Foster

Photograph by Kevin Foster, USFWS

FINAL
FISH AND WILDLIFE COORDINATION ACT REPORT

TUTUILA HARBOR STUDY
ISLAND OF TUTUILA
AMERICAN SAMOA

MAY 2005

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
PN-05-280

MAY - 6 2005

Lieutenant Colonel David E. Anderson
Honolulu District Engineer
U.S. Army Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858

Dear Lieutenant Colonel Anderson:

The U.S. Fish and Wildlife Service (Service) has prepared a Final Fish and Wildlife Coordination Act (FWCA) Report on the Tutuila Harbor Study, Island of Tutuila, American Samoa. This report is provided in accordance with the requirements of section 2(b) of the FWCA of 1934 [16 USC 661 *et seq*; 48 Stat. 401], as amended. The purpose of the report is to document the existing fish and wildlife resources at the proposed project site and to ensure that fish and wildlife conservation receives equal consideration with other proposed project objectives as required under the FWCA. The report includes an assessment of the significant fish and wildlife resources at the proposed project site, an evaluation of potential impacts associated with the proposed project design alternatives, and recommendations for fish and wildlife mitigation measures.

We appreciate the opportunity to coordinate with the U.S. Army Corps of Engineers on the proposed project. If you have any questions regarding this report, please contact Marine Ecologist Kevin Foster by telephone at (808) 792-9420.

Sincerely,

Gina M. Shultz

Gina M. Shultz
Acting Field Supervisor

Enclosure

cc: NMFS - PIRO, Honolulu
USEPA-Region IX, San Francisco
DMWR - American Samoa
ASCMP- American Samoa
ASEPA-American Samoa

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FISH AND WILDLIFE COORDINATION ACT REPORT

TUTUILA HARBOR STUDY
ISLAND OF TUTUILA
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Prepared by

Kevin Foster and Antonio Bentivoglio

U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

Prepared for

U.S. Army Corps of Engineers
Honolulu District
Fort Shafter, Hawaii

May 2005

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INTRODUCTION

Authority, Purpose and Scope

This is the U.S. Fish and Wildlife Service's (Service) final report on plans by the U.S. Army Corps of Engineers (Corps) to construct a commercial dock in Pago Pago Harbor on the island of Tutuila, American Samoa. This report has been prepared under the authority of the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 et seq.; 48 Stat. 401], as amended (FWCA), and other authorities mandating Department of the Interior concern for environmental values. This report is also consistent with the National Environmental Policy Act of 1969 [42 U.S.C. 4321 et seq.; 83 Stat. 852], as amended (NEPA). The purpose of this report is to document the existing fish and wildlife resources at the proposed project sites and to ensure that fish and wildlife conservation receives equal consideration with other proposed project objectives as required under the FWCA. The report includes an assessment of the significant fish and wildlife resources at the proposed project sites, an evaluation of potential impacts associated with the proposed project design alternatives, and recommendations for fish and wildlife mitigation measures.

A proposed Pago Pago (Tutuila Island) Harbor study was authorized under Section 444 of the Water Resources Development Act of 1996 (P.L. 104-303). Funding to initiate this study was provided to the Corps under House Conference Report #105-749 to ..."initiate and complete a reconnaissance study of alternative locations for the development of a harbor at Tutuila, American Samoa." Funds were received in fiscal year 1999 as a Congressional Add.

The purpose of the Corps study is to determine whether Federal interest exists to assist the American Samoa Government in the development of a second commercial dock within Pago Pago Harbor. This phase of the Corps study will result in the development of a Project Study Plan for feasibility-level studies on identified alternative plans, the identification of a non-federal sponsor to share the cost of the feasibility studies, and the development of the Feasibility Cost Sharing Agreement (FCSA).

The American Samoa Department of Port Administration has reported that congestion and delays are presently occurring at the existing commercial dock, which also serves as the principal port of entry for virtually all heavy cargo destined for the Territory of American Samoa. Regular shipping services operate between Pago Pago and the U.S., Australia, Japan, other Pacific Islands, and continental Asia. Container ships, passenger liners, and numerous fishing vessels that support local tuna canneries are experiencing operational delays due to inadequate commercial dock facilities. For example, in 2002 approximately 1,086 vessels of various sizes conducted operations within Pago Pago Harbor (Pers. Comm., C. King 2003). Therefore, to alleviate congestion and delays, a second commercial dock site, complete with entrance channel, turning basin, dock and berthing area is under consideration.

Coordination with Federal and Territorial Resource Agencies

Service biologists have discussed the proposed project with staff of the National Marine Fisheries Service (NMFS), the U.S. Environmental Protection Agency (USEPA), the American Samoa Division of Marine and Wildlife Resources (DMWR), the American Samoa Environmental Protection Agency (ASEPA), and the American Samoa Coastal Management Program (ASCMP). Concerns relative to the protection and conservation of important fish and wildlife resources at

Pago Pago Harbor expressed by these agencies were incorporated into this report. Copies of this report are being provided to the NMFS, USEPA, DMWR, ASEPA, and ASCMP.

Prior Fish and Wildlife Meetings, Studies and Reports

July 2002 – The Service participated in a teleconference with the Corps to discuss the proposed project. The Corps requested that the Service evaluate four potential project sites (Anua, Aua, Leloaloa, and Onesosopo) within Pago Pago Harbor. The Corps also requested that the field investigation of the four sites be completed within one week due to limited funds. The Service asked the Corps to consider reducing the number of survey sites from four to two if additional funding was unavailable. The Corps agreed to reevaluate the proposed activity and consider the Service's request.

January 2003 – The Service participated in a teleconference meeting with the Corps and was requested to evaluate the proposed Anua and Aua sites in Pago Pago Harbor.

January 2003 – The Service and NMFS staff conducted brief reconnaissance visits to the proposed project sites at Anua and Aua.

January 2003 – The Service met with the DMWR Director to discuss Service plans to conduct a FWCA investigation in support of the proposed project.

January 2003 – The Service submitted a Planning Aid Letter (PAL) with a Scope of Work and Cost Estimate to conduct a FWCA investigation for the proposed project.

February 2003 – Service staff met with DMWR staff and ASEPA staff to discuss Service plans to conduct a FWCA investigation in support of the proposed project.

February 2003 – Service and NMFS staff conducted field investigations at the Anua and Aua sites.

August 2003 – Service and NMFS staff met with Corps staff to discuss the need for additional surveys at Leloaloa village, Pago Pago Harbor, in support of the proposed project.

September 2003 – The Corps indicated that additional funds to conduct a survey of the Leloaloa site would be provided. The Service anticipated that the Leloaloa site would be surveyed in October 2003.

September 2003 – The Corps requested the Service to briefly evaluate the area fronting the Power Plant at Anua during the October survey to determine if conditions at this site are similar to the Anua site.

October 2003 – Service staff met with the DMWR Director to discuss plans to survey the proposed Leloaloa and Power Plant at Anua sites. The DMWR Director felt that the preferred site for the proposed commercial dock should be the area fronting the Power Plant at Anua since this area is quite degraded and impacts to marine resources would be minimized as compared to construction of the project at either the Aua or Leloaloa sites. Also, the DMWR Director mentioned that construction of the commercial dock at the proposed Anua site would result in significantly higher costs to remove sediment from the harbor during future maintenance operations. The Anua site is

located in the shallows of inner Pago Pago Harbor and receives substantial sedimentation in runoff directed to the harbor.

November 2003 – The Service participated in a telephone meeting with the DMWR Director and ASEPA staff concerning potential projects that could serve as compensatory mitigation for unavoidable impacts to fish and wildlife resources as a result of the proposed project.

December 2003 – In a telephone call to the Service, the Corps indicated the preferred alternative is the Power Plant at Anua site. Location of the commercial dock at this site may reduce future maintenance and operations costs, as compared to the first Anua alternative.

December 2003 – The Service released the Draft FWCA 2(b) report for review and comment.

February 2004 – The Service and Corps discuss the Draft FWCA 2(b) report and exchange information.

January 2005 – The Service and Corps agree to finalize the FWCA 2(b) report for the proposed project.

DESCRIPTION OF THE PROJECT AREA

The Samoan Archipelago is located in the south Pacific Ocean, approximately 4,345 kilometers (km) southwest of the State of Hawaii. The archipelago is about 480 km in length. The archipelago is politically divided into the Territory of American Samoa, an unincorporated territory of the U. S. (Figures 1 & 2), and the nation of Samoa. American Samoa is comprised of five high islands (Tutuila, Aunu'u, and the Manu'a Islands [Ofu, Olosega, and Ta'u] and two atolls (Rose Atoll and Swains Island). The proposed project area at Pago Pago Harbor is 14° 16' South Latitude and 170° 42' West Longitude (Goldin 2002).

Tutuila Island is approximately 140 km^2 in area. The island is comprised of the remnants of five emergent volcanoes and two submerged volcanoes. The highest elevation on Tutuila is Matafao Peak at 714 meters (m). A drowned barrier reef encircles the island at the 200-m depth contour.

The seasons in American Samoa include tropical dry and wet periods. From June through September, relatively cool and dry conditions prevail throughout Tutuila. From October through May, warm and wet conditions are normal. During the dry season, the average temperature is 27° Celsius (C), and average rainfall is about 15 centimeters (cm) per month. During the wet season, the average temperature is about 28° C, and rainfall averages about 33 cm per month (Craig 2002).

Trade winds usually come from the east-northeast and average between 16 and 32 km/hour. American Samoa has been visited by many hurricanes that primarily originate in the north. Recent hurricanes that exhibited significant destructive force include: Esau (1981), Tusi (1987), Ofa (1990), Val (1991), and Heta (2004).

Pago Pago Harbor is divided into an inner harbor (maximum depth 30 m) and outer harbor (maximum depth 60 m) (Figure 2). The inner harbor has undergone major alterations that destroyed approximately as much as 95 percent of its original coral reefs by dredging and filling activities (IUCN/UNEP 1988). Pago Pago Harbor has served as a deep-water port for the U.S.

Navy since 1872. The tuna canning industry has operated in the inner harbor at Anua since 1954. Cannery operations discharged industrial waste within the inner harbor until 1990. Poor mixing and circulation combined with spilled fuel, pesticides, heavy metals, and sedimentation in runoff have degraded the harbor's water quality (IUCN/UNEP 1988). However, cannery outfalls were moved from the inner harbor to the outer harbor in 1992 and this has contributed to improved water quality conditions. Flushing time for the inner harbor is about 13 to 20 days (Green et. al, 1997).

Finally, a variable number of sailboats occupy inner Pago Pago Harbor for mooring purposes. Several sailboats are usually moored at various locations throughout the inner harbor, between the Power Plant at Anua and the extreme western extent of the harbor, and at the yacht dock at Fagatogo (commercial district) along the southern shore of inner Pago Pago Harbor. During the time of the surveys, approximately 10 and 12 sailboats were moored between the Power Plant and the western extent of the harbor and at the Fagatogo dock, respectively.

Coral Reef Resources

Marine communities in American Samoa are comprised of thousands of plants and animals that are part of the greater coral reef ecosystem, which includes areas that may be dominated by live coral colonies, coralline algae, seagrass, macro-algae, and sand. Coral reefs are unique in that they are geological structures built by living communities. Coral polyps deposit calcium carbonate skeletons and grow upward as they continue to deposit new skeletal material from below. Many other organisms also deposit skeletons or shells on the reef. When corals or these other organisms die, their skeletal remains become part of the reef framework largely as a result of the cementing action of coralline algae. New corals settle on top of dead ones to continue the overall growth of the reef. Thus, the reef can be viewed as a thick framework of calcium carbonate rock covered with a fragile, thin veneer of life. The reef surface and underlying framework form an important complex of holes, tunnels, and elevated projections that provide a wide range of shelter, foraging, and reproductive habitats for numerous species of fishes, invertebrates, and other organisms.

The most ubiquitous type of coral reef at Tutuila Island is the fringing reef (Figure 3). Fringing reefs are geologically young structures that extend a modest distance from the shoreline and represent the general growth pattern of the coral community around high islands. The fringing reefs around Tutuila are relatively high-energy environments that have evolved to support complex communities of plants and animals. The fringing reefs that occur within deep embayments, such as Pago Pago Harbor, are generally low-energy environments that often support unique species assemblages.

Tutuila's fringing reefs are important because they provide extensive habitat that supports a wide variety of ecological functions. From a biological perspective, these functions include nesting, recruitment, foraging, resting, and sheltering from predators for highly diverse assemblages of species, including the federally listed threatened green sea turtle (*Chelonia mydas*) and endangered hawksbill sea turtle (*Eretmochelys imbricata*). Maintenance of coral reef habitats that support these ecological functions is dependent on protecting the thin, top layer of living coral, which requires clean, well-oxygenated, tropical seawater for maximum health. Although corals are fragile and can be broken by storm waves, healthy reefs can continually heal themselves from wave damage and other natural impacts.

Healthy fringing reefs provide other important ecological functions by acting as buffers for island shorelines from oceanic swells and storm events. Wave energy is reduced and dispersed over the reef flat, protecting shorelines from erosion. This protection typically helps support upland areas for human inhabitants and a wide variety of native terrestrial organisms, including coastal vegetation, land snails and other invertebrates, sea turtles and other reptiles, sea birds, shorebirds, and bats.

Other ecological functions provided by healthy fringing reefs include the maintenance of intact marine communities in the near shore environment that interact with pelagic or terrestrial species through complex predator, prey, or symbiotic relationships common in tropical ecosystems. Also, healthy coral reef resources directly benefit the residents of American Samoa by supporting human activities such as subsistence harvest/fishing, recreational activities, tourism, and cultural practices.

Coral distribution is limited by numerous factors, such as alteration of habitat, sedimentation, water quality, water temperature, predator outbreaks, and hurricanes. Dredging can destroy coral tissue and entire coral colonies by direct contact. Sediments that become suspended in the water column may settle on coral polyps and smother them. Suspended sediments may also abrade polyps and planktonic larvae and render them non-viable. Pago Pago Harbor and the shoreline at many places on Tutuila have been altered to various degrees during construction activities related to harbors, boat ramps, shoreline revetments, and coastal roads.

Water temperature also affects the viability of coral tissue. American Samoa coral reefs remain vulnerable to sedimentation and nutrient loading from upland sources as a result of poorly regulated agricultural and human development activities (Green 1997 *et al.*, and Pers. Comm., P. Peshut 2003). Elevated levels of nutrients (*e.g.*, phosphates or nitrates), petroleum products, or polychlorinated byphenyls (PCBs) may have lethal or sub-lethal affects upon coral communities. Sewage and leachate from unlined landfills are primary sources of chemical contamination that may degrade coral reef communities. The ASEPA is evaluating sediments and biota throughout Pago Pago Harbor to determine the relative risk that contaminants may pose to humans that consume marine organisms harvested from the harbor (Pers.Comm, P. Peshut 2003).

Corals may become stressed when water temperatures vary from the optimal range of 25° to 29° C. Water quality is an important consideration for coral reefs. In 1994, sea surface temperatures remained elevated for a sustained period that resulted in the largest "coral bleaching" event recorded in American Samoa (Green 2002).

The indigenous crown-of-thorns sea star (*Acanthaster planci*) is a coralivorous echinoderm occasionally observed on American Samoa coral reefs. It is not well understood whether periodic population outbreaks of this species can be attributable to natural or human influences. However, it is well documented that even modest outbreaks may significantly degrade coral reefs in American Samoa (Birkeland and Randall 1979, Zann 1992).

Hurricanes are a rare weather phenomenon in American Samoa, but they can have devastating consequences for coral reefs. Recent hurricanes, such as Ofa (1990) and Val (1991), were responsible for major damage to coral reefs throughout American Samoa (Green 1999). The most recent hurricane (Heta, January 2004) did not result in serious damage to coral reefs (Pers. Comm., P. Peshut 2004).

FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES

The Service's primary concerns for the proposed project include potential impacts to federally listed and other fish and wildlife species and their habitats from dredging and filling in the marine environment. Specific Service planning objectives are to maintain and enhance the existing significant habitat values at the proposed project sites by (1) obtaining basic biological data for the proposed project sites, (2) evaluating and analyzing the impacts of proposed-project alternatives on fish and wildlife species and their habitats, (3) identifying the proposed-project alternative least damaging to fish and wildlife resources, and (4) recommending mitigation measures as a result of project-related negative impacts to fish and wildlife resources that include: avoidance of unnecessary impacts; minimization of unavoidable impacts; and compensation for unavoidable negative impacts consistent with the FWCA and the Service's Mitigation Policy.

Under the authority of the Endangered Species Act (ESA) of 1973 [16 U.S.C. 1531 *et seq.*; 87 Stat. 884], as amended, the Department of the Interior and the Department of Commerce share responsibility for the conservation, protection and recovery of federally listed endangered and threatened species. Authority to conduct consultations has been delegated by the Secretary of the Interior to the Director of the Service and by the Secretary of Commerce to the Assistant Administrator of NMFS. Section 7(a) (2) of the ESA requires Federal agencies, in consultation with and with the assistance of the Service or NMFS, to insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitats. The Biological Opinion is the document that states the opinion of the Service or NMFS as to whether the Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

The Service's Mitigation Policy (U.S. Fish and Wildlife Service 1981) outlines internal guidance for evaluating impacts affecting fish and wildlife resources. The Mitigation Policy complements the Service's participation under NEPA and the FWCA. The Service's Mitigation Policy was formulated with the intent of protecting and conserving the most important fish and wildlife resources while facilitating balanced development of this nation's natural resources. The policy focuses primarily on habitat values and identifies four resource categories and mitigation guidelines.

The resource categories are the following:

a. Resource Category 1: Habitat to be impacted is of high value for the evaluation species and is unique and irreplaceable on a national basis or in the ecoregion section.

b. Resource Category 2: Habitat to be impacted is of high value for the evaluation species and is relatively scarce or becoming scarce on a national basis on in the ecoregion section.

c. Resource Category 3: Habitat to be impacted is of high to medium value for the evaluation species and is relatively abundant on a national basis.

d. Resource Category 4: Habitat to be impacted is of medium to low value for the evaluation species.

The coral reef ecosystems fronting the project sites at Anua, Aua, Leloaloa, and the Power Plant at Anua comprise the habitats of major concern. Although corals are very small and sensitive organisms, healthy coral colonies are fundamentally important in providing the basic foundation for habitat that supports diverse communities of other highly specialized marine organisms. Corals contribute the bulk of the calcareous raw materials that form and maintain the basic structural framework of the reef. Coral colonies add significantly to the submarine topographic relief in which a large number of fish and invertebrate species find shelter and food. Coral polyps themselves are an important food source for some fishes and other marine life. The institutional significance of U.S. coral reefs has been established through their designation as Special Aquatic Sites [40 CFR Part 230 §230.44/FR v.45n.249] and as a Federal Trust Resource [Executive Order 13089 on Coral Reef Protection]. Such sites possess special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values and contribute to the general overall environmental health or vitality of an entire ecosystem of a region.

Coral reefs are relatively scarce on a national basis and are currently in a world-wide state of decline (Crosby *et al.* 1995; U.S. Coral Reef Task Force 2000). In American Samoa, coral reefs are subjected to relatively frequent adverse impacts, and the extent of healthy and productive coral reefs may be declining on a local basis (Green 2002, Birkeland *et al.* in prep, and Birkeland *et al.* 1996). The Service considers coral reef habitats in Pago Pago Harbor to be Resource Category 2 habitats. The Service's resource goal for Category 2 habitat is no net loss of in-kind habitat values. Under this designation, the Service will recommend ways to mitigate losses, through measures to avoid or minimize significant adverse impacts. If losses are unavoidable, measures to immediately rectify, reduce, or eliminate losses over time by the replacement of in-kind habitat values will be recommended for incorporation into the project description as necessary compensation.

Corals, algae, invertebrates, seagrass, and reef fishes have been selected as the evaluation species for the reef habitats that may be affected by the proposed project. Selection of a diverse assemblage of organisms offers an evaluation at the community level to assess a site's relative contribution to the overall coral reef resources that occur within Pago Pago Harbor.

EVALUATION METHODOLOGY

Marine Biological Assessment

In 2003, the Service conducted a marine biological assessment of four locations within Pago Pago Harbor to evaluate potential impacts to fish and wildlife resources based on the proposed project design criteria. These locations included Anua, Aua, Leloaloa, and the Power Plant at Anua. Observations on the distribution and relative abundance of reef fishes, corals, other macro-invertebrates, algae, and seagrasses were compiled. Global Positioning System (GPS) data were collected to identify the location of each survey transect.

Service ecologists Kevin Foster and Gordon Smith and NMFS biologist Steve Kolinski conducted the marine survey work for this project in February and October, 2003. Mr. Foster collected benthic substrate, macro-invertebrate, and marine plant data at all survey sites and collected coral data at the Leloaloa and Power Plant at Anua survey sites. Mr. Smith collected reef fish data at all survey sites. Mr. Kolinski collected coral data at the Anua and Aua survey sites. All marine

survey work was conducted between 9:00 am and 5:00 pm. Mr. Foster provided all photographs that appear in this report.

Two complementary survey techniques were used at each station: (a) a quantitative benthic substrate transect and (b) a semi-quantitative Rapid Ecological Assessment (REA). Transect data on benthic habitat were obtained using a 25-m tape measure. Data were collected at points every .25 m along the tape. The type of substrate directly beneath each point was recorded on underwater paper for later transcription. Non-biological substrate types included mud, rubble/rock, sand, and consolidated calcareous pavement. Biological substrate types included coral, coralline algae, macro-algae, seagrass, and sponge.

Data from a total of 40 transects were collected to characterize the marine community at the Anua, Aua, Leloaloa, and Power Plant at Anua survey stations. At Anua, 12 transects were surveyed in an east to west orientation, parallel to the shoreline. At Aua, 12 transects were surveyed in a south to north orientation, parallel to the shoreline. At Leloaloa, 12 transects were surveyed in an east to west orientation, parallel to the shoreline. At the Power Plant at Anua, four transects were surveyed in an east to west orientation, parallel to the shoreline. At the Anua, Aua and Leloaloa survey stations, transects were oriented along the depth contours of 1 m (four transects), 5 m (four transects), and 10 m (four transects). At the Power Plant at Anua survey station, transects were oriented along the depth contours of 5 m (two transects) and 10 m (two transects). Fewer transects were conducted at the Power Plant at Anua site because time was limited and the goal of that survey was to determine if the resources were generally similar to the Anua site.

The REA was used to characterize species and habitat conditions at each station. The technique consisted of timed 15-minute scuba dives by biologists to survey fishes, corals, other macroinvertebrates, algae, and seagrasses. All dive operations were conducted from shore. During each REA survey dive, biologists swam over the area immediately surrounding the transect tape in a meandering fashion with a minimum amount of backtracking. Species were recorded on underwater paper for later transcription. Emphasis was given to identifying conspicuous, diurnally active species. As a result, small, cryptic, and nocturnally active species are under-represented in these data.

Species observed during the REAs are ranked as being Dominant, Abundant, Common, Occasional, or Rare. These categories are defined as follows: Dominant (D) = the species constitutes a majority in abundance or substrate coverage (50+% of total) or is very conspicuous throughout the survey area; Abundant (A) = the species contributes substantial abundance or coverage (25+% of total) or is very numerous in the survey area (*e.g.*, 15+ individuals of a fish species) or is dominant within parts of the survey area; Common (C) = the species is present as several or more individuals (*e.g.*, 5-14 individuals of a fish species) or as a few larger colonies or is conspicuous in only one or a few parts of the survey area; Occasional (O)= the species is uncommon or present only as a few individuals (*e.g.*, 2-4 individuals for fish species) or as a few large colonies, but not contributing substantially to abundance or substrate coverage anywhere within the survey area; and Rare (R) = the species is present on the basis of only one individual (*e.g.*, fishes) or colony seen within the survey area.

Typically, divers located the 1-m, 5-m and 10-m depth contours at each station with a hand-held fathometer. GPS data were collected while over each survey transect depth. After these data were

collected, both the fathometer and GPS unit were secured in dry bags attached to a floating dive flag. Divers towed the float while conducting each survey.

Ecological Functions

Coral reef ecosystems in Pago Pago Harbor exhibit a variety of ecological functions, which are described in this report. Each ecological function provides a relative contribution toward the maintenance or protection of individual species or groups of species and their habitats. A value was assigned to an ecological function when it was either directly observed or evidence suggested that it could be performed at some point along the survey transects located at the 1-m, 5-m or 10-m depth contours. For example, if evidence of the function was not observed during any of the survey transects, it received a zero value. If the function was observed at the shallow depth contour, but not at the mid-depth or deep contours, it received a value of 1. If the function was observed at the shallow and mid-depth contours, it received a value of 2. Finally, if the function was observed at the shallow, mid-depth and deep contours, it received a value of three for the survey station. Therefore, the possible value range for each function was zero to three.

DESCRIPTION OF FISH AND WILDLIFE RESOURCES

Benthic substrate data are presented in Table 1 and Appendices 1 and 2 for all survey stations. Lists of marine species of reef fishes, corals, other macroinvertebrates, and marine plants are presented in Tables 2, 3, 4 and 5, respectively. GPS data were collected for each survey transect and are presented in Table 6. Results for the evaluation of ecological functions are presented in Table 7. Photos for each alternative site and marine environment fronting each site appear in Appendices 3 and 4.

Existing Conditions at the Proposed Anua Site

Terrestrial

The terrestrial environment between Route 1 and the shoreline in this area is highly altered by the Ronald Reagan Shipyard and tuna canneries to the east and residential communities to the north and west. Non-native species such as dogs (*Canis familiaris*), cats (*Felis catus*), black rats (*Rattus rattus*), Norway rats (*Rattus norvegicus*), Polynesian rats (*Rattus exulans*), house mice (*Mus musculus*), pigs (*Sus scrofa*) and chickens (*Gallus gallus*) are the primary terrestrial animals that occur within the vicinity of the project site. Coconut (*Cocos nucifera*) and milo (*Thespesia populnea*) trees were recorded in the vicinity of the project site. Also, DMWR biologists report occasional observations of migratory birds, including wandering tattlers (*Heteroscelus incanus*), sanderlings (*Calidris alba*), ruddy turnstones (*Arenaria interpres*), Pacific golden-plovers (*Pluvialis fulva*) and Pacific reef herons (*Egretta sacra*). These species may be observed foraging along the shoreline.

Marine

The marine environment in this area includes a narrow fringing reef flat, about five meters wide and one to two meters deep, which supports a small number of marine plants and animals. The reef descends sharply into the harbor, between 3 and 9 m in depth, and is primarily composed of rubble that supports few marine organisms. At a depth of 10 m, the reef gradually slopes into a muddy substrate on the harbor bottom that is largely devoid of organisms. At Anua, tidal exchange is much reduced and water residence time is significantly longer compared to other areas

of the harbor. Approximately seven sailboats were moored within the footprint of the proposed project.

Benthic substrate data are presented in Table 1a and Appendix 1a-c. A total of 42 species of reef fishes (Tables 2 & 2a-c), 5 species of corals (Tables 3 & 3a-c), 23 species of benthic macro-invertebrates (Tables 4 & 4a-c), and 3 species of marine plants (Tables 5 & 5a-c) were observed and recorded. Although green sea turtles and hawksbill sea turtles are known to exist in Pago Pago Harbor (P. Peshut, 2004), these species were not observed during the Anua site surveys. It is feasible that green sea turtles may use the seagrass beds in the shallows at Anua for foraging purposes.

The shallow marine benthos (1m depth) was primarily comprised of sand (41-46%), rock and rubble (1-41%). The marine community consisted of seagrass (8-54%) with occasional observations of macro-algae (2-5%) and corals (0-2%). Conspicuous reef fish species included snappers (*Lutjanus fulvus* and *L. gibbus*); butterflyfishes (*Chaetodon ephippium*, *C. vagabundus*, *Heniochus chrysostomus,* and *H. monoceros*); damselfishes (*Chrysiptera cyanea*, *Pomacentrus coelestis,* and *Stegastes nigricans*); surgeonfishes (*Acanthurus nigrofuscus*, *A. xanthopterus*, and *Ctenochaetus strigosus*); and gobies (*Amblygobius sphinx* and *A. phalaena*). Coral species recorded included *Leptastrea purpurea* and *Porites lutea*. Observations of macro-invertebrate species consisted of sponges (*Callyspongia* sp, *Axinyssa* sp, *Dysidea* sp, and *Craniella abracadabra*); an unidentified hydroid; sea snails (*Mitra tabanula*, *Conus lividus*, *Tellina crucigera*, and a vermetid snail); and a crustacean (*Balanus amphitrite*). Marine plants recorded at this site included a green alga (*Halimeda opuntia*) and seagrass (*Halophila ovalis*).

Mid-depth surveys were conducted at a depth of 5 m on the reef slope. At 3 m, the reef began to descend towards the harbor bottom. At 5 m, the reef slope was primarily comprised of rubble (53-87%), mud (8-26%) and sand (5-47%). Occasional observations of macro-algae (2%) and coralline algae (1%) were recorded. Observations of conspicuous reef fishes included squirrelfishes (*Myripristis murdjan*, *Neoniphron samara,* and *Sargocentron spiniferum*); pipefishes (*Corythoichthys intestinalis*); cardinalfishes (*Cheilodipterus quinquelineatus*); snappers (*Lutjanus fulvus*); goatfishes (*Mulloidichthys flavolineatus*, *Parupeneus cyclostomus*, and *P. multifasciatus*); butterflyfishes (*Chaetodon auriga*, *C. ephippium*, *C. vagabundus*, *Heniochus chrysostomus*, and *H. monoceros*); damselfishes (*Chrysiptera coelestis*, *Pomacentrus vaiuli*, and *Stegastes nigricans*); wrasses (*Thalassoma lutescens*); surgeonfishes (*Acanthurus nigricans*, *A. nigrofuscus*, and *A. xanthopterus*); and moorish idols (*Zanclus cornutus*). Occasional observations of corals included *Leptastrea purpurea*, *Pocillopora damicornis*, and *Porites lutea*. Macro-invertebrate species included sponges (*Axinnela* sp, *Dysidea* sp, and *Chelanplysilla* sp); hydroids (*Halichordyle disticha* and an unidentified hyroid); a zoanthid (*Zoanthus* sp); sea snails (*Cypraea erosa*, *Conus flavidus*, *C. lividus*, *Vasticardium orbita*, *Vasticardium* sp, and *Irus* sp); crustaceans (*Balanus amphitrite*, *Etisus* sp, and *Calcinus latens*); and a sea squirt (*Polycarpa* sp). Marine plants recorded at this site included a red alga (*Halymenia* sp) and seagrass (*Halophila ovalis*).

Deep surveys were conducted at the harbor bottom (10 m depth), which was comprised exclusively of mud (100%). Reef fish species included a jack (*Caranx melampygus*); snapper (*Lutjanus fulvus*); damselfish (*Pomacentrus coelestis*); and wrasse (*Thalassoma lutescens*). Macroinvertebrate species included sponges (*Callyspongia* sp and *Dysidea* sp); an unidentified hydroid; and sea snails (*Nerita* sp and an unidentified vermetid snails). Species of corals and marine plants were absent at the site at this depth.

Ecological functions provided by the fringing coral reef community at Anua (Table 7) include: modest shoreline protection for the low energy, inner harbor environment; possible forage habitat for protected sea turtles; substrate for coral re-colonization as conditions (*e.g.*, water quality) in the area improve; and potential prey (*e.g.*, reef fish) for migratory birds.

Existing Conditions at the Proposed Aua Site

Terrestrial

An alternative location to construct the proposed commercial dock is the reef area fronting Aua village. The development of residential communities in this area has resulted in significant alterations of the native terrestrial environment. Non-native domestic dogs, cats, black rats, Norway rats, Polynesian rats, house mice, pigs, and chickens are the primary terrestrial animals that occur within the vicinity of the project site. Several trees were recorded along Route 1 in the vicinity of the project site, including coconut tree, hau, milo, and *Barringtonia asiatica*. Also, DMWR biologists report occasional observations of migratory birds, including wandering tattlers, sanderlings, ruddy turnstones, Pacific golden-plovers, and Pacific reef herons, which may be observed foraging along the shoreline.

Marine

The project area includes a broad reef flat that extends seaward of the shoreline for about .25 km and ranges in depths of 1-3 m. The reef flat supports a diverse community of marine plants and animals. The community members of Aua have recognized the unique qualities of this coral reef and have designated it as a marine protected area. The harvest of marine organisms (*e.g.*, reef fish, algae, invertebrates) is controlled by and limited to Aua community members. At 4 m deep, the reef gradually descends towards the harbor bottom. This area was comprised of mud and calcareous algae. At 10 m deep, the harbor bottom is primarily mud and supports a few macro-invertebrate species.

Benthic substrate data are presented in Table 1b and Appendix 1d-f. A total of 43 species of reef fishes (Tables 2 & 2d-f), 17 species of corals (Tables 3 & 3d-f), 28 species of other benthic macro-invertebrates (Tables 4 & 4d-f), and 8 species of marine plants (Tables 5 & 5d-f) were observed. Although green and hawksbill sea turtles are known to exist in Pago Pago Harbor, these species were not observed during the Aua site surveys. It is feasible that green and hawksbill sea turtles may use this coral reef for foraging and or resting.

The shallow reef substrate (1 m depth) primarily consisted of sand (9-29%), rock and rubble (1-29%), and mud (0-15%). A diverse marine community was comprised of seagrasses (0-32%), macro-algae (18-62%), sponges (3-25%), and corals (3-9%). Conspicuous reef fish species included cardinalfishes (*Cheilodipterus quinquelineatus*); snappers (*Lutjanus fulvus*, *L. fulviflamma,* and *L. gibbus*); goatfishes (*Parupeneus barberinus*, *P. bifasciatus*, *P. cyclostomus*, and *P. multifasciatus*); butterflyfishes (*Chaetodon auriga* and *C. ephippium*); damselfishes (*Chrysiptera brownriggii*, *Dascyllus aruanus,* and *Pomacentrus vaiuli*); wrasses (*Pseudocheilinus hexataenia*); parrotfishes (*Chlorurus sordidus*, *Scarus psittacus*, and *S. rubroviolaceus*); surgeonfishes (*Acanthurus nigrofuscus*, *A. triostegus, A. xanthopterus,* and *Ctenochaetus strigosus*); and gobies (*Amblygobius phalaena* and *A. sphinx*). Coral species recorded included *Monitopora grisea*, *M. hoffmeisteri*, *Montipora* sp, *Pavona frondifera*, *Cyphastrea serailia*, *Leptastrea purpurea*, *Pocillopora damicornis*, *P. danae*, and *P. verrucosa*, *Porites cylindrica*, *P. lobata*, and *P. lutea*. Observations of macro-invertebrate species consisted of sponges (*Tethya* sp,

Stylissa massa, *Axinnela* sp, *Dysidea* sp, and *Agelas* sp); an unidentified hydroid, zoanthids (*Discosoma* sp and *Zoanthus* sp); sea snails (*Cypraea annulus*, *Conus flavidus*, *C. pulicarius*, *Tellina sp*, and an unidentified vermetid snails); sea stars (*Linckia laevigata*); sea urchins (*Mespilia globulus*, *Diadema* sp, *Echinothrix diadema*, and *Echnimetra mathaei*); sea cucumbers (*Stichopus chloronotus* and *Opheodesoma* sp); and sea squirts (*Polycarpa* sp). Observations of marine plants included red algae (*Halymenia* sp and *Hydrolithon onkodes*), green algae (*Bryopsis pennata*, *Caulerpa racemosa*, *Halimeda opuntia,* and *Chlorodesmis fastigiata*) and seagrass (*Halophila ovalis*).

Mid-depth transects 2, 3 and 4 were conducted on the reef slope at a depth of 5 m. However, due to bathymetric limitations at the site, mid-depth transect 1 was conducted on the reef flat at 3 m depth. Near 3 m in depth, the reef substrate gradually descends towards the harbor bottom, which levels at about 7 m. The reef slope substrate was primarily comprised of mud (89-95%), sand (0-33%), and rubble (0-9%). The marine community consisted of macro-algae (5-29%), seagrass (0-17%), and corals (0-12%). Conspicuous reef fish species included squirrelfishes (*Neoniphon sammara*); cardinalfishes (*Cheilodipterus quinquelineatus*); goatfishes (*Parupeneus barberinus* and *P. cyclostomus*); butterflyfishes (*Chaetodon auriga*); damselfishes (*Abudefduf sexfasciatus*, *Chrysiptera cyanea*, *Pomacentrus coelestis*, and *P. vaiuli*); wrasses (*Pseudocheilinus hexataenia*); surgeonfishes (*Acanthurus nigroris*, *A. nigrofuscus*, *A. xanthopterus*, and *Ctenochaetus strigosus*); puffers (*Canthigaster solandri*); and gobies (*Amblygobius phalaena* and *A. sphynx*). Coral species observed at this site included *Montipora grisea*, *Pocillopora damicornis*, and *Porites lutea*. Observations of macro-invertebrate species consisted of sponges (*Tethya* sp, *Stylissa massa*, *Axinnela* sp, *Dysidea* sp and *Agelas* sp); an unidentified hydroid; zoanthids (*Zoanthus* sp); sea snails (*Cypraea moneta*, *Conus flavidus*, *C. lividus*, *C. pulicarius*, *Anadara* sp and unidentified vermetid snails); sea stars (*Linckia laevigata*); sea urchins (*Diadema* sp and *Echinothrix diadema*); holothurians (*Holothuria hilla* and *Stichopus chloronotus*); and sea squirts (*Polycarpa* sp). Marine plants recorded at this site included red algae (*Halymenia* sp and *Hydrolithon onkodes*), green algae (*Caulerpa serrulata*, *Halimeda opuntia*, and *Chlorodesmis fastigiata*), and seagrass (*Halophila ovalis*).

The harbor bottom (10 m depth) was mostly comprised of mud (100%), with the exception of one observation of a green alga (*Halimeda opuntia*). A single reef fish species, the snapper *Lutjanus fulvus*, was recorded. Corals were absent from this site. Macro-invertebrate species observed included a crustacean (*Synalpheus streptodactylus*) and sea cucumbers (*Holothuria hilla* and *Stichopus chloronotus*).

This expansive, intact fringing reef at Aua provides a variety of ecological functions (Table 7). Some of these functions include: excellent protection for the shoreline; possible forage and shelter habitat for protected sea turtles; suitable habitat for general marine species recruitment, foraging, resting, and shelter from predators; an abundance of juvenile reef fish and benthic organisms that are potential prey items for migratory birds; a range of age classes of corals suggest conditions to support coral replenishment activities are favorable; and a resource base that has the capacity to support various human activities, such as subsistence harvest/fishing, recreational activities, tourism, and cultural practices.

Existing Conditions at the Proposed Leloaloa Site

Terrestrial

The tuna canneries are located immediately west of the project site. A small peninsula to the east of the project site extends into the harbor. The development of residential communities in this area has resulted in significant alterations of the native terrestrial environment. Non-native domestic dogs, cats, black rats, Norway rats, Polynesian rats, house mice, pigs and chickens are the primary terrestrial animals that occur within the vicinity of the project site. Several trees were recorded along Route 1 in the vicinity of the project site, and these include coconut, hau, and milo. Also, DMWR biologists report occasional observations of migratory birds, including wandering tattlers, sanderlings, ruddy turnstones, Pacific golden-plovers and Pacific reef herons, which may be observed foraging along the shoreline.

Marine

The project area includes a modest reef flat that extends seaward of the shoreline for about 150 m and ranges in depth from 1-2 m. This area is considered a high-energy environment since oceanic swells roll through the harbor entrance unimpeded to the shoreline. The reef flat supports a diverse community of marine plants and animals. At a depth of 3 m, the fringing reef gradually descends toward the harbor bottom. This area is composed of a diverse community of corals, coralline algae, reef fishes, and macro-algae. At depth of 10 m, the fringing reef slopes steeply into the harbor and supports a similar assemblage of species.

Benthic substrate data are presented in Table 1c and Appendix 1g-i. A total of 60 species of reef fishes (Tables 2 & 2g-i), 28 species of corals (Tables 3 & 3g-i), 28 species of benthic macro-invertebrates (Tables 4 & 4g-i), and 12 species of marine plants (Tables 5 & 5g-i) were observed and recorded. Although federally listed green sea turtles and hawksbill sea turtles are known to exist in Pago Pago Harbor, these species were not observed during the Leloaloa site surveys. It is feasible that green sea turtles and hawksbill sea turtles may forage or seek shelter at Leloaloa.

The shallow reef benthic substrate at a depth of 1 m consisted of rock and rubble (8-68%), consolidated calcareous pavement (8-34%), and sand (1-17%). A diverse marine benthic community was comprised of coralline algae (7-40%), macro-algae (8-29%), coral (1-5%), and sponges (1%). Reef fish species observed included cardinalfishes (*Apogon novemfasciatus*); snappers (*Lutjanus fulvus*); butterflyfishes (*Chaetodon citrinellus* and *C. vagabundus*); damselfishes (*Abudefduf sexfasciatus*, *Chrysiptera brownrigii*, and *Pomacentrus vaiuli*); surgeonfishes (*Acanthurus nigrofuscus*, *A. triostegus*, *Ctenochaetus strigosus*, and *Zebrasoma flavescens*); puffers (*Canthigaster solandri*); and gobies (*Amblygobius phalaena*). Coral species observed at this site included *Favia speciosa*, *Favia* sp, *Pocillopora damicornis*, *P. danae* and *P. verrucosa*, *Porites lobata*, *P. lutea* and *P. rus*. Observations of macro-invertebrates included: sponges (*Agelas* sp and *Dysidea* sp); marine worms (*Spirobranchus giganteus*); molluscs (*Conus lividus*, *C. ebraeus*, *Strombus* sp, *Elysia ornata*, and *Pedum spondyloideum*); urchins (*Echinothrix diadema* and *Echinostrephus* sp); sea cucumbers (*Holothuria atra*); and a sea squirt (*Didemnum molle*). Marine plants observed at this location included red algae (*Hydrolithon onkodes* and *Peyssonnelia boergesenii*), green algae (*Bryopsis pennata*, *Caulerpa racemosa*, *C. taxifolia*, *Chlorodesmis fastigiata*, *Halimeda opuntia*, and *H. minima*), and an unidentified turf alga.

Mid-depth surveys were conducted at a depth of 5 m. Between 3-5 m, the reef descends gradually into the lagoon and is primarily comprised of rubble (19-47%) and sand (1-11%). A diverse

marine benthic community was present, consisting of corals (16-39%), coralline algae (8-34%), macro-algae (3-9%), and sponges (1-4%). Reef fish species included squirrelfishes (*Myripristis murdjan* and *Neoniphon sammara*); fusiliers (*Caesio teres*); snappers (*Lutjanus fulvus*); goatfishes (*Parupeneus cyclostomus* and *P. bifasciatus*); butterflyfishes (*Chaetodon auriga, C. ephippium, C. vagabundus, Heniochus chrysotomus, H. monoceros,* and *H. varius*); damselfishes (*Chromis margaritifer, Chrysiptera cyanea, Plectroglyphidodon lacrymatus,* and *Pomacentrus vaiuli*); wrasses (*Labroides dimidiatus* and *Pseudocheilinus hexataenia*); surgeonfishes (*Acanthurus nigrofuscus, Zebrasoma scopas,* and *Z. veliferum*); and moorish idols (*Zanclus cornutus*). Coral species observed at this site included: *Montipora* sp 1 (encrusting juv.), *Monitpora* sp 2, *Acropora austera, A. cytherea, A. digitifera, A. granulosa, A. humilis, A. hyacinthus, Goniastrea retiformis, Leptastrea purpurea, Platygyra daedalea, Fungia fungites, F. repanda, F. scutaria, Pocillopora damicornis, P. danae, P. verrucosa, Porites lobata, P. lutea,* and *P. rus*. Observations of macro-invertebrates included: sponges (*Tethya* sp, *Stylissa flabelliformis, S. massa, Theonella* sp, *Dysidea* sp, *Craniella abracadabra,* and *Paratetilla bacca*); zoanthids (*Palythoa tuberculosa*); sea snails (*Strombus* sp); sea stars (*Fromia monilis*); urchins (*Echinothrix diadema*); and sea squirts (*Didemnum molle* and *Diplosoma* sp). Marine plants observed at this location include red algae (*Mesophyllum* sp, *Halymenia durvillei, Hydrolithon onkodes,* and *Peyssonnelia boergesenii*), a brown alga (*Dictyota repens*), green algae (*Bryopsis pennata* and *Chlorodesmis fastigiata*), and a blue-green alga (*Lyngbya* sp).

Deep surveys were conducted at a depth of 10 m. The benthic substrate was comprised of rock and rubble (25-58%), sand (19-24%) and pavement (1%). The marine benthic community was comprised of coralline algae (16-39%), coral (1-22%), sponges (7-10%), and macro-algae (0-8%). Reef fish species observed included squirrelfishes (*Myripristis murdjan*); snappers (*Lutjanus fulvus*); emperors (*Monotaxis grandoculis*); goatfishes (*Parupeneus cyclostomus, P. multifasciatus* and *P. bifasciatus*); damselfishes (*Chromis margaritifer, Chrysiptera cyanea, Plectroglyphidodon lacrymatus, Pomacentrus vaiuli, Stegastes fasciolatus,* and *S. nigricans*); wrasses (*Labroides dimidiatus*); dartfishes (*Ptereleotris evides*); surgeonfishes (*Acanthurus nigrofuscus, Zebrasoma scopas,* and *Z. veliferum*); and puffers (*Canthigaster solandri*). Coral species observed at this site included: *Montipora* sp, *Acropora austera, A. cytherea, A. digitifera, A. gemmifera, A. granulosa, A. humilis, A. hyacinthus, A. insignis, Goniastrea retiformis, Leptastrea purpurea, Platygyra daedalea, Fungia fungites, F. repanda, F. scutaria, Pocillopora damicornis, P. danae, P. verrucosa, Porites lobata, P. lutea,* and *P. rus*. Observations of macro-invertebrates included: sponges (*Tethya* sp, *Stylissa flabelliformis, Stylotella* sp, *Callyspongia* sp, *Craniella abracadabra,* and *Paratetilla bacca*); hydroids (*Halicordyle disticha*); corallimorpharians (*Discosoma* sp); crustaceans (*Panulirus versicolor*); urchins (*Echinothrix diadema*); and sea squirts (*Didemnum molle* and *Diplosoma* sp). Marine plants observed at this location included a green alga (*Chlorodesmis fastigiata*), red algae (*Mesophyllum* sp, *Halymenia durvillei, Hydrolithon onkodes,* and *Peyssonnelia boergesenii*) and a blue-green alga (*Lyngbya* sp.).

The Leloaloa coral reef supports many ecological functions (Table 7). These functions include: significant shoreline protection from large waves and oceanic swells; forage habitat for protected sea turtles; shelter habitat for protected sea turtles; habitat for general marine species recruitment, foraging, resting, and shelter from predators; reef fish prey for migratory birds; a significant source of coral and coralline algae recruits for potential re-colonization of inner Pago Pago Harbor; and opportunities for human activities such as subsistence harvest/fishing, recreation, tourism, and cultural practices.

Existing Conditions at the Proposed Power Plant at Anua Site

Terrestrial

An alternative location to construct the commercial harbor is the area fronting the Power Plant at Anua village. The northern shoreline is highly modified with revetment structures to support Route 1 and the Power Plant installation. The Ronald Reagan Shipyard and tuna canneries are located to the east and a small residential community exists to the west of this site. Non-native domestic dogs, cats, black rats, Norway rats, Polynesian rats, house mice, pigs and chickens are the primary terrestrial animals that occur within the vicinity of this proposed project site. Also, DMWR biologists report occasional observations of migratory birds, including wandering tattlers, sanderlings, ruddy turnstones, Pacific golden-plovers and Pacific reef herons, which may be observed foraging along the shoreline. No trees were recorded along Route 1 in the vicinity of this project site.

Marine

The narrow reef flat at this site, about 3-5 m wide and 1-2 m deep, was not surveyed. At a depth of 3 m, the reef drops abruptly into the harbor. At 5 m deep, the reef slope is composed of rubble, sand, and mud and supports few marine organisms. At 10 m deep, the reef slope is similar in composition and supports few marine organisms. The tidal exchange in this area is slightly greater than the Anua site, but water residence time remains significantly longer compared to other well-flushed areas of the harbor. One sailboat was moored within the footprint of the proposed project at this site during the survey.

Benthic substrate data are presented in Table 1d and Appendix 1j-k. A total of 13 species of reef fishes (Tables 2 & 2j-k), 1 species of coral (Tables 3& 3j-k), 4 species of benthic macro-invertebrates (Tables 4 & 4j-k), and 2 species of marine plants (Tables 5 & 5j-k) were observed and recorded. Although federally listed green sea turtles and hawksbill sea turtles are known to exist in Pago Pago Harbor, these species were not observed during surveys of this location. It is feasible that green and hawksbill sea turtles may forage and seek shelter at this site.

Mid-depth surveys were conducted at a depth of about 5 m. Between three to five m deep, the reef descends gradually into the lagoon and is primarily comprised of rubble (50-66%), mud (28-41%) and sand (4-6%). A degraded marine benthic community supported just a few coral colonies (0-1%) and some sponges (0-4%). Reef fish species observed at this site include snappers (*Lutjanus fulvus*); butterflyfishes (*Chaetodon vagabundus* and *Heniochus monoceros*); damselfishes (*Pomacentrus vaiuli*); surgeonfishes (*Acanthurus nigrofuscus*); and moorish idols (*Zanclus cornutus*). A single coral species, *Porites lobata*, was observed at this site. Observations of macro-invertebrates at this site included two species of sponges (*Axinyssa* sp and *Chelonaplysilla* sp). Observations of marine plants included a green alga (*Halimeda opuntia*) and a brown alga (*Dictyota bartayresii*).

Deep surveys were conducted at a depth of about 10 m. The benthic substrate was comprised of rock and rubble (80-88%), mud (12-15%), and sand (0-3%). A degraded marine benthic community supported few coral colonies (0-2%). Reef fish species recorded at this site include snappers (*Lutjanus fulvus*); and butterflyfishes (*Chaetodon vagabundus*). A single coral species, *Porites lobata*, was observed at this site. Observations of macro-invertebrates at this site included: sponges (*Tethya* sp, *Axinyssa* sp, and *Chelonaplysilla* sp); and crustaceans (*Stenopus hispidus* and *Panulirus versicolor*). Marine plants were not observed at this site.

Ecological functions provided by the fringing coral reef community at the Power Plant site are indentified in Table 7. The most important functions include: modest shoreline protection; foraging habitat for protected sea turtles; and reef fish prey for migratory birds.

Future Without the Project

Pago Pago Harbor is a critically important receiving site for consumer goods and fuel to support the territory's burgeoning population. The existing commercial dock located on the southern side of inner Pago Pago Harbor services container ships and an occasional cruise line vessel and it is a regular docking facility for various sizes of fishing vessels. Also, inner Pago Pago Harbor supports two large tuna canneries, Samoa Packing and Star-Kist Samoa, Inc. The canneries are located on the northern shore across the harbor from the existing commercial dock. Fishing vessels (*e.g.*, 300-foot purse seine vessels and smaller sized vessels) enter Pago Pago Harbor and unload their catch at the tuna cannery. Fishing vessels are unloaded one at a time and must wait for available space to offload their catch and must either tie-up at the existing commercial dock or anchor in the harbor. Due to its current multi-function role, the existing commercial dock is chronically congested with vessel-related activity. This situation results in additional economic burdens and operational inefficiencies. Furthermore, the vessels operating within this area are at a greater risk of colliding with one another or grounding on the reef, which may result in a release of petroleum products within the harbor or physical impacts to coral reef communities. Therefore, a second commercial dock is proposed for construction. A second commercial dock site would alleviate fishing vessel congestion at the primary commercial dock and reduce the probability of accidents and impacts to trust resources (*e.g.*, migratory birds, coral reef communities, sea turtles) that occur within the harbor.

Without the project, overuse of the existing commercial dock may contribute to increased vessel traffic congestion, and create an environment where the risk of vessel collision or groundings may increase. Vessel collisions or groundings may result in the release of petroleum products into the harbor, posing a significant threat to trust resources. The residence time for released petroleum products within inner Pago Pago Harbor is longer than at other better-flushed areas, and this can contribute to significant negative affects to trust resources.

DESCRIPTION OF ALTERNATIVES EVALUATED

In January 2003, the Corps released information that narrowed site selections for this proposed project from four possible locations (Anua, Leloaloa, Aua, and Onesosopo) to two locations (Anua and Aua). This revision was based on wave analyses conducted in the harbor and on project planning costs. As a result, the Leloaloa and Onesosopo sites were removed from consideration by the Corps. After this step, the Corps identified Aua as the preferred alternative to construct the proposed commercial dock.

The Service conducted field investigations at the Anua and Aua sites in February 2003. During the course of this investigation, the Service learned that the municipal community of Aua had set aside the coral reef area fronting the village as a marine protected area. The Aua marine protected area is designed to preserve marine organisms and habitat for limited harvest and recreation by community members. The Corps had originally identified Aua as the preferred site to construct the proposed commercial harbor. Based on this information, the Corps has since revised the

preferred location for this project to the Anua site, thereby avoiding project-related impacts to coral reef resources at Aua.

In August, 2003, the Corps contacted the Service and requested that an investigation, similar to previous surveys at Anua and Aua, be conducted at the formerly proposed site of Leloaloa. In September, 2003, the Corps asked the Service to evaluate the area fronting the Power Plant at Anua to determine whether conditions are similar to the original Anua alternative, and consider the site as another alternative location to construct the proposed commercial dock.

Alternative 1, Anua Site (Preferred)
This project site is located within the northwestern area of inner Pago Pago Harbor and is bounded by Route 1 to the north, by the Ronald Reagan Shipyard and tuna canneries to the east, and by Anua village to the west. The project site is located within inner Pago Pago Harbor. The Anua harbor would consist of: (a) an entrance channel (78 m wide, 30 m long, and 8 m deep at Mean Low Water [MLW]); (b) a turning basin of about 27,923 square meters at a depth of 8 m at MLW; (c) a dock about 200 m in length; and (d) a berthing area with a width of 23 m and a length of about 200 m. Approximately, 20,921cubic meters (m^3) of sediment would be dredged from the harbor.

Alternative 2, Aua Site
This alternative project site is located within the northeastern portion of Pago Pago Harbor and is bounded by Route 1 and Aua village to the north, east, and south, and Lepua village to the northwest. The main body of Pago Pago Harbor is located due west of the proposed project site. The Aua harbor would consist of: (a) an entrance channel (78 m wide, 30 m long, and 8 m deep at MLW; (b) a turning basin of about 27,923 square meters at a depth of 8 m at MLW; (c) a dock about 200 m in length; and (d) a berthing area with a width of 23 m and a length of about 200 m. Approximately 175,826 m^3 of sediments would be dredged from the harbor.

Alternative 3, Leloaloa Site
This alternative project site is located within the north central portion of Pago Pago Harbor and is bounded by Route 1 and Leloaloa village to the north, tuna canneries to the east, a small peninsula to the west and the main harbor to the south. The Leloaloa harbor would consist of: (a) an entrance channel (78 m wide, 30 m long, and 8 m deep at MLW); (b) a turning basin of about 27,923 square meters at a depth of 8 m at MLW; (c) a dock about 200 m in length; and (d) a berthing area with a width of 23 m and a length of about 200 m. Approximately 175,826 m^3 of sediments would be dredged from the harbor.

Alternative 4, Power Plant at Anua Site
The proposed power plant project site, also located within the northwestern area of inner Pago Pago Harbor, is about 500 m east of the proposed site at Anua. The power plant at Anua harbor would consist of: (a) an entrance channel (78 m wide, 30 m long, and 8 m deep at MLW); (b) a turning basin of about 27,923 square meters at a depth of 8 m at MLW; (c) a dock at about 200 m in length; (d) a berthing area with a width of 23 m and a length of about 200 m. Approximately 21,407 m^3 of sediments would be dredged from the harbor.

PROJECT IMPACTS

The proposed project involves the creation of an entrance channel (78 m wide, 30 m long, and 8 m at MLW); a turning basin (27,923 square meters, depth 8 m at MLW); a dock (200 m long by 30 m wide); and a berthing area (200 m long by 23 m wide). The proposed areal dimensions for these features include:

Proposed Project Feature	Estimated Area of Impact (m^2)
Entrance channel	2,340 m^2
Turning Basin	27, 923 m^2
Dock	6,000 m^2
Berthing Area	4,666 m^2
Approximate Total Area	41,000 m^2

The dimensions for the proposed project features are not site-dependent and will remain constant for each alternative described in this report. Therefore, approximately 41,000 m^2 (10.1 acres) of habitat will be directly impacted by project installation activities. However, there are additional habitat impacts anticipated to result from project dredging activities. The volume of dredged materials may vary at each site, depending upon final plans to orient the dock. Descriptions of anticipated site impacts are provided below.

General Impacts

Construction activities associated with the proposed project are not expected to cause significant adverse impacts to terrestrial biological resources. However, the Service is concerned that disposal of sediment from project-related dredging and future maintenance dredging may result in significant adverse impacts to trust resources. Since upland disposal sites have not been identified, the Service cannot evaluate the anticipated potential impacts (*e.g.*, via leachate or direct contact) to fish and wildlife resources that may occur at those upland sites from the disposal actions.

We are concerned that indirect project-related impacts may significantly affect fish and wildlife resources that occur within Pago Pago Harbor. Dredging associated with this project will mobilize sediment that could migrate and settle out on and smother corals. Coral polyps and larvae are particularly vulnerable to suspended sediment, which may lacerate polyps and larval tissue and result in lethal effects. Sediment excavated from the project site during construction and maintenance dredging may adversely affect fish and wildlife resources through ingestion or contact if the sediment is contaminated.

Other indirect impacts to fish and wildlife resources may include: introductions of alien species; vessel collisions or groundings; and releases of petroleum products. Discharged vessel ballast water is a primary pathway for the introduction of alien species into marine environments, such as harbors, that could displace indigenous coral reef organisms (Coles *et al.* 2003 and Godwin *et al.* 2004). Vessel collisions and groundings may result in the release of petroleum products that have acute and long term toxicity effects upon coral reef organisms (Ornitz 1996). Furthermore, the direct physical damage resulting from vessel groundings create opportunities for alien species to become established and possibly out-compete and alter the native coral reef community.

Alternative 1, Anua Site

About 20,921 m^3 of sediment may be dredged from this site due to creation of the turning basin. Therefore, the total amount of direct impact from construction and dredging-related activities includes the removal of approximately 20,921 m^3 of sediment within approximately 41,000 m^2 of substrate. It is anticipated that ecological functions, identified in Table 7, will be significantly degraded due to project-related activities.

The recovering coral reef community that occurs in the shallow marine environment is the primary habitat of concern at this site. The proposed dredging and construction activities would result in the direct loss of the coral-seagrass-algae community at Anua. Also, it is possible that federally listed green and hawksbill sea turtles may be directly affected by dredging activities.

Increased vessel traffic and operations within the confined area of inner Pago Pago Harbor may present an increased risk of vessel groundings or collisions and accidental release of petroleum products into the marine environment. The distance between the northern and southern shorelines is about 0.3 kilometers (300 m). Also, the existing depth of inner Pago Pago Harbor at Anua is quite shallow, ranging between 5 and 10 meters. Since the harbor basin would occupy most of the inner harbor, large vessels (*e.g.*, 300 + foot purse seine vessels) would be required to operate within the proposed harbor basin, exclusively, to avoid grounding in the shallows immediately outside the perimeter of the basin. Another factor that would contribute to vessel congestion and collision is the simultaneous operation of multiple vessels within the inner harbor, currently a common practice by fishing vessels to off-load their catch or take on supplies.

Because water circulation and exchange at Anua is very low, compared to other locations within Pago Pago Harbor, it is anticipated that the residence time for petroleum products would be significantly longer. Poor flushing would extend exposure time to petroleum products, and increase the likelihood that coral reef organisms could be sub-lethally or lethally affected and that intertidal and subtidal habitat would be degraded, in the event of a release. Furthermore, even small amounts of oil, accidentally released into the inner harbor, could result in significant impacts to coral reef organisms and habitat.

Finally, the recreational sailboat fleet that moors within inner Pago Pago Harbor (Appendix 5) would be displaced, resulting in random vessel anchorages at other locations or the construction of fixed moorings or docks to support the fleet. It is likely that the sailboat fleet would be moved to another location in the harbor and that coral reef resources at this new location would be affected through the direct physical impacts associated with the relocation.

Alternative 2, Aua Site

About 175,826 m^3 of sediments may be dredged from this site due to creation of the turning basin. Therefore, the total amount of direct impact from construction and dredging-related activities includes the removal of approximately 175,826 m^3 of sediments within approximately 41,000 m^2 of substrate. It is anticipated that ecological functions, identified in Table 7, will be significantly degraded due to project-related activities. Of significant concern to the Service is the potential loss of forage and shelter habitat for protected sea turtles; degradation of the expansive reef flat and coral community; and degradation of the Aua marine protected area established to conserve marine resources for the benefit of Aua residents.

A diverse community of coral, algae, seagrass, and sponge species occurs in the shallow marine environment and represents the habitat of major concern at this site. The proposed dredging and dock construction activities will result in the direct loss of this expansive and complex community. Federally listed green and hawksbill sea turtles may also be directly affected by dredging.

Vessel traffic operating at Aua will unavoidably raise the level of risk of vessel groundings or collisions and the associated release of petroleum products into the marine environment. Migratory birds and shoreline habitat, intertidal habitat and marine organisms (*e.g.*, seagrasses, corals, non-coral macro-invertebrates and algae), sea turtles, and subtidal habitat may be at risk of exposure in the event petroleum products are accidentally released into the marine environment. Also, fishing and other cultural gathering activities of marine organisms may be negatively impacted in the event of an oil spill.

Alternative 3, Leloaloa Site

About 175,848 m^3 of sediments may be dredged from this site due to creation of the harbor basin. Therefore, the total amount of direct impact from construction and dredging-related activities includes the removal of approximately 175,848 m^3 of sediments within approximately 41,000 m^2 of substrate. It is anticipated that ecological functions, identified in Table 7, will be significantly degraded due to project-related activities. Of significant concern to the Service is the loss of the fringing reef that provides significant shoreline protection; degradation of reef habitat for marine species recruitment, foraging, resting, and sheltering from predators; and the loss of significant sources of coral larvae that could contribute to coral re-colonization of inner Pago Pago Harbor.

The well-developed coral reef community that occurs in the shallow marine environment is the primary habitat of concern at this site. The proposed dredging and dock construction activities would result in the direct loss of an extensive coral community that is present throughout the aerial extent of the proposed project. Negative impacts to significant coral reef resources that occur within the vicinity of the proposed project are anticipated to occur from project construction-related activities (Pers. Comm., P. Craig 2003). It is feasible that federally listed green and hawksbill sea turtles may be directly affected by dredging activities.

Increased vessel traffic operating at Leloaloa would unavoidably raise the risk of vessel groundings or collisions and the associated release of petroleum products into the marine environment. Migratory birds and shoreline habitat, intertidal habitat and marine organisms (*e.g.*, seagrass, corals, non-coral macro-invertebrates and algae), sea turtles, and subtidal habitat may be at risk of exposure in the event petroleum products are accidentally released into the marine environment.

Alternative 4, Power Plant at Anua Site

About 21,407 cubic meters of sediments may be dredged from this site due to creation of the harbor basin. Therefore, the total amount of direct impact from construction and dredging-related activities includes the removal of approximately 21,407 m^3 of sediments within approximately 41,000 m^2 of substrate. It is anticipated that ecological functions, identified in Table 7, will be significantly degraded due to project-related activities. Of significant concern to the Service is the degradation of shoreline protection provided by the modest fringing reef; and the reduction of prey for migratory birds.

The fragile coral reef community at this site is the primary habitat of concern. The proposed dredging and dock construction activities would result in the destruction and/or displacement of marine organisms and habitat and preclude re-colonization of this area by corals. It is possible that federally listed green and hawksbill sea turtles will be directly affected by dredging activities.

Increased vessel traffic operating at this site will unavoidably raise the risk of vessel groundings or collisions and the associated release of petroleum products into the marine environment. At this site, the existing harbor depth is shallow, ranging between 5 and 20 meters in depth. Furthermore, the distance between the northern and southern shorelines is only about 0.45 km. These factors may contribute to vessel congestion within the harbor and lead to vessel collision or groundings. Water circulation and exchange is moderate within this portion of inner Pago Pago Harbor. Migratory birds and shoreline habitat, intertidal habitat, marine organisms, and sea turtles may be at risk of exposure in the event petroleum products are accidentally released into the marine environment. Also, a portion of the sailboat fleet that moors at inner Pago Pago Harbor would be displaced if the project was implemented at this location (Appendix 5).

In summary, we anticipate that coral reef resources and associated ecological functions would be lost or greatly diminished at each alternative site as a result of project-related construction activities. However, we expect that fewer coral reef resources and functions would be affected if the project were implemented at either of the Anua sites (alternatives 1 & 4). Therefore, in order to minimize impacts to significant coral reef resources and ecological functions, we believe that implementation of the proposed project at either Aua (Alternative 2) or Leloaloa (Alternative 3) would not be environmentally preferable (see Table 7).

FISH AND WILDLIFE SERVICE RECOMMENDATIONS

The Service shares jurisdiction with NMFS over federally listed threatened green sea turtles and endangered hawksbill sea turtles. The Service has lead jurisdiction over these species when they are on shore, and the NMFS has lead jurisdiction over these species when they are in the waters. Based on information from the American Samoa DMWR, sea turtles are not currently known to nest at any of the proposed project sites. Nevertheless, the Service is concerned that potential impacts to these species may occur during project construction activities. Therefore, the Service recommends that any NMFS recommendations for the protection and conservation of sea turtles in the waters of Pago Pago Harbor be made an integral part of the project.

The Service is concerned that the coral reef community at each of the proposed sites would be permanently lost and that certain ecological functions would be permanently degraded during construction activities. Recent Corps guidance (RGL 02-2) provides a structured compensatory mitigation process that is intended to produce mitigation actions that more accurately replace permanently lost coral reef resources from project-related impacts. The basic premise of compensatory mitigation in the Clean Water Act is that the resource functions and values lost from project-related impacts are replaced. A strategy to compensate for these losses includes: (1) Documentation of Anticipated Area of Impact; (2) Assessment of Resources Anticipated to be Impacted; (3) Correlation of Anticipated Impacts and Compensatory Mitigation; (4) Scientific Monitoring of Compensatory Mitigation; (5) Establishment of Performance Standards/Evaluation Criteria; and (6) Determination of the Effectiveness of Implemented Compensatory Mitigation (USFWS 2003). The first two components, "Documentation of Anticipated Area of Impact" and "Assessment of Resources Anticipated to be Impacted" have already been addressed in this report.

Components 3-6 will be addressed in the following discussion on recommended mitigation activities to compensate for the loss of habitat (approximately 10 acres) and associated ecological functions.

Based on a comparison of anticipated impacts at the proposed project sites, we conclude that the least environmentally damaging practicable alternative for the construction of the proposed commercial dock is Alternative 4, Power Plant at Anua. Although construction-related impacts at both Anua sites (alternatives 1 and 4) would be similar (Table 7), we believe future fishing vessel operations under Alternative 1 present a greater risk of vessel collision or grounding and release of petroleum products which may impact coral reef organisms more than they may under Alternative 4. We make this decision based on the consideration that the area between the proposed harbor basin and the nearshore environment provides a smaller 'margin of error' for vessels navigating into and out of the harbor basin under Alternative 1. The distance between northern and southern shores is about 300 m under Alternative 1, whereas the distance is slightly greater, about 450 m, under Alternative 4. We recommend that the measures to avoid and minimize impacts to fish and wildlife resources identified in this report be incorporated into the project plans.

We recommend that a post-construction assessment of the marine environment at the project site be conducted when the project is completed. The marine assessment should evaluate the coral reef community in the vicinity of the proposed project to ensure that the commercial dock installation-related impacts to the coral reef community did not exceed the level of impacts anticipated during the planning phase of this project. The marine assessment should be conducted as soon as possible after completion of project installation activities and prior to completion of compensatory mitigation activities. In addition, we recommend development of a compensatory mitigation plan to offset anticipated unavoidable impacts to fish and wildlife resources by the proposed project. We also recommend that all plans to avoid, minimize or compensate for project-related impacts be finalized prior to implementation of project construction activities.

COMPENSATORY MITIGATION

The Service is unaware of any single activity that may adequately compensate for the degradation and loss of coral reef ecological functions as a result of the proposed project. However, the combined effects of multiple mitigation activities implemented at appropriate scales may replace these losses. We recommend coordination of mitigation activities with the DMWR, American Samoa Petroleum Cooperative, U.S. Coast Guard, and us. More specifically, we recommend that the following features be incorporated into the compensatory mitigation plan.

Preferred Alternative 1, Anua Site

(1) **No-anchor zone and permanent moorings:** Designation of a no-anchor zone of at least 40,468 m^2 (about 4 hectares) and construction of permanent mooring anchorages within Pago Pago Harbor. A no-anchor zone may reduce direct and indirect impacts to coral communities. A permanent mooring site may reduce random anchoring by commercial fishing vessels (*e.g.*, purse seine) throughout the harbor that may result in direct destruction of coral colonies and degradation of benthic communities due to shading (*e.g.*, corals and other organisms rely on sunlight for nutrients). Both actions may afford opportunities for coral community recovery and benefit certain ecological functions.

(2) **Oil Spill Equipment:** Oil spill collection equipment (boom, sweeps, and skimmers) should be acquired and maintained at the newly constructed commercial dock. Recovery of petroleum products in a timely manner will help reduce negative impacts to organisms and functions.

(3) **Wildlife Response Team:** Establish a wildlife response team to collect, clean and rehabilitate wildlife (*e.g.*, federally listed sea turtles, protected migratory birds, coral reef ecosystems) during emergency situations. The team should consist of staff with at least one veterinarian or technician with sufficient expertise to manage wildlife care during emergency events, such as oil spills. Currently, there is no capacity in American Samoa to rehabilitate oiled wildlife.

(4) **Outreach:** Public education and signage (English/American Samoa/Korean/Chinese translations) should be directed at a target audience that includes fishing vessel operators and crew. Public education should direct the audience to refrain from pumping bilge water into the harbor, and instead dispose of bilge water in accordance with Territory of American Samoa Government regulations. Bilge water is a primary source of contamination and vector for the introduction of alien species.

Correlation Between Anticipated Impacts and Compensatory Mitigation

(1) **No-anchor zone and permanent moorings:** The Service believes that no-anchor zones and permanent mooring anchorages may restore some habitat in Pago Pago Harbor for functions that include sea turtle forage and shelter, marine species recruitment, foraging, resting and shelter from predators, improved forage habitat for migratory birds, and sources of coral reef replenishment. Random commercial fishing vessel anchoring throughout Pago Pago Harbor may be reduced, and this may result in fewer direct (*e.g.*, physical) and indirect (*e.g.*, shading) impacts to the benthic community. Shade produced by vessels limit sunlight for marine plants, including dinoflagellates known as zooxanthellae. Zooxanthellae occupy space in coral tissue and are known to serve as an important source of nutrients for corals. Corals, algae and coralline algae may benefit and re-colonize previously affected areas, thus, providing habitat to support the above referenced ecological functions.

We recommend setting aside habitat within Pago Pago Harbor, approximately 40,468 m^2 (4 hectares) in area, that is equivalent to or better in terms of ecological functions to be designated as no-anchoring for vessels of any kind to compensate for project impacts. Four hectares is the approximate aerial extent of habitat anticipated to be lost due to project construction-related activities. A reduction of direct and indirect impacts associated with anchoring may result in re-colonization of this habitat by coral reef organisms. It is anticipated that a no-anchor zone would likely protect only subtidal habitat. However, both fringing reef and sub-tidal habitats would be degraded by the proposed dock construction project. Therefore, the establishment of a no-anchor zone alone would not completely compensate for all project-related impacts. The installation of ten permanent mooring anchorages may result in the consolidation of commercial fishing vessels within approximately 8,580 m^2 (.9 hectare). The total area of impact of a single purse seine vessel is about 898 m^2. Purse seine vessel anchors are about 20 m^2 in area and each vessel usually deploys 2 anchors (bow and stern), for a total of 40 m^2 of direct impact per vessel. Purse seine vessel dimensions are about 66 m by 13 m, which translates into a potential shading impact of 858 m^2, per anchorage. If fishing vessels were grouped within this area, impacts to subtidal habitat that would otherwise be subject to potential random anchoring would be reduced. We recommend marine surveys be conducted

to locate the no-anchor zone and permanent mooring anchorage site to avoid impacts to coral reef resources. Furthermore, we recommend that surveys to site the permanent mooring anchorages be coordinated with DMWR and us.

(2) **Oil Spill Equipment:** In the event of a significant oil spill, coral communities would likely be degraded and ecological functions would be at risk. Given the likelihood of a significant oil spill event in the harbor, it is essential that agencies provide an adequate and timely response to recover petroleum products. Timely responses and product recovery will translate into protection for species and habitat supporting a variety of ecological functions that include: sea turtle foraging; habitat for marine species recruitment, foraging, resting and sheltering from predators; improved forage habitat for migratory birds; and improved opportunities for coral reef replenishment.

Under embayed conditions, one gallon of petroleum product spilled in a harbor may cover an estimated area of 84 m^2 (Pers. Comm., U.S. Coast Guard [USCG], Marine Safety Office, Honolulu, 2003). The amount of fuel maintained on an average size purse seine vessel is about 130,000 gallons (Pers.Comm., C. King 2003). According to USCG officials, the logistics of responding to a vessel grounding in the harbor is less complicated than elsewhere (*e.g.*, exposed fringing reef), and it is reasonable to assume that only a portion (*e.g.*, possibly 30,000 gallons) of the vessel fuel may be released. If 30,000 gallons (approximately 23% of full capacity) of fuel oil were released into the harbor, we can estimate that upwards of 2,520,000 m^2 of harbor surface waters and fish and wildlife resources could be at risk of exposure. The immediate recovery of petroleum products would lessen the potential degradation of water quality and fish and wildlife resources for 2,520,000 m^2 of harbor area. Therefore, sufficient equipment should be acquired, maintained and exercised to recover an equivalent of 30,000 gallons of petroleum product in the event a release of this magnitude occurs in Pago Pago Harbor.

(3) **Wildlife Response Team:** Should an oil spill or other hazardous materials spill occur in the harbor, there is currently no rapid response team to collect, clean and rehabilitate wildlife in American Samoa. Immediate and adequate care for injured organisms greatly benefits their chances for survival. Therefore, we recommend that to offset potential adverse impacts to wildlife, the project description should include establishment of a wildlife response team. It is likely that migratory birds and sea turtles will be the primary beneficiary of this activity.

(4) **Outreach:** Public education and signage is needed to address the need to control and reduce bilge water inputs into Pago Pago Harbor. Fewer bilge water inputs may promote expansion of coral reef communities that support sea turtle forage activities, coral reef replenishment activities, and habitat for general marine species recruitment, foraging, nesting, and sheltering from predators.

Scientific Monitoring of Compensatory Mitigation

The Service recommends that valid scientific methods be used to monitor compensatory mitigation actions. Data from before and after resource surveys should indicate that a balanced community of indigenous coral reef species has been maintained and that it is reasonable to conclude that the area continues to be able to support existing ecological functions.

(1) **No-anchor zone and permanent moorings:** (a) An area in the harbor equivalent to 10 acres should be set aside as a no-anchor zone and evaluated over time for re-colonization by coral reef organisms. We recommend marine surveys be conducted to collect baseline information in the no-anchor zone, and at other similar sites for comparison over time and to evaluate changing conditions. We recommend assessments be conducted within one week of designation of the no-anchor zone (baseline), and at 1 year intervals for up to five years from implementation of the no-anchor zone. (b) An evaluation of the coral reef habitat at the permanent mooring anchorages should be conducted prior to installation of 10 permanent mooring anchorages for purse seine class vessels. Information from this assessment should be used to avoid setting moorings in a manner that may degrade coral reef habitat (*e.g.*, direct impacts and shading).

(2) **Oil Spill Equipment:** Oil spill response exercises should be conducted and evaluated on an annual basis and equipment inspected intermittently to determine response capability of the government to react to a large spill. In the event of an actual spill, measurements of habitat negatively affected by the spill should be acquired.

(3) **Wildlife Response Team:** The Wildlife Response Team should be evaluated on an annual basis to determine their ability to respond to a large spill. Also, in the event of an actual spill, measurements of species handled for rehabilitation purposes should be reported to DMWR and the Service.

(4) **Outreach:** Public education concerning bilge water dumping should be measured in an attempt to quantify the number of vessel operators and crew educated as part of this awareness campaign. Measurement activities, such as before and after surveys (conducted in English, American Samoan, Korean, and Chinese languages) should ascertain and report whether the public education campaign had a positive affect on influencing vessel operators and crew to reduce discarding bilge water into the harbor.

Performance Standards/Evaluation Criteria for Compensatory Mitigation

(1) **No-anchor zone and permanent moorings:** Recovery of this area will be considered successful if the no-anchor zone substrate meets or exceeds baseline conditions for substrate composition (*e.g*, see report for substrate types) and biotic composition, as compared to conditions at similar sites within the harbor. Also, the mooring project will be considered successful if 10 permanent moorings, capable of supporting purse seine class size vessels (*e.g*, 300 foot), are successfully constructed and fully functional and occupied by vessels within 1 month from the completion of the Tutuila Harbor commercial dock construction-related activities.

(2) **Oil Spill Equipment:** Success will be contingent upon the acquisition of sufficient oil spill equipment to respond to a potential release of 30,000 gallons of fuel within 1 month from the completion of project construction-related activities; and that the equipment is exercised annually in preparation for actual oil spill events.

(3) **Wildlife Response Team:** Success will be determined if the Wildlife Response Team is assembled within 1 month from the completion of project construction-related activities, under the leadership of one qualified veterinarian or veterinarian technician, and the team exercises emergency response skills on an annual basis.

(4) **Outreach:** The campaign will be considered a success if: (1) at least 100 vessel operators and crew participate in and demonstrate proficiency in disposing of bilge water according to American Samoa Government guidelines (refer to ASEPA guidelines for disposing of bilge water); and (2) at least 20 signs are posted around the existing commercial dock, tuna canneries and new commercial dock, warning the public from dumping bilge water into the harbor, within one month of completion of project construction activities. Also, these signs will be posted in several languages, including English, American Samoan, Korean, and Chinese. Finally, the public education campaign should be carried out to completion and reported to DMWR and us within 2 years from the completion of project construction activities.

Effectiveness of Implemented Compensatory Mitigation

The Service believes that anticipated project-related impacts to coral reef organisms, habitat and ecological functions from implementation of Alternative 1 will be adequately compensated if: (1) recommended mitigation activities (1, 2, 3 and 4) are successfully implemented; and (2) the performance standards are successfully met within one month from the time the commercial dock is constructed, with the exception of the outreach education campaign that should be completed and reported within 2 years.

Alternative 4, Power Plant at Anua Site:

The Service believes that this site is similar to the Anua site (Alternative 1) in terms of species and habitat composition and ecological functions. Therefore, the Service believes that recommended mitigation activities, previously discussed for Alternative 1, also be considered as measures to avoid, minimize and compensate for impacts to coral reef resources if Alternative 4 is selected. Also, proposed scientific monitoring, performance criteria and an evaluation of mitigation activity effectiveness should conform to recommended objectives previously discussed for Alternative 1.

Alternatives Not Evaluated for Compensatory Mitigation

Alternative 2, Aua Site:

The Service believes that the coral reef community that exists at Aua provides unique functions that benefit the greater Pago Pago Harbor coral reef ecosystem, including the human community at Aua (*e.g.*, Aua marine protected area). Therefore, the Service agrees with the Corps' decision to remove this site from consideration as a potential site to implement the proposed project.

Alternative 3, Leloaloa Site

The Service believes that the coral reef community that exists at Leloaloa provides unique functions (*e.g.*, significant shoreline protection) that benefit the Leloaloa community and the greater Pago Pago Harbor coral reef ecosystem. Therefore, the Service agrees with the Corps' decision to remove this site from consideration as a potential site to implement the proposed project.

AVOIDANCE AND MINIMIZATION OF IMPACTS

Sailboat Displacement: In addition to compensation for unavoidable impacts to coral reef resources, the Service recommends construction of additional slips at the Yacht Dock at Fagatogo or similar location to support 10 sailboats that will be displaced as a result of the proposed project. Use of the new slips should also protect against random mooring of the sailboats after they become displaced and should reduce the overall impact of the project on coral reef resources in the harbor. Also, the Service recommends that an evaluation of the coral colonies in the vicinity of the additional yacht slips be conducted prior to construction to determine whether coral reef organisms or habitat will be negatively affected during these construction activities.

Aids to Navigation: The Service recommends that continuously lighted and high visibility navigational aids be installed and maintained to clearly delineate the entrance channel; turning basin and commercial dock to guide vessels as they approach and exit the dock. Also, navigational aids should be strategically placed throughout the approach to the dock to identify shallow areas that may pose an increased risk of grounding or collision to vessel traffic. Also, we recommend that an evaluation of coral reef habitat within the vicinity of the navigational aids be conducted prior to construction to determine whether coral reef habitat will be negatively affected during navigational aids placement-related activities. Information collected during this activity should be used to place navigation aids in a manner that would avoid or minimize impacts to live coral and coral reef habitat.

Best Management Practices: The Service recommends that the following measures to minimize the degradation of the coastal water quality and impacts to fish and wildlife resources and habitats be incorporated into the project:

a. No construction materials will be stockpiled in the marine environment.
b. Underlayer fills for the dock will be protected from erosion with core-loc units as soon after placement as practicable;
c. All construction-related materials will be placed or stored in ways to avoid or minimize disturbance to the reef;
d. All construction-related materials will be cleaned of pollutants prior to construction;
e. No contamination (trash or debris disposal, introduction of alien species etc) of the marine environment will result from construction activities;
f. A contingency plan to control accidental spills of petroleum products during construction will be developed and implemented prior to construction. Absorbent pads, containment booms and skimmers will be stored on-site to facilitate the clean-up of petroleum spills;
g. Turbidity and siltation from debris removal and placement of fills will be minimized and confined to the immediate vicinity of the removal and placement

through the use of effective silt containment devices and the curtailment of debris removal and filling during adverse sea conditions or severe weather;

h. No debris extracted from harbor sediments will be stockpiled in the marine environment;

i. All debris removed from the harbor will be disposed of at a site that is approved by the American Samoa Government and acceptable to NMFS, EPA and us; and

j. Project construction activities will occur during non-coral spawning periods. In American Samoa, the coral spawning season is approximately October through December (C. Mundy and A. Green 1999). Therefore, we recommend that project construction-related activities occur between January and September to avoid impacts to coral larvae and recruitment-related processes.

Harbor Sediment Risk Analysis: The Service recommends that a risk analysis be performed on the sediment that would be removed as part of the proposed project. Harbor sediment should be disposed of in accordance with appropriate ASEPA laws and regulations. If a Confined Disposal Facility (CDF) is constructed to manage contaminated harbor sediment, the CDF should be lined to prevent leachate from entering soils and ground water. Also, the CDF should be netted to prevent migratory bird exposure to contaminated sediment through dermal contact with accumulated water and sediment or ingestion of water or invertebrates that may be contained within the sediment. We recommend that the Corps provide the results of the analyses to ASEPA, DMWR, ASCMP, NMFS, EPA, and us prior to construction for discussion and further development of additional mitigation requirements, if warranted.

SUMMARY AND FISH AND WILDLIFE SERVICE POSITION

The fringing coral reef within Pago Pago Harbor has been identified as the habitat of major concern for the proposed project because of its contribution to support coral reef organisms (*e.g.*, reef fish, coral, macroinvertebrates, algae and sea turtles). The institutional significance of U.S. coral reefs has been established through their designation as Special Aquatic Sites [40 CFR Part 230 §230.44/FR v.45n.249] and as a Federal Trust Resource [Executive Order 13089 on Coral Reef Protection]. To various degrees, the fringing coral reefs throughout Pago Pago Harbor provide habitat that promote specialized ecological functions that include species recruitment, foraging, nesting, and sheltering from predators and habitat for the federally listed green and hawksbill sea turtles. Fringing coral reefs provide other ecological functions that include shoreline protection from oceanic swells and storm events; significant contributions of larvae/juveniles to promote species replenishment; maintenance of prey items for federally protected migratory birds; and provision of a resource base to support human activities such as subsistence harvest/fishing, recreational activities, tourism and cultural practices.

The Service is concerned that the fringing coral reef community at one of the identified alternative sites will be negatively impacted due to implementation of the proposed project. Recent Corps guidance (RGL 02-2) provides a structured process to ensure that adequate compensatory mitigation will offset project-related impacts to coral reef resources. The Service recommends that the project proponent develop a compensatory mitigation plan that addresses potential impacts to ecological functions identified in this report. To assist in the development of this plan, the Service has provided a list of activities that could be implemented to minimize and compensate for lost ecological functions as a result of the proposed project.

From a resource conservation perspective, the least environmentally damaging practicable alternative for the construction of the proposed commercial dock is Alternative 4, Power Plant at Anua. However, we believe that construction-related impacts at the Anua site (Alternative 1) would essentially be similar. Therefore, we support the Corps' preference to site the commercial dock at Anua (Alternative 1), provided that our recommendations to avoid, minimize and compensate for impacts to fish and wildlife resources are incorporated into and made part of the project. Any requested changes to the proposed project plan or these recommendations will require additional coordination with the Service.

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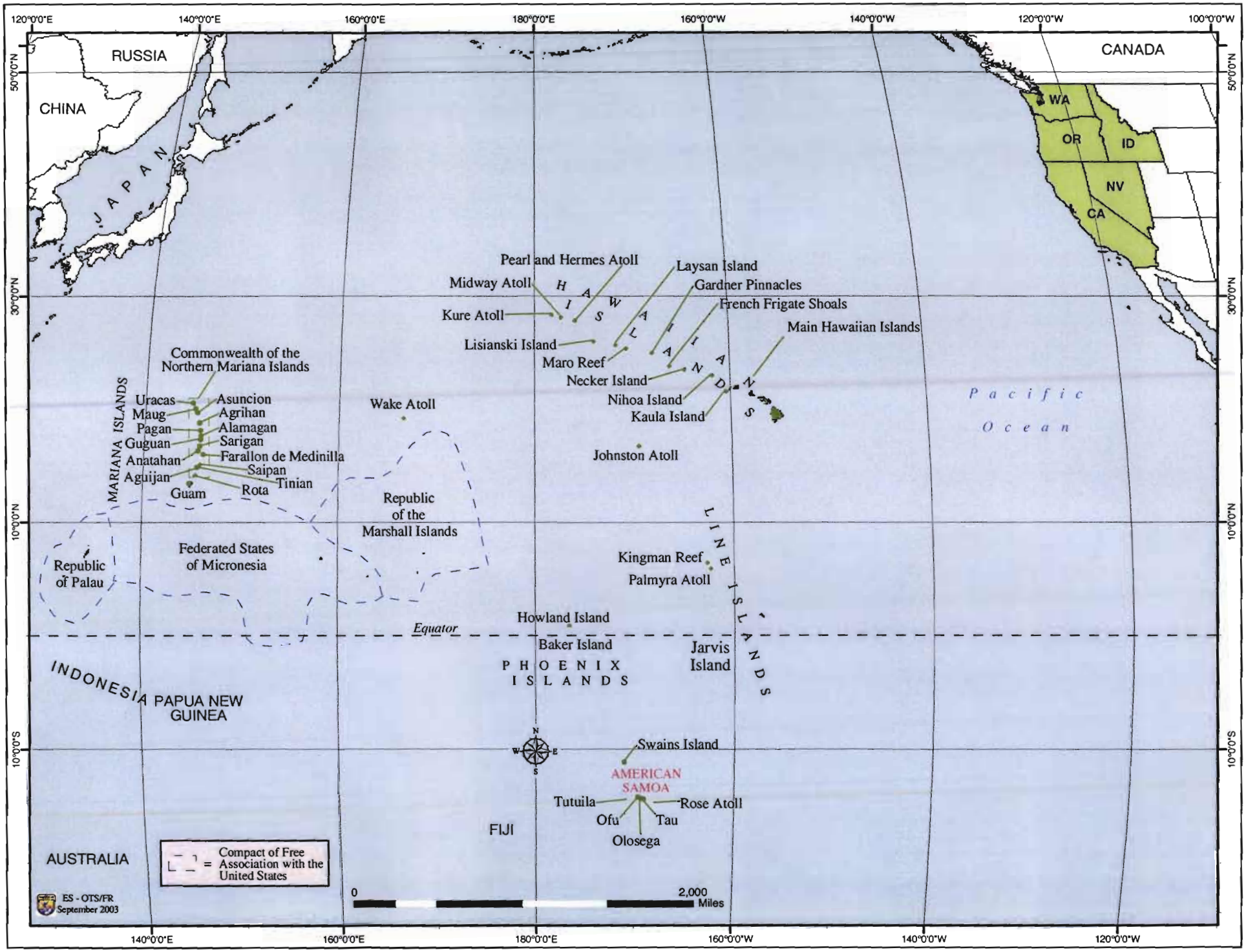


Figure 1. Territory of American Samoa in relation to other U.S. Pacific Islands

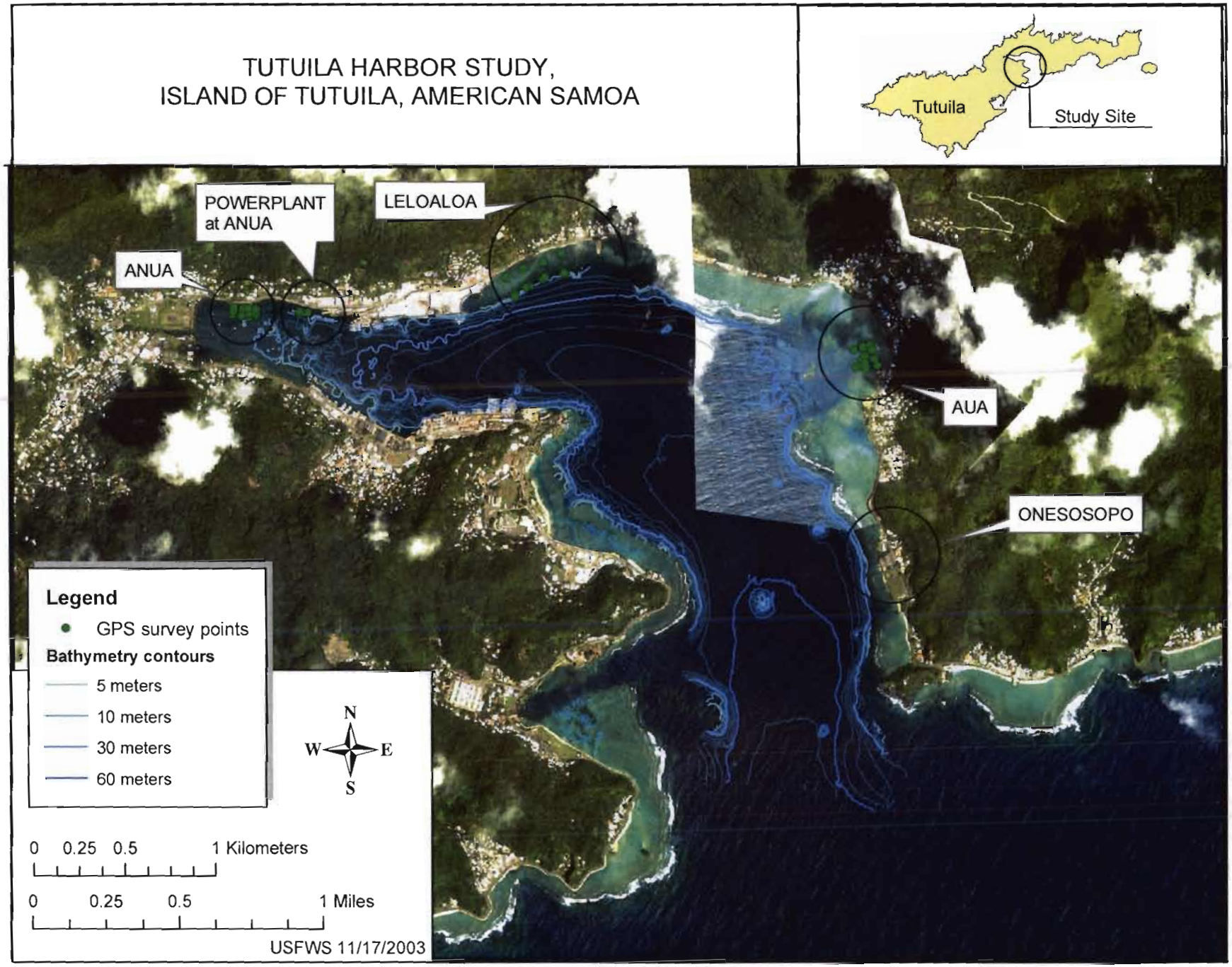


Figure 2. Pago Pago Harbor, Island of Tutuila, American Samoa

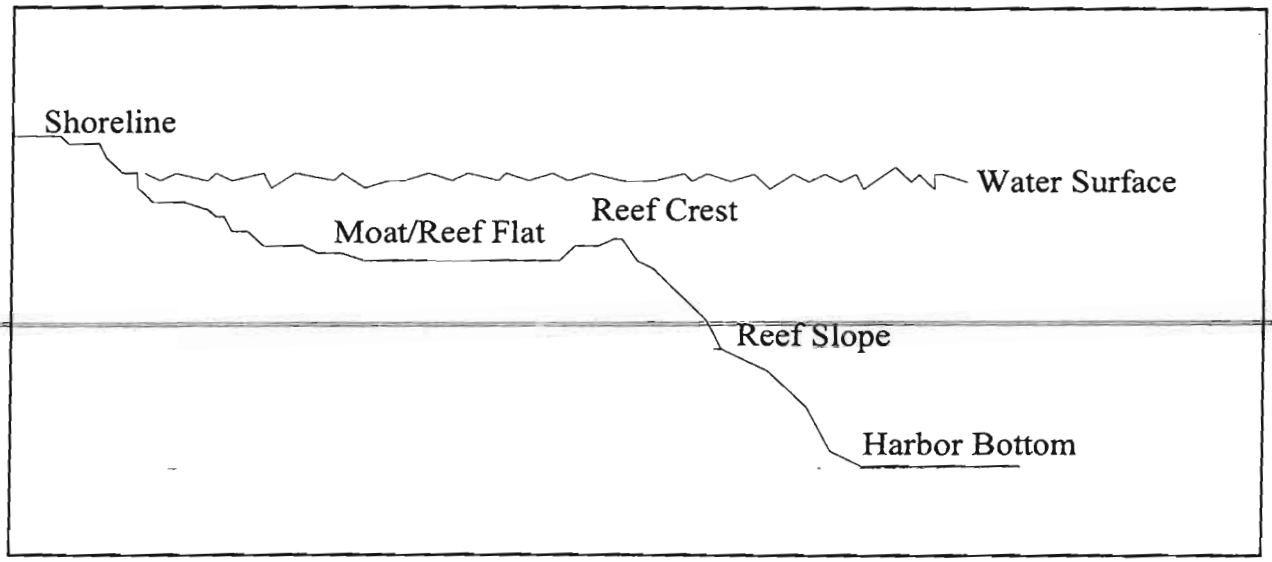


Figure 3. Stylized Fringing Coral Reef Habitat Profile, Pago Pago Harbor, American Samoa

Table 1a. Summary of substrate analyses conducted on twelve transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. Data represent percent cover.

TRANSECT	SUBSTRATE TYPE									
	Coral	Coralline Algae	Macro Algae	Sea Grass	Rock & Rubble	Pavement	Sponge	Mud	Sand	Total
S1	0	0	0	36	23	0	0	0	41	100
S2	2	0	5	8	41	0	0	0	44	100
S3	0	0	0	13	41	0	0	0	46	100
S4	0	0	2	54	1	0	0	0	43	100
M1	0	0	0	0	53	0	0	0	47	100
M2	0	0	0	0	87	0	0	8	5	100
M3	0	0	0	0	74	0	0	26	0	100
M4	0	1	2	0	77	0	0	13	7	100
D1	0	0	0	0	0	0	0	100	0	100
D2	0	0	0	0	0	0	0	100	0	100
D3	0	0	0	0	0	0	0	100	0	100
D4	0	0	0	0	0	0	0	100	0	100

Table 1b. Summary of substrate analyses conducted on twelve transects fronting Aua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. Data represent percent cover.

TRANSECT	SUBSTRATE TYPE									
	Coral	Coralline Algae	Macro Algae	Sea Grass	Rock & Rubble	Pavement	Sponge	Mud	Sand	Total
S1	9	0	22	32	8	0	0	0	29	100
S2	7	0	62	0	15	0	3	0	13	100
S3	9	0	61	0	1	0	10	0	19	100
S4	3	0	18	0	29	1	25	15	9	100
M1	12	0	29	17	9	0	0	0	33	100
M2	0	0	11	0	0	0	0	89	0	100
M3	0	0	8	0	0	0	0	92	0	100
M4	0	0	5	0	0	0	0	95	0	100
D1	0	0	0	0	0	0	0	100	0	100
D2	0	0	0	0	0	0	0	100	0	100
D3	0	0	0	0	0	0	0	100	0	100
D4	0	0	0	0	0	0	0	100	0	100

Table 1c. Summary of substrate analyses conducted on twelve transects fronting Leloaloa, Pago Pago Harbor, American Samoa, on October 15 and 16, 2003. Data represent percent cover.

TRANSECT	SUBSTRATE TYPE									
	Coral	Coralline Algae	Macro Algae	Sea Grass	Rock & Rubble	Pavement	Sponge	Mud	Sand	Total
S1	1	22	8	0	68	0	0	0	1	100
S2	1	40	28	0	18	0	0	0	13	100
S3	5	7	29	0	8	34	0	0	17	100
S4	0	21	19	0	38	8	1	0	13	100
M1	16	34	9	0	41	0	0	0	0	100
M2	39	32	5	0	19	0	1	0	4	100
M3	24	28	3	0	44	0	0	0	1	100
M4	30	8	0	0	47	0	4	0	11	100
D1	1	39	8	0	45	0	7	0	0	100
D2	22	25	0	0	25	0	9	0	19	100
D3	9	38	8	0	34	1	10	0	0	100
D4	2	16	0	0	58	0	0	0	24	100

Table 1d. Summary of substrate analyses conducted on twelve transects fronting the Power Plant at Anua, Pago Pago Harbor, American Samoa, on October 15 and 16, 2003. Data represent percent cover.

TRANSECT	SUBSTRATE TYPE									
	Coral	Coralline Algae	Macro Algae	Sea Grass	Rock & Rubble	Pavement	Sponge	Mud	Sand	Total
M1	1	0	0	0	50	0	4	41	4	100
M2	0	0	0	0	66	0	0	28	6	100
D1	0	0	0	0	88	0	0	12	0	100
D2	2	0	0	0	80	0	0	15	3	100

Table 2. Total fish species observed at four survey sites within Pago Pago Harbor, American Samoa, on February 25-27 and October 15-16, 2003 (x = species presence).

FAMILY	SURVEY SITES			
Genus/species	ANUA	AUA	LELOALOA	POWER PLANT
MURAENIDAE (Moray eels)				
Gymnothorax javanicus			X	
HOLOCENTRIDAE (Squirrelfishes)				
Myripristis murdjan	X		X	
Neoniphon sammara	X	X	X	
Sargocentron spiniferum	X			
SYGNATHIDAE (Pipefishes)				
Corythoichthys flavofasciatus	X	X	X	
C. intestinalis	X	X	X	X
AULOSTOMIDAE (Trumpetfishes)				
Aulostomus chinensis			X	
SERRANIDAE (Groupers)				
Cephalopholis argus			X	
Epinephelus merra			X	X
APOGONIDAE (Cardinalfishes)				
Apogon novemfasciatus	X	X	X	X
CARANGIDAE (Jacks)				
Caranx melampygus	X			
Gnathanodon speciosus	X			
Scomberoides lysan	X			
LUTJANIDAE (Snappers)				
Lutjanus fulviflamma		X		
L. fulvus	X	X	X	X
L. gibbus	X	X		
L. monostigma		X		
Macolor niger			X	
CAESIONIDAE (Fusiliers)				
Caesio teres			X	
LETHRINIDAE (Emperors)				
Monotaxis grandoculus	X		X	
MULLIDAE (Goatfishes)				
Mulloidichthys flavolineatus	X			
Parupeneus barberinus	X	X		
P. bifasciatus		X	X	
P. cyclostomus	X	X	X	
P. multifasciatus	X	X	X	

Table 2 (continued)

FAMILY	SURVEY SITES			
Genus/species	ANUA	AUA	LELOALOA	POWER PLANT
CHAETODONTIDAE (Butterflyfishes)				
Chaetodon auriga	X	X	X	
C. citrinellus	X	X	X	
C. ephippium	X		X	
C. mertensii			X	
C. ornatissimus		X		
C. unimaculatus		X		
C. vagabundus	X	X	X	X
Forcipiger flavissimus			X	
Heniochus chrysostomus	X		X	
H. monoceros	X		X	X
H. varius			X	
POMACANTHIDAE (Angelfishes)				
Centropyge bicolor			X	
Pygoplites diacanthus			X	X
POMACENTRIDAE (Damselfishes)				
Abudefduf sexfasciatus	X	X	X	
Chromis margaritifer			X	
Chrysiptera brownriggii		X	X	
C. cyanea	X	X	X	X
Dascyllus aruanus	X	X		
Plectroglyphidodon dickii			X	
P. johnstonianus		X		
P. lacrymatus			X	
Pomacentrus coelestis	X	X	X	
P. vaiuli	X	X	X	X
Stegastes fasciolatus		X	X	
S. nigricans	X	X	X	
LABRIDAE (Wrasses)				
Labroides bicolor			X	
L. dimidiatus			X	
Pseudocheilinus hexataenia	X	X	X	
Thalassoma hardwickii			X	
T. lutescens	X			
SCARIDAE (Parrotfishes)				
Chlorurus sordidus		X	X	
Scarus psittacus		X		
S. rubroviolaceus		X		
GOBIIDAE (Gobies)				
Amblygobius phalaena	X	X	X	
A. sphynx	X	X		

Table 2 (continued)

FAMILY	SURVEY SITES			
Genus/species	ANUA	AUA	LELOALOA	POWER PLANT
MICRODESMIDAE (Dartfishes)				
Ptereleotris evides			X	
P. microlepis	X	X	X	
SIGANIDAE (Rabbitfishes)				
Siganus argenteus	X	X	X	
ZANCLIDAE (Moorish Idols)				
Zanclus cornutus	X		X	X
ACANTHURIDAE (Surgeonfishes)				
Acanthurus guttatus				X
A. lineatus			X	
A. nigricans	X			
A. nigricauda			X	
A. nigrofuscus	X	X	X	X
A. nigroris			X	
A. pyroferus			X	
A. triostegus		X	X	
A. xanthopterus	X	X	X	
Ctenochaetus strigosus	X	X	X	
Zebrasoma flavescens			X	
Z. scopas			X	
Z. veliferum		X	X	
SCOMBRIDAE (Tuna & Mackerels)				
Rastrelliger kanagurta	X		X	
BALISTIDAE (Triggerfishes)				
Pseudobalistes flavimarginatus	X			
Rhinecanthus aculeatus		X	X	
Sufflamen bursa		X		
TETRAODONTIDAE (Puffers)				
Canthigaster solandri	X	X	X	X
Total Fish Species Per Survey Station =	42	42	61	13

Table 2a. Marine fish species observed on four shallow survey transects fronting Anua, Pago Pago Harbor, American Samoa on February 25-27, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Shallow (S) Survey Transects			
Genus/species	S1	S2	S3	S4
SYGNATHIDAE (Pipefishes)				
Corythoichthys flavofasciatus		R		R
APOGONIDAE (Cardinalfishes)				
Apogon novemfasciatus				O
LUTJANIDAE (Snappers)				
Lutjanus fulvus	C	C		R
L. gibbus		O	R	
LETHRINIDAE (Emperors)				
Monotaxis grandoculus			R	
MULLIDAE (Goatfishes)				
Mulloidichthys flavolineatus	R			
Parupeneus cyclostomus			R	
CHAETODONTIDAE (Butterflyfishes)				
Chaetodon ephippium		O		
C. vagabundus			O	
Heniochus chrysostomus	O		R	
H. monoceros	O			
POMACENTRIDAE (Damselfishes)				
Abudefduf sexfasciatus			C	
Chrysiptera cyanea		O	R	C
Dascyllus aruanus			O	
Pomacentrus coelestis	O			
Stegastes nigricans	O			
LABRIDAE (Wrasses)				
Pseudocheilinus hexataenia	R	R		R
GOBIIDAE (Gobies)				
Amblygobius phalaena				O
A. sphynx				O
SIGANIDAE (Rabbitfishes)				
Siganus argenteus			R	
ZANCLIDAE (Moorish Idols)				
Zanclus cornutus	R			

Table 2a (continued)

FAMILY	Shallow (S) Survey Transects			
Genus/species	S1	S2	S3	S4
ACANTHURIDAE (Surgeonfishes)				
Acanthurus nigrofuscus				C
A. xanthopterus		O	O	O
Ctenochaetus strigosus	O	R	O	
BALISTIDAE (Triggerfishes)				
Pseudobalistes flavimarginatus	R			
TETRAODONTIDAE (Puffers)				
Canthigaster solandri	R	R	R	
Total Families per Survey Transect =	9	7	8	7
Total Species per Survey Transect =	11	9	12	9
Total Fish Species For All Survey Transects =	26			

* = see text for additional explanation

Table 2b. Marine fish species observed on four mid-depth survey transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D= dominant; A= abundant; C = common; O = occasional; R = Rare)*

FAMILY	Mid-depth (M) Survey Transects			
Genus/species	M1	M2	M3	M4
HOLOCENTRIDAE (Squirrelfishes)				
Myripristis murdjan		O		
Neoniphon sammara	R	O	O	
Sargocentron spiniferum	O	O		
SYGNATHIDAE (Pipefishes)				
Corythoichthys flavofasciatus	R			
C. intestinalis		R		O
APOGONIDAE (Cardinalfishes)				
Apogon novemfasciatus				O
CARANGIDAE (Jacks)				
Caranx melampygus	R		R	R
Gnathanodon speciosus				R
Scomberoides lysan		R		
LUTJANIDAE (Snappers)				
Lutjanus fulvus	A	A	A	C
L. gibbus	R			
MULLIDAE (Goatfishes)				
Mulloidichthys flavolineatus	O			
Parupeneus barberinus	R		R	
P. cyclostomus	O		R	
P. multifasciatus	O		O	R
CHAETODONTIDAE (Butterflyfishes)				
Chaetodon auriga	O		O	
C. citrinellus	R		O	
C. ephippium	O	O	O	
C. vagabundus	O	O	O	
Heniochus chrysostomus	C	C	A	
H. monoceros	A	A	C	
POMACENTRIDAE (Damselfishes)				
Abudefduf sexfasciatus		R		
Chrysiptera cyanea	O			
Pomacentrus coelestis	C	C	C	
P. vaiuli			C	
Stegastes nigricans	O	O	O	
LABRIDAE (Wrasses)				
Pseudocheilinus hexataenia				R
Thalassoma lutescens		R	O	

Table 2b (continued)

FAMILY Genus/species	Mid-depth (M) Survey Transects M1	 M2	 M3	 M4
GOBIIDAE (Gobies)				
Amblygobius phalaena				R
MICRODESMIDAE (Dartfishes)				
Ptereleotris microlepis				R
ZANCLIDAE (Moorish Idols)				
Zanclus cornutus	C			
ACANTHURIDAE (Surgeonfishes)				
Acanthurus nigricans	O			
A. nigrofuscus		A	C	O
A. xanthopterus		C	C	
Ctenochaetus strigosus				R
SCOMBRIDAE (Tuna & Mackerels)				
Rastrelliger kanagurta			O	
BALISTIDAE (Triggerfishes)				
Pseudobalistes flavimarginatus		R		
TETRAODONTIDAE (Puffers)				
Canthigaster solandri		R	R	
Total Families per Survey Transect =	9	10	10	9
Total Species per Survey Transect =	21	18	20	11
Total Fish Species For All Survey Transects =	38			

* = see text for additional explanation

Table 2c. Marine fish species observed on four deep survey transects fronting Anua, Pago Pago Harbor, American Samoa on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Deep (D) Survey Transects			
Genus/species	D1	D2	D3	D4
CARANGIDAE (Jacks)				
Caranx melampygus	O			
Gnathanodon speciosus				R
LUTJANIDAE (Snappers)				
Lutjanus fulvus	A		O	O
MULLIDAE (Goatfishes)				
Parapeneus barberinus	R			
POMACENTRIDAE (Damselfishes)				
Pomacentrus coelestis	O			
LABRIDAE (Wrasses)				
Thalassoma lutescens	O			
Total Families per Survey Transect =	5	0	1	2
Total Species per Survey Transect =	5	0	1	2
Total Fish Species For All Survey Transects =	6			

* = see text for additional explanation

Table 2d. Marine fish species observed on four shallow survey transects fronting Aua, Pago Pago Harbor, American Samoa on February 25-27, 2003. (D=dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Shallow (S) Survey Transects			
Genus/species	S1	S2	S3	S4
HOLOCENTRIDAE (Squirrelfishes)				
Neoniphon sammara		R		
SYGNATHIDAE (Pipefishes)				
Corythoichthys flavofasciatus		R		
C. intestinalis				R
APOGONIDAE (Cardinalfishes)				
Apogon novemfasciatus	O	O		
LUTJANIDAE (Snappers)				
Lutjanus fulvus				O
L. fulviflamma	O			
L. gibbus	O	R		
L. monostigma	R			
MULLIDAE (Goatfishes)				
Parupeneus barberinus				O
P. bifasciatus		O		
P. cyclostomus	O	R		
P. multifasciatus	O	C		
CHAETODONTIDAE (Butterflyfishes)				
Chaetodon auriga	O	O		
C. ephippium	O	O	O	O
C. ornatissimus				R
C. unimaculatus			R	
C. vagabundus	R	R		R
POMACENTRIDAE (Damselfishes)				
Chrysiptera brownriggii	R	O	O	O
Dascyllus aruanus	O	O	O	O
Plectroglyphidodon johnstonianus			R	
Pomacentrus vaiuli	R	O	O	R
Stegastes fasciolatus		R		
LABRIDAE (Wrasses)				
Pseudocheilinus hexataenia	R	A	C	O
SCARIDAE (Parrotfishes)				
Chlorurus sordidus	O	O	O	O
Scarus psittacus	R	O	R	R
S. rubroviolaceus		O		
GOBIIDAE (Gobies)				
Amblygobius phalaena	O	O		O
A. sphynx	C	C		C

Table 2d (continued)

FAMILY	Shallow (S) Survey Transects			
Genus/species	S1	S2	S3	S4
MICRODESMIDAE (Dartfishes)				
Ptereleotris microlepis		R		
SIGANIDAE (Rabbitfishes)				
Siganus argenteus		R		
ACANTHURIDAE (Surgeonfish)				
Acanthurus nigrofuscus			R	O
A. triostegus	O	O	O	R
A. xanthopterus	O	O		O
Ctenochaetus strigosus	O	O		
Zebrasoma veliferum		R		
BALISTIDAE (Triggerfishes)				
Rhinecanthus aculeatus	R		R	
Sufflamen bursa		R		
TETRAODONTIDAE (Puffers)				
Canthigaster solandri	R			R
Total Families per Survey Transect =	11	13	6	10
Total Species per Survey Transect =	22	27	12	18
Total Fish Species For All Survey Transects =	38			

* = see text for additional explanation

Table 2e. Marine fish species observed on four mid-depth survey transects fronting Aua, Pago Pago Harbor, American Samoa on February 25-27, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Mid-depth (M) Survey Transects			
Genus/species	M1	M2	M3	M4
HOLOCENTRIDAE (Squirrelfishes)				
Neoniphon sammara	O			
APOGONIDAE (Cardinalfishes)				
Apogon novemfasciatus	C			
LUTJANIDAE (Snappers)				
Lutjanus fulviflamma	R			
L. fulvus				R
L. monostigma	R			
MULLIDAE (Goatfishes)				
Parupeneus barberinus	O			
P. cyclostomus	O			
CHAETODONTIDAE (Butterflyfishes)				
Chaetodon auriga	O			
POMACENTRIDAE (Damselfishes)				
Abudefduf sexfasciatus	O			
Chrysiptera cyanea	C			R
Pomacentrus coelestis	C			
P. vaiuli	O			
Plectroglyphidodon johnstonianus	R			
Stegastes fasciolatus	R			
S. nigricans	R			
LABRIDAE (Wrasses)				
Pseudocheilinus hexataenia	C			
GOBIIDAE (Gobies)				
Amblygobius phalaena	C			R
A. sphynx	C			
MICRODESMIDAE (Dartfishes)				
Ptereleotris microlepis	R			
ACANTHURIDAE (Surgeonfishes)				
Acanthurus nigroris	O			
A. nigrofuscus	O			
A. xanthopterus	O			
Ctenochaetus strigosus	O			

Table 2e (continued)

FAMILY	Mid-depth (M) Survey Transects			
Genus/species	M1	M2	M3	M4
TETRAODONTIDAE (Puffers)				
Canthigaster solandri	O			
Total Families per Survey Transect =	11	0	0	3
Total Species per Survey Transect =	23	0	0	3
Total Fish Species For All Survey Transects =	24			

* = see text for additional explanation

Table 2f. Marine fish species observed on four deep survey transects fronting Aua, Pago Pago Harbor, American Samoa on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Deep (D) Survey Transects			
Genus/species	D1	D2	D3	D4
LUTJANIDAE (Snappers)				
Lutjanus fulvus		O		
Total Families per Survey Transect =	0	1	0	0
Total Species per Survey Transect =	0	1	0	0
Total Fish Species For All Survey Transects =	1			

* = see text for additional explanation

Table 2g. Marine fish species observed on four shallow survey transects fronting Leloaloa, Pago Pago Harbor, American Samoa on October 15–16, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Shallow (S) Survey Transects			
Genus/species	S1	S2	S3	S4
APOGONIDAE (Cardinalfish)				
Apogon novemfasciatus	O	O		
LUTJANIDAE (Snappers)				
Lutjanus fulvus				O
MULLIDAE (Goatfish)				
Parupeneus cyclostomus			R	R
CHAETODONTIDAE (Butterflyfish)				
Chaetodon auriga		R		
C. citrinellus	O			R
C. vagabundus				O
POMACENTRIDAE (Damselfishes)				
Abudefduf sexfasciatus				O
Chrysiptera brownrigii	C	C	O	O
Pomacentrus vaiuli	O	O		R
Stegastes nigricans				R
GOBIIDAE (Gobies)				
Amblygobius phalaena		O		
SIGANIDAE (Rabbitfish)				
Siganus argenteus				R
ACANTHURIDAE (Surgeonfish)				
Acanthurus lineatus				R
A. nigricauda	R			
A. nigrofuscus	O	O		C
A. pyroferus	R			
A. triostegus		C	C	
Ctenochaetus strigosus	C	O		
Zebrasoma flavescens	R		O	
BALISTIDAE (Triggerfish)				
Rhinecanthus aculeatus	C	C		C
TETRAODONTIDAE (Puffers)				
Canthigaster solandri		O		O
Total Families per Survey Transect =	5	7	3	8
Total Species per Survey Transect =	10	10	4	13
Total Fish Species For All Survey Transects =	21			

* = see text for additional explanation

Table 2h. Marine fish species observed on four mid-depth survey transects fronting Leloaloa, Pago Pago Harbor, American Samoa on October 15–16, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Mid-depth (M) Survey Transects			
Genus/species	M1	M2	M3	M4
HOLOCENTRIDAE (Squirrelfishes)				
Myripristis murdjan		C	O	O
Neoniphon sammara		O		
SYGNATHIDAE (Pipefishes)				
Corythoichthys intestinalis	R		R	
SERRANIDAE (Groupers)				
Epinephelis merra			R	R
APOGONIDAE (Cardinalfishes)				
Apogon novemfasciatus		O		
LUTJANIDAE (Snappers)				
Lutjanus fulvus		C		
Macolor niger		R	R	R
CAESIONIDAE (Fusiliers)				
Caesio teres			C	
MULLIDAE (Goatfishes)				
Parupeneus bifasciatus				O
P. cyclostomus		O		
CHAETODONTIDAE (Butterflyfishes)				
Chaetodon auriga	O			
C. ephippium		O	O	
C. vagabundus	O		O	
Forcipiger flavissimus			R	
Heniochus chrysostomus		C		
H. monoceros		C	O	O
H. varius		C		
POMACENTRIDAE (Damselfishes)				
Chromis margaritifer		O	O	
Chrysiptera cyanea	C	C	O	O
Plectroglyphidodon lacrymatus	O	R	O	O
Pomacentrus vaiuli	C	O		
Stegastes fasciolatus			O	
S. nigricans				O
POMACANTHIDAE (Angelfishes)				
Centropyge bicolor		R		
Pygoplites diacanthus				R

Table 2h (continued)

FAMILY	Mid-depth (M) Survey Transects			
Genus/species	M1	M2	M3	M4
LABRIDAE (Wrasses)				
Labroides dimidiatus	O		O	
Pseudocheilinus hexataenia			O	O
SCARIDAE (Parrotfishes)				
Chlorurus sordidus			R	R
MICRODESMIDAE (Dartfishes)				
Ptereleotris evides			O	
ZANCLIDAE (Moorish Idols)				
Zanclus cornutus			C	C
ACANTHURIDAE (Surgeonfishes)				
Acanthurus lineatus	O			
A. nigrofuscus	A	C	C	C
A. pyroferus				R
Zebrasoma scopas	C			
Z. veliferum			O	O
SCOMBRIDAE (Tuna & Mackerels)				
Rastrelliger kanagurta				R
TETRAODONTIDAE (Puffers)				
Canthigaster solandri	R			
Total Families per Survey Transect =	6	8	12	12
Total Species per Survey Transect =	11	16	20	16
Total Fish Species For All Survey Transects =	37			

* = see text for additional explanation

Table 2i. Marine fish species observed on four deep survey transects fronting Leloaloa, Pago Pago Harbor, American Samoa on October 15–16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Deep (D) Survey Transects			
Genus/species	D1	D2	D3	D4
MURAENIDAE (Moray eels)				
Gymnothorax javanicus		R		R
HOLOCENTRIDAE (Squirrelfishes)				
Myripristis murdjan			O	
SYGNATHIDAE (Pipefishes)				
Corythoichthys intestinalis	R			R
AULOSTOMIDAE (Trumpetfishes)				
Aulostomus chinensis			R	
SERRANIDAE (Groupers)				
Cephalopholis argus				R
Epinephelus merra				R
LUTJANIDAE (Snappers)				
Lutjanus fulvus		O		O
Macolor niger		R		
CAESIONIDAE (Fusiliers)				
Caesio teres			O	
LETHRINIDAE (Emperors)				
Monotaxis grandoculus			O	O
MULLIDAE (Goatfishes)				
Parupeneus bifasciatus			O	
P. cyclostomus		C	O	
P. multifasciatus	O		O	
CHAETODONTIDAE (Butterflyfishes)				
Chaetodon mertensii				O
Heniochus chrysostomus		O	O	
H. monoceros		C	O	
H. varius			O	
POMACANTHIDAE (Angelfishes)				
Pygoplites diacanthus			R	O

Table 2i (continued)

FAMILY	Deep (D) Survey Transects			
Genus/species	D1	D2	D3	D4
POMACENTRIDAE (Damselfishes)				
Chromis margaritifer			O	
Chrysiptera cyanea		O		
Plectroglyphidodon dickii		R		
P. lacrymatus				O
Pomacentrus coelestis			R	
P. vaiuli		R	C	
Stegastes fasciolatus			O	
S. nigricans		O	O	O
LABRIDAE (Wrasses)				
Labroides bicolor		R		
L. dimidiatus	O		O	
Thalassoma hardwickii	R			
SCARIDAE (Parrotfishes)				
Chlorurus sordidus	R			
MICRODESMIDAE (Dartfishes)				
Ptereleotris evides		O		O
SIGANIDAE (Rabbitfishes)				
Siganus argenteus			R	
ZANCLIDAE (Moorish Idols)				
Zanclus cornutus		R		
ACANTHURIDAE (Surgeonfishes)				
Acanthurus nigrofuscus	C	A	C	C
A. pyroferus		R		
A. xanthopterus				R
Zebrasoma scopas	O	C		
Z. veliferum			C	O
TETRAODONTIDAE (Puffers)				
Canthigaster solandri	O	O		
Total Families per Survey Transect =	6	10	11	10
Total Species per Survey Transect =	8	17	20	14
Total Fish Species For All Survey Transects =	39			

* = see text for additional explanation

Table 2j. Marine fish species observed on two mid-depth survey transects fronting the Power Plant at Anua, Pago Pago Harbor, American Samoa on October 15–16, 2003. (D = dominant; A = Abundant; C = common; O = occasional; R = rare)*

FAMILY	Mid-depth Survey Transects	
Genus/species	M1	M2
SYGNATHIDAE (Pipefishes)		
Corythoichthys intestinalis	R	R
LUTJANIDAE (Snappers)		
Lutjanus fulvus	O	O
CHAETODONTIDAE (Butterflyfishes)		
Chaetodon vagabundus		O
Heniochus monoceros	O	O
POMACENTRIDAE (Damselfishes)		
Chrysiptera cyanea		R
Pomacentrus vaiuli	O	
POMACANTHIDAE (Angelfishes)		
Pygoplites diacanthus	R	
ZANCLIDAE (Moorish Idol)		
Zanclus cornutus		O
ACANTHURIDAE (Surgeonfishes)		
Acanthurus guttatus	R	
A. nigrofuscus	C	O
TETRAODONTIDAE		
Canthigaster solandri	R	R
Total Families per Survey Transect =	7	7
Total Species per Survey Transect =	8	8
Total Fish Species For All Survey Transects =	11	

* = see text for additional explanation

Table 2k. Marine fish species observed on two deep survey transects fronting the Power Plant at Anua, Pago Pago Harbor, American Samoa on October 15–16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY Genus/species	Mid-depth Survey Transects D1	 D2
SERRANIDAE (Groupers)		
Epinephelis merra		R
APOGONIDAE (Cardinalfishes)		
Apogon novemfasciatus	R	R
LUTJANIDAE (Snappers)		
Lutjanus fulvus	O	O
CHAETODONTIDAE (Butterflyfishes)		
Chaetodon vagabundus	O	O
POMACANTHIDAE (Angelfishes)		
Pygoplites diacanthus	R	
Total Families per Survey Transect =	4	4
Total Species per Survey Transect =	4	4
Total Fish Species For All Survey Transects =	5	

* = see text for additional explanation

Table 3. Total coral species observed at four survey sites within Pago Pago Harbor, American Samoa, on February 25-27 and October 15-16, 2003 (x = species presence).

FAMILY	SURVEY SITES			
Genus/Species	ANUA	AUA	LELOALOA	POWER PLANT
ACROPORIDAE				
Montipora efflorescens		X		
M. floweri		X		
M. grisea		X		
M. hoffmeisteri		X		
Montipora sp. 1	X	X	X	
M. sp. 2 (encrusting juv)		X	X	
Acropora austera			X	
A. cytherea			X	
A. digitifera			X	
A. gemmifera			X	
A. granulosa			X	
A. humilis			X	
A. hyacinthus			X	
A. insignis			X	
A. nasuta			X	
POCILLOPORIDAE				
Pocillopora damicornis	X	X	X	
P. danae		X	X	
P. verrucosa		X	X	
AGARICIIDAE				
Pavona frondifera		X		
P. venosa		X		
FUNGIIDAE				
Fungia fungites			X	
F. repanda			X	
F. scutaria			X	
FAVIIDAE				
Favia speciosa			X	
F. sp (encrusting juv.)			X	
Goniastrea retiformis			X	
Platygyra daedalea			X	
P. pini			X	
Dipoastrea heliopora			X	
Leptastrea purpurea	X	X	X	
Cyphastrea serailia		X		
PORITIDAE				
Porites cylindrica		X		
P. lichen			X	
P. lobata	X	X	X	X
P. lutea	X	X	X	
P. rus		X	X	
Total coral species per survey station =	5	17	28	1

Table 3a. Coral species observed on four shallow survey transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Shallow (S) Survey Transects			
Genus/Species	S-1	S-2	S-3	S-4
FAVIIDAE				
Leptastrea purpurea	O	C	C	C
PORITIDAE				
Porites lutea	O	O		
Total Families per Survey Transect:	2	2	1	1
Total Species per Survey Transect:	2	2	1	1
Total Species For All Survey Transects = 2				

* = see text for additional explanation

Table 3b. Coral species observed on four mid-depth survey transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003.
(D = dominant; A = abundant; C=common; O = occasional; R = rare)*

FAMILY	Mid-Depth (M) Survey Transects			
Genus/Species	M-1	M-2	M-3	M-4
ACROPORIDAE				
Montipora sp. 1			R	
POCILLOPORIDAE				
Pocillopora damicornis		R	O	
FAVIIDAE				
Leptastrea purpurea	O	O	O	O
PORITIDAE				
Porites lobata	R	R		
Porites lutea	O	O	R	
Total Families per Survey Transect:	3	3	4	1
Total Species per Survey Transect:	3	4	4	1
Total Species For All Survey Transects =		5		

* = see text for additional explanation

Table 3c. Coral species observed on four deep survey transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Deep (D) Survey Transects			
Genus/Species	D-1	D-2	D-3	D-4
Total Families per Survey Transect:	0	0	0	0
Total Species per Survey Transect:	0	0	0	0
Total Species For All Survey Transects =		0		

* = see text for additional explanation

Table 3d. Coral species observed on four shallow survey transects fronting Aua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Shallow (S) Survey Transects			
Genus/Species	S-1	S-2	S-3	S-4
ACROPORA				
Montipora efflorescens			R	
M. floweri		R		
M. grisea		R	R	
M. hoffmeisteri	O		R	
M. sp 1 (encrusting juv.)	O			
M. sp. 2 (encrusting juv)			R	
POCILLOPORA				
Pocillopora damicornis	C	C	C	C
P. danae	R	R	R	R
P. verrucosa	R			
AGARICIIDAE				
Pavona frondifera			O	
FAVIIDAE				
Cyphastrea serailia	R	O		
Leptastrea purpurea	C	O	C	O
PORITIDAE				
Porites cylindrica	O	O	C	C
P. lobata	O	O	C	O
P. lutea	C	C	C	C
P. rus	R			
Total Families per Survey Transect:	4	4	5	3
Total Species per Survey Transect:	11	9	11	6
Total Species For All Survey Transects = 17				

* = see text for additional explanation

Table 3e. Coral species observed on four mid-depth survey transects fronting Aua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Mid-depth (M) Survey Transects			
Genus/Species	M-1	M-2	M-3	M-4
ACROPORA				
Montipora floweri	R			
M. grisea	O			
M. sp 1 (encrusting juv.)	R			
POCILLOPORA				
Pocillopora damicornis	C			
AGARICIIDAE				
P. venosa	R			
PORITIDAE				
Porites lobata	R			
P. lutea	C			
Total Families per Survey Transect:	4	0	0	0
Total Species per Survey Transect:	7	0	0	0
Total Species For All Survey Transects = 7				

* = see text for additional explanation

Table 3f. Coral species observed on four deep survey transects fronting Aua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Deep (D) Survey Transects			
Genus/Species	D-1	D-2	D-3	D-4
Total Families per Survey Transect:	0	0	0	0
Total Species per Survey Transect:	0	0	0	0
Total Species For All Survey Transects =		0		

* = see text for additional explanation

Table 3g. Coral species observed on four shallow survey transects fronting Leloaloa, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Shallow (S) Survey Transects			
Genus/Species	S-1	S-2	S-3	S-4
POCILLOPORA				
Pocillopora damicornis	O	O	O	
P. danae		O		O
P. verrucosa		O		
FAVIIDAE				
Favia speciosa			O	
F. sp (encrusting juv.)			O	
PORITIDAE				
Porites lobata	O	O	O	O
P. lutea	O	O	O	O
P. rus			O	
Total Families per Survey Transect:	2	2	3	2
Total Species per Survey Transect:	3	5	6	3

Total Species For All Survey Transects = 8

* = see text for additional explanation

Table 3h. Coral species observed on four mid-depth survey transects fronting Leloaloa, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Mid-Depth (M) Survey Transects			
Genus/Species	M-1	M-2	M-3	M-4
ACROPORA				
Montipora sp 1 (encrusting juv.)	O	C	O	O
M. sp 2 (encrusting juv)	O	O		
Acropora austera			O	O
A. cytherea	O	O	O	O
A. digitifera			O	
A. granulosa			R	R
A. humilis		C	O	
A. hyacinthus	O	O		O
A. insignis			R	
A. nasuta			R	
POCILLOPORA				
Pocillopora damicornis	O	C	C	C
P. danae	O	O	O	O
P. verrucosa	C	C	C	O
FUNGIA				
Fungia fungites		O	O	
F. repanda	O		R	O
F. scutaria		O		
FAVIIDAE				
Goniastrea retiformis	O		O	O
Platygyra daedalea		O		O
Dipoastrea heliopora			R	
Leptastrea purpurea		O	O	O
PORITIDAE				
Porites lichen	R			
P. lobata	C	C	C	C
P. lutea	C	C	C	O
P. rus	O	R	C	O
Total Families per Survey Transect:	5	5	5	5
Total Species per Survey Transect:	13	15	19	14
Total Species For All Survey Transects = 24				

* = see text for additional explanation

Table 3i. Coral species observed on four deep survey transects fronting Leloaloa, Pago Pago Harbor, American Samoa, on October 15-16, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Deep (D) Survey Transects			
Genus/Species	D-1	D-2	D-3	D-4
ACROPORA				
Montipora sp 1 (encrusting juv.)	O	O	C	C
M. sp 2 (encrusting juv)	O	O	O	
Acropora cytherea	C	C	O	R
A. digitifera	O	R	O	
A. gemmifera		O	O	
A. granulosa	R			O
A. humilis	O	O	C	
A. hyacinthus	O		O	O
A. insignis	O			
POCILLOPORA				
Pocillopora damicornis	C	O	O	C
P. danae	O	R	O	
P. verrucosa	O	C	C	C
FUNGIA				
Fungia fungites	O	C	O	O
F. repanda		R		
F. scutaria	O	O		O
FAVIIDAE				
Goniastrea retiformis	R	O	O	
Platygyra daedalea	O			O
P. pini		O		O
Leptastrea purpurea	O	C	C	O
PORITIDAE				
Porites lobata	C	C	C	C
P. lutea	O	O	C	C
P. rus	C	O	O	C
Total Families per Survey Transect:	5	5	5	5
Total Species per Survey Transect:	19	18	16	13
Total Species For All Survey Transects = 23				

* = see text for additional explanation

Table 3j. Coral species observed on two mid-depth survey transects fronting the Power Plant at Anua, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Mid-Depth (M) Survey Transects	
Genus/Species	M-1	M-2
PORITIDAE		
Porites lobata	R	
Total Families per Survey Transect:	1	0
Total Species per Survey Transect:	1	0

Total Species For All Survey Transects = 1

* = see text for additional explanation

Table 3k. Coral species observed on four deep survey transects fronting the Power Plant at Anua, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Deep (D) Survey Transects	
Genus/Species	D-1	D-2
PORITIDAE		
Porites lobata	O	
Total Families per Survey Transect:	1	0
Total Species per Survey Transect:	1	0

Total Species For All Survey Transects = 1

* = see text for additional explanation

Table 4. Total macroinvertebrate species observed at four survey sites within Pago Pago Harbor, American Samoa, on February 25-27 and October 15-16, 2003 (x = species presence).

FAMILY	SURVEY SITES			
Genus/Species	ANUA	AUA	LELOALOA	POWER PLANT
TETILLIDAE				
Craniella abracadabra	X		X	
Paratetilla bacca			X	
TETHYIDAE				
Tethya sp		X	X	X
THEONELLIDAE				
Theonella sp			X	
AXINELLIDAE				
Styllissa flabelliformis			X	
S. massa		X	X	
Axinnell a sp	X	X		
HALICHONDRIIDAE				
Axinyssa sp	X			X
Stylotella sp			X	
CALLYSPONGIIDAE				
Callyspongia sp	X		X	
DYSIDEIDAE				
Dysidea sp	X	X	X	
DARWINELLIDAE				
Chelonaplysilla sp	X			X
AGELASIDAE				
Agelas sp		X	X	
HALICORDYLIDAE				
Halicordyle disticha	X		X	
ZOANTHIDAE				
Discosoma sp		X	X	
Palythoa tuberculosa			X	
Zoanthus sp	X	X		
HYDROZOA				
Unidentified Hydroid	X	X		
SERPULIDAE				
Spirobranchus giganteus			X	

Table 4. (continued)

FAMILY *Genus/Species*	SURVEY SITES ANUA	AUA	LELOALOA	POWER PLANT
NERITIDAE				
Nerita sp	X			
VERMETIDAE				
Unidentified Vermetid Snail	X	X		
STROMBACEA				
Strombus sp			X	
CYPRAEIDAE				
Cypraea annulus		X		
C. erosa	X			
C. moneta		X	X	
C. tigris		X		
MITRIDAE				
Mitra tabanula	X			
CONIDAE				
Conus flavidus	X	X	X	
C. ebraeus			X	
C. lividus	X	X	X	
C. pulicarius		X		
C. vitulins		X		
ARCIDAE				
Anadara sp		X		
CARDITIDAE				
Vasticardium orbita	X			
Vasticardium sp	X			
ELYSIIDAE			X	
Elysia ornata				
PECTINIDAE				
Pedum spondyloideum			X	
VENERIDAE				
Irus sp	X			
TELLINIDAE				
Tellina crucigera	X			
Tellina sp		X		
BALANIDAE				
Balanus amphitrite	X			

Table 4. (continued)

FAMILY *Genus/Species*	SURVEY SITES ANUA	AUA	LELOALOA	POWER PLANT
ALPHEIDAE				
Synalpheus streptodactylus		X		
STENOPODIDAE				
Stenopus hispidus				X
PALINURIDAE				
Panulirus versicolor			X	X
DIOGENIDAE				
Calcinus latens	X			
XANTHIDAE				
Etisus sp	X			
OPHIDIASTERIDAE				
Fromia monilis			X	
Linckia laevigata		X		
DIADEMATIDAE				
Diadema sp		X		
Echinothrix diadema		X	X	
TEMNOPLEURIDAE				
Mespilia globulus		X		
ECHINOMETRIDAE				
Echinometra mathaei		X		
Echinostrephus sp			X	
HOLOTHURIIDAE				
Holothuria atra			X	
H. hilla		X		
STICHOPODIDAE				
Stichopus chloronotus		X		
SYNAPTIDAE				
Opheodesoma sp		X		
DIDEMNIDAE				
Didemnum molle			X	
Diplosoma sp			X	
STYELIDAE				
Polycarpa sp	X	X		
Total macro-invertebrate species per survey station =	23	28	28	5

Table 4a. Macroinvertebrate species observed on four shallow transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Shallow (S) Survey Transects			
Genus/Species	S-1	S-2	S-3	S-4
TETILLIDAE				
Craniella abracadabra	O		C	
TELLINIDAE				
Tellina crucigera		C		
HALICHONDRIIDAE				
Axinyssa sp		O	O	C
CALLYSPONGIIDAE				
Callyspongia sp	O			
DYSIDEIDAE				
Dysidea sp		O		
HYDROZOA				
Unidentified Hydroid				O
VERMETIDAE				
Unidentified Vermetid Snail				C
MITRIDAE				
Mitra tabanula				O
CONIDAE				
Conus lividus	O		C	C
BALANIDAE				
Balanus amphitrite **	O		C	C
Total Families per Survey Transect:	4	3	4	6
Total Species per Survey Transect:	4	3	4	6

Total Species For All Survey Transects = 10

* = see text for additional explanation
**introduced species

Table 4b. Macroinvertebrate species observed on four mid-depth transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Mid-depth (M) Survey Transects			
Genus/Species	M-1	M-2	M-3	M-4
AXINELLIDAE				
Axinella sp	C	C	O	O
DYSIDEIDAE				
Dysidea sp		O	O	O
DARWINELLIDAE				
Chelonaplysilla sp	C	A	O	O
HYDROZOA				
Unidentified Hydroid	C	O	O	
HALICHORDYLIDAE				
Halichordyle disticha			R	
ZOANTHIDAE				
Zoanthus sp	O		O	C
VERMETIDAE				
Unidentified Vermetid Snail			O	
CYPRAEIDAE				
Cypraea erosa	O			
CONIDAE				
Conus flavidus		R	R	
C. lividus				O
CARDITIDAE				
Vasticardium orbita	O			
Vasticardium sp		O		
VENERIDAE				
Irus sp	O			
BALANIDAE				
Balanus amphitrite **		C	O	
DIOGENIDAE				
Calcinus latens	C	O	O	
XANTHIDAE				
Etisus sp	O			
STYELIDAE				
Polycarpa sp			C	O
Total Families per Survey Transect:	9	8	11	6
Total Species per Survey Transect:	9	8	11	6

Total Species For All Survey Transects = 17

* = see text for additional explanation
**introduced species

Table 4c. Macroinvertebrate species observed on four deep transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Deep (D) Survey Transects			
Genus/Species	D-1	D-2	D-3	D-4
CALLYSPONGIIDAE				
Callyspongia sp	O			
DYSIDEIDAE				
Dysidea sp	C			
HYDROZOA				
Unidentified Hydroid	O			
NERITIDAE				
Nerita sp	C			
VERMETIDAE				
Unidentified Vermetid Snail	C			
Total Families per Survey Transect:	5	0	0	0
Total Species per Survey Transect:	5	0	0	0

Total Species For All Survey Transects = 5

* = see text for additional explanation

Table 4d. Macroinvertebrate species observed on four shallow transects fronting Aua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Shallow (S) Survey Transects			
Genus/Species	S-1	S-2	S-3	S-4
TETHYIDAE				
Tethya sp	C	C	C	C
AXINELLIDAE				
Stylissa massa	O			
Axinnela sp		O	O	
DYSIDEIDAE				
Dysidea sp	O	C	O	O
AGELASIDAE				
Agelas sp		O		
HYDROZOA				
Unidentified Hydroid	O		O	
ZOANTHIDAE				
Discosoma sp	C	O	O	O
Zoanthus sp	O	O	R	
VERMETIDAE				
Unidentified Vermetid Snail	C	O	C	C
CYPRAEIDAE				
Cypraea annulus	O		O	
C. tigris			R	
CONIDAE				
Conus flavidus	O			O
C. lividus			R	
C. pulicarius	O		O	
C. vitulins	R			
ARCIDAE				
Anadara sp			R	
TELLINIDAE				
Tellina sp	O	O	C	
OPHIDIASTERIDAE				
Linckia laevigata	O	C		C
DIADEMATIDAE				
Diadema sp	O		O	
Echinothrix diadema	C	C	O	C

Table 4d. (continued)

FAMILY	Shallow (S) Survey Transects			
Genus/Species	S-1	S-2	S-3	S-4
TEMNOPLEURIDAE				
Mespilia globulus	O	O	R	
ECHINOMETRIDAE				
Echinometra mathaei	O	C	C	C
STICHOPODIDAE				
Stichopus chloronotus	A	A	C	A
SYNAPTIDAE				
Opheodesoma sp	O		O	
STYELIDAE				
Polycarpa sp	C	O		R
Total Families per Survey Transect:	16	13	15	10
Total Species per Survey Transect:	20	14	19	10

Total Species For All Survey Transects = 25

* = see text for additional explanation

Table 4e. Macroinvertebrate species observed on four mid-depth transects fronting Aua, Pago Pago Harbor, American Samoa, on February 25-27, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Mid-depth (M) Survey Transects			
Genus/Species	M-1	M-2	M-3	M-4
TETHYIDAE				
Tethya sp	C			
AXINELLIDAE				
Stylissa massa	O			
Axinnela sp	O			
DYSIDEIDAE				
Dysidea sp	O	O	O	
AGELASIDAE				
Agelas sp	O			
HYDROZOA				
Unidentified Hydroid	C			
ZOANTHIDAE				
Zoanthus sp				O
VERMETIDAE				
Unidentified Vermetid Snail	C			
CYPRAEIDAE				
Cypraea moneta				O
CONIDAE				
Conus flavidus	O			
Conus lividus	O			
Conus pulicarius	O			
ARCIDAE				
Anadara sp	R			
OPHIDIASTERIDAE				
Linckia laevigata	C			
DIADEMATIDAE				
Diadema sp	O			
Echinothrix diadema	C			
HOLOTHURIIDAE				
Holothuria hilla		C	C	D
STICHOPODIDAE				
Stichopus chloronotus	C			O
STYELIDAE				
Polycarpa sp	O			
Total Families per Survey Transect:	12	2	2	4
Total Species per Survey Transect:	16	2	2	4

Total Species For All Survey Transects = 19

* = see text for additional explanation

Table 4f. Macroinvertebrate species observed on four deep transects fronting Aua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Deep (D) Survey Transects			
Genus/Species	D-1	D-2	D-3	D-4
ALPHEIDAE				
Synalpheus streptodactylus			O	
HOLOTHURIIDAE				
Holothuria hilla	D	D	D	D
STICHOPODIDAE				
Stichopus chloronotus			R	
Total Families per Survey Transect:	1	1	3	1
Total Species per Survey Transect:	1	1	3	1

Total Species For All Survey Transects = 3

* = see text for additional explanation

Table 4g. Macroinvertebrate species observed on four shallow transects fronting Leloaloa, Pago Pago Harbor, American Samoa, on October 15-16, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Shallow (S) Survey Transects			
Genus/Species	S-1	S-2	S-3	S-4
DYSIDEIDAE				
Disidea sp				O
AGELASIDAE			O	
Agelas sp				
SERPULIDAE				
Spirobranchus giganteus			O	
STROMBACEA				
Strombus sp		R	R	
CYPRAEIDAE				
Cypraea moneta	R			
CONIDAE				
Conus flavidus		R		
Conus lividus	O	C	O	C
Conus ebraeus	O			
ELYSIIDAE				
Elysia ornata	O	O	C	C
PECTINIDAE				C
Pedum spondyloideum	O			
DIADEMATIDAE				
Echinothrix diadema	C			
ECHINOMETRIDAE				
Echinostrephus sp		O		O
HOLOTHURIIDAE				
Holothuria atra				O
DIDEMNIDAE				
Didemnum molle			O	
Total Families per Survey Transect:	5	4	6	6
Total Species per Survey Transect:	6	5	6	6

Total Species For All Survey Transects = 14

* = see text for additional explanation

Table 4h. Macroinvertebrate species observed on four mid-depth transects fronting Leloaloa, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Mid-depth (M) Survey Transects			
Genus/Species	M-1	M-2	M-3	M-4
TETILLIDAE				
Craniella abracadabra	R		O	R
Paratetilla bacca	O	O	O	O
TETHYIDAE				
Tethya sp	O	C	C	C
THEONELLIDAE				
Theonella sp		O	O	
AXINELLIDAE				
Stylissa flabelliformis	C	A	C	C
S. massa			O	
DYSIDEIDAE				
Disidea sp		C		
ZOANTHIDAE				
Palythoa tuberculosa	O	C	C	C
STROMBACEA				
Strombus sp		R	R	
OPHIDIASTERIDAE				
Fromia monilis	O			
DIADEMATIDAE				
Echinothrix diadema		C	C	
DIDEMNIDAE				
Didemnum molle	O		O	
Diplosoma sp		O	O	O
Total Families per Survey Transect:	6	9	8	5
Total Species per Survey Transect:	7	9	11	6
Total Species For All Survey Transects = 13				

* = see text for additional explanation

Table 4i. Macroinvertebrate species observed on four deep transects fronting Leloaloa, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY	Deep (D) Survey Transects			
Genus/Species	D-1	D-2	D-3	D-4
TETHYIDAE				
Tethya sp	O	C	C	C
AXINELLIDAE				
Stylissa flabelliformis	C	A	C	C
HALICHONDRIIDAE				
Stylotella sp				O
CALLYSPONGIIDAE				
Callyspongia sp	O			
TETILLIDAE				
Craniella abracadabra	O	O	O	
Paratetilla bacca	C	O	O	C
HALICORDYLIDAE				
Halicordyle disticha		O		
ACTINODISCIDAE				
Discosoma sp		O		
PALINURIDAE				
Panulirus versicolor		O		
DIADEMATIDAE				
Echinothrix diadema				C
DIDEMNIDAE				
Didemnum molle		O	O	O
Diplosoma sp	R			O
Total Families per Survey Transect:	5	7	4	7
Total Species per Survey Transect:	6	8	5	6

Total Species For All Survey Transects = 12

* = see text for additional explanation

Table 4j. Macroinvertebrate species observed on four mid-depth transects fronting the Power Plant at Anua, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C=common; O = occasional; R = rare)*

FAMILY	Mid-depth (M) Survey Transects	
Genus/Species	M-1	M-2
HALICHONDRIIDAE		
Axinyssa sp	O	O
DARWINELLIDAE		
Chelonaplysilla sp		O
Total Families per Survey Transect:	1	2
Total Species per Survey Transect:	1	2

Total Species For All Survey Transects = 2

* = see text for additional explanation

Table 4k. Macroinvertebrate species observed on four deep transects fronting the Power Plant at Anua, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

FAMILY *Genus/Species*	D-1	D-2
TETHYIDAE		
Tethya sp	O	O
HALICHONDRIIDAE		
Axinyssa sp		O
DARWINELLIDAE		
Chelonaplysilla sp	O	O
STENOPODIDAE		
Stenopus hispidus	R	
PALINURIDAE		
Panulirus versicolor		C
Total Families per Survey Transect:	3	4
Total Species per Survey Transect:	3	4

Total Species For All Survey Transects = 5

* = see text for additional explanation

Table 5. Total marine plant species observed at four survey sites within Pago Pago Harbor, American Samoa, on February 25-27 and October 15-16, 2003 (x = species presence).

PHYLUM FAMILY *Genus/Species*	SURVEY SITES ANUA	AUA	LELOALOA	POWER PLANT
RHODOPHYTA (red algae)				
CORALLINACEAE				
Mesophyllum sp			X	
HALYMENIACEAE				
Halymenia durvillei			X	
Halymenia sp	X	X		
CORALLINACEAE				
Hydrolithon onkodes		X	X	
PEYSSONNELIACEAE				
Peyssonnelia boergesenii			X	
PHAEOPHYTA (brown algae)				
DICTYOTACEAE				
Dictyota bartayresii				X
D. repens			X	
CHLOROPHYTA (green algae)				
BRYOPSIDACEAE				
Bryopsis pennata		X	X	
CAULERPACEAE				
Caulerpa racemosa		X	X	
C. serrulata		X		
C. taxifolia			X	
UDOTEACEAE				
Chlorodesmis fastigiata		X	X	
HALIMEDACEAE				
Halimeda opuntia	X	X		X
H. minima			X	
CYANOBACTERIA (blue-green algae)				
OSCILLATORIACEAE				
Lyngbya sp			X	
MAGNOLIOPHYTA (sea grass)				
HYDROCHARITACEAE				
Halophila ovalis	X	X		
Unidentified turf algae			X	
Total marine plant species per survey site =	3	8	12	2

Table 5a. Marine plant species observed on four shallow survey transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Shallow (S) Survey Transects S-1	 S-2	 S-3	 S-4
CHLOROPHYTA (green algae)				
HALIMEDACEAE				
Halimeda opuntia	C	C		A
MAGNOLIOPHYTA (sea grass)				
HYDROCHARITACEAE				
Halophila ovalis	D	C	A	D
Total Families per Survey Transect:	2	2	1	2
Total Species per Survey Transect:	2	2	1	2

Total Species For All Survey Transects = 2

* = see text for additional explanation

Table 5b. Marine plant species observed on four mid-depth survey transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Mid-depth (M) Survey Transects M-1	 M-2	 M-3	 M-4
RHODOPHYTA (red algae)				
HALYMENIACEAE				
Halymenia sp				O
MAGNOLIOPHYTA (sea grass)				
HYDROCHARITACEAE				
Halophila ovalis		O		
Total Families per Survey Transect:	0	1	0	1
Total Species per Survey Transect:	0	1	0	1

Total Species For All Survey Transects = 2

* = see text for additional explanation

Table 5c. Marine plant species observed four deep survey transects fronting Anua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Deep (D) Survey Transects D-1	 D-2	 D-3	 D-4
Total Families per Survey Transect:	0	0	0	0
Total Species per Survey Transect:	0	0	0	0

Total Species For All Survey Transects = 0

* = see text for additional explanation

Table 5d. Marine plant species observed on four shallow survey transects fronting Aua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Shallow (S) Survey Transects S-1	 S-2	 S-3	 S-4
RHODOPHYTA (red algae)				
HALYMENIACEAE				
Halymenia sp		O		
CORALLINACEAE				
Hydrolithon onkodes	C	C	O	
CHLOROPHYTA (green algae)				
BRYOPSIDACEAE				
Bryopsis pennata	O			
CAULERPACEAE				
Caulerpa racemosa	C			
HALIMEDACEAE				
Halimeda opuntia	C	D	D	D
UDOTEACEAE				
Chlorodesmis fastigiata		O		
MAGNOLIOPHYTA (sea grass)				
HYDROCHARITACEAE				
Halophila ovalis	A	A	A	
Total Families per Survey Transect:	5	5	3	1
Total Species per Survey Transect:	5	5	3	1

Total Species For All Survey Transects = 7

* = see text for additional explanation

Table 5e. Marine plant species observed on four mid-depth survey transects fronting Aua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Mid-depth (M) Survey Transects M-1	 M-2	 M-3	 M-4
RHODOPHYTA (Red Algae)				
HALYMENIACEAE				
Halymenia sp				O
CORALLINACEAE				
Hydrolithon onkodes	C			
CHLOROPHYTA (Green Algae)				
CAULERPACEAE				
Caulerpa serrulata	O			
HALIMEDACEAE				
Halimeda opuntia	A	C	C	O
UDOTEACEAE				
Chlorodesmis fastigiata	O			
MAGNOLIOPHYTA (Sea grass)				
HYDROCHARITACEAE				
Halophila ovalis	D			
Total Families per Survey Transect:	5	1	1	2
Total Species per Survey Transect:	5	1	1	2

Total Species For All Survey Transects = 6

* = see text for additional explanation

Table 5f. Marine plant species observed on four deep survey transects fronting Aua, Pago Pago Harbor, American Samoa, on February 25-27, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Deep (D) Survey Transects D-1	 D-2	 D-3	 D-4
CHLOROPHYTA (Green Algae)				
HALIMEDACEAE				
Halimeda opuntia			R	
Total Families per Survey Transect:	0	0	1	0
Total Species per Survey Transect:	0	0	1	0

Total Species For All Survey Transects = 0

* = see text for additional explanation

Table 5g. Marine plant species observed on four shallow survey transects fronting Leloaloa, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Shallow (S) Survey Transects S-1	 S-2	 S-3	 S-4
RHODOPHYTA (red algae)				
CORALLINACEAE				
Hydrolithon onkodes		C	C	A
PEYSSONNELIACEAE				
Peyssonnelia boergesenii	A	C	A	A
CHLOROPHYTA (green algae)				
BRYOPSIDACEAE				
Bryopsis pennata	A	A	C	C
CAULERPACEAE				
Caulerpa racemosa		C		
C. taxifolia			C	C
CODIACEAE				
Chlorodesmis fastigiata	A	C	C	C
HALIMEDACEAE				
Halimeda opuntia	C	C		
H. minima	C	O	O	C
Unidentified turf alga	C	C	O	C
Total Families per Survey Transect:	5	7	7	7
Total Species per Survey Transect:	6	8	7	7

Total Species For All Survey Transects = 9

* = see text for additional explanation

Table 5h. Marine plant species observed on four mid-depth survey transects fronting Leloaloa, Pago Pago Harbor, American Samoa, on October 15-16, 2003.
(D = dominant; A = abundant; C = common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Mid-depth (M) Survey Transects M-1	 M-2	 M-3	 M-4
RHODOPHYTA (red algae)				
CORALLINACEAE				
Mesophyllum sp		C	C	O
HALYMENIACEAE				
Halymenia durvillei	R	O		O
CORALLINACEAE				
Hydrolithon onkodes	O	C	C	O
PEYSSONNELIACEAE				
Peyssonnelia boergesenii	C		A	C
PHAEOPHYTA (brown algae)				
DICTYOTACEAE				
Dictyota repens			O	
CHLOROPHYTA (green algae)				
BRYOPSIDACEAE				
Bryopsis pennata		C		
CODIACEAE				
Chlorodesmis fastigiata	C	O	O	C
CYANOBACTERIA (blue-green algae)				
OSCILLATORIACEAE				
Lyngbya sp	O	C	C	C
Total Families per Survey Transect:	5	6	6	6
Total Species per Survey Transect:	5	6	6	6

Total Species For All Survey Transects = 8

* = see text for additional explanation

Table 5i. Marine plant species observed on four deep survey transects fronting Leloaloa, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Deep (D) Survey Transects D-1	 D-2	 D-3	 D-4
RHODOPHYTA (red algae)				
CORALLINACEAE				
Mesophyllum sp	A		O	
HALYMENIACEAE				
Halymenia durvillei	O	C	C	
CORALLINACEAE				
Hydrolithon onkodes	O	O	O	
PEYSSONNELIACEAE				
Peyssonnelia boergesenii	C			
CHLOROPHYTA (green algae)				
CODIACEAE				
Chlorodesmis fastigiata	O	C	C	C
CYANOBACTERIA (blue-green algae)				
OSCILLATORIACEAE				
Lyngbya sp	O	O	C	C
Total Families per Survey Transect:	6	4	5	2
Total Species per Survey Transect:	6	4	5	2

Total Species For All Survey Transects = 6

* = see text for additional explanation

Table 5j. Marine plant species observed on four mid-depth survey transects fronting the Power Plant at Anua, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C=common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Mid-depth (M) Survey Transects M-1	 M-2
PHAEOPHYTA (brown algae)		
DICTYOTACEAE		
Dictyota bartayresii	O	
CHLOROPHYTA (green algae)		
HALIMEDACEAE		
Halimeda opuntia	O	
Total Families per Survey Transect:	1	0
Total Species per Survey Transect:	1	0

Total Species For All Survey Transects = 2

* = see text for additional explanation

Table 5k. Marine plant species observed on two deep survey transects fronting the Power Plant at Anua, Pago Pago Harbor, American Samoa, on October 15-16, 2003. (D = dominant; A = abundant; C = common; O = occasional; R = rare)*

PHYLUM FAMILY *Genus/Species*	Deep (D) Survey Transects D-1	 D-2
Total Families per Survey Transect:	0	0
Total Species per Survey Transect:	0	0

Total Species For All Survey Transects = 0

* = see text for additional explanation

Table 6. Global Position System data for four survey sites within Pago Pago Harbor, American Samoa, on February 25-27 and October 15-16, 2003.

Anua Survey Site	**Date**	**Latitude**	**Longitude**
Shallow Transect 1	26-Feb-03	S 14 degrees 16.164'	W 170 degrees 41.511'
Shallow Transect 2	26-Feb-03	S 14 degrees 16.167'	W 170 degrees 41.493'
Shallow Transect 3	26-Feb-03	S 14 degrees 16.166'	W 170 degrees 41.483'
Shallow Transect 4	26-Feb-03	S 14 degrees 16.167'	W 170 degrees 41.468'
Mid-Depth Transect 1	27-Feb-03	S 14 degrees 16.173'	W 170 degrees 41.511'
Mid-Depth Transect 2	27-Feb-03	S 14 degrees 16.179'	W 170 degrees 41.496'
Mid-Depth Transect 3	27-Feb-03	S 14 degrees 16.176'	W 170 degrees 41.480'
Mid-Depth Transect 4	27-Feb-03	S 14 degrees 16.175'	W 170 degrees 41.469'
Deep Transect 1	27-Feb-03	S 14 degrees 16.177'	W 170 degrees 41.512'
Deep Transect 2	27-Feb-03	S 14 degrees 16.180'	W 170 degrees 41.496'
Deep Transect 3	27-Feb-03	S 14 degrees 16.182'	W 170 degrees 41.496'
Deep Transect 4	26-Feb-03	S 14 degrees 16.179'	W 170 degrees 41.468'
Aua Survey Site	**Date**	**Latitude**	**Longitude**
Shallow Transect 1	27-Feb-03	S 14 degrees 16.228'	W 170 degrees 39.545'
Shallow Transect 2	27-Feb-03	S 14 degrees 16.237'	W 170 degrees 39.540'
Shallow Transect 3	27-Feb-03	S 14 degrees 16.254'	W 170 degrees 39.537'
Shallow Transect 4	27-Feb-03	S 14 degrees 16.265'	W 170 degrees 39.531'
Mid-Depth Transect 1	26-Feb-03	S 14 degrees 16.232'	W 170 degrees 39.558'
Mid-Depth Transect 2	26-Feb-03	S 14 degrees 16.248'	W 170 degrees 39.554'
Mid-Depth Transect 3	27-Feb-03	S 14 degrees 16.261'	W 170 degrees 39.593'
Mid-Depth Transect 4	27-Feb-03	S 14 degrees 16.271'	W 170 degrees 39.553'
Deep Transect 1	26-Feb-03	S 14 degrees 16.237'	W 170 degrees 39.574'
Deep Transect 2	26-Feb-03	S 14 degrees 16.255'	W 170 degrees 39.561'
Deep Transect 3	27-Feb-03	S 14 degrees 16.266'	W 170 degrees 39.563'
Deep Transect 4	27-Feb-03	S 14 degrees 16.269'	W 170 degrees 39.571'
Leloaloa Survey Site	**Date**	**Latitude**	**Longitude**
Shallow Transect 1	15-Oct-03	S 14 degrees 16.111'	W 170 degrees 40.847'
Shallow Transect 2	15-Oct-03	S 14 degrees 16.138'	W 170 degrees 40.900'
Shallow Transect 3	16-Oct-03	S 14 degrees 16.156'	W 170 degrees 40.962'
Shallow Transect 4	16-Oct-03	S 14 degrees 16.181'	W 170 degrees 41.016'
Mid-Depth Transect 1	15-Oct-03	S 14 degrees 16.169'	W 170 degrees 40.838'
Mid-Depth Transect 2	15-Oct-03	S 14 degrees 16.181'	W 170 degrees 40.896'
Mid-Depth Transect 3	15-Oct-03	S 14 degrees 16.213'	W 170 degrees 40.953'
Mid-Depth Transect 4	16-Oct-03	S 14 degrees 16.240'	W 170 degrees 40.988'
Deep Transect 1	15-Oct-03	S 14 degrees 16.172'	W 170 degrees 40.835'
Deep Transect 2	15-Oct-03	S 14 degrees 16.188'	W 170 degrees 40.901'
Deep Transect 3	15-Oct-03	S 14 degrees 16.210'	W 170 degrees 40.941'
Deep Transect 4	16-Oct-03	S 14 degrees 16.238'	W 170 degrees 40.987'
Power Plant at Anua Survey Site	**Date**	**Latitude**	**Longitude**
Mid-Depth Transect 1	16-Oct-03	S 14 degrees 16.288'	W 170 degrees 41.620'
Mid-Depth Transect 2	16-Oct-03	S 14 degrees 16.286'	W 170 degrees 41.646'
Deep Transect 1	16-Oct-03	S 14 degrees 16.290'	W 170 degrees 41.620'
Deep Transect 2	16-Oct-03	S 14 degrees 16.292'	W 170 degrees 41.648'

NOTE: DATUM = WGS 84

Table 7. An evaluation of some of the ecological functions at four survey sites within Pago Pago Harbor, American Samoa, on February 25-27 and October 15-16, 2003. Values for Ecological Functions = 0 (no value); 1 (low value); 2 (moderate value); or 3 (high or signficant value).*

Ecological Functions	SURVEY SITES			
	ANUA	AUA	LELOALOA	POWER PLANT
Shoreline Protection	1	3	3	1
Forage Habitat for Sea Turtles	1	1	2	0
Shelter Habitat for Sea Turtles	0	1	2	0
Habitat for marine species recruitment, forage, resting and shelter from predators	1	2	3	1
Prey Items for Migratory Birds	1	2	2	1
Coral Reef Replenishment/Connectivity	0	2	2	0
Human Activities	0	3	2	0
Total values per survey station =	4	14	16	3

* = See text for additional explanation

APPENDIX 1

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Shallow (1meter) Transect Number: 1

Meter	Coral	Coralline Algae	Macro-Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	0	4
2	0	0	0	0	0	0	0	0	4
3	0	0	0	0	0	0	0	0	4
4	0	0	0	0	0	0	0	0	4
5	0	0	0	4	0	0	0	0	0
6	0	0	0	4	0	0	0	0	0
7	0	0	0	4	0	0	0	0	0
8	0	0	0	0	0	0	0	0	4
9	0	0	0	0	0	0	0	0	4
10	0	0	0	0	1	0	0	0	3
11	0	0	0	0	4	0	0	0	0
12	0	0	0	0	4	0	0	0	0
13	0	0	0	0	3	0	0	0	1
14	0	0	0	0	3	0	0	0	1
15	0	0	0	0	2	0	0	0	2
16	0	0	0	0	0	0	0	0	4
17	0	0	0	0	1	0	0	0	3
18	0	0	0	0	1	0	0	0	3
19	0	0	0	4	0	0	0	0	0
20	0	0	0	4	0	0	0	0	0
21	0	0	0	4	0	0	0	0	0
22	0	0	0	4	0	0	0	0	0
23	0	0	0	4	0	0	0	0	0
24	0	0	0	4	0	0	0	0	0
25	0	2	0	4	0	0	0	0	0
Mean	0	0.08	0	1.6	0.76	0	0	0	1.64
SD	0	0.39192	0	1.95959	1.30476051	0	0	0	1.7636

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Shallow (1meter) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	3	0	0	0	1
2	0	0	2	0	0	0	0	0	2
3	0	0	0	0	4	0	0	0	0
4	0	0	0	0	0	0	0	0	4
5	0	0	0	0	0	0	0	0	4
6	0	0	0	0	0	0	0	0	4
7	0	0	0	0	3	0	0	0	1
8	0	0	0	4	0	0	0	0	0
9	0	0	0	4	0	0	0	0	0
10	0	0	0	0	0	0	0	0	4
11	0	0	0	0	0	0	0	0	4
12	0	0	0	0	2	0	0	0	2
13	2	0	0	0	2	0	0	0	0
14	0	0	0	0	0	0	0	0	4
15	0	0	0	0	1	0	0	0	3
16	0	0	3	0	0	0	0	0	1
17	0	0	0	0	2	0	0	0	2
18	0	0	0	0	4	0	0	0	0
19	0	0	0	0	2	0	0	0	2
20	0	0	0	0	4	0	0	0	0
21	0	0	0	0	4	0	0	0	0
22	0	0	0	0	4	0	0	0	0
23	0	0	0	0	4	0	0	0	0
24	0	0	0	0	0	0	0	0	4
25	0	0	0	0	2	0	0	0	2
Mean	0.08	0	0.2	0.32	1.64	0	0	0	1.76
SD	0.392	0	0.6928	1.08517	1.64632925	0	0	0	1.6317

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Shallow (1meter) Transect Number: 3

	Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
	1	0	0	0	0	0	0	0	0	4
	2	0	0	0	0	1	0	0	0	3
	3	0	0	0	0	0	0	0	0	4
	4	0	0	0	0	2	0	0	0	2
	5	0	0	0	0	4	0	0	0	0
	6	0	0	0	0	4	0	0	0	0
	7	0	0	0	0	4	0	0	0	0
	8	0	0	0	0	4	0	0	0	0
	9	0	0	0	0	4	0	0	0	0
	10	0	0	0	0	4	0	0	0	0
	11	0	0	0	0	3	0	0	0	1
	12	0	0	0	0	0	0	0	0	4
	13	0	0	0	0	0	0	0	0	4
	14	0	0	0	0	1	0	0	0	3
	15	0	0	0	1	2	0	0	0	1
	16	0	0	0	4	0	0	0	0	0
	17	0	0	0	1	1	0	0	0	2
	18	0	0	0	0	2	0	0	0	2
	19	0	0	0	0	0	0	0	0	4
	20	0	0	0	0	0	0	0	0	4
	21	0	0	0	0	0	0	0	0	4
	22	0	0	0	0	2	0	0	0	2
	23	0	0	0	1	1	0	0	0	2
	24	0	0	0	4	0	0	0	0	0
	25	0	0	0	2	2	0	0	0	0
Mean	mean	0	0	0	0.52	1.64	0	0	0	1.84
SD	sd	0	0	0	1.13561	1.57175062	0	0	0	1.6415

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Shallow (1meter) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	0	4
2	0	0	1	3	0	0	0	0	0
3	0	0	0	4	0	0	0	0	0
4	0	0	0	4	0	0	0	0	0
5	0	0	1	1	0	0	0	0	2
6	0	0	0	0	0	0	0	0	4
7	0	0	0	0	0	0	0	0	4
8	0	0	0	1	1	0	0	0	2
9	0	0	0	4	0	0	0	0	0
10	0	0	0	4	0	0	0	0	0
11	0	0	0	3	0	0	0	0	1
12	0	0	0	4	0	0	0	0	0
13	0	0	0	4	0	0	0	0	0
14	0	0	0	4	0	0	0	0	0
15	0	0	0	4	0	0	0	0	0
16	0	0	0	2	0	0	0	0	2
17	0	0	0	2	0	0	0	0	2
18	0	0	0	1	0	0	0	0	3
19	0	0	0	3	0	0	0	0	1
20	0	0	0	4	0	0	0	0	0
21	0	0	0	2	0	0	0	0	2
22	0	0	0	0	0	0	0	0	4
23	0	0	0	0	0	0	0	0	4
24	0	0	0	0	0	0	0	0	4
25	0	0	0	0	0	0	0	0	4
Mean	0	0	0.08	2.16	0.04	0	0	0	1.72
SD	0	0	0.2713	1.66565	0.19595918	0	0	0	1.6618

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Mid-Depth (5 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	1	0	0	3	0
4	0	0	0	0	4	0	0	0	0
5	0	0	0	0	3	0	0	1	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	3	0	0	1	0
8	0	0	0	0	1	0	0	3	0
9	0	0	0	0	4	0	0	0	0
10	0	0	0	0	3	0	0	1	0
11	0	0	0	0	2	0	0	2	0
12	0	0	0	0	2	0	0	2	0
13	0	0	0	0	4	0	0	0	0
14	0	0	0	0	3	0	0	1	0
15	0	0	0	0	3	0	0	1	0
16	0	0	0	0	4	0	0	0	0
17	0	0	0	0	4	0	0	0	0
18	0	0	0	0	2	0	0	2	0
19	0	0	0	0	4	0	0	0	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	3	0	0	1	0
25	0	0	0	0	3	0	0	1	0
Mean	0	0	0	0	2.12	0	0	1.88	0
SD	0	0	0	0	1.55743379	0	0	1.557	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Mid-Depth (5 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	4	0	0	0	0
2	0	0	0	0	4	0	0	0	0
3	0	0	0	0	1	0	0	3	0
4	0	0	0	0	3	0	0	1	0
5	0	0	0	0	2	0	0	2	0
6	0	0	0	0	3	0	0	1	0
7	0	0	0	0	3	0	0	1	0
8	0	0	0	0	4	0	0	0	0
9	0	0	0	0	4	0	0	0	0
10	0	0	0	0	3	0	0	1	0
11	0	0	0	0	2	0	0	2	0
12	0	0	0	0	2	0	0	2	0
13	0	0	0	0	4	0	0	0	0
14	0	0	0	0	4	0	0	0	0
15	0	0	0	0	4	0	0	0	0
16	0	0	0	0	4	0	0	0	0
17	0	0	0	0	4	0	0	0	0
18	0	0	0	0	4	0	0	0	0
19	0	0	0	0	4	0	0	0	0
20	0	0	0	0	4	0	0	0	0
21	0	0	0	0	4	0	0	0	0
22	0	0	0	0	4	0	0	0	0
23	0	0	0	0	4	0	0	0	0
24	0	0	0	0	4	0	0	0	0
25	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	3.32	0	0	0.52	0
SD	0	0	0	0	1.0851728	0	0	0.854	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo:
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Mid-Depth (5 meters) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	4	0	0	0	0
2	0	0	0	0	3	0	1	0	0
3	0	0	0	0	3	0	1	0	0
4	0	0	0	0	2	0	0	2	0
5	0	0	0	0	2	0	0	2	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	4	0	0	0	0
11	0	0	0	0	4	0	0	0	0
12	0	0	0	0	3	0	0	1	0
13	0	0	0	0	4	0	0	0	0
14	0	0	0	0	3	0	0	1	0
15	0	0	0	0	4	0	0	0	0
16	0	0	0	0	4	0	0	0	0
17	0	0	0	0	4	0	0	0	0
18	0	0	0	0	4	0	0	0	0
19	0	0	0	0	4	0	0	0	0
20	0	0	0	0	4	0	0	0	0
21	0	0	0	0	4	0	0	0	0
22	0	0	0	0	4	0	0	0	0
23	0	0	0	0	4	0	0	0	0
24	0	0	0	0	2	0	0	2	0
25	0	0	0	0	4	0	0	0	0
Mean	0	0	0	0	2.96	0	0.08	0.96	0
SD	0	0	0	0	1.45547243	0	0.2713	1.483	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Mid-Depth (5 meters) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	1	0	0	3	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	2	0	0	2	0
4	0	0	0	0	2	0	0	2	0
5	0	0	0	0	4	0	0	0	0
6	0	0	0	0	4	0	0	0	0
7	0	0	0	0	3	0	0	1	0
8	0	0	0	0	4	0	0	0	0
9	0	0	0	0	4	0	0	0	0
10	0	0	0	0	4	0	0	0	0
11	0	0	0	0	4	0	0	0	0
12	0	0	0	0	4	0	0	0	0
13	0	0	0	0	4	0	0	0	0
14	0	0	0	0	4	0	0	0	0
15	0	0	0	0	1	0	0	0	3
16	0	0	0	0	4	0	0	0	0
17	0	0	0	0	4	0	0	0	0
18	0	0	0	0	4	0	0	0	0
19	0	0	0	0	4	0	0	0	0
20	0	0	0	0	0	0	0	0	4
21	0	0	0	0	3	0	0	1	0
22	0	0	1	0	3	0	0	0	0
23	0	1	1	0	2	0	0	0	0
24	0	0	0	0	4	0	0	0	0
25	0	0	0	0	4	0	0	0	0
Mean	0	0.04	0.08	0	3.08	0	0	0.52	0.28
SD	0	0.19596	0.2713	0	1.32423563	0	0	1.063	0.96

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Deep (10 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	0	0	0	4	0
4	0	0	0	0	0	0	0	4	0
5	0	0	0	0	0	0	0	4	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	0	4	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	0	0	0	4	0
13	0	0	0	0	0	0	0	4	0
14	0	0	0	0	0	0	0	4	0
15	0	0	0	0	0	0	0	4	0
16	0	0	0	0	0	0	0	4	0
17	0	0	0	0	0	0	0	4	0
18	0	0	0	0	0	0	0	4	0
19	0	0	0	0	0	0	0	4	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	0	0	0	0	0	4	0
Mean	0	0	0	0	0	0	0	4	0
SD	0	0	0	0	0	0	0	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Deep (10 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	0	0	0	4	0
4	0	0	0	0	0	0	0	4	0
5	0	0	0	0	0	0	0	4	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	0	4	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	0	0	0	4	0
13	0	0	0	0	0	0	0	4	0
14	0	0	0	0	0	0	0	4	0
15	0	0	0	0	0	0	0	4	0
16	0	0	0	0	0	0	0	4	0
17	0	0	0	0	0	0	0	4	0
18	0	0	0	0	0	0	0	4	0
19	0	0	0	0	0	0	0	4	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	0	0	0	0	0	4	0
Mean	0	0	0	0	0	0	0	4	0
SD	0	0	0	0	0	0	0	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Deep (10 meters) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	0	0	0	4	0
4	0	0	0	0	0	0	0	4	0
5	0	0	0	0	0	0	0	4	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	0	4	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	0	0	0	4	0
13	0	0	0	0	0	0	0	4	0
14	0	0	0	0	0	0	0	4	0
15	0	0	0	0	0	0	0	4	0
16	0	0	0	0	0	0	0	4	0
17	0	0	0	0	0	0	0	4	0
18	0	0	0	0	0	0	0	4	0
19	0	0	0	0	0	0	0	4	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	0	0	0	0	0	4	0
Mean	0	0	0	0	0	0	0	4	0
SD	0	0	0	0	0	0	0	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Anua Depth: Deep (10 meters) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	0	0	0	4	0
4	0	0	0	0	0	0	0	4	0
5	0	0	0	0	0	0	0	4	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	0	4	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	0	0	0	4	0
13	0	0	0	0	0	0	0	4	0
14	0	0	0	0	0	0	0	4	0
15	0	0	0	0	0	0	0	4	0
16	0	0	0	0	0	0	0	4	0
17	0	0	0	0	0	0	0	4	0
18	0	0	0	0	0	0	0	4	0
19	0	0	0	0	0	0	0	4	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	0	0	0	0	0	4	0
Mean	0	0	0	0	0	0	0	4	0
SD	0	0	0	0	0	0	0	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Shallow (1 meter) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	0	4
2	0	0	1	0	1	0	0	0	2
3	1	0	3	0	0	0	0	0	0
4	1	0	1	0	0	0	0	0	2
5	1	0	1	0	2	0	0	0	0
6	0	0	2	0	0	0	0	0	2
7	0	0	0	0	1	0	0	0	3
8	0	0	1	0	1	0	0	0	2
9	0	0	2	0	0	0	0	0	2
10	0	0	0	0	2	0	0	0	2
11	0	0	2	0	0	0	0	0	2
12	0	0	0	0	1	0	0	0	3
13	0	0	1	0	0	0	0	0	3
14	0	0	0	4	0	0	0	0	0
15	0	0	0	4	0	0	0	0	0
16	0	0	0	4	0	0	0	0	0
17	0	0	0	4	0	0	0	0	0
18	0	0	4	0	0	0	0	0	0
19	0	0	0	4	0	0	0	0	0
20	0	0	0	4	0	0	0	0	0
21	0	0	3	1	0	0	0	0	0
22	1	0	1	2	0	0	0	0	0
23	3	0	0	0	0	0	0	0	1
24	2	0	0	1	0	0	0	0	1
25	0	0	0	4	0	0	0	0	0
Mean	0.36	0	0.88	1.28	0.32	0	0	0	1.16
SD	0.742	0	1.1426	1.75545	0.61449166	0	0	0	1.2548

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Shallow (1 meter) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	1	0	3	0	0	0	0	0	0
2	0	0	3	0	0	0	1	0	0
3	0	0	3	0	0	0	1	0	0
4	0	0	3	0	0	0	1	0	0
5	0	0	4	0	0	0	0	0	0
6	0	0	1	0	3	0	0	0	0
7	0	0	0	0	4	0	0	0	0
8	1	0	3	0	0	0	0	0	0
9	1	0	2	0	1	0	0	0	0
10	2	0	0	0	2	0	0	0	0
11	0	0	3	0	1	0	0	0	0
12	0	0	1	0	2	0	0	0	1
13	1	0	3	0	0	0	0	0	0
14	1	0	3	0	0	0	0	0	0
15	0	0	2	0	2	0	0	0	0
16	0	0	4	0	0	0	0	0	0
17	0	0	3	0	0	0	0	0	1
18	0	0	4	0	0	0	0	0	0
19	0	0	3	0	0	0	0	0	1
20	0	0	4	0	0	0	0	0	0
21	0	0	4	0	0	0	0	0	0
22	0	0	4	0	0	0	0	0	0
23	0	0	1	0	0	0	0	0	3
24	0	0	1	0	0	0	0	0	3
25	0	0	0	0	0	0	0	0	4
Mean	0.28	0	2.48	0	0.6	0	0.12	0	0.52
SD	0.531	0	1.3303	0	1.09544512	0	0.325	0	1.0998

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Shallow (1 meter) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	0	4
2	0	0	2	0	0	0	0	0	2
3	0	0	3	0	0	0	0	0	1
4	0	0	2	0	1	0	0	0	1
5	2	0	0	0	0	0	1	0	1
6	1	0	1	0	0	0	1	0	1
7	1	0	0	0	0	0	0	0	3
8	0	0	4	0	0	0	0	0	0
9	0	0	3	0	0	0	0	0	1
10	2	0	2	0	0	0	0	0	0
11	1	0	2	0	0	0	1	0	0
12	0	0	3	0	0	0	0	0	1
13	0	0	4	0	0	0	0	0	0
14	0	0	3	0	0	0	0	0	1
15	0	0	3	0	0	0	1	0	0
16	0	0	4	0	0	0	0	0	0
17	2	0	2	0	0	0	0	0	0
18	0	0	4	0	0	0	0	0	0
19	0	0	4	0	0	0	0	0	0
20	0	0	4	0	0	0	0	0	0
21	0	0	4	0	0	0	0	0	0
22	0	0	3	0	0	0	1	0	0
23	0	0	0	0	0	0	1	0	3
24	0	0	2	0	0	0	2	0	0
25	0	0	3	0	0	0	1	0	0
Mean	0.36	0	2.48	0	0.04	0	0.36	0	0.76
SD	0.686	0	1.36	0	0.19595918	0	0.5571	0	1.1056

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Shallow (1 meter) Transect Number: 4

Transect 4	Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
	1	2	0	0	0	0	0	0	0	2
	2	0	0	2	0	0	0	0	0	2
	3	0	0	3	0	0	0	0	0	1
	4	0	0	0	0	0	0	1	0	3
	5	0	0	0	0	3	0	1	0	0
	6	0	0	0	0	1	0	3	0	0
	7	0	0	0	0	2	0	2	0	0
	8	0	0	3	0	0	0	1	0	0
	9	0	0	0	0	0	0	3	0	1
	10	0	0	0	0	1	0	3	0	0
	11	0	0	0	0	2	0	2	0	0
	12	0	0	0	0	4	0	0	0	0
	13	0	0	1	0	0	0	3	0	0
	14	0	0	2	0	0	1	1	0	0
	15	0	0	1	0	0	0	3	0	0
	16	0	0	2	0	0	0	2	0	0
	17	0	0	2	0	2	0	0	0	0
	18	0	0	0	0	2	0	2	0	0
	19	0	0	0	0	1	0	3	0	0
	20	0	0	0	0	0	0	4	0	0
	21	0	0	0	0	0	0	4	0	0
	22	0	0	0	0	2	0	2	0	0
	23	0	0	0	0	4	0	0	0	0
	24	0	0	2	0	2	0	0	0	0
	25	1	0	0	0	3	0	0	0	0
Mean		0.12	0	0.72	0	1.16	0.04	1.6	0	0.36
SD		0.431	0	1.04	0	1.31696621	0.19596	1.3565	0	0.794

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Mid-Depth (5 meters) Transect Number: 1

Transect 1	Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
	1	4	0	0	0	0	0	0	0	0
	2	4	0	0	0	0	0	0	0	0
	3	4	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	4
	5	0	0	0	0	3	0	0	0	1
	6	0	0	1	0	1	0	0	0	2
	7	0	0	1	0	0	0	0	0	3
	8	0	0	4	0	0	0	0	0	0
	9	0	0	2	0	0	0	0	0	2
	10	0	0	0	0	0	0	0	0	4
	11	0	0	0	0	0	0	0	0	4
	12	0	0	3	0	0	0	0	0	1
	13	0	0	2	0	0	0	0	0	2
	14	0	0	1	0	0	0	0	0	3
	15	0	0	0	0	4	0	0	0	0
	16	0	0	3	0	1	0	0	0	0
	17	0	0	4	0	0	0	0	0	0
	18	0	0	4	0	0	0	0	0	0
	19	0	0	4	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	4
	21	0	0	0	1	0	0	0	0	3
	22	0	0	0	4	0	0	0	0	0
	23	0	0	0	4	0	0	0	0	0
	24	0	0	0	4	0	0	0	0	0
	25	0	0	0	4	0	0	0	0	0
Mean		0.48	0	1.16	0.68	0.36	0	0	0	1.32
SD		1.3	0	1.5409	1.46205	0.97488461	0	0	0	1.5677

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Mid-Depth (5 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	1	0	0	0	0	3	0
4	0	0	0	0	0	0	0	4	0
5	0	0	2	0	0	0	0	2	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	0	0	0	0	0	4	0
9	0	0	1	0	0	0	0	3	0
10	0	0	0	0	0	0	0	4	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	0	0	0	4	0
13	0	0	0	0	0	0	0	4	0
14	0	0	1	0	0	0	0	3	0
15	0	0	3	0	0	0	0	1	0
16	0	0	1	0	0	0	0	3	0
17	0	0	0	0	0	0	0	4	0
18	0	0	0	0	0	0	0	4	0
19	0	0	0	0	0	0	0	4	0
20	0	0	1	0	0	0	0	3	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	1	0	0	0	0	3	0
Mean	0	0	0.44	0	0	0	0	3.56	0
SD	0	0	0.7526	0	0	0	0	0.753	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Mid-Depth (5 meters) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	0	0	0	4	0
4	0	0	0	0	0	0	0	4	0
5	0	0	0	0	0	0	0	4	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	1	0	0	0	0	3	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	0	4	0
11	0	0	2	0	0	0	0	2	0
12	0	0	1	0	0	0	0	3	0
13	0	0	0	0	0	0	0	4	0
14	0	0	0	0	0	0	0	4	0
15	0	0	0	0	0	0	0	4	0
16	0	0	0	0	0	0	0	4	0
17	0	0	0	0	0	0	0	4	0
18	0	0	2	0	0	0	0	2	0
19	0	0	1	0	0	0	0	3	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	1	0	0	0	0	3	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	0	0	0	0	0	4	0
Mean	0	0	0.32	0	0	0	0	3.68	0
SD	0	0	0.6145	0	0	0	0	0.614	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Mid-Depth (5 meters) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	1	0	0	0	0	3	0
4	0	0	0	0	0	0	0	4	0
5	0	0	0	0	0	0	0	4	0
6	0	0	0	0	0	0	0	4	0
7	0	0	1	0	0	0	0	3	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	0	4	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	0	0	0	4	0
13	0	0	1	0	0	0	0	3	0
14	0	0	2	0	0	0	0	2	0
15	0	0	0	0	0	0	0	4	0
16	0	0	0	0	0	0	0	4	0
17	0	0	0	0	0	0	0	4	0
18	0	0	0	0	0	0	0	4	0
19	0	0	0	0	0	0	0	4	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	0	0	0	0	0	4	0
Mean	0	0	0.2	0	0	0	0	3.8	0
SD	0	0	0.4899	0	0	0	0	0.49	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Deep (10 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	0	0	0	4	0
4	0	0	0	0	0	0	0	4	0
5	0	0	0	0	0	0	0	4	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	0	4	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	0	0	0	4	0
13	0	0	0	0	0	0	0	4	0
14	0	0	0	0	0	0	0	4	0
15	0	0	0	0	0	0	0	4	0
16	0	0	0	0	0	0	0	4	0
17	0	0	0	0	0	0	0	4	0
18	0	0	0	0	0	0	0	4	0
19	0	0	0	0	0	0	0	4	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	0	0	0	0	0	4	0
Mean	0	0	0	0	0	0	0	4	0
SD	0	0	0	0	0	0	0	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Deep (10 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	0	0	0	4	0
4	0	0	0	0	0	0	0	4	0
5	0	0	0	0	0	0	0	4	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	0	4	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	0	0	0	4	0
13	0	0	0	0	0	0	0	4	0
14	0	0	0	0	0	0	0	4	0
15	0	0	0	0	0	0	0	4	0
16	0	0	0	0	0	0	0	4	0
17	0	0	0	0	0	0	0	4	0
18	0	0	0	0	0	0	0	4	0
19	0	0	0	0	0	0	0	4	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	0	0	0	0	0	4	0
Mean	0	0	0	0	0	0	0	4	0
SD	0	0	0	0	0	0	0	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Deep (10 meters) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	0	0	0	4	0
4	0	0	0	0	0	0	0	4	0
5	0	0	0	0	0	0	0	4	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	0	4	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	0	0	0	4	0
13	0	0	0	0	0	0	0	4	0
14	0	0	0	0	0	0	0	4	0
15	0	0	0	0	0	0	0	4	0
16	0	0	0	0	0	0	0	4	0
17	0	0	0	0	0	0	0	4	0
18	0	0	0	0	0	0	0	4	0
19	0	0	0	0	0	0	0	4	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	0	0	0	0	0	4	0
Mean	0	0	0	0	0	0	0	4	0
SD	0	0	0	0	0	0	0	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Aua Depth: Deep (10 meters) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	4	0
2	0	0	0	0	0	0	0	4	0
3	0	0	0	0	0	0	0	4	0
4	0	0	0	0	0	0	0	4	0
5	0	0	0	0	0	0	0	4	0
6	0	0	0	0	0	0	0	4	0
7	0	0	0	0	0	0	0	4	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	0	4	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	0	0	0	4	0
13	0	0	0	0	0	0	0	4	0
14	0	0	0	0	0	0	0	4	0
15	0	0	0	0	0	0	0	4	0
16	0	0	0	0	0	0	0	4	0
17	0	0	0	0	0	0	0	4	0
18	0	0	0	0	0	0	0	4	0
19	0	0	0	0	0	0	0	4	0
20	0	0	0	0	0	0	0	4	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	0	0	0	4	0
24	0	0	0	0	0	0	0	4	0
25	0	0	0	0	0	0	0	4	0
Mean	0	0	0	0	0	0	0	4	0
SD	0	0	0	0	0	0	0	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Shallow (1 meter) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	4	0	0	0	0
2	0	0	1	0	2	0	0	0	1
3	0	0	0	0	4	0	0	0	0
4	0	0	0	0	4	0	0	0	0
5	0	0	2	0	2	0	0	0	0
6	0	0	0	0	4	0	0	0	0
7	0	0	0	0	4	0	0	0	0
8	0	0	0	0	4	0	0	0	0
9	0	0	0	0	4	0	0	0	0
10	0	1	1	0	2	0	0	0	0
11	0	2	0	0	2	0	0	0	0
12	1	1	0	0	2	0	0	0	0
13	0	0	0	0	4	0	0	0	0
14	0	1	0	0	3	0	0	0	0
15	0	0	0	0	4	0	0	0	0
16	0	0	0	0	4	0	0	0	0
17	0	0	0	0	4	0	0	0	0
18	0	1	0	0	3	0	0	0	0
19	0	1	2	0	1	0	0	0	0
20	0	3	0	0	1	0	0	0	0
21	0	2	0	0	2	0	0	0	0
22	0	3	0	0	1	0	0	0	0
23	0	3	0	0	1	0	0	0	0
24	0	1	2	0	1	0	0	0	0
25	0	3	0	0	1	0	0	0	0
Mean	0.04	0.88	0.32	0	2.72	0	0	0	0.04
SD	0.196	1.10707	0.6765	0	1.24963995	0	0	0	0.196

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Shallow (1 meter) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	1	1	0	2	0	0	0	0
2	0	2	1	0	1	0	0	0	0
3	0	0	3	0	1	0	0	0	0
4	0	2	1	0	1	0	0	0	0
5	0	1	3	0	0	0	0	0	0
6	0	3	1	0	0	0	0	0	0
7	0	2	2	0	0	0	0	0	0
8	0	2	1	0	1	0	0	0	0
9	0	2	1	0	1	0	0	0	0
10	0	3	1	0	0	0	0	0	0
11	0	2	2	0	0	0	0	0	0
12	0	1	2	0	1	0	0	0	0
13	0	2	1	0	1	0	0	0	0
14	0	1	2	0	0	0	0	0	1
15	0	1	1	0	0	0	0	0	2
16	0	1	2	0	0	0	0	0	1
17	0	1	1	0	0	0	0	0	2
18	0	4	0	0	0	0	0	0	0
19	0	2	0	0	1	0	0	0	1
20	0	1	0	0	2	0	0	0	1
21	0	1	0	0	2	0	0	0	1
22	0	2	0	0	0	0	0	0	2
23	1	0	2	0	1	0	0	0	0
24	0	2	0	0	1	0	0	0	1
25	0	1	0	0	2	0	0	0	1
Mean	0.04	1.6	1.12	0	0.72	0	0	0	0.52
SD	0.196	0.89443	0.9086	0	0.7222188	0	0	0	0.6997

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Shallow (1 meter) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	4	0	0	0	0	0	0
2	0	1	1	0	0	0	0	0	2
3	0	0	1	0	0	0	0	0	3
4	0	1	1	0	2	0	0	0	0
5	0	0	2	0	1	0	0	0	1
6	2	1	1	0	0	0	0	0	0
7	0	0	3	0	0	0	0	0	1
8	0	0	0	0	0	2	0	0	2
9	0	0	2	0	1	0	0	0	1
10	0	0	1	0	2	0	0	0	1
11	0	0	0	0	0	4	0	0	0
12	0	0	0	0	0	4	0	0	0
13	0	0	1	0	0	3	0	0	0
14	0	1	1	0	0	2	0	0	0
15	0	0	2	0	0	2	0	0	0
16	0	0	0	0	2	2	0	0	0
17	1	1	1	0	0	1	0	0	0
18	0	1	1	0	0	1	0	0	1
19	0	0	1	0	0	1	0	0	2
20	0	0	0	0	0	3	0	0	1
21	1	0	0	0	0	2	0	0	1
22	1	0	2	0	0	1	0	0	0
23	0	0	1	0	0	3	0	0	0
24	0	0	2	0	0	2	0	0	0
25	0	1	1	0	0	1	0	0	1
Mean	0.2	0.28	1.16	0	0.32	1.36	0	0	0.68
SD	0.49	0.449	0.9666	0	0.67646138	1.29244	0	0	0.8352

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Shallow (1 meter) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	1	3	0	0	0
2	0	2	1	0	1	0	0	0	0
3	0	0	0	0	2	2	0	0	0
4	0	0	3	0	0	1	0	0	0
5	0	0	1	0	2	1	0	0	0
6	0	1	2	0	0	1	0	0	0
7	0	1	0	0	0	0	0	0	3
8	0	1	0	0	0	0	0	0	3
9	0	0	3	0	0	0	0	0	1
10	0	0	1	0	2	0	0	0	1
11	0	0	0	0	3	0	0	0	1
12	0	2	1	0	1	0	0	0	0
13	0	1	0	0	2	0	0	0	1
14	0	0	0	0	4	0	0	0	0
15	0	0	2	0	2	0	0	0	0
16	0	0	1	0	3	0	0	0	0
17	0	1	2	0	1	0	0	0	0
18	0	4	0	0	0	0	0	0	0
19	0	2	0	0	2	0	0	0	0
20	0	2	0	0	2	0	0	0	0
21	0	2	1	0	0	0	1	0	0
22	0	1	0	0	1	0	0	0	2
23	0	1	0	0	2	0	0	0	1
24	0	0	1	0	3	0	0	0	0
25	0	0	0	0	4	0	0	0	0
Mean	0	0.84	0.76	0	1.52	0.32	0.04	0	0.52
SD	0	1.00717	0.9499	0	1.23676999	0.73321	0.196	0	0.8998

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Mid-Depth (5 meters) Transect Number: 1

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	4	0	0	0	0	0	0	0	0
2	4	0	0	0	0	0	0	0	0
3	1	1	0	0	2	0	0	0	0
4	1	1	1	0	1	0	0	0	0
5	0	2	0	0	2	0	0	0	0
6	1	2	0	0	1	0	0	0	0
7	0	1	0	0	3	0	0	0	0
8	0	2	0	0	2	0	0	0	0
9	1	0	0	0	3	0	0	0	0
10	0	2	0	0	2	0	0	0	0
11	0	0	2	0	2	0	0	0	0
12	0	2	1	0	1	0	0	0	0
13	0	2	1	0	1	0	0	0	0
14	0	2	1	0	1	0	0	0	0
15	0	2	0	0	2	0	0	0	0
16	0	1	0	0	3	0	0	0	0
17	0	2	1	0	1	0	0	0	0
18	0	4	0	0	0	0	0	0	0
19	1	1	1	0	1	0	0	0	0
20	2	0	1	0	1	0	0	0	0
21	0	0	0	0	4	0	0	0	0
22	0	0	0	0	4	0	0	0	0
23	0	4	0	0	0	0	0	0	0
24	0	2	0	0	2	0	0	0	0
25	1	1	0	0	2	0	0	0	0
Mean	0.64	1.36	0.36	0	1.64	0	0	0	0
SD	1.127	1.12712	0.5571	0	1.12712022	0	0	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Mid-Depth (5 meters) Transect Number: 2

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	4	0	0	0	0	0	0	0	0
2	4	0	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0	0
4	2	0	1	0	1	0	0	0	0
5	0	1	0	0	0	0	0	0	3
6	3	1	0	0	0	0	0	0	0
7	2	0	0	0	1	0	0	0	1
8	0	0	0	0	4	0	0	0	0
9	0	3	0	0	1	0	0	0	0
10	3	0	0	0	1	0	0	0	0
11	0	0	0	0	4	0	0	0	0
12	4	0	0	0	0	0	0	0	0
13	3	1	0	0	0	0	0	0	0
14	2	1	0	0	1	0	0	0	0
15	2	1	0	0	1	0	0	0	0
16	0	1	3	0	0	0	0	0	0
17	0	2	1	0	1	0	0	0	0
18	0	4	0	0	0	0	0	0	0
19	0	4	0	0	0	0	0	0	0
20	1	3	0	0	0	0	0	0	0
21	1	1	0	0	2	0	0	0	0
22	0	3	0	0	1	0	0	0	0
23	0	2	0	0	1	0	1	0	0
24	2	2	0	0	0	0	0	0	0
25	2	2	0	0	0	0	0	0	0
Mean	1.56	1.28	0.2	0	0.76	0	0.04	0	0.16
SD	1.499	1.28125	0.6325	0	1.105622	0	0.196	0	0.6119

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Mid-Depth (5 meters) Transect Number: 3

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	1	0	0	0	3	0	0	0	0
2	2	1	0	0	1	0	0	0	0
3	2	0	0	0	2	0	0	0	0
4	1	2	0	0	1	0	0	0	0
5	0	2	0	0	2	0	0	0	0
6	1	1	1	0	1	0	0	0	0
7	1	1	1	0	1	0	0	0	0
8	0	3	0	0	1	0	0	0	0
9	0	3	0	0	1	0	0	0	0
10	1	1	0	0	2	0	0	0	0
11	2	2	0	0	0	0	0	0	0
12	2	0	0	0	1	0	0	0	1
13	1	0	1	0	2	0	0	0	0
14	0	4	0	0	0	0	0	0	0
15	0	2	0	0	2	0	0	0	0
16	0	0	0	0	4	0	0	0	0
17	0	0	0	0	4	0	0	0	0
18	0	2	0	0	2	0	0	0	0
19	1	1	0	0	2	0	0	0	0
20	2	0	0	0	2	0	0	0	0
21	1	0	0	0	3	0	0	0	0
22	1	0	0	0	3	0	0	0	0
23	1	2	0	0	1	0	0	0	0
24	3	1	0	0	0	0	0	0	0
25	1	0	0	0	3	0	0	0	0
Mean	0.96	1.12	0.12	0	1.76	0	0	0	0.04
SD	0.824	1.14263	0.325	0	1.105622	0	0	0	0.196

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Mid-Depth (5 meters) Transect Number: 4

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	3	0	0	0	1	0	0	0	0
2	3	0	0	0	1	0	0	0	0
3	0	1	0	0	2	0	1	0	0
4	2	0	0	0	2	0	0	0	0
5	4	0	0	0	0	0	0	0	0
6	0	0	0	0	4	0	0	0	0
7	0	0	0	0	3	0	1	0	0
8	2	0	0	0	2	0	0	0	0
9	2	0	0	0	2	0	0	0	0
10	2	0	0	0	2	0	0	0	0
11	2	0	0	0	2	0	0	0	0
12	2	0	0	0	2	0	0	0	0
13	1	0	0	0	3	0	0	0	0
14	1	0	0	0	2	0	1	0	0
15	1	0	0	0	3	0	0	0	0
16	2	1	0	0	1	0	0	0	0
17	0	3	0	0	1	0	0	0	0
18	2	0	0	0	1	0	1	0	0
19	1	0	0	0	3	0	0	0	0
20	0	0	0	0	0	0	0	0	4
21	0	0	0	0	1	0	0	0	3
22	0	2	0	0	1	0	0	0	1
23	0	0	0	0	3	0	0	0	1
24	0	0	0	0	2	0	0	0	2
25	0	1	0	0	3	0	0	0	0
Mean	1.2	0.32	0	0	1.88	0	0.16	0	0.44
SD	1.166	0.73321	0	0	0.99277389	0	0.3666	0	1.0229

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Deep (10 meters) Transect Number: 1

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	1	3	0	0	0	0	0	0	0
2	0	4	0	0	0	0	0	0	0
3	0	1	0	0	1	0	2	0	0
4	0	4	0	0	0	0	0	0	0
5	0	3	0	0	1	0	0	0	0
6	0	2	0	0	2	0	0	0	0
7	0	0	4	0	0	0	0	0	0
8	0	1	3	0	0	0	0	0	0
9	0	1	1	0	1	0	1	0	0
10	0	0	0	0	4	0	0	0	0
11	0	2	0	0	1	0	1	0	0
12	0	2	0	0	2	0	0	0	0
13	0	2	0	0	2	0	0	0	0
14	0	3	0	0	1	0	0	0	0
15	0	0	0	0	4	0	0	0	0
16	0	0	0	0	4	0	0	0	0
17	0	0	0	0	4	0	0	0	0
18	0	2	0	0	2	0	0	0	0
19	0	1	0	0	3	0	0	0	0
20	0	2	0	0	1	0	1	0	0
21	0	1	0	0	2	0	1	0	0
22	0	1	0	0	2	0	1	0	0
23	0	1	0	0	3	0	0	0	0
24	0	2	0	0	2	0	0	0	0
25	0	1	0	0	3	0	0	0	0
Mean	0.04	1.56	0.32	0	1.8	0	0.28	0	0
SD	0.196	1.16893	0.9683	0	1.32664992	0	0.5307	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Deep (10 meters) Transect Number: 2

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	0	0	0	0	4
2	0	0	0	0	0	0	0	0	4
3	0	0	0	0	0	0	0	0	4
4	0	0	0	0	4	0	0	0	0
5	0	0	0	0	2	0	0	0	2
6	0	0	0	0	2	0	0	0	2
7	0	0	0	0	2	0	0	0	2
8	0	0	0	0	3	0	1	0	0
9	3	0	0	0	0	0	1	0	0
10	3	1	0	0	0	0	0	0	0
11	4	0	0	0	0	0	0	0	0
12	2	2	0	0	0	0	0	0	0
13	3	1	0	0	0	0	0	0	0
14	0	0	0	0	2	0	1	0	1
15	2	1	0	0	1	0	0	0	0
16	0	1	0	0	3	0	0	0	0
17	0	2	0	0	1	0	1	0	0
18	0	2	0	0	1	0	1	0	0
19	1	1	0	0	1	0	1	0	0
20	2	2	0	0	0	0	0	0	0
21	1	1	0	0	0	0	2	0	0
22	1	3	0	0	0	0	0	0	0
23	0	1	0	0	3	0	0	0	0
24	0	4	0	0	0	0	0	0	0
25	0	3	0	0	0	0	1	0	0
Mean	0.88	1	0	0	1	0	0.36	0	0.76
SD	1.243	1.13137	0	0	1.2328828	0	0.5571	0	1.3647

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Deep (10 meters) Transect Number: 3

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	1	0	0	3	0	0	0	0
2	0	2	0	0	2	0	0	0	0
3	0	1	0	0	3	0	0	0	0
4	0	0	0	0	4	0	0	0	0
5	0	1	0	0	2	0	1	0	0
6	3	1	0	0	0	0	0	0	0
7	0	1	0	0	3	0	0	0	0
8	0	2	1	0	1	0	0	0	0
9	0	1	2	0	0	0	1	0	0
10	0	2	0	0	1	0	1	0	0
11	0	1	1	0	1	0	1	0	0
12	0	1	0	0	3	0	0	0	0
13	0	2	0	0	1	0	1	0	0
14	3	1	0	0	0	0	0	0	0
15	0	2	2	0	0	0	0	0	0
16	0	4	0	0	0	0	0	0	0
17	0	2	1	0	1	0	0	0	0
18	0	2	0	0	2	0	0	0	0
19	0	3	0	0	0	0	1	0	0
20	0	1	0	0	3	0	0	0	0
21	0	2	1	0	1	0	0	0	0
22	3	1	0	0	0	0	0	0	0
23	0	0	0	0	2	0	2	0	0
24	0	2	0	0	0	0	2	0	0
25	0	2	0	0	1	1	0	0	0
Mean	0.36	1.52	0.32	0	1.36	0.04	0.4	0	0
SD	0.975	0.85417	0.6145	0	1.22898332	0.19596	0.6325	0	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo:
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Leloaloa Depth: Deep (10 meters) Transect Number: 4

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	3	0	0	0	1
2	0	0	0	0	3	0	0	0	1
3	0	1	0	0	2	0	0	0	1
4	0	0	0	0	1	0	0	0	3
5	0	1	0	0	2	0	0	0	1
6	0	1	0	0	1	0	0	0	2
7	0	2	0	0	1	0	0	0	1
8	0	0	0	0	4	0	0	0	0
9	0	0	0	0	4	0	0	0	0
10	0	1	0	0	2	0	0	0	1
11	0	1	0	0	1	0	0	0	2
12	0	0	0	0	2	0	0	0	2
13	0	0	0	0	3	0	0	0	1
14	0	0	0	0	2	0	0	0	2
15	1	0	0	0	3	0	0	0	0
16	0	0	0	0	4	0	0	0	0
17	0	0	0	0	2	0	0	0	2
18	0	1	0	0	1	0	0	0	2
19	1	2	0	0	1	0	0	0	0
20	0	3	0	0	1	0	0	0	0
21	0	1	0	0	3	0	0	0	0
22	0	0	0	0	4	0	0	0	0
23	0	0	0	0	3	0	0	0	1
24	0	2	0	0	1	0	0	0	1
25	0	0	0	0	4	0	0	0	0
Mean	0.08	0.64	0	0	2.32	0	0	0	0.96
SD	0.271	0.84285	0	0	1.12142766	0	0	0	0.8709

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Power Plant at Anua Depth: Mid-Depth (5 meters) Transect Number: 1

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	3	0	1	0	0
2	0	0	0	0	4	0	0	0	0
3	0	0	0	0	2	0	1	0	1
4	0	0	0	0	4	0	0	0	0
5	0	0	0	0	3	0	0	1	0
6	0	0	0	0	2	0	0	2	0
7	0	0	0	0	2	0	0	2	0
8	0	0	0	0	4	0	0	0	0
9	0	0	0	0	1	0	0	3	0
10	0	0	0	0	1	0	0	3	0
11	0	0	0	0	2	0	0	2	0
12	0	0	0	0	3	0	0	1	0
13	0	0	0	0	3	0	0	1	0
14	1	0	0	0	1	0	0	2	0
15	0	0	0	0	2	0	0	2	0
16	0	0	0	0	2	0	0	2	0
17	0	0	0	0	1	0	0	0	3
18	0	0	0	0	2	0	0	2	0
19	0	0	0	0	0	0	1	3	0
20	0	0	0	0	0	0	1	3	0
21	0	0	0	0	0	0	0	4	0
22	0	0	0	0	0	0	0	4	0
23	0	0	0	0	4	0	0	0	0
24	0	0	0	0	2	0	0	2	0
25	0	0	0	0	2	0	0	2	0
Mean	0.04	0	0	0	2	0	0.16	1.64	0.16
SD	0.196	0	0	0	1.26491106	0	0.3666	1.261	0.6119

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Power Plant at Anua Depth: Mid-Depth (5 meters) Transect Number: 2

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	4	0	0	0	0
2	0	0	0	0	4	0	0	0	0
3	0	0	0	0	4	0	0	0	0
4	0	0	0	0	4	0	0	0	0
5	0	0	0	0	4	0	0	0	0
6	0	0	0	0	4	0	0	0	0
7	0	0	0	0	2	0	0	2	0
8	0	0	0	0	0	0	0	4	0
9	0	0	0	0	2	0	0	2	0
10	0	0	0	0	2	0	0	2	0
11	0	0	0	0	0	0	0	4	0
12	0	0	0	0	3	0	0	1	0
13	0	0	0	0	4	0	0	0	0
14	0	0	0	0	4	0	0	0	0
15	0	0	0	0	4	0	0	0	0
16	0	0	0	0	0	0	0	2	2
17	0	0	0	0	4	0	0	0	0
18	0	0	0	0	2	0	0	0	2
19	0	0	0	0	1	0	0	3	0
20	0	0	0	0	2	0	0	2	0
21	0	0	0	0	3	0	0	1	0
22	0	0	0	0	2	0	0	1	1
23	0	0	0	0	1	0	0	3	0
24	0	0	0	0	4	0	0	0	0
25	0	0	0	0	2	0	0	1	1
Mean	0	0	0	0	2.64	0	0	1.12	0.24
SD	0	0	0	0	1.41081537	0	0	1.306	0.5851

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Power Plant at Anua Depth: Deep (10 meters) Transect Number: 1

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	4	0	0	0	0
2	0	0	0	0	4	0	0	0	0
3	0	0	0	0	4	0	0	0	0
4	0	0	0	0	4	0	0	0	0
5	0	0	0	0	4	0	0	0	0
6	0	0	0	0	4	0	0	0	0
7	0	0	0	0	4	0	0	0	0
8	0	0	0	0	2	0	0	2	0
9	0	0	0	0	4	0	0	0	0
10	0	0	0	0	3	0	0	1	0
11	0	0	0	0	1	0	0	3	0
12	0	0	0	0	4	0	0	0	0
13	0	0	0	0	4	0	0	0	0
14	0	0	0	0	4	0	0	0	0
15	0	0	0	0	4	0	0	0	0
16	0	0	0	0	4	0	0	0	0
17	0	0	0	0	4	0	0	0	0
18	0	0	0	0	4	0	0	0	0
19	0	0	0	0	4	0	0	0	0
20	0	0	0	0	4	0	0	0	0
21	0	0	0	0	4	0	0	0	0
22	0	0	0	0	1	0	0	3	0
23	0	0	0	0	4	0	0	0	0
24	0	0	0	0	4	0	0	0	0
25	0	0	0	0	1	0	0	3	0
Mean	0	0	0	0	3.52	0	0	0.48	0
SD	0	0	0	0	1	0	0	1.024	0

APPENDIX 1 (continued)

POINT TRANSECT DATA

Point Transect Data for three depths at four alternative sites at Pago Pago Harbor, American Samo
Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate number of times a substrate type was recorded.

Site: Power Plant at Anua Depth: Deep (10 meters) Transect Number: 2

Meter	Coral	Corallin e Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand
1	0	0	0	0	4	0	0	0	0
2	0	0	0	0	4	0	0	0	0
3	0	0	0	0	4	0	0	0	0
4	0	0	0	0	1	0	0	3	0
5	0	0	0	0	2	0	0	2	0
6	0	0	0	0	3	0	0	1	0
7	0	0	0	0	1	0	0	3	0
8	0	0	0	0	4	0	0	0	0
9	0	0	0	0	4	0	0	0	0
10	0	0	0	0	4	0	0	0	0
11	0	0	0	0	4	0	0	0	0
12	0	0	0	0	4	0	0	0	0
13	0	0	0	0	0	0	0	2	2
14	0	0	0	0	1	0	0	2	1
15	0	0	0	0	4	0	0	0	0
16	0	0	0	0	2	0	0	2	0
17	0	0	0	0	4	0	0	0	0
18	0	0	0	0	4	0	0	0	0
19	0	0	0	0	4	0	0	0	0
20	0	0	0	0	4	0	0	0	0
21	0	0	0	0	4	0	0	0	0
22	1	0	0	0	3	0	0	0	0
23	1	0	0	0	3	0	0	0	0
24	0	0	0	0	4	0	0	0	0
25	0	0	0	0	4	0	0	0	0
Mean	0.08	0	0	0	3.2	0	0	0.6	0.12
SD	0.271	0	0	0	1.2328828	0	0	1.02	0.4308

APPENDIX 2

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Shallow (1 meter) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	0	100	100
2	0	0	0	0	0	0	0	0	100	100
3	0	0	0	0	0	0	0	0	100	100
4	0	0	0	0	0	0	0	0	100	100
5	0	0	0	100	0	0	0	0	0	100
6	0	0	0	100	0	0	0	0	0	100
7	0	0	0	0	100	0	0	0	0	100
8	0	0	0	0	0	0	0	0	100	100
9	0	0	0	0	0	0	0	0	100	100
10	0	0	0	0	25	0	0	0	75	100
11	0	0	0	0	100	0	0	0	0	100
12	0	0	0	0	100	0	0	0	0	100
13	0	0	0	0	75	0	0	0	25	100
14	0	0	0	0	75	0	0	0	25	100
15	0	0	0	0	50	0	0	0	50	100
16	0	0	0	0	0	0	0	0	100	100
17	0	0	0	0	25	0	0	0	75	100
18	0	0	0	0	25	0	0	0	75	100
19	0	0	0	100	0	0	0	0	0	100
20	0	0	0	100	0	0	0	0	0	100
21	0	0	0	100	0	0	0	0	0	100
22	0	0	0	100	0	0	0	0	0	100
23	0	0	0	100	0	0	0	0	0	100
24	0	0	0	100	0	0	0	0	0	100
25	0	0	0	100	0	0	0	0	0	100
Percent Average	0	0	0	36	23	0	0	0	41	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Shallow (1 meter) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	75	0	0	0	25	100
2	0	0	50	0	0	0	0	0	50	100
3	0	0	0	0	100	0	0	0	0	100
4	0	0	0	0	0	0	0	0	100	100
5	0	0	0	0	0	0	0	0	100	100
6	0	0	0	0	0	0	0	0	100	100
7	0	0	0	0	75	0	0	0	25	100
8	0	0	0	100	0	0	0	0	0	100
9	0	0	0	100	0	0	0	0	0	100
10	0	0	0	0	0	0	0	0	100	100
11	0	0	0	0	0	0	0	0	100	100
12	0	0	0	0	50	0	0	0	50	100
13	50	0	0	0	50	0	0	0	0	100
14	0	0	0	0	0	0	0	0	100	100
15	0	0	0	0	25	0	0	0	75	100
16	0	0	75	0	0	0	0	0	25	100
17	0	0	0	0	50	0	0	0	50	100
18	0	0	0	0	100	0	0	0	0	100
19	0	0	0	0	50	0	0	0	50	100
20	0	0	0	0	100	0	0	0	0	100
21	0	0	0	0	100	0	0	0	0	100
22	0	0	0	0	100	0	0	0	0	100
23	0	0	0	0	100	0	0	0	0	100
24	0	0	0	0	0	0	0	0	100	100
25	0	0	0	0	50	0	0	0	50	100
Percent Average	2	0	5	8	41	0	0	0	44	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Shallow (1 meter) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	0	100	100
2	0	0	0	0	25	0	0	0	75	100
3	0	0	0	0	0	0	0	0	100	100
4	0	0	0	0	50	0	0	0	50	100
5	0	0	0	0	100	0	0	0	0	100
6	0	0	0	0	100	0	0	0	0	100
7	0	0	0	0	100	0	0	0	0	100
8	0	0	0	0	100	0	0	0	0	100
9	0	0	0	0	100	0	0	0	0	100
10	0	0	0	0	100	0	0	0	0	100
11	0	0	0	0	75	0	0	0	25	100
12	0	0	0	0	0	0	0	0	100	100
13	0	0	0	0	0	0	0	0	100	100
14	0	0	0	0	25	0	0	0	75	100
15	0	0	0	25	50	0	0	0	25	100
16	0	0	0	100	0	0	0	0	0	100
17	0	0	0	25	25	0	0	0	50	100
18	0	0	0	0	50	0	0	0	50	100
19	0	0	0	0	0	0	0	0	100	100
20	0	0	0	0	0	0	0	0	100	100
21	0	0	0	0	0	0	0	0	100	100
22	0	0	0	0	50	0	0	0	50	100
23	0	0	0	25	25	0	0	0	50	100
24	0	0	0	100	0	0	0	0	0	100
25	0	0	0	50	50	0	0	0	0	100
Percent Average	0	0	0	13	41	0	0	0	46	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Shallow (1 meter) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	0	100	100
2	0	0	25	75	0	0	0	0	0	100
3	0	0	0	100	0	0	0	0	0	100
4	0	0	0	100	0	0	0	0	0	100
5	0	0	25	25	0	0	0	0	50	100
6	0	0	0	0	0	0	0	0	100	100
7	0	0	0	0	0	0	0	0	100	100
8	0	0	0	25	25	0	0	0	50	100
9	0	0	0	100	0	0	0	0	0	100
10	0	0	0	100	0	0	0	0	0	100
11	0	0	0	75	0	0	0	0	25	100
12	0	0	0	100	0	0	0	0	0	100
13	0	0	0	100	0	0	0	0	0	100
14	0	0	0	100	0	0	0	0	0	100
15	0	0	0	100	0	0	0	0	0	100
16	0	0	0	50	0	0	0	0	50	100
17	0	0	0	50	0	0	0	0	50	100
18	0	0	0	25	0	0	0	0	75	100
19	0	0	0	75	0	0	0	0	25	100
20	0	0	0	100	0	0	0	0	0	100
21	0	0	0	50	0	0	0	0	50	100
22	0	0	0	0	0	0	0	0	100	100
23	0	0	0	0	0	0	0	0	100	100
24	0	0	0	0	0	0	0	0	100	100
25	0	0	0	0	0	0	0	0	100	100
Percent Average	0	0	2	54	1	0	0	0	43	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Mid-Depth (5 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	0	100	100
2	0	0	0	0	0	0	0	0	100	100
3	0	0	0	0	25	0	0	0	75	100
4	0	0	0	0	100	0	0	0	0	100
5	0	0	0	0	75	0	0	0	25	100
6	0	0	0	0	0	0	0	0	100	100
7	0	0	0	0	75	0	0	0	25	100
8	0	0	0	0	25	0	0	0	75	100
9	0	0	0	0	100	0	0	0	0	100
10	0	0	0	0	75	0	0	0	25	100
11	0	0	0	0	50	0	0	0	50	100
12	0	0	0	0	50	0	0	0	50	100
13	0	0	0	0	100	0	0	0	0	100
14	0	0	0	0	75	0	0	0	25	100
15	0	0	0	0	75	0	0	0	25	100
16	0	0	0	0	100	0	0	0	0	100
17	0	0	0	0	100	0	0	0	0	100
18	0	0	0	0	50	0	0	0	50	100
19	0	0	0	0	100	0	0	0	0	100
20	0	0	0	0	0	0	0	0	100	100
21	0	0	0	0	0	0	0	0	100	100
22	0	0	0	0	0	0	0	0	100	100
23	0	0	0	0	0	0	0	0	100	100
24	0	0	0	0	75	0	0	0	25	100
25	0	0	0	0	75	0	0	0	25	100
Percent Average	0	0	0	0	53	0	0	0	47	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Mid-Depth (5 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	100	0	0	0	0	100
2	0	0	0	0	100	0	0	0	0	100
3	0	0	0	0	25	0	0	75	0	100
4	0	0	0	0	75	0	0	25	0	100
5	0	0	0	0	50	0	0	50	0	100
6	0	0	0	0	75	0	0	25	0	100
7	0	0	0	0	75	0	0	25	0	100
8	0	0	0	0	100	0	0	0	0	100
9	0	0	0	0	100	0	0	0	0	100
10	0	0	0	0	75	0	0	0	25	100
11	0	0	0	0	50	0	0	0	50	100
12	0	0	0	0	50	0	0	0	50	100
13	0	0	0	0	100	0	0	0	0	100
14	0	0	0	0	100	0	0	0	0	100
15	0	0	0	0	100	0	0	0	0	100
16	0	0	0	0	100	0	0	0	0	100
17	0	0	0	0	100	0	0	0	0	100
18	0	0	0	0	100	0	0	0	0	100
19	0	0	0	0	100	0	0	0	0	100
20	0	0	0	0	100	0	0	0	0	100
21	0	0	0	0	100	0	0	0	0	100
22	0	0	0	0	100	0	0	0	0	100
23	0	0	0	0	100	0	0	0	0	100
24	0	0	0	0	100	0	0	0	0	100
25	0	0	0	0	100	0	0	0	0	100
Percent Average	0	0	0	0	87	0	0	8	5	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Mid-Depth (5 meters) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	100	0	0	0	0	100
2	0	0	0	0	75	0	0	25	0	100
3	0	0	0	0	75	0	0	25	0	100
4	0	0	0	0	50	0	0	50	0	100
5	0	0	0	0	50	0	0	50	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	100	0	0	0	0	100
11	0	0	0	0	100	0	0	0	0	100
12	0	0	0	0	75	0	0	25	0	100
13	0	0	0	0	100	0	0	0	0	100
14	0	0	0	0	75	0	0	25	0	100
15	0	0	0	0	100	0	0	0	0	100
16	0	0	0	0	100	0	0	0	0	100
17	0	0	0	0	100	0	0	0	0	100
18	0	0	0	0	100	0	0	0	0	100
19	0	0	0	0	100	0	0	0	0	100
20	0	0	0	0	100	0	0	0	0	100
21	0	0	0	0	100	0	0	0	0	100
22	0	0	0	0	100	0	0	0	0	100
23	0	0	0	0	100	0	0	0	0	100
24	0	0	0	0	50	0	0	50	0	100
25	0	0	0	0	100	0	0	0	0	100
Percent Average	0	0	0	0	74	0	0	26	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Mid-Depth (5 meters) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	25	0	0	75	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	0	0	50	0	0	50	0	100
4	0	0	0	0	50	0	0	50	0	100
5	0	0	0	0	100	0	0	0	0	100
6	0	0	0	0	100	0	0	0	0	100
7	0	0	0	0	75	0	0	25	0	100
8	0	0	0	0	100	0	0	0	0	100
9	0	0	0	0	100	0	0	0	0	100
10	0	0	0	0	100	0	0	0	0	100
11	0	0	0	0	100	0	0	0	0	100
12	0	0	0	0	100	0	0	0	0	100
13	0	0	0	0	100	0	0	0	0	100
14	0	0	0	0	100	0	0	0	0	100
15	0	0	0	0	25	0	0	0	75	100
16	0	0	0	0	100	0	0	0	0	100
17	0	0	0	0	100	0	0	0	0	100
18	0	0	0	0	100	0	0	0	0	100
19	0	0	0	0	100	0	0	0	0	100
20	0	0	0	0	0	0	0	0	100	100
21	0	0	0	0	75	0	0	25	0	100
22	0	0	25	0	75	0	0	0	0	100
23	0	25	25	0	50	0	0	0	0	100
24	0	0	0	0	100	0	0	0	0	100
25	0	0	0	0	100	0	0	0	0	100
Percent Average	0	1	2	0	77	0	0	13	7	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Deep (10 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	0	0	0	0	0	100	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	0	0	0	0	0	100	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	0	0	0	100	0	100
13	0	0	0	0	0	0	0	100	0	100
14	0	0	0	0	0	0	0	100	0	100
15	0	0	0	0	0	0	0	100	0	100
16	0	0	0	0	0	0	0	100	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	0	0	0	0	0	100	0	100
19	0	0	0	0	0	0	0	100	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	0	0	0	0	0	100	0	100
Percent Average	0	0	0	0	0	0	0	100	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Deep (10 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	0	0	0	0	0	100	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	0	0	0	0	0	100	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	0	0	0	100	0	100
13	0	0	0	0	0	0	0	100	0	100
14	0	0	0	0	0	0	0	100	0	100
15	0	0	0	0	0	0	0	100	0	100
16	0	0	0	0	0	0	0	100	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	0	0	0	0	0	100	0	100
19	0	0	0	0	0	0	0	100	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	0	0	0	0	0	100	0	100
Percent Average	0	0	0	0	0	0	0	100	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Deep (10 meters) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	0	0	0	0	0	100	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	0	0	0	0	0	100	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	0	0	0	100	0	100
13	0	0	0	0	0	0	0	100	0	100
14	0	0	0	0	0	0	0	100	0	100
15	0	0	0	0	0	0	0	100	0	100
16	0	0	0	0	0	0	0	100	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	0	0	0	0	0	100	0	100
19	0	0	0	0	0	0	0	100	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	0	0	0	0	0	100	0	100
Percent Average	0	0	0	0	0	0	0	100	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Anua Depth: Deep (10 meters) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	0	0	0	0	0	100	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	0	0	0	0	0	100	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	0	0	0	100	0	100
13	0	0	0	0	0	0	0	100	0	100
14	0	0	0	0	0	0	0	100	0	100
15	0	0	0	0	0	0	0	100	0	100
16	0	0	0	0	0	0	0	100	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	0	0	0	0	0	100	0	100
19	0	0	0	0	0	0	0	100	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	0	0	0	0	0	100	0	100
Percent Average	0	0	0	0	0	0	0	100	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Shallow (1 meter) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	0	100	100
2	0	0	25	0	25	0	0	0	50	100
3	25	0	75	0	0	0	0	0	0	100
4	25	0	25	0	0	0	0	0	50	100
5	25	0	25	0	50	0	0	0	0	100
6	0	0	50	0	0	0	0	0	50	100
7	0	0	0	0	25	0	0	0	75	100
8	0	0	25	0	25	0	0	0	50	100
9	0	0	50	0	0	0	0	0	50	100
10	0	0	0	0	50	0	0	0	50	100
11	0	0	50	0	0	0	0	0	50	100
12	0	0	0	0	25	0	0	0	75	100
13	0	0	25	0	0	0	0	0	75	100
14	0	0	0	100	0	0	0	0	0	100
15	0	0	0	100	0	0	0	0	0	100
16	0	0	0	100	0	0	0	0	0	100
17	0	0	0	100	0	0	0	0	0	100
18	0	0	100	0	0	0	0	0	0	100
19	0	0	0	100	0	0	0	0	0	100
20	0	0	0	100	0	0	0	0	0	100
21	0	0	75	25	0	0	0	0	0	100
22	25	0	25	50	0	0	0	0	0	100
23	75	0	0	0	0	0	0	0	25	100
24	50	0	0	25	0	0	0	0	25	100
25	0	0	0	100	0	0	0	0	0	100
Percent Average	9	0	22	32	8	0	0	0	29	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Shallow (1 meter) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	25	0	75	0	0	0	0	0	0	100
2	0	0	75	0	0	0	25	0	0	100
3	0	0	75	0	0	0	25	0	0	100
4	0	0	75	0	0	0	25	0	0	100
5	0	0	100	0	0	0	0	0	0	100
6	0	0	25	0	75	0	0	0	0	100
7	0	0	0	0	100	0	0	0	0	100
8	25	0	75	0	0	0	0	0	0	100
9	25	0	50	0	25	0	0	0	0	100
10	50	0	0	0	50	0	0	0	0	100
11	0	0	75	0	25	0	0	0	0	100
12	0	0	25	0	50	0	0	0	25	100
13	25	0	75	0	0	0	0	0	0	100
14	25	0	75	0	0	0	0	0	0	100
15	0	0	50	0	50	0	0	0	0	100
16	0	0	100	0	0	0	0	0	0	100
17	0	0	75	0	0	0	0	0	25	100
18	0	0	100	0	0	0	0	0	0	100
19	0	0	75	0	0	0	0	0	25	100
20	0	0	100	0	0	0	0	0	0	100
21	0	0	100	0	0	0	0	0	0	100
22	0	0	100	0	0	0	0	0	0	100
23	0	0	25	0	0	0	0	0	75	100
24	0	0	25	0	0	0	0	0	75	100
25	0	0	0	0	0	0	0	0	100	100
Percent Average	7	0	62	0	15	0	3	0	13	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Shallow (1 meter) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	0	100	100
2	0	0	50	0	0	0	0	0	50	100
3	0	0	75	0	0	0	0	0	25	100
4	0	0	25	0	25	0	0	0	25	100
5	50	0	0	0	0	0	25	0	25	100
6	25	0	25	0	0	0	25	0	25	100
7	25	0	0	0	0	0	0	0	75	100
8	0	0	100	0	0	0	0	0	0	100
9	0	0	75	0	0	0	0	0	25	100
10	50	0	50	0	0	0	0	0	0	100
11	25	0	50	0	0	0	25	0	0	100
12	0	0	75	0	0	0	0	0	25	100
13	0	0	100	0	0	0	0	0	0	100
14	0	0	75	0	0	0	0	0	25	100
15	0	0	75	0	0	0	25	0	0	100
16	0	0	100	0	0	0	0	0	0	100
17	50	0	50	0	0	0	0	0	0	100
18	0	0	100	0	0	0	0	0	0	100
19	0	0	100	0	0	0	0	0	0	100
20	0	0	100	0	0	0	0	0	0	100
21	0	0	100	0	0	0	25	0	0	100
22	0	0	75	0	0	0	25	0	0	100
23	0	0	0	0	0	0	25	0	75	100
24	0	0	50	0	0	0	50	0	0	100
25	0	0	75	0	0	0	25	0	0	100
Percent Average	9	0	61	0	1	0	10	0	19	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Shallow (1 meter) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	50	0	0	0	0	0	0	0	50	100
2	0	0	50	0	0	0	0	0	50	100
3	0	0	75	0	0	0	0	0	25	100
4	0	0	0	0	0	0	25	0	75	100
5	0	0	0	0	75	0	25	0	0	100
6	0	0	0	0	25	0	75	0	0	100
7	0	0	0	0	50	0	50	0	0	100
8	0	0	75	0	0	0	25	0	0	100
9	0	0	0	0	0	0	75	0	25	100
10	0	0	0	0	25	0	75	0	0	100
11	0	0	0	0	50	0	50	0	0	100
12	0	0	0	0	100	0	0	0	0	100
13	0	0	25	0	0	0	75	0	0	100
14	0	0	50	0	0	25	25	0	0	100
15	0	0	25	0	0	0	75	0	0	100
16	0	0	50	0	0	0	50	0	0	100
17	0	0	50	0	50	0	0	0	0	100
18	0	0	0	0	50	0	0	50	0	100
19	0	0	0	0	25	0	0	75	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	50	0	0	50	0	100
23	0	0	0	0	100	0	0	0	0	100
24	0	0	50	0	50	0	0	0	0	100
25	25	0	0	0	75	0	0	0	0	100
Percent Average	3	0	18	0	29	1	25	15	9	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Mid-Depth (5 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	100	0	0	0	0	0	0	0	0	100
2	100	0	0	0	0	0	0	0	0	100
3	100	0	0	0	0	0	0	0	0	100
4	0	0	0	0	0	0	0	0	100	100
5	0	0	0	0	75	0	0	0	25	100
6	0	0	25	0	25	0	0	0	50	100
7	0	0	25	0	0	0	0	0	75	100
8	0	0	100	0	0	0	0	0	0	100
9	0	0	50	0	0	0	0	0	50	100
10	0	0	0	0	0	0	0	0	100	100
11	0	0	0	0	0	0	0	0	100	100
12	0	0	75	0	0	0	0	0	25	100
13	0	0	50	0	0	0	0	0	50	100
14	0	0	25	0	0	0	0	0	75	100
15	0	0	0	0	100	0	0	0	0	100
16	0	0	75	0	25	0	0	0	0	100
17	0	0	100	0	0	0	0	0	0	100
18	0	0	100	0	0	0	0	0	0	100
19	0	0	100	0	0	0	0	0	0	100
20	0	0	0	0	0	0	0	0	100	100
21	0	0	0	25	0	0	0	0	75	100
22	0	0	0	100	0	0	0	0	0	100
23	0	0	0	100	0	0	0	0	0	100
24	0	0	0	100	0	0	0	0	0	100
25	0	0	0	100	0	0	0	0	0	100
Percent Average	12	0	29	17	9	0	0	0	33	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Mid-Depth (5 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	25	0	0	0	0	75	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	50	0	0	0	0	50	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	25	0	0	0	0	75	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	0	0	0	100	0	100
13	0	0	0	0	0	0	0	100	0	100
14	0	0	25	0	0	0	0	75	0	100
15	0	0	75	0	0	0	0	25	0	100
16	0	0	25	0	0	0	0	75	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	0	0	0	0	0	100	0	100
19	0	0	0	0	0	0	0	100	0	100
20	0	0	25	0	0	0	0	75	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	25	0	0	0	0	75	0	100
Percent Average	0	0	11	0	0	0	0	89	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Mid-Depth (5 meters) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	0	0	0	0	0	100	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	0	0	0	0	0	100	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	25	0	0	0	0	75	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	50	0	0	0	0	50	0	100
12	0	0	25	0	0	0	0	75	0	100
13	0	0	0	0	0	0	0	100	0	100
14	0	0	0	0	0	0	0	100	0	100
15	0	0	0	0	0	0	0	100	0	100
16	0	0	0	0	0	0	0	100	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	50	0	0	0	0	50	0	100
19	0	0	25	0	0	0	0	75	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	25	0	0	0	0	75	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	0	0	0	0	0	100	0	100
Percent Average	0	0	8	0	0	0	0	92	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Mid-Depth (5 meters) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	25	0	0	0	0	75	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	0	0	0	0	0	100	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	25	0	0	0	0	75	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	0	0	0	100	0	100
13	0	0	25	0	0	0	0	75	0	100
14	0	0	50	0	0	0	0	50	0	100
15	0	0	0	0	0	0	0	100	0	100
16	0	0	0	0	0	0	0	100	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	0	0	0	0	0	100	0	100
19	0	0	0	0	0	0	0	100	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	0	0	0	0	0	100	0	100
Percent Average	0	0	5	0	0	0	0	95	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Deep (10 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	0	0	0	0	0	100	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	0	0	0	0	0	100	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	0	0	0	100	0	100
13	0	0	0	0	0	0	0	100	0	100
14	0	0	0	0	0	0	0	100	0	100
15	0	0	0	0	0	0	0	100	0	100
16	0	0	0	0	0	0	0	100	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	0	0	0	0	0	100	0	100
19	0	0	0	0	0	0	0	100	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	0	0	0	0	0	100	0	100
Percent Average	0	0	0	0	0	0	0	100	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Deep (10 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	0	0	0	0	0	100	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	0	0	0	0	0	100	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	0	0	0	100	0	100
13	0	0	0	0	0	0	0	100	0	100
14	0	0	0	0	0	0	0	100	0	100
15	0	0	0	0	0	0	0	100	0	100
16	0	0	0	0	0	0	0	100	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	0	0	0	0	0	100	0	100
19	0	0	0	0	0	0	0	100	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	0	0	0	0	0	100	0	100
Percent Average	0	0	0	0	0	0	0	100	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Deep (10 meters) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	0	0	0	0	0	100	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	0	0	0	0	0	100	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	0	0	0	100	0	100
13	0	0	0	0	0	0	0	100	0	100
14	0	0	0	0	0	0	0	100	0	100
15	0	0	0	0	0	0	0	100	0	100
16	0	0	0	0	0	0	0	100	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	0	0	0	0	0	100	0	100
19	0	0	0	0	0	0	0	100	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	0	0	0	0	0	100	0	100
Percent Average	0	0	0	0	0	0	0	100	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Aua Depth: Deep (10 meters) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	100	0	100
2	0	0	0	0	0	0	0	100	0	100
3	0	0	0	0	0	0	0	100	0	100
4	0	0	0	0	0	0	0	100	0	100
5	0	0	0	0	0	0	0	100	0	100
6	0	0	0	0	0	0	0	100	0	100
7	0	0	0	0	0	0	0	100	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	0	0	0	100	0	100
10	0	0	0	0	0	0	0	100	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	0	0	0	100	0	100
13	0	0	0	0	0	0	0	100	0	100
14	0	0	0	0	0	0	0	100	0	100
15	0	0	0	0	0	0	0	100	0	100
16	0	0	0	0	0	0	0	100	0	100
17	0	0	0	0	0	0	0	100	0	100
18	0	0	0	0	0	0	0	100	0	100
19	0	0	0	0	0	0	0	100	0	100
20	0	0	0	0	0	0	0	100	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	0	0	0	100	0	100
24	0	0	0	0	0	0	0	100	0	100
25	0	0	0	0	0	0	0	100	0	100
Percent Average	0	0	0	0	0	0	0	100	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Shallow (1 meter) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	100	0	0	0	0	100
2	0	0	25	0	50	0	0	0	25	100
3	0	0	0	0	100	0	0	0	0	100
4	0	0	0	0	100	0	0	0	0	100
5	0	0	50	0	50	0	0	0	0	100
6	0	0	0	0	100	0	0	0	0	100
7	0	0	0	0	100	0	0	0	0	100
8	0	0	0	0	100	0	0	0	0	100
9	0	0	0	0	100	0	0	0	0	100
10	0	25	25	0	50	0	0	0	0	100
11	0	50	0	0	50	0	0	0	0	100
12	25	25	0	0	50	0	0	0	0	100
13	0	0	0	0	100	0	0	0	0	100
14	0	25	0	0	75	0	0	0	0	100
15	0	0	0	0	100	0	0	0	0	100
16	0	0	0	0	100	0	0	0	0	100
17	0	0	0	0	100	0	0	0	0	100
18	0	25	0	0	75	0	0	0	0	100
19	0	25	50	0	25	0	0	0	0	100
20	0	75	0	0	25	0	0	0	0	100
21	0	50	0	0	50	0	0	0	0	100
22	0	75	0	0	25	0	0	0	0	100
23	0	75	0	0	25	0	0	0	0	100
24	0	25	50	0	25	0	0	0	0	100
25	0	75	0	0	25	0	0	0	0	100
Percent Average	1	22	8	0	68	0	0	0	1	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Shallow (1 meter) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	25	25	0	50	0	0	0	0	100
2	0	50	25	0	25	0	0	0	0	100
3	0	0	75	0	25	0	0	0	0	100
4	0	50	25	0	25	0	0	0	0	100
5	0	25	75	0	0	0	0	0	0	100
6	0	75	25	0	0	0	0	0	0	100
7	0	50	50	0	0	0	0	0	0	100
8	0	50	25	0	25	0	0	0	0	100
9	0	50	25	0	25	0	0	0	0	100
10	0	75	25	0	0	0	0	0	0	100
11	0	50	50	0	0	0	0	0	0	100
12	0	25	50	0	25	0	0	0	0	100
13	0	50	25	0	25	0	0	0	0	100
14	0	25	50	0	0	0	0	0	25	100
15	0	25	25	0	0	0	0	0	50	100
16	0	25	50	0	0	0	0	0	25	100
17	0	25	25	0	0	0	0	0	50	100
18	0	100	0	0	0	0	0	0	0	100
19	0	50	0	0	25	0	0	0	25	100
20	0	25	0	0	50	0	0	0	25	100
21	0	25	0	0	50	0	0	0	25	100
22	0	50	0	0	0	0	0	0	50	100
23	25	0	50	0	25	0	0	0	0	100
24	0	50	0	0	25	0	0	0	25	100
25	0	25	0	0	50	0	0	0	25	100
Percent Average	1	40	28	0	18	0	0	0	13	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Shallow (1 meter) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	100	0	0	0	0	0	0	100
2	0	25	25	0	0	0	0	0	50	100
3	0	0	25	0	0	0	0	0	75	100
4	0	25	25	0	50	0	0	0	0	100
5	0	0	50	0	25	0	0	0	25	100
6	50	25	25	0	0	0	0	0	0	100
7	0	0	75	0	0	0	0	0	25	100
8	0	0	0	0	0	50	0	0	50	100
9	0	0	50	0	25	0	0	0	25	100
10	0	0	25	0	50	0	0	0	25	100
11	0	0	0	0	0	100	0	0	0	100
12	0	0	0	0	0	100	0	0	0	100
13	0	0	25	0	0	75	0	0	0	100
14	0	25	25	0	0	50	0	0	0	100
15	0	0	50	0	0	50	0	0	0	100
16	0	0	0	0	50	50	0	0	0	100
17	25	25	25	0	0	25	0	0	0	100
18	0	25	25	0	0	25	0	0	25	100
19	0	0	25	0	0	25	0	0	50	100
20	0	0	0	0	0	75	0	0	25	100
21	25	0	0	0	0	50	0	0	25	100
22	25	0	50	0	0	25	0	0	0	100
23	0	0	25	0	0	75	0	0	0	100
24	0	0	50	0	0	50	0	0	0	100
25	0	25	25	0	0	25	0	0	25	100
Percent Average	5	7	29	0	8	34	0	0	17	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Shallow (1 meter) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	25	75	0	0	0	100
2	0	50	25	0	25	0	0	0	0	100
3	0	0	0	0	50	50	0	0	0	100
4	0	0	75	0	0	25	0	0	0	100
5	0	0	25	0	50	25	0	0	0	100
6	0	25	50	0	0	25	0	0	0	100
7	0	25	0	0	0	0	0	0	75	100
8	0	25	0	0	0	0	0	0	75	100
9	0	0	75	0	0	0	0	0	25	100
10	0	0	25	0	50	0	0	0	25	100
11	0	0	0	0	75	0	0	0	25	100
12	0	50	25	0	25	0	0	0	0	100
13	0	25	0	0	50	0	0	0	25	100
14	0	0	0	0	100	0	0	0	0	100
15	0	0	50	0	50	0	0	0	0	100
16	0	0	25	0	75	0	0	0	0	100
17	0	25	50	0	25	0	0	0	0	100
18	0	100	0	0	0	0	0	0	0	100
19	0	50	0	0	50	0	0	0	0	100
20	0	50	0	0	50	0	0	0	0	100
21	0	50	25	0	0	0	25	0	0	100
22	0	25	0	0	25	0	0	0	50	100
23	0	25	0	0	50	0	0	0	25	100
24	0	0	25	0	75	0	0	0	0	100
25	0	0	0	0	100	0	0	0	0	100
Percent Average	0	21	19	0	38	8	1	0	13	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Mid-Depth (5 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	100	0	0	0	0	0	0	0	0	100
2	100	0	0	0	0	0	0	0	0	100
3	25	25	0	0	50	0	0	0	0	100
4	25	25	25	0	25	0	0	0	0	100
5	0	50	0	0	50	0	0	0	0	100
6	25	50	0	0	25	0	0	0	0	100
7	0	25	0	0	75	0	0	0	0	100
8	0	50	0	0	50	0	0	0	0	100
9	25	0	0	0	75	0	0	0	0	100
10	0	50	0	0	50	0	0	0	0	100
11	0	0	50	0	50	0	0	0	0	100
12	0	50	25	0	25	0	0	0	0	100
13	0	50	25	0	25	0	0	0	0	100
14	0	50	25	0	25	0	0	0	0	100
15	0	50	0	0	50	0	0	0	0	100
16	0	25	0	0	75	0	0	0	0	100
17	0	50	25	0	25	0	0	0	0	100
18	0	100	0	0	0	0	0	0	0	100
19	25	25	25	0	25	0	0	0	0	100
20	50	0	25	0	25	0	0	0	0	100
21	0	0	0	0	100	0	0	0	0	100
22	0	0	0	0	100	0	0	0	0	100
23	0	100	0	0	0	0	0	0	0	100
24	0	50	0	0	50	0	0	0	0	100
25	25	25	0	0	50	0	0	0	0	100
Percent Average	16	34	9	0	41	0	0	0	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Mid-Depth (5 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	100	0	0	0	0	0	0	0	0	100
2	100	0	0	0	0	0	0	0	0	100
3	100	0	0	0	0	0	0	0	0	100
4	50	0	25	0	25	0	0	0	0	100
5	0	25	0	0	0	0	0	0	75	100
6	75	25	0	0	0	0	0	0	0	100
7	50	0	0	0	25	0	0	0	25	100
8	0	0	0	0	100	0	0	0	0	100
9	0	75	0	0	25	0	0	0	0	100
10	75	0	0	0	25	0	0	0	0	100
11	0	0	0	0	100	0	0	0	0	100
12	100	0	0	0	0	0	0	0	0	100
13	75	25	0	0	0	0	0	0	0	100
14	50	25	0	0	25	0	0	0	0	100
15	50	25	0	0	25	0	0	0	0	100
16	0	25	75	0	0	0	0	0	0	100
17	0	50	25	0	25	0	0	0	0	100
18	0	100	0	0	0	0	0	0	0	100
19	0	100	0	0	0	0	0	0	0	100
20	25	75	0	0	0	0	0	0	0	100
21	25	25	0	0	50	0	0	0	0	100
22	0	75	0	0	25	0	0	0	0	100
23	0	50	0	0	25	0	25	0	0	100
24	50	50	0	0	0	0	0	0	0	100
25	50	50	0	0	0	0	0	0	0	100
Percent Average	39	32	5	0	19	0	1	0	4	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Mid-Depth (5 meters) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	25	0	0	0	75	0	0	0	0	100
2	50	25	0	0	25	0	0	0	0	100
3	50	0	0	0	50	0	0	0	0	100
4	25	50	0	0	25	0	0	0	0	100
5	0	50	0	0	50	0	0	0	0	100
6	25	25	25	0	25	0	0	0	0	100
7	25	25	25	0	25	0	0	0	0	100
8	0	75	0	0	25	0	0	0	0	100
9	0	75	0	0	25	0	0	0	0	100
10	25	25	0	0	50	0	0	0	0	100
11	50	50	0	0	0	0	0	0	0	100
12	50	0	0	0	25	0	0	0	25	100
13	25	0	25	0	50	0	0	0	0	100
14	0	100	0	0	0	0	0	0	0	100
15	0	50	0	0	50	0	0	0	0	100
16	0	0	0	0	100	0	0	0	0	100
17	0	0	0	0	100	0	0	0	0	100
18	0	50	0	0	50	0	0	0	0	100
19	25	25	0	0	50	0	0	0	0	100
20	50	0	0	0	50	0	0	0	0	100
21	25	0	0	0	75	0	0	0	0	100
22	25	0	0	0	75	0	0	0	0	100
23	25	50	0	0	25	0	0	0	0	100
24	75	25	0	0	0	0	0	0	0	100
25	25	0	0	0	75	0	0	0	0	100
Percent Average	24	28	3	0	44	0	0	0	1	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Mid-Depth (5 meters) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	75	0	0	0	25	0	0	0	0	100
2	75	0	0	0	25	0	0	0	0	100
3	0	25	0	0	50	0	25	0	0	100
4	50	0	0	0	50	0	0	0	0	100
5	100	0	0	0	0	0	0	0	0	100
6	0	0	0	0	100	0	0	0	0	100
7	0	0	0	0	75	0	25	0	0	100
8	50	0	0	0	50	0	0	0	0	100
9	50	0	0	0	50	0	0	0	0	100
10	50	0	0	0	50	0	0	0	0	100
11	50	0	0	0	50	0	0	0	0	100
12	50	0	0	0	50	0	0	0	0	100
13	25	0	0	0	75	0	0	0	0	100
14	25	0	0	0	50	0	25	0	0	100
15	25	0	0	0	75	0	0	0	0	100
16	50	25	0	0	25	0	0	0	0	100
17	0	75	0	0	25	0	0	0	0	100
18	50	0	0	0	25	0	25	0	0	100
19	25	0	0	0	75	0	0	0	0	100
20	0	0	0	0	0	0	0	0	100	100
21	0	0	0	0	25	0	0	0	75	100
22	0	50	0	0	25	0	0	0	25	100
23	0	0	0	0	75	0	0	0	25	100
24	0	0	0	0	50	0	0	0	50	100
25	0	25	0	0	75	0	0	0	0	100
Percent Average	30	8	0	0	47	0	4	0	11	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Deep (10 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	25	75	0	0	0	0	0	0	0	100
2	0	100	0	0	0	0	0	0	0	100
3	0	25	0	0	25	0	50	0	0	100
4	0	100	0	0	0	0	0	0	0	100
5	0	75	0	0	25	0	0	0	0	100
6	0	50	0	0	50	0	0	0	0	100
7	0	0	100	0	0	0	0	0	0	100
8	0	25	75	0	0	0	0	0	0	100
9	0	25	25	0	25	0	25	0	0	100
10	0	0	0	0	100	0	0	0	0	100
11	0	50	0	0	25	0	25	0	0	100
12	0	50	0	0	50	0	0	0	0	100
13	0	50	0	0	50	0	0	0	0	100
14	0	75	0	0	25	0	0	0	0	100
15	0	0	0	0	100	0	0	0	0	100
16	0	0	0	0	100	0	0	0	0	100
17	0	0	0	0	100	0	0	0	0	100
18	0	50	0	0	50	0	0	0	0	100
19	0	25	0	0	75	0	0	0	0	100
20	0	50	0	0	25	0	25	0	0	100
21	0	25	0	0	50	0	25	0	0	100
22	0	25	0	0	50	0	25	0	0	100
23	0	25	0	0	75	0	0	0	0	100
24	0	50	0	0	50	0	0	0	0	100
25	0	25	0	0	75	0	0	0	0	100
Percent Average	1	39	8	0	45	0	7	0	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Deep (10 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	0	0	0	0	100	100
2	0	0	0	0	0	0	0	0	100	100
3	0	0	0	0	0	0	0	0	100	100
4	0	0	0	0	100	0	0	0	0	100
5	0	0	0	0	50	0	0	0	50	100
6	0	0	0	0	50	0	0	0	50	100
7	0	0	0	0	50	0	0	0	50	100
8	0	0	0	0	75	0	25	0	0	100
9	75	0	0	0	0	0	25	0	0	100
10	75	25	0	0	0	0	0	0	0	100
11	100	0	0	0	0	0	0	0	0	100
12	50	50	0	0	0	0	0	0	0	100
13	75	25	0	0	0	0	0	0	0	100
14	0	0	0	0	50	0	25	0	25	100
15	50	25	0	0	25	0	0	0	0	100
16	0	25	0	0	75	0	0	0	0	100
17	0	50	0	0	25	0	25	0	0	100
18	0	50	0	0	25	0	25	0	0	100
19	25	25	0	0	25	0	25	0	0	100
20	50	50	0	0	0	0	0	0	0	100
21	25	25	0	0	0	0	50	0	0	100
22	25	75	0	0	0	0	0	0	0	100
23	0	25	0	0	75	0	0	0	0	100
24	0	100	0	0	0	0	0	0	0	100
25	0	75	0	0	0	0	25	0	0	100
Percent Average	22	25	0	0	25	0	9	0	19	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Deep (10 meters) Transect Number: 3

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	25	0	0	75	0	0	0	0	100
2	0	50	0	0	50	0	0	0	0	100
3	0	25	0	0	75	0	0	0	0	100
4	0	0	0	0	100	0	0	0	0	100
5	0	25	0	0	50	0	25	0	0	100
6	75	25	0	0	0	0	0	0	0	100
7	0	25	0	0	75	0	0	0	0	100
8	0	50	25	0	25	0	0	0	0	100
9	0	25	50	0	0	0	25	0	0	100
10	0	50	0	0	25	0	25	0	0	100
11	0	25	25	0	25	0	25	0	0	100
12	0	25	0	0	75	0	0	0	0	100
13	0	50	0	0	25	0	25	0	0	100
14	75	25	0	0	0	0	0	0	0	100
15	0	50	50	0	0	0	0	0	0	100
16	0	100	0	0	0	0	0	0	0	100
17	0	50	25	0	25	0	0	0	0	100
18	0	50	0	0	50	0	0	0	0	100
19	0	75	0	0	0	0	25	0	0	100
20	0	25	0	0	75	0	0	0	0	100
21	0	50	25	0	25	0	0	0	0	100
22	75	25	0	0	0	0	0	0	0	100
23	0	0	0	0	50	0	50	0	0	100
24	0	50	0	0	0	0	50	0	0	100
25	0	50	0	0	25	25	0	0	0	100
Percent Average	9	38	8	0	34	1	10	0	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Leloaloa Depth: Deep (10 meters) Transect Number: 4

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	75	0	0	0	25	100
2	0	0	0	0	75	0	0	0	25	100
3	0	25	0	0	50	0	0	0	25	100
4	0	0	0	0	25	0	0	0	75	100
5	0	25	0	0	50	0	0	0	25	100
6	0	25	0	0	25	0	0	0	50	100
7	0	50	0	0	25	0	0	0	25	100
8	0	0	0	0	100	0	0	0	0	100
9	0	0	0	0	100	0	0	0	0	100
10	0	25	0	0	50	0	0	0	25	100
11	0	25	0	0	25	0	0	0	50	100
12	0	0	0	0	50	0	0	0	50	100
13	0	0	0	0	75	0	0	0	25	100
14	0	0	0	0	50	0	0	0	50	100
15	25	0	0	0	75	0	0	0	0	100
16	0	0	0	0	100	0	0	0	0	100
17	0	0	0	0	50	0	0	0	50	100
18	0	25	0	0	25	0	0	0	50	100
19	25	50	0	0	25	0	0	0	0	100
20	0	75	0	0	25	0	0	0	0	100
21	0	25	0	0	75	0	0	0	0	100
22	0	0	0	0	100	0	0	0	0	100
23	0	0	0	0	75	0	0	0	25	100
24	0	50	0	0	25	0	0	0	25	100
25	0	0	0	0	100	0	0	0	0	100
Percent Average	2	16	0	0	58	0	0	0	24	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Power Plant at Anua Depth: Mid-Depth (5 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	75	0	25	0	0	100
2	0	0	0	0	100	0	0	0	0	100
3	0	0	0	0	50	0	25	0	25	100
4	0	0	0	0	100	0	0	0	0	100
5	0	0	0	0	75	0	0	25	0	100
6	0	0	0	0	50	0	0	50	0	100
7	0	0	0	0	50	0	0	50	0	100
8	0	0	0	0	100	0	0	0	0	100
9	0	0	0	0	25	0	0	75	0	100
10	0	0	0	0	25	0	0	75	0	100
11	0	0	0	0	50	0	0	50	0	100
12	0	0	0	0	75	0	0	25	0	100
13	0	0	0	0	75	0	0	25	0	100
14	25	0	0	0	25	0	0	50	0	100
15	0	0	0	0	50	0	0	50	0	100
16	0	0	0	0	50	0	0	50	0	100
17	0	0	0	0	25	0	0	0	75	100
18	0	0	0	0	50	0	0	50	0	100
19	0	0	0	0	0	0	25	75	0	100
20	0	0	0	0	0	0	25	75	0	100
21	0	0	0	0	0	0	0	100	0	100
22	0	0	0	0	0	0	0	100	0	100
23	0	0	0	0	100	0	0	0	0	100
24	0	0	0	0	50	0	0	50	0	100
25	0	0	0	0	50	0	0	50	0	100
Percent Average	1	0	0	0	50	0	4	41	4	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Power Plant at Anua Depth: Mid-Depth (5 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	100	0	0	0	0	100
2	0	0	0	0	100	0	0	0	0	100
3	0	0	0	0	100	0	0	0	0	100
4	0	0	0	0	100	0	0	0	0	100
5	0	0	0	0	100	0	0	0	0	100
6	0	0	0	0	100	0	0	0	0	100
7	0	0	0	0	50	0	0	50	0	100
8	0	0	0	0	0	0	0	100	0	100
9	0	0	0	0	50	0	0	50	0	100
10	0	0	0	0	50	0	0	50	0	100
11	0	0	0	0	0	0	0	100	0	100
12	0	0	0	0	75	0	0	25	0	100
13	0	0	0	0	100	0	0	0	0	100
14	0	0	0	0	100	0	0	0	0	100
15	0	0	0	0	100	0	0	0	0	100
16	0	0	0	0	0	0	0	50	50	100
17	0	0	0	0	100	0	0	0	0	100
18	0	0	0	0	50	0	0	0	50	100
19	0	0	0	0	25	0	0	75	0	100
20	0	0	0	0	50	0	0	50	0	100
21	0	0	0	0	75	0	0	25	0	100
22	0	0	0	0	50	0	0	25	25	100
23	0	0	0	0	25	0	0	75	0	100
24	0	0	0	0	100	0	0	0	0	100
25	0	0	0	0	50	0	0	25	25	100
Percent Average	0	0	0	0	66	0	0	28	6	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Power Plant at Anua Depth: Deep (10 meters) Transect Number: 1

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	100	0	0	0	0	100
2	0	0	0	0	100	0	0	0	0	100
3	0	0	0	0	100	0	0	0	0	100
4	0	0	0	0	100	0	0	0	0	100
5	0	0	0	0	100	0	0	0	0	100
6	0	0	0	0	100	0	0	0	0	100
7	0	0	0	0	100	0	0	0	0	100
8	0	0	0	0	50	0	0	50	0	100
9	0	0	0	0	100	0	0	0	0	100
10	0	0	0	0	75	0	0	25	0	100
11	0	0	0	0	25	0	0	75	0	100
12	0	0	0	0	100	0	0	0	0	100
13	0	0	0	0	100	0	0	0	0	100
14	0	0	0	0	100	0	0	0	0	100
15	0	0	0	0	100	0	0	0	0	100
16	0	0	0	0	100	0	0	0	0	100
17	0	0	0	0	100	0	0	0	0	100
18	0	0	0	0	100	0	0	0	0	100
19	0	0	0	0	100	0	0	0	0	100
20	0	0	0	0	100	0	0	0	0	100
21	0	0	0	0	100	0	0	0	0	100
22	0	0	0	0	25	0	0	75	0	100
23	0	0	0	0	100	0	0	0	0	100
24	0	0	0	0	100	0	0	0	0	100
25	0	0	0	0	25	0	0	75	0	100
Percent Average	0	0	0	0	88	0	0	12	0	100

APPENDIX 2 (continued)

PERCENT SUBSTRATE COVER

Percent Substrate Cover for three depths at four alternative sites at Pago Pago Harbor, American Samoa. Data were collected every 0.25 meter along a 25-meter transect line on February 25-27 and October 15-16, 2004. Figures indicate the percentage of time a substrate type was recorded.

Site: Power Plant at Anua Depth: Deep (10 meters) Transect Number: 2

Meter	Coral	Coralline Algae	Macro Algae	Sea Grass	Rubble/Rock	Pavement	Sponge	Mud	Sand	Total
1	0	0	0	0	100	0	0	0	0	100
2	0	0	0	0	100	0	0	0	0	100
3	0	0	0	0	100	0	0	0	0	100
4	0	0	0	0	25	0	0	75	0	100
5	0	0	0	0	50	0	0	50	0	100
6	0	0	0	0	75	0	0	25	0	100
7	0	0	0	0	25	0	0	75	0	100
8	0	0	0	0	100	0	0	0	0	100
9	0	0	0	0	100	0	0	0	0	100
10	0	0	0	0	100	0	0	0	0	100
11	0	0	0	0	100	0	0	0	0	100
12	0	0	0	0	100	0	0	0	0	100
13	0	0	0	0	0	0	0	50	50	100
14	0	0	0	0	25	0	0	50	25	100
15	0	0	0	0	100	0	0	0	0	100
16	0	0	0	0	50	0	0	50	0	100
17	0	0	0	0	100	0	0	0	0	100
18	0	0	0	0	100	0	0	0	0	100
19	0	0	0	0	100	0	0	0	0	100
20	0	0	0	0	100	0	0	0	0	100
21	0	0	0	0	100	0	0	0	0	100
22	25	0	0	0	75	0	0	0	0	100
23	25	0	0	0	75	0	0	0	0	100
24	0	0	0	0	100	0	0	0	0	100
25	0	0	0	0	100	0	0	0	0	100
Percent Average	2	0	0	0	80	0	0	15	3	100

APPENDIX 3. Photo sequence of alternative commercial dock facility sites at Anua, Aua, Leloaloa, and the Power Plant (Anua).

Alternative 1: Anua (West View)

Alternative 1: Anua (East View)

Alternative 2: Aua (East View)

Alternative 2: Aua (South View)

Alternative 3: Leloaloa (West view)

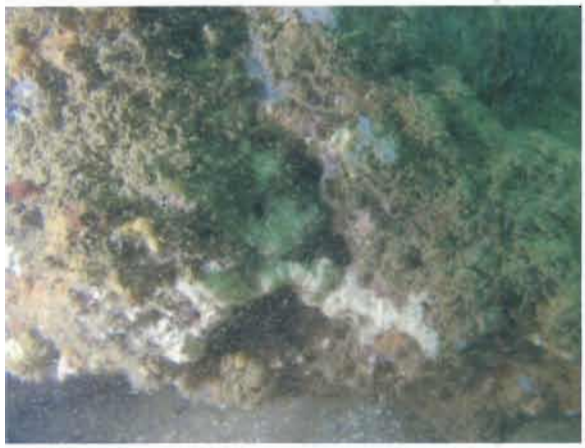
Alternative 3: Leloaloa (South View)

APPENDIX 3. (continued)

Alternative 4: Power Plant (Anua) (North View)

Alternative 4: Power Plant (Anua) (West View)

APPENDIX 4a. Photo sequence of the Pago Pago Harbor Area fronting the Anua Alternative

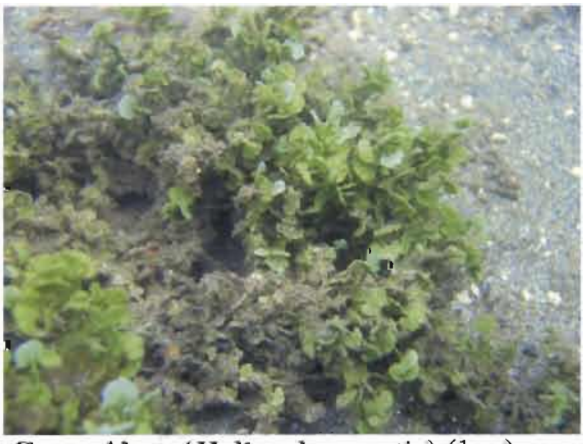

Invertebrate Community (10 m)


Benthic Substrate (10 m)


Benthic Substrate (5 m)


Hydroid (*Halichordyle disticha*)(5 m)


Sea grass (*Halophila ovalis*) (1 m)

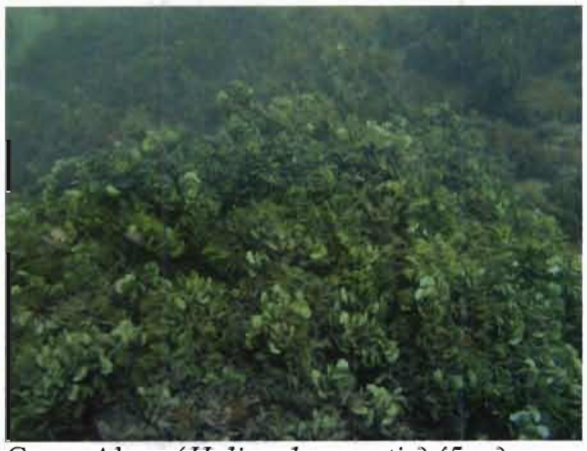

Green Algae (*Halimeda opuntia*) (1 m)

APPENDIX 4b. Photo sequence of the Pago Pago Harbor Area fronting the Aua Alternative

Benthic Substrate (10 m)

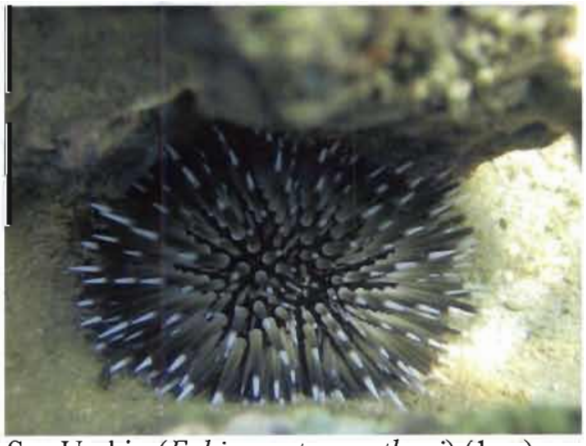
Benthic Substrate (10 m)

Sea Cucumber (*Holothuria hilla*) (5 m)



Green Algae (*Halimeda opuntia*) (5 m)

Sea grass (*Halophila ovalis*) (1 m)

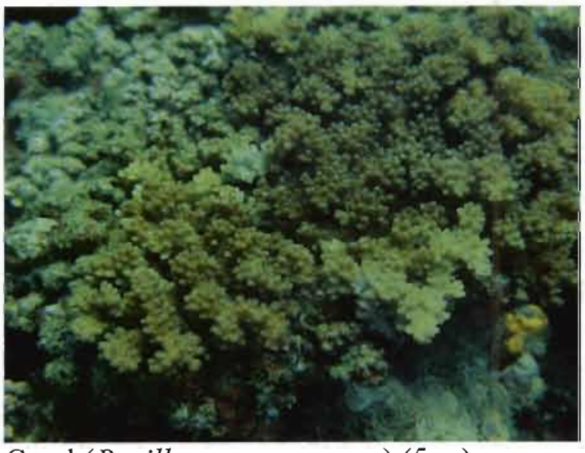


Sea Urchin (*Echinometra mathaei*) (1 m)

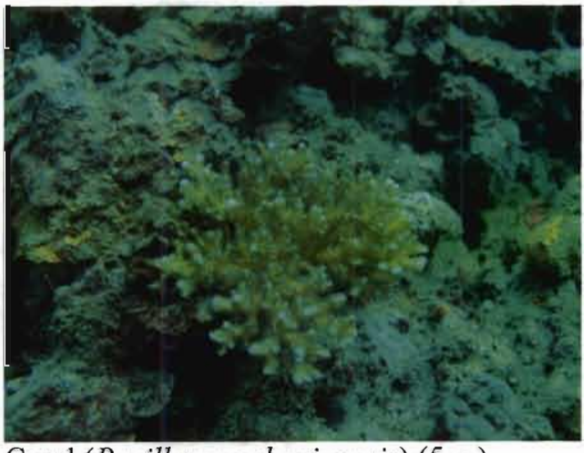
APPENDIX 4c. Photo sequence of the Pago Pago Harbor area fronting the Leloaloa Alternative

Coral (*Acropora digitifera*) (10 m)

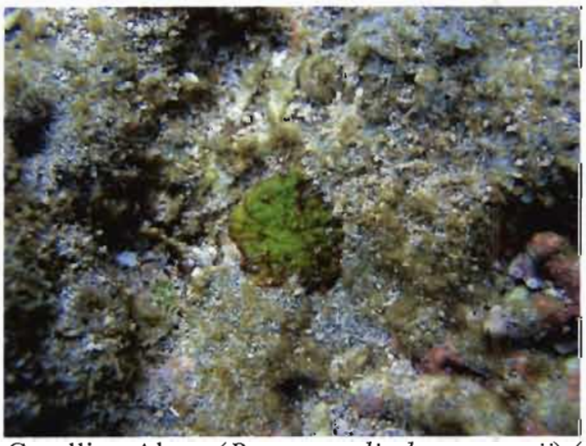
Coral (*Acropora insignis*) (10 m)



Coral (*Pocillopora verrucosa*) (5 m)



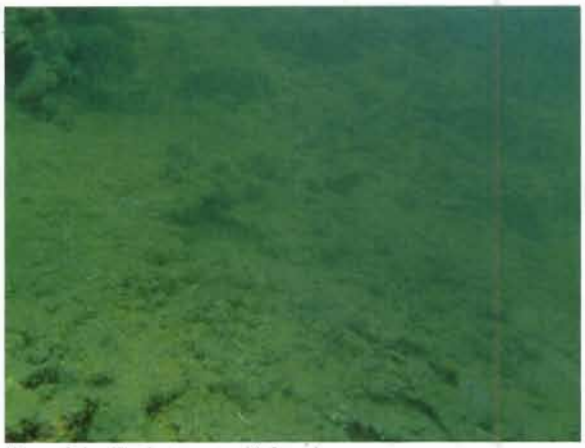
Coral (*Pocillopora damicornis*) (5 m)



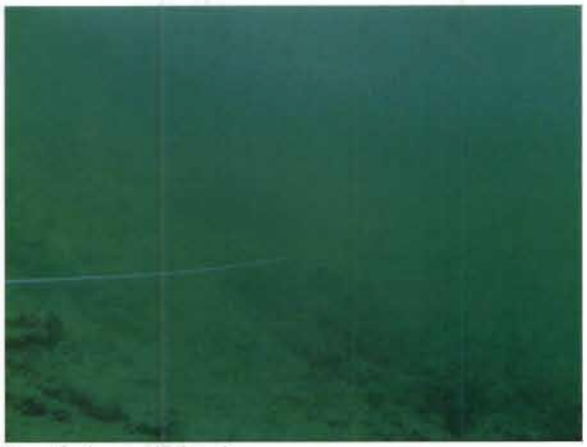
Coralline Algae (*Peyssonnelia boergesenii*) (1m)

Coral (*Porites lutea*) (1 m)

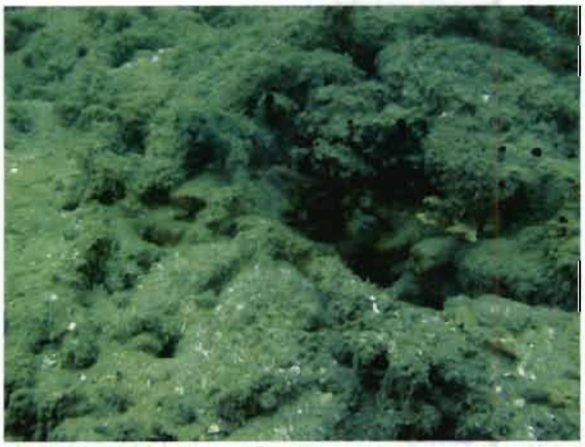
APPENDIX 4d. Photo sequence of the Pago Pago Harbor Area fronting the Power Plant at Anua Alternative



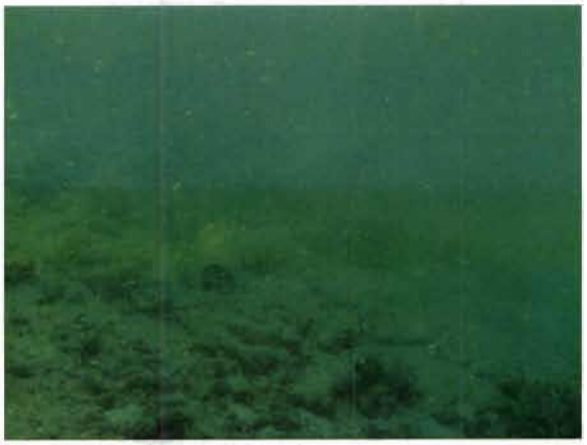
Benthic Substrate (10 m)



Reef slope (10 m)



Benthic Substrate (5 m)



Benthic Substrate (5 m)

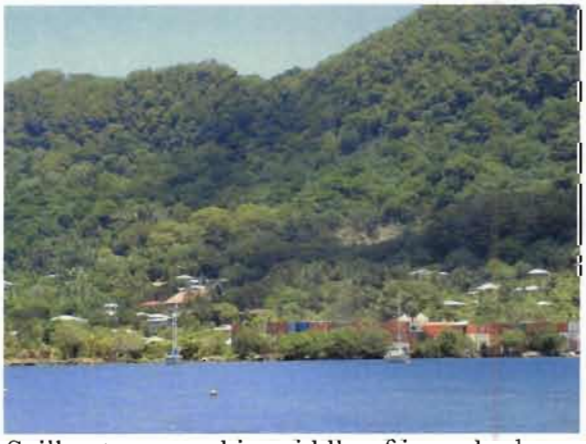
APPENDIX 5. Photo sequence of the sailboat anchorage at inner Pago Pago Harbor.

Sailboat moored near Power Plant

Sailboats moored near Anua Site

Sailboats moored in middle of inner harbor

Sailboat moored near the Anua Site



Sailboats moored in middle of inner harbor

Sailboat dock at Fagatogo (Southern Shore)