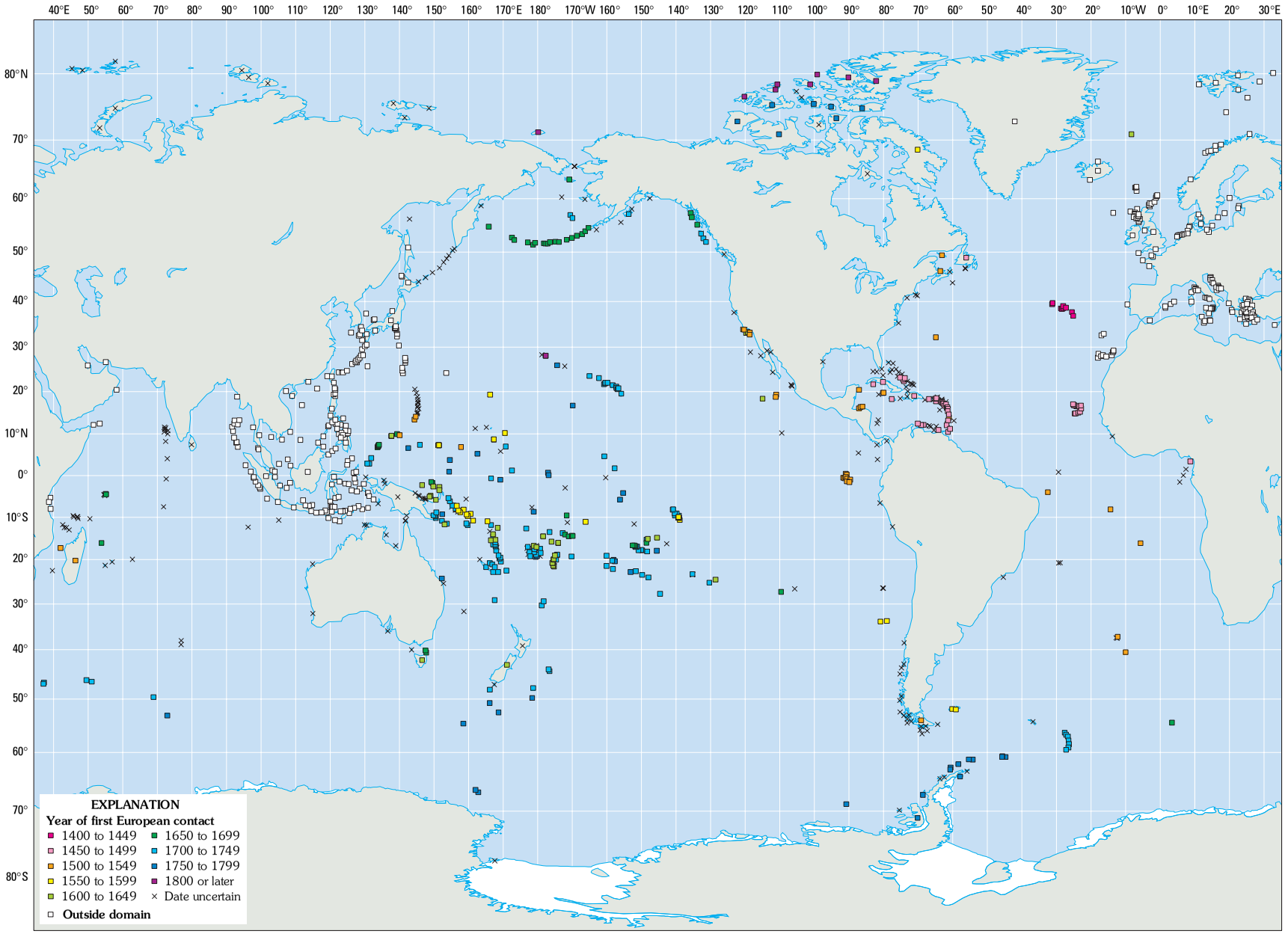


Figure 5. Extent of the domain of first European contact.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 6. Global perspective on the temporal distribution of first European contact with islands.

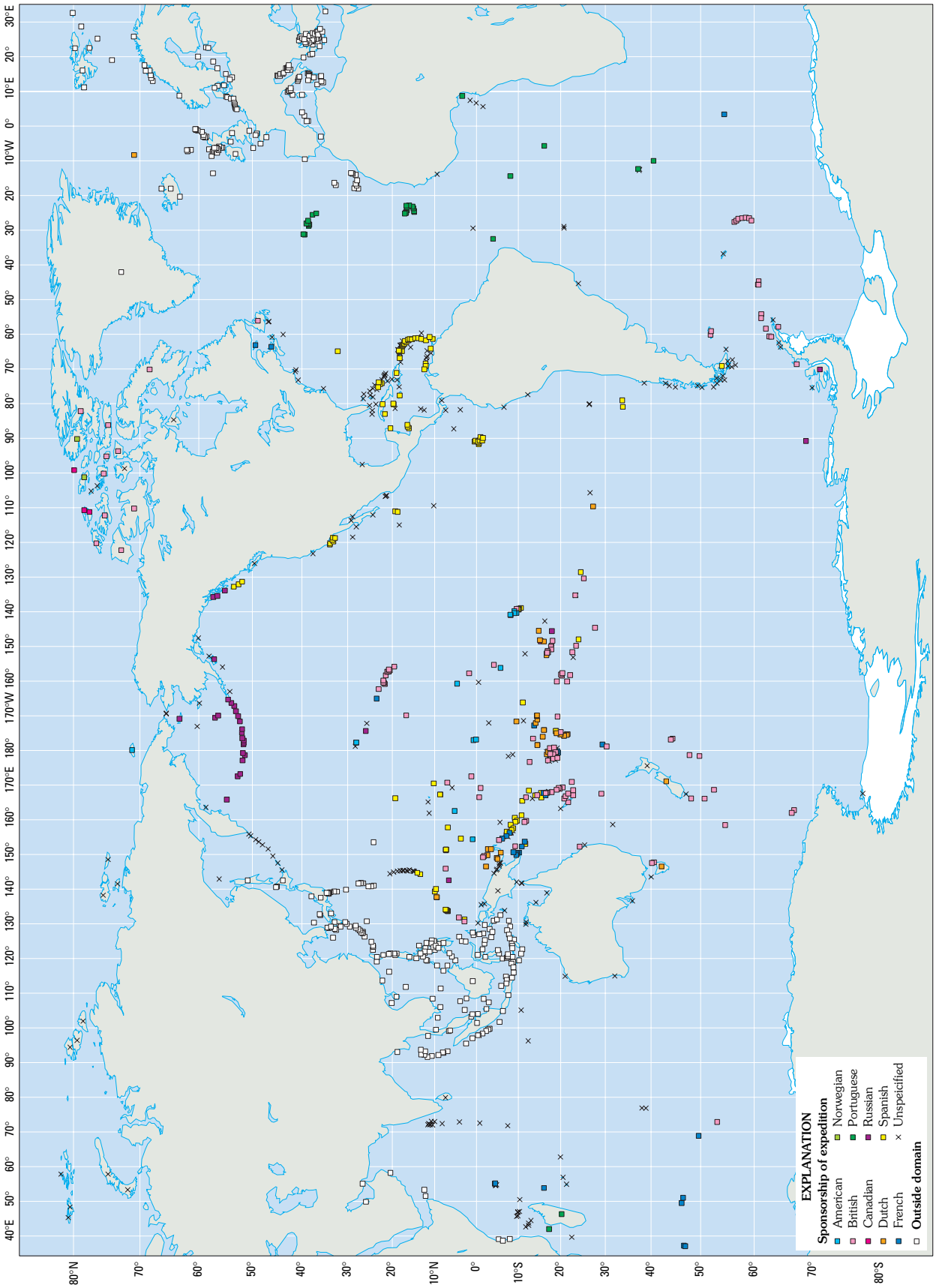


Figure 7. Global distribution of first European contact with islands per sponsorship of expedition.

For example, Pascua (Spanish for Easter; more appropriately, Isla de Pascua) is the official name of the island with the ID number 1,000. When Jacob Roggeveen, who was captain of a Dutch expedition, sighted the island, the first European to do so, on Easter morning, April 15, 1722, he named the island Paasch Eylandt (Dutch for Easter Island), which is the historical name of the island. The conventional name of the island is Easter Island.

In addition to the 1,000 official names of the 1,000 islands, there are:

- 37 islands with conventional names,
- 149 islands with historical names, and
- 326 islands with former names.

Each of the 326 islands with former names has at most 7 alternate names, such that the total number of former names for these islands is 987. Combining the four classes of names, the total number of names associated with the 1,000 islands of the Primary Island Set amounts to 2,173 (= 1,000 + 37 + 149 + 987).

Inforamtion, mainly historical, that does not lend itself to a spreadsheet presentation is given in Appendix K for 281 of the 1,000 islands belonging to the primary island set.

Summary

The island coverages by the eight historic parameters are summarized in table 5.

Geographic Parameters

A map of the world reveals that the saltwater islands are not uniformly distributed, even in a statistical sense, over the Earth's oceanic surface. Most of the islands are concentrated in the Pacific Ocean, more specifically in the western Pacific Ocean. A description and explanation of the distribution of the islands is important in addressing a number of diverse questions concerning such matters as follow:

- The Earth's geologic history,
- Dispersion and concentration of terrestrial plant and fauna species within the oceanic environment,
- Communication and trade between continental and island nations, and
- Development of an island's resources within the bounds of the island's exclusive economic zone.

Herein, the distribution of the world's islands is viewed through the distribution of the 1,000 islands in the Primary Island Set, the distribution being described by the 22 Geographic parameters specified in table 2. The parameters may be partitioned into the following groups:

Table 5. Island coverage, by historical parameter

Parameter	Islands				
	Specified A	Inapplicable B	Covered A+B	Unspecified C	Total A+B+C
Contact index	1,000	0	1,000	0	1,000
Year of earliest contact	379	371	750	250	1,000
Captain of expedition	378	371	749	251	1,000
Expedition sponsorship	376	371	747	253	1,000
Name given to island following earliest contact	149	371	520	480	1,000
Conventional name	1,000	0	1,000	0	1,000
Other names	308	0	1,000	692	1,000
Island name code	1,000	0	1,000	0	1,000

- Those that provide specific locations of the islands on the Earth's surface and general locations of the islands among themselves;
- Those that identify affinities between the islands, and
- Those that relate to topologic properties of the islands defined in terms of distances between one island and another.

Locations of Islands

The location of an island on the Earth's surface is uniquely specified by the values of its geographic coordinates — latitude and longitude. Herein, the coordinate values are reported to the nearest hundredth degree with positive (negative) values denoting latitudes north (south) of the equator and longitudes east (west) of Greenwich. These values are decimal degree equivalents of the values given by the U.S. Board on Geographic Names that are expressed to the nearest minute with the values designated as N (S) which denote latitudes north (south) of the equator, and values designated as E (W) which denote longitudes east (west) of Greenwich. The values given by the U.S Board on Geographic Names refer to points on geographically scaled maps of the islands that are judged to be at or near the geometric centers of the islands; that is, the centers of gravity of the areas of the islands. Refer to Appendix A.

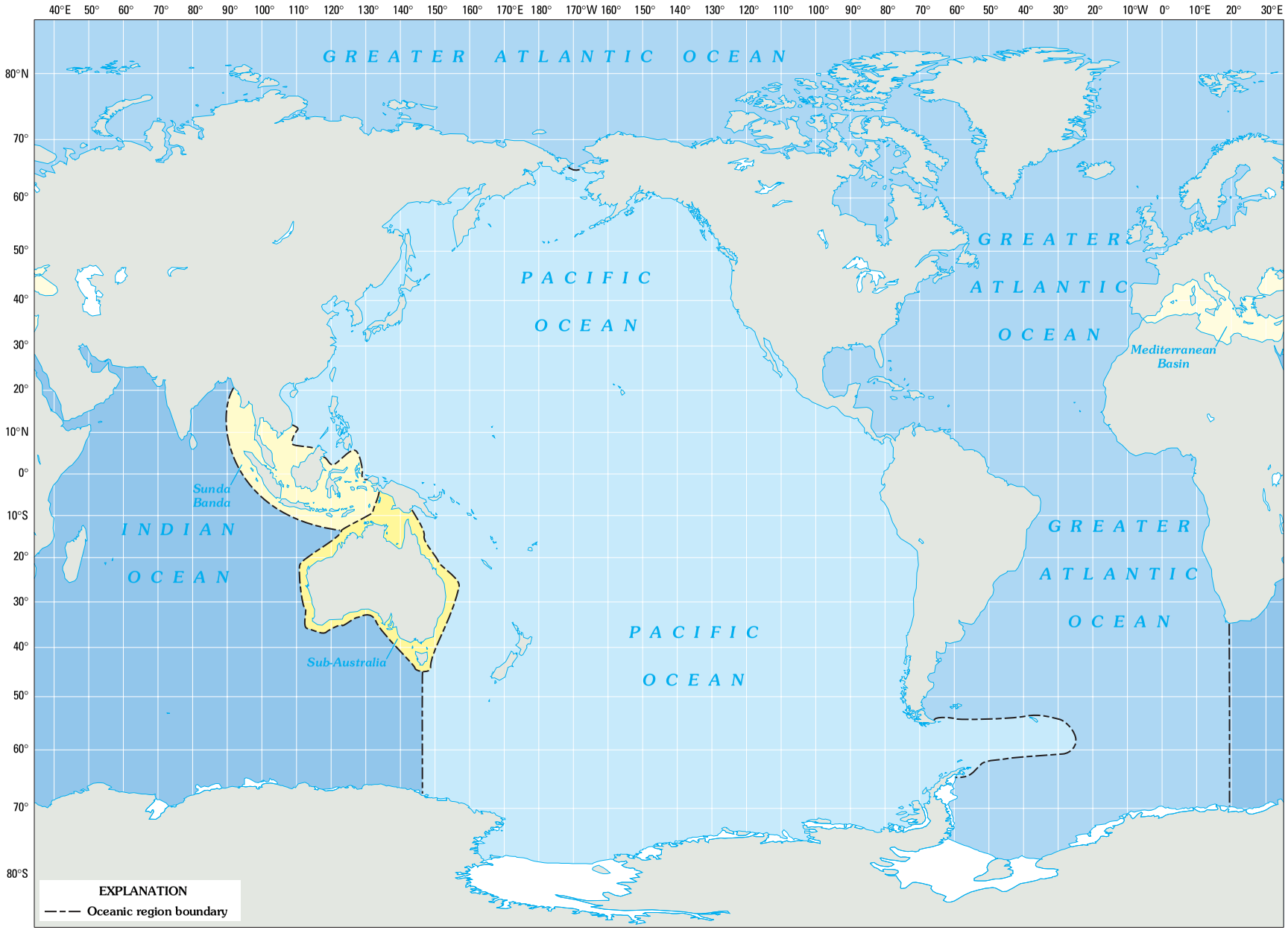
The geographic coordinates are specified for each of the 1,000 islands.

The location of an island is further specified by its oceanic setting. Herein the oceanic surface of the Earth is partitioned into six regions, as shown in table 6. The boundaries of the regions are depicted in figure 8.

The six oceanic regions are divided into 32 subregions, which form natural provinces of the oceans as delineated by major topographic features of the ocean floor and the continental margins, as shown in table 7. The oceanic regions and the oceanic subregions for the 1,000 islands are specified.

Table 6. Oceanic regions

Count	Region	Description
1	Greater Atlantic Ocean	Encompasses the Atlantic and the Arctic Oceans which includes their adjacent seas.
2	Mediterranean Basin	Remnant of a once much-larger expanse of water, Tethys, that was connected with the modern Atlantic Ocean by way of the Strait of Gibraltar. Its connection with the modern Indian Ocean is now separated by the Arabian Peninsula and its northern extension.
3	Indian Ocean	Encompasses the Indian Ocean, which includes all adjacent seas, except those along the eastern margin of the Ocean.
4	Sub-Australia	Encompasses the waters over the Continental Shelf of Australia.
5	Sunda–Banda	Encompasses the waters over the relatively shallow extension of the Continental Shelf of Southeast Asia and the sea adjacent to the eastern margin of the Indian Ocean.
6	Pacific Ocean	Encompasses all the oceanic waters not encompassed by the other five regions.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 8. Boundaries of oceanic regions.

Table 7. Oceanic subregions

Count	Subregion	General bounds of subregion
	Greater Atlantic Ocean	
1	Baltic Sea	East of Skagerrak
2	Northeastern Sector	Above triple junction of North American, Eurasian, and African Lithospheric Plates; East of Mid-Atlantic Ridge
3	Sub-Arctic Rim	Arctic Ocean and adjacent seas
4	Northwestern Sector	North of Equator; West of Mid-Atlantic Ridge
5	Caribbean Basin	Caribbean Sea
6	Southeastern Sector	South of Equator; East of Mid-Atlantic Ridge
7	Southwestern Sector	Below triple junction of North American, Eurasian, and African Lithospheric Plates; West of Mid-Atlantic Ridge
	Mediterranean Basin	
8	Western Sector	West of Malta Channel
9	Eastern Sector	East of Malta Channel
	Indian Ocean	
10	Western Sector	West of Southwest Indian and Carlsberg Ridges
11	Southern Sector	South of Southwest Indian and Mid-Indian Ridges
12	Eastern Sector	East of Carlsberg and Mid-Indian Ridges
	Sub-Australia	
13	Western Sector	Western Continental Shelf of Australia
14	Southern Sector	Southern Continental Shelf of Australia
15	Eastern Sector	Eastern Continental Shelf of Australia
16	Northern Sector	Northern Continental Shelf of Australia
	Sunda–Banda	
17	Halmahera Sector	Seram, Halmahera, and Molucca Seas
18	Sulawesi Sector	Flores and Molucca Seas; Makassar Strait
19	Outer Bunda Arc	Seram and Banda Seas
20	Inner Bunda Arc	Along southern margin of Banda, Flores, and Java Seas; Selat Mentawani and Strait of Malacca
21	Inner Sunda Arc	Andaman, Java, Flores, and Banda Seas
22	Outer Sunda Arc	Along Andaman – Java Trench
23	Andaman Sea	Andaman Sea
24	Malay Trend	Along emerged and submerged Malay Peninsula
25	Borneo Sector	Selat Karimata; northern margin of Java Sea; Makassar Strait
	Pacific Ocean	
26	Northwestern Rim	South and East China Seas; Seas of Japan and Okhotsk
27	Northern Rim	Aleutian Trench; Bering Sea
28	Eastern Rim	East of Queen Charlotte and Cascade Faults; Mid-America– Peru – Chile Trenches; Scotia Basin; off Grahamland

Table 7. Oceanic subregions—Continued

Count	Subregion	General bounds of subregion
29	Southwestern Rim	Macquarie Ridge; Chatham – Campbell Plateau; Lord Howe Rise; Fiji, New Hebrides, Santa Cruz, and Solomon Basins; Bismarck Sea.
30	Western Sector	Along Belau, Yap, Mariana, and Japan Trenches
31	Central Sector	East of Belau– Mariana and Kermadec –Tonga Trenches ; south of Aleutian Trench; west of Pacific Rise
31	Eastern Sector	East of Pacific Rise; Peru– Chile Trench

Island Affinities

Each island is presumed to be a member of an island group that forms a more or less distinct island cluster. An island group may consist of the following:

- A single island and nothing more than off-shore rocks, the number and the areas of which vary with the tide; for example, Newfoundland (ID–117);
- Several islands comparable in area; for example, the Bahamas (ID–133, …, ID–146), or
- A few islands that make up the greater share of the total area of the islands in the group; for example, the Fiji Islands (ID–731, …, ID–752).

If an island is part of an island group that is commonly referred to by a specific name in the geographic literature, then the island is coded as 0, and the island group name is associated with the island. In reference to a particular island, if the literature gave no indication that the island is a member of a named island group, then the island is coded as 1, and the island is assumed to "belong" to a group that bears the island's name. Some particular island groups named in the literature that are taken into account in the study do not accord with a strict geographic hierarchical clustering of islands. For example, the four island groups — Greater Sunda, Lesser Sunda, Northern Moluccas, and Southern Moluccas — considered herein collectively form the geographically specified Malay Archipelago, which extends from the Malay Peninsula eastward to the large island of New Guinea (ID–820). The Japanese Archipelago is considered to include the four large Japanese islands — Kyushu (ID–571), Shikoku (ID–572), Honshu (ID–574), and Hokkaido (ID–576) — and the relatively small islands that lie within a few kilometers from their shores.

The 1,000 islands are partitioned into 299 island groups, where:

- The names of 137 island groups — official names or, if applicable, conventional names reported by the U.S. Board on Geographic Names — which account for 838 islands, are derived from the literature, and
- The names of the remaining 162 (= 299 – 137) island groups, which account for the remaining 162 (= 1,000 – 838) islands, are the same as those of the single islands that make up these groups.

The island group to which an island belongs is noted not only by the name of the island group, but also by the island group's identification number that corresponds to the order number of the first occurrence along the track of the Alisida of an island that belongs to the island group. Thus, the island of Åland (ID–1) is identified as belonging to the Ahvenanmaa Islands (ID–1), and the island of Pascua (ID–1,000) is identified as belonging to the "Pascua Islands" (ID–299) — Pascua is generally thought of as an isolated island.

Within an island group that consists of two or more islands, the names of the island subgroups to which the islands belong are given if the subgroup names were found in the geographic literature — official or, if applicable, conventional names reported by the U.S. Board on Geographic Names. Names were found for 125 subgroups, which account for 363 of the 1,000 islands. In the case where no subgroup name was found in the literature, no subgroup name was imposed. The subgroup names are not used as a basis for further description of the islands and therefore the remaining 637(=1,000-363) islands were presumed not to be part of any island subgroup.

Topologic Properties of the Islands

The topologic properties of the islands are defined in terms of the distances between one island and another. All distances, which are measured in kilometers (km), between specific points on the Earth's surface are determined as great circle distances for a spherical Earth with a radius of 6,370.997 km, whereby the equatorial circumference is 40,030 km. Refer to Appendix A.

Two distances between one island and another were considered:

- Positional distance — the great circle distance between the points on the Earth's surface marked by the geographic coordinates of the islands, and
- Virtual distance — the positional distance minus the sum of the radii of the islands, assuming they were shaped as circles.

The virtual distance approximates the minimum coast-to-coast distance between two islands.

The Alisida passes only once through each of the six regions into which the Earth's oceanic surface has been partitioned, it never crosses itself, and only once, in passing from the Mediterranean Basin to the Persian Gulf, does it cross a continental "barrier." The length of the Alisida, which is equivalently the sum of the inter-island positional distances from Åland (ID–1) to Pascua (ID–1,000) is 329,251 km. Along the track of the Alisida, the following "milestones" are reached (figure 9):

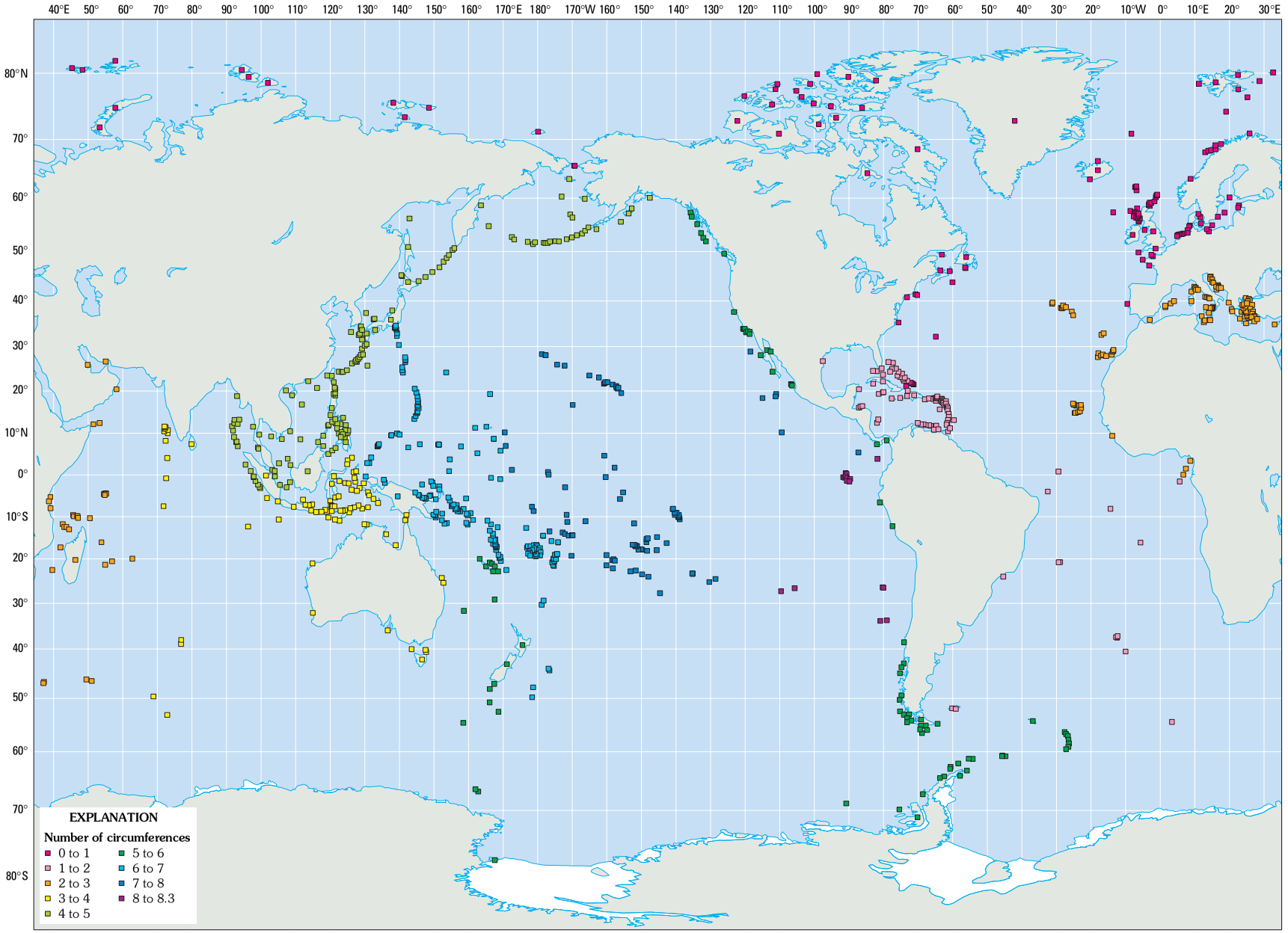
1. Great Exuma (ID–139) marks the Alisida's length at 40,021 km, *which is equivalent to about one circumference of the Earth*;
2. Principe (ID–226) marks the Alisida's length at 79,984 km, *which is equivalent to about two circumferences of the Earth*;
3. Possession (ID–377) marks the Alisida's length at 119,412 km, *which is equivalent to about three circumferences of the Earth*;
4. Tanahmasa (ID–471) marks the Alisida's length at 160,035 km, *which is equivalent to about four circumferences of the Earth*;
5. Chichagof (ID–619) marks the Alisida's length at 200,426 km, *which is equivalent to about five circumferences of the Earth*;
6. Antipodes (ID–707) marks the Alisida's length at 240,190 km, *which is equivalent to about six circumferences of the Earth*;
7. Mejit (ID–892) marks the Alisida's length at 280,210 km, *which is equivalent to about seven circumference of the Earth*;
8. Cocos (ID–984) marks the Alisida's length at 320,020 km, *which is equivalent to about eight circumferences of the Earth*, and
9. Pascua (ID–1,000) marks the total length of the Alisida at 329,251 km, *which is equivalent to about eight and one-fourth circumferences of the Earth*.

The positional distance between Åland (ID–1) and Pascua (ID–1,000) is 14,742 km, which is about three-fourths of the distance from any one of the islands to its antipode.

The following sets of extremal topologic properties of the islands were considered:

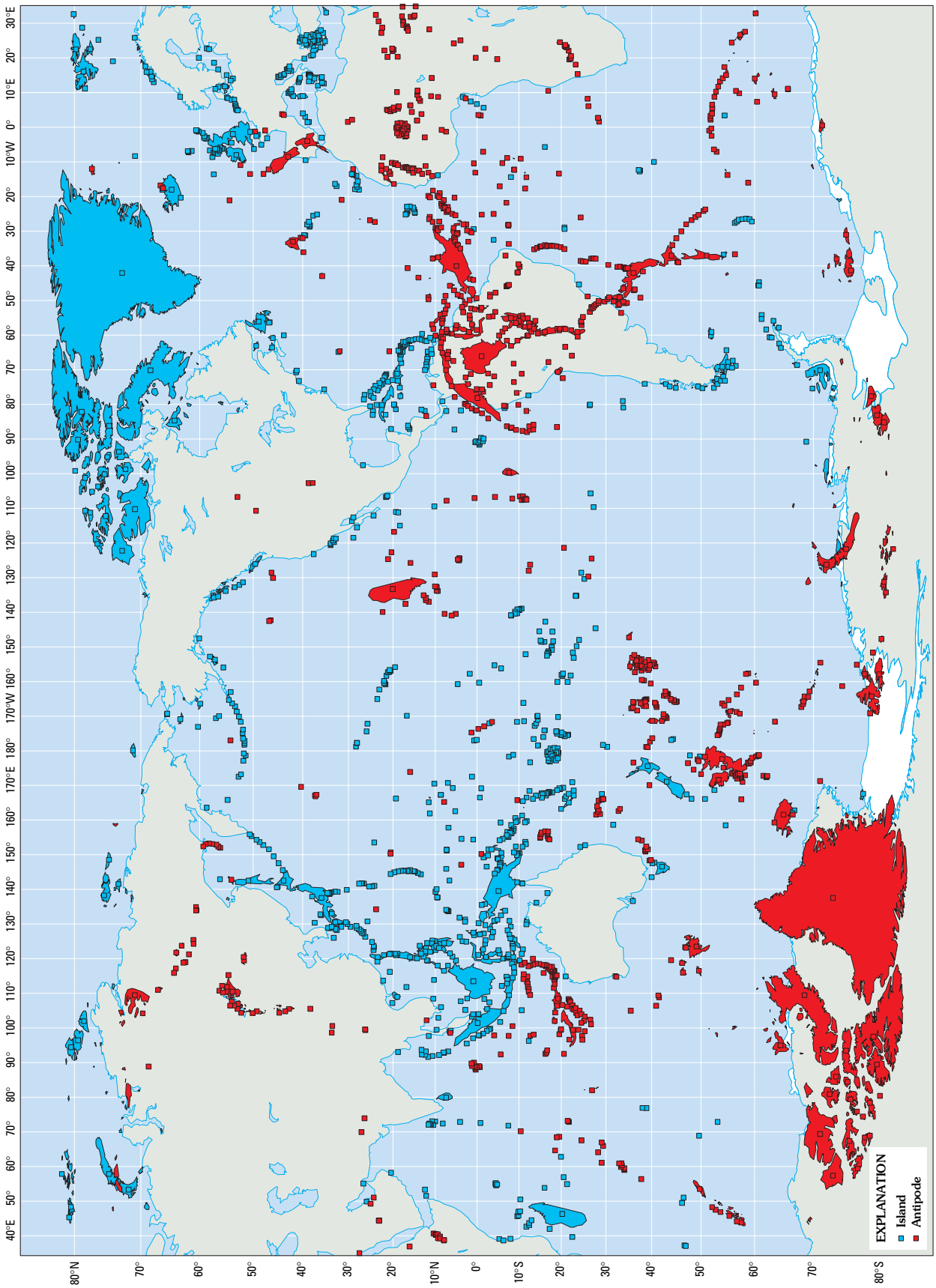
- The name and ID number of the nearest island to a specific island as measured by the positional and virtual distances between the islands;
- The name and ID number of the farthest island, and the oceanic region in which it is located to a specific island as measured by the positional distance between the islands, and
- The geographic coordinates of each island's antipode and the antipode's ocean or continent location.

The antipode marks the location of a point on the Earth's surface that is diametrically opposite the location of a specific point. For all islands, the positional distance between the location of an island, as marked by its geographic coordinates, and the location of its antipode is 20,015 km (= one-half of the equatorial circumference).The relative locations of the islands and their antipodes is shown in figure 10.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 9. Distance along the track of the Alisida, expressed as equivalent circumferences of the Earth.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 10. Relative locations of the islands and their antipodes.

Summary

For each of the 22 geographic parameters, the island coverages are complete; that is, for each island, a specific alpha or numeric value is given for each of the 22 parameters. Table 8 lists the condensed parameter descriptions.

Table 8. Island coverage, by geographic parameter

Parameter	Islands				
	Specified A	Inapplicable B	Covered A+B	Unspecified C	Total A+B+C
Location					
Latitude	1,000	0	1,000	0	1,000
Longitude	1,000	0	1,000	0	1,000
Oceanic region	1,000	0	1,000	0	1,000
Oceanic subregion	1,000	0	1,000	0	1,000
Association					
Island group name	1,000	0	1,000	0	1,000
Code that indicates if island belongs to a geographically named island group	1,000	0	1,000	0	1,000
Island group ID (identification) number	1,000	0	1,000	0	1,000
Island subgroup number	1,000	0	1,000	0	1,000
Topology					
Interisland positional distance	1,000	0	1,000	0	1,000
Cumulative interisland positional distance	1,000	0	1,000	0	1,000
Name of nearest island to a specific island	1,000	0	1,000	0	1,000
ID (identification) number of nearest island	1,000	0	1,000	0	1,000
Positional distance to nearest island	1,000	0	1,000	0	1,000
Virtual distance to nearest island	1,000	0	1,000	0	1,000
Name of farthest island	1,000	0	1,000	0	1,000
ID (identification) number of farthest island from a specific island	1,000	0	1,000	0	1,000
Positional distance to farthest island	1,000	0	1,000	0	1,000
Oceanic region of farthest island	1,000	0	1,000	0	1,000
Latitude of antipode	1,000	0	1,000	0	1,000
Longitude of antipode	1,000	0	1,000	0	1,000
Ocean of antipode	1,000	0	1,000	0	1,000
Continent of antipode	1,000	0	1,000	0	1,000

Physiographic Parameters

Knowledge of the physiographies of islands is important to various studies; for example, to determine orthographic controls on the distribution of precipitation over islands, variations in island ecological zones with elevation, rates of water and sediment discharges from islands, history of climate change and associated changes in sea levels reflected by islands as evidenced by terraces, and crustal movements of the Earth, such as local tectonics as evidenced by uplifting and tilting of islands.

Herein, the physiographies of the 1,000 islands are described by 20 parameters that may be partitioned into five groups that provide the following:

- Basic measures of the sizes of the islands;
- Quantitative descriptors of the island groups to which the islands belong;
- Qualitative descriptors of island topographies;
- Qualitative descriptors of island shapes, and
- Dimensional measures of islands.

Size of Islands

The basic measures of the size of an island are as follows:

- Surface area — measured in units of square kilometers (km^2) in reference to sea level, and
- Elevation of the highest peak — measured in units of meters (m) above sea level.

The elevation of the highest peak describes an extremal property of an island's physiography. A more representative property is the mean elevation. Unfortunately, estimates of mean elevations have been reported for very few islands. For still fewer islands have their hypsometries, changes in surface area as a function of elevation, been reported (see, for example, Strahler, 1952).

The values of the island areas and elevations of their highest peaks were obtained from the scientific literature and from government reports and maps. The values of area range over eight orders of magnitude, from 0.1 (= 10^{-1}) km^2 to 2,175,600 (= 2.1756 x 10^6) km^2, the upper bound being the area of Grønland (ID–112). The values of highest elevation range over four orders of magnitude, from 5 (= 5 x 10^0) m to 5,030 (= 5.030 x 10^3) m, the lower bound being related to several of the islands that have very small areas and the upper bound being the highest elevation of New Guinea (ID–820).

Global perspectives on the distribution of the areas of the islands and on the distributions of the elevations of the highest peaks on the islands are given in figures 11 and 12, respectively.

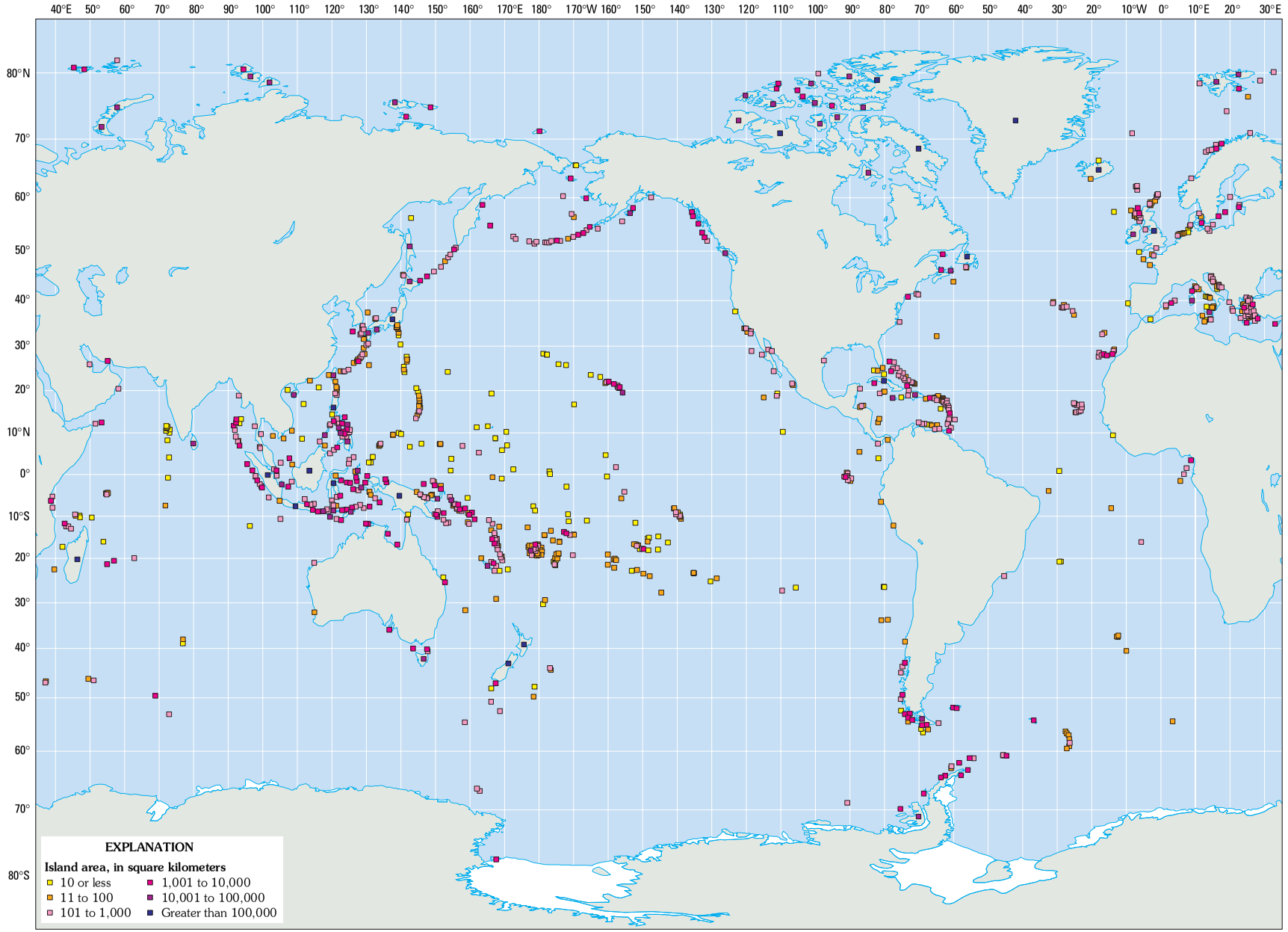
The values of area and elevation of the highest peak were assumed to be in reference to a common sea level datum. However, the literature is, for the most part, ambiguous as to which sea level datum is used for the reported values of area and elevation of highest peak. Tide gages are located at only a very few islands (see, for example, Emery and Aubrey, 1991), thus making it difficult to determine values of area and elevation of highest peak for all islands relative to a common sea level datum.

For many islands, reported values of area and elevation of highest peak differ somewhat among reference sources. In such cases, preference was given to those values reported in official government reports. If such reports could not be found, then preference was given to the values reported in the most current scientific literature unless the "weight of evidence" favored some earlier publication. Herein, the values are given to the same level of accuracy as reported in the literature, except for the few islands whose areas of less than 0.1 km^2 were rounded up to 0.1 km^2. Values reported in the literature in English units were converted to metric units of equivalent accuracy.

It should be noted that for the "low" islands, the values given for the elevations of the highest peaks may not be necessarily the highest values. In the literature, many of the low islands were said to be above sea level by certain amounts without specifying whether the values were to be interpreted as the highest values or as general average values. The literature is much more specific regarding "high" islands.

The area and the elevation of the highest peak are given for each of the 1,000 islands. Had one or the other or both of these basic measures of island size not been determined for a particular island, that island would not be part of the Primary Island Set.

For many islands, the highest peaks are unnamed, particularly for the "low" islands where the peaks, as such, are not very significant physiographic



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 11. Global perspective on the distribution of the area of the islands.

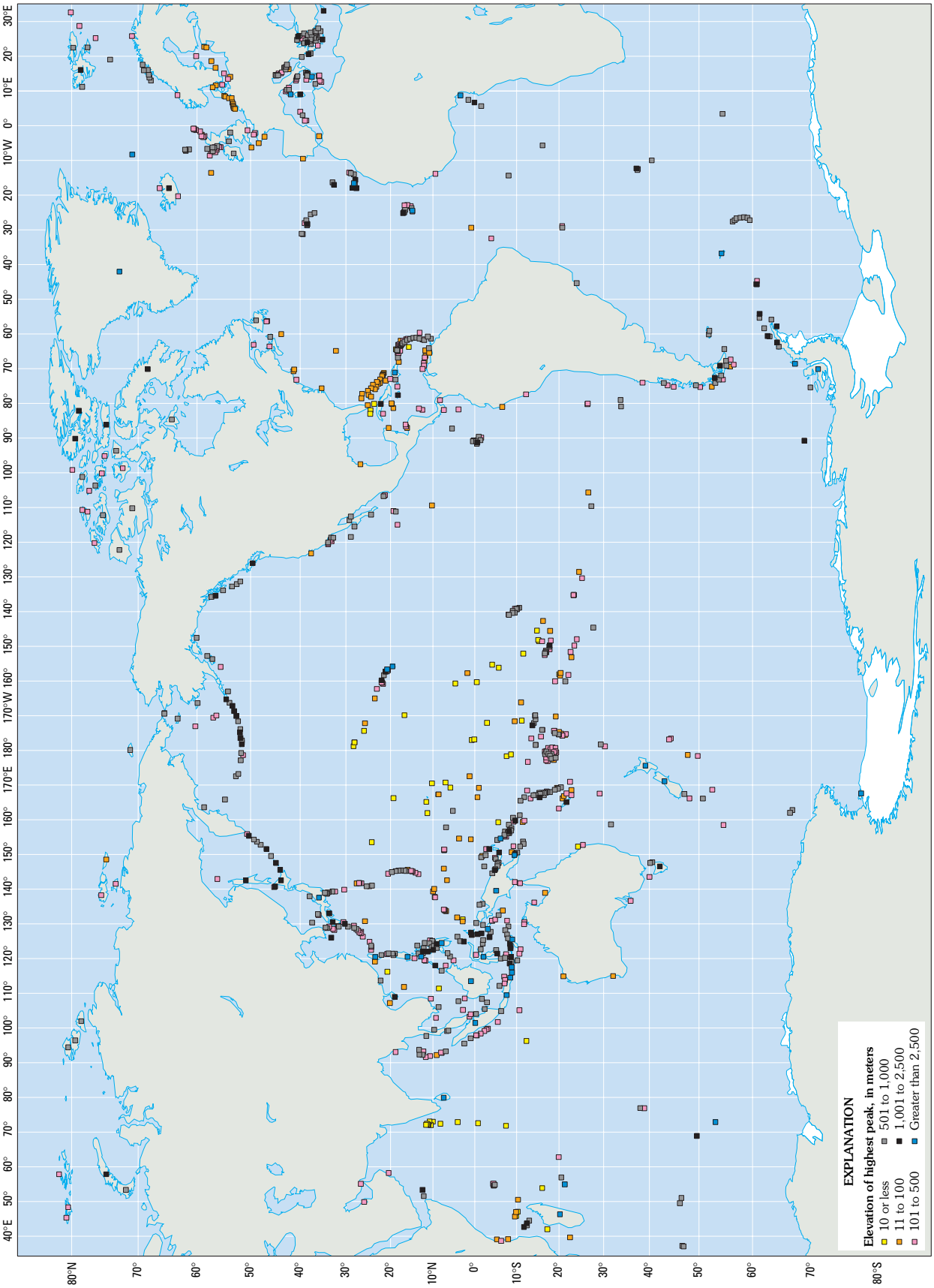


Figure 12. Global perspective on the distribution of the elevations of the highest peaks on the islands.

aspects of the islands. For the purpose of this study, the highest peaks of the islands were taken to be unnamed if the elevations of the peaks did not exceed 50 m. For the 139 islands whose highest peaks do not exceed 50 m, the names and coordinates of the highest peaks are therefore not applicable (†).

Of the 861 (= 1,000 – 139) islands whose highest peaks exceed 50 m:

- The names of the highest peaks, which were derived from the literature, are given for 552 islands; and for these islands
- The coordinates, latitude and longitude, of the highest peaks are given as decimal degree equivalents of the degree/minute values of the U.S. Board on Geographic Names; and
- For 49 additional islands, the coordinates of their highest peaks were read from maps; whereby
- The total number of islands for which the coordinate values of their highest peaks are given is 601 (= 552 + 49).

To each of these island counts, the value 139 must be added to obtain the island coverages noted in table 2 — 139 being the number of islands whose highest peaks do not exceed 50 m and, therefore, the number of islands for which names and coordinates of their highest peaks are not applicable (†).

Quantitative Descriptors of Island Groups

Associated with each island are the following characteristics of the island group to which the island belongs:

- The number of islands of the Primary Island Set, in the island group;
- The total land area of the island group; that is, the sum of the areas of the islands in the island group, and
- The percentage of the island group area represented by the area of the island.

The characteristics, particularly the number of islands in an island group, should not be construed as estimates that relate to all the islands — those within and those outside the Primary Island Set — of the island group. To illustrate, the island of Åland is indicated as belonging to an island group that consists of one island, whereas the literature suggests the number of islands in the island group to be several thousand.

Qualitative Descriptors of Island Topographies

Topography is a relevant factor in most studies of islands. It is important to theoretical analyses of island morphology, and in other studies; for example, those dealing with local climate, hydrology, geology, vegetation distribution, and economic activity. To facilitate quantitative synoptic studies of the islands, a scheme for topographically classifying islands in a systematic, consistent, and incisive manner was needed. Such a scheme could not be found in the literature. The literature does provide descriptions of the geography and topographic features of individual islands, but the descriptions vary greatly in detail. For some islands, the descriptions are seemingly nonexistent. On the basis of the topographic information provided by the literature and on the depictions of the terrains in maps, a scheme was developed for topographically classifying the islands in a uniform manner.

Considering only primary topographic characteristics, 16 types of island terrains were defined. For a given island, the classification scheme entailed the following:

- Identifying the primary topographic units, where a unit spans all or a significant portion of the island;
- Identifying the terrain type of each unit;
- Identifying the topological relations between the component units terrains, and
- Coding the topographic identifications of the terrain types and compounding the codes by using symbolic logic to correspond to the topological relations among the terrain units.

The coding is as follows. To each terrain type, a code that consists of one of four letters is assigned — H, P, T, and N — followed by a number (for example, P 3) that denotes the primary topographic feature *hill*. The numbers differentiate among the terrains that share general aspects of the terrains represented by a letter. Basically,

- The H group denotes terrains that consist of roughly horizontal surfaces but with different elevation ranges;

- The P group denotes positive topographic terrains with variations in style and degree of relative elevation;
- The T group denotes terrains that are of a tabular nature, and
- The N group denotes negative terrains with variations in style and degree of relative depression.

The global distribution of the islands belonging to the various terrain groups is shown in figure 13. More specifically, the codes are given in table 9.

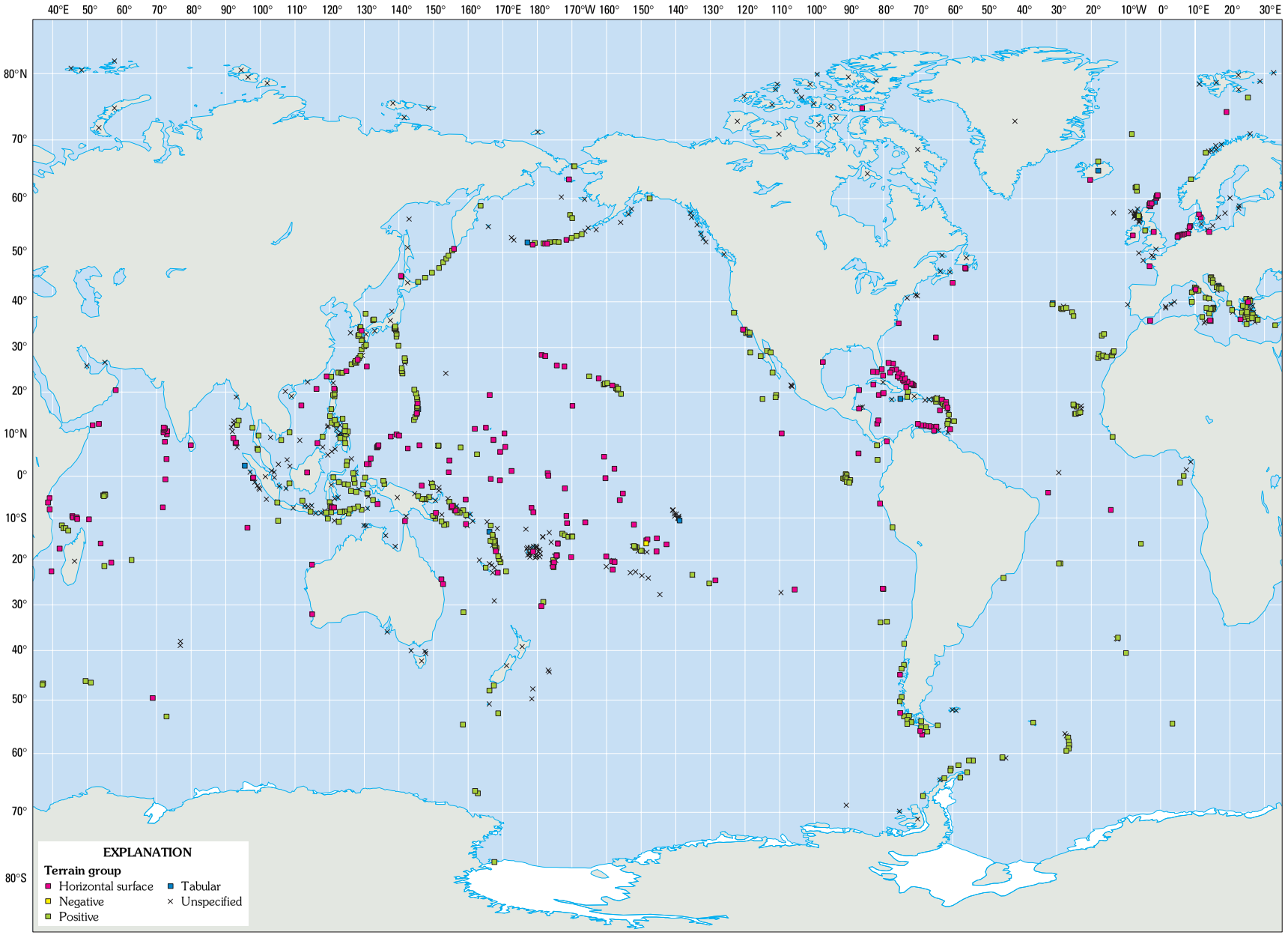
If an island has only one primary topographic unit, then the island's topographic classification is given simply by the appropriate code. If there are several primary topographic units, then the classification is given by a compound code formed of the codes of the individual units. For a topographically compound island, the connection among the component codes is defined by symbolic logic. If x and y denote two primary topographic units having the topographic classifications X and Y, respectively, then

- $X \cup Y$ denotes the classification of the union of the two units; that is, $x \cup y$ — to a first approximation, x and y are adjoining nonoverlapping units, and
- $X \supset Y$ denotes the classification where y is contained in x; that is, $x \supset y$ — to a first approximation, y is surrounded by x.

If an island has several units, $x_1, x_2, ..., x_n$, each of the same terrain type, then X, which is the union of the units, $\bigcup_{i=1}^{n} x_i$, has the classification $\bigcup_{i=1}^{n} X$, abbreviated in bold type as $\boldsymbol{X}$.

Table 9. Codification of island topographies

Count	Name	Code	Definition
1	Low island	H1	An island that has a single terrain unit that is nowhere more than 50 m in elevation
2	Lowland	H2	Unit of flat or relatively low relief that is nowhere more than 100 m in elevation
3	Rolling terrain	H3	Unit of rolling terrain with relatively low relief and such that the general elevation is more than 100 m; for example a plateau
4	Knob	P1	Unit that, in profile, appears as a pinnacle or a rounded hill
5	Conical terrain	P2	Unit whose topography forms a conical mass
6	Hill	P3	Isolated mass of relatively smooth terrain and relief of less than 700 m relative to surrounding low areas above which the isolated mass gradually rises
7	Dome	P4	Isolated uparched mass shaped; for example, as unbreached anticline(s)
8	Ridge	P5	Elongated mass, the general shape of which is like an anticline, that extends over a substantial part of the length of the island
9	Hills	P6	Unit of high, smooth-surface terrain that rises gradually from the surrounding terrain and with relative low relief of less than 700 m with respect to adjoining low areas
10	Blocky	P7	Isolated mass with roughly planar lateral boundaries
11	Mountain	P8	Rough-surfaced terrain that rises abruptly from surrounding terrain and with relief of more than 700 m relative to surrounding terrain or sea level.
12	Monocline	T1	Mass whose upper surface is planar and is uniformly tilted
13	Tabular terrain	T2	Surface appears to consist of stacked horizontal layers that decrease in lateral extent in an upward direction, and form in effect shelves
14	Apron	T3	Surface is concave-upward, such as a piedmont, abutting against or merging into hilly or mountainous terrain
15	Basinal	N1	Surface of unit is depressed relative to surrounding terrain, such as a basin or syncline
16	Valley	N2	Terrain forms in effect a valley



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 13. Global distribution of islands per terrain group.

The classification of the topographies of the 1,000 islands was limited to the identification of no more than three primary topographic units per island. Availability of information permitted the application of the terrain classification scheme to 660 islands. The quality of the information was such that classification based on 2 topographic units was limited to 100 islands and classification based on 3 topographic units was limited to 12 islands

Qualitative Descriptors of Island Shapes

The notion of the shape of an island is limited to the shape defined by the coastline of an island as represented in a map. This is the shape that is seen from the air or space and is most relevant to human activities. Several measures of shape have been proposed, none of which has proved to be entirely satisfactory. No measure can almost always differentiate in numerical terms among all shapes that are visually distinctly different. Alternately, shape may be described in qualitative terms that may be used to develop a scheme for qualitatively classifying island shapes.

A review of the basic set of maps described above, complemented by a review of maps presented in scientific reports, suggested a scheme for classifying the shapes of islands as being one of 10 generic shapes. General descriptions of the generic shapes are given in table 10.

In figure 14, schematic representations of the generic shapes are shown relative to two islands whose shapes reflect, to a first approximation, each of the 10 generic shapes.

The classification scheme for island shapes parallels that for island topographies. If an island has only one primary shape unit, then the island's shape classification is given simply by the appropriate code number. If there are more than one primary shape unit, then the classification is given by a compound code formed by the codes of the individual units — the connection between the codes being defined by symbolic logic. If x and y denote two primary units that have the shape classifications *X* and *Y*, respectively, then:

- $X \cup Y$ denotes the classification of the union of the two units; that is, $x \cup y$ — to a first approximation, x and y are adjoining, nonoverlapping units, and
- $X \supset Y$ denotes the classification where y is contained in x; that is, $x \supset y$ — to a first approximation, y is superimposed on x.

The shape classification of the 1,000 islands was limited to the identification of no more than two primary shape units per island. If the shape of an island is dominantly of a single specific type, then the island's "second" shape unit is assigned the shape type value zero (0). Of the 1,000 islands, 997 were classified as to their shape type, and of these islands, 488 were judged to be dominated by a single specific shape type.

Table 10. Descriptions of generic shapes

Name	Code	Definition
Polygonal	1	Contour formed by linear segments.
Soft Rounded	2	Contour without sharp edges or bends
Elongated	3	Smooth contour with a central axis of pronounced length relative to the length along any other axis
Calabash	4	Smooth contour with one prominent handle-like extension
Horseshoe	5	Smooth contour shaped like a horseshoe
Hourglass	6	Contour with two prominent bulgy parts connected by a narrower neck
Crazy H	7	Smooth contour with four arms that extend from a central body, like a distorted letter H
Skeletal	8	Contour witrh central axis or body with lateral armlike extensions
Amoebic	9	Contour with smooth fingers that extend randomly in several directions
Serrated	10	Contour distorted by numerous sharp indentations

The global distribution of the island shapes is shown in figure 15.

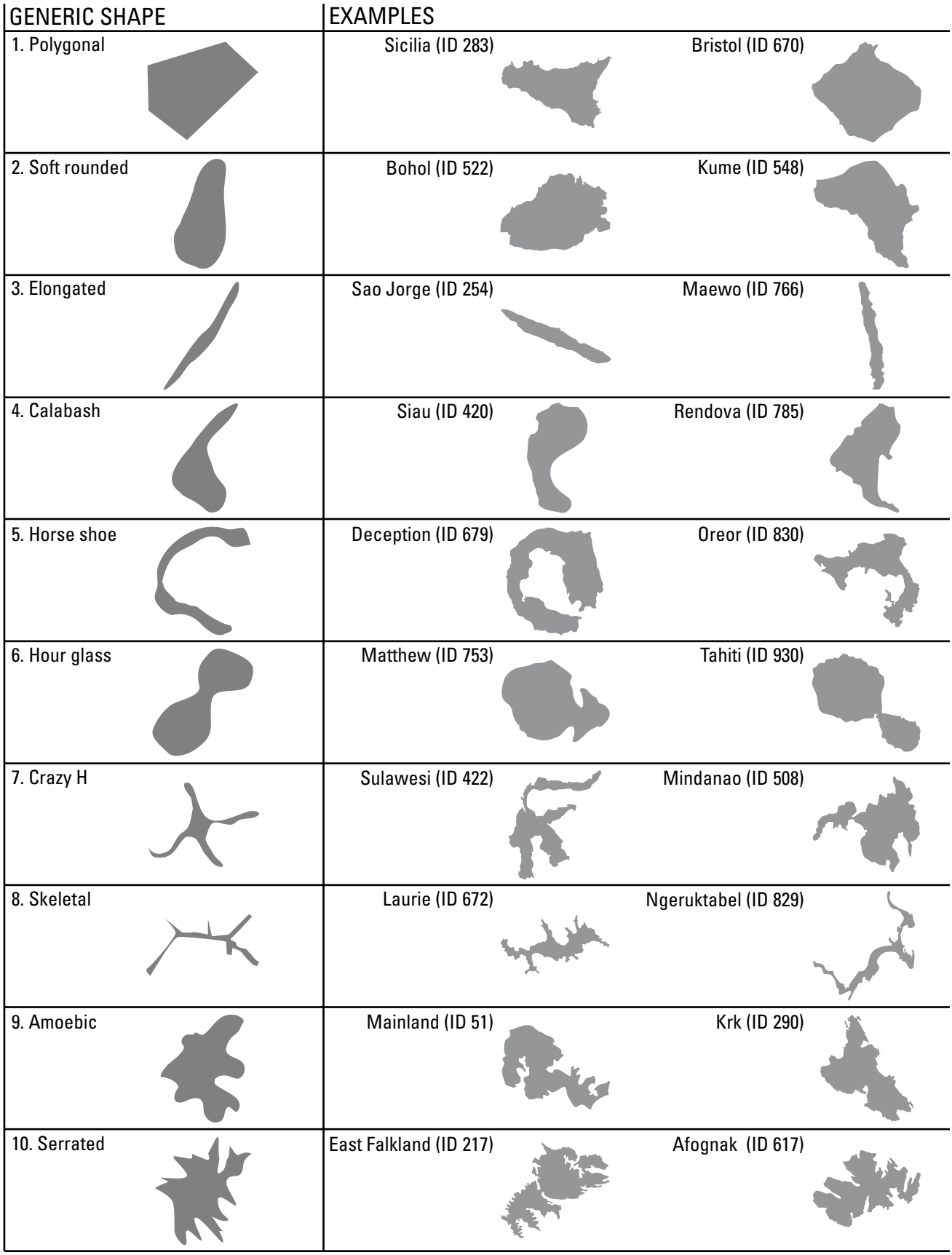
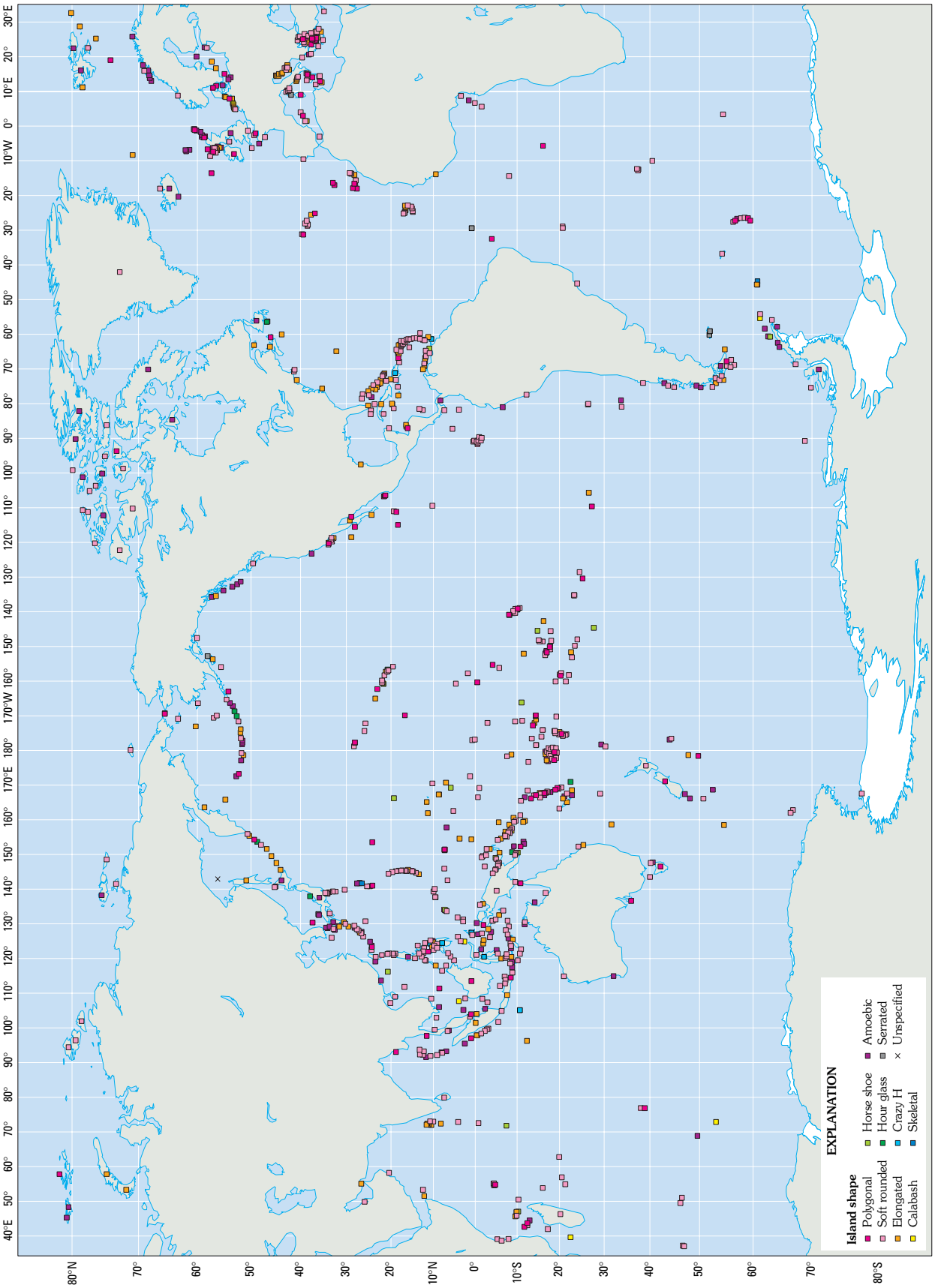


Figure 14. Shape comparison of generic and real islands.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 15. Global distribution of island shapes.

Dimensional Measures of Islands

In addition to area, the spatial extent of an island may be described in terms of various geometrical properties of an island. Among these properties are those that measure:

- The linear extent of an island;
- The ruggedness of an island's coastline, and
- The compactness of an island's shape.

These properties were determined, in part, by means of digitalization of map-depicted coastlines for 267 of the 1,000 islands, whereby geographic coordinates were obtained for sets of points distributed along the coastlines of each of the islands. Refer to Appendix B.

Two measures, in kilometers, of the linear extent of an island are length and width. For many islands whose areas are distributed along distinct axes, the values of length and width are reported in the literature. However, with few exceptions, the literature is not specific as to how the values were obtained, where along the island the values were determined, and if the values take into account the curvature of the Earth's surface, particularly in the case of the large islands. Implicitly, length is the longest spatial extent of the island. Width is often referred to as being the maximum width without stating if it is measured normal to the axis of length.

From the literature, values of length and width, expressed herein in kilometers, were obtained for 734 of the 1,000 islands.

The following additional measures, in kilometers, of the linear extent of an island were considered:

- The effective radius is the radius associated with the area of an island, assuming that the island is shaped as a circle, and
- The radius of gyration is the distance from a reference point to a point where, if the area of an island was concentrated, the moment of inertia of the concentrated area would equal the moment of inertia of the distributed area of the island.

The moment of inertia, which is measured in square kilometers, measures the "resistance" of the island to rotation by a unit force for an island viewed as a rigid two-dimensional plate of unit density.

Of the 1,000 islands:

- The effective radius was determined for each island on the basis of the island's area obtained from the literature, and
- The radius of gyration was determined for each of the 267 islands whose map-depicted coastlines had been digitized.

Refer to Appendix B.

Another linear measure of an island is the island's perimeter, which is measured in kilometers. For a given value of area, the more rugged the island's coastline, the longer the island's perimeter. In the above discussion of the shape classification scheme, two extreme cases were noted, shapes formed by smooth contours and shapes formed by contours distorted by numerous sharp indentations. The variation in the forms of the contours between these two extremes reflects the degree of ruggedness of the coastline, where the degree of ruggedness may be measured by the fractal dimension of the coastline. For a smooth contour (refer to shape type 2, figure 1, table 12), the fractal dimension has the value of 1. The more rugged coastline is the more "space filling" coastline, whereby the nearer is the coastline's fractal dimension to the value of 2 (refer to shape type 10, figure 1, table 12; Mandelbrot, 1975).

The perimeter and the coastline fractal dimension were determined for each of the 267 islands whose map-depicted coastlines had been digitized. Refer to Appendix B.

The compactness of an island's shape represents the extent to which the island "is as long as it is wide" (Richardson, 1961). The following dimensionless measures of compactness of an island were considered:

- Compactness 1, which is the function of the length and width of the island;
- Compactness 2, which is the function of the perimeter and the area of the island, and
- Compactness 3, which is the function of the area and the moment of inertia of the area of the island.

Each of the three measures of compactness was normalized, such that the normalized values lie in the range (0,1), where the value 1 attains for a circle, which is the most compact shape of a two dimensional object, and the value 0 is the limiting value of a very long, nar-

row object, such as, a very elongated island (refer to shape type 3, figure 1, table 10). Refer to Appendix C.

Among the 1,000 islands:

- Values of compactness 1 were determined for each of the islands whose values of length and width had been obtained from the literature;
- Values of compactness 2 and compactness 3 were determined for each of the 267 islands whose map-depicted coastlines had been digitized; and of these 267 islands,
  - 202 are among those whose values of compactness 1 also had been determined.

Summary

The island coverages by the 23 physiographic parameters are summarized in table 11.

Table 11. Island coverage, by physiographic parameter

Parameter	Islands				
	Specified A	Inapplicable B	Covered A+B	Unspecified C	Total A+B+C
Basic measure of size					
Area	1,000	0	1,000	0	1,000
Elevation of highest peak	1,000	0	1,000	0	1,000
Name of highest peak	552	139	691	309	1,000
Latitude of highest peak	601	139	740	260	1,000
Longitude of highest peak	601	140	740	260	1,000
Descriptions of island groups					
Number of islands in island group	1,000	0	1,000	0	1,000
Area of island group	1,000	0	1,000	0	1,000
Percentage of island group area represented by island area	1,000	0	1,000	0	1,000
Qualitative measures of topography and shape					
Topographic type	660	0	660	340	1,000
Shape type	999	0	997	3	1,000
Dimensional measures					
Length	734	0	734	266	1,000
Width	734	0	734	266	1,000
Effective radius	1,000	0	1,000	0	1,000
Radius of gyration	267	0	267	733	1,000
Perimeter	267	0	267	733	1,000
Fractal dimension of coastline	267	0	267	733	1,000
Compactness 1	734	0	734	266	1,000
Compactness 2	267	0	267	733	1,000
Compactness 3	267	0	267	733	1,000

Geologic Parameters

A first-order synthesis of the geology of the 1,000 islands is provided in terms of 15 parameters. The parameters may be partitioned into the following groups that:

- Identify the islands in relation to specific features of the Earth's surface;
- Summarily describe the geology of the islands and geologically characterize the island groups to which the islands belong;
- Account for the general chronology of island volcanism, and
- Provide a general geologic topology of the islands.

Relational Features of the Earth's Surface

Of fundamental importance to geophysical studies is the partition of the Earth's lithosphere into a number of "plates" and the movement of those plates relative to one another. Herein, the Earth's surface is considered to be partitioned into 16 plates (table 12).

Table 12. Lithospheric plates

Count	Name	Code
1	Adriatic	AD
2	Aegean	AG
3	African	AF
4	Antarctic	AN
5	Arabian	AR
6	Caribbean	CB
7	Cocos	CO
8	Eurasian	EA
9	Indian – Australian	IA
10	North American	NA
11	Nazca	NZ
12	Pacific	PA
13	Philippine Sea	PH
14	Scotian	SC
15	South American	SA
16	Turkish	TU

The plates that contain the 1,000 islands are identified in figure 16. In the case where an island lies near two plates, say P_1 and P_2, and it was difficult to discern, with the information at hand, on just which of the two plates the island is situated, the plate boundary was identified and noted as follows:

- P_1– P_2 if the boundary is a constructive margin; that is, a spreading margin, or
- P_1/P_2 if the boundary is a convergent margin where plate P_2 is being subducted under plate P_1.

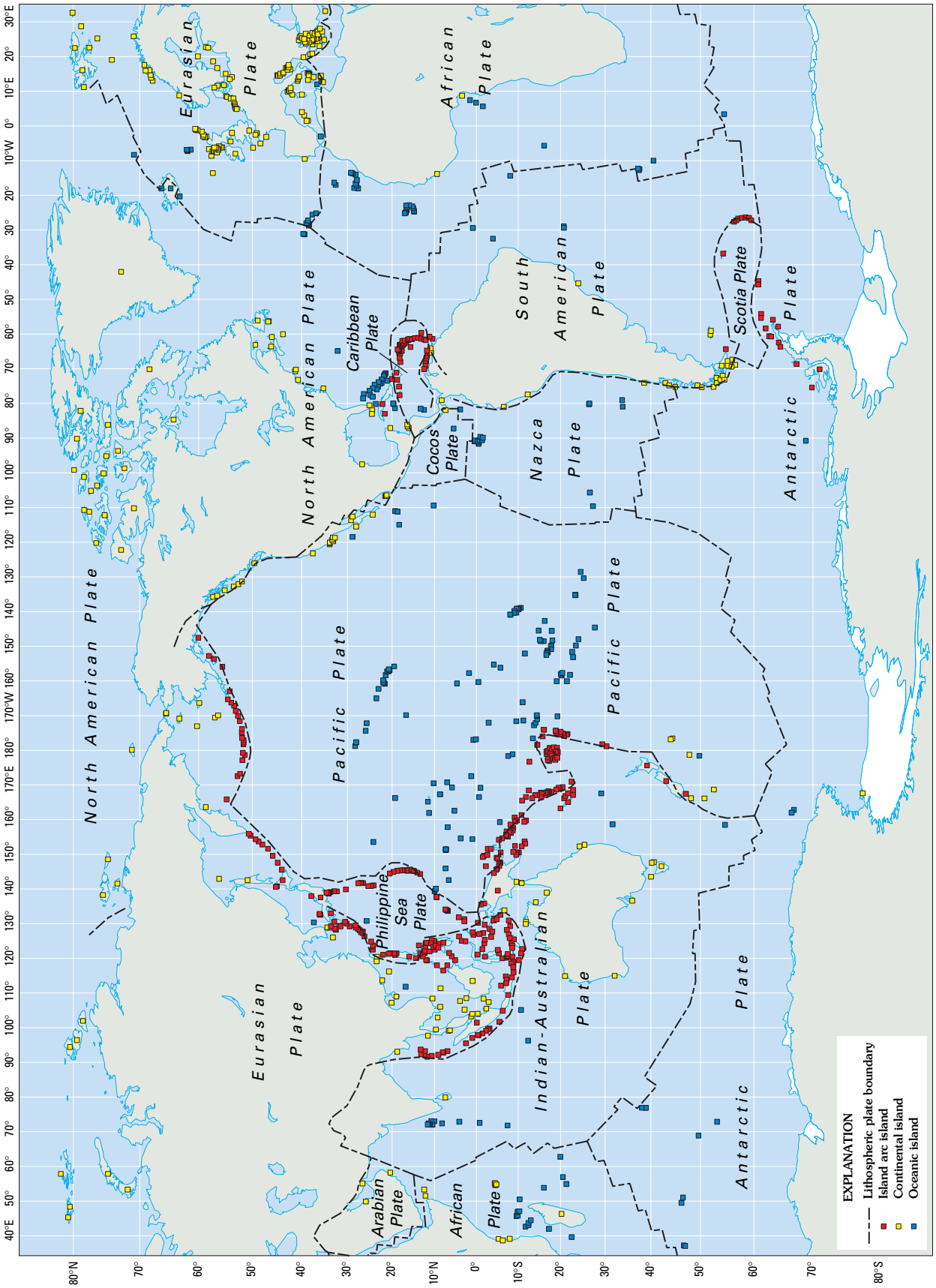
The global distribution of the islands over the lithospheric plates is shown in figure 16.

Islands are distributed along specific tracts over the ocean floor in the form of clusters or alignments, which are referred to as "chains," or in isolated states. An island tract is characterized as being of a common or closely similar geologic origin; this is a more or less distinct geologic process that has led to the occurrence of the islands along a given tract. However, despite the common basic geology that underlies a given tract, variations are found in the geologic characterization of the individual islands that are on the tract. Each tract conveys categorical information that is referred to as "quipu," which is the name of bundles of knotted ropes used by the Incas to transmit information. Six quipu categories are listed in table 13.

Table 13. Quipu categories

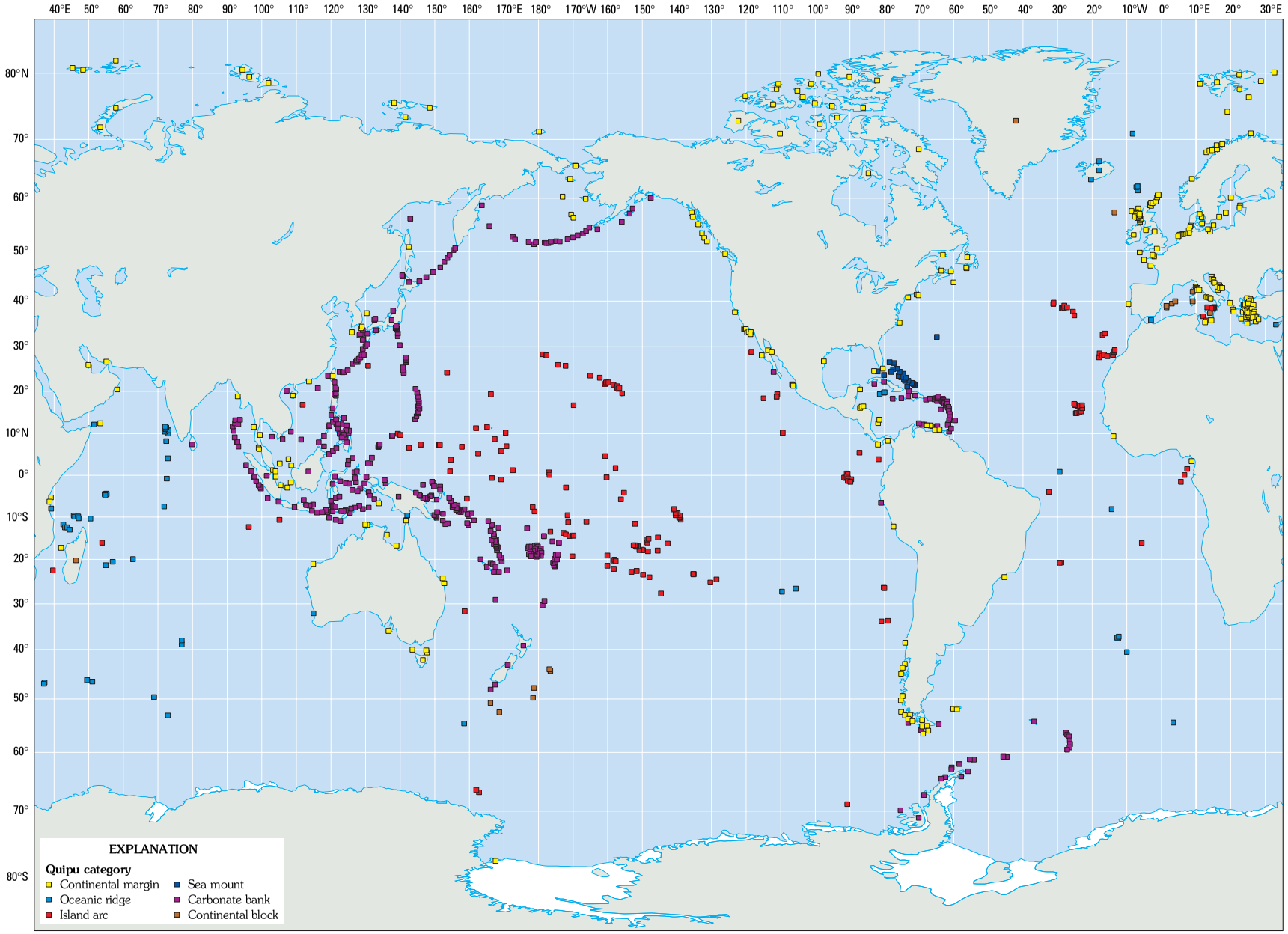
Count	Category	Code
1	Islands on a continental margin	α
2	Islands on a spreading center or an oceanic ridge of other origin	β
3	Islands within an island arc	γ
4	Islands on sea mounts	δ
5	Islands on carbonate oceanic banks	ε
6	Islands on continental blocks	ζ

Each of the 1,000 islands is coded according to its quipu category. The quipu categories associated with the islands are shown in figure 17.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 16. Global distribution of islands per lithospheric plates.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 17. Global distribution of islands per Quipu category.

Geologic Classification

The geologic type of each of the 1,000 islands is identified by an alphanumeric code; the alpha part identifies the geologic "class" of an island, and the numeric part, the geologic "species" of an island. The geologic class is noted by one of three letters, A, C or O, to indicate the general geologic aspects shared by the island of a particular class.

Along convergent plate margins, ridges form island arc systems. The ridges tend to have an arcuate pattern, the inner sides being concave to the adjacent continents and the outer sides being fronted by deep trenches where ocean depths are in excess of the adjacent ocean floor. Where transcurrent fault zones are large, the arcuate pattern of the ridges is distorted, the resultant pattern being referred to as a "fractured island arc." In general, the arcuate ridges are paired; the outer ridge comprises sedimentary rocks, and the inner ridge, mainly volcanic material. The arc-trench systems, which may be several thousand kilometers in length with widths of only a few hundred kilometers, are parts of two major active orogenic belts that girdle the Earth, the Eurasian–Melanesian and the East Asian–Cordilleran, or the circum-Pacific (Wilson, 1954). The emerged portions of the ridges make up the class A islands.

The class C islands, (that is, the continental islands), are those islands that rise above the Continental Shelf, or slope, and islands that are associated with isolated continental fragments. Among the isolated continental islands are the Seychelles, which were connected to Madagascar in the Mesozoic or early Tertiary but now, as a consequence of plate tectonics, remotely located in the northwestern sector of the Indian Ocean. Islands included in class C vary from very large blocks to small rocky islands and reefs. Included are islands along the continental margins that are remnants of Pleistocene moraines, stabilized deposits of terrigenous and bioclastic sands, and aerial exposures of carbonate formation.

The remaining islands are grouped as class O islands. Most of these are directly or indirectly the product of volcanism associated with spreading centers, abyssal flood basalts, or ocean basin volcanoes. Those indirectly attributed to volcanism are the islets of atolls, which are coraline formations supported on the flanks of submerged ocean basin volcanoes. Included in class O are islands associated with carbonate banks that rise above the deep ocean floor.

The class C, A and O islands are partitioned into 11, 5 and 8 subclasses, respectively, referred to as "species." To fully account for the Earth's dry-land surface, the continents, which in a geographic sense are islands, also, are assigned to class C. The continents are assumed not be geologically differentiated among themselves, whereby the species of each continent, as such, is indicated by the number zero (0; table 14).

Table 14. Continent and island geologic types

Count	Category	Subcategory	Code
		Continents	
1	Continental	Continent	C-0
		Islands	
1	Continental	Tectonic block	C–1
2		Structural block	C–2
3		Margin – Composite	C–3
4		Margin –Igneous/metamorphic	C–4
5		Margin – Volcanic	C–5
6		Margin – Sedimentary	C–6
7		Margin – Carbonate	C–7
8		Margin – Depositional	C–8
9		Orogenic – Cordilleran Archipelago	C–9
10		Orogenic – Alpine Archipelago	C–10
11		Shield/Platform Archipelago	C–11
1	Arc	Orogenic	A–1
2		Outer Arc	A–2
3		Carbonate/volcanic	A–3
4		Carbonate	A–4
5		Volcanic/mafic	A–5
1	Oceanic	Carbonate Bank/ridge	O–1
2		Nonvolcanic in an atoll	O–2
3		Makatea/no volcanic exposed	O–3
4		Carbonate/volcanic	O–4
5		Volcanic/mafic	O–5
6		Volcanic in an atoll	O–6
7		Makatea/volcanic exposed	O–7
8		Plateau volcanic	O–8

Each of the 1,000 islands is classified as to its geologic type.

The global distributions of the islands per their geologic classes is shown in figure 18, and per their geologic species conditioned on the geologic classes A, C and O, respectively are shown in figures 18 though 20. Figure 22 shows the global distribution of the islands that comprise carbonate rocks, (that is, the A–4, C–7 and O–1 islands); volcanic rocks, (that is, the A–5, C–5 O–5, O–6 and O–7 islands); and carbonate and volcanic rocks, (that is, the A–3, O–4 and O–7 islands).

A metric was devised for quantitatively measuring the extent of difference between two islands as reflected by their geologic types, the difference being termed the "geologic distance." The geologic distance assumes 1 of 18 discrete values in the range (0, 200):

0	**5**	**10**	**15**	**20**	**25**
30	**35**	**40**	**50**	**55**	**60**
100	**120**	**140**	**160**	**180**	**200**

If two islands are of the same geologic type, then the geologic distance between them is zero (0), no matter how far apart the two islands are situated on the surface of the Earth. Geologic distance equal to 0 indicates that the two islands evolved by means of the same kind of geologic process in a common geologic province marked by the first-level geologic classifications of the islands. At most, the geologic distance between two islands is 200, which indicates that the islands have evolved by means of distinctly different geologic processes in different geologic provinces. The geologic distance between one island and the next along the tract of the Alisida is specified (table 15).

The islands belong to 1 of 299 island groups. The geologic class of an island group is defined in reference to the geologic classes of the islands that belong to the island group. If the islands of an island group are all of the same geologic class A, C or O, then the island group is of the same geologic class, which is indicated by the appropriate geologic class code. For example, all the islands that belong to the Fiji island group are class A islands, and, therefore, the Fiji island group is a geologic class A island group. If, however, the islands in an island group are of different geologic classes, then the geologic class of the island group is defined to be jointly of those classes, which is indicated by the appropriate geologic class codes arranged in alphabetic order. For example, the Greater Sunda island group has geologic class A and C islands, and, therefore, the island group is designated as being of geologic class AC. For each island, the geologic class of its associated island group is given.

Volcanism

The 1,000 islands are partitioned into two sets — one set including those islands on which there are no volcanoes, and the other set, those islands on which there are volcanoes. Among the islands in the first set are the islets of atolls that are supported on submerged volcanic sea mounts. For islands in the first set, there obviously has been no volcanic activity, and, therefore, the islands are accordingly marked by the code letter N, which indicates that any attribute of volcanism is non-applicable. An island in the second set is coded to indicate the most recent time when volcanism was active on the island — HI (historical), HO (Holocene), P (prior to Holocene), † (not applicable), and ‡ (not determined).

The global distribution of the islands per the most recent period of volcanic eruption is shown in figure 23.

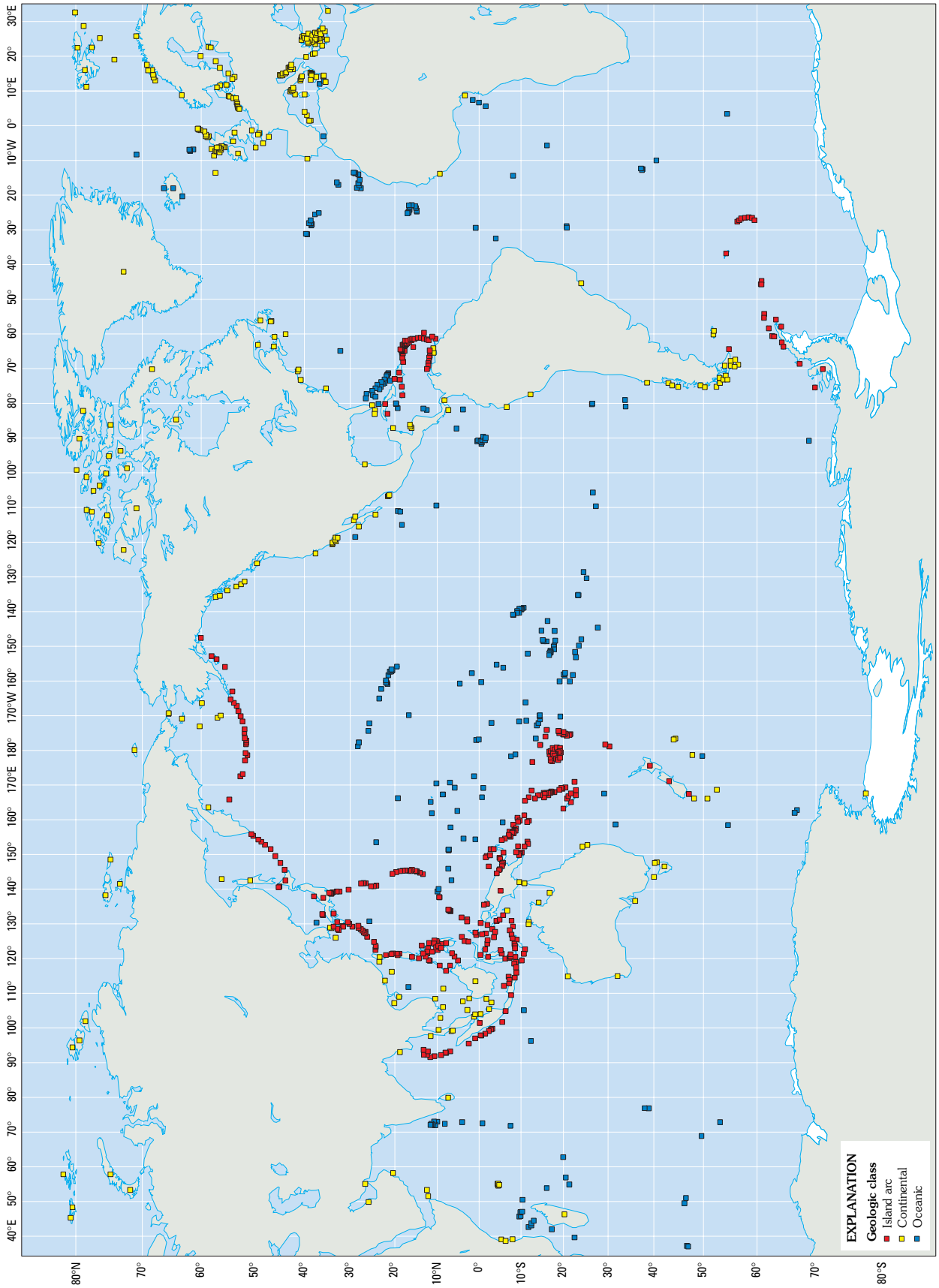
Geologic Topology

The geologic topology of the islands is described in reference to an island's geologic "neighbors." Each island has three geologic neighbors — the nearest island of the same geologic class and the two nearest islands of the other two geologic classes. The positional distances between geologic neighbors are great circle distances measured in kilometers . See Appendix A.

For each island, its geologic neighbor is identified by name, ID number and geologic class, and the positional distance between the islands is given.

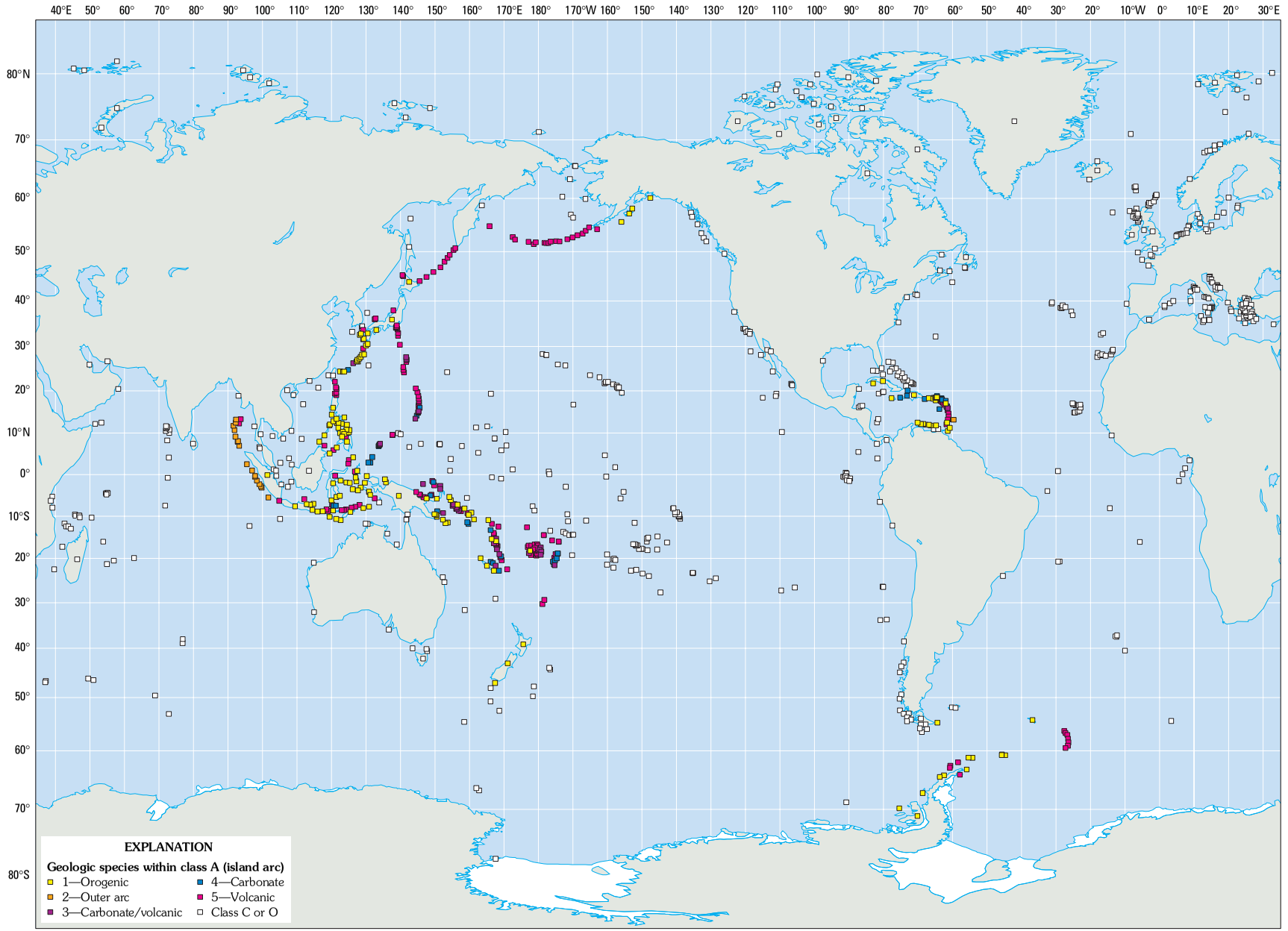
Summary

The island coverages by the 15 geologic parameters are summarized in table 16.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 18. Global distribution of islands per geologic class.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 19. Global distribution of islands per geologic species conditioned on geologic class A.

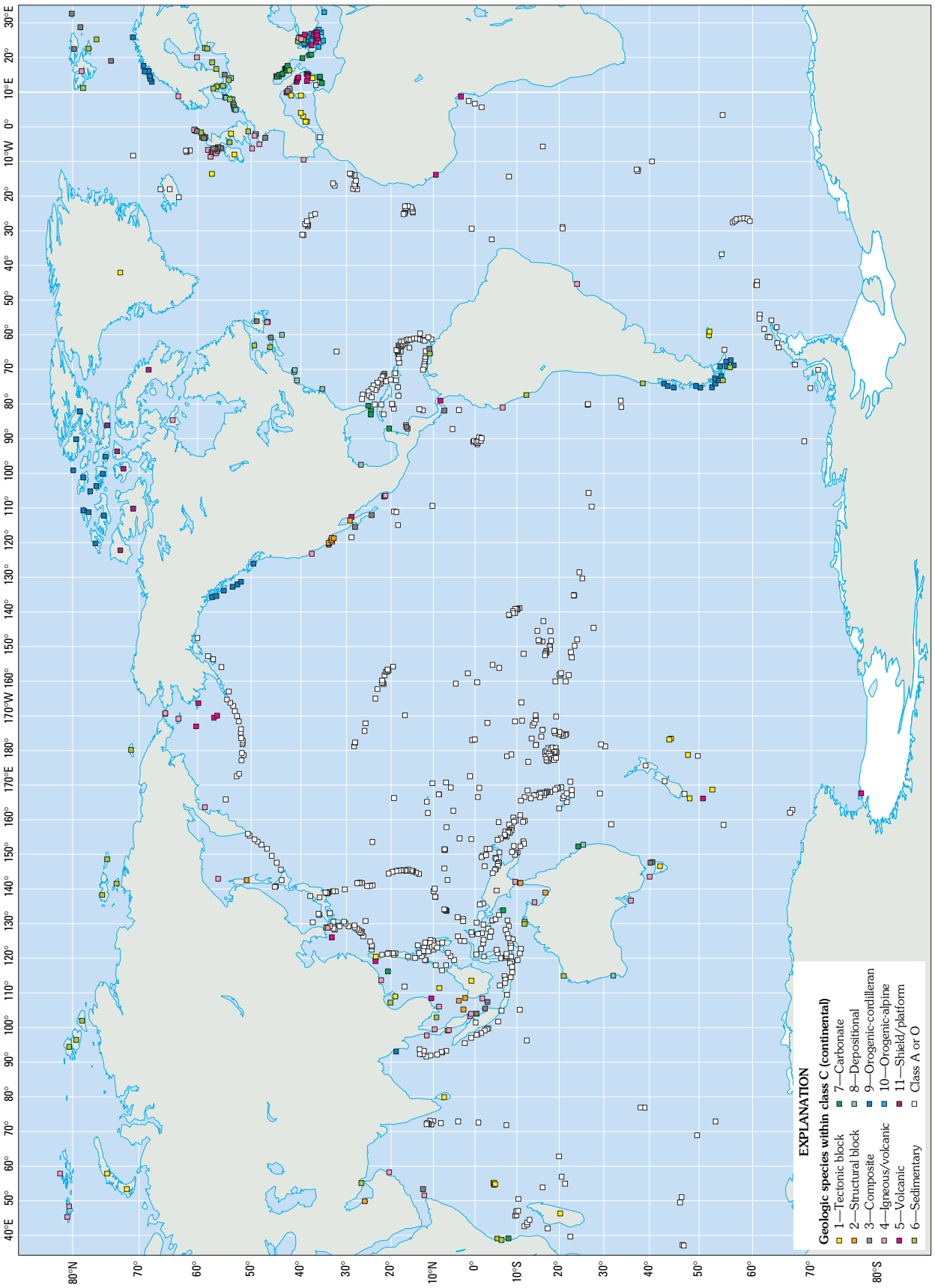
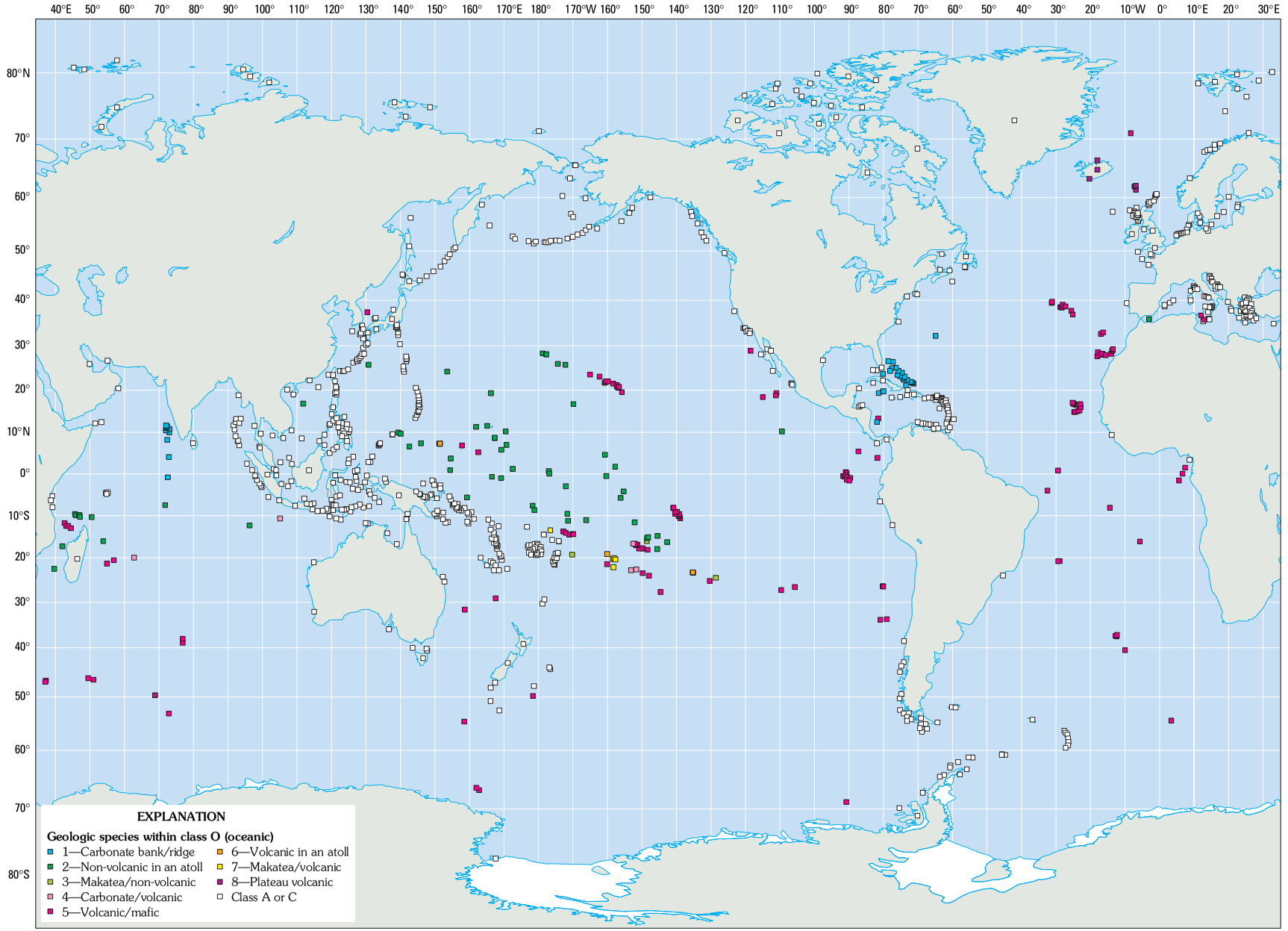


Figure 20. Global distribution of islands per geologic species conditioned on geologic class C.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 21. Global distribution of islands per geologic species conditioned on geologic class O.

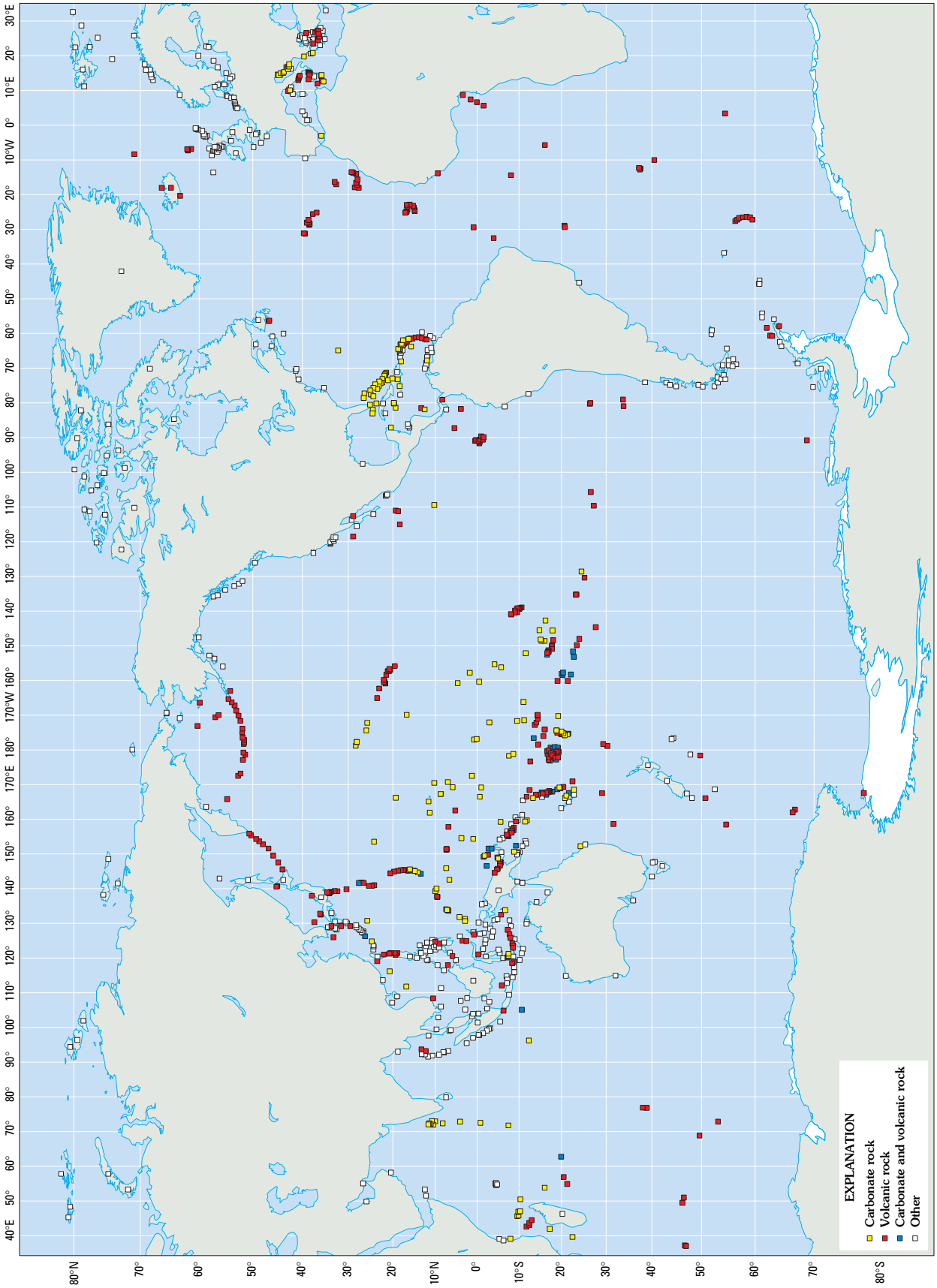


Figure 22. Global distribution of islands composed of carbonate or volcanic rocks.

Table 15. Geologic distance between two islands of specific geologic types

	C-0	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	C-11	A-1	A-2	A-3	A-4	A-5	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8
C-0	0	30	50	50	50	50	50	50	50	50	50	40	200	240	240	240	240	180	240	240	240	240	240	240	180
C-1	30	0	20	40	40	40	40	40	40	40	40	40	160	200	200	200	200	180	200	200	200	200	200	200	180
C-2	50	20	0	30	30	30	30	30	30	25	25	30	160	200	200	200	200	180	200	200	200	200	200	200	180
C-3	50	40	30	0	20	20	20	20	20	30	30	30	200	160	200	200	200	180	200	200	200	200	200	200	160
C-4	50	40	30	20	0	20	20	20	20	30	30	30	200	200	200	200	200	200	200	200	200	200	200	200	180
C-5	50	40	30	20	20	0	20	20	20	30	30	30	200	200	180	200	120	200	180	200	160	120	180	180	180
C-6	50	40	30	20	20	20	0	10	10	30	30	30	180	160	200	160	200	160	200	160	200	200	200	200	200
C-7	50	40	30	20	20	20	10	0	10	30	30	30	200	180	180	120	200	120	160	120	200	200	180	180	200
C-8	50	40	30	20	20	20	10	10	0	30	30	30	200	180	200	180	200	180	200	180	200	200	200	200	200
C-9	50	40	25	30	30	30	30	30	30	0	10	30	140	160	200	200	200	200	200	200	200	200	200	200	200
C-10	50	40	25	30	30	30	30	30	30	10	0	30	180	160	200	200	200	200	200	200	200	200	200	200	200
C-11	40	40	30	30	30	30	30	30	30	30	30	0	200	160	160	160	160	200	200	200	200	200	200	200	200
A-1	200	160	160	200	200	200	180	200	200	140	180	200	0	20	50	50	50	200	200	200	200	200	200	200	200
A-2	240	200	200	160	200	200	160	180	180	160	160	160	20	0	50	50	50	180	180	180	200	200	200	200	200
A-3	240	200	200	200	200	180	200	180	200	200	200	160	50	50	0	30	10	180	180	180	160	180	160	180	200
A-4	240	200	200	200	200	200	160	120	180	200	200	160	50	50	30	0	30	160	160	180	180	200	160	180	200
A-5	240	200	200	200	200	120	200	200	200	200	200	160	50	50	10	30	0	200	180	200	160	100	180	180	180
O-1	180	180	180	180	200	200	160	120	180	200	200	200	200	180	180	160	200	0	10	5	35	40	25	30	60
O-2	240	200	200	200	200	180	200	160	200	200	200	200	200	180	180	160	180	10	0	5	25	30	15	20	50
O-3	240	200	200	200	200	200	160	120	180	200	200	200	200	180	180	180	200	5	5	0	30	35	20	25	55
O-4	240	200	200	200	200	160	200	200	200	200	200	200	200	200	160	180	160	35	25	30	0	5	10	5	25
O-5	240	200	200	200	200	120	200	200	200	200	200	200	200	200	180	200	100	40	30	35	5	0	15	10	20
O-6	240	200	200	200	200	180	200	180	200	200	200	200	200	200	160	160	180	25	15	20	10	15	0	5	35
O-7	240	200	200	200	200	180	200	180	200	200	200	200	200	200	180	180	180	30	20	25	5	10	5	0	30
O-8	180	180	180	160	180	180	200	200	200	200	200	200	200	200	200	200	180	60	50	55	25	20	35	30	0

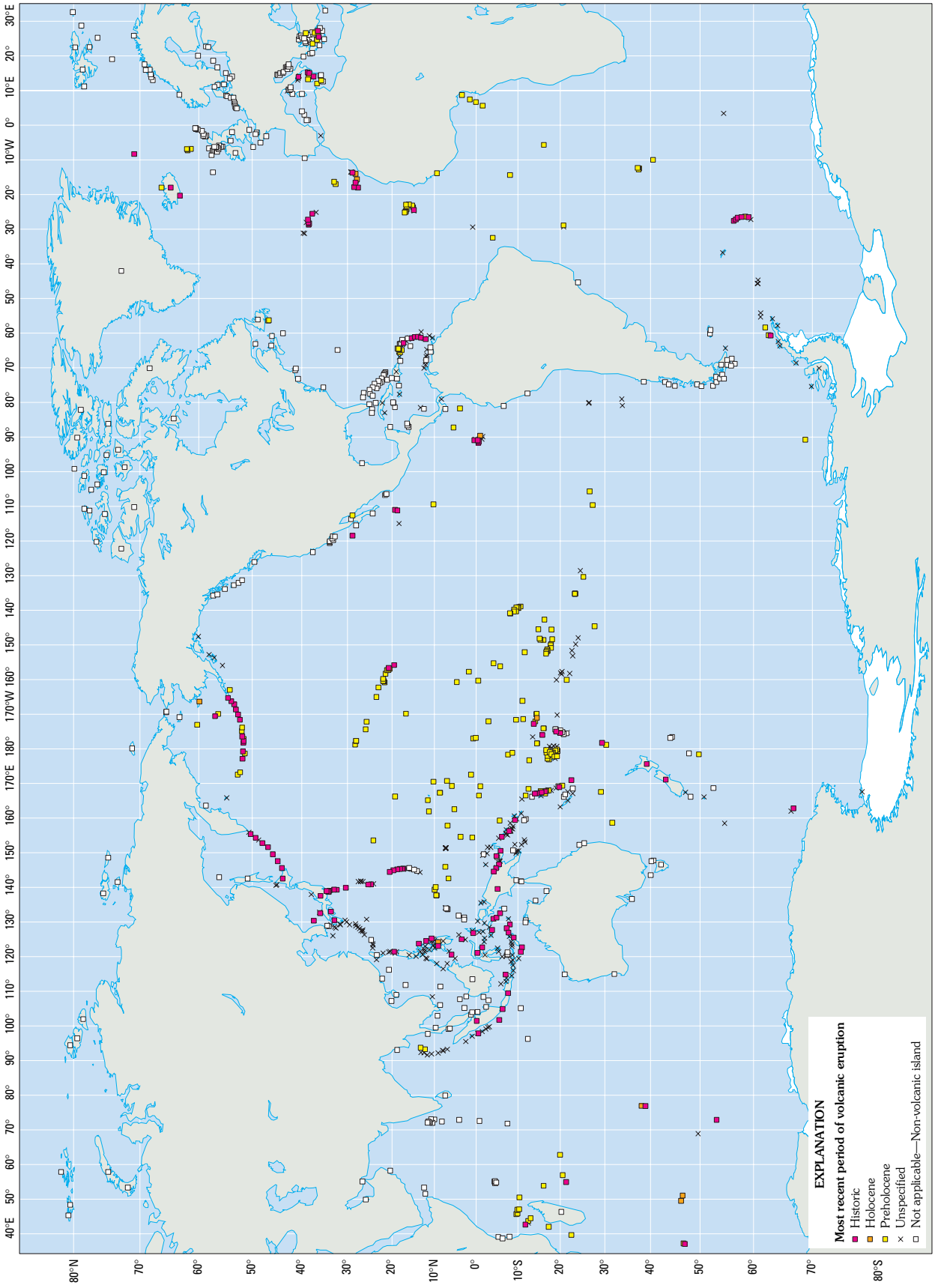


Figure 23. Global distribution of islands per most recent period of volcanic eruption.

Table 16. Island coverage, by geologic parameter

Parameter	Islands				
	Specified A	Inapplicable B	Covered A+B	Unspecified C	Total A+B+C
Lithospheric plate	1,000	0	1,000	0	1,000
Quipu	1,000	0	1,000	0	1,000
Island geologic type	1,000	0	1,000	0	1,000
Island group geologic class	1,000	0	1,000	0	1,000
Volcanism	1,000	0	1,000	0	1,000
Interisland geologic distance	1,000	0	1,000	0	1,000
Name of nearest type C island	1,000	0	1,000	0	1,000
ID (identification) number of nearest type C island	1,000	0	1,000	0	1,000
Positional distance to nearest type C island	1,000	0	1,000	0	1,000
Name of nearest type A island	1,000	0	1,000	0	1,000
ID (identification) number of nearest type A island	1,000	0	1,000	0	1,000
Positional distance to nearest type A island	1,000	0	1,000	0	1,000
Name of nearest type O island	1,000	0	1,000	0	1,000
ID (identification) number of nearest type O island	1,000	0	1,000	0	1,000
Positional distance to nearest type O island	1,000	0	1,000	0	1,000

Hydrologic Parameters

There are very few islands for which there are hydrologic observations. Of those islands, few have sufficiently long records on the spatial and temporal coverage of the hydrologic fluxes — runoff, precipitation, and evapotranspiration — from which reasonably accurate estimates of the water balances of the islands may be obtained. Moreover there is no analytical framework by which the water balance of a particular island may be estimated from the water balances of other islands. For these reasons, a description of the hydrology of an island is limited to a hydrologic sketch of the island's surface-water landscape.

Hydrologic Sketch

The hydrologic sketch of an island is expressed in terms of the presence or absence of nine specific hydrologic features that relate to rivers, springs, wetlands, lakes, and reservoirs. With respect to the sketches:

- The presence or absence of a feature is noted by the numerical score 1 or 0, respectively;
- No account was taken of the frequency with which a particular feature is present on a given island — a numerical score 1 implies the presence of at least one expression of that feature;
- Rivers and springs are perennial if their discharges are sustained throughout the year and they are seasonal if they flow only during the "rainy season";
- Wetlands refer to swamps, bogs, or marshes that are significant hydrologic aspects of an island;
- Lakes refer to natural water bodies and are accounted for independently of lakes that have been transformed into reservoirs;

- No account was taken of the quality of lake waters other than a general distinction between fresh and brackish where fresh implies potable in terms of salinity;
- Rooftop catchments were not considered in accounting for the presence or absence of surface reservoirs;
- The presence of a perennial river or spring indicates the likelihood, though not the certainty, of the presence of a ground-water aquifer, but
- The absence of each of the hydrologic features does not necessarily imply the absence of aquifers.

Of the 1,000 islands:

- 643 are coded as CS, which indicates that for each of these island, its hydrologic sketch is complete; that is, all hydrologic features are scored;
- 211 are coded as PS, which indicates that for each of these islands, its hydrologic sketch is partially complete; that is, some of, but not all, the features are scored, and
- 146 (= 1,000 – 643 – 211) are coded as ‡, which indicates that for each of these islands, its hydrologic sketch is totally incomplete; that is, none of the features are scored owing to lack of success in obtaining pertinent information.

Many of the islands with incomplete sketches are located at high latitudes. Above 60° and below -60° latitude, many islands are extensively and permanently covered by ice and snow, and other islands have liquid-phase hydrologies only during short summer seasons. For these islands, in terms of the hydrologic features considered herein, hydrologic sketches are not very meaningful, at least not in the form of complete sketches. Of the 643 islands with complete sketches, 597 islands are located at low or mid-latitude where the sketches are more meaningful.

For the subset of islands with complete information relative to perennial and seasonal rivers jointly, to perennial and seasonal springs jointly, and to freshwater and brackish water lakes jointly, the global distributions of these paired hydrologic features are shown in figures 24, through 26, respectively. The global distributions of the islands with wetlands and the islands with surface reservoirs are shown in figures 27 and 28, respectively.

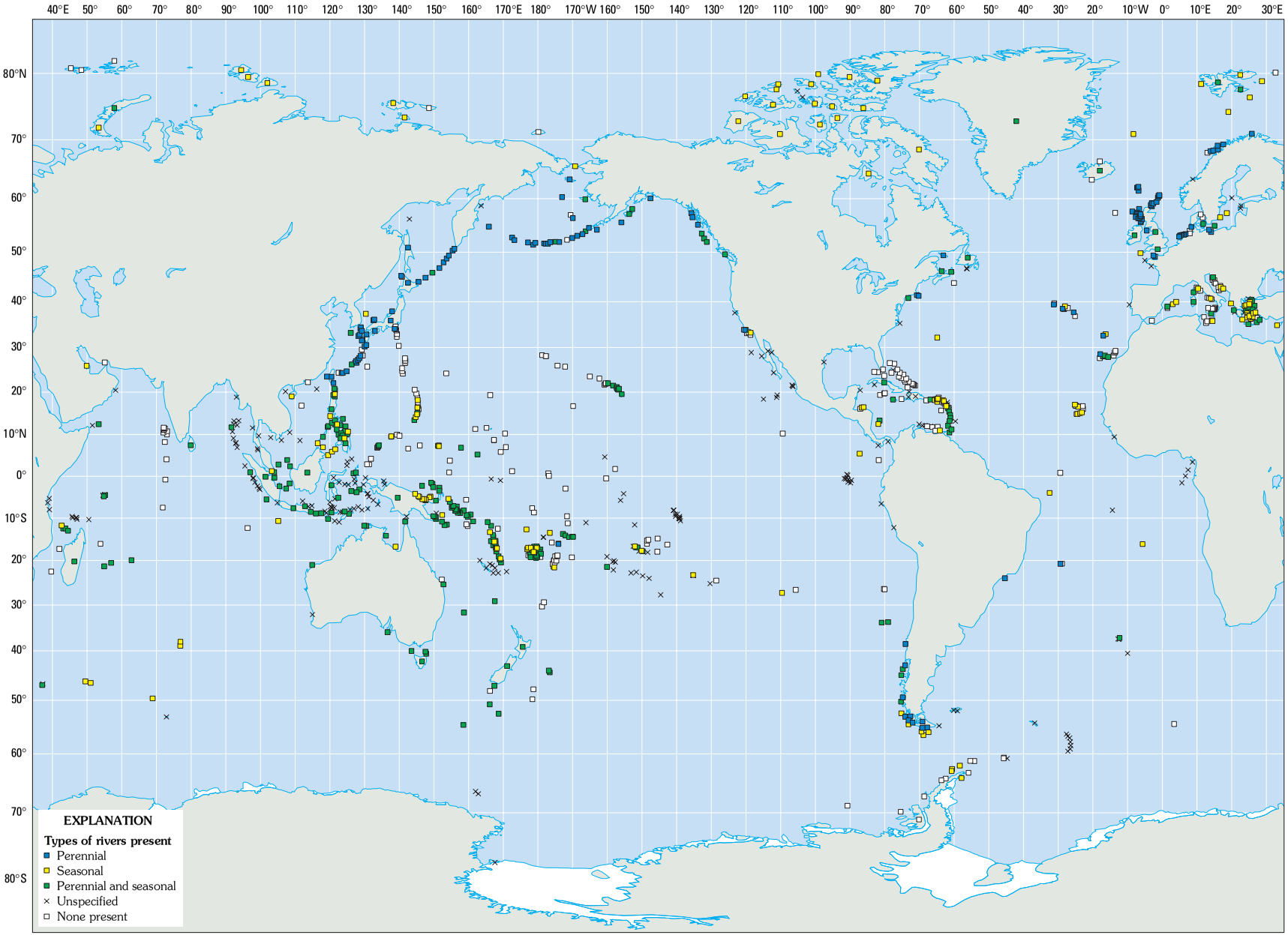
For the islands with complete information regarding the presence or absence of each individual hydrologic feature covered by figures 24, through 26, their global distributions are given in Appendix G.

Summary

From the hydrologic literature, sketches could be constructed for few islands. Personal communications with hydrologists who have first-hand knowledge of the islands enabled a substantial island coverage by the nine hydrologic parameters to be obtained, as listed in table 17.

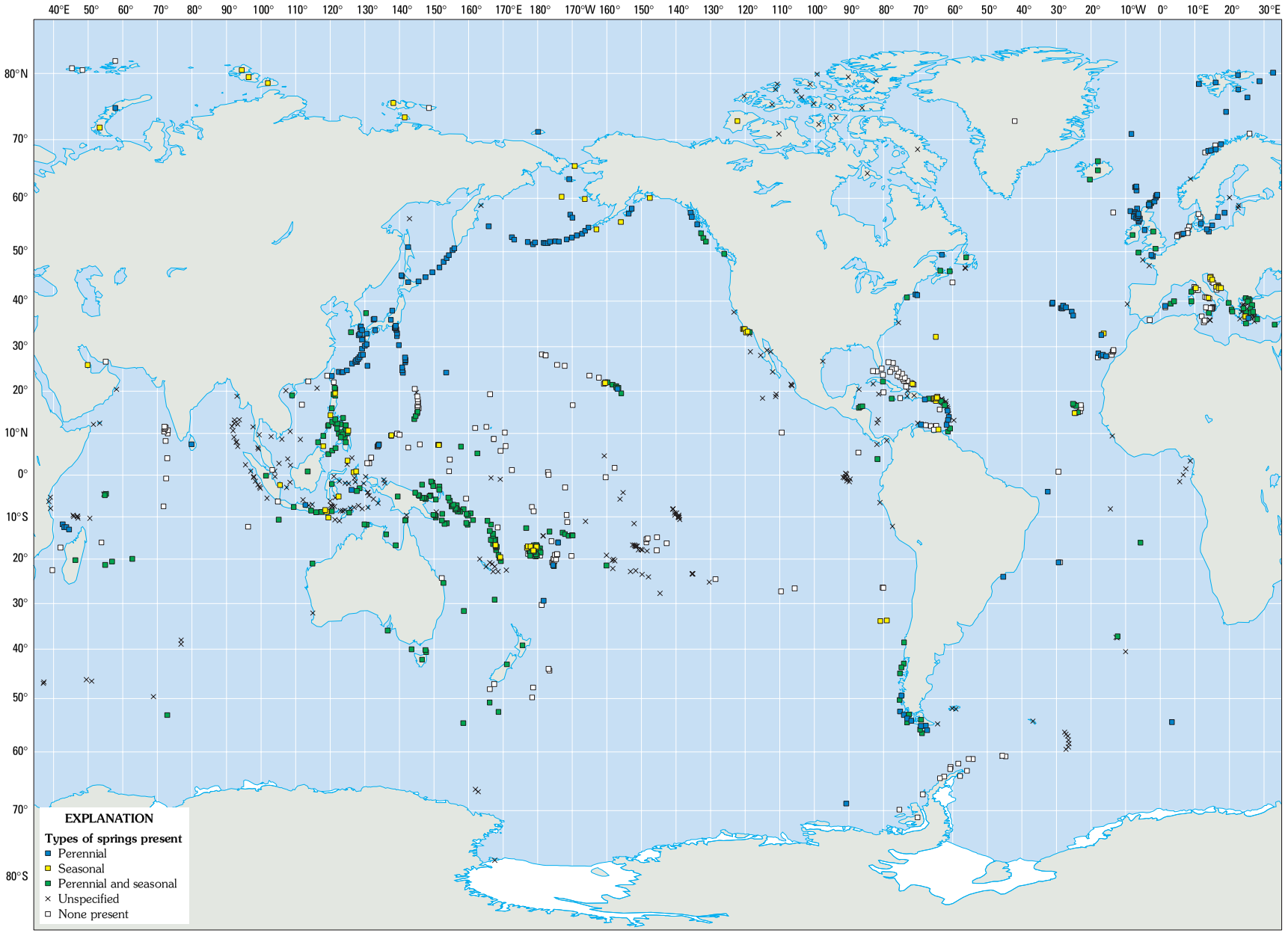
Table 17. Island coverage, by hydrologic parameter

	Islands				
Parameter	Specified A	Inapplicable B	Covered A+B	Undetermined C	Total A+B+C
Hydrologic sketch code	1,000	0	1,000	0	1,000
Perennial river	794	0	794	206	1,000
Seasonal river	784	0	784	216	1,000
Perennial spring	776	0	776	224	1,000
Seasonal spring	727	0	727	273	1,000
Wetlands	715	0	715	285	1,000
Freshwater lake	815	0	815	185	1,000
Brackish water lake	690	0	690	310	1,000
Surface reservoir	812	0	812	188	1,000



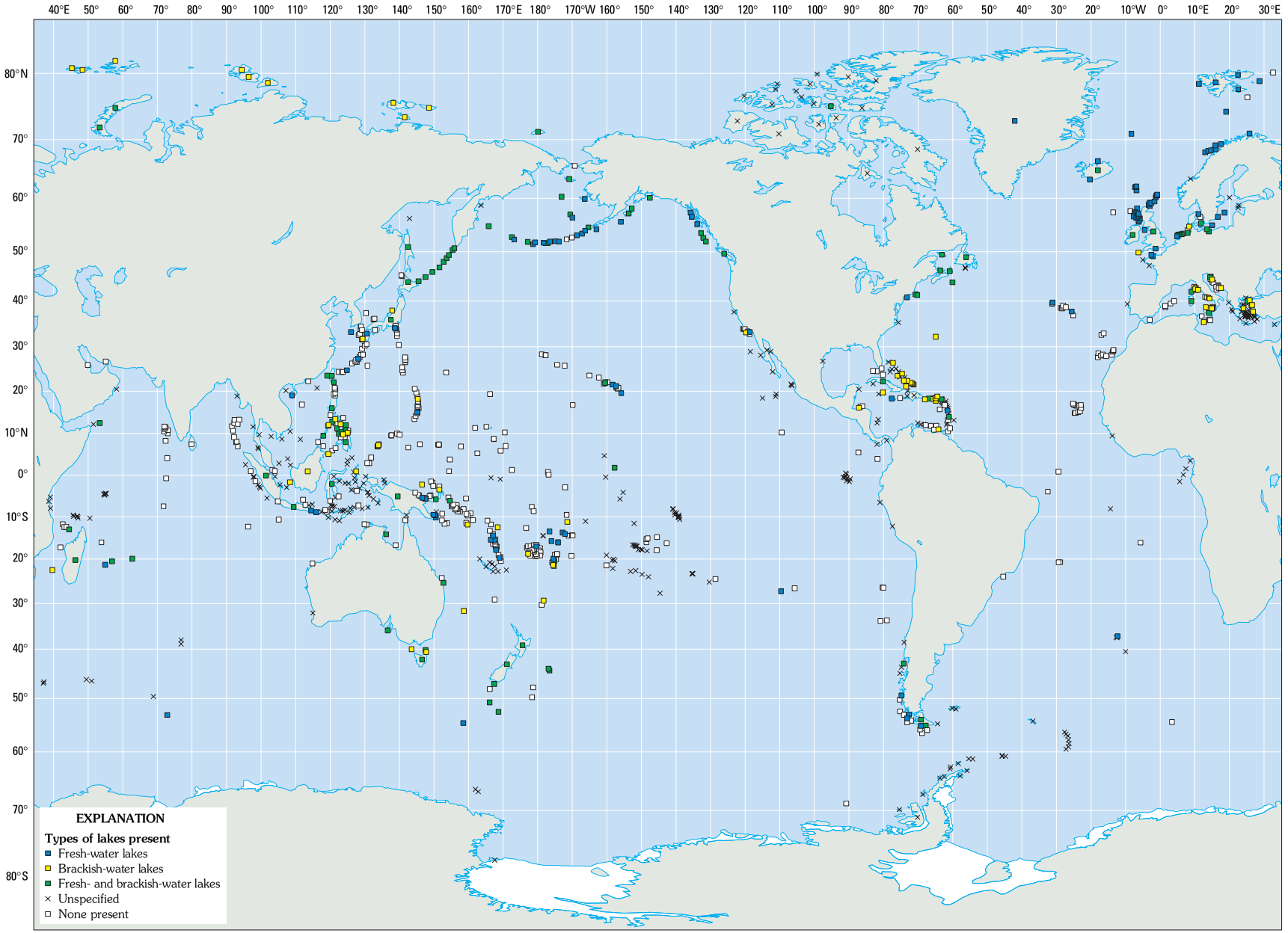
Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 24. Global distribution of island hydrologic features — Perennial or seasonal rivers.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 25. Global distribution of island hydrologic features — Perennial or seasonal springs.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 26. Global distribution of island hydrologic features — Fresh- or brackish-water lakes.

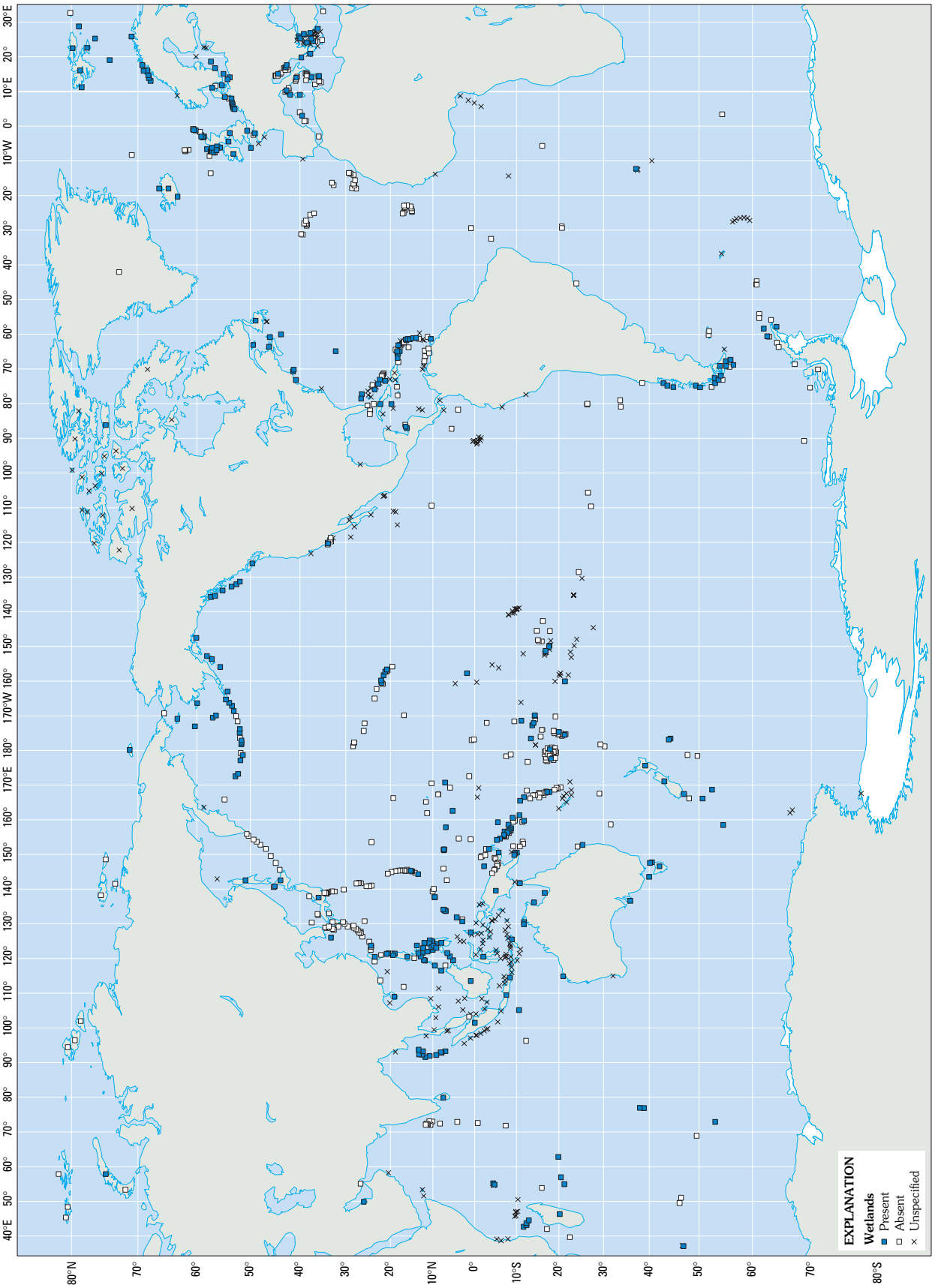
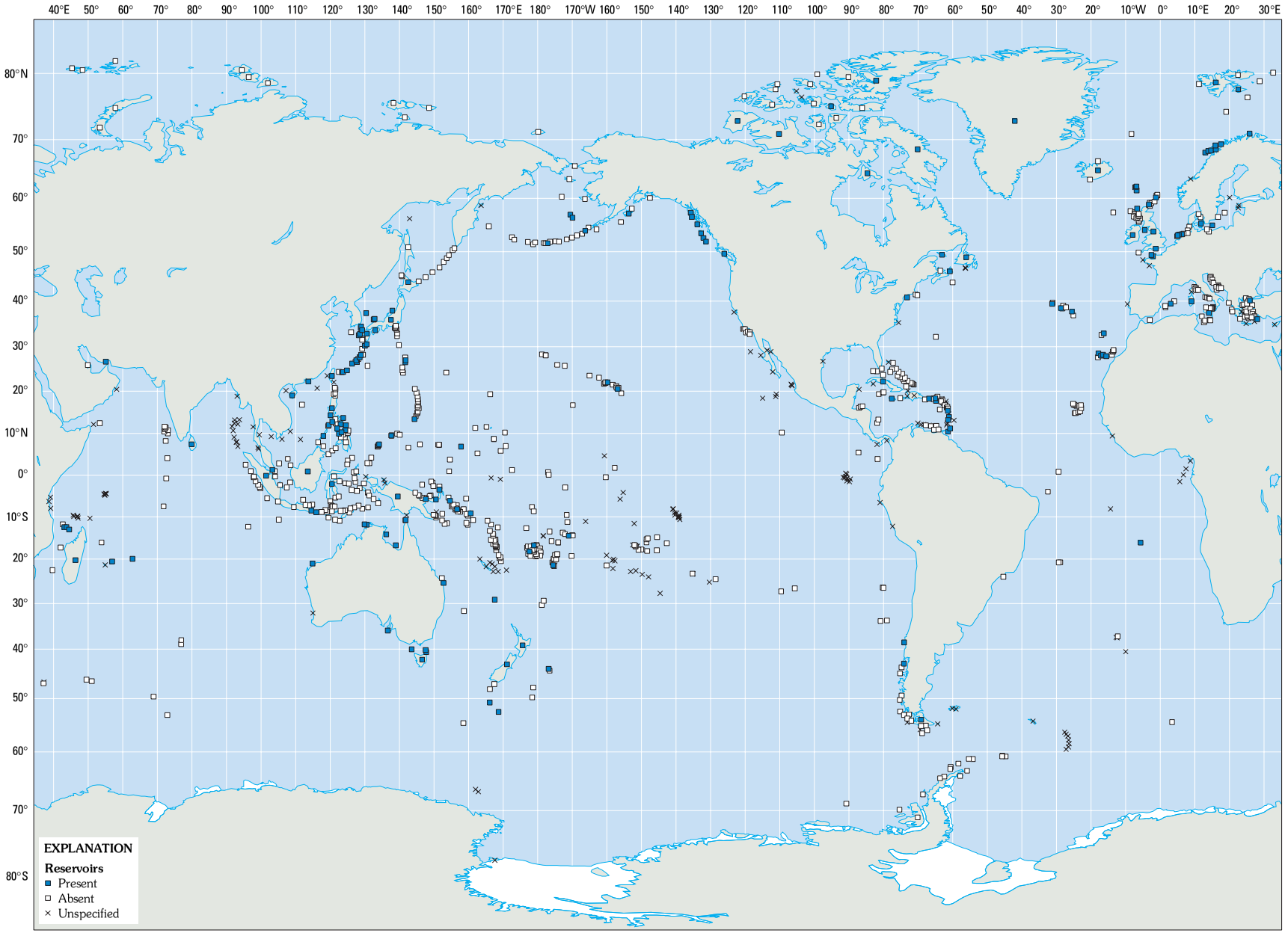


Figure 27. Global distribution of island hydrologic feature — Wetlands.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 28. Global distribution of island hydrologic feature — Surface reservoirs.

Economic Parameters

The economies of the islands in terms of such factors as the number, type, and size of the various economic sectors, gross national product, and so forth, are not dealt with herein. On an island-by-island basis, such an economic account would be difficult to obtain. An overview of the general base for economic activities on the islands was limited to 30 parameters that may be partitioned into the following groups:

- Sovereignty of the islands;
- Population of the islands and of their principal centers;
- Principal ports and airports on the islands, and
- Local time on the islands.

Sovereignty of Islands

Among the 1,000 islands, claims of sovereignty for 21 are presently (1995) unsettled, 19 of which are located below –60° (south) latitude where claims of sovereignty are not recognized by the signatories of the Antarctic Treaty. For each of these 21 islands, their sovereignty is noted as not applicable (†). Sovereignty of the other 979 islands is distributed among 90 countries. The names of the particular countries that have sovereignty over these islands are given with respect to each of the islands, where the names are the conventional, the short form if applicable, names reported by the U.S. Board on Geographic Names.

The following islands are politically partitioned into separate sectors that are sovereign parts of different countries:

1. Borneo (ID–495) — The northwestern sector (20 percent of the island) forms the Malaysian States of Sabah and Sarawak, except for a small enclave (10 percent of the island) that forms the independent State of Brunei. The rest (70 percent of the island) is partitioned into the Indonesian Provinces of East, West, Central, and South Kalimantan;
2. Cyprus (ID–342) — The southern (Greek) part (60 percent of the island) is controlled by the internationally recognized Cypriot Government, the northern (Turkish) part (35 percent of the island) is recognized only by Turkey as the Turkish Republic of Northern Cyprus, and two enclaves (5 percent of the island) are sovereign bases of the United Kingdom;
3. Hispaniola (ID–165) — The western sector (40 percent of the island) forms the Republic of Haiti, and the larger, eastern sector (60 percent of the island), the Dominican Republic;
4. Ireland (ID–31) — The northern sector (20 percent of the island) forms the United Kingdom's administrative division of Northern Ireland, and the rest (80 percent of the island) forms the Republic of Ireland;
5. New Guinea (ID–820) — The western sector (50 percent of the island) forms the Indonesian Province of Irian Jaya, and the eastern sector (50 percent of the island) forms the Papua New Guinean Province of Papua;
6. Saint Martin (ID–178) — The northern sector (50 percent of the island) is part of the French overseas Department of Guadeloupe, and the southern sector (50 percent of the island) is part of the Netherlands Antilles;
7. Tierra del Fuego (ID–662) — The western sector (50 percent of the island) is part of Chile, and the eastern sector (50 percent of the island) is part of Argentina;
8. Usedom (ID–7) — The western sector (90 percent of the island) is part of Germany, and the rest (10 percent of the island) is part of Poland.

In the case where an island is partitioned into two or three sovereign parts, the names of the particular countries are given in alphabetic order; for example, the three distinct sovereign parts of Borneo (ID–495) are identified as Brunei; Indonesia; Malaysia.

The sovereignties of the 979 islands are distributed over 90 countries, and are each associated with a sovereignty identification number in reference to the rank order of the countries by the number of islands under their sovereignty. The countries, which are arranged in order from most to least number of islands, are assigned sovereignty ID numbers that correspond to their rank order numbers. For example, the United States has sovereignty over 96 islands, the most for any of the 90 countries, and accordingly the United States is assigned the sovereignty ID number of 1. In cases where the number of islands is the same for several countries, the countries being ordered alphabetically, each of the countries is assigned the sovereignty

identification number equal to the average of the appropriate rank order numbers. For example, Mexico, Portugal, and Seychelles have ranks 25, 26 and 27, respectively, and each has sovereignty over 12 islands. The sovereignty ID number for each country is the average of the ranks of the countries, 26 = (25 + 26 + 27)/3 (table 18).

Table 18. Distribution of islands by country

[f, frequency; cf, cumulative frequency; Sov. ID, sovereignty identification number]

Ordered by increasing number of islands					Ordered alphabetically by country			
Rank	Country	Number of islands		Sov. ID	Country	Number of islands		Sov. ID
		f	cf			f	cf	
1	United States	96.0	96.0	1.0	Antigua and Barbuda	2.0	2.0	57.0
2	Indonesia	74.2	170.2	2.0	Argentina	1.5	3.5	68.0
3	France	68.5	238.7	3.0	Australia	22.0	25.5	14.0
4	United Kingdom	66.3	305.0	4.0	Bahamas	15.0	40.5	20.5
5	Japan	52.0	357.0	5.0	Bahrain	1.0	41.5	77.0
6	Greece	39.0	396.0	6.0	Barbados	1.0	42.5	77.0
7	Philippines	33.0	429.0	7.0	Belau	8.0	50.5	32.5
8	Canada	28.0	457.0	8.0	Brazil	5.0	55.5	39.0
9	Papua New Guinea	27.5	484.5	9.0	Brunei	0.1	55.6	89.5
10	Russia	26.0	510.5	10.0	Burma	2.0	57.6	57.0
11	Chile	23.5	534.0	11.0	Canada	28.0	85.6	8.0
12	Fiji	23.0	557.0	12.0	Cape Verde	10.0	95.6	29.5
13	Australia	22.0	579.0	14.0	Chile	23.5	119.1	11.0
14	Italy	22.0	601.0	14.0	China	6.0	125.1	37.0
15	Solomon Islands	22.0	623.0	14.0	Colombia	3.0	128.1	42.5
16	Federated States of Micronesia	18.0	641.0	17.5	Comoros	3.0	131.1	42.5
17	India	18.0	659.0	17.5	Cook Islands	7.0	138.1	35.0
18	Norway	18.0	677.0	17.5	Costa Rica	1.0	139.1	77.0
19	Vanuattu	18.0	695.0	17.5	Croatia	13.0	152.1	24.0
20	Bahamas	15.0	711.0	20.5	Cuba	2.0	154.1	57.0
21	Tonga	15.0	725.0	20.5	Cyprus	0.6	154.7	87.5
22	New Zealand	14.0	739.0	22.5	Denmark	10.0	164.7	29.5
23	Spain	14.0	753.0	22.5	Dominica	1.0	165.7	77.0
24	Croatia	13.0	766.0	24.0	Dominican Republic	0.6	166.3	87.5
25	Mexico	12.0	778.0	26.0	Ecuador	9.0	175.3	31.0

Table 18. Distribution of islands by country—Continued

[f, frequency; cf, cumulative frequency; Sov. ID, sovereignty identification number]

Ordered by increasing number of islands					Ordered alphabetically by country			
Rank	Country	Number of islands		Sov. ID	Country	Number of islands		Sov. ID
		f	cf			f	cf	
26	Portugal	12.0	790.0	26.0	Equatorial Guinea	2.0	177.3	57.0
27	Seychelles	12.0	802.0	26.0	Estonia	2.0	179.3	57.0
28	Netherlands	10.5	812.5	28.0	Federated States of Micronesia	18.0	197.3	17.5
29	Cape Verde	10.0	822.5	29.5	Fiji	23.0	220.3	12.0
30	Denmark	10.0	832.5	29.5	Finland	1.0	221.3	77.0
31	Ecuador	9.0	841.5	31.0	France	68.5	289.8	3.0
32	Belau	8.0	849.5	32.5	Germany	5.9	295.7	38.0
33	Kiribati	8.0	857.5	32.5	Greece	39.0	334.7	6.0
34	Cook Islands	7.0	864.5	35.0	Grenada	2.0	336.7	57.0
35	Marshall Islands	7.0	871.5	35.0	Guinea	1.0	337.7	77.0
36	Venezuela	7.0	878.5	35.0	Haiti	2.4	340.1	46.0
37	China	6.0	884.5	37.0	Honduras	3.0	343.1	42.5
38	Germany	5.9	890.4	38.0	Iceland	3.0	346.1	42.5
39	Brazil	5.0	895.4	39.0	India	18.0	364.1	17.5
40	Colombia	3.0	898.4	42.5	Indonesia	74.2	438.3	2.0
41	Comoros	3.0	901.4	42.5	Iran	1.0	439.3	77.0
42	Honduras	3.0	904.4	42.5	Ireland	0.8	440.1	86.0
43	Iceland	3.0	907.4	42.5	Italy	22.0	462.1	14.0
44	Tanzania	3.0	910.4	42.5	Jamaica	1.0	463.1	77.0
45	Vietnam	3.0	913.4	42.5	Japan	52.0	515.1	5.0
46	Haiti	2.4	915.8	46.0	Kiribati	8.0	523.1	32.5
47	Antigua and Barbuda	2.0	917.8	57.0	Madagascar	1.0	524.1	77.0
48	Burma	2.0	919.8	57.0	Malaysia	1.2	525.3	70.0
49	Cuba	2.0	921.8	57.0	Maldives	2.0	527.3	57.0
50	Equatorial Guinea	2.0	923.8	57.0	Malta	2.0	529.3	57.0
51	Estonia	2.0	925.8	57.0	Marshall Islands	7.0	536.3	35.0
52	Grenada	2.0	927.8	57.0	Mauritius	2.0	538.3	57.0
53	Maldives	2.0	929.8	57.0	Mexico	12.0	550.3	26.0
54	Malta	2.0	931.8	57.0	Nauru	1.0	551.3	77.0
55	Mauritius	2.0	933.8	57.0	Netherlands	10.5	561.8	28.0

Table 18. Distribution of islands by country—Continued

[f, frequency; cf, cumulative frequency; Sov. ID, sovereignty identification number]

Ordered by increasing number of islands					Ordered alphabetically by country			
Rank	Country	Number of islands		Sov. ID	Country	Number of islands		Sov. ID
		f	cf			f	cf	
56	Panama	2.0	935.8	57.0	New Zealand	14.0	575.8	22.5
57	Peru	2.0	937.8	57.0	Norway	18.0	593.8	17.5
58	Saint Kitts and Nevis	2.0	939.8	57.0	Oman	1.0	594.8	77.0
59	Sao Tome and Princip	2.0	941.8	57.0	Panama	2.0	596.8	57.0
60	South Africa	2.0	943.8	57.0	Papua New Guinea	27.5	624.3	9.0
61	South Korea	2.0	945.8	57.0	Peru	2.0	626.3	57.0
62	Sweden	2.0	947.8	57.0	Philippines	33.0	659.3	7.0
63	Thailand	2.0	949.8	57.0	Poland	0.1	659.4	89.5
64	Trinidad and Tobago	2.0	951.8	57.0	Portugal	12.0	671.4	26.0
65	Tuvalu	2.0	953.8	57.0	Russia	26.0	697.4	10.0
66	Western Samoa	2.0	955.8	57.0	Saint Kitts and Nevis	2.0	699.4	57.0
67	Yemen	2.0	957.8	57.0	Saint Lucia	1.0	700.4	77.0
68	Argentina	1.5	959.3	68.0	Saint Vincent and Grenadines	1.0	701.4	77.0
69	Turkey	1.4	960.6	69.0	Sao Tome and Princip	2.0	703.4	57.0
70	Malaysia	1.2	961.8	70.0	Seychelles	12.0	715.4	26.0
71	Bahrain	1.0	962.8	77.0	Singapore	1.0	716.4	77.0
72	Barbados	1.0	963.8	77.0	Solomon Islands	22.0	738.4	14.0
73	Costa Rica	1.0	964.8	77.0	South Africa	2.0	740.4	57.0
74	Dominica	1.0	965.8	77.0	South Korea	2.0	742.4	57.0
75	Finland	1.0	966.8	77.0	Spain	14.0	756..4	22.5
76	Guinea	1.0	967.8	77.0	Sri Lanka	1.0	757.4	77.0
77	Iran	1.0	968.8	77.0	Sweden	2.0	759.4	57.0
78	Jamaica	1.0	969.8	77.0	Tanzania	3.0	762.4	42.5
79	Madagascar	1.0	970.8	77.0	Thailand	2.0	764.4	57.0
80	Nauru	1.0	971.8	77.0	Tonga	15.0	779.4	20.5
81	Oman	1.0	972.8	77.0	Trinidad and Tobago	2.0	781.4	57.0
82	Saint Lucia	1.0	973.8	77.0	Turkey	1.4	782.8	69.0
83	Saint Vincent and Grenadines	1.0	974.8	77.0	Tuvalu	2.0	784.8	57.0
84	Singapore	1.0	975.8	77.0	United Kingdom	66.3	851.0	4.0
85	Sri Lanka	1.0	976.8	77.0	United States	96.0	947.0	1.0

Table 18. Distribution of islands by country—Continued

[f, frequency; cf, cumulative frequency; Sov. ID, sovereignty identification number]

Ordered by increasing number of islands					Ordered alphabetically by country			
Rank	Country	Number of islands		Sov. ID	Country	Number of islands		Sov. ID
		f	cf			f	cf	
86	Ireland	0.8	977.6	85.0	Vanuatu	18.0	965.0	17.5
87	Dominican Republic	0.6	978.2	86.5	Venezuela	7.0	972.0	35.0
88	Cyprus	0.6	978.8	86.5	Vietnam	3.0	975.0	42.5
89	Brunei	0.1	978.9	89.5	Western Samoa	2.0	977.0	57.0
90	Poland	0.1	979.0	89.5	Yemen	2.0	979.0	57.0

For the remaining 21 (= 1,000 - 979) islands for which there are various unrecognized claims assignments of associated sovereignty identification numbers are not applicable (†).

The global distribution of the islands relating to the five highest frequencies of sovereignty are shown in figure 29. The global distributions of all the islands in reference to their sovereignties are depicted in figures 57 through 74 in Appendix H.

Population of Islands and Principal Centers

The population of an island is a major determinant in the economic development of its resources. For example, the magnitude of the population and the economy that the population can support determines the demand (that is, willingness to pay) for the development of the island's water resources. Although some islands are decreasing in population, others are increasing. For those whose population is growing, a contributing factor is a high birth rate relative to the death rate, [for example, the Seychelles (ID–355, ..., ID–366) in the Indian Ocean and the Marshall Islands (ID–885, ..., ID–889 and ID–892 and ID–893) in the Pacific Ocean] or a high immigration rate relative to the emigration rate [for example, the Hawaiian Islands (ID–969, ..., ID–978) in the Pacific Ocean]. Many archipelagos, particularly those that comprise "low islands" [for example, the Cook Islands (ID–910, ..., ID–916) in the Pacific Ocean] have small total land areas, and, therefore, the stress placed on their support systems by population growth gives meaning to sustainable development. A high rate of population growth coupled with a low rate of economic growth is characteristic of many of the world's islands.

For those islands that are losing population [for example, the Azores (ID–250, ..., ID–258) in the Atlantic Ocean and the Hebrides (ID–33, ..., ID–48) off the west coast of Great Britain (ID–29)] the contributing factor is mainly a high rate of emigration relative to the rate of immigration. This is particularly the case among the younger and the more skilled individuals who leave in hope of securing a better future for themselves on the continental "mainlands."

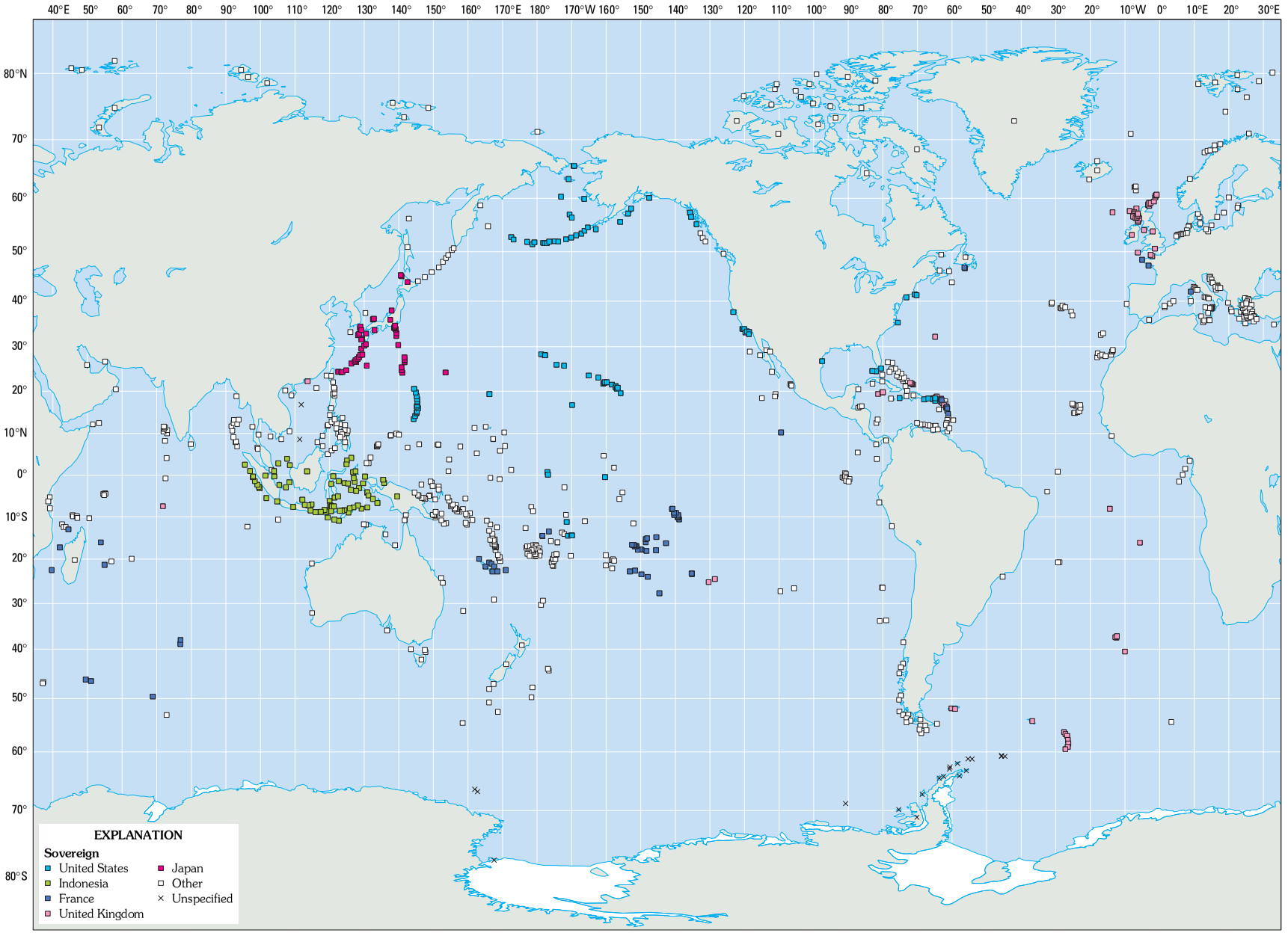
Of the 1,000 islands:

- 805 are coded as Y to indicate that the islands are permanently inhabited;
- 159 are coded as N to indicate that the islands are not permanently inhabited, and
- 36 are coded as ‡ to indicate that effort to determine whether or not the islands are permanently inhabited was not successful.

Counted among the permanently inhabited islands are those on which the only inhabitants are personnel of scientific stations (for example, stations for making meteorologic observations; conducting various types of research; and so forth) or of other government facilities (for example, prisons or military bases). Counted among the islands that are not permanently inhabited are those that are visited briefly during the year for one reason or another; for example, seeking temporary shelter during storms at sea or gathering of food.

Included among the 759 islands for which census values are given are:

- 600 of the 805 permanently inhabited islands, and the



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 29. Global distribution of islands relating to the five highest frequencies of sovereignty.

- 159 (= 759 – 600) islands that are not permanently inhabited and therefore have census values effectively equal to 0.

There remain 241 (= 1,000 – 759) islands for which census values are not given, of which:

- 36 are those for which permanent habitation could not be determined, and
- 205 (= 241 – 36) are those which are among the permanently inhabited islands.

With respect to the year of census:

- The census years are given for 570 of the 600 islands whose census values are specified;
- Values are assumed to be inapplicable for the 159 islands that are not permanently inhabited; whereby
- Values are effectively specified for 72 9(= 570 + 159) islands; which leaves
- 271 (= 1,000 – 729) islands without specified values; of which
- 235 are permanently inhabited islands, and
- 36 (= 271 – 235) are islands for which habitation has not been determined.

The population densities, which are expressed to the nearest integer value of the number of individuals per unit area, are given for each of the 759 islands whose census values are specified.

A global perspective on the distribution of the island population densities is shown in figure 30.

For most permanently inhabited islands, their populations are concentrated at few centers. If an island is a sovereign part of a single nation, then one of the centers may be identified as the principal center, a principal center being defined as follows:

- If among the centers of population on a given island, one is the national capital (NC) of the island nation made up of that island and perhaps others, then that center is identified as the island's principal center;
- If among the centers of population, none is a national capital, but one is the provincial or lower level administrative (AC) for the island as a whole, then that center is identified as the island's principal center;
- If an island is partitioned into two or more provinces, then that center with the largest population is identified as the island's principal center and is referred to as the "metro center" (MC);
- If the only human habitat on an island is a meteorologic station (MS) or a research station (RS) or some other type of government facility (GF), then that station or facility is identified as the island's principal center, and
- In the case of an island that is itself a single province or together with other islands forms a single province, if none of the island's centers is a national capital or a provincial capital (PC) and if the size of the populations of the various centers are more or less the same, then the island is said not to have a principal center.

As defined, the principal center of an island is identified as being one of the six mutually exclusive types (table 19).

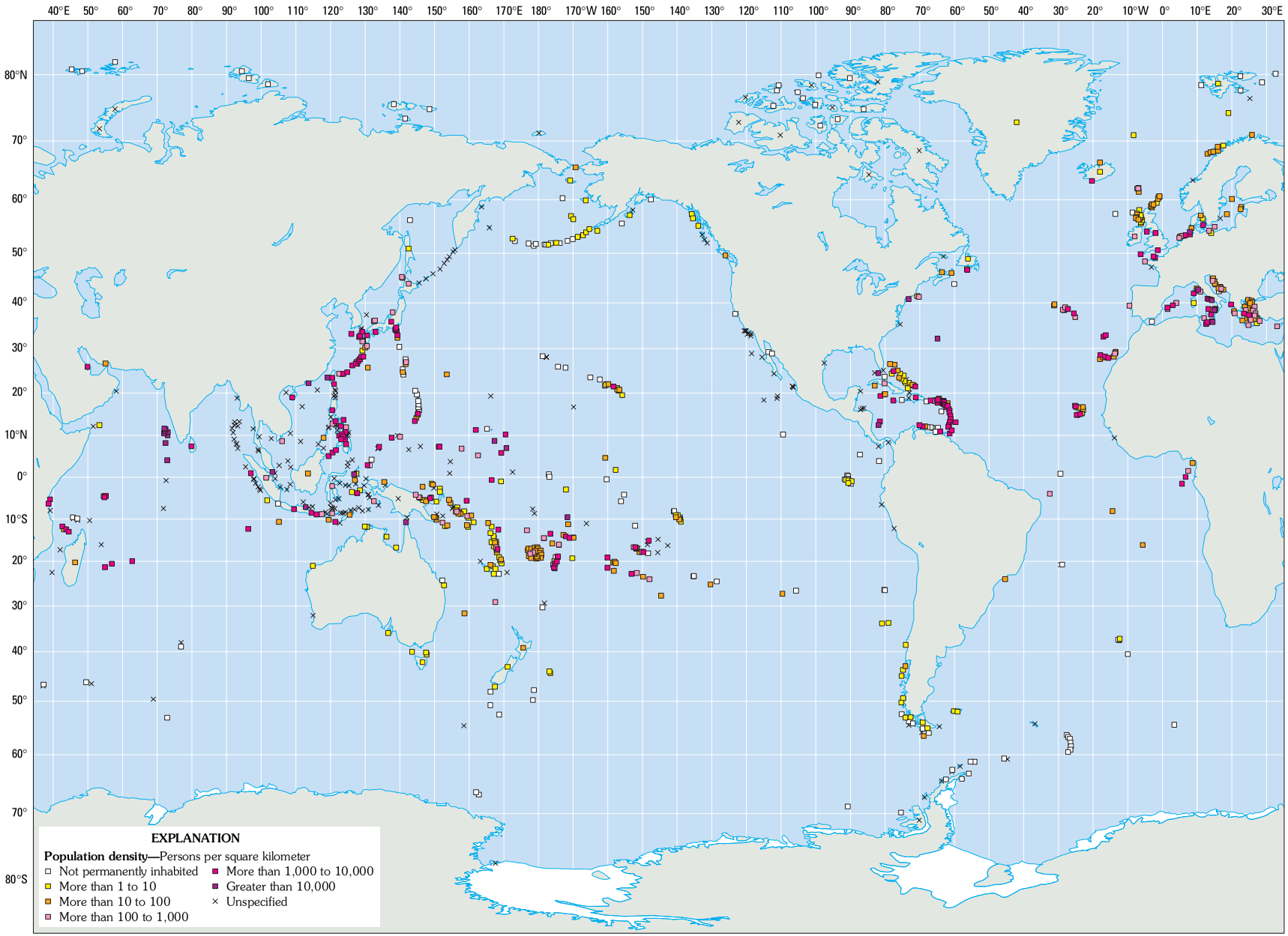
Table 19. Types of principal centers

Count	Type	Code
1	National capital	NC
2	Other administratuve center	AC
3	Metro center	MC
4	Meteorologic station	MS
5	Research station	RS
6	Other government facility	GF

Herein an island was assumed to have but one principal center. Thus, in the case of an island partitioned into two or more different sovereign parts, the definition of a principal center was assumed to be not applicable (†). The definition of a principal center, however, can readily be extended to such islands by applying the definition to each part separately and then, by identifying the island's set of principal centers.

Of the 1,000 islands:

- 585 are coded Y to indicate that the islands have principal centers;
- 159 are coded N to indicate otherwise, the islands being those that are not permanently inhabited;
- 8 are coded † to indicate that identification of a principal center is inapplicable, the islands being



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 30. Global perspective on the distribution of island population density.

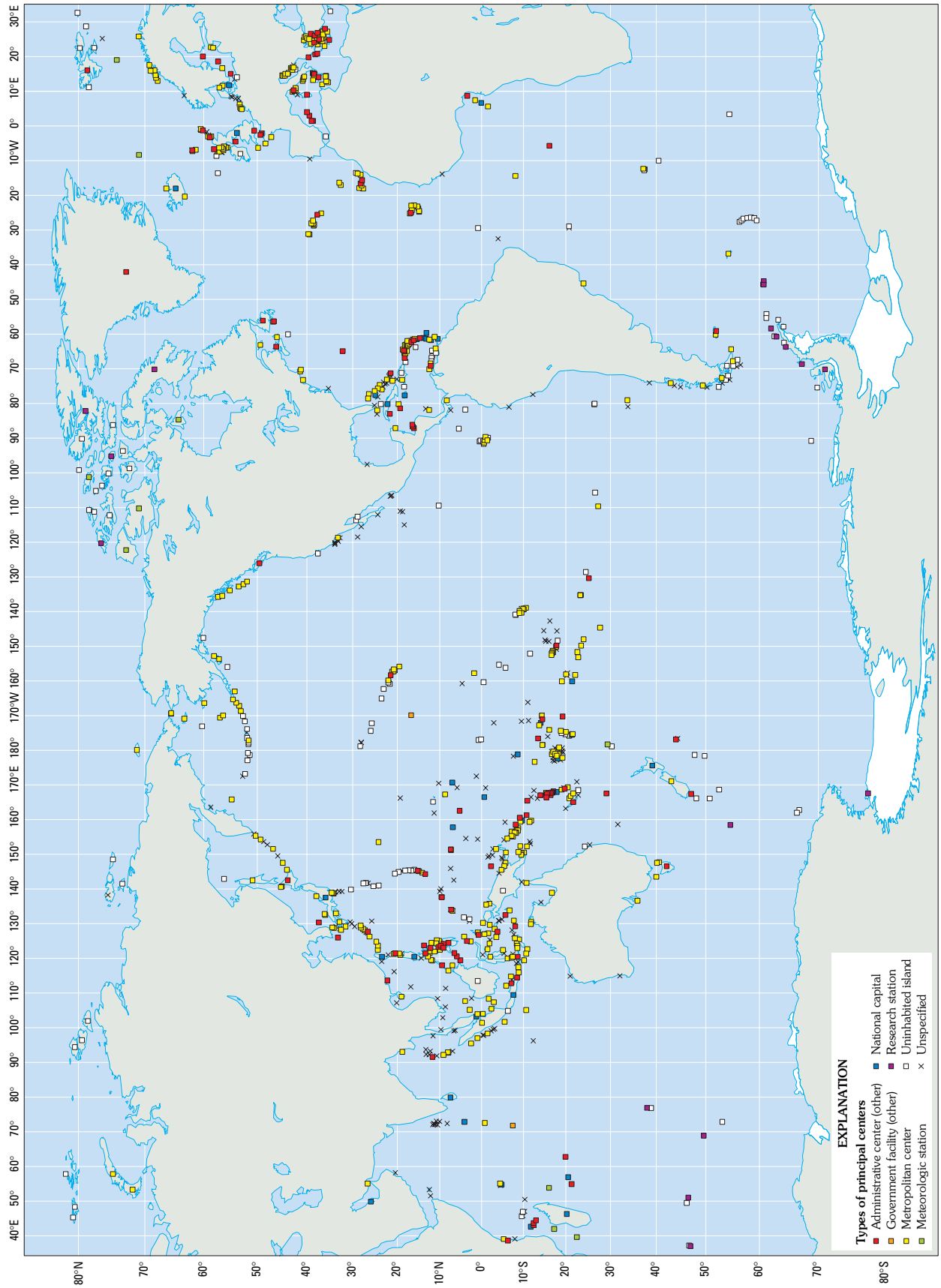


Figure 31. Global distribution of the types of island principal centers.

those that are partitioned into two or more sovereign parts, and

- 248 (= 1,000 – 585 – 159 – 8) are coded ‡ to indicate the matter of whether or not the islands have principal centers was not resolved.

The global distribution of types of principal population centers associated with the islands is shown in figure 31.

Among the 585 islands identified as having principal centers and thereby coded Y:

- The names of the principal centers, which are official names reported by the U.S. Board on Geographic Names, are given for 581 of the islands;
- The censuses of the principal centers are given for 173 of the islands;
- The years of census of the principal centers are given for 171 of the islands;
- The types of principal centers (see table 20) are given for each of the 582 islands;
- The geographic coordinates, latitude and longitude of the principal centers, which are expressed to the nearest hundredth degree, are given for 523 of the islands, and
- The concentrations of the populations of the islands at the principal centers, which are the ratio of the principal center population to the island population, are given for 159 islands.

To each of these island counts the value 167 must be added to obtain the island coverages by the parameters noted in table 2; 167 is the sum of the 159 islands identified as not having principal centers (coded N) and the 8 islands partitioned into two or more sovereign parts (coded †).

Principal Seaports and Airports

Important to the economic well-being of an island is the availability of facilities for off-island transportation (commercial shipping and flight) of people and goods and that link the island to markets abroad. The islands where these means of transport exist were identified in reference to a listing of the world's seaports by the U.S. Defense Mapping Agency (1988) and a listing of the world's airports by the International Civil Aviation Organization (1992). If an island has but a single seaport or airport, then that seaport or airport is referred to as the island's principal seaport or airport. In the case where an island has more than one seaport or airport, then the principal seaport or principal airport was considered to be one that serves the island's principal center. No count was made of the numbers of seaports and airports for any of the islands. Information about the island seaports and airports were obtained from governmental and intergovernmental sources.

Of the 1,000 islands:

- 372 are coded as Y to indicate that these islands have principal seaports, and
- 628 (= 1,000 – 372) are coded as N to indicate otherwise.

For each of the 372 islands coded Y, the name of the principal seaport (official or if applicable, conventional name reported by the U.S. Board on Geographic Names) is given, and for 370 of the islands:

- The geographic coordinates, latitude and longitude (expressed to the nearest hundredth degree), of the seaports are given;
- The port types are indicated by the codes listed in table 20, and
- The seaport sizes are indicated as being large (L), medium (M), small (S), or very small (V).

To each of these island counts, the value 628 must be added to obtain the island coverages given in table 2 for these particular parameters; 628 is the number of islands without seaports and, therefore, the number of islands for which the parameter values are not applicable (†).

Of the 372 principal seaports:

- 165 are coded as Y to indicate that goods and individuals may clear customs at these seaports;
- 42 are coded as N to indicate otherwise, and
- 165 (= 372 – 165 – 42) are coded as ‡ to indicate that for these seaports it was not determined if goods and individuals may clear customs.

Table 20. Classification of seaport types

Type		Description	Code
Coastal:	Breakwater	Coastal harbor behind a manmade breakwater constructed to provide shelter	CB
	Natural	Coastal harbor sheltered by its location within a natural coastal indentation or in the protective lee of an island or other natural barrier	CN
	Open roadstead	Port that has no natural or artificial barrier for protection	OR
River:	Basin	Harbor located in a river in which slips have been excavated in the riverbanks	RB
	Natural	Harbor located in a river, the waters of which are not retained by artificial means	RN

Thus, there are 207 (= 165 + 42) islands with seaports for which the matter of whether or not goods and individuals may clear customs was not specified. To this island count, the value 628 must be added to obtain the island coverage given in table 2 that corresponds to the particular parameter. For further discussion regarding the size and type classifications of the seaports and clearance of customs at the seaports, see U.S. Defense Mapping Agency (1988).

Construction of facilities to provide or enhance interisland air transport impacts an island's environment. The impact may be extensive on small islands whose terrains or coastlines are significantly altered. A case in point is Johnston Island (ID–961). Prior to 1939, it had an area of 0.19 km^2. Between 1939 and 1945, the island was leveled, and its area increased to 0.85 km^2 to accommodate military operations during World War II. From 1963 to 1964, extension of the airport runway increased the island's area to 2.3 km^2. For many small, low islands, paved runways serve as catchments of rainfall to augment the supply of freshwater supplied by the islands natural ground-water reservoir.

Of the 1,000 islands:

- 377 are coded Y to indicate that these islands have principal airports, and
- 623 (= 1,000 – 377) are coded N to indicate otherwise.

Of the 377 islands coded Y:

- The names of the principal airports, official or if applicable, conventional names reported by the U.S. Board on Geographic Names, are given for each of the 377 islands;
- The code letters that identify the airports are given for 357 islands;
- The geographic coordinates, latitude and longitude (expressed to the nearest hundredth degree), of the airports are given for 185 airports;
- The elevations of the airports, which are measured in meters, are given for 143 islands, and
- The lengths of the longest runways, which are measured in meters, are given for 170 airports.

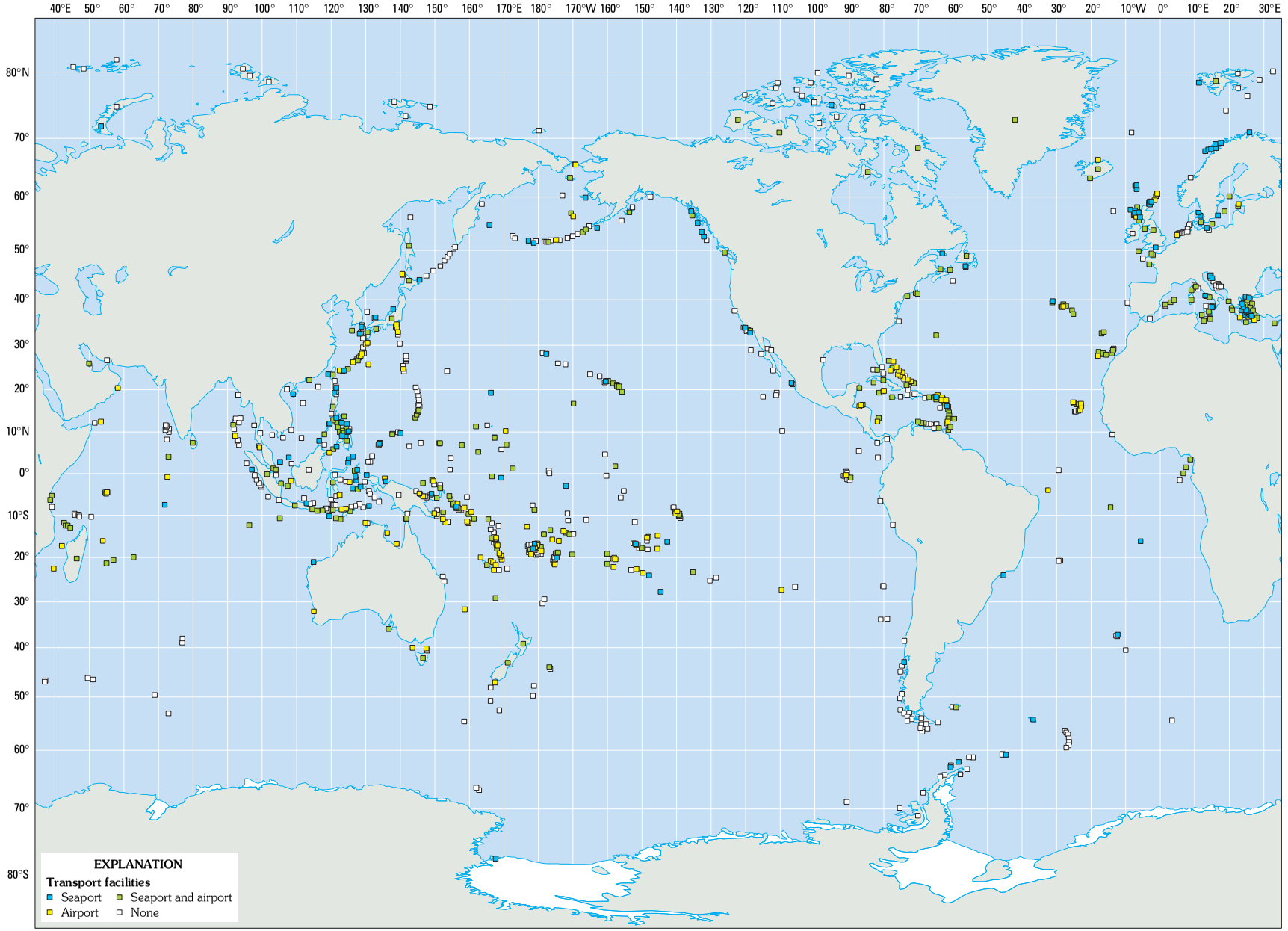
To each of these island counts, the value 623 must be added to obtain the island coverages of the parameters as noted in table 2; 623 is the number of islands without principal airports.

Of the 377 principal airports:

- 148 are coded as Y to indicate that goods and individuals may clear customs at the airports, and
- 229 are coded as N to indicate otherwise.

Thus, the matter of whether or not goods and individuals may clear customs is specified for each of the 377 (= 148 + 229) islands with airports. To this island count the value 623 must be added to obtain the island coverage noted in table 2.

The global distribution of islands with ports or airports is shown in figure 32.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 32. Global distribution of offshore transportation facilities.

Local Time

Local time is defined in reference to the system of standard time zones adopted at the 1884 International Meridian Conference in Washington, D.C. (Brown, 1949). There are 24 time zones, each spanning 15° of longitude. The zero-th time zone, which is centered on Greenwich meridian, extends from -7.5° longitude to 7.5° longitude. The time zone entered on 180° longitude is divided into two parts. The part that extends from -172.5° longitude to 180° longitude is designated as zone 12, and the part that extends from 180° longitude to 172.5° longitude is designated as zone -12. With mean solar time at the Greenwich meridian, which is denoted as Universal Time (UT) or Greenwich Mean Time (GMT), set equal to zero, local time (that is, the time within another zone), differs from GMT by an integral number of hours, but the minutes and seconds are the same. Local time decreases (increases) by one hour in moving progressively from one zone to another eastward (westward) from Greenwich to zone -12 (12). A 13th time zone that has the same hour as zone 11 has been introduced to allow some countries and island groups to retain the same calendar day. Below -60° latitude, local time does not accord with the time zones. Scientific parties in that region take as their local times those of their sponsoring countries.

Many countries prefer to conduct their affairs without strict adherence to the universal system of fixed time zones, and, therefore, by law have changed their local times to "legal" or "standard" times. Also many countries modify their standard times during part of the year, particularly during the summer to increase the number of daylight hours. The modification, which is achieved by adopting the standard time of the zone immediate to the east, advances the local time by 1 hour. Some countries maintain the modified local time throughout the year.

The International Date Line is a specifically set line that approximates the 180° longitude. By international agreement, a traveler upon crossing the line must change the date by 1 calendar day. The date is increased (decreased) by 1 calendar day when traveling eastward (westward) across the line.

For each of the 981 islands above -60° latitude, their "standard" times are given. For the other 19 (= 1,000 - 981) islands below -60°, where local time is not defined by time zone, the "standard" times are noted as being not applicable (†).

Summary

A condensed version of the 30 Economic Parameters are listed in table 21.

Table 21. Island coverage, by economic parameter

Parameter	Islands				
	Specified A	Inapplicable B	Covered A+B	Unspecified C	Total A+B+C
Sovereignty					
Name of nation	979	21	1,000	0	1,000
Sovereignty ID (identification) number	979	21	1,000	0	1,000
Island habitation					
Code that indicates if an island is permanently inhabited	964	0	964	36	1,000
Census	759	0	759	241	1,000
Year of census	570	159	729	271	1,000
Density	759	0	759	241	1,000
Principal center habitation					
Code that indicates if an island has a principal center	744	8	752	248	1,000
Name	581	167	748	252	1,000
Census	173	167	340	660	1,000

Table 21. Island coverage, by economic parameter—Continued

Parameter	Islands				
	Specified A	Inapplicable B	Covered A+B	Unspecified C	Total A+B+C
Year of census	171	167	338	662	1,000
Type	582	167	749	251	1,000
Latitude	523	167	690	310	1,000
Longitude	523	167	690	310	1,000
Concentration	159	167	326	673	1,000
Port					
Code that indicates if an island has a principal port	1,000	0	1,000	0	1,000
Name	372	628	1,000	0	1,000
Latitude	370	628	998	2	1,000
Longitude	370	628	998	2	1,000
Code that indicates if customs may be cleared	207	628	835	165	1,000
Size	370	628	998	2	1,000
Type	370	628	998	2	1,000
Airport					
Code that indicates if an island has a principal airport	1,000	0	1,000	0	1,000
Name	377	623	1,000	0	1,000
Code letters	357	623	980	20	1,000
Latitude	185	623	808	192	1,000
Longitude	185	623	808	192	1,000
Code that indicates if customs may be cleared	377	623	1,000	0	1,000
Elevation	143	623	766	234	1,000
Length of longest runway	170	623	793	207	1,000
Local time					
International time zone	1,000	0	1,000	0	1,000

Environmental Parameters

Islands constitute unique platforms for making meteorologic observations because of their remoteness from large centers of human activity concentrated on the continents.

If predictions of global warming by means of increasing levels of "greenhouse" gases in the atmosphere are realized, then many of the world's islands will be impacted one way or another. For some islands, the impacts may be adversely severe. Among the "low" islands, some may become submerged if global warming occasions sea level to rise appreciably, say by several centimeters. Other islands, "low" or "high," could be effected in terms of increased coastal erosion, accelerated rates and increased volumes of sediment discharge, or diminution of fresh ground-water supplies along coastal reaches by means of saltwater intrusion

of aquifers. The environment of islands could be further effected by global warming in terms of changes in the mix of types and coverages of vegetation and by changes in bacterial populations that could adversely affect the health of the island inhabitants. Some impacts could lead to decreases in economic productivity. It may well be that some islands, perhaps those in polar climes, would benefit from a warmer climate.

To assess the impact of global warming on island environments, more complete biologic descriptions of the islands are needed. To assess the extent to which the Earth's climate is changing and if anthropomorphically induced changes are, at least in the short-run, overriding or augmenting natural changes, more extensive spatial and temporal meteorologic coverage of the world's islands are needed.

A limited description of the environment of the islands is provided in terms of the general climatic states of the islands. The climatic states are of local importance in so far as they define the habitability of the islands and the viability of their economic growth. The climatic states also are of global importance in that the islands provide a valuable platform on the Earth's climate over the oceanic expanse.

The descriptions of the island environments are given by 17 parameters that may be partitioned into the following groups that provide:

- Quantitative measures of the local meteorology of islands;
- Markers of long-term island climates, and
- Measure of current relative states of wetness/dryness of islands.

Local Meteorology of Islands

In this study, the information about the local meteorology of an island is limited to the following:

- Mean annual precipitation, which is measured in millimeters, and
- Mean annual temperature, which is measured in degrees Celsius,

determined at specific locations on the island, where the descriptors are qualified by the

- Elevation, which is measured in meters, of the station where precipitation or temperature observations are recorded, and
- Length of precipitation or temperature record, which is measured in the number of years of observation.

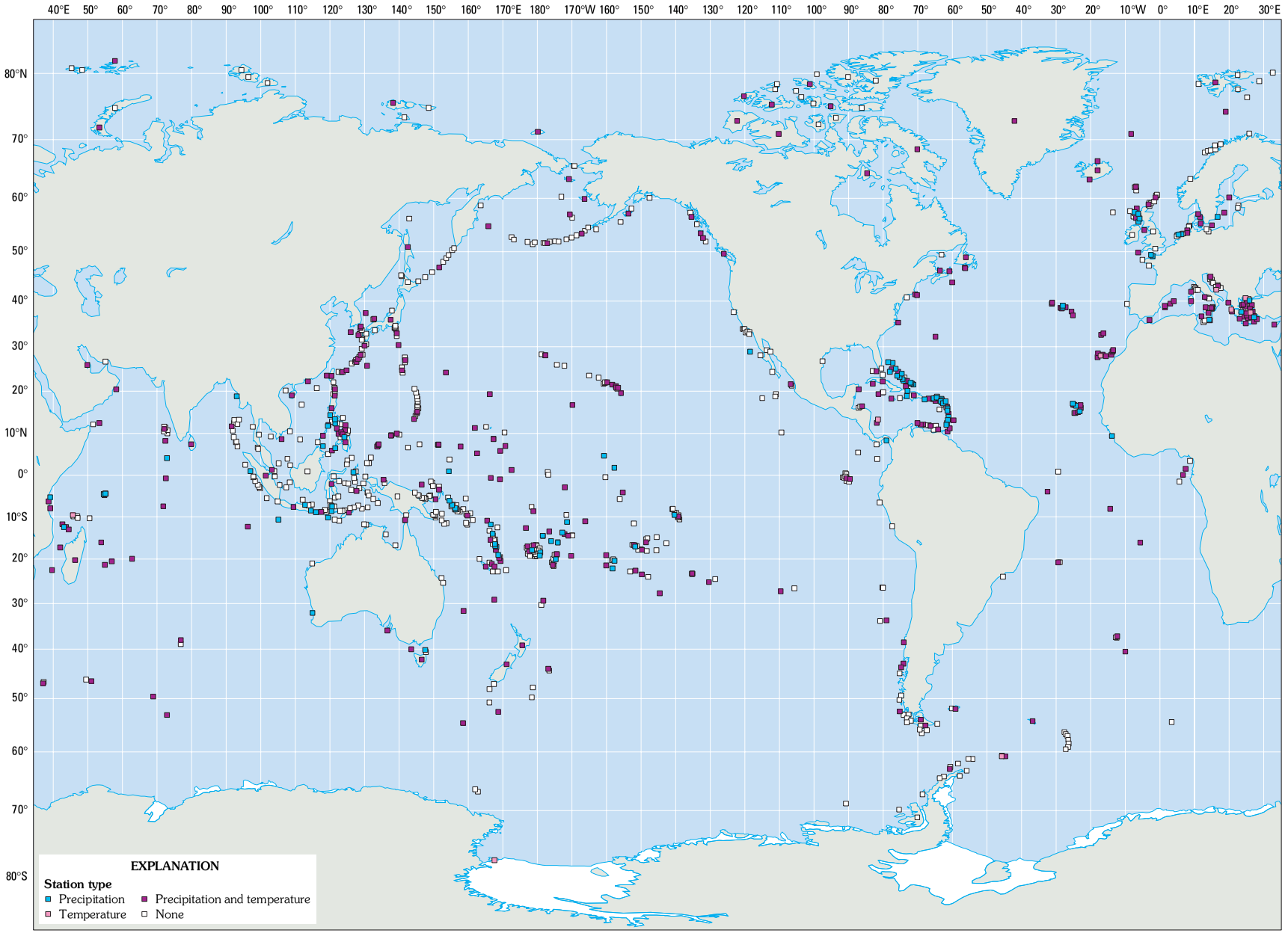
Except for a small, low island, the local meteorology does not reflect the general or average meteorology of the island as a whole. For many of the small islands, there is, at most a single meteorologic station. If an island, small or large, has two or more meteorologic stations, then only one of the stations is taken into account, namely the station with the longest record. In most cases, the station selected is located at or near the island's principal center. Most of the principal centers are located on the coast, and therefore, an island's local meteorology is, in most cases, defined at that location. However, because an island's local meteorology is effected orographically by its topography, its local meteorology does not necessarily reflect that at the surface of the nearby sea.

Of the 1,000 islands:

- 320 are coded as PT to indicate that the local meteorologies for those islands are specified by values of mean annual precipitation and mean annual temperature;
- 98 are coded as P to indicate that the local meteorologies for those islands are specified only by values of mean annual precipitation;
- 11 are coded as T to indicate that the local meteorologies for those islands are specified only by values of mean annual temperature; whereby there are
- 418 (= 320 + 98) islands for which values of mean annual precipitation are specified; and
- 331 (= 320 + 11) islands for which values of mean annual temperature are specified; which leaves
- 571 (= 1,000 – 320 – 98 – 11) islands that are coded as ‡ to indicate that for those islands, it could not be determined if observations of precipitation and temperature on the islands are available.

Among the 418 islands coded PT or P relative to observations of precipitation, there are:

- 184 islands for which the station elevations are given;
- 224 islands for which the lengths of records are given, and



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 33. Global distribution of island meteorological stations.

- 181 islands for which the station elevations and the lengths of records are given.

Among the 331 islands coded PT or T relative to observations of temperature, there are:

- 237 islands for which the station elevations are given;
- 243 islands for which the lengths of records are given, and
- 211 islands for which the station elevations and the lengths of records are given.

The global distribution of islands with recordings of precipitation or temperature is shown in figure 33.

Climatic Markers

The general climates of the islands are reflected in the various biological and physical parameters of the islands. In particular, nine parameters serve as markers that delineate three climatic states (table 22).

Table 22. Island climates

Count	Climatic state	Parameter (marker)
1	Tropical / subtropical	Mangroves Coral reefs Tropical peat Palms
2	Temperate	Seasonal snow / ice Sphagnum peat
3	Subpolar / polar	Permafrost Permanent snow / ice Glaciation

The parameters, however, do not provide precise markings of climatic states, for example:

- Palms are not restricted to a particular species — coconut palms (*Cocos nucifera*) are limited to tropical and subtropical climates, whereas date palms (*Phoenix dactylifera*) are found in relatively dry warm climates;
- Apart from Glaciation, the parameters are scored as 1 or as 0, respectively, whether they are or are not manifest on a particular island (Glaciation is described by a more detailed scoring scheme);
- Apart from Glaciation, a parameter reflects the more recent climatic environment of an island, for example, no account is taken whether or not peat is still forming on a particular island;
- Glaciation reflects the current polar state of an island relative to the island's polar state during the Pleistocene; a more remote polar state cannot be reflected since many of today's islands did not exist prior to the Pleistocene, particularly the oceanic islands (geologic type O islands) and the islands in island arcs (geologic type A islands).

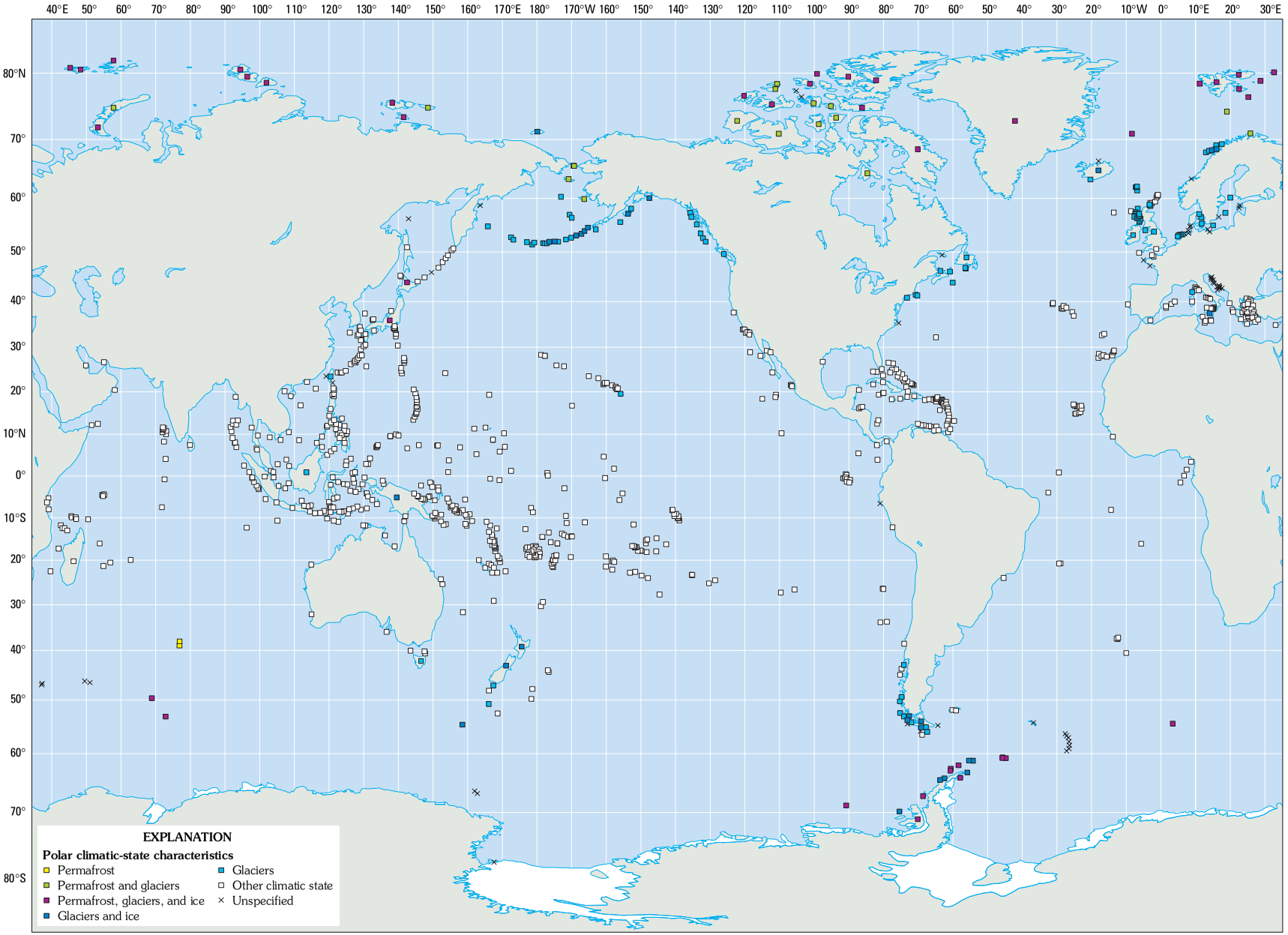
The global distributions of the islands in the tropical/subtropical, temperate, and subpolar/polar climatic states are shown in figures 34 through 36, respectively.

The scheme for scoring Glaciation is given in table 23.

Table 23. Scale of island glaciation

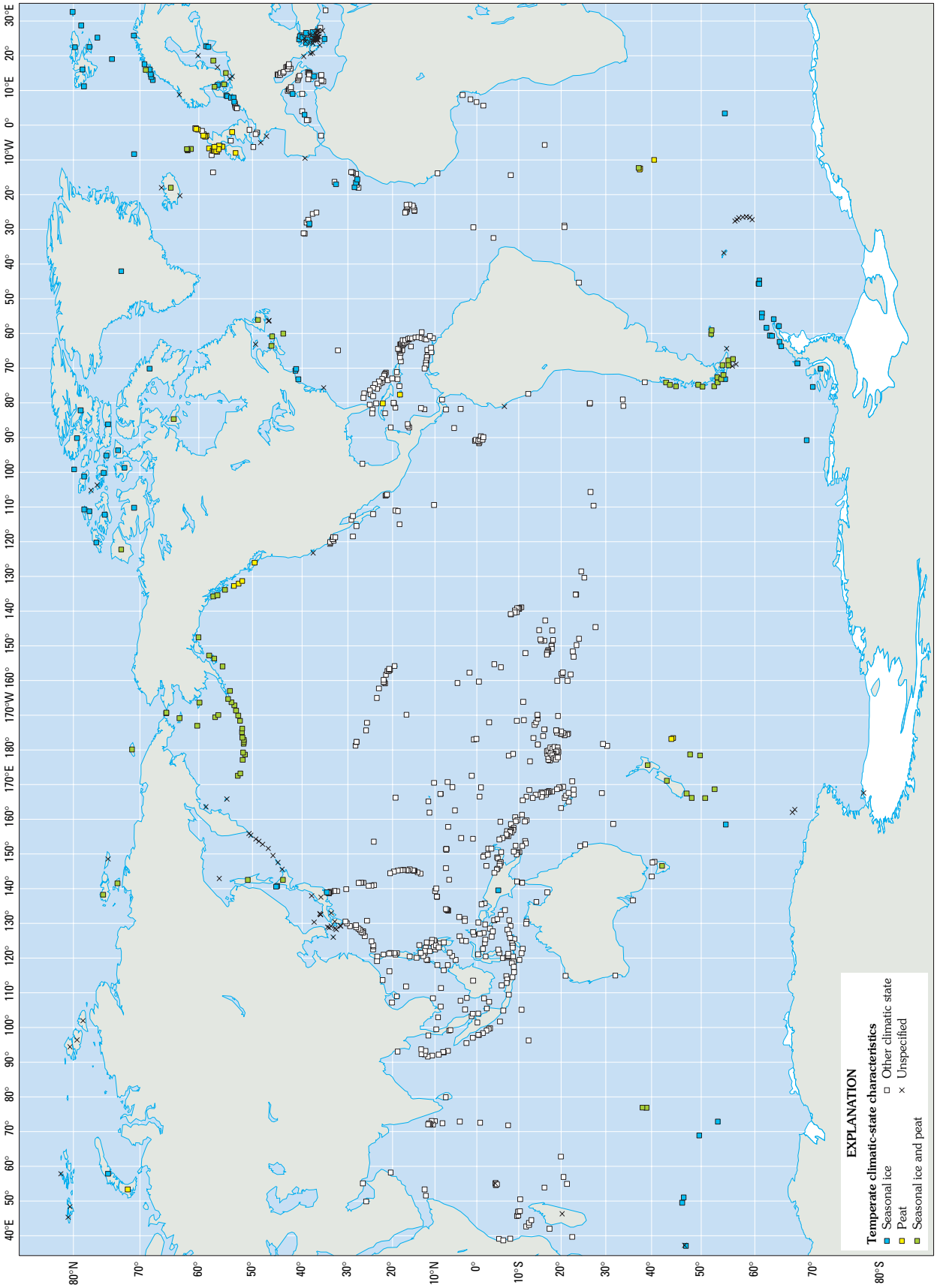
Present	Pleistocene	Score
Glaciated combination observed on Earth		
None	None	0
	High mountain	1
	Mountain	2
	Entirely glaciated	3
Only high mountain	Entirely glaciated or just reached by ice sheets	4
	Overrun by ice sheets	5
Glaciated	Glaciated	6
Glaciated combination not observed on Earth		
Glaciated	None	†

The global distribution of islands per their scale of glaciation is shown in figure 37.



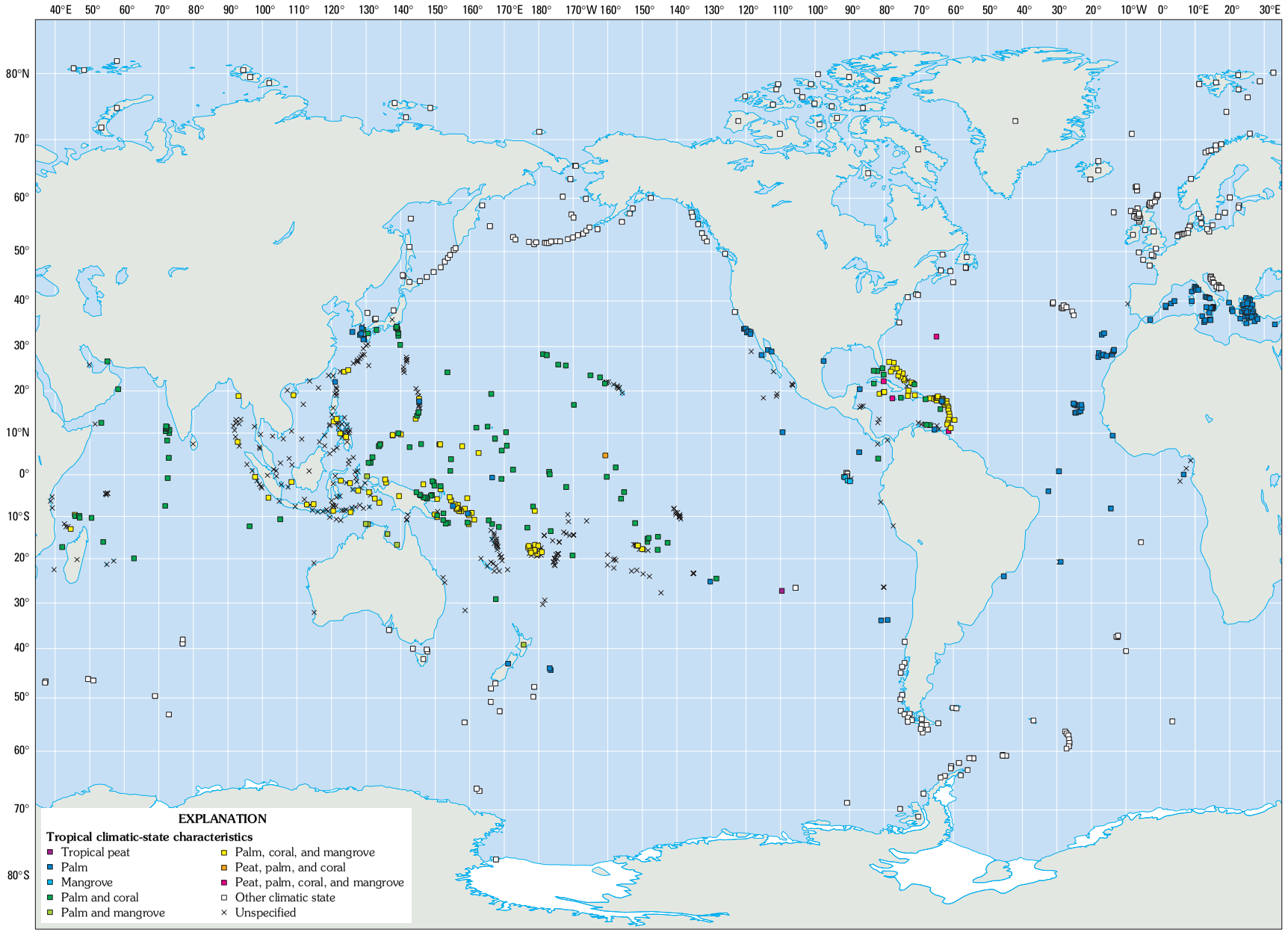
Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 34. Global distribution of islands per polar climatic state.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 35. Global distribution of islands per temperate climatic state.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 36. Global distribution of islands per tropical climatic state.

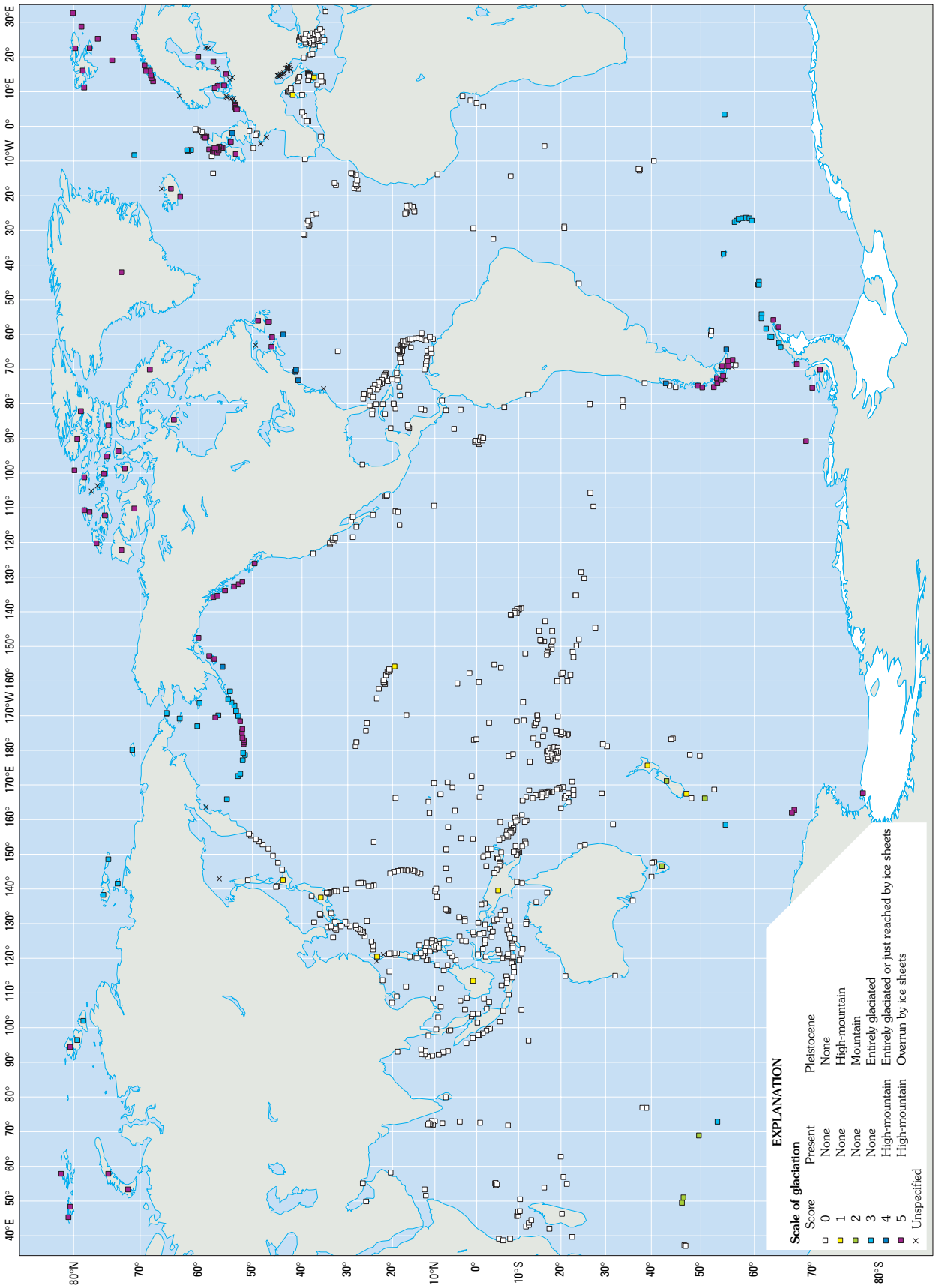


Figure 37. Global distribution of islands per scale of glaciation.

Table 24. Distribution of islands, by hydrologic feature and class

[pR- perennial river; pS- perennial spring; wL- wetlands; fL- freshwater lake; CS- complete sketch; PS- partial sketch; f- frequency = total number of islands sketched per hydrologic class; cf- cumulative frequency; (.), total number of islands]

Hydrologic features				Islands sketched		Islands classified	
pR	pS	wL	fL	CS	PS	f	cf
Hydrologic class 1 (dry)							
0	0	0	0	175	6	181	181
Hydrologic class 2							
0	0	1	0	24	3		
0	0	0	1	7	2		
0	0	1	1	8	5		
				(39)	(10)	49	230
Hydrologic class 3							
0	1	0	0	62	4	66	296
Hydrologic class 4							
0	1	1	0	22	1		
0	1	0	1	6	0		
				(28)	(1)	29	325
Hydrologic class 5							
0	1	1	1	13	1	14	339
Hydrologic class 6							
1	0	0	0	3	0		
1	0	1	0	3			
1	0	0	1	2	2		
1	0	1	1	15	0		
				(23)	(2)	25	364
Hydrologic class 7							
1	1	0	0	77	0	77	441
Hydrologic class 8							
1	1	1	0	66	4	70	511
Hydrologic class 9							
1	1	0	1	40	3	43	554
Hydrologic class 10 (wet)							
1	1	1	1	120	4	124	678

Hydrologic Classes

On the basis on the hydrologic sketches discussed above, the islands are classified on a general scale of dryness/wetness. The classification scheme is based on four of the seven hydrologic features that provide a hydrologic sketch of an island:

1. Perennial stream, which is designated pR;
2. Perennial spring, which is designated pS;
3. Wetlands, which is designated wL, and
4. Freshwater lakes, which is designated fL.

Depending upon which of these features is present, an island is assigned to 1 of 10 classes, where

- Class 1, in which each of the four features is absent, denotes a general state of dryness;
- The intermediate classes, 2, ..., 9 in which one or more, but not all, of the features are absent denote a general scaling from less dry to more wet;
- Class 10 in which each of the four features is present denotes a general state of wetness.

The states of dryness/wetness relate only to the surficial hydrologies of the islands.

Of the 1,000 islands:

- The hydrologic class is specified for each of the 643 islands coded as CS; that is, the islands with complete hydrologic sketches; and
- The hydrologic class is specified for 35 of the 212 islands coded PS; that is, the islands with partially complete sketches, but such that the relevant hydrologic features (pR, pS, wL, and fL) are each scored; whereby
- The hydrologic class is specified for a total of 678 (= 643 + 35) islands; this leaves
- 322 (= 1,000 – 678) islands whose hydrologic classes could not be ascertained (‡).

The definitions of the hydrologic classes in terms of the presence or absence of the four hydrologic features (pR, pS, wL, and fL) and the distribution of islands over the hydrologic classes are given in table 24.

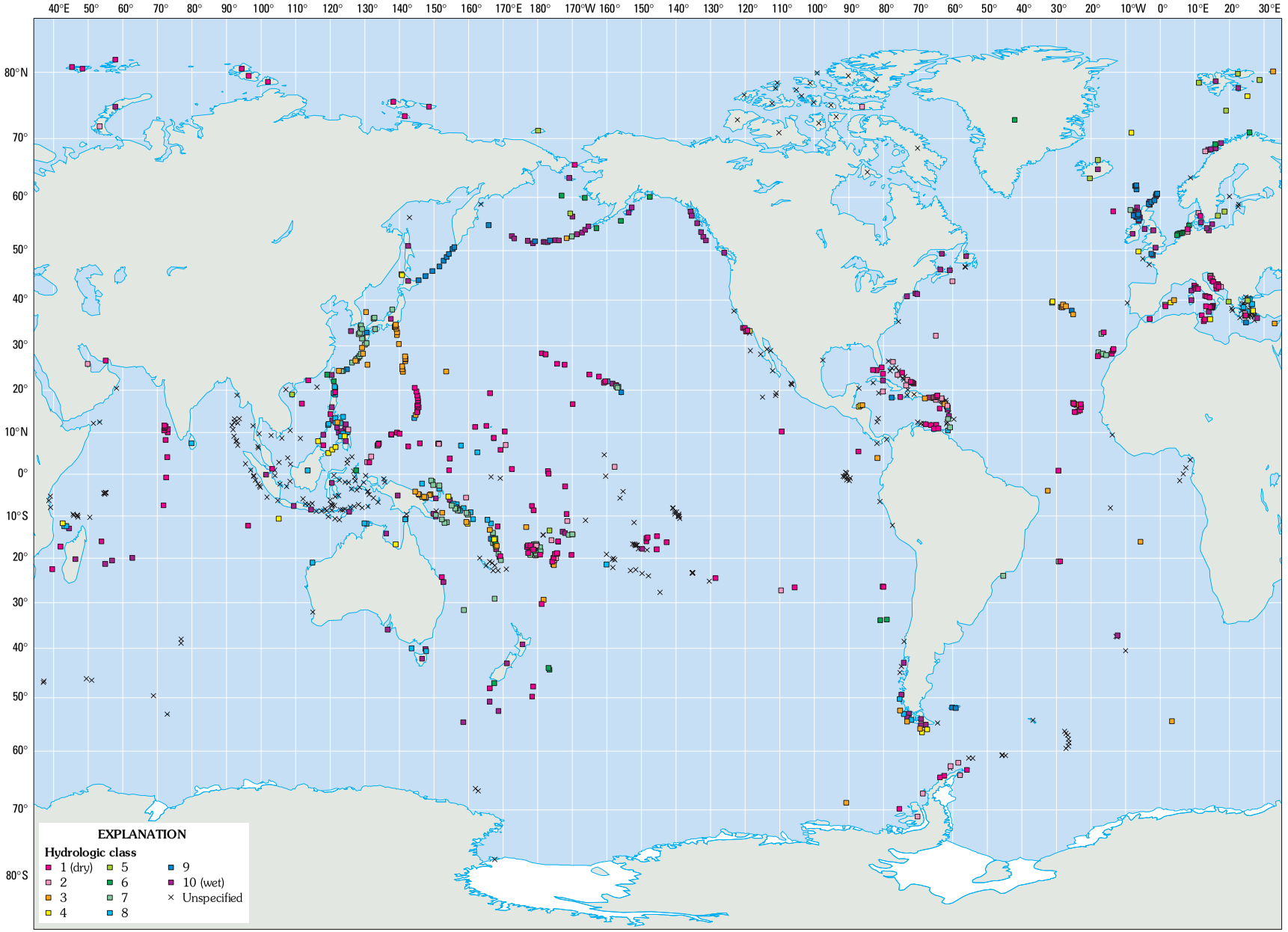
With respect to table 24:

- Classes 2, 4 and 6 entail combinations of three, two, and four hydrologic features, respectively, and
- Within classes 2, 4 or 6, each combination of features is accorded equal weight; that is, the order in which the combinations are presented does not imply any increase or decrease of wetness or dryness.

The global distribution of the islands identified as being of the extremal hydrologic classes 1 (dry) and 10 (wet) is shown in figure 38.

Summary

The island coverages of the 17 Environmental parameters are summarized in table 25.



Base modified from U.S. Geological Survey digital data, Gall's Sterographic Cylindrical projection, scale varies with latitude

Figure 38. Global distribution of islands per hydrologic class.

Table 25. Island coverage, by environmental parameter

Parameter	Islands				
	Specified A	Inapplicable C	Covered A+C	Unspecified B	Total A+B+C
Local meteorology					
Observation code	1,000	0	1,000	0	1,000
Station elevation for precipitation	184	0	184	816	1,000
Length of record of precipitation	224	0	224	776	1,000
Mean annual precipitation	418	0	418	592	1,000
Station elevation for temperature	237	0	237	763	1,000
Length of record of temperature	243	0	243	757	1,000
Mean annual temperature	331	0	331	669	1,000
Tropical / subtropical climate markers					
Mangroves	690	0	690	310	1,000
Coral reefs	979	0	979	21	1,000
Palms	995	0	995	5	1,000
Tropical peat	984	0	984	16	1,000
Temperate climate markers					
Seasonal snow / ice	948	0	948	52	1,000
Sphagnum peat	953	0	953	47	1,000
Subpolar / polar climate markers					
Permafrost	981	0	981	19	1,000
Permanent snow / ice	989	0	989	11	1,000
Score indicating scale of glaciation	963	0	963	37	1,000
Wetness / dryness					
State	678	31	678	322	1,000

SUPPLEMENTAL ISLAND SETS A AND B

As noted above, the Supplemental Island Set A consists of the following:

- Those islands that were extracted from the Primary Island Set in the course of refining that set, and
- Islands for which values of the elevations of their highest peaks could not be determined (‡), a shortfall that excluded the islands from having been in the Primary Island Set.

As also noted above, the Supplemental Island Set B consists of lagoonal atolls; dry-lagoon atolls, particularly raised atolls, were defined to be within the sample space for selecting islands to form the Primary Island Set.

Relative to the eight categories over which the parameters of the Primary Island Set are distributed (table 1):

- The 14 parameters that describe the 386 islands in the Supplemental Island Set A, and
- The 17 parameters that describe the 368 islands in the Supplemental Island Set B

are distributed over five of the eight categories; the three empty categories for both Supplemental Island Sets are Historical, Hydrologic, and Environmental (table 26).

Table 26. Distributions of Supplemental Island Sets A and B parameters, by category

[f, frequency; cf, cumulative frequency]

		Set A		Set B	
Count	Category	f	cf	f	cf
1	Designation	2	2	2	2
2	Historical	0	2	0	2
3	Geographic	7	9	7	9
4	Physiogrphic	2	11	5	14
5	Geologic	2	13	2	16
6	Hydrologic	0	13	0	16
7	Economic	1	14	1	17
8	Environmental	0	14	0	17

With respect to the Supplemental Island Sets A and B, the island coverages by their parameters and the information sources of the alpha/numeric values of their parameters are given in tables 27 and 28, respectively.

Among the parameters that describe the islands that belong to the Supplemental Island Sets A and B of which 12 are common to both sets. In Supplemental Island Set A, the parameter “Area of an Island” is, in effect, the land area of an island. In Supplemental Island Set B, the term “Land” is used to distinguish the area of an island, effectively the sum of the areas of the islets forming the island, that is, from the area of the atoll’s lagoon.

The 12 parameters that are common to Supplemental Island Sets A and B are, with one exception, a subset of the parameters that describe the islands of the Primary Island Set. The parameters of the subset have the same frame of reference relative to each of the three island sets. For example, the island names are the official names reported by the U.S. Board on Geographic Names, latitudes and longitudes are expressed to the nearest hundredth degree, and areas and elevations are expressed in square kilometers and meters, respectively. The islands in Supplemental Island Sets A and B are geologically characterized by geologic class, whereas the islands in the Primary Island Set are geologically characterized by geologic class and geologic species; that is, by geologic type.

Apart from “Land area of an Island,” the physiographic parameters that describe the Supplemental Island Set B islands are unique to the set. “Lagoon Area” and “Lagoon Depth” are expressed in square kilometers and meters, respectively.

Detailed accounts of the island coverages by the parameters that describe Supplemental Island Sets A and B islands are listed in tables 29 and 30, respectively.

Table 27. Parameters of Supplemental Island Set A

Count		Parameter description	Island covered	Information source
Cum.	Category			
		Designation		
1	1	Island name	386	L
2	2	Island ID number per a specific geophysically based sequential order of the islands	386	N_1
		Geographic		
3	1	Island latitude	386	L
4	2	Island longitude	386	L
5	3	Oceanic region in which an island is located	386	N_1
6	4	Oceanic subregion in which an island is located	386	N_1
7	5	Island group to which an island belongs	386	L
8	6	Code that indicates whether or not island group name found in geographic literature	386	L
9	7	Island subgroup to which an island belongs	386	L
		Physiographic		
10	1	Area of an island	386	L
11	2	Elevation of highest peak	139	L
		Geologic		
12	1	Lithospheric plate	386	N_1
13	2	Geologic class	386	N_1
		Economic		
14	1	Sovereignty	386	L

Table 28. Parameters of Supplemental Island Set B

Count		Parameter description	Island covered	Information source
Cum.	Category			
		Designation		
1	1	Island name	368	L
2	2	Island ID number per a specific geophysically based sequential order of the islands	368	N_1
		Geographic		
3	1	Island latitude	368	L
4	2	Island longitude	368	L
5	3	Oceanic region in which an island is located	368	N_1
6	4	Oceanic subregion in which an island is located	368	N_1
7	5	Name of island group to which an island belongs	368	L
8		Code that indicates whether or not island group name found in geographic literature	368	L
9		Island subgroup to which an island belongs	368	L
		Physiographic		
10	1	Number of islets	148	L
11	2	Number of passes	59	L
12	3	Land area of an island	132	L
14	4	Lagoon area	99	L
12	5	Lagoon depth	111	L
		Geologic		
15	1	Lithospheric plate	368	N_1
16	2	Geologic class	338	N_1
		Economic		
17	1	Sovereignty	368	L

Table 29. Island coverage, by parameters of Supplemental Island Set A

Parameter	Islands				
	Specified A	Inapplicable B	Covered A+B	Undetermined C	Total A+B+C
Designation					
Island name	386	0	386	0	386
Island ID per the Alisida	386	0	386	0	386
Geographic					
Island latitude	386	0	386	0	386
Island longitude	386	0	386	0	386
Oceanic region	386	0	386	0	386
Oceanic subregion	386	0	386	0	386
Island group name	386	0	386	0	386
Code on island group names	386	0	386	0	386
Island subgroup	386	0	386	0	386
Physiographic					
Area of an island	386	0	386	0	386
Elevation of highest peak	386	0	386	0	386
Geologic					
Lithospheric plate	386	0	386	0	386
Geologic class	386	0	386	0	386
Economic					
Sovereignty	386	0	386	0	386

Table 30. Island coverage, by parameters of Supplemental Island Set B

Parameter	Islands				
	Specified A	Inapplicable B	Covered A+B	Undetermined C	Total A+B+C
Designation					
Island name	368	0	368	0	368
Island ID (identification) per the Alisida	368	0	368	0	368
Geographic					
Island latitude	368	0	368	0	368
Island longitude	368	0	368	0	368
Oceanic region	368	0	368	0	368
Oceanic subregion	368	0	368	0	368
Island group name	368	0	368	0	368
Code on island group names	368	0	368	0	368
Island subgroup	114	254	368	0	368
Physiographic					
Number of islets	148	0	148	220	368
Number of passes	59	0	59	309	368
Land area of an island	132	0	132	236	368
Lagoon area	99	0	99	269	368
Lagoon depth	111	0	111	257	368
Geologic					
Lithospheric plate	368	0	368	0	368
Geologic class	338	0	338	30	368
Economic					
Sovereignty	368	0	368	0	368

WINDOWS ON THE PRIMARY ISLAND SET

The descriptions of the islands in the Primary Island Set may be viewed through various "windows." The Primary Island Set, which is, in effect, a matrix of 1,000 rows (islands) and 122 columns (parameters), is partitioned into 13 "windows," which are noted as W–1, ..., W–13. Each window, except W–13, is a matrix of 1,000 islands (rows) and a limited number of parameters (columns). The 13th window, "Names of Island," is shaped somewhat differently from the other windows in that the number of rows (island names) exceeds 2,000.

The various windows on the Primary Island Set are summarily listed in table 31.

Each window on the Primary Island Set provides a distinct description of the 1,000 islands. The distinctness of the descriptions derives from two aspects of the windows:

- The particular set of parameters used to describe the islands, and
- The particular ordering of the islands, which is either alphabetic, by island name, or sequentially, by island ID per the Alisida.

Of the 122 parameters that collectively characterize the islands, several parameters are common to some of, but not all, the windows; the following are common to windows W–1, ..., W–12:

- The official name of the island;
- The island ID number per the Alisida;
- The latitude of the island;
- The longitude of the island, and
- The oceanic region in which the island is located.

Except "the oceanic region in which the island is located," the parameters are common to window W–13.

Maps of the islands, coupled with some general information about the islands, are given in Appendix G.

Table 31. Windows on the Primary Island Set

Window	Description	Number	
		Islands (rows)	Parameters (columns)
W–1	Basic information	1,000	16
W–2	Historical information	1,000	13
W–3	Geographic information	1,000	11
W–4	Physiographic information	1,000	20
W–5	Topologic information	1,000	19
W–6	Geophysical information	1,000	27
W–7	Geologic neighbors	1,000	17
W–8	Demographic information	1,000	20
W–9	Geographic–geologic–sovereignty affinities	1,000	17
W–10	Ports and airports	1,000	22
W–11	Meteorologic information	1,000	17
W–12	Climatic information	1,000	23
W–13	Island names	2, 148	7

REFERENCES CITED

Brown, L.A., 1950, The story of maps: Boston, Little Brown and Company, 397 p.

Defense Mapping Agency, 1988, World port index: Washington, D.C., Hydrographic/Topographic Center Publication 150, 278 p.

Emery, K.O., and Aubrey, D.G., 1991, Sea levels, land levels, and tide gauges: New York, Springer–Verlag, 237 p.

International Civil Aviation Organization, 1992a, Summary and Explanation, v. 1 *of* Airport characteristics data bank: Montreal, (International Civil Aviation Organization), 72 p.

———1992b, Africa–Indian Ocean Region, v. 2 *of* Airport characteristics data bank: Montreal, Canada, 193 p.

———1992c, Caribbean and South American Regions, v. 3 *of* Airport characteristics data bank: Montreal, Canada, 221 p.

———1992d, European Region, v. 4 *of* Airport characteristics data bank: Montreal, Canada, 572 p.

———1992e, Middle East and Asian Regions, v. 5 *of* Airport characteristics data bank: Montreal, Canada, 277 p.

———1992f, North Atlantic, North American and Pacific Regions, v. 6 *of* Airport characteristics data bank: Montreal, Canada, 255 p.

MacArthur, R.H., and Wilson, E.O., 1967, Island biogeography: Princeton, Princeton University Press, 203 p.

Mandlebrot, B.B., 1975, Stochastic models for the Earth's relief—The shape and the fractal dimension of the coastlines, and the number–area rule for islands: Washington, D.C., Proceedings of the National Academy of Sciences, v. 72, p. 3825–3828.

Menard, H.W., 1986, Islands: New York, Scientific American Books, Inc, 230 p.

Motteler, L.S., 1986, Pacific island names: Honolulu, Bernice P. Bishop Museum Miscellaneous Publication 34, 91 p.

Nunn, P.D., 1994, Oceanic islands: Oxford, United Kingdom, Blackwell, 413 p.

Richardson, L.F., 1961, The problem of contiguity—An appendix to the statistics of deadly quarrels, *in* Rapoport, Anatol, von Bertalantfly, Ludwig, and Meier, R.L., eds., General systems: v. 6, p. 139–187.

Sharp, Andrew, 1985, The Discovery of the Pacific Islands: Westport, Conn., Greenwood Press, 259 p.

Strahler, A. N., 1952, Hypsometric (area-altitude) analysis of erosional topography: Bulletin of the Geological Society of America, v. 63, p. 1,117–1,142.

Wilson, J.T., 1954, The development and structure of the crust, chap. 4, *in* Kuiper, G. P., ed., The Earth as a planet: Chicago, Chicago University Press, p. 138–214.

ABBREVIATIONS AND NOTATION

The abbreviations and notation specific to each of the windows on the Primary and Supplemental Island Sets are given above precceding each of the windows given by the Tables 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67 and 70. A full account of the abbreviations and notation used throughout this report are listed below in table 81.

Table 32. Full account of abbreviations and notations

A	Arc class	C-11	Continental shield/platform	Dimen.	Dimension
A-1	Arc orogenic	C-2	Continental structural block	Dist.	Distance
A-2	Arc outer arc	C-3	Continental margin–composite	Distr.	District
A-3	Arc carbonate/volcanic	C-4	Continental margin–igneous/metamorphic	DU	Dutch
A-4	Arc carbonate	C-5	Continental margin–volcanic	E.	Eastern
A-5	Arc volcanic/mafic	C-6	Continental margin–sedimentary	Ea	Eurasia
AC	Other administrative center	C-7	Continental margin–carbonate	EA	Eurasian
Af	Africa	C-8	Continental margin–depositional	Effect.	Effective
AF	African	C-9	Continental orogenic–cordilleran	Elev.	Elevation
AG	Aegean	C.C.	Clear customs	Exped.	Expedition
AM	American	CA	Canadian	fL	Freshwater lake
An	Antarctica	Carib.	Caribbean	FN	Former name
AN	Antarctic	CB	Caribbean	FR	French
AR	Arabian	CB.	Coastal (breakwater)	Geog.	Geographic
Arch.	Archipelago	CL	Climatic	Geol.	Geologic
Atl.	Atlantic	Clim.	Climatic	GF	Other government facility
AU	Australian	CN	Coastal (natural)	Gl	Glaciation
Aus.	Australia	CN	Conventional name	Gp.	Group
bL	Brackish water lake	CO	Cocos	Gtr.	Greater
BR	British	Conc.	Concentration	Gyra.	Gyration
C	Continental class	Cont.	Continent	H1	Low island
C(1)	Compactness 1	Cr	Coral reef	H2	Lowland
C(2)	Compactness 2	CS	Complete sketch	H3	Rolling terrain
C(3)	Compactness 3	Cum.	Cumulative	HI	Historic
C-1	Continental tectonic block	C°	Degree centigrade	High.	Highest
C-10	Continental orogenic–Alpine	deg.	degree	HN	Historical name

Table 32. Full account of abbreviations and notations—Continued

HO	Holocene	NC	National capital	PA	Pacific
hr.	Hour	Ne.	Northeastern	Pac.	Pacific
HY	Hydrologic	NG	New Guinea	Perim	Perimeter
I.	Inner	No.	Number	Pf	Permafrost
IA	Indian-Australian	Nw.	Northwestern	PH	Philippine
ID	Identification	NZ	Nazca	pH	Prior to Holocene
Ind.	Indian	O	Oceanic class	Pl	Palm
Indo.	Indonesia	O-1	Oceanic carbonate bank/ridge	PO	Portuguese
Is.	Islands	O-2	Oceanic non-volcanic in an atoll	pR	Perennial river
Kep.	Kepulan	O-3	Oceanic makatea / no volcanic exposed	Proj.	Projection
King.	Kingdom	O-4	Oceanic carbonate / volcanic	PS	Partial sketch
km	Kilometer	O-5	Oceanic volcanic / mafic	pS	Perennial spring
L	Large	O-6	Oceanic volcanic in an atoll	PT	Precipitation and temperature
L	Length	O-7	Oceanic makatea / volcanic exposed	Q.	Queen
Lat.	Latitude	O-8	Oceanic plateau volcanic	R	Radius
Litho.	Lithospheric	O.	Outer	RB	River (basin)
Long.	Longitude	Obs.	Observations	Rep.	Republic
M	Medium	Oc.	Ocean	Res	Reservoir
m	Meter	ON	Official name	RN	River (natural)
Malay.	Malaysia	OR	Open roadstead	RS	Research station
MC	Metro center	P	Positional	Rw	Runway
Med.	Mediterranean	P	Precipitation	S	Small
Mg	Mangrove	P.I.	Permanent ice / snow	S.	Southern
mm	Millimeter	P1	Knob	S.A.	South America
MS	Meteorologic station	P2	Conical terrain	S.I.	Seasonal ice / snow
N	No	P3	Hill	S.P.	Sphagnum peat
N.	Northern	P4	Dome	SA	South American
N.A.	North America	P5	Ridge	SC	Scotia
N1	Basinal	P6	Hills	Se.	Southeastern
N2	Valley	P7	Blocky	Sov.	Sovereignty
NA	North American	P8	Mountain	SP	Spanish

Table 32. Full account of abbreviations and notations—Continued

Spon.	Sponsorship	TU	Turkish	‡	Unsuccessful search
sq.	Square	USBGN	United States Board on Geographic Names	#	Not determined due to lack of resources
sR	Seasonal river	USDMA	United States Defense Mapping Agency	•	Applies
sS	Seasonal spring	V	Very small	%	Percent
Sta.	Station	V	Virtual	∪	Logic operator–union
Str.	Strait	Vlc	Volcanism	⊃	Logic operator–subset
Sw.	Southwestern	W	Width	α	Islands on continental margin
T	Temperature	W.	Western	β	Islands on spreading center
T.P.	Tropical peat	W/D	Wetness / dryness	δ	Islands on seamounts
T1	Monocline	wL	Wetlands	ε	Islands on carbonate banks
T2	Tabular terrain	Y	Yes	γ	Islands within an island arc
T3	Apron	Z.	Zemlya	ξ	Islands on continental blocks
Tr.	Trend	†	Not applicable		
Trop.	Tropical	*	Information not adequate for for further detail		

GLOSSARY

Foreign Terms

Apart from island names, very few foreign words are used (table 33).

Table 33. Dictionary

Word	Foreign language	English
Ada	Turkish	Island
Alto	Spanish	Height
Ayios	Greek	Saint
Bahia	Spanish	Bay
Cabeco	Portugese	Hilltop
Cerro	Spanish	Hill
Dake	Japanese	Hill
Do	Korean	Island
Gora	Russian	Mountain
Gunto	Japanese	Island Group
Gunung	Indonesian	Mountain
Jima	Japanese	Island
Kepulan	Indonesian	Archipelago
Mont	French	Mountain
Monte	Italian	Mountain
Monte	Portugese	Mountain
Monte	Spanish	Mountain
Morne	French	Hill
Pic	French	Peak
Picco	Italian	Peak
Pico	Spanish	Peak
Piton	French	Peak
Retto	Japanese	Archipelago
San	Japanese	Mountain
Shima	Japanese	Island
Shoto	Japanese	Archipelago
Take	Japanese	Mountain
Yama	Japanese	Mountain
Zemlya	Russian	Land

Technical Terms

Aquifer. A body of rock sufficiently permeable to conduct ground water and to yield economically significant quantities of water to wells and springs. See **Spring**.

Archipelago. Group of islands in close proximity to one another, generally bearing a geologic relation. The word derives from 'pelagus' (Greek for principal sea), and was initially used in reference to the Aegean Sea.

Atoll. Especially an annular coral ring that has as its foundation an extinct, submerged seamount. Found only in tropical waters. Morphologically, and thereby more generally, any annular ring in tropical waters on or off the Continental Shelf. See **Continental Shelf**.

Brackish water. An imprecise term that refers to water with salinity between that of normal seawater and normal freshwater.

Coefficient of compactness. A measure on the range (0,1) of the degree an enclosed planar body is as broad as it is wide relative to a circle for which the coefficient of compactness equals one (1). A circle is the most compact form of a two-dimensional object. See Appendix B.

Coefficient of concordance. A measure on the range (0,1) of the degree of agreement which two or more individuals judge an object to have a specific quality. See Appendix C.

Coherence. Implies a degree of uniformity in terms of aspects or measures among geophysical features, phenomena, or observations over broad spans of time or space.

Constructive margin. Boundary between intersecting lithospheric plates where, owing to the upwelling of passive magma, an area of new crust is being added to the Earth's surface. See **Lithospheric plate**.

Continental Shelf. Near shore, relative flat portion of the continental slope. See **Continental slope**.

Continental slope. Subsurface continent/ocean interface.

Convergent margin. Boundary between intersecting lithospheric plates, where the plate of lesser density is being subducted under the plate of higher density. See **Lithospheric plate**.

Coral. Any of a a large group of bottom-dwelling, sessile marine invertabrate organisms that belong to the class Anthozoa (phylum coelenterata) found in intertropical waters.

Coral Reef. A mound or ridge of in-place coral colonies and accumulated skeletal fragments, carbonate sand, and limestone that result from organic secretion of calcium carbonate that lithifies colonies and sand. See **Coral**.

Effective radius. The radius of a circle whose area equals that of an arbitrary two-dimensional object.

Ellipticity. A measure of the geometric flattening of a prolate ellipsoid, which is defined as the ratio of the difference between the prolate ellipsoid's largest and smallest radii to its largest radius.

Freshwater. Water that contains only small quanitities of dissolved minerals.

Geoid. Hypothetical surface of the Earth that serves as a reference for the measurement of dry-land heights and oceanic depths.

Great circle. A circle on the Earth's surface, the plane of which passes through the center of the Earth.

Hypsometric curve. Functional relation between the area of a feature of the Earth's surface and its height or depth above or below a given datum.

Hypsometry. Measure of height or depth, generally in relation to sea level.

Island. A body of land surrounded by water. By definition, all dry-land fragments of the Earth are islands. Generally, the word 'island' is used in reference to dry-land fragments whose areas are less than that of Antarctica, which is the smallest "continent."

Lake. An inland body of standing water that occupies a depression in the Earth's surface of sufficient size and depth to prohibit growth of nonsubaqueous plants, except, perhaps, near shore.

Latitude. Angular distance of a point on the Earth's surface north or south of the equator.

Lithosphere. Earth's rigid surface layer that floats on the weak plastic layer, the asthenosphere. The depth of the lithosphere is in the range of (0 – 100 km), which tends to vary as the square root of the age of the crust.

Lithosheric plate. Portion of the lithosphere; plate boundary marked by seismic activity. See **Lithosphere**.

Longitude. Angular distance between the plane of a given meridian through any point on a sphere or a spheroid and the plane of an arbitrary meridian selected as a line of reference.

Mangroves. Common name for various shrubs and trees of the families Rhizophoraceae, Verbenaceae, Sonneratiaceae, and Arecaceae (Palmae). Mangroves grow as dense thickets or forests along tidal estuaries, and in salt marshes and muddy coasts in tropical and subtropical regions.

Matrix. A rectangular array of alphanumeric information.

Meridian. An imaginary line on the Earth's surface formed by a plane that intersects the Earth at right angle to any parallel.

Moment of inertia. A measure of the "resistance" of a rigid two-dimensional plate of unit density to rotation by a unit force.

Palms. Common name for any flowering plant of the order Arecales and of the single family in the order Arecaceae (Palmae). Palms are mainly found in tropical and subtropical regions. Among the various species are *Phoenix dactylifera* (date palm) and *Cocos nuicifera* (coconut palm).

Parallel. An imaginary line on the Earth's surface formed by a plane that intersects the Earth normal to the polar axis. The parallel whose plane bisects the Earth is referred to as the "equator."

Peat. An unconsolidated deposit of semicarbonized plant remains in a water-saturated environment and of moisture content in excess of 75 percent.

Perennial. Refers to river or spring flow being continuous throughout the year.

Permafrost. Any soil, subsoil, or other surficial deposit that occurrs in arctic, subarctic, or alpine regions at a variable depth beneath the Earth's

surface in which below-freezing temperatures exist continuously over a broad expanse of time.

Positional distance. The great circle distance between two points that marks the location of two islands on the Earth's surface. See **Great circle**.

Projection. Any well-defined system of lines drawn on a plane surface to represent the corresponding system of parallels and meridians in reference to the Earth's surface. See **Parallel** and **Meridian**.

Radius of gyration. The distance from a reference point to a point where if the area of a two-dimensional body was concentrated, then the moment of inertia of the concentrated area would equal the moment of inertia of the distributed area of the body. See **Moment of inertia**.

River. A body of running water that moves by gravity to progressively lower levels in relative narrow but well-defined channel on the surface of the ground. Herein, "river" is synonymous with "stream."

Salt water island. An island surrounded by seawater. Islands within freshwater bodies or within deltas of rivers that discharge to the sea are excluded from the study.

Scale. The ratio between linear distance on a map and the corresponding distance on the surface being mapped.

Seasonal. Refers to river or spring flows that occurr only during and following the rainy season over part of the year.

Shape. The spatial form of an island as reflected by its coastal outline.

Spring. A place where ground water flows naturally from rock or soil onto the land surface or into a body of surface water.

Subduction. Process by which one of two interacting lithospheric plates is forced under the other. See **Constructive margin**.

Topography. The physical surface features of a region considered as forming a unit.

Virtual distance. The distance equal to the positional distance between two islands minus the sum of the effective radii of the islands. See **Effective radius**.

Wetlands. Areas that are permanently wet or intermittently covered by water.