American Samoa Coral Reef Herbivore Fish
Climate Change Vulnerability Assessment Summary

An Important Note About this Document: *This document represents an initial evaluation of vulnerability for coral reef herbivore fish based on workshop results 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.*

Species Description

Common reef herbivore fish used for subsistence, artisanal, and recreational purposes include the surgeon fisheries such as the lined surgeonfish or Alogo (*Acanthurus lineatus*) and Manini and pone (*Acanthurus* sp.).[1] Other reef herbivores include parrotfishes (*Scaridae*), soldierfishes/squirrelfishes (*Holocentridae*), wrasses (*Labridae*), and goatfishes (*Mullidae*). The Alogo is a quite abundant and popular Samoan food fish and accounts for approximately 30% of reef fish caught for the subsistence fishery, while the Manini and pone are also abundant and popular subsistence and artisanal fisheries.[1] Parrotfishes and surgeonfishes also have close association to the reef environment. Parrotfishes are known as bioeroders, feeding on detritus on reefs by scrapping reef surfaces, while surgeonfishes are more diverse and can feed on both plant and detrital matter. All reef herbivore fishes contribute to the limitation of algal growth in coral reefs and help maintain diversity and coral reef health.[2] Regionally these species assemblages are threatened while globally they are at low risk of extinction due to increased harvest from subsistence fisheries. The bumphead parrotfish (*Bolbometapon muricatum*) is considered a prize catch and has been listed as a species of concern because of night spearfishing and habitat degradation.[3]

Species Vulnerability

Low-Moderate Vulnerability

Low → High

High Confidence

The relative vulnerability of herbivore reef fish was evaluated by workshop participants to be low to moderate due to moderate sensitivity to climate and non-climate stressors, such as sea surface temperatures, habitat destruction by disease, and invasive species such as the crown-of-thorns starfish; moderate exposure to projected future climate changes in the next 20 years of increased nutrient runoff and sedimentation from precipitation and extreme storms; and high adaptive capacity. Reef fish tend to live near the upper end of their thermal tolerance limit and may experience physiological and developmental impacts and range shifts due to increases in sea temperature.[4,5]

Sensitivity

Moderate Sensitivity — Low → High — **High Confidence**

Herbivore reef fish are moderately sensitive to several climate drivers such as tropical storms, ocean acidification, coastal erosion, and increased sea surface temperatures, which impact reef habitat and may cause changes in growth and reproduction. Non-climate stressors such as crown-of-thorns invasive establishment can impact coral reef habitat and overharvest may locally threaten these species assemblages.

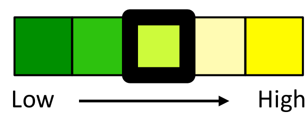
SENSITIVITY FACTORS AND IMPACTS*	
CLIMATE STRESSORS	Moderate-high sensitivity; High confidence
FACTOR	**IMPACT**
Tropical storms	• Causing physical impacts to species assemblage and physical impacts to coral reef habitats.
Ocean acidification	• Indirectly due to impacts on coral reef habitat and directly through egg and larval development.
Sea surface temperature	• Increased sea temperature can impact biological processes such as growth and reproduction.
Coastal erosion/Sea level rise	• Impacting water quality through increased sedimentation and nutrient loading.
DISTURBANCE REGIMES	Low-moderate sensitivity; Moderate confidence
FACTOR	**IMPACT**
Disease/ invasive/ storm events	• Crown-of-thorns outbreaks, which can consume large portions of coral reefs, linked to nutrient loading from runoff.
DEPENDENCIES	Low-moderate sensitivity; Moderate confidence
FACTOR	**IMPACT**
Habitat Prey/forage dependency/ Generalist or specialist	• High dependency on corals reefs, rock and rubble areas, seagrasses, and mangroves. • Species assesmblages are dependent on coral reef habitat • Very diverse species assemblages from being specialists to generalists but specialized in coral reef habitats.
NON-CLIMATE STRESSORS	Moderate-high sensitivity; High confidence

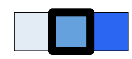
* Factors presented are those ranked highest by workshop experts, scoring 4 or above.

SENSITIVITY FACTORS AND IMPACTS[*]	
FACTOR	**IMPACT**
Land use change	• Including coastal construction and armoring. • Mostly localized in Faga'alu, Tafuna, around the airport, and in the south coast.
Harvest	• Broadly distributed, mostly for subsistence fishing.
Dredging	• Highly localized mostly, mostly in Ta'u and Ofu.
Pollution & poisons	• Broadly distributed • Some localized areas with significant impacts especially in Pala

Exposure[†]

Moderate Exposure





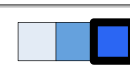
Mod Confidence

Herbivore reef fish will experience moderate climate exposure in the next 20 years due to increased nutrient loading and sedimentation resulting from changes in precipitation and more intense tropical storms.

PROJECTED CLIMATE AND CLIMATE-DRIVEN CHANGES[‡]	
CLIMATE STRESSOR	**PROJECTED CHANGES**
Coastal erosion & runoff/ Tropical storms	• Extreme rainfall projections are highly variable influenced by ENSO/PDO patterns and other factors. • Potential reduction in cyclone activity but increased storm intensity over the next 70 years. ○ Increased erosion, sedimentation, and nutrient loading due to sea level rise, and changes in precipitation.

Adaptive Capacity[§]

High Adaptive Capacity



High Confidence

If managed properly, herbivore reef fish could have high adaptive capacity in American Samoa. These species assemblages are locally threatened due to over fishing.

[†] Relevant references for regional climate projections can be found in the Climate Impacts Summary Table.
[‡] Factors presented are those ranked highest by workshop experts, scoring 4 or above.
[§] 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.

ADAPTIVE CAPACITY FACTORS AND CHARACTERISTICS	
FACTOR	**SPECIES CHARACTERISTICS**
Extent, status, & dispersal ability High adaptive capacity High confidence	• Regionally these species are threatened while globally the species assemblages are at low risk of extinction due to harvest for subsistence fisheries.
Intraspecific/life history diversity High adaptive capacity High confidence	• Species assemblages long lived • Within family there will be some variation in plasticity
Resistance Moderate-high adaptive capacity High confidence	• Varies dependent on specific species, over all species assemblages will be impacted and possibly extinct locally due to fishing
Management potential Moderate-high adaptive capacity High confidence	• Culturally important species used for subsistence and recreational purposes • Management efforts in reducing pollution loads, sedimentation, protection of nursery habitats, and regulating land-use practices in construction of green sea walls, removal of shoreline armoring, and outreach and education

Literature Cited

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