❖Standard 9: Conduct an analysis of the severity and geographic scope of threats to conservation targets/biodiversity elements, and analyze the root causes of priority threats.

Case Study: **Assessment of Threats to the Marine Biodiversity of the Caribbean using Expert Workshops**

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Purpose and region of analysis

An expert workshop was conducted to assess the threats to priority areas for biodiversity conservation in the Caribbean. Experts were asked to identify and rank current threats, rank the persistence of specific seascape and integrity features to threats, and rank future threats. Results were summarized in a web-based report and interactive map and were used to inform priority actions. This assessment was conducted for the Mesoamerican Caribbean reef which extends from NW Yucatan Peninsula, Mexico to eastern Honduras.

Criteria/Methods

This analysis began with the review and synthesis of several existing threats assessments (Jorge 1999, FAO 2000). At a workshop, experts worked groups by taxa and subregion of expertise and given 3'x3' maps displaying relevant biological, physical and socioeconomic data. The experts were asked to identify the most important threats by subregion by ranking a threat as high, medium or low for that subregion. Threats were then evaluated for their persistence.

A persistence analysis was conducted for each priority area to determine the resiliency of an area after a disturbance. Persistence was defined as "The degree to which a particular habitat, community or population will tend to retain its present status should the current level of human pressure on the system remain unchanged". A low persistence site is one that will require active management to recover following a major natural disturbance with current anthropogenic pressures. Experts assembled at a workshop were asked evaluated and rank the persistence of seascape level processes using criteria of seascape and integrity features.

Table 1. Criteria and rank definitions to evaluate level of persistence among Biodiversity Priority Areas.

Seascape and Integrity Features	Level of Persistence
• Size and intactness of area • Habitat structure and complexity	• Highest: Would tend to maintain high quality and resilience under current

• Linkages/proximity/connectivity to adjacent intact ecosystems • Quality of habitat or assemblage • Abundance of larval supply/settlement areas/nurseries • Intactness of trophic structures (e.g., presence/absence of key herbivores, top predators) • Status of species, populations • Abundance/density of key species (e.g., Diadema, grouper, manatee) • Presence/absence of top predators • Susceptibility to large-scale disturbances (e.g., bleaching hurricanes)	pressures and management regimes. • High: Would maintain quality and resilience with minimal reduction of human pressures. • Moderate: Would require a reduction of human pressures and/or minor restoration effort to restore desired resilience and quality. • Low: Would require major intervention to remove anthropogenic pressures and/or major site restoration and restocking efforts to restore desirable resilience and quality. • Unknown: Not enough information available to assess likelihood of persistence.

Workshop participants were also asked to conduct a future threats analysis where "future threat" was defined as "the likelihood of a degradation of the status of a particular habitat, community or population should there be a change in human pressure to the system". Future threats were categorized as land-based, marine-aquatic, or marine biota and ranked as high, medium or low. A list of these threats and the criteria used to rank priority areas by these threats are in Table 2.

Table 2: Threat list and ranking criteria for the evaluation of future threats to the Mesoamerican Caribbean Reef

Threat category	Specific threat criteria	Ranking criteria
Land-based Threats	• Loss of coastal habitats (e.g., mangroves) • Urbanization and associated changes in runoff • Changes in coastal processes • Pollution from urbanization, agriculture, shrimp farming • Increased contamination/ consumption of groundwater	The likelihood threats originating from land-based activities would result in a loss, degradation or alteration of terrestrial or marine habitats or processes was ranked as high (potential change of >50%), medium (25-50% change), low (up to 25% change), or No threat (0% change).
Marine Habitat Threats	• Habitat fragmentation, or other barriers to dispersal and general movement • Loss or disruption of nursery or spawning grounds • Loss of transition zones or environmental gradients • Degraded water quality (e.g. point or nonpoint source pollution; changes in temperature, pH, DO, other physical parameters; sedimentation and/or siltation) • Altered hydrographic integrity (flow	Threats that would alter or degrade marine habitats and associated processes were ranked high, medium or low by evaluating expected changes in marine habitats.

	regimes, water levels), resulting from surface or groundwater withdrawals, canalization, etc. • Loss/conversion of riparian/floodplain vegetation • Excessive recreational impacts	
Marine Biota Threats	• High species mortality and population decreases • Loss of species richness or diversity • Poor recruitment or alteration of reproductive patterns • Shifts in trophic and/or community structures • Decrease in resilience potential • Loss of coral reef complexity or structure • Increased disease outbreaks • Impacts associated with increased frequency/intensity of El Niño/La Niña, hurricanes, etc. • Competition, predation or infestations of exotic species • Unsustainable or illegal fishing or hunting	Threats affecting marine biota were ranked based on the intensity (high, medium, low) of exploitation or disturbance anticipated.

Products/Outcomes

Four primary threats were identified for the Mesoamerican Caribbean Reef. These include; (1) coastal habitat degradation or conversion, (2) declining water quality, (3) declining or depleted fisheries, and (4) increased stress due to oceanographic and climatic- meteorological phenomena.

For the persistence analysis, of the 26 selected Biodiversity Priority Areas (BPAs), eleven areas received a high rank, eleven moderate, 2 low and 2 areas did not have enough information to rank. None of the high ranked areas ranked high across all criteria indicating that none of the selected priority areas are likely to maintain their quality under the current level of human pressure. However, high-ranking areas may only require minimal management to maintain quality. Examining persistence versus the biological importance of the priority areas can further prioritize conservation action (Table 3).

Table 3. Integration Matrix for Biological Importance and Persistence Value for each Biodiversity Priority Area

Biological Importance	Persistence Value			
		High	Moderate	Low

	Highest	NE Yucatán (QR2) Sian Ka'an (SK3) Banco Chinchorro (SK1) Lighthouse Reef (BB2) Turneffe (BB1) Gladden Spit (BB6)	S. Yucatán (SK4) Glovers Reef Atoll (BB3) Bay Islands (HG3)	
	High	Belize City Complex (BB4)	Cozumel (QR1) Central Yucatán (SK2) Chetumal/Corozoal (SK5) Sapodilla Cayes (BB8) Port Honduras (BB9) Gulf of Honduras (HG5)	
	Priority	Ría Lagartos (QR3) Central Belize Barrier (BB7) Rio Platano (HG2)	N. Yucatán (Xpuha-Tulum) (QR6)	N.Yucatán (Cancun) (QR5) Tela -Manabique Coast (HG4)

Fourteen BPA's were assigned to the high future threat category, 9 were assigned to the moderate category, one to the low category, and 2 remained uncategorized due to lack of information. An overall future threat rank was also determined and major sources of that threat were identified (Table 4). Again, a threat by biodiversity value matrix can further assist in setting conservation action priorities.

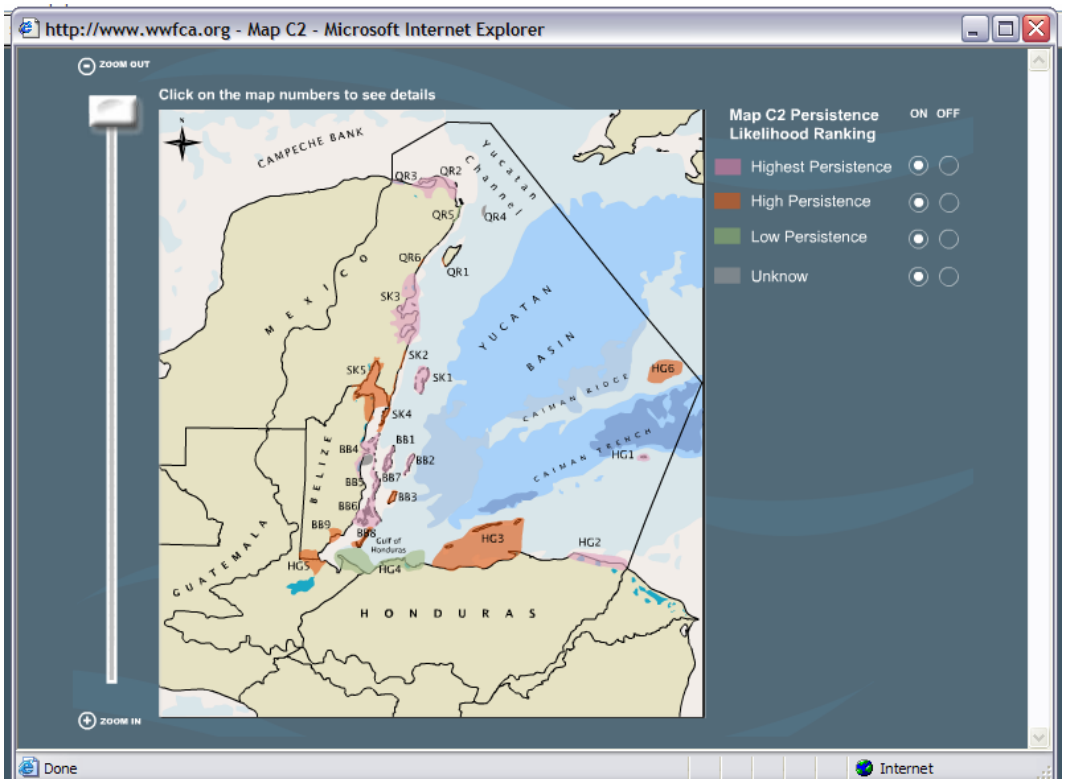
Table 4. Results of Future Threats Ranking. (H=High, M=Medium, L=Low, U=Unknown). Biodiversity Priority Area (BPA) codes are as given in Table 3.

BPA	Land+	Aquatic+	Biota=	Future Threat	Source of Future Threats
QR1	M	L	M	M	Tourism, urban development and associated pollutants
QR2	M	M	H	H	Isla Blanca development
QR3	M	M	L	M	Tourism
QR4	U	U	U	U	Unknown, possible overfishing?
QR5	H			H	Tourism, fishery, urban development
QR6	H	H	H	H	Tourism
SK1	N	L	M	M	Tourism, lack of enforcement, coral bleaching
SK2	H	H	H	H	Tourism, population growth, cruise ship activity (including groundings, sewage)
SK3	L	L	M	M	Agricultural pollution, unsustainable fishing if not regulated and enforced, loss of coastal habitat
SK4	M	M	H	H	Tourism, land conversion, overfishing

SK5	H	M	M	H	Pollution from sugar plantation runoff, heavy metals from sugar cane factories untreated sewage, creation of canal for cruise ships, tourism, illegal hunting of manatees
BB1	L	L	M	M	Maritime activities in English Channel, loss of crocodile habitat to development, overfishing of spawning sites, global impacts on reefs (bleaching, hurricanes), recreational damage
BB2	N	L	M	M	Recreational impacts, increased fishing pressure, some coastal development, global impacts on reefs (bleaching, hurricanes)
BB3	H	M	H	H	Agricultural contaminants (e.g., pesticides) from Gulf of Honduras degrading water quality, global impacts on reefs
BB4	H	H	H	H	Loss of mangrove habitat to development, urban pollution (e.g., sewage) from Belize City, risk of oil spills from ships, agriculture runoff, global impacts on reefs (bleaching, hurricanes)
BB5	U	U	U	U	Unknown, possible shipping? Global reef impacts?, fishing?
BB6	M	H	H	H	Increased fishing, tourism, coastal development, aquaculture, agriculture, shipping, population growth, global impacts on reefs (bleaching, hurricanes)
BB7	L	L	M	L	Fishing, global impacts on reefs (bleaching, hurricanes)
BB8	H	H	H	H	Land-based pollutants transported by Gulf of Honduras Gyre, runoff from Guatemala watersheds, fishing (illegal too), recreational activities on cayes, global impacts on reefs (bleaching, hurricanes)
BB9	H	H	H	H	The few remaining reefs are at high risk to global impacts (bleaching, hurricanes), land based pollution (logging, agriculture), illegal manatee killings, poor water quality from land based activities transported by Gulf of Honduras Gyre
HG1	N	L	H	M	Fishing
HG2	L	L	H	M	Fishing
HG3	H	M	H	H	Bay Island development (sedimentation, sewage, habitat loss, recreational impacts), global impacts on reefs (bleaching, hurricanes), land based pollution (e.g., agriculture, shipping), commercial/artisanal fishing on coast and islands
HG4	H	M	M	H	Water quality degradation due to land based

					activities (agriculture) and shipping (major ports), coastal fishing
HG5	H	M	H	H	Population growth/urban development near Livingston, overfishing, cattle farms.
HG6	N	L	H	M	Fishing

The results of the threats analyses are represented visually in several interactive maps that can be accessed at http://www.wwfca.org/php/macr/appendixc01.php#.



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