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TITLE: CenSeam, an International Program on Seamounts within the Census of Marine Life: Achievements and Lessons Learned

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ABSTRACT:

Seamounts (undersea mountains) continue to be focal areas for marine science, encompassing research that ranges from plate tectonics, oceanic convective heat budgets, the physical structure and dynamics of the ocean's water masses, and the composition of the ancient atmosphere [1]?[5]. Research into the ecological function of seamounts is equally varied. Several groups of organisms have demonstrated hotspots of elevated biomass over seamounts, including mobile pelagic fauna [6]?[9] and larger invertebrates on the seafloor [10], [11]. Seamounts can act as refugia: as presumably isolated habitats, they create conditions that favour the existence of 'living fossils' and, in a few isolated cases, support archaic assemblages that are more similar to fossil strata than extant communities [12]?[14]. This refugia function of seamounts may gain new importance as future, shallow-water refuge areas for deep-water corals that become displaced from deeper layers by changing ocean chemistry [15], [16] (but see [16]). Conventional wisdom previously held that seamounts mimic islands whose biological communities contain more species of small geographic ranges (i.e. 'endemics') than other areas of the oceans, though this notion has been challenged in recent studies, including those employing genetic techniques [12], [17]?[19]. Instead, seamount communities, though they have structural differences, may play a dynamic role in the source-sink dynamics of abutting systems [20].

There is widespread consensus that biological components of seamounts are highly vulnerable and sensitive to human disturbance and exploitation [21], [22]. The best documented, most widespread, and presumably most substantial human impacts on seamounts are caused by fishing. The history of fishing on many seamounts and for many seamount-associated fish stocks shows a classic 'boom and bust' pattern, with few seamount fisheries appearing to be sustainable in the longer term [23]. The impacts of fishing extend from detrimental effects on fish stocks to the seafloor: benthic communities are frequently composed of long-lived and fragile invertebrates (e.g. corals) that have very low tolerances to physical encounters with fishing gear [24], [25]. Consequently, impacts from bottom-contact fishing can be massive, and recovery times may be in the range of decades to centuries [26]. Mining for mineral deposits on seamounts presents a new, and potentially large, threat to seamount ecosystems [27], and emphasizes a need for global, scientifically robust conservation and management planning for seamounts [28], [29]. The increasing biological research on seamounts [30], coupled with these growing management concerns, led to the founding of the Global Census of Marine Life on Seamounts (CenSeam) in 2005 as part of the Census of Marine Life program.

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