A SUMMIT ON THE ROLE OF DEEP-SEA CORALS AND SPONGES AS HABITAT FOR MANAGED SPECIES OFF THE WEST COAST AND ALASKA – SUMMARY OUTCOMES

19 March 2015

The National Marine Fisheries Service (NMFS) convened a "Summit on the Role of Deep-sea Corals and Sponges as Habitat for Managed Species" at NOAA's Sand Point facilities in Seattle, Washington 3–5 March 2015. The Summit brought together 13 researchers and other subject-matter experts from NMFS Alaska Fisheries Science Center (AFSC), Northwest Fisheries Science Center (NWFSC), Southwest Fisheries Science Center (SWFSC), West Coast Region (WCR), Office Habitat Conservation (OHC), and academia to summarize the scientific understanding of the association and functions of deep-sea corals and sponges (DSC&S) as habitat for groundfishes off the West Coast and Alaska. Summit outcomes are being submitted to the Pacific Fishery Management Council (PFMC) and to the North Pacific Fishery Management Council (NPFMC) in the context of their deliberations related to Pacific Coast and Alaska groundfish essential fish habitat (EFH). This document presents a summary of these outcomes. A full peer-reviewed analysis will be forthcoming.

Summit Attendees:

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Background:

DSC&S, as well as other relatively large invertebrate taxa, add complexity and structure to seafloor habitat. Many fishes associate with various types of structure, such as rocks, depressions in soft sediment, kelp, human-made debris, and DSC&S. With the notable exception of sea whips and sea pens, DSC&S mostly occur on rocky substrata; many managed groundfish species (especially the rockfishes) co-occur with DSC&S in the same rocky areas. DSC&S taxa are slow growing and vulnerable to disturbance by those bottom-tending fishing gears that generally target groundfish species. Damage from such gear can be long lasting and recovery of DSC&S can be slow.

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Understanding the function of DSC&S as groundfish habitat is fundamental to the review and management of groundfish EFH for PFMC, NPFMC, and other Councils. Whereas the vulnerability of DSC&S may evoke strong calls for conservation, there is limited information on the distribution, abundance, and ecological function of DSC&S taxa. The role of DSC&S as a component of groundfish EFH (i.e., habitats essential for spawning, breeding, feeding or growth to maturity), in particular, is not well established. Strong associations between rockfishes and DSC&S have been documented from visual surveys conducted in Alaska (e.g., Aleutian Islands and parts of the Gulf of Alaska) and between rockfishes and sponges in Grays Canyon off Washington, but not from other similar surveys off the West Coast. A key consideration is whether similar levels of association of DSC&S and groundfishes along the West Coast can be inferred from visual surveys conducted in areas of Alaska with similar habitats.

There is considerable expertise within NMFS and the greater scientific community that can be used to summarize the current state of scientific knowledge on associations of managed fishery species with DSC&S, and improve our understanding of the role of DSC&S as habitat (particularly EFH) for groundfishes. To that end, NMFS convened a web-enabled series of 8 seminars from August 2014 to February 2015 (see Attachment 1). These science-based seminars were presented by researchers with expertise in associations and functions of DSC&S as habitat and attracted significant interest and discussion nationwide. In addition, the Steering Committee compiled a substantial bibliography to help us understand DSC&S as habitat for groundfishes (see Attachment 2). Following the webinar series and completion of the bibliography, a core group of these researchers and other subject-matter experts met at an in-person Summit to discuss and synthesize the information as it relates to northeast Pacific groundfishes.

Goals:

- Develop a better understanding of the connection between DSC&S and Pacific Coast and Alaska groundfishes.
- Summarize what is known and unknown on the role of DSC&S as habitat for groundfishes.
- Provide clear statements regarding DSC&S protection and the sustainable management of groundfishes.

Summit Outcomes:

We developed science-based statements on what is known and unknown regarding the role of DSC&S as habitat for groundfishes. Summit outcomes are summarized as: 1) associations between groundfishes and DSC&S; 2) lines of evidence that may indicate a functional role of DSC&S as habitat for groundfishes; 3) points to consider in data analyses and interpretations; and 4) issues to keep in mind when communicating research results on DSC&S as habitat for groundfishes.

Associations

- There are geographic gradients both in the densities of DSC&S and in the magnitude of associations of DSC&S and groundfishes from Alaska (relatively high) to southern California (relatively low).
- Regardless of the magnitude, rockfishes (particularly juveniles and/or dwarf species) are the principal taxonomic group of groundfishes associated with DSC&S off Alaska and the West Coast.
- Rockfishes are associated with structure (including rocks, as well as corals, sponges, and other megafauna). There is some evidence for equivalency of structures; that is, rock habitats may be as important (or more so) to fishes as sponges or corals.
- Size and shape of DSC&S may influence the degree of association with groundfishes. For example, fishes may be more associated with large DSC&S than with small DSC&S.
- The intersection of depth distributions of both DSC&S and rockfishes may be important in understanding some of the differences in the strength of association found in Alaska and elsewhere on the West Coast.
- Only three studies have looked at day-night differences in associations of northeast Pacific groundfishes and DSC&S. There is some evidence of greater use of sponges by certain rockfishes at night off Oregon. In addition, Pacific Ocean perch formed dense aggregations at night in a "forest" of sea whips while feeding in mid-water during the day in the Pribilof Canyon off Alaska. Similarly, northern rockfish formed aggregations at night on the seafloor in dense sponge habitats while feeding in the water column during the day at a rocky site on the outer shelf of the eastern Bering Sea.
- Organisms other than rockfishes are associated to varying degrees with DSC&S off Alaska and the West Coast. These include juvenile king crab associated with sponges in Alaska, spot prawns with sponges off the Washington coast, sculpins and sharks that deposit their eggs on corals or sponges, and megafaunal invertebrate taxa (e.g., brittle stars, tunicates, and small crabs) on corals or sponges. Off Southern California, a greater number of megafaunal invertebrates were found consistently on dead corals and sponges than on living ones.

Functional Roles

- In parts of Alaska, high levels of association specifically between corals and groundfishes (largely juvenile rockfishes) may indicate functional, although not necessarily obligatory, roles of corals especially as shelter and/or nursery grounds. There is no significant evidence of this in California.
- On the West Coast, juvenile and adult rockfishes primarily are associated with non-biogenic structure (e.g., rocky outcrops, boulders, and cobbles), which can be locally abundant and used for shelter and/or nursery grounds.

- The magnitude of association between sponges and groundfishes, which differs from Alaska (relatively high), to British Columbia and Washington (moderate), to Oregon and California (relatively low), could indicate that sponges have a functional role as habitat for some groundfishes.
- In some parts of Alaska, structure (i.e., coral, sponge, or rocks) provides habitat for juveniles, potentially influencing production for those groundfish species. Preliminary models from trawl-survey data off parts of Alaska illuminate the potential for DSC&S to increase fish production.
- Compared to Alaska, the level of sustained pressure from both recreational and commercial fishing has been greater and over a longer time period off the West Coast. The removal of large fishes has resulted in altered ecosystems, with demersal fish assemblages in rocky areas now dominated by dwarf species of rockfishes. The connection between DSC&S and rockfishes may not be as important when large predators are not present in the community. With almost no information on intact fish assemblages prior to fishing, it is impossible to fully understand the function of DSC&S as habitat for groundfishes off the West Coast.
- Restoration of community structure (both species and size compositions) of groundfishes and their habitats to pre-fishing conditions off the West Coast is central to the evaluation of the function of DSC&S as habitat in any role (nursery, shelter, prey enhancement, etc.).
- Long-term restriction on the use of the most damaging bottom-contact fishing gears is an appropriate management measure to protect DSC&S from physical damage. Restoring community structure and potentially the functional role of DSC&S to particular areas off the West Coast may require no-take fishery closures.
- Protection of DSC&S (particularly on the West Coast) is not likely to result in increased production of groundfishes unless this protection is coupled with measures to restore the entire demersal community.

Data Considerations

- Information to evaluate associations of DSC&S and groundfishes is limited for many areas of the West Coast and parts of Alaska. Meaningful evaluation of associations may be dependent on size and densities of fishes and DSC&S, amount of available rock, depth, and spatial, diel, and seasonal sampling.
- Visual surveys provide the most meaningful information for evaluating associations of groundfishes with DSC&S. These surveys are site-specific, often target untrawlable rocky areas where many DSC&S occur, and provide fine-scale information on demersal communities (i.e., fishes, DSC&S, habitats). These surveys generally are conducted during daylight hours in summer and fall, and therefore evaluation of diel and seasonal associations of DSC&S and groundfishes is limited.
- Broad areas off the West Coast and Alaska have been surveyed by trawls, but not by visual methods. Trawl surveys do not typically target rocky areas where most DSC&S occur and therefore yield limited

information on DSC&S as habitat for groundfishes. However, the broad spatial coverage of trawl surveys results in a general understanding of the location of DSC&S from the benthic invertebrate catch data.

- DSC&S data from NMFS trawl surveys and observed commercial fishing trawlers are important, but the spatial resolution is not sufficient to determine density of DSC&S on a local scale.
- Predictive models are being used to integrate data from large-scale trawl surveys with those from small-scale visual surveys. Results are useful to guide the design of the visual surveys and to interpret data on a broad region-wide basis.
- Rocky habitat is the best predictor of the distribution of many DSC&S taxa (with the exception of sea pens and sea whips). Improved coastwide seafloor mapping is needed to more accurately delineate the distribution and extent of rocky areas. Improved seafloor maps will greatly assist in design of visual surveys and in more meaningful predictive models.
- Analysis of coastwide indices of historical fishing effort (particularly by foreign fleets and the highly mechanized U.S. fleet that emerged in the 1970s) for all bottom-tending gears from the Bering Sea to Southern California would help in evaluating the role of DSC&C as habitat for groundfishes, given the legacy of altered community structure that has resulted from this type of fishing.
- Coastwide measures of oceanographic conditions (e.g., temperature, dissolved oxygen, ocean acidification, and productivity) from the Bering Sea to Southern California would add context when interpreting information on DSC&C as habitat for groundfishes.
- Several laboratory and field experiments were discussed that could help in understanding both the role and function of DSC&C as habitat for groundfishes and potential drivers (e.g., density and sizes of fishes and DSC&C; availability of equivalent structure) that influence these functions.
- From a recent study in the Northwest Atlantic, researchers suggested a functional role of sea pens as nursery habitat for newly released rockfish larvae. There are significant methodological concerns with this study that call into question the validity of the results; these concerns should be resolved before results are used to inform management decisions.

Communication Considerations

- Singular images that imply high densities of DSC&S habitat or high levels of association of DSC&S with groundfishes are not representative of all DSC&S communities.
- There are significant differences in DSC&S and groundfish assemblages among habitats and geographic regions. Scientists, stakeholders, and managers should be aware of these differences in order to avoid improper inference of findings on DSC&S as habitat for fishes from one region or habitat to another.

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Attachment 1

Webinar List

- *August 14, 2014*: Peter Auster – Deep Sea Corals and Sponges as EFH (and related ecological musings)

- *September 17, 2014*: Bob Stone – Association of FMP Species with emergent epifauna: Case studies from Alaska

- *October 29, 2014*: Mary Yoklavich – Associations of groundfishes and corals in the Southern California Bight

- *November 5, 2014*: Sandrine Baillon – Deep-sea pennatulacean corals in the Northwest Atlantic: a nursery for *Sebastes* species and a habitat for other species

- *November 19, 2014*: Sean Rooney – Groundfish, Deep-water Corals, and Sponges: Examining diel patterns of fish-habitat associations on Hecate Bank, Oregon

- *December 10, 2014*: Chris Rooper – Linking fish productivity to deep-sea coral and sponges in Alaska

- *January 21, 2015*: Andrea Quattrini – Fishes associated with deep coral reefs in the western North Atlantic

- *February 4, 2015*: Elizabeth Clarke – Characterization of glass sponge habitats and associated groundfish in Grays Canyon area off the Washington Coast

Some of the webinars have been archived and will be available to the public at: http://www.westcoast.fisheries.noaa.gov/

Attachment 2

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