



## American Samoa Charismatic Reef Fish Climate Change Vulnerability Assessment Summary

**An Important Note About this Document:** This document represents an initial evaluation of vulnerability for charismatic reef fish 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.

### Species Description



Photo by NOAA Fisheries

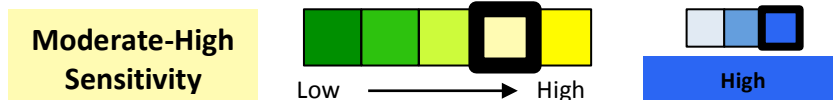
Reef fish (both piscivores and herbivores) are abundant and highly diverse with over 930 species.<sup>1</sup> Many coral reef fish are territorial algal eaters and habitat specialists, tending to only frequent certain habitats within the coral reef system with some taking permanent residence, such as damselfish (*Pomacentridae*), mano'o blennies, and gobies (*Gobiidae*).<sup>2</sup> Damselfish in particular are very territorial and aggressively protect their habitat. Butterflyfishes are fully dependent on feeding on live coral and are vulnerable to the overall decline in coral reefs worldwide.<sup>3</sup> Charismatic reef species assemblages are also vulnerable to capture for aquaria and/or bioprospecting trade.

### Species Vulnerability











The relative vulnerability of charismatic reef fish was evaluated by workshop participants to be low to moderate due to moderate to high sensitivity to climatic and non-climatic factors such as ocean acidification, increased sea temperature, land use changes, and dredging that impacts coral reef habitat. Species assemblages will be impacted by future moderate exposure of increased sea surface temperature and erosion causing further sedimentation to the coral reef habitat.

### Sensitivity



Charismatic reef fish have moderate to high sensitivity to several climate factors that affect coral reef habitats, such as ocean acidification, increased sea surface temperatures, and

tropical storms. These species assemblages are highly dependent on the coral reef habitats and influenced by non-climatic stressors that impact the health of coral reefs.

<b>SENSITIVITY FACTORS AND IMPACTS*</b>	
<b>CLIMATE STRESSORS</b> Moderate-high sensitivity  High confidence 	
<i>Ocean acidification/ pH</i>	<ul style="list-style-type: none"> <li>Indirectly due to impacts on coral reef habitat and directly through egg and larval development.</li> <li>Decline to coral habitat health and ability of coral to recover from bleaching events.<sup>4</sup></li> </ul>
<i>Sea surface temperature</i>	<ul style="list-style-type: none"> <li>Increased bleaching events impacting habitat.</li> </ul>
<i>Tropical storms/ Coastal erosion/ Flooding</i>	<ul style="list-style-type: none"> <li>Impacting water quality through increased sedimentation and nutrient loading.</li> <li>Causing physical impacts to species assemblage and physical impacts to coral reef habitats.</li> </ul>
<b>DISTURBANCE REGIMES</b> Moderate-high sensitivity  High confidence 	
<i>Disease/ El Niño patterns</i>	<ul style="list-style-type: none"> <li>Impacting coral reef habitat.</li> </ul>
<b>DEPENDENCIES</b> Low-moderate sensitivity  Moderate confidence 	
<i>Habitat Prey/forage dependency/ Generalist or specialist</i>	<ul style="list-style-type: none"> <li>High dependency on coral reefs.</li> <li>Species dependent, some prey on specific coral species.</li> <li>Some species are habitat specialists.</li> </ul>
<b>NON-CLIMATE STRESSORS</b> Moderate-high sensitivity  High confidence 	
<i>Land use change</i>	<ul style="list-style-type: none"> <li>Increased sedimentation from construction, farming, and deforestation.</li> </ul>
<i>Dredging</i>	<ul style="list-style-type: none"> <li>Localized dredging impacts; habitat destruction</li> </ul>
<i>Pollution &amp; poisons/ Nutrient loading</i>	<ul style="list-style-type: none"> <li>Broadly distributed</li> <li>Some localized areas with significant impacts especially in Pala</li> </ul>

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

Exposure<sup>†</sup>



Charismatic reef fish will experience moderate exposure in the next 20 years of increased sea surface temperature, changes in precipitation and intense storms impacting both the reef dependent habitat and water quality.

PROJECTED CLIMATE AND CLIMATE-DRIVEN CHANGES <sup>‡</sup>	
CLIMATE STRESSOR	PROJECTED CHANGES
<i>Sea surface temperature</i>	<ul style="list-style-type: none"> <li>Sea surface temperatures will increase +1.1-1.7° by 2030.</li> </ul>
<i>Coastal erosion &amp; runoff/Tropical storms</i>	<ul style="list-style-type: none"> <li>Extreme rainfall projections are highly variable influenced by ENSO/PDO patterns and other factors.</li> <li>Potential reduction in cyclone activity but increased storm intensity over the next 70 years.                             <ul style="list-style-type: none"> <li>Increased erosion, sedimentation, and nutrient loading due to sea level rise, and changes in precipitation.</li> </ul> </li> </ul>

Adaptive Capacity<sup>§</sup>









Charismatic reef fish have moderate to high adaptive capacity. Although this species assemblage is not valued culturally or important for tourism, management efforts that promote coral reef protection will also benefit species.

ADAPTIVE CAPACITY FACTORS AND CHARACTERISTICS	
FACTORS	SPECIES CHARACTERISTICS
<i>Extent, status, &amp; dispersal ability</i> High adaptive capacity High confidence	<ul style="list-style-type: none"> <li>High connectivity and ability to disperse</li> <li>Some species are demersal spawners, while others are mouth brooders.</li> </ul>

<sup>†</sup> Relevant references for regional climate projections can be found in the Climate Impacts Summary Table.

<sup>‡</sup> Factors presented are those ranked highest by workshop experts, scoring 4 or above.

<sup>§</sup> 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.

<p><i>Intraspecific/life history diversity</i></p> <p>High adaptive capacity </p> <p>High confidence </p>	<ul style="list-style-type: none"> <li>• High diversity and plasticity</li> </ul>
<p><i>Resistance</i></p> <p>Moderate adaptive capacity </p> <p>High confidence </p>	<ul style="list-style-type: none"> <li>• Obligatory corallivores, such as butterflyfishes, will be less resistant than herbivores.</li> </ul>
<p><i>Management potential</i></p> <p>Low adaptive capacity </p> <p>High confidence </p>	<ul style="list-style-type: none"> <li>• Not valued as a tourism attractor</li> <li>• Management efforts in reducing pollution loads, sedimentation, protection of nursery habitats, and regulating land-use practices in construction of green sea walls, removal of armoring that impacts mangroves, and outreach and education</li> <li>• Marine protected areas.</li> </ul>

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## Literature Cited

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- <sup>1</sup> Craig, P. Editor. Natural History Guide to American Samoa. 3<sup>rd</sup> Edition. 2009. National Park of American Samoa, Department Marine and Wildlife Resources and American Samoa Community College.
  - <sup>2</sup> Wass, R. C. 1984. An annotated checklist of the fishes of American Samoa. U. S. Dept. of Commerce, NOAA Technical Report NMFS SSRF-781. Rockville, Maryland
  - <sup>3</sup> Cole A.J, M.S. Pratchett, and G.P. Jones. 2008. Diversity and functional importance of coral-feeding fishes on tropical coral reefs. *Fish and Fisheries* 9:286-307
  - <sup>4</sup> Keener, V.W., J.J. Marra, M.L. Finucane, D. Spooner, and M.H. Smith (Eds.). 2012. Climate Change and Pacific Islands: Indicators and Impacts. Report for The 2012 Pacific Islands Regional Climate Assessment. Island Press, Washington, D.C.