GULF of ALASKA

Comparison of the physical attributes of the central and eastern Gulf of Alaska IERP study sites

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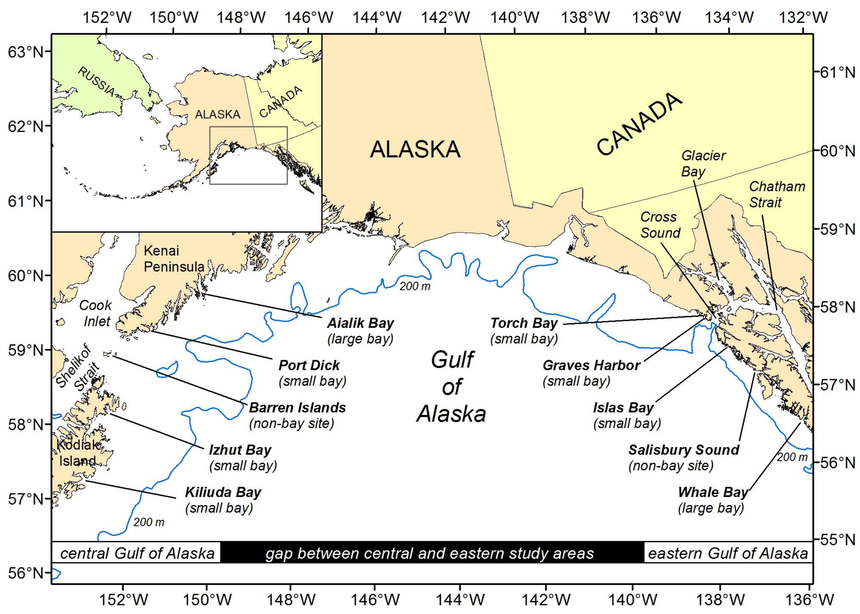
Introduction

Are the 5 central and 5 eastern GOA-IERP inshore sites organized on a regional basis (central versus east), a size basis (small versus large), or some other factor of previously unknown importance?

It is known that the western Gulf has: 1) higher fish and invertebrate benthic biomass, 2) higher primary productivity, 3) more upwelling, 4) stronger tidal currents, 5) stronger alongshore currents, and 6) broader shelf area, resulting in higher fish biomass in the west, and greater species diversity and richness in the east (Mueter and Norcross, 2002) . However it is not known if inshore sites reflect these regional differences.



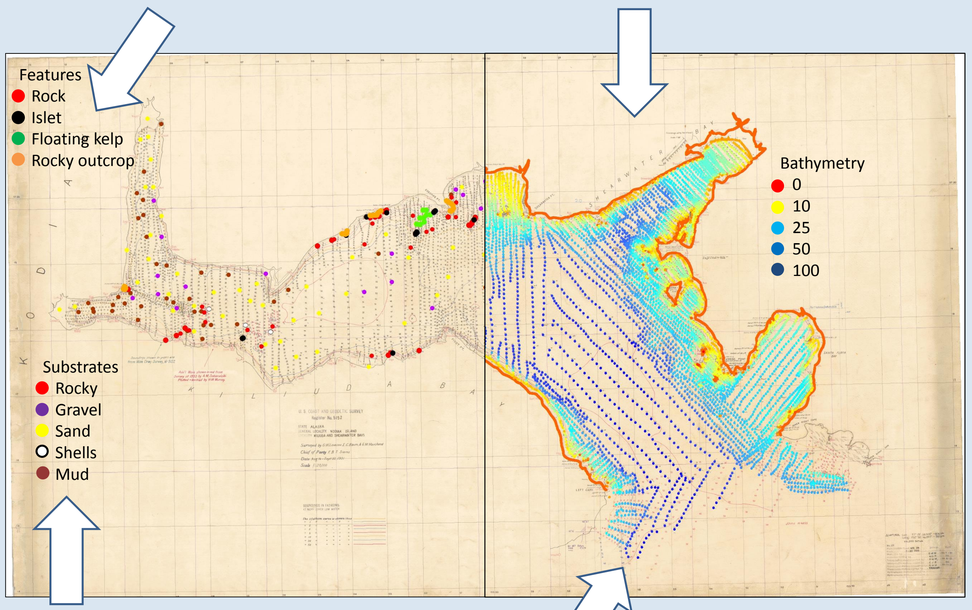
Smooth sheet digitizing

Prior to GOA-IERP, not many quantifiable measures were available for these study sites. We relied on smooth sheets to derive information, since field work was focused on biological sampling.

Smooth sheets can be downloaded for free at National Geophysical Data Center (NGDC: *http://www.ngdc.noaa.gov*), often along with a file of digitized soundings. The smooth sheet needs to be georegistered in a GIS and datum-shifted.
In this case, H05152 was created in the Valdez datum and needed to be shifted 239 m north (Lat.), 293 m east (Long.) to align with a modern datum - NAD83.

Features such as floating kelp, rocky outcrops, rocks and islets can be digitized.

Shorelines, which are defined as Mean High Water (MHW=-2.68 meters), can be digitized as additional bathymetry.

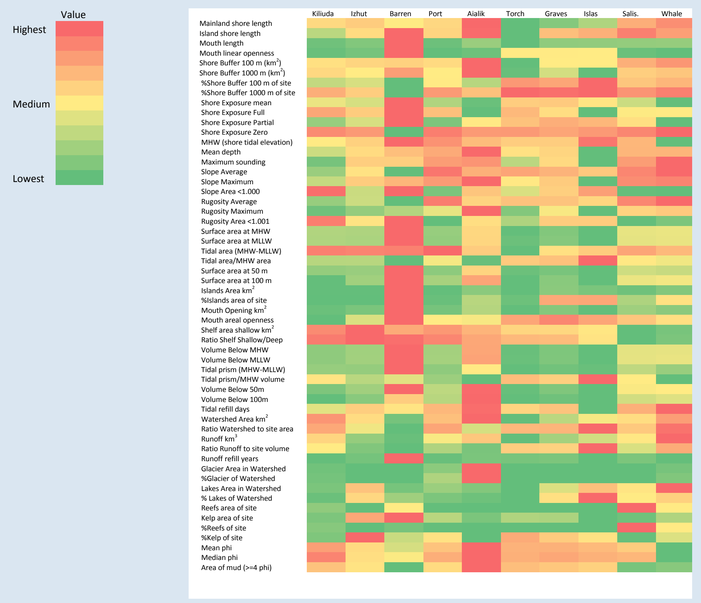


Substrates are digitized as verbal descriptions – “fine gray sand” - and then converted into numerical data using usSEABED (*http://walrus.wr.usgs.gov/usseabed*).

Soundings also need to be datum-shifted, proofed and edited.

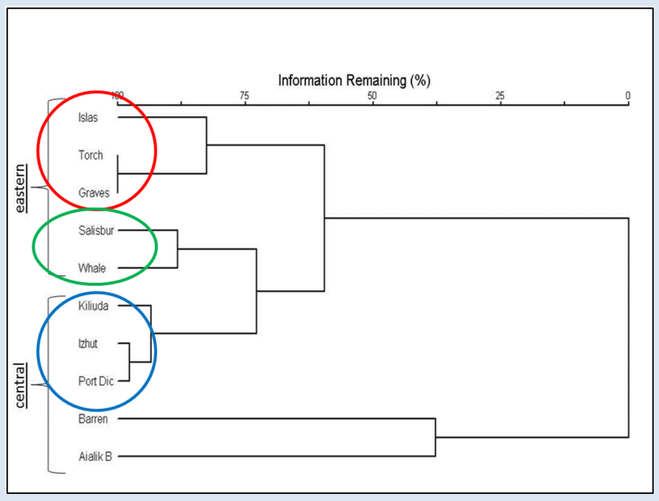
GIS calculations: 56 relative and absolute metrics

Fifty-six GIS metrics were derived from the smooth sheets. They were a mix of absolute measures (e.g. bay surface area, volume, and mainland shore length), which would tend to discriminate between larger and smaller study sites, and relative measures (e.g. ratio of watershed area to bay surface area, ratio of freshwater runoff to bay volume, percentage of watershed covered in lakes), which might discriminate between sites independent of size.



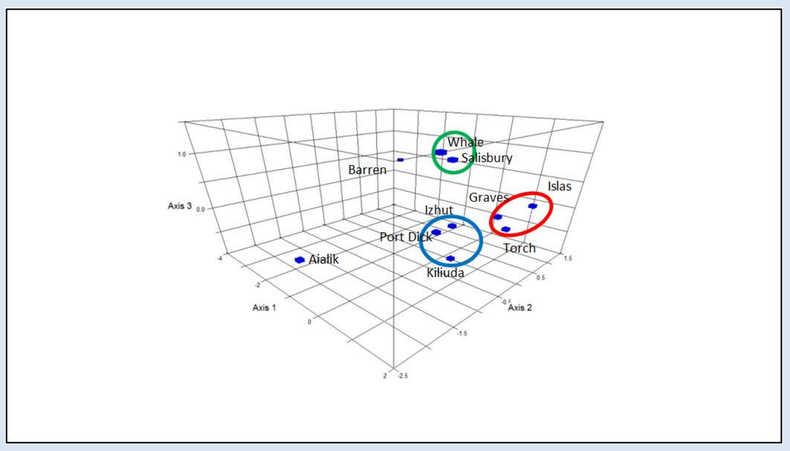
Cluster analysis

The clustering analysis had a low degree (15%) of chaining (sequential addition of entities to a group), clearly identified the cGOA (blue circle) and eGOA (red circle) small bay groups, and SS/WB (green circle) was a group, but Aialik Bay and the Barren Islands were outliers. The SS/WB group (eGOA) was more closely linked to the cGOA small bay group but, in general, the clustering grouped sites on the basis of geographical proximity: eGOA sites were more similar to each other and cGOA sites were more similar to each other.



Principal Components Analysis

The first three principal components analysis axes explained 76.4% of the variance and clearly depicted the same groups as seen in the clustering analysis. Numerous volume and surface area metrics were the strongest negative (< -0.4) loadings on PC1 (43.3% of variance) while the strongest positive (> 0.4) loadings were relative littoral and watershed measures, such as percentage of bay within 100 and 1000 m of shoreline, ratio of watershed area to bay area, and ratio of runoff volume to bay volume.



Conclusions

This analysis confirmed some cGOA and eGOA dissimilarities in study sites, however it seems that study site size is driving some of the results and differences. Fish growth, distribution, and abundance will be examined with reference to the study site groupings.