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Appendix

Template for Submission of Scientific Information

to Describe Ecologically or Biologically Significant Marine Areas

*Note: Please **DO NOT** embed tables, graphs, figures, photos, or other artwork within the text manuscript, but please send these as separate files. Captions for figures should be included at the end of the text file, however.*

Title/Name of the area: Buccoo Reef Marine Park

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Abstract (*in less than 150 words)*

Introduction

The Buccoo Reef Marine Park is the only marine protected area for the country of Trinidad and Tobago and represents one of the largest and most popular coral reefs in Tobago. It is a specially protected area, legally designated in 1973, under the Marine Area Order of the Marine Areas (Preservation and Enhancement) Act 1970; as well as a Ramsar site in 2006. The park is characterized by five insular emergent fringing reefs (Buccoo Reef) to the north protecting a shallow sandy lagoon with a patchy distribution of coral communities, and the mangrove-fringed Bon Accord Lagoon in which a seagrass community is present. The Buccoo Reef and Bon

Accord Lagoon system is located at the southwestern end of the island of Tobago between 11°08'N to 11°12'N latitude and 60°40'W to 60°51'W longitude. The park covers an area of approximately 7 km^2, and is the best example of contiguous reef, seagrass, and mangrove wetland in Trinidad and Tobago.

Location

(Indicate the geographic location of the area/feature. This should include a location map. It should state if the area is within or outside national jurisdiction, or straddling both. It should also state if the area is wholly or partly in an area that is subject to a submission to the Commission on the Limits of the Continental Shelf)

See attached Fig 2- Map of Buccoo Reef Marine Park

Feature description of the proposed area

(This should include information about the characteristics of the feature to be proposed, e.g. in terms of physical description (water column feature, benthic feature, or both), biological communities, role in ecosystem function, and then refer to the data/information that is available to support the proposal and whether models are available in the absence of data. This needs to be supported where possible with maps, models, reference to analysis, or the level of research in the area)

The reefs of Trinidad and Tobago are the southern most of Caribbean reefs; unique in their ability to persist in an environment heavily influenced by the runoff events from the South American continent, including freshwater, sediment and nutrients from the Orinoco and Amazon Rivers (Muller-Karger et al., 1988 and Muller-Karger and Aparicio-Castro, 1994). Consequently, the coral reefs are characterised by a limited number of sediment tolerant coral species, mainly boulder corals such as *Siderastrea* sp., and *Porites* sp. (Laydoo 1991).

The extant reef is of Holocene origin (ca. 10,000-12,000 years BP) lying on a Pleistocene carbonate platform. The platform, which is emergent to the south of the reef system, characterizes the terrestrial geology of the low-lying southwestern region of Tobago (Maxwell, 1948). The reef flats are generally characterized by narrow seaward reef crests and a more extensive back reef toward the reef lagoon. They are known as Pigeon Point Reef, Outer Reef, Northern Reef, Western Reef and Eastern Reef. Between the reef flats are sandy bottom channels, the widest and deepest is the Deep Channel located between the Western and Northern Reefs. The fore reef is most extensive in the northern part of the reef system, and here it slopes to depths of 10 to 15m in depth. West of the reef flats the fore reef slopes to a depth of 20m; to the east the fore reef slopes to a depth of 15m. The Bon Accord Lagoon is located to the south of the Nylon Pool and to the west of the Eastern Reef Flat. The lagoon is poorly flushed, and the water in the lagoon circulates every 2 to 5 days. Water movement in the Buccoo Reef is wind-driven and generally westerly, with some reversal in the Bon Accord Lagoon and the south west channel near Pigeon Point during flood tide. Surface circulation to the west of Buccoo Reef is apparently more influenced by north-westerly water movement between Trinidad and Tobago. Discharges from the Orinoco River reduce the salinity and increase the turbidity of this water during the wet season, which reduce light availability needed for coral growth. 10 However, this chronic seasonal stress has not prevented the development of massive and biologically diverse reef formations in the Buccoo Reef.

Tobago is surrounded by rich reefs with 300 species of South Atlantic coral and more than 600 species of fish (Laydoo, 1987). A 1994 assessment of the shallow water Buccoo reef revealed approximately 40 coral species and at least 119 species of fish (IMA 1994). Similarly the

seagrass and mangroves are home to over 30 species of juvenile fish, conch and lobster. A 1994 inventory of species in the complex revealed approximately 179 species spanning several taxa. Regular monitoring of these ecosystems has been underway since the early 1990s. The structure and composition of the reef are changing with the acroporids (staghorns and elkhorns) being all but gone, except for scattered colonies of *Acropora cervicornis*. Over a 25 year period (1985-2009) there has been no significant change in coral cover (Hassanali 2009), however shallow water coral reefs seemed to be shifting from hard coral dominated reefs to hydrocoral dominated reefs such as *Millepora* (Von Bochove *et al.* 2008) (Fig 1). Additionally, coral health also appeared to be inversely related to depth, with the highest incidences of disease occurring at shallower depths (von Bochove *et al.* 2008)., which are more directly affected by stressors such as reef walking, anchor dropping, sedimentation and climate change impacts such as mass coral bleaching.

The reef protects a large, low-lying and developed area of southwest Tobago: over 25 years, it has been estimated the damage avoided because of the presence of the reef amounted to between USD $140 bad $250 million. Additionally, revenues in 2006 generated as a result of the Buccoo Reef from tourism and recreational activities associated with it was estimated between USD $7.2 and 8.8 million. The Buccoo Reef /Bon Accord complex is an important national icon important for the maintenance of livelihoods and as a nursery habitat for fishing.

Feature condition and future outlook of the proposed area

(Description of the current condition of the area – is this static, declining, improving, what are the particular vulnerabilities? Any planned research/programmes/investigations?)

The Buccoo Reef-Bon Accord Lagoon area is unique to the southern Caribbean because of its size, attractiveness, and easy accessibility (Goreau, 1967). Being located on the low-energy, leeward southwestern coast of Tobago, has led to its development as a major tourist attraction. The Buccoo Reef/Bon Accord complex is the best example of contiguous reef, seagrass, and mangrove wetland in Trinidad and Tobago. However, the promotion of the Buccoo Reef area as a major tourist attraction, combined with hotel and residential development in adjacent coastal areas, has resulted in direct and indirect negative impacts on the ecosystems (Laydoo et al., 1998). Direct impacts are evident as there has been noted physical damage over an extensive area of the Outer Reef flat where the Buccoo Reef Tour once frequented. Corals have been broken or crushed by trampling feet, falling anchors, and intermittent boat groundings (Goreau, 1967; Kenny, 1976). Indirect impacts are more subtle and are linked to the discharge of untreated sewage and to increased surface run-off (Laydoo and Heileman, 1987, Lapointe 2003). The major population centers adjacent to the Buccoo Reef system are the villages of Buccoo and Bon Accord, as well as numerous hotels and guest houses along the coast from Plymouth to Crown Point. As a result of this development, pollution threatens the viability of the reef through accelerated eutrophication of the seawater resulting in increased algal growth. This development and subsequent pollution, combined with the effects of reef-walking, potentially reduces the coral resilience reducing the possibility of coral regeneration in damaged areas (Laydoo et al., 1998).

Given these threats several applied research projects, programmes, initiatives have been implemented to assist, inform and guide management of the area, involving government, academia, lobbyists and civil society.

Research currently underway and proposed to address some of these impacts, knowledge gaps and management deficiencies is as follows:

- Investigate the coral reef resilience at Buccoo Reef (recruitment rates and genetic connectivity among reef flats, as well as reef fish community structure)
- As past of GEF-funded Project for Ecosystem Services (ProEcoServ) (www.proecoserv.org), the Buccoo Reef/Bon Accord complex area is a case study for the demonstration of the extent to which coastal ecosystems (coral reefs, seagrass beds and mangroves) contribute to the coastal protection, and how this model can be integrated into the planning process. Trinidad and Tobago is among five countries where research will be carried out on how to better integrate ecosystem assessment, scenario development and economic valuation of ecosystem services into national sustainable development planning.
- Southwest Tobago (inclusive of the Buccoo Reef Marine Park) will be used as a demonstration site for the development of develop an Integrated Coastal Zone Management Policy (ICZM) framework, strategies and action plan that incorporates climate change adaptation.
- Research continues into monitoring the productivity and health of the coral reefs, mangroves and seagrasses
- The park is the process of being designated an Environmental Sensitive Area (under the Environmental Management Act 2001). Such a designation would add an additional layer of protection to the park and facilitate legal options for infractions on the park.

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Assessment of the area against CBD EBSA Criteria

(Discuss the area in relation to each of the CBD criteria and relate the best available science. Note that a candidate EBSA may qualify on the basis of one or more of the criteria, and that the boundaries of the EBSA need not be defined with exact precision. And modeling may be used to estimate the presence of EBSA attributes. Please note where there are significant information gaps)

CBD EBSA Criteria (Annex I to decision IX/20)	**Description** (Annex I to decision IX/20)	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Uniqueness or rarity	Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features.			X	
Explanation for ranking This is the only marine protected area in the country and there is no other area where coral reefs, seagrasses and mangroves can be found in this association.					
Special importance for life-history stages of species	Areas that are required for a population to survive and thrive.			X	
Explanation for ranking The seagrass areas are within the Buccoo Reef/Bon Accord Complex is critical to the life cycle of conch (*Strombus gigas*) and spiny lobster (*Panulirus argus*). Additionally, the seagrass beds serve as a feeding ground for green turtles. Investigations are currently underway on the connectivity between the deep water and shallow water reefs.					
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.		X		
Explanation for ranking Scattered colonies of *Acropora cervicornis* and thriving *A. prolifera* give some indication of a limited recovery. Similarly, increased densities of *Diadema diadema* also suggest recovery of the species. Additionally, the endangered Pillar coral (*Dendrogyra cylindricus*) (IUCN redlist) has been noted on the Buccoo Reef amid recovering *Acropora cervicornis*.					
Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.				X

Explanation for ranking

Two decades of research on the Buccoo Reef/Bon Accord complex have highlighted the vulnerability coral reefs to human impacts and climate change impacts. Nutrient pollution is one of the main problems affecting the Buccoo Reef, and its effects are evident by the dying corals, lack of fish and general lack of marine life in some parts of the reef. The accumulation of nutrients in the Buccoo Reef has encouraged macroalgae to thrive and overgrow much of the coral. Overfishing of macroalgae consumers like parrotfish and surgeonfish in the reef has also allowed the macroalgae to grow unchecked. As a result many of the coral species die, the fish and other marine animals move to other areas. Also a history or reef walking, boat groundings and reckless anchor dropping have physically resulted in significant damage to some parts of the Buccoo Reef.

Within the last five years, the landward mangrove trees (white, black and buttonwood mangroves) fringing the Bon Accord lagoon have been removed and are threaten by current and future housing and resort development. Houses continue to encroach on the mangrove fringe.

Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.			X	

Explanation for ranking

The Buccoo Reef/Bon Accord complex supports a wide diversity of marine organisms, the main contributors being corals (42 species), molloscs (24 species) and reef fish (over 100). Other taxa include seagrass, sponges, hydrozoans, zoanthids, anemones, annelids, crustaceans, echinoderms, ascidians, rays, reptiles and marine mammals. The seagrass and mangroves are import nursery and breeding grounds for several species of commercially important species such as conch, lobster, shrimp, shellfish, snappers, groupers, jacks, baitfish and parrotfish. Rare and unique species such as seahorses have only been noted among seagrasses. The mangroves are also important breeding, feeding and living habitat for several species of crustaceans, resident birds and migratory birds. This system represents one of the most diverse and productive areas on the islands. Other areas to the north are arguably more productive and efforts are being made to these areas as well.

Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.			X	

Explanation for ranking

The Buccoo Reef/Bon Accord complex supports a wide diversity of marine organisms, the main contributors being corals (42 species), molloscs (24 species) and reef fish (over 100). Other taxa include seagrass, sponges, hydrozoans, zoanthids, anemones, annelids, crustaceans, echinoderms, ascidians, rays, reptiles and marine mammals. The seagrass and mangroves are import nursery and breeding grounds for several species of commercially important species such as conch, lobster, shrimp, shellfish, snappers, groupers, jacks, baitfish and parrotfish. Rare and unique species such as seahorses have only been noted among seagrasses. The mangroves are also important breeding, feeding and living habitat for several species of crustaceans, resident birds and migratory birds. This system represents one of the most diverse and productive areas on the islands. Other areas to the north are arguably more productive and efforts are being made to these areas as well.

Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.		X		

Explanation for ranking

The relative high dependence on the reefs, seagrass and mangrove areas for livelihoods and recreations have resulted in high human impacts. Nutrient pollution, sedimentation and physical damage have negatively impacted coral reef and seagrass areas. Demands on infrastructural development have also meant the clearing of fringing mangroves for the development of residences and resorts. On a monthly cycle, the mangroves are gleaned for crabs by both for subsistence and recreation.

Sharing experiences and information applying other criteria (Optional)

Other Criteria	**Description**	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Add relevant criteria					
Explanation for ranking					

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(e.g. relevant documents and publications, including URL where available; relevant data sets, including where these are located; information pertaining to relevant audio/visual material, video, models, etc.)

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Maps and Figures

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