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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:** Mid-Cayman Rise

**Presented by:**

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**Abstract**

In August 2011, NOAA Ship *Okeanos Explorer* conducted an expedition at the Mid-Cayman Rise (MCR). Over the course of 11 days the expedition team, including U.S. and U.K. scientists, systematically explored the region in a new way, discovering and characterizing new seafloor habitats, imaging new species in high-definition, and observing the first live vent tubeworm ever seen in that part of the world ocean. Seafloor mapping operations using the ship's deep-water multibeam sonar focused on the shallow outer "walls" or Oceanic Core Complexes bounding either side of the MCR rift valley, and the Cayman Trough Fracture zone immediately to the north. The team used a CTD rosette, *in situ* sensors, and on board gas chromatograph analyses to investigate the water-column overlying the ridge-axis for chemical signals of nearby venting, and they conducted detailed observations of the seafloor using a two-body remotely operated vehicle (ROV) capable of diving to 4,000m.

**Introduction**

The Mid-Cayman Rise, a rift in the seafloor 70 miles (110 km) long and more than 9 miles (15 km) across, is the deepest active spreading ridge on the planet, plunging to nearly 20,000 feet (6,000 m) in places, and is thought to generate some of the thinnest (approximately 3km) oceanic crust on the Earth. It is an ultra-slow spreading center located in the deepest part of the Caribbean Sea, widening by just over half an inch (15-17 mm) per year. Fault systems there have uplifted rocks from deep within Earth's interior to the seafloor forming "Oceanic Core Complexes" (John and Cheadle, 2010). These oceanic core complexes expose deep rocks from the crust and mantle from beneath the ridge axis revealing how the Earth's crust grows in these locations. The surfaces of oceanic core complexes are one of the few places in

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the world where we can visit and sample the Earth’s mantle – normally the mantle is covered by 7-80km of the Earth’s crust. Hydrothermal vent sites are known in both shallow and deep settings at the Mid-Cayman Rise, including the deepest known hydrothermal vent site on the planet.

**Location**

Operations during the expedition were focused south of Grand Cayman, along Mid-Cayman Rise rift valley and bounding outer walls, as well as the Cayman Trough fracture zone immediately to the north. The area is within the national jurisdiction of the Cayman Islands, a British Overseas Territory. I cannot tell you if the area is subject to a submission to the Commission on the Limits of the Continental Shelf. See the attached map showing the Mid-Cayman Rise, and providing an overview of operations conducted during the 2011 NOAA-sponsored expedition.

**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)*

**Feature condition and future outlook of the proposed area**

Our expedition was exploratory in nature, assisting in the development of baseline data. A follow-on expedition was conducted in January 2012 (<http://oases2012.blogspot.com/>) and another funded by the U.K.’s NERC programme is also planned for 2012.

**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
<b>Uniqueness or rarity</b>	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.				<b>X</b>
<i>Explanation for ranking</i>					
This is the only hydrothermal vent site in the Atlantic where tubeworms are known to exist. Multiple sites					

<p>of venting and tubeworm aggregations were observed during the 2011 expedition. In one location, microbial mats, vent shrimp, tubeworms and gastropods were all observed coexisting in one area of hydrothermal flow.</p> <p>Hydrothermal fluids emanating from vents found on top of the Oceanic Core Complex could have similar chemistry to those which may have supported the first living organisms, thus benefitting investigations into origins of life. These hydrothermal systems are also uniquely rich in hydrogen and methane suggesting that these systems could host abundant and unique deep-sea life. The diversity of the deep-sea and subsurface biosphere in these locations has only just begun to be explored.</p> <p>The area contains a new species of eyeless shrimp, and the deepest hydrothermal vent site on the planet.</p>					
<b>Special importance for life-history stages of species</b>	Areas that are required for a population to survive and thrive.			<b>X</b>	
<p><i>Explanation for ranking</i> The area contains hydrothermal vent habitats. Deep-sea coral habitats were also observed.</p>					
<b>Importance for threatened, endangered or declining species and/or habitats</b>	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.	<b>X</b>			
<p><i>Explanation for ranking</i></p>					
<b>Vulnerability, fragility, sensitivity, or slow recovery</b>	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.			<b>X</b>	
<p><i>Explanation for ranking</i> The area contains hydrothermal vent habitats. Deep-sea coral habitats were also observed.</p>					
<b>Biological productivity</b>	Area containing species, populations or communities with comparatively higher natural biological productivity.			<b>X</b>	
<p><i>Explanation for ranking</i> The area contains hydrothermal vent habitats. Deep-sea coral habitats were also observed.</p>					
<b>Biological diversity</b>	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.			<b>X</b>	
<p><i>Explanation for ranking</i> This inquiry needs to be made to the scientists for a more appropriate ranking. I expect that more information needs to be gathered to determine this, as baseline information is still being gathered.</p>					

<p>However I can say:</p> <ul style="list-style-type: none"> <li>- The Von Damm Vent field contains multiple sites of venting with differing community assemblages. Deep-sea coral habitats were also observed.</li> <li>- The area has considerable depth and topography variation.</li> <li>- A geological and biological transect was conducted up the north face of the Cayman Trough fracture zone.</li> </ul>					
<b>Naturalness</b>	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			
<i>Explanation for ranking</i>					

**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
<i>Add relevant criteria</i>					
<i>Explanation for ranking</i>					

**References**

Expedition record on the NOAA Office of Ocean Exploration and Research Digital Atlas (including links to National Archive data holdings): <http://go.usa.gov/nwd>

Expedition Website: <http://oceanexplorer.noaa.gov/oceanos/explorations/ex1104/welcome.html>

January 2012 follow-on expedition website: <http://oases2012.blogspot.com/>

B.E.John and M.J.Cheadle. Deformation and alteration associated with oceanic and continental detachment fault systems: Are they similar? *Geophys. Monogr.* 188, doi. 10.1029/2008GM000772

Connelly, D.P. *et al.* Hydrothermal vent fields and chemosynthetic biota on the world's deepest seafloor spreading centre. *Nat. Commun.* 3:620 doi: 10.1038/ncomms1636 (2012).

C.R.German, A. Bowen, M.L.Coleman, D.L.Honig, J.A.Huber, M.V.Jakuba, J.C.Kinsey, M.D.Kurz, S.Leroy, J.M.McDermott, B.Mercier de Lépinay, K.Nakamura, J.S.Seewald, J.L.Smith, S.P.Sylva, C.L.Van Dover, L.L.Whitcomb & D.R.Yoerger. Diverse styles of submarine venting on the ultra-slow spreading Mid-Cayman Rise. *Proc. Natl. Acad. Sci.* 107, 14020-14025, 2010.

C.R.German, C.McIntyre, P.A.Tyler, K.Elliott, S.R.Hammond & the EX11-04 ECC team. Off-axis exploration of the Mid-Cayman Rise: the view from the beach and from the Okeanos Explorer. *EOS Trans. Am. Geophys. U.* (abstract), OS11C-08, 2011.

National Oceanic and Atmospheric Administration (NOAA). (2011, September 7). Strange Vent-fellows: Explorers on NOAA expedition discover chemosynthetic shrimp, tubeworms together for first time at hydrothermal vent, also first live vent tubeworms seen in Atlantic waters [Press release]. Retrieved from [http://www.noaaneews.noaa.gov/stories2011/20110907\\_mid-caymanrise.html](http://www.noaaneews.noaa.gov/stories2011/20110907_mid-caymanrise.html)

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All data from the 2011 NOAA-sponsored expedition reside at the U.S. National Archives, in the public domain.