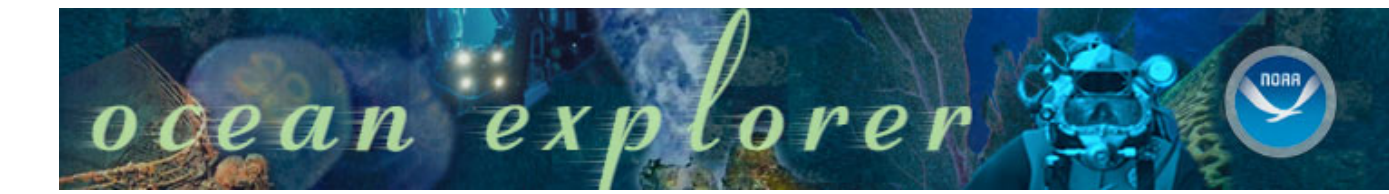


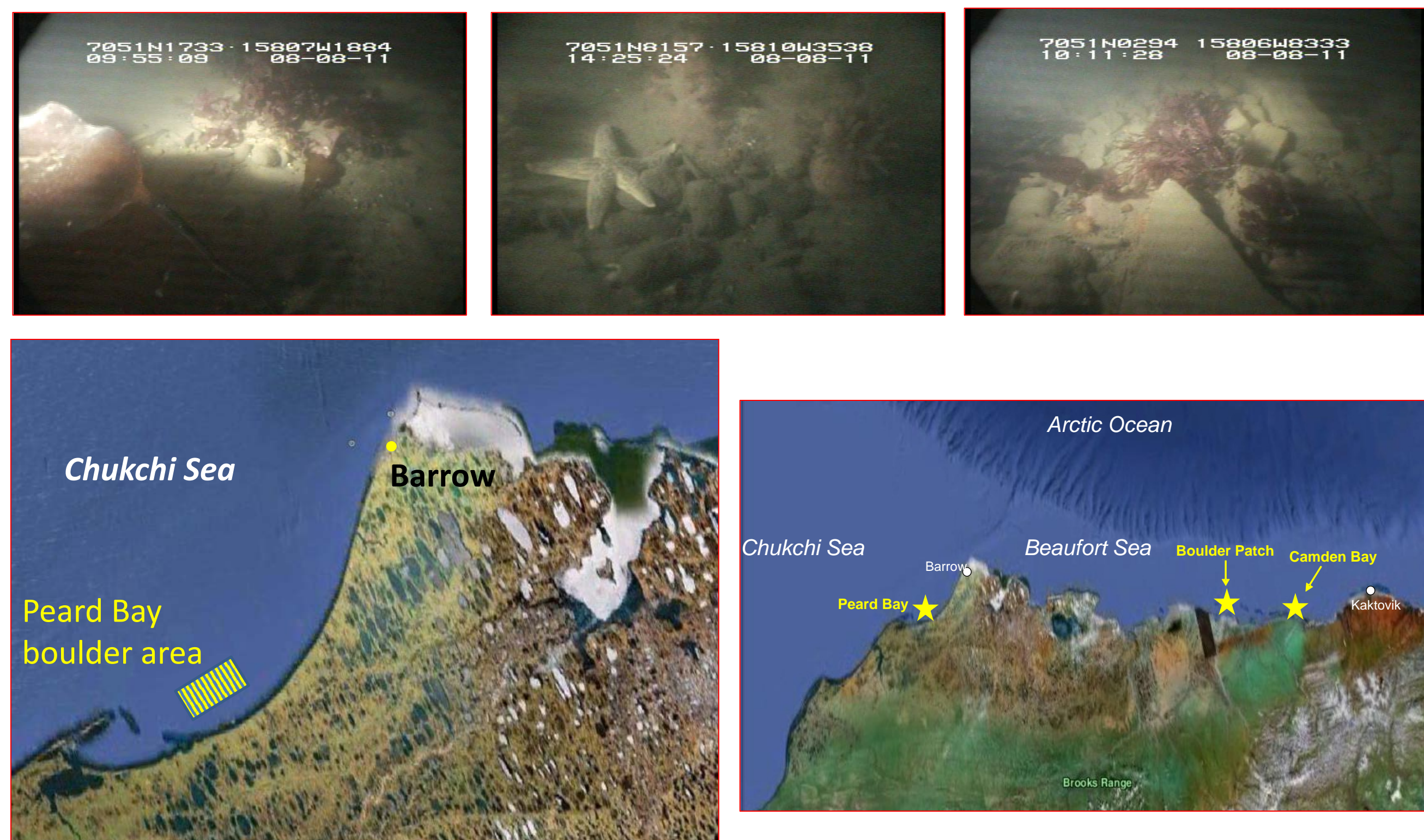
A comparison of nearshore kelp habitats across the Alaskan Arctic coast - an Ocean Exploration project -

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Introduction

Rocky habitats dominated by kelps are rare in the nearshore Arctic, but where they occur, these habitats are known to be distinct biodiversity hotspots. From known boulder regions in the Beaufort Sea we understand that these habitats are ecologically important because they support high diversity and benthic primary producers with tightly linked food webs (Dunton et al. 1982). In the Chukchi Sea, the presence of a kelp-dominated boulder field in Peard Bay, south of Barrow, was described in 1957 (Mohr et al. 1957), but the area was never biologically characterized. Here we present the first quantitative biological description from the recent exploration of the Peard Bay boulder field. We also compare this community to other such kelp communities in the coastal Beaufort Sea to assess if these boulder habitats may present distribution stepping stones for hard-bottom associated fauna and flora.



Methods

The Peard Bay boulder field was sampled on 7-8 August 2012. After preliminary video-exploration of the region to determine the approximate extent, three sites at 8-10 m depth were selected for detailed biological sampling using SCUBA. Percent cover of substrate type (sand, rock) and biological organisms was determined from ten haphazardly distributed 1x1 m quadrats at each site. In addition, we collected all organisms from six haphazard 50x50 cm quadrats into fine mesh bags and analyzed biomass and abundance of macroalgae and invertebrates.

Identical collections were done in the Beaufort Sea, in the Stefansson Sound Boulder Patch (2006) and in a boulder area in Camden Bay (2007), which are used here for large-scale comparisons of boulder communities.

Differences in community composition among sites in Peard Bay, as well as among different region boulder fields, was analyzed using multivariate statistics (Primer v6), including MDS plots for visual representation, ANOSIM to elucidate differences among sites/regions, and SIMPER to identify taxa that contribute most to the observed differences.

Acknowledgements

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Results

A total of nine macroalgal species were found in Peard Bay, and 79 invertebrate taxa were identified from collections. There were no significant differences in diversity or species composition based on percent cover among the three sites investigated in Peard Bay (ANOSIM R=0.34, Fig. 1A). However, slight site separations were found, driven by the % sandy substrate (lowest at site 1, Fig 1B), % *Phyllophora* (highest at site 2, Fig 1C), and % *Laminaria solidungula* (highest at site 2, Fig 1D). Among the invertebrates collected, ascideans, followed by asteroids, gastropods, sponges and decapods were the most common taxa contributing to overall biomass (Fig 2).

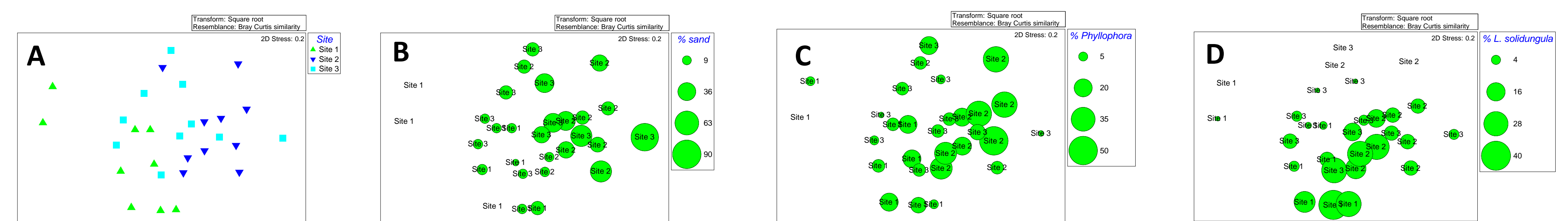


Fig. 1: **A.** MDS of community composition based on % cover at three sites in the Peard Bay boulder field. Bubble size in Fig. 1 B-D represents the % cover contribution of sandy substrate (**B**), the red alga *Phyllophora* sp.(**C**), and the kelp *Laminaria solidungula* (**D**)

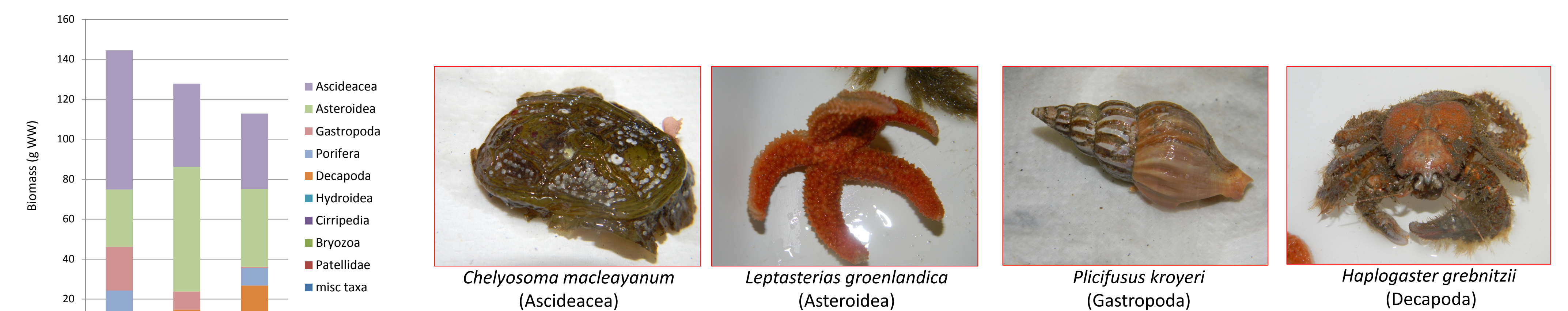


Fig. 2: Invertebrate taxon composition of boulder field community in Peard Bay. Pictures illustrate particularly common taxa

In a comparison among three boulder regions in the coastal Alaskan Arctic, community composition differed significantly among regions for macroalgae and invertebrates (both based on biomass, Fig. 3A and B). Macroalgal composition among regions was slightly more similar (ANOSIM R=0.82, Fig. 3A) than invertebrate composition (ANOSIM R=0.94, Fig 3B). Regional macroalgal differences were due to high biomass of *Saccharina latissima* in Camden Bay, low biomass of *Odonothalia* sp. in the Boulder Patch, and low biomass of *Phycodryis* sp. in Peard Bay. The separation in invertebrate composition between Peard Bay and the other regions was driven by the high biomass of ascideans and amphipods in Peard Bay. The Boulder Patch was characterized by particularly high sponge biomass, while Camden Bay separated from the other regions by high gastropod and bivalve biomass.

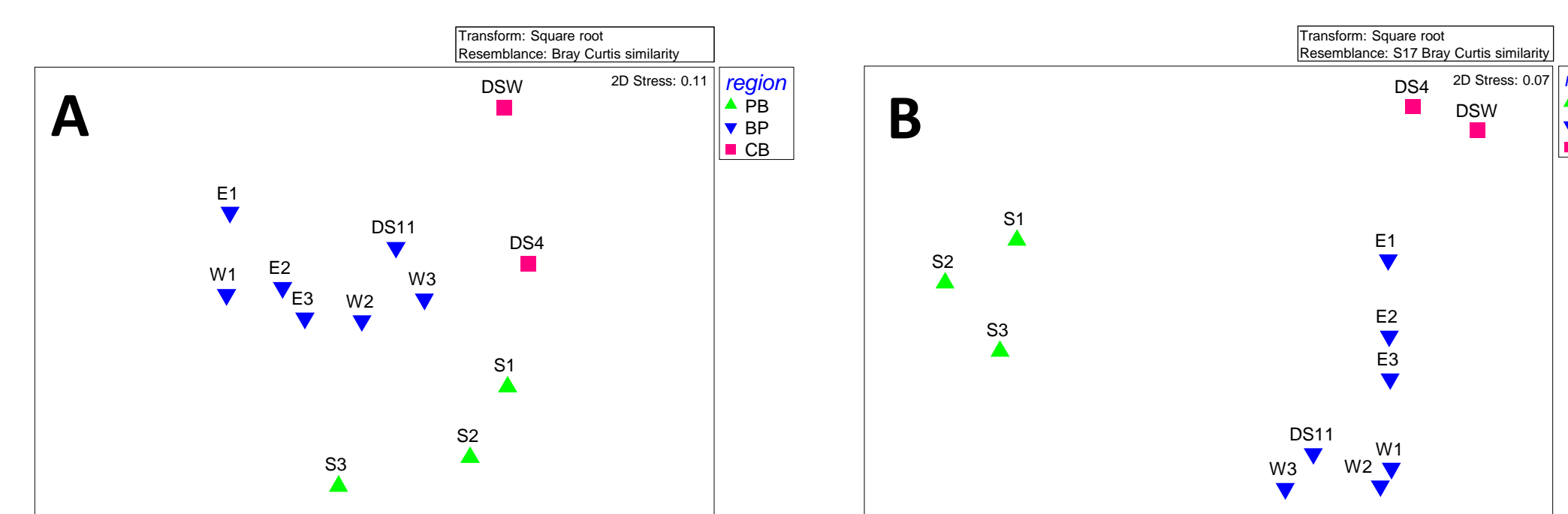


Fig. 3: **A.** MDS plots of macroalgal composition and **B.** Invertebrate community (both based on average biomass per site) of the three boulder field regions along the Alaskan Arctic coast.

Conclusion

This project presented the first biological description of a coastal boulder field community in Peard Bay, Chukchi Sea. Particularly striking was the high presence of the ascidean *Chelyosoma macleayanum* in the invertebrate community, which is rare in the other Arctic boulder fields. In comparison with the other regions, the macroalgal communities consisted of the same species but differed in biomass contribution among regions. For the invertebrate community, many of the species were different. On the higher taxon-level, each boulder region contained some invertebrate taxa that seemed to be representative of the region but only occurred in very low abundances in the other regions. This may be an indication of limited exchange of invertebrate recruits among these regions and high local recruitment, while more exchange among regions may exist for macroalgae.

Further work will include more detailed analysis of within-region and among-region comparisons of community composition and diversity. We also will attempt to map and characterize the Peard Bay boulder field based on geo-referenced video sequences.