American Samoa Sharks and Rays

Climate Change Vulnerability Assessment Summary

An Important Note About this Document: *This document represents an initial evaluation of vulnerability for sharks and rays 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.*

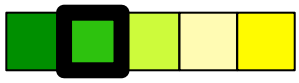
Photo: NOAA Photo Library

Species Description

Common species of sharks in American Samoa include the blacktip reef shark (*Carcharhinus melanopterus*) and the whitetip reef shark (*Triaenodon obesus*). Other rarer species include hammerhead sharks, tiger sharks (*Galeocerdo cuvier*), and whale sharks (*Rhincodon typus*).[1] The most common species of rays in American Samoa are Eagle rays (*Myliobatidae* sp.). Sharks and rays are generally rare across Indo-Pacific coral reef habitats, are not targeted by fishermen, and have been protected from catch and possession since 2012.[1,2] Blacktip and whitetip reef sharks are commonly found in nearshore waters and sighted while diving, snorkeling, and swimming. Hammerhead sharks are known to give birth in Pago Pago Harbor, while few tiger sharks have been caught around Tutuila.[1] Increased sea surface temperatures may affect shark and ray ranges, prey availability, and embryonic development.[3] Extreme precipitation events can also diminish their ability to effectively use their sense of smell and electroreception to locate prey.[3]

Species Vulnerability

Low-Moderate Vulnerability



Mod Confidence

Sharks and rays were evaluated have low to moderate vulnerability by workshop participants due to climate and non-climate stressors such as ocean acidification, sea surface temperature, and changes in currents and wind. Although sharks are protected, there are threats of harvest for shark fins. Sharks are rays are impacted by the same oceanographic conditions that affect pelagic fish, and as well as by land-based stressors including coastal erosion, sedimentation, and runoff.

Sensitivity

Moderate Sensitivity

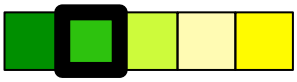
Sharks and rays moderate sensitivity to climatic and non-climatic factors. Changes in currents can impact distribution and migratory pathways, and increased sea surface temperature may affect prey availability. Increased sea surface temperature and ocean acidification can also affect embryonic development.[3]

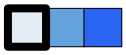
SENSITIVITY FACTORS AND IMPACTS*	
CLIMATE STRESSORS — Moderate sensitivity — Moderate confidence	
FACTOR	**IMPACT**
Ocean acidification/ sea surface temperature /currents	• Embryonic development • Changes in distribution and prey availability. • Diminishing effectiveness in using their sense of smell and electroreception to locate prey.
DISTURBANCE REGIMES — Low-moderate sensitivity — Moderate confidence	
Wind	• Impacting circulation and distribution.
DEPENDENCIES — Low-moderate sensitivity — Moderate confidence	
Habitat Prey/forage dependency/ Generalist or specialist	• Low dependency on sensitive habitats. • Moderate dependency on specific prey. • Mostly generalist species assemblage.
NON-CLIMATE STRESSORS — High sensitivity — High confidence	
Harvest	• Illegal harvest and shark finning.

* Factors presented are those ranked highest by workshop and field experts.

Exposure[†]

Low-Moderate Exposure





Low Confidence

Sharks and rays will experience low climate exposure in the next 20 years from increased temperatures, changes in currents/mixing, and coastal erosion and runoff.

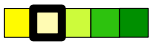
PROJECTED CLIMATE AND CLIMATE-DRIVEN CHANGES[*]	
CLIMATE STRESSORS	**PROJECTED CHANGES**
Increased sea surface temperature *Currents/Mixing* *Coastal erosion & runoff*	• Sea surface temperatures will increase +1.1-1.7°F by 2030. • Distribution affected by shifts in temperature and ocean conditions.

Adaptive Capacity[‡]

Moderate Adaptive Capacity

Mod Confidence

Sharks and rays have moderate adaptive capacity due to relative long-range dispersal and ability to be able to move to more favorable areas. Increased sea surface temperatures may affect shark and ray ranges, prey availability, and embryonic development.[4]

ADAPTIVE CAPACITY FACTORS AND CHARACTERISTICS	
FACTOR	**SPECIES CHARACTERISTICS**
Extent, status, & dispersal ability Moderate-high adaptive capacity  Moderate confidence 	• Long range dispersal ability.
Intraspecific/life history diversity Moderate adaptive capacity  Moderate confidence 	• High genetic diversity and behavioral and phenotypic plasticity.
Resistance Low-moderate adaptive capacity  Moderate confidence 	• Fluctuations in sea surface temperature and ocean acidification can impacts ability to find prey.

[†] 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.

ADAPTIVE CAPACITY FACTORS AND CHARACTERISTICS	
FACTOR	**SPECIES CHARACTERISTICS**
Management potential Low-moderate adaptive capacity  Moderate confidence 	• Many sharks and rays are charismatic megafauna with high societal value, yet many misconceptions. • More enforcement and broader regulations.

Literature Cited

[1] Craig, P. Editor. Natural History Guide to American Samoa. 3rd Edition. 2009. National Park of American Samoa, Department Marine and Wildlife Resources and American Samoa Community College.

[2] 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.

[3] Hobday A.J., Griffiths S. and Ward T. 2009. Pelagic Fishes and Sharks. In A Marine Climate Change Impacts and Adaptation Report Card for Australia 2009 (Eds. E.S. Poloczanska, A.J. Hobday and A.J. Richardson), NCCARF Publication 05/09, ISBN 978-1-921609-03-9