



Cruise Report
Samoa
December 4 – December 18, 2017

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www.100islandchallenge.org
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Expedition Team

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Executive Summary

In December 2017, the 100 Island Challenge team partnered with American Samoa Department of Marine & Wildlife Resources Coral Reef Advisory Group (DMWR/CRAG) to survey reefs around the islands of Upolu and Savai'i in Samoa. The team worked with the Ministry of Agriculture and Fisheries (MAF) to attain permits to conduct reef surveys in Samoa.

Chris Sullivan and Nicole Pedersen conducted baseline assessments of the benthic community around Samoa, while Lindsay Bonito and partner Alice Lawrence collected fish abundance and biomass data in addition to benthic photoquadrat imagery. In total, fish counts were conducted at 24 sites, benthic photomosaics collected at 24 sites, and temperature loggers deployed at 8 sites around Upolu and Savai'i. One benthic mosaic site was conducted in the Asau Bay on Savai'i in collaboration with MAF to collect baseline data of sea cucumber abundance within a protected area.

In general, sites across Samoa showed signs of disturbance, likely due to the 2015 warm water event and subsequent storms. Despite experiencing an apparent decline in coral cover, the scientific team did see signs of recovery across most sites surveyed. The reefs had not yet shifted to a turf-dominated state; small coral colonies of various genera were present alongside and calcifying algae growing over recently dead coral. Along the northern coast of Upolu, there were a small number of sites that were buffered from the bleaching event and retained high coral cover, dominated by large plating and branching *Acropora* species.

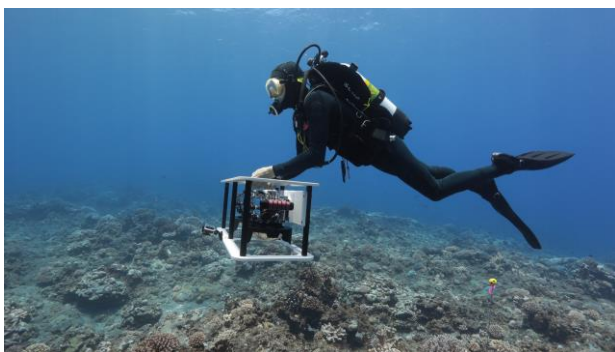
The scientific team will return to Samoa to repeat sampling at these 24 sites and recover deployed temperature loggers, with the goal of understanding shift in fish and benthic communities over time.

100 Island Challenge

Description: This research initiative employs novel approaches for studying coral reef community dynamics through the application of underwater photomosaic technology. Working with colleagues from the University of Miami, we have built a camera system that allows us to capture images of large swaths of the reef surface. Further, by re-visiting exact locations multiple times and replicating photography, we have an unprecedented opportunity to track the dynamics of corals and algae. In particular, with advanced image analysis, we can track how a reef community changes, addressing questions of coral growth, death, and competition that are currently unresolved. We have field-trialed this photomosaic equipment and are developing a reliable image analysis protocol. We are now poised to apply this tool to generate the large-scale data of reef community dynamics that have to date been unavailable. Further, by combining these image-based data with reliable information about the composition of the fish community, the general oceanography, and the human situation of each location, we can begin to elucidate the conditions that are more (or less) conducive to the maintenance of growing and so-called 'healthy' coral reefs.

Application to Samoa: By linking the fates of these reefs to the oceanographic conditions and to the local activities of people, we will be able to start understanding cause-and-effect pathways for reef change. Given that local-scale marine managers consistently seek information on the 'state' of their coral reef, looking for comparisons to help guide local management. Further, by making the data that describe each reef readily available and easy to visualize, there is a terrific opportunity to increase the dialogue between the science and management communities, as well as independently among the managers looking for tangible information to improve their self-management. By working side-by-side with regional managers and partners in local NGOs (e.g., the Nature Conservancy, Conservation International), we will expand the scientific insights into the state and future of their reef areas.

For more information, visit www.100islandchallenge.org



Samoa Background

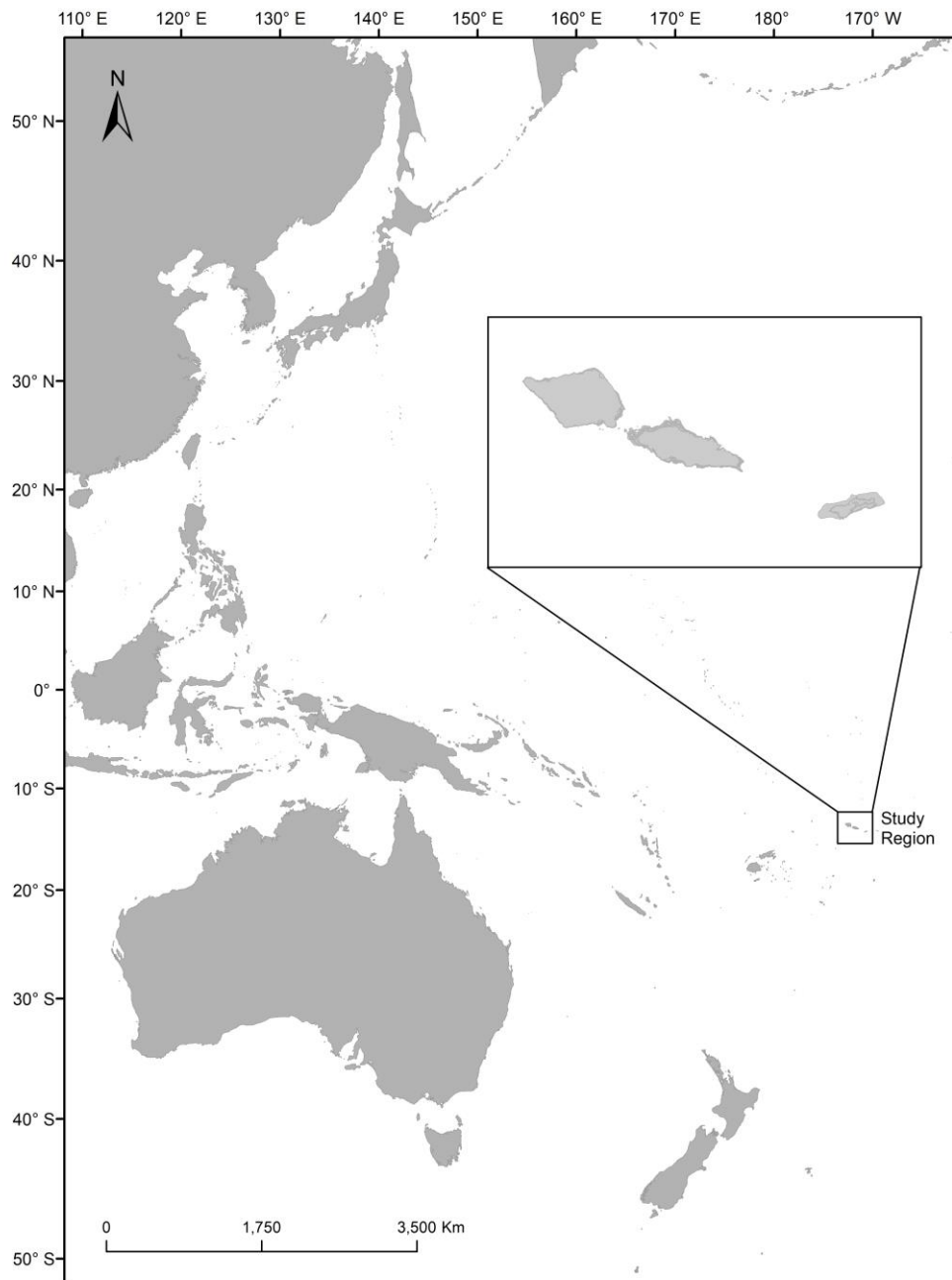


Figure 1. Map of Samoa.

Samoa, previously known as Western Samoa until 1997, is a member of the Commonwealth of Nations. Samoa has a total land area of 2,842km², consisting of the two large islands, Upolu and Savai'i, and eight small islets.

Survey Metadata

Table 1. Sites surveyed to assess fish and benthic communities during the Samoa 2017 expedition.

Island	Site Name	Date	Mosaic Divers ¹	Fish Divers ¹	Habitat	Latitude	Longitude	Depth (m)	Area (m ²)	Data ²	Temp Loggers Deployed
Upolu	UPO_19	2017-12-08	CS/NP	LB/AL	Forereef	-13.84610	-172.08818	10	100	F, M, P	
Upolu	UPO_17	2017-12-08	CS/NP	LB/AL	Forereef	-13.81162	-172.03905	10	100	F, M, P	HOBO-20106085
Upolu	UPO_CRIOBE	2017-12-08	CS/NP	LB/AL	Forereef	-13.80583	-172.03200	10	100	F, M, P	
Upolu	UPO_14	2017-12-09	CS/NP	LB/AL	Forereef	-13.80336	-171.99669	10	100	F, M, P	
Upolu	UPO_13	2017-12-09	CS/NP	LB/AL	Forereef	-13.80449	-171.97520	10	100	F, M, P	SBE-541654762
Upolu	UPO_12	2017-12-09	CS/NP	LB/AL	Forereef	-13.79325	-171.94775	10	100	F, M, P	
Upolu	UPO_1	2017-12-10	CS/NP	LB/AL	Forereef	-13.79921	-171.77888	10	100	F, M, P	
Upolu	UPO_2	2017-12-10	CS/NP	LB/AL	Forereef	-13.79420	-171.79640	10	100	F, M, P	HOBO-20105850
Upolu	UPO_3	2017-12-10	CS/NP	LB/AL	Forereef	-13.77959	-171.80196	10	100	F, M, P	
Upolu	UPO_5	2017-12-11	CS/NP	LB/AL	Forereef	-13.77171	-171.83777	10	100	F, M, P	
Upolu	UPO_6	2017-12-11	CS/NP	LB/AL	Forereef	-13.77397	-171.85630	10	100	F, M, P	Waypoint for fish ³
Upolu	UPO_7	2017-12-11	CS/NP	LB/AL	Forereef	-13.76846	-171.87349	10	100	F, M, P	HOBO-10950556
Savaii	SAV_MAF	2017-12-13	CS/NP/LB/AL	-	Lagoon	-13.50702	-172.63792	3-4	200	M, P	
Savaii	SAV_17	2017-12-13	CS/NP	LB/AL	Forereef	-13.50037	-172.64476	10	100	F, M, P	
Savaii	SAV_16	2017-12-13	CS/NP	LB/AL	Forereef	-13.49803	-172.62442	10	100	F, M, P	
Savaii	SAV_15	2017-12-13	CS/NP	LB/AL	Forereef	-13.49168	-172.60287	10	100	F, M, P	
Savaii	SAV_21	2017-12-14	CS/NP	LB/AL	Forereef	-13.51234	-172.71886	10	100	F, M, P	HOBO-10950535
Savaii	SAV_22	2017-12-14	CS/NP	LB/AL	Forereef	-13.50164	-172.73518	10	100	F, M, P	
Savaii	SAV_23	2017-12-14	CS/NP	LB/AL	Forereef	-13.49158	-172.76183	10	100	F, M, P	HOBO-20101124
Savaii	SAV_14	2017-12-15	NA	LB/AL	Forereef	-13.49181	-172.58409	10	100	F, P	
Savaii	SAV_13	2017-12-15	CS/NP	LB/AL	Forereef	-13.48404	-172.56863	10	100	F, M, P	HOBO-20105848
Savaii	SAV_12	2017-12-15	CS/NP	LB/AL	Forereef	-13.47842	-172.55028	10	100	F, M, P	
Savaii	SAV_20	2017-12-16	CS/NP	LB/AL	Forereef	-13.51478	-172.69682	10	100	F, M, P	
Savaii	SAV_19	2017-12-16	CS/NP	LB/AL	Forereef	-13.50573	-172.67613	10	100	F, M, P	SBE-3948689-3868
Savaii	SAV_18	2017-12-16	CS/NP	LB/AL	Forereef	-13.49934	-172.66071	10	100	F, M, P	

¹ AL- Alice Lawrence; CS- Chris Sullivan; LB- Lindsay Bonito; NP- Nicole Pedersen

² B-Benthic; F- Fish; M-Mosaic; P-photoquadrats

³ Waypoint taken at fish site, not reference stake. Mosaic site is closer to shore. Will be difficult to resurvey.

Benthic Photomosaic Survey Methods

Benthic photomosaics were completed to collect a permanent record of reef habitat on a larger scale (100m²). The benthic photomosaic system consists of a diver operating a camera system including dual SLR cameras and video camera mounted to a custom frame. The first still camera is setup to use a wide-angle 18mm focal length lens to sure high overlap among adjacent images while the second still camera uses a 55mm focal length lens to capture images with sub-cm resolution. The high-resolution wide-angle video camera serves as a backup in the event that images from the still cameras are compromised. To obtain the large image covering 10m x10m the diver operating the camera system swims a gridded pattern approximately 1.5 m above the benthos recording images at 1 sec intervals throughout the plot. A pair of lasers is mounted within the frame of the 55mm camera to provide scale in the high-resolution imagery. Images are later stitched together analytically using custom algorithms to create a single image file representative of the 100m² plot.

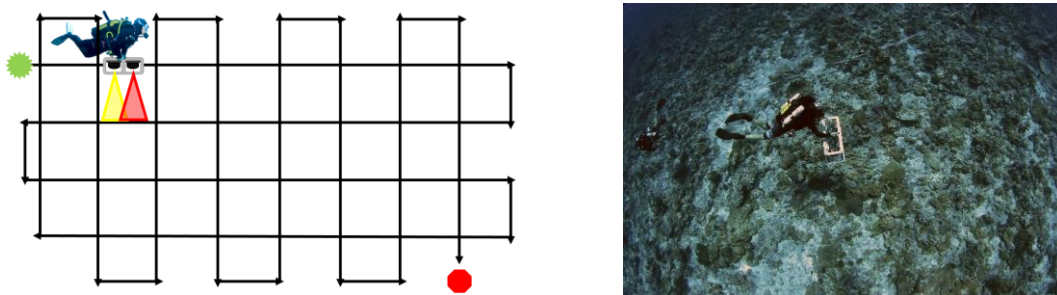


Figure 2. Photomosaic Data Collection Method. Each mosaic is stitched together from ~2000 photos acquired by swimming back and forth over the reef in the pattern on the left.

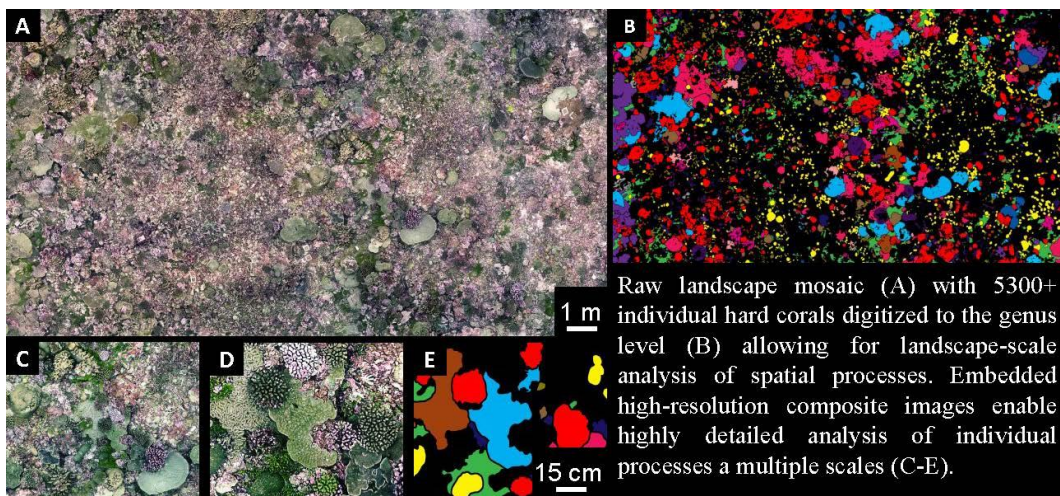


Figure 3. Photomosaic Processing Method. Once stitched, each mosaic is ecologically post-processed by tracing individual coral colonies and algae species of interest. Once individual colonies are traced and identified (E), data is exported and run through custom algorithms to evaluate both standard metrics including percent coral cover and more complex spatial statistics.

Summary Findings

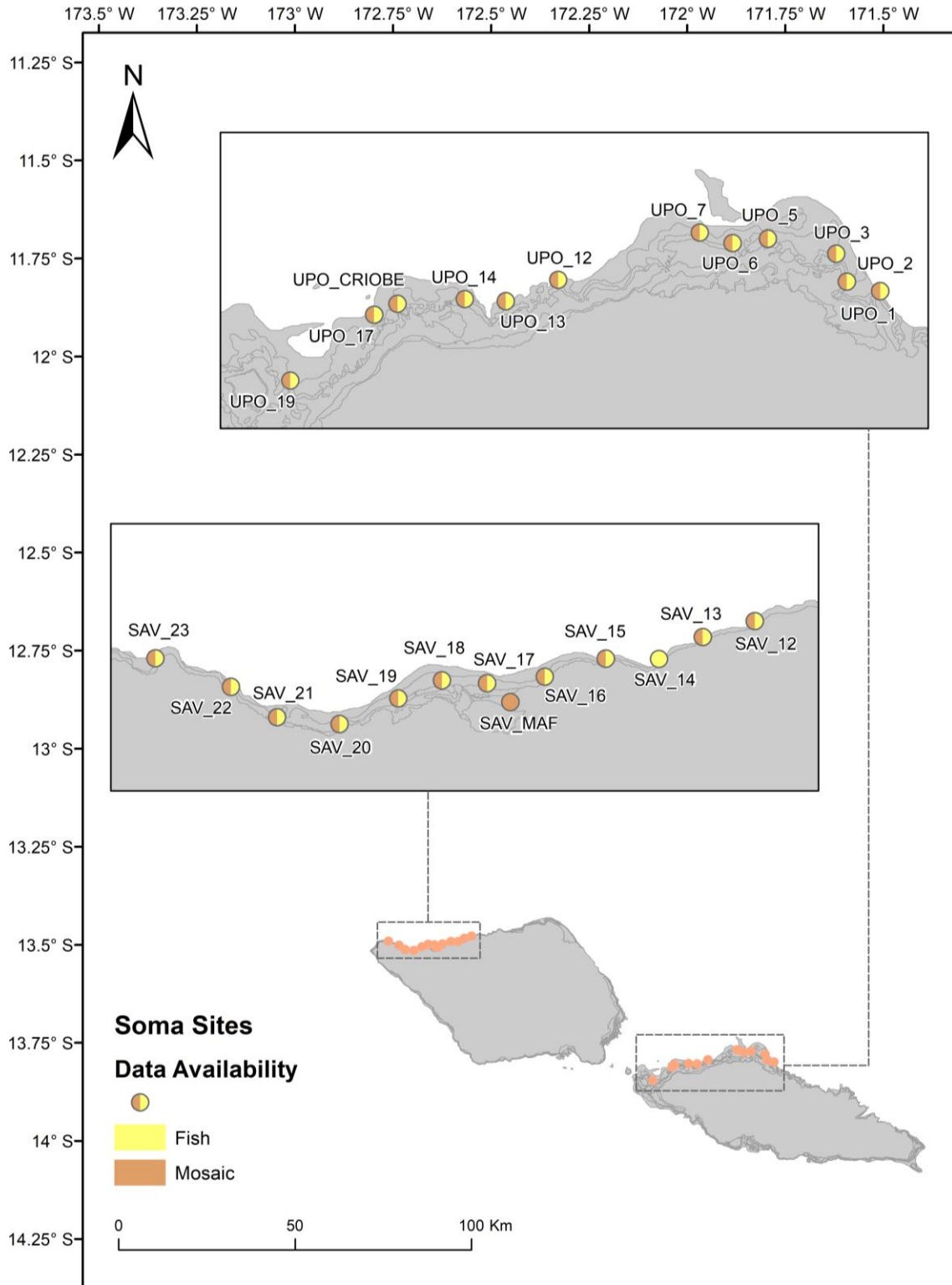


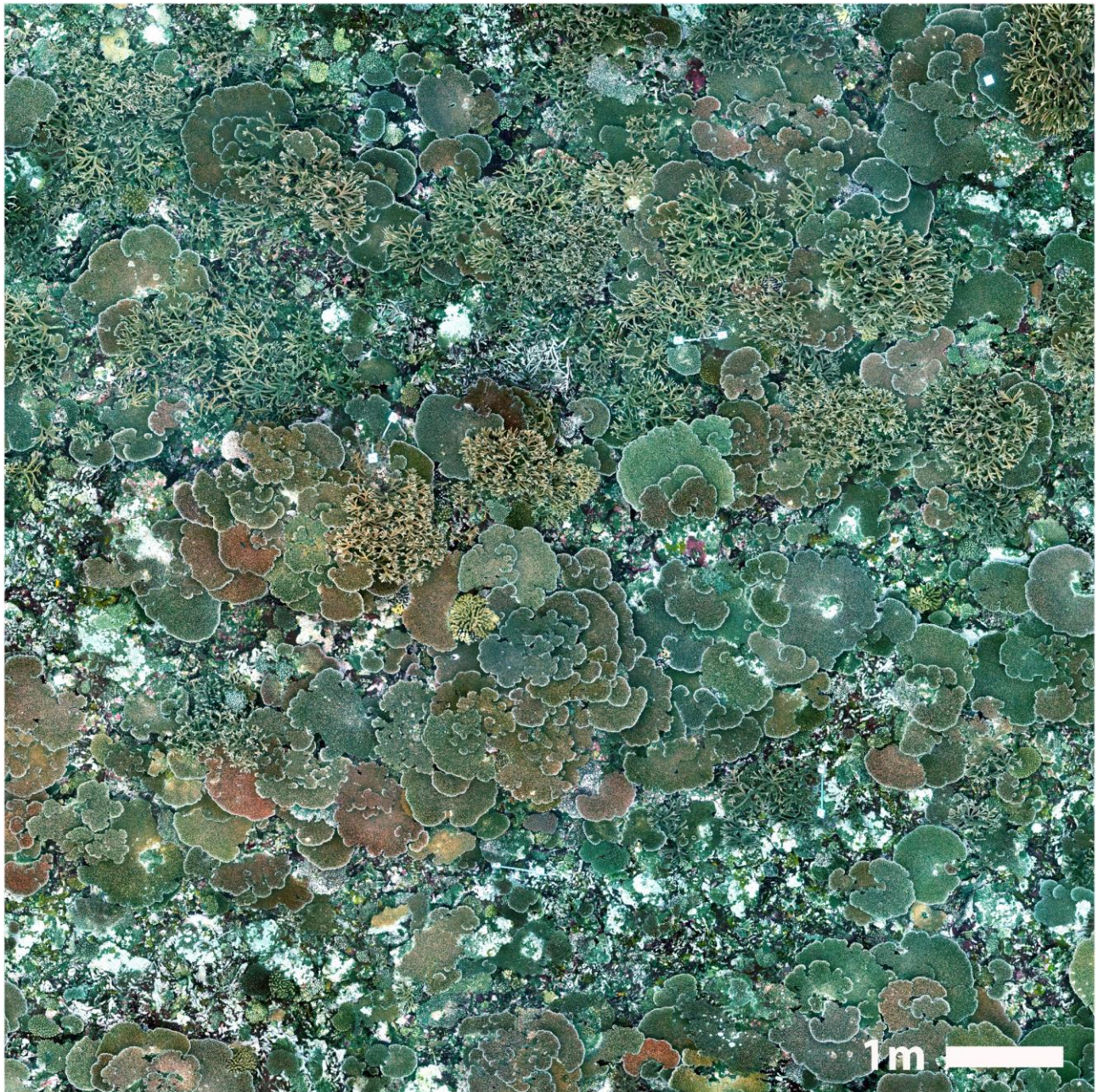
Figure 4. Sites surveyed in Samoa in 2017.

Sample Mosaic

Site: UPO_2

Date: December 10, 2017

Notes: 100m², 10m depth



Photomosaic Results & Products

All mosaic products are available online both on the 100 Island Challenge website and through our public Google Drive. Below are links to the photomosaics and 3D model videos from the Samoa 2017 expedition.

100 Island Challenge | Google Drive [Upolu](#) & [Savai'i](#) | [YouTube Channel](#)

Expedition Photos

