

GOVERNMENT OF AMERICAN SAMOA
PAGO PAGO, AMERICAN SAMOA 96799
OFFICE OF MARINE RESOURCES

In reply refer to:

January 20, 1976

THE MARINE ENVIRONMENT OF ASAGA STRAIT

I. INTRODUCTION

During January 13 and 14, 1976, personnel from the Office of Marine Resources, Government of American Samoa were engaged in a marine survey of Asaga Strait which lies between the islands of Ofu and Olosega in American Samoa. The survey was conducted to gather information for the environmental statement regarding the proposed Ofu-Olosega vehicular connection and to comment regarding the possible effects of the proposed alternatives on the marine environment. Dr. Richard C. Wass, Sr. Fishery Biologist; Mr. Henry Seseapasara, Fishery Biologist; and Mr. Felei Misa'alefua, Biological Technician carried out the survey.

II. METHODS

At hourly intervals current velocity and direction were measured at three stations along a line connecting the nearest points of Ofu and Olosega. The first station was on the Ofu side of Asaga Strait at a low-tide depth of about 1.3 m. the second was in the middle of the strait on top of the reef at a low-tide depth of about 0.3 m., the third was on the Olosega side of the strait at a low-tide depth of

about 1.3 m. Velocity was measured by noting the number of seconds required for a submerged bottle to drift to the end of a ten-meter length of line.

A fish species list was compiled for the strait by swimming the entire area with an underwater slate and noting every species observed. Species seen during other portions of the survey were also added to the list. A few fishes of unknown identity were speared and brought to shore where they were identified with the aid of reference literature. A transect line marked off in ten-meter sections lettered from "A" to "M" was strung across Asaga Strait between the nearest points of Ofu and Olosega and, presumably, along the proposed construction site. Physical and biological characteristics of the bottom under each section were described on an underwater slate and the average depth at low tide was noted. The fishes within one meter on either side of the line from the bottom to the surface were also identified and counted for each section.

III. RESULTS

A. Current

Current velocities and directions are noted in Table 1 for the various times and stations. It is seen that the strongest currents occurred in the deeper channels at the sides of the strait rather than in the middle which is composed largely of shallow reef. During the observation period the current flowed mostly from the northeast which was also the direction of the prevailing wind (average velocity 5 - 15 knots). The current was weak and somewhat variable in direction during the low tide period and strongest just before the high

tide. Observations were made one and two days after the full moon and, thus, during a period of relatively large tidal fluctuation. The maximum current velocity measured was 20 meters/minute which equals about 3/4 mile/hour:

B. Bottom Composition and Depth

Section A of Transect Line

About half of this section was above the water line (on Ofu) at low tide. The depth at the deep end of this section was 0.5 m. The bottom was composed entirely of sand with the exception of a few small pieces of coral rubble.

Section B of Transect Line

The bottom consisted of a sandy slope to a hard flat on which were scattered pieces of dead coral the largest being about 0.6 m. in diameter. Depth of the hard flat was 1.7 m.

Section C of Transect Line

The bottom under this section was hard and relatively flat and averaged about 1.7 m. deep. Numerous pieces of dead coral were scattered loosely or cemented to the bottom. Four small colonies of finger coral (Porites) and 18 tiny heads of brain coral were found within 1 m. of the transect line.

Section D of Transect Line

The average depth of this section was 1.3 m. About 80% of the bottom was covered with dead coral, 15% live coral and 5% sand. The dominant coral in this section was unidentified but consisted of a massive head with rose to within a few inches of the water surface and was dead on top. Finger coral (Porites) was also scattered about this area.

Section E of Transect Line

The bottom under this section consisted almost 100% of live coral. Dominant types were 50% finger coral (Porites) 45% staghorn coral (Acropora) and 5% stinging coral (Millepora). Average depth was 1 m.

Section F of Transect Line

Average depth of this section was 1.7 m. About 25% of the bottom was covered with dead coral and the remainder with live coral. The dominant types were finger coral (Porites), stinging coral (Millepora) and staghorn coral (Acropora).

Section G of Transect Line

The average depth was 2 m. About 40% of the hard bottom was covered with live coral. The dominant types were 65% stinging coral and 20% finger coral, several other species were represented by small to medium sized colonies. The remaining 60% of the bottom was mostly covered with dead coral.

Section H of Transect Line

The average depth was 2.2 m. The bottom was almost entirely covered with dead coral with a few small colonies of live finger and stinging coral scattered about as well as some unidentified types.

Section I of Transect Line

The average depth was 2 m. Half of this section consisted of hard bottom covered with large and small pieces of coral rubble. The other half was sandy with scattered pieces of dead coral. Some algae was growing on the larger pieces of rubble.

Section J of Transect Line

The average depth was about 1 m. The bottom was sandy with a few

pieces of dead coral and some lava stones scattered about.

Section K of Transect Line

Again the bottom was sandy with lava and coral pieces scattered about. Average depth was 0.6 m.

Section L of Transect Line

Average depth was 0.5 m. The bottom consisted mostly of lava rocks on which algae were growing. There were some small sand pockets.

Section M of Transect Line

Only about half of this section was below the low tide line. The bottom consisted of large lava rocks.

All the above depths were measured about an hour after the low tide.

C. Fishes and Invertebrates

A total of 113 species of fish were observed during the survey. They are listed in the Appendix as are the species and numbers observed for each section of the transect. The transect totals show that the dominant species numerically were damselfishes (Glyphidodontops cyanea, 122; Pomacentrus nigricans, 109; P. albofasciatus, 27) and parrotfishes (juvenile Scarus sp., 37; Scarus sordidus, 20). Surgeonfishes and wrasses were also abundant. In terms of biomass, another parrotfish (Scarus jonesi) might be considered dominant. Members of this species roamed the area in schools of 4 to 12 individuals. At the approach of a diver, they would flee and for this reason were not counted during the transect census. Total lengths of this species ranged from 20 to 35 cm. while the numerically dominant species averaged only 4 to 12 cm. in length.

Fishes were most abundant in the transect sections containing live

coral and particularly mixed species of coral. This is to be expected as there is a wider variety of types of food and shelter available in this kind of habitat.

In addition to the corals, commonly observed invertebrates in the area were the sea cucumbers Holothuria atra, H. argus, Stichopus chloronatus, and Actinopyga sp.; sea urchins, Echinometra sp.; and sea anemones.

D. Fishermen Interview

Several local fishermen were interviewed in order to get a rough idea of the amount of fishing pressure exerted in Asaga Strait as well as the catch rates. It was determined that the people from Ofu seldom fish the area as their village is on the opposite end of the island which is about a 20 minute drive or an hour's walk away. Villagers from Olosega and Sili, however, fish the area regularly as they live much closer. Apparently, most of the fishing is done at night by lantern. On an average night, six or eight fishermen work the area primarily for lobsters and fish. They catch about 10 lbs. per man.

IV. DISCUSSION AND RECOMMENDATIONS

The fish fauna in Asaga Strait is rich but no more so than that on the reefs and in the channels which completely surround the islands of Ofu and Olosega. All species observed are common throughout the Samoan Islands.

Two of the four structures or systems which have been proposed for spanning the strait would, undoubtedly, have adverse effects on the marine fauna and are not recommended. A revetment across the entire strait would wipe out the coral reef on which it was constructed as well

as restrict water circulation. Coral, being a sessile organism, is dependent upon water movement for bringing in food and oxygen and to carry away metabolic wastes. Retardation or elimination of water movement would probably kill some of the corals which require relatively high rates of flow (Millepora) and retard the growth of others. This, in turn, would have adverse effects on the fishes and invertebrates dependent on these corals for food and shelter.

A ferry system is also not recommended. Construction of this system would require blasting portions of the living reef in order to deepen a channel for the ferry.

Alternatively, a multiple span bridge or a combination of a bridge with revetment approach at both ends should not have a long-term adverse effect on the marine environment provided the revetment approaches of the combination structure are constructed in the shallows on the two sides of the strait. It appears that this would be the case as the deeper portions of the strait which harbor most of the living coral are centered in the middle 300 ft. which would be spanned by the bridge. These latter alternatives would also enable small-boat traffic to use the strait.

Table 1. Current velocity (meters/minute) for three stations in Asaga Strait. Station 1 is near Ofu where the depth is about 1.3 m. at low tide; Station 2 is on the reef in the middle of the strait where the depth averages less than 0.5 m. at low tide; Station 3 is on the Olosega side of the strait where the average depth is 1.3 m. During most measurements, the current was flowing from the northeast. An asterisk (*) next to a figure denotes a current from the southwest.

Date	and	Time	Station 1	Station 2	Station 3
1/13/76		1615	10.9	6.3	17.1
(high tide at 1639)		1715	12.0	5.7	12.0
1/14/76		1000	*6.7	4.0	2.5
(low tide at 1050)		1100	*4.4	3.3	1.1
		1200	6.7	3.3	10.0
		1300	12.0	4.0	10.9
		1400	13.3	5.0	12.0
(high tide at 1722)		1500	20.0	15.0	17.1

Table 2. Summary of species and numbers of fishes observed on transect across Asaga Strait.

	A	B	C	D	E	F	G	H	I	J	K	L	M	TOTAL
Number of Species	0	3	16	17	14	18	24	12	2	0	1	0	0	48
Number of Individuals	0	5	37	85	65	116	157	26	5	0	1	0	0	497

APPENDIX cont'd.

<u>Taxa</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>	<u>H</u>	<u>I</u>	<u>J</u>	<u>K</u>	<u>L</u>	<u>M</u>	<u>TOTAL</u>
<u>C. pelawensis</u>							1							1
<u>C. reticulatus</u>							1							1
<u>C. trifasciatus</u>							1							1
<u>C. variegatus</u>														1
<u>Centropyge flavissimus</u>					1									1
<u>Henicopus permutatus</u>														1
<u>Megamotodon strigangulus</u>						1								1
<u>Xylocentrus diacanthus</u>														
CIRRHITIDAE (Hawkfishes)														
<u>Paracirrhites forsteri</u>														
DIODONIDAE (Spiny Puffers)														
<u>Diodon hystrix</u>														
FISTULARIIDAE (Cornetfishes)														
<u>Fistularia commersonii</u>								1						1
GOBIIDAE (Gobies)														
<u>Eleotriodes strigatus</u>				1										1
HOLOCENTRIDAE (Squirrelfishes)														
<u>Adicoryx microstomus</u>														
<u>A. spinifer</u>														
<u>Flammeo sammara</u>														
<u>Myriowistis kuntee</u>														
KUHLIIDAE (Mountain Basses)														
<u>Kuhlia mugil</u>														
KYPHOSIDAE (Rudderfishes)														
<u>Kyphosus sp.</u>														
LABRIDAE (Wrasses)														
<u>Cheilinus digrammus</u>														
<u>Coris aygula</u>														
<u>C. galuardi</u>														3
<u>Epibullis insidiator</u>														6
<u>Gomphosus varius</u>	1	3	2											2
<u>Halichoeres centriquadrus</u>						1	1							

* APPENDIX cont'd.

Taxa	A	B	C	D	E	F	G	H	I	J	K	L	M	TOTAL
<u>H. maculitaceus</u>		2	7					2						11
<u>H. maculatus</u>				1	1		2							4
<u>H. bifasciatus</u>			1	5				4	4					14
<u>Hemiramphus melapterus</u>														
<u>Labridichthys unilineata</u>						1	1							2
<u>Labroides bicolor</u>														
<u>L. diadematoides</u>							1							1
<u>Macromisgurnus meleagris</u>														
<u>Pseudocheilodactylus hexataenia</u>				1			2							3
<u>Stethacanthus axillaris</u>									3					3
<u>S. lineatus</u>				3										3
<u>Thalassoma amblycephalus</u>														
<u>T. hutchingsi</u>				1	3	4	3	1						12
<u>T. duboisi</u>						1								1

LETHRINIDAE (Emperors)

- Gnathodentex aureolineata
- Monotaxis grandoculus

MONACANTHIDAE (Filefishes)

- Oxymonacanthus longirostris

MULLIDAE (Goatfishes)

- Mulloidichthys flavolineatus
- Parapeneus bifasciatus
- P. cyclostomus
- P. trifasciatus

MURAENIDAE (Moray Eels)

- Echidna nebulosa
- Gymnothorax fimbriata

MYLIOBATHIDAE (Eagle Rays)

- Actopterygus marineri

OSTRACIONTIDAE (Trunkfishes)

- Ostracion cubicus
- O. lentiginosus

PARAPERIDAE (Sand Perches)

- Paraperca cephalocaudata

*APPENDIX cont'd.

Taxa	A	B	C	D	E	F	G	H	I	J	K	L	M	TOTAL
POMACENTRIDAE (Damsel-fishes)														
<u>Abudefduf amabilis</u>				1										1
<u>A. bimacellatus</u>					1									1
<u>A. diabolus</u>														
<u>A. lauripomus</u>														2
<u>A. leucopomus</u>				2										3
<u>A. sordidus</u>	1					1					1			3
<u>Amphiprion melanopus</u>						3								3
<u>Thromis atripectoralis</u>								1						1
<u>C. caeruleus</u>							4							4
<u>Dascyllus aruanus</u>				10				2						12
<u>D. reticulatus</u>														
<u>Hypnoidontops cyanea</u>	6	8	8	49	45	6								122
<u>H. glaucus</u>				1										1
<u>H. laevis</u>														
<u>Pomacentrus albofasciatus</u>	5	15					3	3	1					27
<u>P. jenkinsi</u>				4	22	32	51							109
<u>P. nigricans</u>	1	3				1	6							11
<u>P. vatuli</u>														

SCARIDAE (Parrotfishes)

<u>Scarus jonesi</u>														4
<u>S. oviceps</u>	4	10			1	5								20
<u>S. sordidus</u>				20	10	2	5							37
<u>Scarus juveniles</u>														
<u>Scarus sp.</u>														
<u>Scarus sp.</u>														

SERRANIDAE (Groupers and Sea Basses)

<u>Cephalopholis argus</u>														
<u>C. urotaelus</u>														
<u>Epinephelus hexagonatus</u>	1	1	1				2	1						6
<u>E. merus</u>														
<u>Epinephelus sp.</u>														
<u>Gramistes sexlineatus</u>														

SYNGNATHIDAE (Pipefishes)

Corythoichthys flavofasciatus

TETRAODONTIDAE (Puffers)

Arothron meleagris
A. nigropunctatus

<u>Taxa</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>	<u>H</u>	<u>I</u>	<u>J</u>	<u>K</u>	<u>L</u>	<u>M</u>	<u>TOTAL</u>
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Canthiaster amboinensis

C. solandri

2

2

ZANCLIDAE (Moorish Idol Family)

Zanclus canescens