American Samoa Giant Clams
Climate Change Vulnerability Assessment Summary

An Important Note About this Document: *This document represents an initial evaluation of vulnerability for giant clams based on workshop input and existing information. The aim of this document is to expand understanding of species vulnerability to changing climate conditions, and to provide a foundation for developing appropriate adaptation responses.*

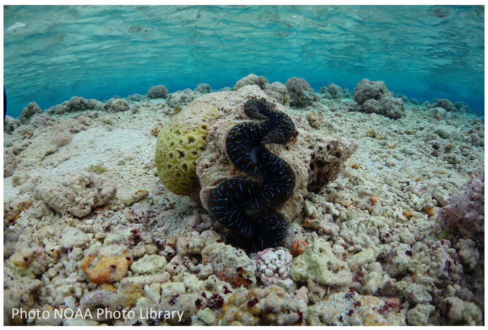
Photo NOAA Photo Library

Species Description

Giant clams, *Tridacna maxima*, are generally found in the Rose atoll, the North and west sides of Ta'u Island, and on the tops or slopes of the reef in shallow and clear waters. They are a traditional and culturally important American Samoa cultural heritage, the fa'a-Samoa, and have become increasing in popularity for the ornamental trade, thus are at risk to be overfished.[1] Fa'alavelave, traditional gatherings among communities and extended families, include offerings of giant clams when available. [1] There have been some aquaculture efforts for *Tridacna sp.* in Tutuila and initiating grow-out facilities in Aunu'u and the Manu'a islands.[2] Giant clams, *Tridacna sp.* were listed vulnerable on the IUCN red List in 2006.[3]

Species Vulnerability

Moderate Vulnerability

Low → High

High Confidence

Workshop participants and expert evaluated giant clams in American Samoa to have a moderate relative vulnerability to climate change due to moderate-high sensitivity to climate and non-climate stressors, moderate exposure to future climate changes, and moderate-high adaptive capacity. Giant clams are sensitive to several climate stressors, including ocean acidification, sea surface temperature, and currents, mixing, and stratification. These stressors can directly affect recruitment and growth of giant clams.

Sensitivity

Moderate Sensitivity

Low → High

Mod Confidence

Giant clams have moderate sensitivity to several climate and non-climate stressors including ocean acidification, increased sea surface temperature, changes in currents, and over harvest. Ocean acidification will directly affect the survival and growth of giant clams reducing calcification and impairing growth and recruitment.[4]

SENSITIVITY FACTORS AND IMPACTS*	
CLIMATE STRESSORS	High sensitivity; Moderate confidence
FACTOR	**IMPACT**
Ocean acidification	Reduced calcification, impairing growth and recruitment.[4]
Warmer sea surface temperature	Possible causing disease. Need more research on disease susceptibility.
Currents/ mixing/ stratification	• Altered larval dispersal, possible increase in dispersal. • Altered nutrient delivery.
DISTURBANCE REGIMES	Low-moderate sensitivity; Moderate confidence
Disease/ Flood/ Tsumanis	Possible impacts causing poor water quality.
DEPENDENCIES	Low-moderate sensitivity; Moderate confidence
FACTOR	**IMPACT**
Habitat Prey/forage dependency/ Generalist or specialist	• High dependcy to coral reefs structure but low dependency on zooxanthalllae. • Dependent on reproductive cues. • Generalist filter feeders.
NON-CLIMATE STRESSORS	Moderate sensitivity; High confidence
FACTOR	**IMPACT**
Harvest	Broad harvest excluding Rose Atoll.
Overwater/ underwater structures	Localized around airport strip, Otu.
Dredging	Localized in the harbors.

* Factors presented are those ranked highest by workshop participants.

Exposure[†]

Moderate Exposure

Low → High

Mod Confidence

Under future climate conditions over the next 20 years, Giant clams will experience warmer sea surface temperatures, altered precipitation, and ocean acidification which will likely affect recruitment, and survival.

PROJECTED CLIMATE AND CLIMATE-DRIVEN CHANGES	
CLIMATE STRESSORS	**PROJECTED CHANGES**
Altered precipitation/runoff	• Extreme rainfall events that currently occur once every 20 years on average are generally simulated to occur four times per year. • Streamflow will likely fluctuate with precipitation patterns, but extreme rainfall events in the Central South Pacific are likely to increase in frequency and intensity. No erosion projections are available.
Ocean Acidification	By 2060: aragonite saturation state will fall below 3.5, and continue declining thereafter resulting in reduced calcification and growth.
Sea surface temperature	Sea surface temperatures in the Pacific Islands are projected to increase +1.1 to +1.7°F by 2030, +1.8 to +2.3°F by 2055, and +2.5 to +4.7°F by 2090.

Adaptive Capacity[‡]

Moderate Adaptive Capacity

Low → High

Mod Confidence

Giant clams are highly dependent on coral reef habitat and on current zfor dispersal but more studies need to take place to properly understand how they will be able to adapt to a changing climate. Species are highly valued and there is a management possibility increased aquaculture and seeding reefs in the future.

Adaptive capacity factors and characteristics[§]	
FACTOR	**SPECIES CHARACTERISTICS**
Extent, status, & dispersal ability Moderate-high adaptive capacity Moderate confidence	• Transboundary species. • Dispersal depends on currents.

[†] Relevant references for regional climate projections can be found in the Climate Impacts Summary Table.

[‡] Please note that the color scheme for adaptive capacity has been inverted, as those factors receiving a rank of "High" enhance adaptive capacity while those factors receiving a rank of "Low" undermine adaptive capacity.

[§] Characteristics with a green plus sign contribute positively to adaptive capacity, while characteristics with a red minus sign contribute negatively to adaptive capacity.

Adaptive capacity factors and characteristics§	
FACTOR	**SPECIES CHARACTERISTICS**
Intraspecific/life history diversity Low-moderate adaptive capacity Low confidence	• Understudied, yet rapidly declining.
Resistance Moderate adaptive capacity Low confidence	• Moderate resistance; need more information on climate impacts.
Management potential Moderate-high adaptive capacity High confidence	• Highly culturally valued species for food and shells. • Possible increased aquaculture and seeding reefs. • Reduce near shore pollution and sediment runoff.

Literature Cited

[1] U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries. 2012. Fagatele Bay National Marine Sanctuary final management plan/final environmental impact statement. Silver Spring, MD. Available from http://sanctuaries.noaa.gov/management/mpr/mpr-nmsam-2012.pdf.

[2] Fenner, D., Speicher, M., Gulick, S., Aeby, G., Cooper Aletto, S., Anderson, P., et al. 2008. The State of Coral Reef Ecosystems of American Samoa. In J. E. Waddell and A. M. Clarke (Eds.), The Status of the Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008. NOAA Tech Memo NOS NCCOS 73. NOAA/NCCOS Center for Coastal Monitoring and Assessment, Biogeography Team (pp. 307-351). Silver Spring, MD.

[3] International Union for Conservation of Nature Red List. 2014. http://www.iucnredlist.org

[4] Cheng B, Gaskin E. 2011. Climate impacts to the nearshore marine environment and coastal communities: American Samoa and Fagatele Bay National Marine Sanctuary. Marine Sanctuaries Conservation Series ONMS-11-05. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD. Available from http://sanctuaries.noaa.gov/science/conservation/pdfs/fbnms_climate.pdf.