Fishies observed during the Tutuila Coastal Resources Inventory

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Prepared by:
Anne M. Orcutt
University of Hawaii
Sea Grant Extension Service

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I. Introduction

In 1991, the Director of the American Samoa Department of Marine and Wildlife Resources (DMWR) requested that the U.S. Army Corps of Engineers (ACE), Pacific Ocean Division, prepare an updated coastal resource atlas and inventory for the main island of Tutuila, American Samoa. This research would compliment a similar survey covering the entire territory (Tutuila, Manua, Ofu-Olosega, and Tau Islands) conducted in 1980 by an environmental consulting firm based in Hawaii (AECOS, 1980). Subsequently in 1992, at the request and support of the ACE, a coastal resource inventory of Tutuila, American Samoa, was completed by the University of Hawaii Sea Grant Extension Service (SGES) under authority of Planning Assistance to States (Section 22 of the Water Resources Development Act). Unlike the 1980 ASCRI, sufficient funding was only available to complete a resurvey of Tutuila, American Samoa’s main island. Henceforth, this process and report will be referred to as the Tutuila Coastal Resource Inventory (TCRI). This report is the companion volume to the Tutuila Coastal Resources Atlas currently in preparation. The SGES has also provided assistance previously to the inventory program for Pohnpei, Yap, and now Chuuk States in the Federated States of Micronesia, and also Kwajalein, Arno, and Majuro Atolls in the Republic of the Marshall Islands.

This report represents the results of semi-qualitative fish surveys conducted at forty (40) sites around the main island of Tutuila, American Samoa.

II. Purpose

The purpose of this report is to characterize the fish resources surrounding Tutuila with respect to ecological, subsistence, and economic importance. This information will be useful to both planners and managers of Samoa’s coastal resources.

III. Methods

Data for this report were obtained primarily from field surveys. Additionally, data from previous scientific investigations were also reviewed for supplemental information. Of particular usefulness was the ASCRI survey text (AECOS, 1980).

Dive survey sites were selected and geographically categorized into seven (7) study areas by the American Samoa Department of Marine and Wildlife personnel. Table 1 represents a listing of the individual dive sites surveyed within each area. The field survey was semi-qualitative in nature. Each dive was divided into two thirty (30) minute periods for censusing reef populations at the 60 and 20 foot contours. Unsafe weather and sea conditions, particularly at the 20 foot contour, occasionally caused the dive
team to shorten the survey time period. All surveys were preformed using snorkel and scuba gear. Access to each dive site varied. A small inflatable Avon boat launched from the shoreline was used for sites located off villages with bays or fringing reefs. In the absence of access to the shore by roads, the DMWR research vessel (7 name), was used to transport divers.

Using a clipboard with water proof paper, the author recorded fishes species and relative abundances based on the following scale: 1 = rare, 2-5 = common, 5-10 = abundant, and 10 or more = dominant. With species that tend to school, the number of schools observed and the approximate number of individuals within the school was recorded. In general, only larger, more conspicuous species were recorded while other small, cryptic or nocturnal species were only incidentally observed. Fish counts were generally made just ahead of the divers completing examinations of other reef components.

The TCRI fish surveys were completed by three individuals: Anne Orcutt, this report's author, Peter Craig, Chief Biologist, DMWR and Elia Henry, Fisheries Technician from DMWR. Twenty-nine sites were surveyed by the author while the other eleven other stations were completed by Peter Craig and Elia Henry (Table 1). Comparison of the data collected by these different investigators suggests that having different individuals perform the censuses introduced a source of variability.

IV. Literature Review

Information collected by previous investigators with a marine or coastal emphasis was also reviewed to supplement the field survey data. Literature searches were conducted at the Pacific Collection at Hamilton Library, University of Hawaii Manoa campus, and DMWR. Notable contributions were from the 1980 American Samoa Coastal Resource Inventory report by AECOS (1980). A resource management bibliography review of American Samoa was recently compiled (Knudsen et al., 1992), and the author does not attempt to duplicate this effort. Samoan spelling are taken from the U.S.G.S topographic map of Tutuila Island, American Samoa (Scale: 1:24,000). Samoan fish names are taken from the paper "An annotated checklist of the fishes of Samoa" (Wass, 1984).
<table>
<thead>
<tr>
<th>Area</th>
<th>Total # Fish Families</th>
<th>Total # Fish</th>
<th>Total # Fish observed at 20 foot contour</th>
<th>Total # Fish observed at 30 foot contour</th>
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<td>61</td>
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<td>51</td>
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<tr>
<td>Area D</td>
<td>15</td>
<td>50</td>
<td>35</td>
<td>40</td>
<td>PC</td>
</tr>
</tbody>
</table>

Note: No data was collected at 40 foot contour.
V. Geographic Area Descriptions of Fish Resources by Sites

The following descriptive narrative describes seven areas according to the geographic areas listed below:

1. Pago Pago Harbor
2. Breakers Point to Cape Matatula
3. Cape Matatula to Pola Rock
4. Pola Rock to Cape Taputimu
5. Cape Taputimu to Logologo Point
6. Logologo Point to Fogogogo
7. Fogogogo to Breakers Point

Each geographic area is reviewed according to the sites visited by the scientific team.

A. Pago Pago Harbor

This area includes only inner and outer Pago Pago Harbor. The outer western and eastern boundaries of Pago Pago Harbor’s mouth are Niuloa Point and Breakers Point, respectively. A total of five stations were surveyed and are described below.

1. Fagaalu

Fagaalu is located on the western side and outer mouth of Pago Pago Harbor. A surprisingly high and diverse fauna of at least 30 fish species inhabits the reef slopes here, representing at least 19 fish families. The most diverse families observed are Labridae (wrasses) with 13 species followed by Acanthuridae (surgeonfishes), Chaetodontidae (butterflyfishes) and Pomacentridae (damselfishes) with 11 species each. A fairly steep reef front slope descended to about 60 - 70 feet before a talus slope begins. Along the 60 foot contour, large patch reefs attracted fairly diverse fish assemblages including surgeonfishes (Acanthurus nigricans, A. xanthurus, and A. pyroferus), butterflyfishes (Chaetodon lunula, C. reticulatus, C. trifasciatus) and damselfishes (Chromis (omealas, Dascyllus aruanus). The damselfish Amblyglyphidodon leucogaster and the angel fish Centropyge bicolor occurred abundantly, while a large school of Cestio caerulea (fusiliers) passed through the area. In shallower waters, the diversity remained high with numerous wrasses observed (Bodianus axillaris, Epibulus insidiator, Gomphosus varius, Hemigymnus fasciatus, Thalassoma jucunicans). Several schools of juvenile Naso annulatus frequented the area while the surgeonfishes Acanthurus nigricans and A. lineatus are abundant.
2. Utulei

The marine survey followed a wall which dropped to 30-40 feet in depth from the top of the fringing reef flat margin. Below forty feet, the reef gently sloped deeper to 60 feet and beyond. A diverse fauna of at least 61 species inhabits the reef slopes off Utulei representing at least 23 families. The most diverse families observed are Chaetodontidae (butterflyfishes) and Labridae (wrasses) with 11 species each. A fairly steep reef front slope descended to about 40-60 feet before a talus slope begins. Along the deeper reef slope two surgeonfish species (Acanthurus jussimieri and Ctenochaetus striatus) and small groups of 20-30 individuals of the pyramidal butterflyfish, Hemitaurichthys polylepis are abundant. Schools of juvenile jacks (Caranx melampygus) migrated from shallow to deeper waters throughout the survey area. The diversity of wrasses was greater at the twenty foot contour (10 species) compared with the sixty foot contour (5 species). Snappers (Lutjanus buqa and L. gibbus) and small groupers (Epinephelus meta, F. tauvina, and Cephalopholis argus) were commonly observed at all depths.

3. Lololaloa

Underwater visibility is poor at this site (about 20 feet) due to silt-laden water. Fine particulate matter covering the coral reef slope was easily resuspended by divers moving through the area. Live reef growth ended at about the 30 foot contour. Below this depth, a talus, silt, and terrigenous slope continued to the Harbor’s floor.

Fish surveys were conducted above thirty feet. Fishes are not abundant nor is the fauna diverse. At least 50 species are present in low numbers. Most abundant are butterflyfishes (Chaetodontidae) with 9 species followed by surgeonfishes (Acanthuridae), wrasses (Labridae), and damselfishes (Pomacentridae) with 8 species each. The surgeonfishes Acanthurus nigricans, Ctenochaetus striatus, juvenile schooling of Naso lituratus, and N. lituratus were most abundant. Also abundant were juvenile schools of jacks (Caranx melampygus) and the butterflyfish Chaetodon auriga. Three goatfish species were observed commonly (Mullidium vanicolensis, Parupeneus bifasciatus and P. multifasciatus) while one species of angelfish (Centropyge flavissimus) was abundant despite silt conditions.

4. Aua

The front reef off Aua descends steeply from the reef flat margin to depths of 80-90 feet (AECOS, 1980). On the outer reef slope, visibility is about 20 feet, partly due to discharges from Aua stream. The fish assemblage along the reef front include at least 37 species, with the fauna most varied near the surface and along the sides. Fish
abundance decreases with depth. Most common are butterflyfishes (Chaetodontidae) and wrasses (Labridae) with 9 and 8 species respectively. A school of juvenile Caranx melampygus (jacks) darted through the area, while two angelfish species were common (Pomacanthus imperator and Pygoplites diacanthus).

5. Anasosopo

The sloping reef seaward of the reef margin is an areas of high turbidity. The fish assemblage along the reef front of Anasosopo includes at least 38 species, with the fauna most diverse near the surface. Fish abundance decreases with depth. Most abundant at the 60 foot contour was a school of Naso hexacanthus (unicornfish). Several groupers (Epinephelus sp., Cephalopholis argus and C. urodela), surgeonfishes (Acanthurus diademus, A. nigripinnis, A. xanthopterus, Naso annulatus and Zeacara cornutus), the damselfish Abudefduf saxatilis and the parrotfish, Scarus frenatus, also appeared commonly at the 60 foot contour. Schools of juvenile jacks (Caranx melampygus) roam through the area along the reef face.

Figure 1: represents the total number of fish species observed by depth (20' and 60') in Area 1.
B. Breakers Point to Cape Matatula

This area extends from Breakers Point, at the southwestern side of Pago Harbor, to Cape Matatula, Tutuila's eastern-most end of the island. A total of seven stations were surveyed and are described below.

1. Lauliiutai

Fishes are moderately abundant on the reef front off Lauliiutai. The family Labridae (wrasses) dominate an assemblage representing at least 18 fish families and 78 species. Wrasses are represented by 18 species at both the 20 and 60 foot contours. Acanthuridae (surgeonfishes) and Chaetodontidae (butterflyfishes) follow in diversity with nine and seven species respectively. At the 60 foot contour, a school of Acanthurus blochii was observed while numerous other surgeonfishes (A. guttatus, A. lineatus, A. nigricans, A. olivaceus, A. xanthurus, and Zanclus cornutus) and unicornfishes (juvenile Naso annulatus) occurred commonly at both the 20 and 60 foot contours. There is good diversity within families. For instance, snappers (Lutjanidae) have five species (Aphareus furca, Lutjanus bohar, L. gibbus, L. monostigma, and Macolor niger) and groupers have 4 species (Epinephelus sp. E. hexagonatus, Cephalopholis argus, and C. urodelta).

2. Fagatua Village

The outer reef is characterized by a fairly diverse fish fauna with at least 74 species and 20 families present. Most diverse families include Labridae (wrasses), Acanthuridae (surgeonfishes), Pomacentridae (damselfishes) and Chaetodontidae (butterflyfishes) with 14, 10, 9 and 8 species dominated the assemblage although several species occurred abundantly including Acanthurus lineatus (surgeonfish) at the 20 foot contour, and Monotaxis granuloculis (lethrinid) and Apherus furca (snapper) at the 60 foot contour. Juvenile recruits of goatfishes (Mulloidichthys vanicolensis and Parupeneus multifasciatus) and surgeonfishes (Naso annulatus) were commonly observed. Butterflyfishes occurred at all depths with the ubiquitous school of pyramid butterflyfish (Hemiraurelia polyepis) occurring near the 60 foot contour. Unlike other stations, a pod of dolphins moved through Fagatua Bay throughout the duration of the scientists work.
3. Alofau

There is a generally steep sloping reef front off Alofau. Village descending to a sand bottom at about 100 feet. Fishes are moderately abundant and the fauna diverse on the reef front. The fish assemblage includes at least 81 species representing 21 fish families. The most diverse family was Labridae (wrasses) with 15 species observed followed by Pomacentridae (damselfishes), Acanthuridae (surgeonfishes), and Chaetodontidae (butterflyfishes) with 10, 9, and 8 species respectively. Large numbers of damselfishes (Chromis margaritifer, C. xanthera, Plectrophthalmus dickii, and P. lacrymatus) together with surgeonfishes, (Acanthurus achilles, A. lineatus, A. nigricans, A. olivaceus, and juvenile schools of Naso annulatus), and butterflyfishes (Chaetodon pelewensis, C. reticulatus, C. unimaculatus, and Humia richthys polylepis), are common on the reef slope. The snapper Acheilurus forsteri was abundant while other snappers occurred commonly (Apoon virescens, Lutjanus fulvus, L. gibbus, and L. kasmira). Several parrotfishes (Scarus ovicpes, S. globiceps, and S. sordidus) and groupers (Plectopomus aerolatus, Epinephelus merra, and Caranxplus argus) were also common on the reef.

4. Amouli

The fish assemblage off Amouli is quite diverse with at least 83 species observed representing over 20 fish families. Labridae (wrasses) appeared to be the most diverse family represented by 15 species followed by Pomacentridae (damselfishes), Acanthuridae (surgeonfishes), and Chaetodontidae (butterflyfishes) with 12, 10, and 8 species respectively. A small school of Scomberoides lusian (approximately 18 individuals) passed through the survey area. Two species of snappers were abundant, Lutjanus gibbus and L. kasmira, followed by Aphaeropus forer, L. bohar, and Macolor niger which were observed commonly. A solitary eagle ray (Aetobatus narinari) was also observed. Two species of monoline breams were observed commonly (Scolopsis margaritifer and S. trilineatus) as were several species of parrotfishes (Scarus sordidus, S. ovicpes, and Cetoscarus bicolor).

5. Auasi

A spur and groove system fronts the southeast end of Auasi Village. Fishes are fairly diverse on the reef front off Auasi Village. The assemblage includes over 15 families representing at least 81 species. The most diverse families are Acanthuridae (surgeonfishes) with 13 species observed followed by Pomacentridae (damselfishes) and Labridae (wrasses) with 11 species each. Other common species include parrotfishes (Cetoscarus sandwicensis, Cetoscarus bicolor, Scarus sordidus, S. ghobban, S. globiceps, S. ovicpes, and S. rubriolicaus) and the butterflyfishes...
(Chaetodon reticulatus, C. unimaculatus Forcipiger longirostris, Heniochus varius, and Hemipterus polyepis). Several goatfishes occurred commonly (Mulliodes flavolineatus, Parupeneus bifasciatus, P. cyclostomus) as did two groupers, Cephalopholis argus and C. urodetes. A school of fusilier (Caesio teres) passed through the survey area.

6. Aunuu (west)

At this station only the 60 foot contour was surveyed. At least 57 species are present representing a relatively diverse assemblage of 18 fish families. Pomacentridae (damsel fishes) is the most diverse family observed with at least 11 species followed by Acanthuridae (surgeonfishes) with 10 species and Chaetodontidae (butterflyfishes) with at least 8 species observed. Small, but abundant aggregations of the damselfish Chromis xanthona occurred with less common occurrences of the anemonefish Amphiprion chrysopterus. The goatfish, Mulliodes vanicolensis, was abundant as were a school of Pterocaesio ilee (fusiliers) which passed through the survey area. The angelfishes Centropyge bicolor, C. bispinosus, and C. flavissimus, and Pygopistes diacanthus occurred commonly as did the parrotfishes Scarus oviceps and S. sordidus, and the groupers Cephalopholis argus and C. urodetes.

7. Aunuu (south)

The assemblage at Aunuu (south) includes at least 35 species at the 60 foot contour representing at least 15 families. Although the diversity was low, the most abundant families are Acanthuridae (surgeon fishes) with 8 species observed followed by Balistidae (triggerfish) and Labridae (wrasses) with 6 species each. The high diversity of triggerfish is notable with Balistus undulatus, Melichthys niger, M. vidua, Rhinecanthus rectangulatus, R. aculeatus, and Sufflamen freraetus occurring commonly. Unlike other areas, butterlyfishes were only represented by 2 species while the surgeonfish Acanthurus striatus dominated this strong surge area. The surgeonfishes Acanthurus nigricans and Naso lituratus were abundant while other species were common (Zebrasoma veliferum, Acanthurus olivaceus, and A. lineatus). Other common species include the wrasses Coris garmani, Somphus varius, Halichoeres hortulanus, Thalassoma lutescens, T. hardwickei.
Figure 2. represents the total number of fish species observed by depth (20° and 60°) in Area 2.

C. Cape Matatula to Pola Rock

This area extends from Cape Matatula, Tutuila’s eastern-most end of the island, to Pola Rock along the north coast. A total of eight stations were surveyed and are described below.

1. Onenoa

The fringing reef is about 350 feet wide off Onenoa Village. The area opens into a gently sloping reef front of spurs and grooves that shelters a diverse and moderately abundant fish fauna. The assemblage includes at least 79 species, representing 19 families. Of these, Labridae (wrasses) is the most abundant family with 16 species observed followed by Acanthuridae (surgeonfish) with 10 species and Lutjanidae and Pomacentridae (damselsh) with 7 species each. Several surgeonfishes were abundantly observed.
including Acanthurus lineatus, A. nigricans, and Ctenochaetus striatus at the 20 foot contour. Naso lituratus were abundant at the 60 foot contour. A large school of balistid triggerfish (Melichthys vidua) was also observed in shallow waters while several groups of large lethrinids (Monotaxis grandoculis) hovered above the reef slope below 60 feet. Snappers were commonly encountered (Aphareus furca, Aprior viridescens, Lutjanus bohar, L. gibbus, L. kasmira, L. monostigma, and L. sanguineus) while damselfishes (Chromis margaritifer, Plectrolyphidodon dickii, Chrysiptera caeruleolineatus and C. laucopoma), and butterflies (Chaetodon pulchellus, C. punctatofasciatus, and C. utimaculatus) were also common. A single porcupinefish (Diodon hystrix) and napoleon wrasse (Cheilinus undulatus) were also encountered.

2. Aoa Bay

An extensive reef buttress system extending from shore occurs off Aoa Village where a narrow fringing reef opens into a wide-mouth bay. At least 77 species are present with representatives from over 20 families. At about a three foot water depth, a vertical wall with some relief dropped to about 20 - 25 feet where a well-developed coral buttress system began and extended seaward. Wrasses (Labridae) were the most diverse family with 12 species, followed by Acanthuridae (surgeonfish) with 9 species and Serranidae (groupers) and Chaetodontidae (butterflyfishes) with 8 species each. Closely associated with the coral structure are surgeon fishes (Acanthurus lineatus, A. mata, A. nigricans, A. pyroferus and Ctenochaetus striatus), and wrasses of the genus Thalassoma. Several larger fish species occur common such as Lutianus bohar, L. gibbus, and L. monostigma (snappers), Cephalopholis argus, C. leopardus, and Variola louti (groupers), and schools of Melichthys vidua (balistid triggerfish). A ubiquitous school of pyramid butterfly fishes (Hemitaurichthys polylepis) also occurred.

On a sand flat at the bottom of one of these buttresses in about 100 feet of water, the author and Elia Henry observed two very large and aggressive trigger fish (Balistoides viridescens) quickly swimming in fast circles. Additionally, about 100 meters away from these two individuals, the author observed a large grouper (Plectropomus sp??) approximately 1.5-2 meters in length, hovering motionless above the sand.

3. Masausi

An abundant and relatively diverse fish assemblage inhabit the upper reef front off Masausi village. The assemblage at Masausi includes at least 86 species representing at least 22 families. Within this high diversity area, the most abundant families are Labridae (wrasses) with 15 species observed followed by Acanthuridae (surgeonfishes) with 13 species and Pomacentridae (damselfishes) with 12 species observed. No one labrid genus was abundant although many species were common including
Gymnophorus varius, Halichoeres hortulanus, Hemigymnus fasciatus, Labroides dimidiatus, Macropharyngodon meleagris, Pseudocheilinus octabantius, Stethojulis bandangensis, Thalassoma luteoventrum, and T. quinquenemestum. Damsel fish are also common, with Abudefduf saxatilis, Chromis ambogynus, C. caerulea, C. margaritifera, C. xanthura, Dascyllus aruanus, Chrystipera leucopsoma, and Plectoglyphidiodon dicki being especially numerous. Snappers of at least 7 species are common (Lpriacanthus viridescens, L. luidens, L. trius, L. gibbus, L. monostigma, and Macloida nigra). Adults are more abundant in the deeper depths and juveniles are more common near the reef margin. The yellow angelfish Centropyge flavispilus was particularly abundant at deeper depths.

4. Masefau

In general the reef flat affords little cover for fishes and abundance is low. The reef front, however, is a steep slope of consolidated limestone. Spur-and-groove formations are well formed along the outer reef front of Masefau Bay. At least 60 species are present, with at least 23 families represented with low to moderate diversity. Among the dominant species are the Acanthurids (surgeonfishes), Labridae (wrasses) and Chaetodontidae (butterflyfishes). Parrotfishes of at least three species are common including Scarus schlegeli, Cetoscarus bicolour, and juvenile Scarus spp. As expected, the pyramid butterfly fish (Hemitaurichthys polylepis) is abundant at the 60 foot contour. Several schools of larger fish commonly passed through the area including Scarus frenatus (southern end of reef only). Scolopsis tulear, and Kuphus cinaeascens. Unlike other sites, sweeptips (Plectryphonchus orientalis) of various sizes were common. Adults are more abundant in the deeper depths and juveniles are more common near the reef margin. Several groupers species were common (Cephalopholis argus and Epinephelus fuscus) while other species were rare (Cephalopholis leonardus and Veriola patula).

5. Afono

The diversity of fish is high along the reef front. A total of 52 species were observed representing 17 different families. Forty-seven species were observed at the 60 foot contour while only 18 species were observed at the 20 foot contour. The dominant families are Chaetodontidae (butterflyfishes) with 14 species observed and Acanthuridae (surgeonfishes) with only 7 species observed. A variety of butterflyfishes are common at all depths, although no single species is dominant. Species observed include Chaetodon auriga, C. brevis, C. ephippium, C. lineatus, C. luteoventralis, Hemitaurichthys acuminatus, and Forcipiger longirostris. Several schools of Hemitaurichthys polylepis (pyramid butterflyfishes) were encountered. Other common fishes are the surgeonfishes (Acanthurus lineatus, A. nigricans, A. pyrfischer, A. xanthopterus and the
unicornfishes, *Naso hexacanthus* and *Naso lituratus*, damselfishes ( Chromis margaritifer, C. xanthur, and Chrysiptera leucopoma) and two angel fishes (Centropyge bicolor and C. flavissimus). Two species of anemonefish, Amphiprion chrysopterus and A. melanopus, were also commonly observed amongst the coral rubble.

6. Vatia Bay

This Bay appeared to be severely damaged from the 1992 typhoon. At 60 feet below, the scientific team saw evidence of the storm’s power which had turned a fairly productive coral reef into large stretches of coral rubble (Elia Henry, Per. comm.). Interspersed among the rubble are living, robust hard coral heads. Along the northern Bay at about 80 feet, a terraced wall with some coral relief was observed. Surprisingly, the ASCRI (1980) report indicates much of Vatia Bay was rubble during the 1980 survey suggesting the Bay exhibited a recovery and growth period during the last ten years (1980-1992).

Although fishes are not particularly abundant, the fauna is diverse along the reef front along the eastern margin of Vatia Bay. This assemblage includes at least 40 species representing 17 families with butterflyfishes (Chaetodontidae) being the most abundant. Perhaps due to the lack of coral cover and associated habitat for hiding area, the fish diversity appeared low compared to other areas. Chaetodontids (butterflyfish) exhibited the highest diversity with 10 species, followed by surgeonfishes with 8 species. The deep water pyramid butterflyfish (*Hemitaurichthys polylepis*) was abundant in aggregations of 20 individuals while other butterfly fishes were only commonly encountered (*Chaetodon ocellatus*, C. ornatus, *C. rafaeli*, C. reticulatus, C. unimaculatus, *Heniochus erythrostomus*, and *H. monoceros*). Schools of *Lutjanus fulvus* (snapper) and the monocle bream *Scopelos margaritifer* appeared commonly.

7. Vatia Bay (North)

Sixty species were observed with 16 families dominating the assemblage with Labridae being the most diverse family observed with 14 species. 14 species observed and Acanthuridae (surgeonfishes) with only 7 species observed. Two large schools of fusiliers *Caesio teres* and *Pterocaesio tile* passed through the area as did a several *Scomberoides lyan* (mackerel soild). Damselfish are also common, with *Plectrolyphidodon pavo* and *P. lacrymatus* being especially numerous. *Scarus oridus* and *S. rubroviolaceus* are the most conspicuous parrotfishes. One sweeetlips (*Plectrohynchus orientalis*) was also observed along the 60 foot drop-off. Midwater fishes observed included *Gnathanodon rudolphi* (lethrind) and the more solitary snappers (*Aphanurus furca*, *Macolor niger*, and *M. maculatus*). Several small snapper schools were observed of *Lutjanus gibbus*, *L. kohar*, and *Azlron viriscans*.
Figure 3. represents the total number of fish species observed by depth (20' and 60') in Area 3.

**D. Pola Rock to Cape Taputimu**

This area extends from Pola Rock along the north coast to Cape Taputimu, Tutuila’s western-most end of the island. A total of seven stations were surveyed and are described below.

1. **Pola Rock**

At least 61 species are present with representatives from over 17 families. This surge-swept area is dominated by acanthurids (surgeonfish) and chaetodontids (butterfly fishes). At least 10 surgeon fishes were encountered including *Acanthurus nigricans* and *Ctenochaetus striatus* in abundant numbers; while *A. lineatus*, *A. olivaceus*, and the unicornfish *Naso lituratus* occurred commonly. A diverse assemblage of butterfly fishes was noted, although none where abundant except within localized schools of the
Solitary manta ray (Mobulidae). Five species of parrotfishes (Cetoscarus bicolor, Scarus sordidus, S. globiceps, S. ovatus, S. rubrocinctus), two species of groupers (Cephalopholis argus and Variola louti), and three snappers (Aphareus furca, Lutjanus fulvus, and L. bohar) occurred commonly. An anemonefish, Amphiprion melanopus, occupied small assemblages of several individuals each while large aggregations of the damselfish Chromis chromis occurred abundantly. Several Plectorhynchus orientalis (sweetlips) were also observed.

2. Agapie Cove

The assemblage at Agapie Cove includes at least 67 species representing at least 17 families. Within this location, the most abundant families were Acanthuridae (surgeonfishes) and Chaetodontidae (butterflyfishes) with 11 species observed each followed by Labridae (wrasses) with 13 species observed. The surgeonfishes Acanthurus achilles and Ctenochromis stratus were abundant while 8 other species were common. The diversity of butterflyfishes was moderate with no single species being dominant. Observed at this site were Chaetodon trifasciatus, C. iridula, C. vagabundus, and Hemitaurichthys thompsoni. These butterflyfish were observed at less than one third of all the TCRI stations. Hovering midwater were several lethrinids, Gnathodentex aureolineatus and Monotaxis gregoculmis and several solitary Lethrinus harak. Five species of snappers (Lutjanidae) were observed including small groups of Lutjanus bohar, L. gibbus, and L. fulvus. Pyramid butterflyfish (Hemitaurichthys polylepis) schools hovered in deeper water while schools of Kyphosus cinerascens moved between shallow and deeper depths as did large aggregations of juvenile Carangoides melamobbatus. As with other northern stations, the sweetlips Plectorhynchus orientalis was common. The diversity of balistid triggerfish was high with 5 species being observed. The triggerfish Melichthys vidua appeared in abundant numbers.

3. Fagasa Bay

A moderately diverse fish assemblage inhabit the upper reef front off Fagasa Village. Most abundant of at least fifteen families and 51 species are Acanthuridae (surgeonfishes) with eleven species followed by Chaetodontidae (butterflyfishes) with 10 species. In shallow water, Acanthurus lineatus (lined surgeonfish) were abundant while Acanthurus guttatus, A. nigricans, A. nigrofus, A. pyroferus, A. thompsoni, N. literratus, Zancus cornutus and Z. veliferum were common. Juvenile unicornfish Naso annulatus were also abundant in several schools of 30-50 individuals each. The butterflyfish Chaetodon rivulatus was abundant in shallow water while nine other species were common including aggregations of Hemitaurichthys polylepis, the pyramid butterflyfish. Although much less abundant three snappers (Aphareus furca, Lutjanus fulvus, and L. monostigma) and four goatfishes including a big school of Mullidae
pyramid butterflyfish (*Hemitaurichthys polylepis*). Schools of the fusiliers *Caesio teres* and the rudderfish *Kyphosus cinctascens* passed through the survey area as did a solitary manta ray (*Mobula*). Five species of parrotfishes (*Cetoscarus sicylor*, *Sparus sagitta*, *S. olivaceus*, *S. viridiceps*, *S. rubrovulaceus*), two species of groupers (*Cephalopholis kropadus* and *Vaniola louti*), and three snappers (*Acanthias furca*, *Lutjanus fulvus*, and *L. bohar*) occurred commonly. An anemonefish, *Amphiprion melanopus*, occupied small assemblages of several individuals each while large aggregations of the damselfish *Chrysiptera crozieri* occurred abundantly. Several *Plectrachys orientalis* (sweetlips) were also observed.

2. Agapie Cove

The assemblage at Agapie Cove includes at least 67 species representing at least 17 families. Within this location, the most abundant families were Acanthuridae (surgeonfishes) and Chaetodontidae (butterflyfishes) with 11 species observed each followed by Labridae (wrasses) with 10 species observed. The surgeonfishes *Acanthurus achilles* and *Chirnmena truncatus* were abundant while 8 other species were common. The diversity of butterflyfishes was moderate with no single species being dominant. Observed at this site were *Chaetodon trifasciatus*, *C. loricula*, *C. vagabundus*, and *Hemitaurichthys thompsoni*. These butterflyfish were observed at less than one third of all the TCRI stations. Hovering midwater were several lethrinids, *Gnathodentex aureolineatus* and *Monotaxis grandoculis* and several solitary *Lethrinus harak*. Five species of snappers (*Lutjanidae*) were observed including small groups of *Lutjanus bohar*, *L. gibbus*, and *L. fulvus*. Pyramid butterflyfish (*Hemitaurichthys polylepis*) schools hovered in deeper water while schools of *Kyphosus cinctascens* moved between shallow and deeper depths as did large aggregations of juvenile *Caranx melampygus*. As with other northern stations, the sweetlips *Plectrachys orientalis* was common. The diversity of balistid triggerfish was high with 5 species being observed. The triggerfish *Melichthys vidua* appeared in abundant numbers.

3. Fagasa Bay

A moderately diverse fish assemblage inhabit the upper reef front off Fagasa Village. Most abundant of at least fifteen, families and 51 species are Acanthuridae (surgeonfishes) with eleven species followed by Chaetodontidae (butterflyfishes) with 10 species. In shallow water, *Acanthurus lineatus* (lined surgeonfish) were abundant while *Acanthurus guttatus*, *A. nigricans*, *A. doris*, *A. pyroferus*, *A. thompsoni*, *N. lituratus*, *Zanclus cornutus* and *Z. veliferum* were common. Juvenilia unicornfish *Naso annulatus* were also abundant in several schools of 30-50 individuals each. The butterflyfish *Chaetodon reticulatus* was abundant in shallow water while nine other species were common including aggregations of *Hemitaurichthys polylepis*, the pyramid
butterflyfish. Although much less abundant three snappers (Aphanes furca, Lutjanus fulvus, and L. monostigma) and four goatfishes including a big school of Mullidae vanicolensis are common. Wrasses are present with Bodianus avilia, Coris cairjari, Labroides bicolor, Pseudocheilinus octotenia, Stethojulis bandanensis, Thalassoma purpureum and I. hardwickei being common. A school of Kyphosus sp. passed through the survey area while a large aggregation of Melichthys vidua triggerfish hovered above the deeper reef slope. Several colorful clown triggerfish, Balistoides conspicillum inhabited this reef as well.

4. Aasu (Massacre Bay)

High bottom relief on the reef front provide habitat for a diverse fish assemblage. At least 55 species are recorded from 19 different families. Wrasses, surgeonfishes, and butterflyfishes are the best represented families. Although not abundant, 12 species of wrasses and 9 butterflyfish species were encountered. Several species of the genus Thalassoma were common, while Halichoeres hortulanus was abundant at the 20 foot contour. No butterflyfish was dominant although the ubiquitous group of Hemitarichthys polylepis (pyramid butterflyfish) occurred in deeper waters. The common surgeonfish species were Acanthurus guttatus, A. mata, A. nigricans, A. pyroferus, Naso lituratus, N. hexacanthus, and the morish idol Zanclus cornutus with Ctenochaetus striatus being most abundant. Several species of parrotfish (Scarus spp.) and snappers were common. The lutjanid Apherus furca occurred in abundant numbers while Lutjanus bohar, L. fulvus, L. monostigma, and Macolor niger were common at all depths. Mackerel scad (Scromberoides mazara) moved through the area while Monotaxis grandoculis, a lethrinid, appeared in small groups. The groupers Cephalopholis argus, C. leopardus, and Promicrops lanceolatus also occurred throughout the reef slope.

5. Fagamalo

Seaward of the fringing reef, coral knolls rise 10 feet above a boulder and rubble bottom at depths of 25 to 40 feet. Flanking the western and eastern sides of Fagamalo Bay is a steeply-sloping, sometimes irregular bottom of consolidated limestone. At least 87 species compose the highly diverse fish assemblage representing over 24 families. Wrasses are represented by at least 19 species followed by surgeonfishes with at least 11 species. Of the wrasses, Stethojulis bandanensis was abundant while several species were rarely encountered (Hemigymnus fasciatus, Novaculichthys teaniopus, Sordanus saifaris, and Cheilinus unifasciatus). Other common wrasses included Gomphosus varius, Halichoeres hortulanus, Labroides bicolor, Pseudocheilinus octotenia, and Thalassoma hardwickei. The surgeonfish genus Acanthurus was most common with Acanthurus nigricauda being most abundant. A solitary trumpetfish
(Aulostomus chinensis) was observed. A high number of angelfish (Pomacanthidae) species were present including the genus Centropyge and Pygoplites diacanthus. Schools and local aggregations of the fusiliers Pterocaesio tia, juvenile jacks (Caranx melampygus) and pyramid butterflyfishes (Hemitaurichthys polylepis) were commonly located along the reef slope. The snapper Macolor niger appeared abundantly with other less common species such as Lutjanus fulvus, L. bohar, and L. gibbus. Larger fish commonly observed included parrotfishes (Scarus spp.) and groupers (Serranidae).

6. Malacca

At least 76 species are present with representatives from over 19 families. Wrasses are the dominant family followed by surgeonfishes and butterflyfishes. No one labrid genus was abundant although many species were common including Bodianus axillaris, Cheilinus unifasciatus, Coris gaimard, Epibulus insidiator, Halichoerus horutulus, Hemigymnus fasciatus, Labroides dimidiatus, Macrophthalmus melas, Microcebus lacteolus, and Thalassoma lutescens, and T. quinquenotatum. The acanthids Naso lituratus and Acanthurus nigricans appeared abundant while other species were only common (Acanthurus aequalis, A. dussumieri, A. lineatus, A. olivaceus, and juvenile Naso annulatus). The snapper Macolor niger was abundant as was the lethrinid Monopterus grandoculis. Other commonly noted fish were a school of Caesio caerulaurea (fusiliers), damselfishes (Chromis bimaculata, C. maculifrons, Dascyllus trimaculatus, and Plectropomus discus), parrotfishes (Scarus torquius, and S. freya), and butterflyfishes (Chetodon auriga, C. lunula, C. ornata, C. olivaceus, C. nuchalis, C. unimaculatus, C. vagabundus, and Forcipiger longirostris).

7. Poras Bay

Fish are moderately abundant and the fauna diverse on the reef slope. At least 75 species are present representing over 20 families. Wrasses are the most diverse family with 16 species followed by 5 species of surgeonfishes. Several wrasses were regularly encountered (Aneroplys caeruleopunctatus, the napoleon wrasse (Cheilinus undulatus), C. fasciatus, C. oxycephalus, Hemigymnus fasciatus, and Labroides dimidiatus). Other common wrasses included Cephalopholis varius, Halichoerus horutulus, Labroides dimidiatus, Pseudocirrhites octacrinus, and Thalassoma lutescens. Less conspicuous species include hawkfishes (Cirrhitidae), gobies (Gobiidae), squirrelfishes (Holocentridae), and darters (Microstomidae). Schools of numerous individuals of Scolopsis trilineatus (monocole brean) and Scomberoides lyea (mackerel scad) were common. A diverse assemblage of triggerfishes (Balistidae), parrotfishes (Scarus spp.) and groupers (Serranidae) were observed.
Figure 4. represents the total number of fish species observed by depth (20' and 60') in Area 4.

Area 4.

No. of fish species observed by depth

E. Cape Taputima to Logologo Point

This area extends from the western-most end of Tutuila at Cape Taputima to Logologo Point along Tutuila's southwestern coastline. A total of five marine stations were surveyed and are described below.

1. Amanave

The fringing reef slope descends at almost a 90 degree angle from the reef margin. This wall begins at about 10 feet and descends to a sand bottom in depths over 100 feet. At least 20 families are represented within the 78 species observed. The diversity was highest at the 60 foot contour accounting for 87 percent of the total number of species observed at this station. Butterflyfishes (Chaetodontidae), damselfishes
A moderately diverse fish assemblage inhabit the upper reef front off Afao village. Most abundant of at least seventeen families and 54 species are Acanthuridae (surgeonfishes) with nine species followed by Pomacentridae (damsel fishes) with 7 species. The blue-lined surgeonfish (Acanthurus lineatus) dominated shallow waters, with Ctenochaetus striatus being slightly less abundant in deeper waters. Seven other surgeonfishes were common including Acanthurus nigricans, A. guttatus, and Naso hexacanthus. The wrasse Chromis margaritifer was abundant while six other species were only commonly encountered. Several large individuals of the jack Caranx melampygus and the sweetlip Plectorhinchus orientalis, and the monochrome Monotaxis grandoculis were observed. A very large aggregation of several hundred individuals of Mullidae vanicolensis dominated the reef slope. Several wrasses (Cheilinus triobatus, Thalassoma cuprureum and T. quinquemaculatum), snappers (Anisops virescens, Lutjanus bohar, L. fulvus, L. gibbus), and the genus Scarus spp. (parrotfishes) were common. Groupers composed a diverse assemblage with five species being present (Epinephelus hexacanthus, E. merra, E. tawina, Cephalopholis argus, C. urodeta).
3. Assil Point

The diversity of the fish community increases again with depth. The reef possesses a well-developed coral community, providing numerous habitats for over 18 fish families and at least 70 fish species. The two families of Chaetodontidae (butterflyfishes) and Labridae (wrasses) were the most diverse with eleven species each followed by Acanthuridae (surgeonfishes) with nine species. Ten species of butterflyfish were observed with no species being abundant. Common species include Chaetodon auriga, C. lunula, C. pelvelensis, C. reticulatus, and Psecuiper longirostris. Likewise, wrasses occurred commonly throughout the reef. Acanthiids are well represented on the reef with the blue-lined surgeonfish (Acanthurus lineatus) occurring commonly in shallower waters. Amongst the coral reef, anemone fishes (Amphiprion clarkii and A. melanopus) and groups of pyramid butterfly fishes (Hemitaurichthys polylepis) appeared commonly and throughout the reef. Predator species including the emperor bream (Monotaxis grandoculis), snapper (Macolor niger), and several species of groupers (Cephalopholis argus, C. urodeta, and Variola louti) swim close to the reef structure. Rudderdish (Kypsis cinereascens) and foraging parrotfishes (Scarus sordidus, S. rubroviolaceus, Cetoscarus holocephalus, and Calotomus sandvicensis) cruised through the area. A group of fusilier (Caesio arenaria) and small barracuda (Sphyraena (aristei) passed quickly through the area.

4. Niua veve Rock

Fishes are abundant along the reef front. At least 77 species are represented by 19 fish families. Dominant families are wrasses (Pomacentridae), surgeon fishes (Acanthuridae), and butterflyfishes (Chaetodontidae). Wrasses exhibited the highest diversity with at least 16 commonly species observed followed by surgeonfishes with eleven species. Juvenile Naso annulatus and adult Acanthurus literatus (surgeonfishes) were abundant while Acanthurus gittatus, A. nigriclips, and Naso lituratus were most common. The goatfish Mullolidae vanicolensis tended to congregate in large schools, while other goatfishes (Parageneus bifasciatus and P. multifasciatus) appeared in smaller groups or as individuals. The butterfly fishes Chaetodon omenesimus and C. reticulatus are common while the damselfishes Chromis marginata, C. xanther, Dascyllus trimaculatus, and Plectrolyphiododon jaccymus are abundant. A large trumpetfish (Aulostomus chinensis) was conspicuous on the deeper reef front. Nocturnal fishes such as squirrel fishes (Myripristis spp.) hovered underneath coral overhangs and small caves as did bronze sweepers (Parapriphes quadriens). Predator species including the emperor bream (Gnathanotus cinereus), snappers (Lutjanus bohar, L. fulvus, L. zithus, Macolor niger), and several species of groupers (Cephalopholis argus, C. urodeta, and Variola louti) swam close to the reef structure. A solitary school of Caesio arenaria (fusilier) swam throughout the area.
Figure 5. represents the total number of fish species observed by depth (20' and 60') in Area 5.

### F. Logologo Point to Fogagogo

This area extends from Logologo Point to Fogagogo along Tutulla's southwestern coastline. A total of four stations were surveyed and are described below.

1. Avaola

Only the sixty foot contour was surveyed at this location where at least 40 species are present within 14 families. Among these species, each exhibited low to moderate diversity. Among the dominant species are the Labridae (wrasses), Acanthurids (surgeonfishes), and Chaetodontidae (butterflyfishes). Wrasse species such as Cheilinus undulatus, C. diacromus, Coris gaimard, Epibulus insidiator, and Halichoeres
hortulanus occurred commonly. Ctenochaetus striatus was the dominant surgeon fish species observed of the seven present. Acanthurus nigricans was abundant while A. olivaceus, Naso lituratus, and Zebrasoma veliferum appeared commonly. A large school of pyramid butterflyfish Hemitaurichthys polylepis dominated the chaetodontids while others were common (Chaetodon unluca, C. pulcher, C. reticulatus, and Heniochus chrysogonatus). Nocturnal squirrel fishes (Myripristis spp.) hovered underneath coral overhangs and small caves. Several predatory fish were observed including Cithara melampygus (jack), Cephalopholis maculata (grouper) and the snappers Macolor maculatus, and Lutjanus bohar.

2. Fagatele Bay

In April 1985, Fagatele Bay was designated as a National Marine Sanctuary through a partnership program with the American Samoa Government and the U.S. Office of Coastal Resources Management. As such, Fagatele Bay has been fortunate to have an ongoing coral reef monitoring program, and may be considered one of the most studied reef systems in American Samoa. A series of permanent transect stations were established in 1985 by scientist from the University of Guam (Birkeland et al., 1987). These transects have been surveyed in 1985, 1988, and a third survey is scheduled for mid-1994. This data provides good baseline comparison over time, while the TCRI data provides only a highly qualitative "snap-shot" of the Bay's fish populations at a specific time.

The "snap-shot" picture presented by the ASCRI indicates that Fagatele Bay's fish fauna continues to be relatively diverse after the 1992 typhoon. The assemblage includes at least 91 species and 21 fish families of which wrasses (Labridae) were most abundant. Labridae exhibited the highest diversity with 18 species, followed by damselfishes (Pomacentridae) with 12 species and surgeon fishes (Acanthuridae) and butterflyfishes (Chaetodontidae) with 10 species each. The most abundant wrasses were Halichoeres hortulanus and Gomphosus varius while Coris axylia, Epibulus insidiator, Labroides dimidiatus, Pseudochelinus octotaenia, Thalassoma lutescens, and T. maculatus were most common. Amphiprion chrysopterus, A. melanopus and A. clarkii, three species of anemone fish were also commonly observed amongst the coral rubble. Elsewhere, more localized assemblages of Chromis xanthurus and Plectoglyphidodon pavo darted among the branching Acropora coral fingers.

Juvenile Naso lituratus were abundant as well as the surgeonfishes Acanthurus lineatus, A. nigricans, the black tarpon, Zebrasoma scopas, and Ctenochaetus striatus. The butterflyfishes Forcipiger flavifrons and Chaetodon reticulatus were abundant in deeper depths, while at least eight other species were common throughout the reef. Groupers and snappers were particularly numerous here. Groups of Macolor maculatus, Lutjanus kasmira, and L. bohar were common. The groupers Vesiola louti and
Cephalopholis argus were abundant while *Epinephelus merra*, *E. spilotoceps*, *C. leopardus*, *C. urodeta* and *Plectropomus aerolatus* were common, particularly in deeper depths.

Along the seaward end of the Bay, fish families dominating included aggregations of *Monotaxis granculeus* and *Gnathodentex auriculatus* (emperor bream) and fusiliers (*Caesio caerulaurea* and *C. teres*) migrated along the deeper depths (60 foot contour). Small groups of parrot fishes (*Scarus sordidus*, *S. oxycephalos*, and *S. rubroviolaceus*) foraged on the coral. Several goat fishes (*Parupeneus bifasciatus* and *P. multifasciatus*) schools including a large group of *Mullolidia vanicolensis* migrated throughout the coral reef area. Hidden under ledges awaiting darkness were nocturnal fishes such as bronze sweepers (*Penchisera cuculans*) and squirrel fishes (*Neotrichon stamneus*). Also noted was a school of rudderfish *Kyphosus cinerascens* and monocle barns *Scotopsis triacetus*.

3. Larsen Bay

The reef front harbors large numbers of fishes (mostly adults). The diversity of the fish community increases again with depth. The reef possesses a well-developed coral community, providing numerous habitats for over 18 fish families and over 73 fish species. Wrasses (*Labridae*) exhibited the highest diversity with at least 12 species commonly observed followed by damselfishes (*Pomacentridae*) with ten species. Amongst the coral reef, several damselfishes were abundant (*Chromis maccullouha, C. xanthura*, and *Dascyllus trimaculatus*) with the anemone fishes *Amphiprion chrysogaster* and *A. melanopus* being common. The butterflyfishes (*Chaetodon ephippium, C. lunulatus, C. mesole, C. reticulatus, C. semion*, and *Hemirhichus varius*) and groups of pyramid butterfly fishes (*Hemirhichus polylepis*) appeared commonly throughout the reef. Predator species including the emperor bream (*Monotaxis grandoculis*), snappers, (*Lutjanus kamara, L. gibbus, Macolor niger*), and several species of groupers (*Cephalopholis argus*, and *C. urodet") swam close to the reef structure. The snapper *Lutjanus bohar* occurred abundantly. Rudderfish (*Kyphosus cinerascens*) and foraging parrotfishes (*Calotomus sandwicensis* and *Scarus sordidus*) cruised through the area. Acanthurids are well represented on the reef with the blue-lined surgeonfish (*Acanthurus lineatus*) being abundant. The fusiliers *Caesio teres* and *Pteroceros tile* cruised through the survey area while a large aggregation of the balistid *Melichthys vidua* remained in a localized area about 30 feet deep. Several sweetlips (*Plectorhinchus orientalis*) congregated together in shallow waters along the 20 foot contour.
4. Valtogi

Only the 60 foot contour surveyed at this site resulting in the identification of 26 species within 12 families. Although the diversity was low, the dominant families of Labridae (wrasses), Acanthuridae (surgeonfishes) and Chaetodontidae (butterflyfishes) were observed. Of the five surgeonfish species counted, Acanthurus nigricans was dominant followed by Ctenochaetus striatus. Butterflyfishes such as aggregations of Hemipterus polylepis (pyramid butterflyfish), Chaetodon pellewensis, C. reticulatus, C. trisaculus, Forcipiger longirostris, Heniochus monoceros and H. varius were common. Platax teira orientalis, the lined sweetlips occurred in small groups close to the reef structure as did the parrotfishes Scarus sordidus and S. ovatus. A school of the iridescent blue fusilier Caesio teres cruised through the survey area.

Figure 6. represents the total number of fish species observed by depth (20' and 60') in Area 6.
G. Fogogogo to Breakers Point

This area extends from Avatele Point at the end of the Airport runway to Breakers Point at the mouth of Pago Pago Harbor along Tutuila's southeastern coastline. A total of six stations were surveyed and are described below.

1. Avatele Point

At least 33 species are present with representatives from over 14 families. The most diverse family was wrasses with 8 species encountered followed by Acanthuridae (surgeonfishes) with 5 species and Chaetodontidae (butterflyfishes) and Balistidae (triggerfishes) with 4 species each. The wrasse Halichoeres hortulanus was most abundant with Cephalopholis argus, C. echidna, Thalassoma bifasciata, T. quinquemaculatum and Anampses mejalesgrides appearing commonly. The lined surgeonfish Ctenochaetus strigosus was the most abundant of the 5 surgeonfish species observed. The balistid triggerfishes Melichthys niger and M. spilurus were also present in large numbers while only solitary individuals of Balistoides viridescens and Sufolamna burgei occurred. Other fishes commonly observed included butterflyfishes Chaetodon pentagonus, C. reticulatus, C. trifasciatus, and Forcipiger longirostris, emperor bream (Monotaxis grandoculis), knapper (Acanthurus tuberculatus), parrotfishes (Scarus sp.), and several angelfishes (Centropyge bicolor, C. bispinosus, and C. flavidus). Schools of two fusilier species, Caesio teres and Pterocaesio ille, moved through the survey area as did a solitary dog-tooth tuna, Gymnosarda unicolor.

2. Coconut Point

A snorkel survey was completed along the wide fringing reef flat at Coconut Point where at least 55 species were observed representing 14 families. The inner reef flat closest to shore is blanketed by sand and small patches of seagrasses. Coral colonies are uncommon here. Few fishes were observed in this area. Surprisingly, however, three spacedefishes (Platax obicularis) were observed here near several rusty, and deteriorating fuel drums.

The outer reef flat, however, has a network of small, low-relief patch reefs develops closer to the seaward margin of the reef flat. Here, interspersed among the branching coral heads and sand patches were numerous juveniles of the families Labridae (wrasses), Chaetodontidae (butterflyfishes), and Acanthuridae (surgeonfishes). Of the thirteen wrasses species seen, Thalassoma hardwickei and Halichoeres hortulanus were abundant as were the butterflyfishes Chaetodon ocellatus, C. reticulatus, and C. trifasciatus. The surgeonfishes Acanthurus nigrofuscus and Ctenochaetus strigosus...
were the most visible of the seven surgeonfish species noted. The most conspicuous damselfish species were Stegastes a bilefasciatus and Chrysiptera leucopoma. Localized assemblages of Dascyllus aruanus and Plectrolophiodon pavo (damselfishes) darted among the branching coral fingers and near anemones with the anemonefish Amphiprion chrysopterus. The protected waters near the dredge borrow pits by the airport runway shelters an extremely diverse and abundant fish assemblage. This area appears to be primarily a nursery for juvenile fishes, although adults of some species are present. Here, several large schools of juvenile goatfishes (Mulloidichthys vanicolensis and M. flavolineatus) and snappers (Lutjanus fulvus and L. kasmira) were encountered as were smaller groups of Parupeneus multifasciatus (goatfishes). Adjacent to the airport dredge spoil sites, there are thickets of Acropora which provided great cover for electric blue damselfishes (Plectrolophiodon pavo). A school of juvenile rudderfishes (Kyphosus cinerascens) cruised through the outer reef flat area.

3. Nu’uuli

At least 40 species were present representing 15 different fish families. None of the families were particularly abundant. Acanthuridae (surgeonfishes) and Chaetodontidae (butterflyfishes) were most abundant with 7 species each. The surgeonfishes Ctenochaetus striatus and Acanthurus nigricans and the butterflyfish Chaetodon reticulatus were most conspicuous. Other commonly seen fishes were wrasses (Epibulus insidiator, Gomphosus varius, Halichoeres bortulanus, Holocarpus doliatus, Thalassoma lutescens, and Hemigymnus fasciatus), snappers (Lutjanus fulvus, L. monostigma), goatfish (Parupeneus multifasciatus), and angelfishes (Ctenocephalus flavissimus and Pygopistes diacanthus). Solitary individuals of the trumpetfish Aulostomus chinensis and the tuna Gymnosarda unicolor hovered above the reef while a school of fusiliers (Pterocaesio tile) moved through the area.

4. Faga’aga

This assemblage includes at least 61 species representing 18 families. Surgeonfishes (Acanthuridae) were the most diverse family observed, followed by Chaetodontidae (butterflyfish) with 9 species, and wrasses (Labridae) with 8 species. Perhaps due to the lack of coral cover and associated habitat for hiding area, the fish diversity appeared low compared to other areas. The blue-lined surgeonfish Acanthurus lineatus, Ctenochaetus striatus, Naso hexacanthus and juvenile N. annulatus were the most numerous acanthurids encountered. Other commonly seen acanthurids included Acanthurus guttatus, A. nigricans, A. olivaceus, and Naso lituratus. Butterflyfishes commonly encountered included Chaetodon lunula, C. meyeri, C. ornata, C. unimaculatus, C. trifasciatus, and C. reticulatus. Wrasses were observed, but not in great abundances although Thalassoma lutescens and Halichoeres lutescens appeared
commonly. The balistid Melichthys vidua was most common while infrequent occurrences of Sufflamen bursa, Melichthys niger, and the large triggerfish Balistoides viridescens were recorded. Hovering midwater was the lethrinid Monotaxis grandoculis, the snapper Achromeus furca and several species of snappers (Lutjanidae) including small groups of Lutjanus gibbus, and L. fulvus. Bronze sweepers (Peripheris guineensis) hovered under coral ledges the damselfishes Stegastes nigricans, Plectrotyphlogodon dickeyi and P. lacrymatius stayed close to the reef structure. The groupers Cephalopholis argus and C. urodetes appeared commonly while Variola louti was only observed once.

5. Matuu

The Matuu fish assemblage occupied wide coral buttresses oriented perpendicular to shore with low coral relief. Moderate to low diversity was represented by at least 43 fish species and 13 families. Labridae (wrasses) were the dominant family followed by butterflyfishes (Chaetodontidae) and surgeonfishes (Acanthuridae). Nine wrasse species were observed with Thalassoma hardwickei and Halichoeres bortulanus being most abundant while Gomphosus varius, Epibulus insidiator, Labroides dimidiatus and Pseudochelinus hexataenia were common. The damselfishes Stegastes nigricans and Plectrotyphlogodon vauiti, and the acanthurids Ctenochaetus striatus and Acanthurus nigricans were the most conspicuous on the reef front. The butterflyfishes Chaetodon uralniculatus, C. reticulatus, and C. punctatofasciatus were most common. Several schools of juvenile goatfishes, Mulloides vanicolensis, and surgeonfishes Naso annulatus, passed through the survey area, while abundant numbers of the blue-spotted grouper Cephalopholis argus were seen frequently. The snapper Lutjanus fulvus was locally abundant in small groups of 5-10 individuals. Near the reef structure, solitary individuals of the emperor bream Monotaxis grandoculis, the Pomacanthus imperator, and the trumpetfish Aulostomus chinensis were seen. The parrotfishes Scarus oviceps and S. sordidus were seen commonly.

6. Fatumafuti

The reef front off Fatumafuti harbors a fish assemblage of at least 58 species representing at least 14 fish families. The most diverse families are Acanthuridae (surgeonfishes) with 13 species observed followed by Pomacentridae (damselfishes) and Labridae (wrasses) with 11 species each. Other common species include parrotfishes (Calotomus sandwicensis, Cetoscarus bicolor, Scarus sordidus, S. ghobban, S. obliceps, S. oviceps, and S. nubroviaceatus) and the butterflyfishes (Chaetodon reticulatus, C. unimaculatus, Forcipiger longirostris, Heniochus varius, and Hamtaurichthys polytaenia). Several goatfishes occurred commonly (Mulloides flavolineatus, Parupeneus vigilacius, P. cyclostomus) as did two groupers,
Cephalopholis argus and C. urodeta. A school of fusiliers (Caesio teres) passed through the survey area as did a white-tip shark.

Figure 7 represents the total number of fish species observed by depth (20' and 60') in Area 7.
Results

A total of 40 stations were surveyed for fish populations around the island of Tutuila during the TCRI (Table 1). A total of 272 species were observed representing 42 families of fish previously documented in American Samoa (Wass, 1984). Fish density ranged from 33 to 90 species observed per station, and the number of species by depth ranged from 19 to 68 species observed at 60 feet and 15 to 53 species observed at the 20-foot contour. In general, species richness and abundance was greater in the deeper surveys (60') rather than at the shallower ones (Figures 1-7).

Comparison of all the survey areas indicates the species diversity was greatest at Fagatele Bay (91 species) followed by Fagafu (90 species), Fagamalo (87 species) and Masausi (86 species) (Table 1). The greatest number of families was observed at Fagamalo (24 families), followed by Utelei and Mafegau with 23 each, and by Masausi with 22 families (Table 1). The predominant species occurring at all sites were the surgeonfishes Acanthurus chirurgus, A. nigricans, Ctenochaetus straensis and Zebrasoma flavescens, the butterflyfish Chaetodon teletactus, the wrasses Halichoeres lutescens and the angelfish Centropyge flavissimus. The groupers Cephalopholis argus and C. vroewa, the damselfish Chromis xanthura, the goatfish Parupeneus biliatus, and the snapper Aphareus furca were equally numerous and common in all areas.

During the period the TCRI field work took place (March-April), large numbers of small, presumably newly recruited individuals of the jack Caranx melampeucus and the unicornfish Naso annulatus were observed. Other juveniles recruits of chaetodontids, labrises, pomacentrids, serranids, and scarids were noted, but were not nearly as numerous as these two fish species.

Trends within the Area's were difficult to interpret due to the survey's qualitative procedures. Within Area 1 (Pago Pago Harbor), however, there was a distinct decrease in the number of species observed within the harbor's 5 stations. Fagafu, although located on the southwestern edge of Pago Pago Harbor, had the highest density with 90 species observed, followed by Utelei with 61 species, Leleloa with 61 species, Aua Point with 37 species and Anascope with 38 species observed. There appears to be a direct correlation between the number of species observed and the clarity of the water surrounding the survey site. Where visibility was greatly reduced, the number of fish species and coral species observed was lower. At Fagafu the water was the clearest and clearest, while the inner harbor and the eastern survey stations have extremely poor water quality with much suspended particulate material clouding the water. In the remaining six Areas (Area 2-7), the species richness was generally similar between stations.

Comparison of the data collected by the different investigators suggests that having different individuals perform the censuses introduced a source of variability. In some
instances, investigators (Craig/Henry) had difficulty in identifying some species beyond the family level. Additionally, holes and cracks in the reef were not closely inspected for nocturnal or secretive fishes. It’s likely the qualitative nature of the survey resulted in an under-estimate of some fish families abundances (ex. squirrelfishes, gobies, etc). Additionally, larger and more transient fishes, being wary of divers, probably exited the survey area causing them to be under-censused by this report.

With the exception of Coconut Point, the TCRI survey did not sample any reef flat and nursery areas where the bulk of American Samoa’s highly valued subsistence fishery resides (DesRochers, 1993 and Ponwith 1992). Without sampling the reef flat areas adjacent to the offshore reef slope sites, there are relatively few conclusions to be drawn with any degree of confidence. The short-term effects of the coral devastation (over 10% from Maragos in prep.) from the typhoon will affect species known to associate with and feed on Acropora corals. The abundance of coralivores Plectocephalodon johnstonianus and P. dickii has probably declined. There is an indication that surgeonfishes may have increased due to a reportedly large blooim of benthic algae on newly created substrate resulting from the typhoon (Ponwith and Craig, 1992, per. comm). The compilation of species for the TCRI (Appendices 1-3) suggests that sufficient stocks of fishes targeted by Samoan fishpersons exists, and will remain plentiful if carefully managed to achieve pre-typhoon densities.

General conclusions and observations

Visual observations suggest that the damage caused by the 1992 typhoon to Tutuila’s coral reef structure was significant resulting in a net loss of habitat and available food sources to support Samoas’s fish populations. Historical data suggests that the cyclical destruction and rebuilding of reefs from natural hazards is a normal and natural process with time as the prevailing guideline. With proper management, Samoas’s reefs should begin to rapidly recover. In fact, the survey results indicate new recruitment of juvenile corals (Maragos, in prep).

It appears clear that what American Samoas’s reefs need to recover is a period of time (five to ten years) with few or no natural disturbances (Acanthaster outbreaks or typhoons). Since it is difficult, if not impossible to control “mother nature, it’s probably wise that coastal managers continue to carefully manage and reduce man-induced stresses on the reefs. Several suggestions are listed below for consideration by American Samoa’s coastal resource management agencies and residents:

- Continue to mitigate erosion and run-off onto Samoas’s reefs which will increase the chances of new coral recruits to find suitable substrate to settle on and grow. Over time, the coral structure will grow and provide additional habitat and food sources for Samoas’s reef fishes.
Encourage the development and enhancement of new and existing solid waste disposal programs for aluminum cans, plastics, and disposable diapers. The hazards associated with the ingestion of plastics by marine life, particularly turtles, has been well documented. The ability of plastics and pampers to cover suitable habitat for corals to settle on, and fishes to recruit to, needs to be minimized wherever possible.

Continue the enforcement of gill net sizes to prevent the harvest of undersized and not yet viable fishes. This effort should be implemented simultaneously with village education programs about fisheries management practices. Fish populations are more vulnerable now because of the lack of habitat available for juvenile fishes to associate with upon recruitment to the reef. Therefore, there is a need to take proactive measures to restrict the harvest of juvenile fishes.

Work closely with other American Samoan government agencies and village landowners to carefully plan development along the coastline to reduce erosion, reduce solid waste disposal problems, and to enhance reef environments wherever possible.

Continue and expand public and village education programs on marine resource management and fisheries practices.
Bibliography


Maragos, J.E. (in prep.). Corals observed during the Tutuila Coastal Resource Inventory.


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**Table Note:**
- Column descriptions are provided for each column.
- Data entries are placeholders for actual values.
- The table is intended to represent a structured data set for analysis or reporting purposes.