

BASIC DATA FOR:

TONGA

One of 10 Country Reports prepared as part of a joint activity under Grant # LAC-0605-G-SS-6049 from the United States Agency for International Development to The Nature Conservancy.

These reports are necessarily incomplete. Please send all recommendations, comments, criticisms, and new data to:

Sam Pearsall, Project Director
The Nature Conservancy
1258 Wilhelmina Rise
Honolulu, Hawaii
USA

12/88



Introduction to the Project

Since the early 1970s, The Nature Conservancy (TNC) has developed a standard methodology for collecting, managing, organizing, storing, and retrieving biological diversity data. This methodology has been applied, tested, and refined in 49 of the 50 United States and in eight Latin American countries. The TNC approach consists of a basic data management structure, the Biological Conservation Database (BCD), and various procedures and protocols for biological conservation program development and management. One aspect of the TNC method is an emphasis on data collection and management at the local level with data collation and interpretation occurring in successively larger regions, until ultimately biological conservation data is collated and interpreted at the global level. TNC is currently working with the International Union for the Conservation of Nature and Natural Resources (IUCN) on refinements for the system so that data collected locally can be more usefully applied in international biological conservation efforts.

For several years, TNC has been considering the possibility of extending its international efforts into the Asia and Pacific region. In January 1988, TNC entered into an agreement with the U. S. Agency for International Development (AID) to evaluate the possibility of building a biological conservation program in the AID South Pacific Region consisting of the countries of Cook Islands, Kiribati, Fiji, Niue, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu, and Western Samoa. The evaluation was to consist of several parts. These were:

1. the identification of additional data (that is, in addition to data collected in the standard TNC methodology) that would be necessary for a multinational project in a region with many countries, most of which occupy many islands;
2. the collection and organization of this data plus basic information on endemic and threatened taxa and significant ecosystems for the countries of the AID South Pacific Region;
3. the development of country bibliographies on biological conservation;
4. the preparation of 10 country overviews and a regional overview of biological conservation issues and opportunities; and
5. a desirability and feasibility analysis and suggested plan for a TNC and/or AID program in the region.

Progress to Date

Regional Overview and Suggested Plan

On 30 April 1988, I submitted to TNC and AID a document entitled Materials in Support of a Biological Diversity Annex to the Regional Development Strategy Statement (RDSS) for the South Pacific Region Served by USAID. That document contained a regional overview including regional discussions of the distribution of biological diversity, threats to biological diversity, and the relationship between development and biological diversity. Nine regional programmatic opportunities were identified, and are listed here, in order of priority for action:

1. Surveys of Biota, Related Resource Inventories, and Information Management
2. Assistance with the Establishment and Strengthening of National Institutions for the Management of Biological Diversity and Protected Areas
3. Development of Public Information and Secondary School and Teachers' College Curricular Materials for the Management of Biological Diversity
4. Planning and Establishment of Protected Areas
5. Development and Demonstration of Alternative Approaches to Protected Area Establishment on Customary Lands and Waters, with Special Emphasis on Developing and Testing Incentives for the Conservation of Biological Diversity on Non-alienated Customary Lands
6. Extra-curricular and In-service Training of Young Professional in Biological Diversity Conservation Including Environmental Assessment and Planning for and Management of Protected Areas
7. Development of Programs to Respond To and Correct Pollution of Coastal Areas, Especially Reef, Lagoon, and Mangrove Areas
8. Basic Research
9. Legislation

Items 1, 2, and 4 fall well within the areas of TNC expertise and international experience. Item 5 is an area where TNC's experience in the United States with non-acquisition protection methods could be useful to an on-going process supported by the South Pacific Regional Environment Programme (SPREP). SPREP identifies items 1 through 9 as programmatic goals, although the

SPREP order of priority might differ. AID ultimately listed the following priorities for the U. S. federal fiscal years 1990 - 1994:

- a) as part of its overall goal, ensuring that agricultural and marine development activities are designed to minimize any threat to biological diversity and maximize resource conservation;
- b) strengthening its relationship with SPREP and seeking to have conservation of biological diversity given a greater priority in the programmatic activities of SPREP;
- c) supporting the systematic collection and management of information relating to biological diversity;
- d) supporting activities which increase the awareness in island communities of long-term importance of this issue and its relationship to economic development; and
- e) supporting activities which increase the capacity and commitment of island governments in the conservation of biological diversity

(Regional Development Office, South Pacific. 1988 p 44).

The Materials in Support document also included a section titled "Considerations for the Establishment of a Regional Conservation Data Center for the AID Region." This section reviewed the general backgrounds of TNC's international data programs and SPREP's various biological diversity activities before evaluating physical requirements, institutional linkages, and alternative approaches for a TNC regional program. The proposal can be updated and summarized as follows:

1. A regional network of TNC Conservation Data Centers (CDCs) is both desirable and feasible in the South Pacific island region including but not limited to the AID South Pacific Region.
2. Such a network would require permanent (or at least long term) flows of financial and technical support from outside the region.
3. The network would include the following nodes:
 - a. TNC international, national, and Hawaii centers
 - b. SPREP
 - c. sub-national, national, and sub-regional centers

- d. University of the South Pacific
 - (1) Institute for Natural Resources including the South Pacific Regional Herbarium
 - (2) Pacific Information Centre
 - (3) extension offices with satellite and computer linkages
 - e. Bishop Museum
 - f. East-West Center Environment and Policy Institute
 - g. IUCN's Conservation Monitoring Centres, UNEP's GRID system, the data system under development at the University of Papua New Guinea, and other international data bases as appropriate.
4. The best approach to developing the network would be to:
- a. with SPREP involvement, establish a national center (pilot project) in a country where interest is already strong (Western Samoa is recommended);
 - b. work with SPREP to develop a regional data center;
 - c. assist the Bishop Museum with its efforts to develop a specimen data base for the region; and
 - d. begin building linkages with the other nodes listed above.

Limited progress has been made toward actually establishing the network, although such progress was not strictly included in the original project agreement. This progress includes:

- 1. establishment of good working relations, either directly or through correspondence, with many of the key environmental people in the governments of the USAID/RDO/SP Region;
- 2. establishment of good working relations directly with staff at the South Pacific Regional Environment Programme and some key staff at all universities and in some of the environmental PVOs in the USAID/RDO/SP Region;
- 3. agreement in principle among most of those listed in 1. and 2. above on the idea of a regional network of CDCs;

4. establishment of a Department of the Environment in Western Samoa. This Department has an explicit mandate to assess environmental impacts of development projects including impacts on biological diversity;
5. work with Bishop Museum to scope a project to computerize the locations of all Pacific islands specimens in systematics regional collections;
6. negotiation of a Memorandum of Understanding between TNC and EWC for biological diversity conservation in the region;
7. commitments to coordinate with the data base activities managed by Lance Hill at UPNG; and
8. development of support for a project in Western Samoa to map and computerize the maps of vegetation and locations of rare plants and animals for the country.

Progress on the South Pacific Data Base

TNC's BCD system is a relational data base that includes files on elements (rare, threatened, or otherwise significant taxa or communities) global ranks (a compound variable comprised of indices of threats to, abundance and distribution of, and conservation status of elements), individual occurrences of the elements, sites and ownership tracts where the elements occur, managed areas, and TNC projects including protection and stewardship. The current proposal is to add files on countries, islands, and element distributions to the BCD data base. Country files would include the basic information needed by a conservation biologist planning to work in the country. Country files would be supplemented by agency and non-governmental organization files. Island files would serve as geographic unit files and be supplemented by group membership and island synonym files. Country files would be linked with tract and island files. Island files would also be linked with element occurrence, managed area, site, and tract files to produce distribution files..

The data base developed in the current project is not organized in the BCD format. It is, in fact, a set of text documents designed to facilitate the entry of data into the BCD system. The following files have been developed for each country:

Country Basic Files - Data which should eventually be entered into country files in the BCD. The format of the text files approximates the format of the proposed BCD country files.

Taxa and Ecosystem Files - Data which should eventually be entered into element files in the BCD.

Managed Area Files - Data for the BCD managed area files.

Agency and NGO Files - Files which would supplement the BCD country files.

Island Basic Files - Data which should eventually be entered into island files in the BCD. The format of the text files approximates the format of the proposed BCD island files. The island files are coded to correspond with Motteler (1986), a useful gazetteer for the region.

Bibliographies - All of the bibliographic references used in this project are stored in a text-base data base. Topical, geographic, and country keywords are included.

The following pages include individual introductions to the various text files developed during the current project.

Notes:

This introduction is accompanied by a country report including country, taxa, ecosystem, managed area, agency, and NGO files. The data in these files is certainly incomplete. Any additional information you can provide will be greatly appreciated! We especially need additional data on endemic and threatened species, current maps, and agency information. Please send your recommendations, comments, criticisms, and additional data to me:

Sam Pearsall, Project Director
The Nature Conservancy
1258A Wilhelmina Rise
Honolulu, HI 96816

	<u>CI</u>	<u>FJ</u>	<u>KI</u>	<u>NI</u>	<u>NG</u>	<u>SI</u>	<u>TO</u>	<u>TU</u>	<u>VA/NH</u>	<u>SA</u>
Agricola 70-88	55	513	23	18	1813	217	83	11	49/71	239
Biosis 69-88	91	722	73	54	3736	551	164	25	76/190	351
SciSearch 74-88	38	305	32	17	1486	168	127	10	79/118	132
Oceanic Abstracts 64-88	27	127	40	5	189	46	82	10	20/49	66
Enviroline 70-88	2	27	1	0	76	9	6	0	3/3	16
Aquatic Science Abstracts 78-88	26	219	81	7	506	73	147	23	79/109	107
Environ. Bibliog. 74-88	2	47	9	0	241	22	8	4	1/1	28

Table 1.

Numbers of bibliographic entries in data bases supported by Dialog for each of the ten island states in the AID South Pacific Region. Search conducted in September 1988.

Key Words

CI = Cook Islands
 FI = Fiji
 KI = Kiribati
 NI = Niue
 NG = New Guinea (Papua New Guinea)
 SI = Solomon Islands
 TO = Tonga
 TU = Tuvalu
 VA = Vanuatu NH = New Hebrides
 SA = Samoa

Introduction

COUNTRY BASIC FILES

- COUNTRY:** The country's most common name. The term "country" applies to a local South Pacific political entity, so New Caledonia would be listed rather than France. This field is intended to serve as a linking field to other files, so standardization is important. Use the short name provided in Bureau of Intelligence and Research (1983).
- SYNONYMS:** The first synonym is the long or official name from Bureau of Intelligence and Research (1983). Other synonyms from the local language, French, German, and Spanish should be provided as appropriate. Do not include island group synonyms unless the island group is perfectly synonymous with the country.
- CMC CODE:** Code used by the IUCN Conservation Monitoring Centers in Cambridge and Kew. The code is geographic, rather than political, so more than one may apply.
- ISO CODE:** International Standards Organization national codes.
- UN CODE:** UN national codes. For some reason, several of the South Pacific Countries have the same code (998).

BASIC GEOGRAPHY

- LATITUDE OF CENTER:** Expressed as degrees and decimal fractions thereof.
- LONGITUDE OF CENTER:**
- NORTH TO SOUTH LATITUDE EXTENT:**
- WEST TO EAST LONGITUDE EXTENT:**
- CONTIGUOUS COUNTRIES:** Based on 200 mile EEZs and negotiated boundaries only.
- TERRESTRIAL AREA:** Express in km².
- EEZ AREA:**
- COMPONENT ISLANDS:** List if 50 or fewer. Otherwise give total number. This is not a linking field.

MEAN ANNUAL PRECIPITATION:

Express in mm followed by a dash and the measurement station. For countries with widely spread islands, provide data for several stations if possible.

MEAN MONTHLY MAX PRECIPITATION:

Express in mm followed by a dash and the month of occurrence followed by a dash and the measurement station. If needed, provide for several stations as above.

MEAN MONTHLY MIN PRECIPITATION:

MEAN ANNUAL TEMPERATURE:

Express in n° C.

MEAN MAX TEMPERATURE:

Express in n° C followed by a dash and the measurement station. If needed, provide for several stations as above.

MEAN MIN TEMPERATURE:

1985 POPULATION:

ANNUAL GROWTH RATE (1980-1985):

MAPS, IMAGES, AND SURVEYS

List here any important regional references including this country as well as good general quality maps (e.g. planimetric and road maps) for the country.

AERIAL PHOTOS:

Provide dates, scales, coverage, and availability.

SATELLITE IMAGERY:

Provide sources.

TOPOGRAPHIC MAPS:

Provide reference(s) or source code(s) for specific maps, otherwise provide sources for acquisition.

VEGETATION MAPS:

GEOLOGY MAPS:

SOIL SURVEYS:

POLITICAL INFORMATION

POLITICAL STATUS: Select one of the options below and include date of that status.

French Overseas Territory
Independent Democratic Republic
Independent Military Republic
Commonwealth Constitutional Monarchy
Commonwealth Democratic Republic
Commonwealth Limited-democratic Republic (restricted suffrage)
New Zealand Free Associate
New Zealand Territory
UK Territory
US Free Associate
US Commonwealth
US Incorporated Territory
US Unincorporated Territory
UN Trust Territory of the Pacific Islands (US trustee)

CAPITAL ISLAND:

CAPITAL CITY:

SENIOR LEADER: List prime ministers, presidents, governor-generals, heads of state, kings, etc. List the senior leader(s) in the Pacific location.

COMMENTS ON THE POLITICAL SITUATION:

Review the most recent transfer of leadership and such other factors as are useful for evaluating the political climate of the country.

MEMBERSHIP IN INTERNATIONAL CONVENTIONS AND ORGANIZATIONS:

List appropriate international agencies and conventions relating to the environment and the date of accession or membership. In some cases, a larger group of countries (e.g. the Forum states) will bind itself to a treaty if a smaller number of their members accede to it. In such cases, list those which accede.

SPREP FOCAL POINT:

Provide the name, address, and phone number.

THREATS TO BIOLOGICAL DIVERSITY

POPULATION AND LAND-USE THREATS TO BIOLOGICAL DIVERSITY:

Discuss those threats which are directly related to population growth, economic development, and land-use conversions.

ALIEN SPECIES THREATS TO BIOLOGICAL DIVERSITY:

Discuss threats from alien (non-indigenous) species.

OTHER THREATS TO BIOLOGICAL DIVERSITY:

Discuss accidental disasters, pollution, commercial exploitation, and other threats not included above.

LAWS RELATING TO BIOLOGICAL DIVERSITY:

Use the following form:

Standard Citation

Discussion. Source.

LAND TENURE

LAND TENURE NARRATIVE:

Discuss the general nature of land ownership, access, and control, paying particular attention to customary tenure.

TENURE CLASSES: Provide class title, percentage, and source.

Introduction

TAXA FILES

COUNTRY:

TAXA:

Provide here any general information on the relative levels of endemism, the numbers of species, and other indicators of biological diversity. Try to provide this information for the following groups: Plants, Invertebrates, Fish, Amphibians and Reptiles, Birds, Mammals.

ENDEMIC TAXA: Plants etc. Use the following form:

Common name (scientific name) (information about endemism and threats) (sources)

THREATENED TAXA: Mammals etc. as above.

MAJOR COLLECTIONS:

Discuss the herbaria, botanical gardens, zoos, and museums with significant collections from the country's biota. Where would one have to go to collect specimen data for biological diversity data base development? Unfortunately, in most cases, this information is not available.

Introduction

ECOSYSTEM FILES

COUNTRY:

ECOSYSTEMS

Provide here a discussion of the country's major ecosystems.

THREATENED ECOSYSTEMS: Use the following form:

Characteristic or dominant genus
structural or physiognomic type
(source)

Introduction

MANAGED AREA FILES

COUNTRY:

MANAGED AREA SYSTEMS

Use the following form:

Managed Area System Name (Legal Basis in
the form of citations)

Managed Area Name (date: area in km²)
(comments) (source)

Introduction

AGENCY FILES

(This file is restricted to agencies of the governments of the countries in the data base.)

AGENCY RESPONSIBLE FOR: list one or more of the following:

Marine Resources Conservation
Forest Conservation
Parks and Protected Areas
Conservation of Rare, Threatened, or
Endangered Species of Plants and
Animals

AGENCY NAME: List the level most congruent with the area of responsibility, e.g. the Division of Parks rather than the Department of Agriculture (including Parks) or the South Ranger District (within Parks).

COUNTRY WHERE BASED:

SENIOR LEADER: Provide the name and title of the highest ranking manager of the agency at the level named above, e.g. the Director of the Division of Parks.

ADDRESS: Provide the full business address of the Senior Leader.

TELEPHONE:

TELEX:

AGENCY POSITION IN GOVERNMENT:

List the Senior Leader and all appropriate individuals in the chain of command above and below him or her including titles, as follows:

name, Minister of Agriculture
name, Director of Agriculture
name, Director, Parks Division
name, Deputy Director, Parks Division
name, etc.

Introduction

NGO FILES

NGO NAME:

PRIMARY GOALS: If available

GEOGRAPHIC SCOPE: Do not include NGOs with global scope.

KEY PEOPLE, ADDRESSES:

COMMENTS:

COUNTRY BASIC FILES

COUNTRY: Tonga
SYNONYMS: Kingdom of Tonga (official)
Royaume de Tonga (French)
CMC CODE: KY
ISO CODE: TO
UN CODE: 998 (South Pacific islands)

BASIC GEOGRAPHY

LATITUDE OF CENTER: 20° S.
LONGITUDE OF CENTER: 177° W.
NORTH TO SOUTH LATITUDE EXTENT: 14° S. - 26° S (southern extent based on the questionable assignment of a 200 mile EEZ to Minerva Reefs) (USDS Office of the Geographer c1985)
WEST TO EAST LONGITUDE EXTENT: 177.5° E. - 171.5° W. (western extent based on the questionable assignment of a 200 mile EEZ to Minerva Reefs) (USDS Office of the Geographer c1985)
CONTIGUOUS COUNTRIES: Fiji, Wallis and Futuna, Western Samoa, American Samoa, Niue, New Zealand (New Zealand contiguity based on the questionable assignment of a 200 mile EEZ to Minerva Reefs) (USDS Office of the Geographer c1985)
TERRESTRIAL AREA: 671 km² (Ridgell 1982)
699 km² (Bureau of Intelligence and Research 1983, Dahl 1986, SPC 1987)
EEZ AREA: 700,000 km² (Dahl 1986, SPC 1987) (not clear whether this includes a 200 mile EEZ for Minerva Reefs)
COMPONENT ISLANDS: 70 islands and reefs with files in this data base; at least 150 islands total

MEAN ANNUAL PRECIPITATION:	1703 mm - Ha'apai Group (Taylor 1973)
	2318 mm - Niuatoputapu (Taylor 1973)
	1687 mm - Nuku'alofa (Taylor 1973)
	2175 mm - Vava'u (Taylor 1973)
MEAN MONTHLY MAX PRECIPITATION:	283 mm - March - Ha'apai Group (Taylor 1973)
	299 mm - March - Niuatoputapu (Taylor 1973)
	227 mm - March - Nuku'alofa (Taylor 1973)
	359 mm - March - Vava'u (Taylor 1973)
MEAN MONTHLY MIN PRECIPITATION:	68 mm - June - Ha'apai Group (Taylor 1973)
	96 mm - August - Niuatoputapu (Taylor 1973)
	92 mm - June - Nuku'alofa (Taylor 1973)
	93 mm - June - Vava'u (Taylor 1973)
MEAN ANNUAL TEMPERATURE:	23.5° C - Vava'u Group (Carter 1984)
	21° C - Tongatapu Group (Carter 1984)
MEAN MAX TEMPERATURE:	26° C - February (Wickman 1984)
MEAN MIN TEMPERATURE:	21° C - July, August (Wickman 1984)
1985 POPULATION:	94,400 (SPC 1987)
ANNUAL GROWTH RATE (1980-85):	0.3 (SPC 1987)

MAPS, IMAGES, AND SURVEYS

For regional references, use:

Center for Pacific Islands Studies 1987a,b,c (maps for illustration only)
Defense Mapping Agency 1983 Catalogue of Maps, Charts, and Related Products (charts are very useful for coastal planimetric detail and locating reefs and shoals)
Department of Lands and Survey and External Intelligence Bureau 1986 (atlas)
GeoCenter Internationales 1988 (catalogue)
Hydrographer of the Navy 1985 (catalogue of charts)
Kennedy et al. 1974 (atlas)
Motteler 1986 (gazetteer with planimetric maps)
Pacific Travelers' Supply 1988 (catalogue)
SPC 1984 (regional map)
Thompson 1984 (regional bibliography of geology maps)
USDS Office of the Geographer c1985 (the best regional map, unfortunately not officially published)
Winch 1976 (bibliography)

For general maps of good quality, use:

Defense Mapping Agency 1983 (chart)
Directorate of Overseas Surveys 1960
Hydrographer of the Navy n.d. (chart)

AERIAL PHOTOS:

SATELLITE IMAGERY:

Landsat data and images are available from EOSAT Corporation in Lanham, Maryland and Sioux Falls, South Dakota. Reference NOAA 1982 sheet 20

SPOT data and images are available from ORSTOM in Noumea, New Caledonia and SPOT Data Corporation in Washington, D. C.

TOPOGRAPHIC MAPS:

VEGETATION MAPS:

Sykes 1981

Directorate of Overseas Surveys 1975-1976

GEOLOGY MAPS:

SOIL SURVEYS:

Wilde and Hewitt 1983

POLITICAL INFORMATION

POLITICAL STATUS: Commonwealth Constitutional Monarchy (1970)
CAPITAL ISLAND: Tongatapu
CAPITAL CITY: Nuku'alofa
SENIOR LEADER: King George Taufa'ahau Tupou IV (1965)
Prince Fatafehi Tu'ipelehake, Prime Minister
(1965)

COMMENTS ON POLITICAL SITUATION:

Tonga was never a colony, but did sign a Treaty of Friendship with Great Britain that assigned all foreign affairs to British management. This treaty was formally dissolved in 1970 after it served as the model for Free Association between Cook Islands and New Zealand. King George and his brother, Prince Fatafehi, assumed control of the country after the death of Queen Salote in 1965. Prince Fatafehi is suffering from very poor health. Although Tonga is a constitutional monarchy modeled after the British pattern, the king and the royal family exercise great influence. Crown Prince Tupouto'a is now hier to the throne.

MEMBERSHIP IN INTERNATIONAL CONVENTIONS AND ORGANIZATIONS

(convention information and memberships from Pulea and Va'ai (1983) and Venkatesh et al. (1983), organization information from Carter (1984) and Franco et al. (1982)):

Asian Development Bank
Commonwealth of Nations
Convention on the Continental Shelf
Convention on Fishing and Conservation of the Living Resources of the High Seas
Convention on the High Seas (London Convention)
Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction
Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (SPREP Convention; requires 10 instruments of ratification, and so far only Cook Islands and Marshall Islands have deposited such instruments)
Economic and Social Commission for Asia and the Pacific
European Community (associate member)
Food and Agriculture Organization
South Pacific Bureau for Economic Cooperation
South Pacific Commission (1983)
South Pacific Forum (1971)
South Pacific Forum Fisheries Agency Convention
Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water (Nuclear Test Ban Treaty)

United Nations Educational, Scientific and Cultural Organization
University of the South Pacific
World Health Organization

SPREP FOCAL POINT:

Mr. Sione L. Tongilava, Secretary for Lands, Survey and Natural
Resources
Ministry of Lands, Survey and Natural Resources
P. O. Box 5
Nuku'alofa, TONGA

phone: 23-611

THREATS TO BIOLOGICAL DIVERSITY

POPULATION AND LAND-USE THREATS TO BIOLOGICAL DIVERSITY:

Population growth in Tonga is fairly low. 79% of the land is considered arable (Vergara and Nair 1985). Virtually all of the arable land on the flat islands (e.g. Tongatapu) has been converted from primary forest for many years. This is partly a result of the Tongan system of land tenure. Sand and coral mining for construction are severe problems driven by development, especially for tourism. Logging is a growing problem on the volcanic islands (SPC 1987, Thamen 1986). Thamen (1986) lists soil destruction, deforestation, overgrazing, and mining as severe problems. Fire and overgrazing are contributing to the spread of anthropogenic grasslands (Vergara and Nair 1985).

ALIEN SPECIES THREATS TO BIOLOGICAL DIVERSITY:

Standardization of garden and agricultural crops is probably resulting in the loss of endemic cultivars of Breadfruit (Artocarpus altilis), Kong Taro (Xanthosoma sagittifolium), True Taro (Colocasia esculanta), Giant Taro (Alocasia macrorrhiza), Banana (Musa spp), Kava (Piper methysticum), and Yam (Dioscorea spp) (Barrau 1961).

Rats (Rattus rattus, R. exulans, R. norvegicus); feral dogs (Canis familiaris) and cats (Felis domesticus); feral goats (Capra hircus), pigs (Sus scrofa), and other ungulates; and mongooses (Herpestes auropunctatus) are ubiquitous in the region (Thamen 1986). Dahl (1986) mentions those islands where the impacts from some or all these alien species have been avoided.

OTHER THREATS TO BIOLOGICAL DIVERSITY:

Isolated populations of rare species are subject to "accidental" extirpation through the agencies of natural disasters. Thamen (1986) reviews these for Tonga and cites tropical cyclones (26 from 1946-76) and moderate seasonality of precipitation with droughts moderately common and floods very common. Earthquakes, landslides, and vulcanism are common on some islands.

Indiscriminant use of pesticides in agriculture, landscaping, and household and urban pest control; illegal poisoning and bombing of fish; and indiscriminant disposal of various pollutants, including sewage, solid wastes, and soluble toxics is resulting in localized environmental damage throughout the region (Dahl 1984, Dahl and Baumgart 1983, Thamen 1986). 585 pesticides are recommended or approved for use in the member states of the South Pacific Commission; 76 of these are banned or restricted in the United States and/or the European Community (Mowbray 1984 reported in Thamen 1986). Thamen (1986) lists pollution as a severe problem.

LAWS RELATING TO BIODIVERSITY CONSERVATION

Royal Decrees and Privy Council (cabinet) Decisions

In order to conserve fish breeding areas, there is a prohibition on the dumping of any effluents, on the cutting of any mangroves, on commercial fishing, and on certain forms of subsistence fishing in Fanga'uta and Fangakakau Lagoons on Tongatapu and in Vaipuaa Lagoon in Vava'u (Eaton 1985, Venkatesh et al. 1983)

Since 1978, there has been a total moratorium on the catching of Humpback Whales (Eaton 1985, Venkatesh et al. 1983)

Forest Act of ??

This act provides for Forest Reserves and for the conservation of important "culture trees" used in the making of traditional crafts and other products (Eaton 1985, Pulea 1984, Venkatesh et al. 1983).

Birds and Fish Preservation Act of ??

11 bird species are protected against killing or taking. The act also provides a ban on turtle catching during the designated breeding season (Eaton 1985, Pulea 1984).

Pesticide Act of ??

The uses of pesticides are regulated (Venkatesh et al. 1983).

Preservation of Archaeological Interest Act of ??

Ancient archaeological sites and historical landmarks are protected from "harassment" (Venkatesh et al. 1983).

Whale Industry Act of ??

This act prohibits the capture, wounding, or killing of whales in Tongan waters (Pulea 1984, Venkatesh et al. 1983).

Building Regulations of 1941

All development projects in Nuku'alofa, Vava'u, and Pangai are assessed for environmental impacts (Venkatesh et al. 1983).

Petroleum Mining Act of 1969

This act provides a licensing system for petroleum exploration and extraction (Venkatesh et al. 1983).

Continental Shelf Act of 1970

This act prohibits pollution of the sea by oil from ships or off-shore operations (Pulea 1984).

Parks and Reserves Act of 1976

This act establishes a Parks and Reserves Authority and provides for the creation of National Parks and Reserves. Parks must not have restricted access, but reserves can be restricted to protect the habitat and wildlife concerned (Eaton 1985, Pulea 1988).

LAND TENURE

LAND TENURE NARRATIVE:

The Tongan system of land tenure is unique. All land is the property of the crown. However, large estates have been divided among the nobles for administration. Most (up to 95% per estate) of the estate land is "tax-alloted" to native Tongan citizens. When a native Tongan male achieves legal maturity at 16, he is (theoretically) assigned a "bush allotment" of .03 km² and a "town site" of .0016 km². He pays an annual rent for his bush allotment but not for his town site. The Minister of Lands makes the allotment which is usually withdrawn, subject to the noble's agreement, from the estate of the noble where the applicant lives. Sometimes, allotments are made from government (non-estate) lands. Neither estate lands nor tax allotment lands may be alienated to any person except by lease, subject to approval from the cabinet. Land is not sold in Tonga. Estates and allotments are heritable. A Tongan may decline to apply for his tax allotment and apply instead for an ordinary lease over more land. Such leases are more than proportionally more expensive.

There is a severe shortage of land, and many young Tongan men do not have tax allotment lands. There are waiting lists. Every holder of a bush allotment is required to plant 200 coconuts and remove any weeds within 12 months of taking possession. Eviction for noncompliance or non-payment of rents or taxes does occur.

Crown Land may be leased for development or for charitable purposes (e.g. to the church). The cabinet reviews all leases every 5 years. Crown Land is variously distributed as government land (including reserves and uninhabited islands) and leased lands. The Crown has retained unencumbered all land outside a line 50 feet inside the high water mark plus all territorial seas and all streams, lakes and internal waters (Carter 1984, Eaton 1985).

TENURE CLASSES: Crown Land (20%)
 Estate Land (7%)
 Tax Allotment Land (66%)
 Telekitonga and Telekivava'u Islands (7%)
 (Carter 1984)

TAXA FILES

COUNTRY: Tonga

TAXA

Tonga is believed to support 771 species of vascular plants. Of these, 70 species are ferns including 3 endemics, 3 species are gymnosperms including 1 endemic, and 698 species are angiosperms including 9 endemics (Dahl 1986, Davis et al. 1986). The IUCN CMC Plant Data Unit has 29 computerized taxon records for Tonga, of which 3 are endemic taxa, and no taxa are considered threatened (IUCN CMC Threatened Plants Data Unit 1988).

Tonga has 24 species of butterflies, none of which is endemic (Dahl 1986).

Tonga originally had 2 endemic species of endodontid and 6 of charopid snails. Their current status is not known (Solem 1976, 1982).

ENDEMIC TAXA: Plants
 Langakali (Agila heterotruga) (Tonga) (Dahl 1986)
 Ponga (tree fern) (Cyathea rugosula) (Tonga) (Dahl
 1986)
 fern (Dryopteris euanensis) ('Eua) (Dahl 1986)
 fern (Dryopteris macroptera) ('Eua) (Dahl 1986)
 Mo'ota (Dysoxylum tongense) ('Eua) (Dahl 1986)
 Kahikahi (liana) (Freycineta urvilleana) (Tonga)
 (Dahl 1986)
 Hunivau (flowering shrub) (Ixora yunckeri) ('Eua)
 (Dahl 1986)
 tree (Maniltou amoxium) ('Eua, Vava'u) (Dahl 1986)
 Lauteau (Pittosporum yunckeri) (Tongatapu, 'Eua)
 (Dahl 1986)
 tree (Podocarpus pallidus) (Tonga) (Dahl 1986)
 Lala Vau (Wickstroemia rotundifolia) (Tonga) (Dahl
 1986)

ENDEMIC TAXA:

Birds

Niuafu'ou Megapode (Megapodius pritchardii)
(Niuafu'ou) (Collar and Andrew 1988, Dahl
1986, Pratt et al. 1987)

Tonga Whistler (Pachycephala melanops) (Vava'u
Group) (Dahl 1986) (Pratt et al. 1987 prefer
P. jacquinoti)

Tahiti Monarch ssp (Pomaria nigra tabuensis)
(Tongatapu) (extinct) (Dahl 1986)

THREATENED TAXA:

- Invertebrates
black coral (Antipathes dichotima) (Indo-Pacific) (Wells et al. 1983)
Triton's Trumpet (Charonia tritonis) (Indo-Pacific) (IUCN CMC and ICBP 1988, Wells et al. 1983)
black coral (Cirrhopathes anguina) (Indo-Pacific) (Wells et al. 1983)
black coral (Cirrhopathes spiralis) (Indo-Pacific) (Wells et al. 1983)
precious corals (Corallium spp.) (Indo-Pacific) (IUCN CMC and ICBP 1988, Wells et al. 1983)
Horses Hoof Clam (Hippopus hippopus) (Indo-Pacific) (IUCN CMC and ICBP 1988, Wells et al. 1983)
Scaly Clam (Tridacna squamosa) (Indo-Pacific) (IUCN CMC and ICBP 1988, Wells et al. 1983)
Small Giant Clam (Tridacna maxima) (Indo-Pacific) (IUCN CMC and ICBP 1988, Wells et al. 1983)

THREATENED TAXA:

Amphibians and Reptiles

- Fiji Banded Iguana (Brachylophus fasciatus)
(Fiji and Tonga) (threatened by feral
cats, habitat by feral goats) (Dahl 1986,
Fitter 1986, Groombridge and Wright 1982)
- Loggerhead Turtle (Caretta caretta) (Eaton
1985, IUCN CMC and ICBP 1988)
- Green Turtle (Chelonia mydas) (Indo-Pacific)
(Groombridge and Wright 1982, IUCN CMC
and ICBP 1988)
- Hawksbill Turtle (Eretmochelys imbricata)
(Indo-Pacific) (Groombridge and Wright
1982, IUCN CMC and ICBP 1988)

THREATENED TAXA:

Birds

Niuafu'ou Megapode (Megapodius pritchardii)
(Niuafu'ou, incubates its eggs in hot volcanic ash, threatened by feral cats and egg harvesting) (Collar and Andrew 1988, IUCN CMC and ICBP 1988)

Bristle-thighed Curlew (Numenius tahitiensis)
(winter range is Hawaii, Marshall Islands, Fiji, Tonga, Samoas, Marquesas, and Tuamotus; flocks down to ≤ 100)
(Collar and Andrew 1988)

THREATENED TAXA:

Mammals

Fin Whale (Balaenoptera physalus) (Indo-Pacific, hunted) (IUCN CMC and ICBP 1988, Thornback et al. 1978)

Blue Whale (Balaenoptera musculus) (Indo-Pacific, hunted) (IUCN CMC and ICBP 1988, Thornback et al. 1978)

Southern Right Whale (Eubalaena australis) (South Pacific) (IUCN CMC and ICBP 1988)

Humpback Whale (Megaptera novaeangliae) (Indo-Pacific, hunted) (IUCN CMC and ICBP 1988, Thornback et al. 1978)

Insular Flying Fox (Pteropus tonganus) (New Guinea, Samoa, Cook Islands according to IUCN CMC and ICBP 1988) (on Tongatapu according to Dahl 1986)

MAJOR COLLECTIONS:

The B. P. Bishop Museum in Honolulu, Hawaii has approximately 500,000 plant specimens, of which approximately 60% are vascular plants from the SPC region; approximately 5,000,000 land snail specimens, of which approximately 30% are from the SPC region; 13,500,000 insect specimens, of which approximately 70% are from the SPC region; and approximately 10,000 bird specimens, of which approximately 50% are from the SPC region. All island groups are represented (personal communications with Bishop Museum personnel 1988).

The U. S. National Herbarium at the Smithsonian Institution has over 4,100,000 plant specimens with an unknown but significant percentage from the SPC region (Holmgren and Stafleu 1981). The herbarium includes the Wilkes expedition collection from Polynesia (all but the Cook Islands) and Fiji. All island groups are represented (personal communications with Smithsonian Institution personnel 1988).

The British Museum of Natural History Herbarium in London has over 4,000,000 specimens including extensive collections from Tonga (Holmgren and Stafleu 1981, Oliver 1957). Oliver (1957) also considered that the Herbarium at the Royal Botanical Gardens, Kew, with over 5,000,000 specimens (Holmgren and Stafleu 1981), included an important Tongan collection.

The National Museum of New Zealand in Wellington has over 300,000 plant specimens, of which a significant portion are from Tonga (Holmgren and Stafleu 1981).

ECOSYSTEM FILES

COUNTRY: Tonga

ECOSYSTEMS

Although most of the larger islands of Tonga are raised coral limestone islands, much of the soil is volcanic, having been deposited as ash and cinders from the chain of volcanoes to the west.

Dahl (1980a) lists 29 "biomes/habitats" for the Tonga - Niue province.

"Lowland rain forests, dominated by Calophyllum, on limestone islands, but much has been cleared on the larger islands for settlements and ... cultivation... (Yuncker, 1959); ... coastal scrub, with Barringtonia and Scaevola, on most islands; Cassurina woodlands on recent lava flows; large areas of secondary vegetation, including Lantana and Psidium scrub, and Sorghum and Panicum grasslands, mangroves ... The crater zone of most volcanic islands has a distinct but sparse herbaceous flora." (Davis et al. 1986 p 357)

THREATENED ECOSYSTEMS: lowland limestone forests (Dahl 1986)
mangroves (Dahl 1986)

MANAGED AREA FILES

COUNTRY: Tonga

MANAGED AREA SYSTEMS

Parks and Reserves (Parks and Reserves Act of 1976)

Ha'atafu Beach Reserve (1978: .084 km²)
(Eaton 1985)

Hakaumama'o Reef Reserve (1978: 1.26 km²)
(Eaton 1985)

Malinoa Reef Reserve and Island Park
(1978: .73 km²) (Eaton 1985)

Monuafe Reef Reserve and Island Park
(1978: .32 km²) (Eaton 1985)

Pangaimotu Reef Reserve (1978: .48 km²)
(Eaton 1985)

Reserves (Royal Decrees and Privy Council (cabinet) Decisions)

Fanga'uta and Fangakakau Lagoons on
Tongatapu (Eaton 1985)

Vaipua Lagoon in Vava'u (Eaton 1985)

Reserves (de facto on Crown Estates)
There are several of these. Most are historic, but Prince Tu'ipelehake has established a reserve on his estate for the last limestone rain forest on Tongatapu (Eaton 1985).

AGENCY FILES

AGENCY RESPONSIBLE FOR: Conservation of Rare, Threatened, or
Endangered Species of Plants and
Animals
National Parks, Nature Reserves, and
other Protected Areas
Forest Conservation
Marine Resources Conservation

AGENCY NAME: Ministry of Lands, Survey and Natural Resources

COUNTRY WHERE BASED: Tonga

SENIOR LEADER: Mr. Taniela Tukia, Physical Planner

ADDRESS: Ministry of Lands, Survey and Natural Resources
P. O. Box 5
Nuku'alofa, TONGA

TELEPHONE: 23-611

TELEX: 66269 PRIMO TS

AGENCY POSITION IN GOVERNMENT:

The Honorable Baron Tuita, Minister of Lands, Survey and Natural
Resources

Mr. Sione L. Tongilava, Secretary for Lands, Survey and Natural
Resources

Mr. Taniela Tukia, Physical Planner, Ministry of Lands, Survey and
Natural Resources

REFERENCES

- Agassiz, A. 1903. The Coral Reefs of the Tropical Pacific. Harvard Museum of Comparative Zoology Memoir 28. 236 pp. illus.
- Andrews, E. C. 1940. Origin of the Pacific Insular Floras. Proceedings of Pacific Science Congress VI (Berkeley 1939). 4:613-620.
- Baker, H. B. 1938. Zonitid Snails from Pacific Islands. Part I. Bulletin of the B. P. Bishop Museum 158. 102 pp. illus.
- Baker, H. B. 1940. Zonitid Snails from Pacific Islands. Part II. Bulletin of the B. P. Bishop Museum 165:103-201. illus.
- Baker, H. B. 1941. Zonitid Snails from Pacific Islands. Parts III & IV. Bulletin of the B. P. Bishop Museum 166:202-370. illus.
- Balazs, G. H. 1983. Status Review Document for Pacific Sea Turtles. NOAA National Marine Fisheries Service, Southwest Fisheries Center, Honolulu, Hawaii. 16 pp.
- Birkeland, C. and D. Grosenbaugh. 1985. Ecological Interactions between Tropical Coastal Ecosystems. UNEP Regional Seas Reports and Studies 73, Geneva, Switzerland and South Pacific Regional Environment Programme Topic Review 23, SPC, Noumea, New Caledonia. 71 pp.
- Brigham, W. T. 1900. An Index to the Islands of the Pacific Ocean. Memoirs of the B. P. Bishop Museum 1(2):87-257. illus.
- Britton, S. G. 1982. The Political Economy of Tourism in the Third World. Annals of Tourism Research 9(3):331-358.
- Britton, S. G. 1987. Tourism in Pacific Island States. pp 113-139 in S. Britton and W. C. Clarke (eds.). Ambiguous Alternative: Tourism in Small Developing Countries. University of the South Pacific, Suva, Fiji. vi + 194 pp. illus.
- Broder, S. and J. van Dyke. 1982. Ocean Boundaries in the South Pacific. University of Hawaii Law Review 4(1):1-59. illus.

- Brookfield, H. C. and D. Hart. 1966. Rainfall in the Tropical Southwest Pacific. Australian National University, Department of Geography Publication G/3, Canberra, Australia. v + 25 pp + 10 maps + 25 tables.
- Brown, W. C. 1957. The Distribution of Terrestrial Reptiles in the Islands of the Pacific. Proceedings of Pacific Science Congress VIII (Quezon City 1953) 3A:1479-1491.
- Bryan, E. H., Jr. 1943. Pacific War Atlas. Tongg Publishing, Honolulu, Hawaii. 43 pp. illus.
- Bryan, E. H., Jr. 1943. Guide to Pacific Islands. US General Staff, Military Intelligence Division, San Francisco, California. 394 pp. illus.
- Bryan, E. H., Jr. 1972. Guide to Islands in the Tropical Pacific (Polynesia, Micronesia, Melanesia). B. P. Bishop Museum, Honolulu, HI. 26 pp. illus.
- Bryan, E. H., Jr. 1983. Guide to Islands in the Tropical Pacific. unpublished preliminary revised edition, Pacific Science Information Center, B. P. Bishop Museum, Honolulu. 23 pp. illus.
- Bryan, E. H., Jr. n.d. Air Photos of Pacific Islands filed in Bishop Museum. Pacific Scientific Information Center, B. P. Bishop Museum, Honolulu, Hawaii. 105 pp.
- Bryan, W. B. 1971. Coral Sea Pumice on Eua Island, Tonga, in 1969. Bulletin of the Geological Society of America 82:2799-2812. illus.
- Bureau of Intelligence and Research. 1983. Status of the World's Nations. USDS publication 8735, Washington, D. C. 19 pp.
- Burkill, I. H. and C. S. Crosby. 1901. The Flora of Tonga. Botanical Journal of the Linnean Society of London 35:20-.
- Cammack, F. M. and S. Saito. 1962. Pacific Island Bibliography. Scarecrow Press, New York, New York. 421 pp.

Carter, J. 1984. Pacific Islands Year Book (fifteenth edition). Pacific Publications, Sidney, Australia. 557 pp + map. illus.

Center for Pacific Islands Studies. 1987. The Pacific Islands. no scale. Center for Pacific Islands Studies, University of Hawaii, Honolulu, Hawaii.

Center for Pacific Islands Studies. 1987. 200 Mile Exclusive Economic Zones of the Pacific Islands. no scale. Center for Pacific Islands Studies, University of Hawaii, Honolulu, Hawaii.

Center for Pacific Islands Studies. 1987. Political Entities of the Pacific Islands. no scale. Center for Pacific Islands Studies, University of Hawaii, Honolulu, Hawaii.

Chambers, M. R. 1985. Extinct and Endangered Birds of the South Pacific Commission Region. Ples 1985(1):62-68.

Chang, J. -H. 1968. Rainfall in the Tropical Southwest Pacific. Geographical Review 58(1):142-144.

Chapman, V. J. 1969. Conservation of Island Ecosystems in the South-West Pacific. Biological Conservation 1(2):159-165. illus.

Chapman, V. J. 1976. Mangal Vegetation of Papua New Guinea, the Philippines, and Oceania. pp 169-189 in Mangrove Vegetation. Cramer, Vaduz, Liechtenstein. viii + 447 pp + 20 plates. illus.

Chesher, R. H. 1984. Pollution Sources Survey of the Kingdom of Tonga. SPREP Topic Review 19, SPC, Noumea. 110 pp. illus.

Clapp, R. B. 1977. Notes on the Vertebrate Fauna of Tongareva Atoll. Atoll Research Bulletin 198. 8 pp.

Cole, R. V. 1986. Land Policies and Issues in the South Pacific. Islands/Australia Working Paper 86/12, National Centre for Development Studies, Australian National University, Canberra. v + 51 pp.

- Collar, N. J. and P. Andrew. 1988. Birds to Watch: The ICBP World Checklist of Threatened Birds. ICBP Technical Publication 8, Cambridge, United Kingdom. xvi + 303 pp.
- Connell, J. 1984. Islands Under Pressure Population Growth and Urbanization in the South Pacific. *Ambio* 13(5/6):306-308, 310-312. illus.
- Conover, H. F. 1943. Islands of the Pacific: A Selected List of References. United States Library of Congress, Washington, D. C. 3 + 181 pp.
- Corner, E. J. H. 1963. Ficus in the Pacific Region. pp 233-245 in J. L. Gressitt (ed.) Pacific Basin Biogeography, Proceedings of a Symposium, Pacific Science Congress X (Honolulu 1961). B. P. Bishop Museum, Honolulu. ix + 563 pp. illus.
- Crocombe, R. G. 1972. Land Tenure in the South Pacific. pp 219-251 in R. G. Ward (ed.) Man in the Pacific Islands: Essays on Geographical Change in the Pacific Islands. Oxford-Clarendon Press, London. x + 339 pp. illus.
- Crocombe, R. G. 1975. Land Tenure in Tonga: The Process of Change, Past, Present and Future. South Pacific Social Sciences Association, Suva. 19 pp.
- Crocombe, R. G. 1984. Registration in the Pacific Islands: Experiences and Potentials. pp 26-46 in E. Acquaye and R. G. Crocombe (eds.). Land Tenure and Rural Productivity in the Pacific Islands. University of the South Pacific, Suva, Fiji. vii + 218 pp. illus.
- Croft, K. D. and P. Tu'ipulotu. 1980. A Survey of Tongan Medicinal Plants. *South Pacific Journal of Natural Science* 1:45-57. illus.
- Cumberland, K. B. 1968. Southwest Pacific: A Geography of Australia, New Zealand, and their Pacific Island Neighbors. Praeger, New York, New York. xviii + 423 pp. illus.
- Curry-Lindahl, K. 1980. Zoogeographic Subregions of the Pacific Realm as a Background for Terrestrial Ecological Reserves: Part 1, General Introduction and Northern and Western Pacific Regions. *Environmental Conservation* 7(1):67-76. illus.

Curry-Lindahl, K. 1980. Zoogeographic Subregions of the Pacific Realm as a Background for Terrestrial Ecological Reserves: Part 2, Central and Eastern Regions, etc. with Conclusions. *Environmental Conservation* 7(2):125-136. illus.

Dahl, A. L. 1978. Environmental and Ecological Report on Tonga. SPC, Noumea, New Caledonia. 48 pp. illus.

Dahl, A. L. 1980. Regional Ecosystems Survey of the South Pacific Area. SPC Technical Paper 179, Noumea, New Caledonia. i + 99. pp. illus.

Dahl, A. L. 1985. The Challenge of Conserving and Managing Coral Reef Ecosystems. pp 85-87 in A. L. Dahl and J. Carew-Reid (eds.). *Environment and Resources in the Pacific*. UNEP Regional Seas Reports and Studies No. 69., Geneva. iv + 294 pp. illus.

Dahl, A. L. 1986. Review of the Protected Areas System in Oceania. UNEP and IUCN Commission on National Parks and Protected Areas, Gland, Switzerland. vii + 73 + 239 pp. illus.

Dale, W. R. and B. C. Waterhouse. 1985. Pacific Islands' Hydrogeology and Water Quality. pp 57-68 in A. L. Dahl and J. Carew-Reid (eds.). *Environment and Resources in the Pacific*. UNEP Regional Seas Reports and Studies No. 69., Geneva. iv + 294 pp. illus.

Darwin, S. P. 1979. A Synopsis of the Indigenous Genera of Pacific Rubiaceae. *Allertonia* 2(1):1-44. illus.

Davies, H. L. 1985. Mineral Potential of the Southwest Pacific Islands. pp 129-142 in A. L. Dahl and J. Carew-Reid (eds.). *Environment and Resources in the Pacific*. UNEP Regional Seas Reports and Studies No. 69., Geneva. iv + 294 pp. illus.

Davis, S. D., S, J, M, Droop, P. Gregerson, L. Henson, C. J. Leon, J. L. Villa-Lobos, H. Synge, and J. Zantovska. 1986. *Plants in Danger: What Do We Know?* IUCN Conservation Monitoring Centre, Kew, Surrey, Richmond, United Kingdom. xiv + 461 pp. illus.

Dawson, E. W. 1971. Marine Biology in Tonga Vava'u and the Western Islands: An Interim Report. Bulletin of the Royal Society of New Zealand 8:107-122. illus.

Defense Mapping Agency. 1983. Catalogue of Maps, Charts, and Related Products. Part 2. Hydrographic Products. Volume VIII. Oceania. USDD, Washington, D. C. 30 pp. illus.

Defense Mapping Agency. 1983. Tonga Islands. 1:589,330. Hydrographic Chart 83AC083030, USDD Navy Hydrographic Office, Washington, D. C.

Defilipps, R. A. 1987. A Bibliography of Plant Conservation in the Pacific Islands: Endangered Species, Habitat Conversion, Introduced Biota. Atoll Research Bulletin 311. 195 pp. illus.

Department of Lands and Survey and External Intelligence Bureau. 1986. Atlas of the South Pacific. scales vary. Government Printing Office, Wellington, New Zealand. iii + 48 pp + map index.

Directorate of Overseas Surveys. 1960. Tonga. 1:2,000,000. DOS 990, Tolworth, Surrey, United Kingdom.

Directorate of Overseas Surveys. 1975-1976. Kingdom of Tonga. 1:25,000. topographic: contour interval = 10 meters. shaded relief. vegetation structure. X872 (DOS 337), Tolworth, Surrey, United Kingdom for the Lands and Survey Department, Kingdom of Tonga. 23 sheets.

Doran, E. D., Jr. (ed.). 1961. Land Tenure in the Pacific, A Symposium of the Tenth Pacific Science Congress (Honolulu 1961). Atoll Research Bulletin 85. 60 pp. illus.

Douglas, G. 1969. Draft Checklist of Pacific Oceanic Islands. E. M. Nicholson and L. G. Eldridge (eds.). IBP Technical Meeting on the Conservation of Pacific Islands (Koror and Guam 1968). Micronesica 5(2):327-463 (introduction by E. M. Nicholson).

Drake Del Castillo, E. 1886-1892. Illustrationes Florae Insularum Maris Pacifici. Masson, Paris, France. reprinted in 1977 by Cramer, Vaduz, Liechtenstein. 458 pp + 50 plates.

DuPont, J. E. 1976. South Pacific Birds. Delaware Museum of Natural History, Monograph Series 3, Greenville, Delaware. xii + 218 pp. illus.

Dubsky, R. 1986. The Organization of Development Planning in the South Pacific. University of Hawaii, Pacific Islands Studies Program, Honolulu, Hawaii. 197 pp. illus.

Dwyer, L. 1986. Tourism. Islands/Australia Working Paper No. 86/3, National Centre for Development Studies, Australian National University, Canberra. ii + 37 pp.

Eaton, P. 1985. Land Tenure and Conservation: Protected Areas in the South Pacific. South Pacific Regional Environment Programme Topic Review No. 17, SPC, Noumea. 103 pp. illus.

Eaton, P. 1986. Tenure and Taboo: Customary Rights and Conservation in the South Pacific. pp 114-134 in South Pacific Commission. Report of the Third South Pacific National Parks and Reserves Conference (Apia 1985). Volume II. Collected Key Issue and Case Study Papers. Noumea. iii + 295 pp. illus.

Eaton, P. 1987. Protected Areas in the South Pacific: Tonga. Ples 3:35-40. illus.

Economist Intelligence Unit. 1982. Regional Report No. 12: The South Pacific Islands. International Tourism Quarterly 1982(1):14-34.

Eldridge, L. G. 1987. Bibliography of Marine Ecosystems: Pacific Islands. UNEP Regional Seas Directories and Bibliographies, FAO, Rome. 72 pp.

Fairbairn, T. I. J. 1985. Economic Prospects for the Pacific Islands. pp 44-69 in R. C. Kiste and R. A. Herr (eds.) The Pacific Islands in the Year 2000. University of Hawaii Pacific Islands Studies Program, Honolulu. 170 pp.

Farrell, B. H., D. R. Ross, L. B. Evans, and D. Weertz (Pacific Research Unit, University of California Santa Cruz). 1983. Tourism in the Pacific A Bibliography. Pacific Islands Study Program Working Paper, University of Hawaii, Honolulu, Hawaii. iv + 293 pp.

Fosberg, F. R. 1957. The Vegetation Provinces of the Pacific. Proceedings of Pacific Science Congress VIII (Quezon City 1953) 4:15-23.

Fowler, H. W. 1967. The Fishes of Oceania. reprinted from Memoirs of the B. P. Bishop Museum, volumes 10, 11, and 12. Johnson Reprints, Cramer, Lehre, New York. various pagings. illus.

Franco, A. B., J. F. Dupon, M. P. Hamnett, J. V. Makasiale, J. Roughan, K. Sere, F. Seui, R. Staff, and K. Matsumoto. 1982. Country Profiles: Cook Islands, Fiji, Kiribati, Nauru, Niue, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu, Western Samoa. EWC Pacific Islands Development Program, Honolulu, Hawaii. 126 pp. illus.

Freeman, O. W. (ed.). 1951. Geography of the Pacific. John Wiley and Sons, New York, New York. xii + 573 pp. illus.

Frodin, D. G. 1984. Oceania. pp 503-533 in Guide to the Standard Floras of the World. Cambridge University Press, London. xx + 619 pp.

Garnett, M. C. 1984. Conservation of Seabirds in the South Pacific Region: A Review. pp 547-558 in J. P. Croxall, P. G. H. Evans, and R. W. Schreiber (eds.). Status and Conservation of the World's Seabirds. ICBP Technical Publication 2, Cambridge, United Kingdom. x + 779 pp. illus.

GeoCenter Internationales. 1988. Geo Katalog. Landkartenhaus, Stuttgart, Federal Republic of Germany. 3 looseleaf volumes. illus.

Goo, F. C. C. and A. H. Banner. 1963. A Preliminary Compilation of Tongan Animal Names. University of Hawaii Marine Laboratory, Honolulu, Hawaii. 49 pp.

Government of Tonga. 1985. Tonga. pp 211-216 in SPREP. Report of the Third South Pacific National Parks and Reserves Conference (Apia 1985): Volume III. Country Reviews. SPC, Noumea, New Caledonia. iii + 269 pp. illus.

- Gressitt, J. L. 1961. Problems in the Zoogeography of Pacific and Antarctic Insects. B. P. Bishop Museum, Pacific Insects Monograph 2. ii + 127 pp. illus.
- Grigg, R. W. and J. V. Eade. 1981. Precious Corals. Report of the Inshore and Nearshore Resources Training Workshop (Suva). University of Hawaii, Honolulu.
- Hay, R. 1985. Bird Conservation in the Pacific Islands. South Pacific Regional Environment Programme Topic Review No. 25 (International Council for Bird Protection Study Report No. 7), SPC, Noumea. vi + 115 pp.
- Hayden, B. P., G. C. Ray, and R. Dolan. 1984. Classification of Coastal and Marine Environments. Environmental Conservation 11(3):199-207. illus.
- Hemsley, W. B. 1894. The Flora of the Tonga or Friendly Islands. Botanical Journal of the Linnean Society of London 30:158-217. illus.
- Hoffmeister, J. E., H. L. Alling, and G. L. Whipple. 1932. Geology of Eua, Tonga. Bulletin of the B. P. Bishop Museum 96. 93 pp + 11 plates. illus.
- Holmgren, P. K. and F. A. Stafleu. 1981. Index Herbariorum: A Guide to the Location and Contents of the World's Public Herbaria (seventh edition). Part I: The Herbaria of the World. Regnum Vegetabile 106. Junk, The Hague, Netherlands. viii + 452 pp.
- Honegger, R. E. 1979. IUCN Red Data Book. Volume 3. Amphibia and Reptilia. IUCN, Morges, Switzerland. not paged.
- Hydrographer of the Navy. 1985. Catalogue of Admiralty Charts and Other Hydrographic Publications. Taunton, Somerset, United Kingdom. 176 pp. illus.
- Hydrographer of the Navy. n.d. Tonga Islands. 1:580,000. Admiralty Chart 2421, Taunton, Somerset, United Kingdom.

IUCN Conservation Monitoring Centre and International Council for Bird Preservation. 1988. 1988 IUCN Red List of Threatened Animals. IUCN Conservation Monitoring Centre, Cambridge, United Kingdom. xviii + 154 pp.

IUCN Conservation Monitoring Centre, Threatened Plants Data Unit. 1988. unpublished printouts of globally threatened and candidate species for Pacific islands. Kew, Richmond, Surrey, United Kingdom.

IUCN Conservation Monitoring Centre. 1985. IUCN Directory of Protected Areas in Oceania. unpublished photocopy from IUCN CMC, Cambridge, United Kingdom. unpagged.

IUCN Conservation Monitoring Centre. 1985. Towards a Protected Areas Systems Plan for the South Pacific Region. unpublished paper presented at the Third South Pacific National Parks and Reserves Conference (Apia, Western Samoa). IUCN Commission on National Parks and Protected Areas, Gland, Switzerland.

IUCN. 1975. South Pacific Conference on National Parks and Reserves: Recommendations. Special Supplement to IUCN Bulletin 6(4). 4 pp.

IUCN/SSC Mollusc Specialist Group. 1987. Action Plan for Molluscan Conservation: 1988-1992. unpublished photocopy. IUCN Species Survival Commission, Gland, Switzerland. 9 pp + printout of "threatened, rare and recently extinct molluscs."

International Council for Bird Preservation. 1988. single island and island group endemics. unpublished printouts. Cambridge, United Kingdom.

Iwatsuki, K. 1963. New or Noteworthy Ferns from the Tonga Islands. American Fern Journal 53:113-138. illus.

Jackson, M. M. 1986. Pacific Island Studies: A Survey of the Literature. Greenwood Press, New York, New York. xii + 244 pp.

Jenkins, J. A. F. 1980. Seabird Records from Tonga An Account Based on the Literature and Recent Observations. Notornis 27:205-234. illus.

- Johannes, R. E. 1978. Traditional Marine Conservation Methods in Oceania and Their Demise. *Annual Review of Ecology and Systematics* 9:349- 364.
- Kaplin, P. A. 1981. Relief, Age and Types of Oceanic Islands. *New Zealand Geographer* 37(1):3-12.
- Kavapalu, O. 1981. An International Airport. pp 61-68 in A. Bartlett, P. Larmour, R. G. Crocombe, and A. Taungenga (eds.). *Land, People and Government: Public Lands Policy in the South Pacific*. University of the South Pacific, Suva, Fiji. xiii + 191 pp. illus.
- Kenchington, R. A. and B. E. T. Hudson (eds.). 1988. *Coral Reef Management Handbook*. UNESCO Regional Office for Science and Technology for South-East, Jakarta, Indonesia. xx + 321 pp. illus.
- Kennedy, T. F., J. Petro, and L. Forsdyke. 1974. *A Descriptive Atlas of the Pacific Islands* (3rd edition). Reed Education, Commercial Print, Wellington, New Zealand. 80 pp. illus.
- King, W. B. (ed.). 1974. *Pelagic Studies of Seabirds in the Central and Eastern Pacific Ocean*. *Smithsonian Contributions to Zoology* 158. iv + 277 pp. illus.
- King, W. B. 1967. *Seabirds of the Tropical Pacific Ocean*. Smithsonian Institution, Washington, D. C. xxxii + 126 pp + 11 plates. illus.
- Kondo, Y. 1980. *Endangered Land Snails, Pacific*. unpublished photocopy. IUCN Conservation Monitoring Centre, Cambridge, United Kingdom. 15 pp. illus.
- Lemoto, S. N. 1981. Tonga: Assessing Compensation. pp 15-18 in A. Bartlett, P. Larmour, R. G. Crocombe, and A. Taungenga (eds.). *Land, People and Government: Public Lands Policy in the South Pacific*. University of the South Pacific, Suva, Fiji. xiii + 191 pp. illus.
- Lucas, P. H. C., S. Gorio, and K. Poai. 1981. *Parks and Reserves in the South Pacific*. South Pacific Regional Environment Programme Topic Review no. 2, South Pacific Commission, Noumea. 18 pp.

Maude, A. 1971. Tonga: Equality Overtaking Privilege. pp 106-128 in R. G. Crocombe (ed.). Land Tenure in the Pacific. Oxford University Press, Melbourne, Australia. xi + 419 pp.

Maude, A. and F. Sevele. 1987. Tonga: Equality Overtaking Privilege. pp 114-142 in R. G. Crocombe and S. Arutangai (eds.). Land Tenure in the Pacific. University of the South Pacific, Suva, Fiji. x + 420 pp. illus.

Mayr, E. 1940. Borders and Subdivisions of the Polynesian Region Based on our Knowledge of the Distribution of Birds. Proceedings of Pacific Science Congress VI (Berkeley 1939). 4:191-195.

Mayr, E. and F. L. Jacques. 1978. Birds of the Southwest Pacific: A Field Guide to the Birds of the Area Between Samoa, New Caledonia, and Micronesia (new edition). Tuttle, Rutland, Vermont. xxv + 316 pp + 4 plates. illus.

Merriam Webster Inc. 1984. Webster's New Geographical Dictionary. Springfield, Massachusetts. xxxi + 1376 pp. illus.

Merrill, E. D. and E. H. Walker. 1947. A Botanical Bibliography of the Islands of the Pacific; and A Subject Index to Elmer D. Merrill's A Botanical Bibliography of the Islands of the Pacific. Contributions from the United States National Herbarium 30(1):1-404.

Morrison, R. J. and D. M. Leslie. 1982. Bibliography of Soils Information from the South Pacific. pp 383-445 in R. J. Morrison and D. M. Leslie (eds.). Proceedings of the South Pacific Regional Forum on Soil Taxonomy (Suva 1981). University of the South Pacific, Suva, Fiji. 445 pp. illus.

Morrison, R. J. and J. Brodie. 1985. Pollution Problems in the South Pacific: Fertilizers, Biocides, Water Supplies, and Urban Wastes. pp 69-74 in A. L. Dahl and J. Carew-Reid (eds.). Environment and Resources in the Pacific. UNEP Regional Seas Reports and Studies No. 69., Geneva. iv + 294 pp. illus.

Motteler, L. S. 1986. Pacific Island Names: A Map and Name Guide to the New Pacific. B. P. Bishop Museum Miscellaneous Publication 34, Honolulu, Hawaii. 91 pp. illus.

Naval Photographic Interpretation Center. 1950. A Guide to Pacific Landforms and Vegetation for Use in Photographic Interpretation. United States Department of the Navy, Washington, D. C. variously paged. illus.

Naya, S. 1983. Asian and Pacific Developing Countries: Performance and Issues. Asian Development Review 1(1):1-40. illus.

Oliver, W. R. B. 1957. Report on the Standing Committee on Pacific Plant Areas. Proceedings of Pacific Science Congress VIII (Quezon City 1953) 4:11-15.

Orbell, G. E. 1983. Soils of the Kingdom of Tonga. DSIR, Wellington, New Zealand. 47 pp. illus.

Pacific Information Centre. 1983. Environmental Issues in the South Pacific: A Preliminary Bibliography. University of the South Pacific Library, Suva, Fiji for the South Pacific Regional Environment Programme, SPC, Noumea, New Caledonia. ix + 64 pp.

Pacific Manuscripts Bureau. 1976. A Gazetteer of Obsolete/Alternative Names of the Pacific Islands. Research School of Pacific Studies, Australian National University, Canberra, Australia. 26 pp.

Pacific Travelers' Supply. 1988. MapLink. Santa Barbara, California. v + 198 pp + appendix. illus.

Pearsall, S. H. 1988. Materials in Support of a Biological Diversity Annex to the Regional Development Strategy Statement (RDSS) for the South Pacific Region Served by USAID. unpublished photocopy. The Nature Conservancy, South Pacific Regional Biodiversity Project, Honolulu, Hawaii. vi + 125.

Pernetta, J. C., P. Nunn, D. Randall, R. Ali, L. Bualia, P. Hughes, G. McGregor, M. O'Collins, P. Osborne, and M. Sullivan. 1988. Potential Impacts of Greenhouse Gas Generated Climatic Change and Projected Sea-Level Rise on Pacific Island States of the SPREP Region. SPC, Noumea. i + 14 pp + 8 annexes. illus.

Pratt, H. D., P. L. Bruner, and D. G. Berrett. 1987. A Field Guide to the Birds of Hawaii and the Tropical Pacific. Princeton University Press, Princeton, New Jersey. xx + 409 pp + 45 plates. illus.

Prescott, J. R. V. 1985. The South Pacific Ocean. pp 180-208 in The Maritime Political Boundaries of the World. Methuen, London. xv + 377 pp. illus.

Pritchard, P. C. H. 1982. Marine Turtles of the South Pacific. pp 253-262 in K. A. Bjorndal (ed.). Biology and Conservation of Sea Turtles: Proceedings of the World Conference on Sea Turtle Conservation (Washington, D. C. 1979). Smithsonian Institution Press in cooperation with the World Wildlife Fund, Washington, D. C. 583 pp. illus.

Pulea, M. 1984. Environmental Legislation in the Pacific Region. *Ambio* 13(5-6):369-371.

Pulea, M. 1985. Customary Law Relating to the Environment. South Pacific Regional Environment Programme Topic Review 21. SPC, Noumea. x + 37 pp.

Pulea, M. 1985. Legal Measures for Implementation of Environmental Policies in the Pacific Region. pp 157-162 in A. L. Dahl and J. Carew-Reid (eds.). Environment and Resources in the Pacific. UNEP Regional Seas Reports and Studies No. 69., Geneva. iv + 294 pp. illus.

Pulea, M. 1988. The Law, Custom, and Development. unpublished paper presented at the SPREP Workshop on Customary Tenure, Traditional Resource Management and Nature Conservation (Noumea). 16 pp + 2 appendices.

Pulea, M. and A. V. S. Va'ai. 1983. Review of International and Regional Conventions Relevant to the Environmental Management of the South Pacific Region. South Pacific Regional Environment Programme Working Paper. SPC, Noumea. 26 pp.

Puniani, T. A. 1984. Tonga: Tenure, Registration, and Productivity. pp 114-117 in E. Acquaye and R. G. Crocombe (eds.). Land Tenure and Rural Productivity in the Pacific Islands. University of the South Pacific, Suva, Fiji. vii + 218 pp. illus.

Rajotte, F. and R. Crocombe (eds.). 1980. Pacific Tourism as Islanders See It. University of the South Pacific, Suva, Fiji. vi + 171 pp. illus.

Regional Development Office, South Pacific. 1988. Regional Development Strategy Statement FY1990-FY1994. USDS Agency for International Development, Washington, D. C. iv + 56 pp + annexes. illus.

Ridgell, R. 1982. European Explorers of the Pacific. p 37 in Pacific Nations and Territories: The Islands of Micronesia, Melanesia, and Polynesia. Guam Community College. viii + 158 pp. illus.

Ridgell, R. 1982. Islands of the Pacific. p 52 in Pacific Nations and Territories: The Islands of Micronesia, Melanesia, and Polynesia. Guam Community College. viii + 158 pp. illus.

Ridgell, R. 1982. Colonial Acquisition in the Pacific. pp 46-47 in Pacific Nations and Territories: The Islands of Micronesia, Melanesia, and Polynesia. Guam Community College. viii + 158 pp. illus.

Rinke, D. 1986. The Status of Wildlife in Tonga. Oryx 20(3):146-151. illus.

Robbins, R. G. 1972. Vegetation and Man in the South-West Pacific and Papua New Guinea. pp 74-89 in R. G. Ward (ed.) Man in the Pacific Islands: Essays on Geographical Change in the Pacific Islands. Oxford Clarendon Press, London. x + 339 pp. illus.

Roedelberger, F. A. and V. I. Groschoff. 1967. Wildlife of the South Seas. Viking, New York, New York. 216 pp. illus.

Rural Institutes Division. 1972. Bibliography on Land Tenure. FAO, Rome, Italy.

SPC. 1984. Area Served by the South Pacific Commission. Mercator projection, no scale given. SPC, Noumea, New Caledonia.

- SPC. 1984. Pacific Population and Area Information Sheet. Noumea. 1 sheet xerox.
- SPC. 1985. Recent Comparative Pacific Population Figures. Noumea.
- SPC. 1987. South Pacific Economies: Statistical Summary (9th ed.). South Pacific Commission, Noumea. 60 pp.
- Sachet, M.-H. and F. R. Fosberg. 1955. Island Bibliographies. National Academy of Sciences, National Research Council, Washington, D. C. v + 577 pp.
- Sachet, M.-H. and F. K. Fosberg. 1971. Island Bibliographies Supplement. National Academy of Sciences, Pacific Science Board, Washington, D. C. ix + 427 pp.
- Simkin, C. G. F. 1980. The South Pacific Islands: Patterns and Strategies of Economic Development, 1975-1990. Economic Bulletin for Asia and Pacific 31(2):77-113.
- Simpson, E. S. 1987. Fiji and Tonga. pp 169-189 in The Developing World: An Introduction. Longman Scientific and Technical, Essex, United Kingdom. xv + 360 pp. illus
- Singh, B. B. 1984. The Oceanian Realm. pp 310-314 in J. A. McNeely and K. R. Miller (eds.). National Parks, Conservation, and Development: The Role of Protected Areas in Sustaining Society. Proceedings of the World Congress on National Parks, Bali, Indonesia, 11-22 October 1982. Smithsonian Institution Press, Washington, D. C. xiii + 825 pp. illus.
- Smith, A. C. 1979 . Flora Vitiensis Nova. Pacific Tropical Botanical Garden, Lawai, Hawaii. 5 volumes to date. illus.
- Snow, P. A. 1969. A Bibliography of Fiji, Tonga, and Rotuma. University of Miami Press, Coral Gables, Florida. xliii + 418 pp + map.
- Solem, A. 1976-1982. Endodontoid Land Snails from Pacific Islands: (Mollusca, Pulmonata, Sigmurethra). Field Museum of Natural History, Chicago, Illinois. 2 volumes.

South Pacific Regional Environment Programme. 1985. Action Strategy for Protected Areas in the South Pacific Region. SPC, Noumea, New Caledonia. 21 pp.

St. John, H. 1977. The Flora of Niuatoputapo Island, Tonga. *Phytologia* 36(4):374-390. illus.

Stoddart, D. R. 1968. Isolated Island Communities. *Science Journal* 4(4):32-38. illus.

Stoddart, D. R. 1975. Sand Cays of Tongatapu. *Atoll Research Bulletin* 181. 32 pp. illus.

Stone, B. C. 1967. Notes on the Plant Genus *Pandanus* in Fiji, Tonga, the New Hebrides, and Niue. *Proceedings Biological Society of Washington* 80:47-60. illus.

Straatmans, W. 1964. Dynamics of Some Pacific Island Forest Communities in Relation to the Survival of the Endemic Flora. *Micronesica* 1(1):113-122. illus.

Sykes, W. R. 1981. The Vegetation of Late, Tonga. *Allertonia* 2(6):323-353. illus + map.

Sykes, W. R. 1983. Conservation on South Pacific Islands. pp 37-42 in D. R. Given (ed.). *Conservation of Plant Species and Habitats: A Symposium held at the 15th Pacific Science Congress, Dunedin, New Zealand, February 1983.* 128 pp. illus.

Takhtajan, A. 1986. *Floristic Regions of the World.* University of California Press, Berkeley. xxii + 522 pp. illus.

Tamson, R. 1973. *Bibliography on Medicinal Plants and Related Subjects.* SPC, Noumea, New Caledonia. 102 pp.

Taylor, R. C. 1973. *Atlas of Pacific Islands Rainfall.* Office of Naval Research by Hawaii Institute of Geophysics, University of Hawaii, Honolulu, Hawaii. variously paged. illus.

- Thamen, R. R. 1976. The Tongan Agricultural System. University of the South Pacific, Suva, Fiji. 433 pp. illus.
- Thamen, R. R. 1986. Trees, Conflict Resolution, and Peace: The Preservation of Trees as a Precondition for Environmental and Social Stability. pp 379-396 in J. P. Maas and R. A. C. Stewart (eds.). Toward a World of Peace: People Create Alternatives. Proceedings of the First International Conference on Conflict Resolution and Peace Studies in the United Nations Year of Peace. University of the South Pacific, Suva, Fiji. xiii + 601 pp. illus.
- Thamen, R. R. 1986. Environmental Issues in the Pacific Islands: Constraints to Sustainable Island Development. unpublished photocopy of a paper presented to the Pacific Circle Consortium "Ocean Project II Conference" (Auckland, New Zealand). 79 pp + tables + map
- Thamen, R. R. 1986. Microparks in the Pacific Islands The Relevance of Traditional and Modern Small Scale Conservation Areas in the Pacific Islands. pp 215-236 in South Pacific Commission. Report of the Third South Pacific National Parks and Reserves Conference (Apia 1985). Volume II. Collected Key Issue and Case Study Papers. Noumea. iii + 295 pp. illus.
- Thamen, R. R. 1987. The Pacific Islands and Beyond. Unasyuva 39(155):2-13. illus.
- Thompson, A.-G. 1986. Southwest Pacific: An Annotated Guide to Bibliographies. Australian National University and Academy of Social Sciences, Canberra, Australia. 126 pp.
- Thompson, B. N. 1984. Geological Maps of the Islands of the South Pacific. DSIR South Pacific Technical Inventory 4, Wellington, New Zealand. iii + 62 pp. illus.
- Thompson, C. S. 1986. The Climate and Weather of Tonga. New Zealand Meteorological Service Miscellaneous Publication 188(5). 60 pp. illus.
- Thornback, J., H. A. Goodwin, and C. W. Holloway. 1978. IUCN Red Data Book. Volume 1. Mammalia. IUCN, Morges, Switzerland. not paged.

- Thorne, R. F. 1963. Biotic Distribution Patterns in the Tropical Pacific. pp 311-353 in J. L. Gressitt (ed.) Pacific Basin Biogeography, Proceedings of a Symposium, Pacific Science Congress X (Honolulu 1961). B. P. Bishop Museum, Honolulu. ix + 563 pp. illus.
- Titcomb, M. 1973. Pacific: A Core Collection. Xerox University Microfilms, Ann Arbor, Michigan. vi + 61 pp.
- Tongilava, S. L. 1988. completed questionnaire. Secretary for Lands, Survey and Natural Resources, Kingdom of Tonga.
- Tsusaka, A. 1984. South Pacific Developing Countries: Development Issues and Challenges. Asian Development Review 2(1):65-81.
- U. S. Board on Geographic Names. 1972. Australia, New Zealand and Oceania. USDS Office of Geography, Gazetteer Supplement, Washington, D. C. iii + 48 pp.
- U. S. Board on Geographic Names. 1974. Fiji, Tonga, and Nauru: Official Standard Names. USDS Office of Geography, Washington, D. C. vi + 231 pp.
- USDS Office of the Geographer. c1985. Claimed and Potential Maritime Zones in the Central and South Pacific. map 1:12,000,000. Washington, D. C.
- USGS. 1944. Photo Interpretation of Vegetation in the Tropical Pacific Area and Its Use as an Indicator of Kind of Ground. Military Intelligence Division, U. S. Army Corps of Engineers, Washington, D. C. 115 pp. illus.
- USND Hydrographic Office. 1944. Islands of the Central and South Pacific. Gazetteer 7. Washington, D. C. ii + 222 pp. illus.
- University of the South Pacific Library. 1981 . South Pacific Bibliography. Suva, Fiji. series.
- Van Balgooy, M. M. J. 1960. Preliminary Plant-Geographical Analysis of the Pacific. Blumea 10(2):385-430.

- Van Balgooy, M. M. J. 1969. A Study on the Diversity of Island Floras. *Blumea* 17(1):139-178. illus.
- Van Balgooy, M. M. J. 1971. Plant-Geography of the Pacific As Based on a Census of Phanerogam Genera. *Blumea Supplement* 6. 222 pp. illus.
- Van Balgooy, M. M. J. 1975. Pacific Plant Areas 3. Rijksherbarium, Leiden, The Netherlands. viii + 386 pp. illus.
- Van Balgooy, M. M. J. 1984. Pacific Plant Areas 4. Rijksherbarium, Leiden, The Netherlands. viii + 270 pp. illus.
- Van Steenis, C. G. G. J. 1963. Pacific Plant Areas, Volume 1. National Institute of Science and Technology, Manila, Philippines. iii + 297 pp. illus.
- Van Steenis, C. G. G. J. and M. M. J. Van Balgooy. 1966. Pacific Plant Areas 2. *Blumea Supplement* 5. 312 pp. illus.
- Venkatesh, S. V., S. Va'ai, and M. Pulea. 1983. An Overview of Environmental Protection Legislation in the South Pacific Countries. South Pacific Regional Environment Program Topic Review No. 13, SPC, Noumea. v + 63 pp.
- Vergara, N. T. and P. K. R. Nair. 1985. Agroforestry in the South Pacific Region An Overview. *Agroforestry Systems* 3(4):363-380. illus.
- Vodonaivalu, S. 1982. A Botanical Survey of the Tidal Forest (Mangal) of Fiji, Tonga, and Western Samoa. University of the South Pacific, Institute of Marine Resources, Suva, Fiji.
- Watling, D. and C. Talbot-Kelly. 1982. Birds of Fiji, Tonga, and Samoa. Milwood Press, Wellington, New Zealand. 176 pp. illus.
- Weiner, M. A. 1970. Medicinal Plants of Tonga. unpublished thesis submitted for the degree of Master of Science in Botany, University of Hawaii, Honolulu, Hawaii. viii + 108 pp. illus.

Weinstock, J. A. 1984. Tenure and Forest Lands in the Pacific. East-West Center Environment and Policy Institute Working Paper, Honolulu. vi + 32 pp.

Wells, S. 1985. Information Required for Oceania Protected Areas Systems Review: Brief Notes on Endemic and Threatened Pacific Land Snails. unpublished photocopy. IUCN Conservation Monitoring Centre, Cambridge, United Kingdom. unpagged.

Wells, S. M., R. M. Pyle, and N. M. Collins. 1983. The IUCN Invertebrate Red Data Book. IUCN, Gland, Switzerland. 1 + 632 pp. illus.

Western Pacific Regional Fishery Management Council. 1980. Final Environmental Impact Statement on the Fishery Management Plan for the Precious Coral Fisheries (and Associated Non-precious Corals) of the Western Pacific Region. Honolulu, Hawaii. 4 + 46 + 116 pp. illus.

Wheeler, M. E. 1979. A Bibliography of the Fruit Bat Genus *Pteropus*. Department of Agriculture, Division of Aquatic and Wildlife Resources, Technical Publication 10, Guam. iv + 30 pp. illus.

Whistler, W. A. 1980. Coastal Flowers of the Tropical Pacific. A Guide to Widespread Seashore Plants of the Pacific Islands. Oriental Publishing, Honolulu, Hawaii. 83 pp. illus.

Whistler, W. A. 1983. Weed Handbook of Western Polynesia. German Agency for Technical Cooperation, Eschborn, West Germany. vi + 151 pp. illus.

Whitmore, T. C. 1973. Plate Tectonics and Some Aspects of Pacific Plant Geography. *New Phytologist* 72(5):1185-1190. illus.

Wickman, S. B. 1984. Tonga. pp 413-430 in F. M. Bunge and M. W. Cooke (eds.) *Oceania: A Regional Study*. U. S. Government Printing Office, Washington, D. C. xv + 572 pp. illus.

Wilde, R. H. and A. E. Hewitt. 1983. Soils of 'Eua Island, Kingdom of Tonga. DSIR, Wellington, New Zealand. 42 pp + map. illus.

Wilkinson, W. A. 1977. Marine Conservation in Tonga. Parks
2(2):11-12. illus.

Wilson, E. O. and R. W. Taylor. 1967. The Ants of Polynesia. B. P.
Bishop Museum, Pacific Insects Monograph 14. 109 pp. illus.

Winch, K. L. (ed.). 1976. International Maps and Atlases in Print
(second edition). Bowker, London, United Kingdom. xvi + 866 pp.
illus.

Yuncker, T. G. 1959. Flora of Tonga. Bulletin of the B. P. Bishop
Museum 220. 283 pp. illus.

Zann, L. P., W. P. Kimmerer, and R. E. Brock. 1984. The Ecology of
Fanga'uta Lagoon, Tongatapu, Tonga. University of Hawaii, Sea
Grant Program UNIHI-SEAGRANT-CR 84-4, Honolulu, Hawaii. 102 pp.
illus.