Physical Representation – Oceanographic Regions (renamed Upper Ocean Sub Regions)

description

The overall objective of this map is to inform the development of networks of marine protected areas by considering that Pacific Canada marine waters can be subdivided into major upper ocean sub regions with recurring physical oceanographic processes and potentially different marine plankton production and diversity. Although the surrogacy between the sub regions and diversity remains to be tested, the sub regions offer a starting point for recognizing that the ocean is not homogenous. Twenty-four upper ocean sub regions were identified.

The analysis considered information from satellite imagery, oceanographic simulation models and experts. The analysis was restricted to the upper ocean (~20-30 m depth) and to oceanographic processes linked to enhancing nutrient supply to surface waters. Ignored are processes such as those transporting oxygen to basin habitats where waters can be well oxygenated to anoxic depending upon restrictions of deep water circulation. Further, because many physical and chemical oceanographic processes can change markedly from season-to-season and year-to-year, it was necessary to simplify the analysis by considering ocean processes that occurred during the summer only (mid June to mid September). It was assumed that each ocean sub region has a suite of recurring and enduring physical oceanographic processes that distinguish itself from its neighbor, and that the oceanographic processes result in lower trophic level properties (e.g., primary production) that influence the organization and production of higher trophic levels, such as fish, seabirds and marine mammals. Conceptually, the boundaries of the upper ocean sub regions should be considered "fuzzy" because of temporal and spatial variability in the location of water masses due to surface winds and tidal currents, but pragmatically, the boundaries are represented on the maps as hard lines to facilitate presentation. Finally, it should be noted that the shoreward boundary of the upper ocean sub regions described is the kelp zone or 'white-strip' (~ depth of 30 m). It is anticipated that the upper ocean sub region boundaries represented on the map will endure for at least 10 years until additional oceanographic knowledge and data become available.

PHOTO: JOHN BROUWER

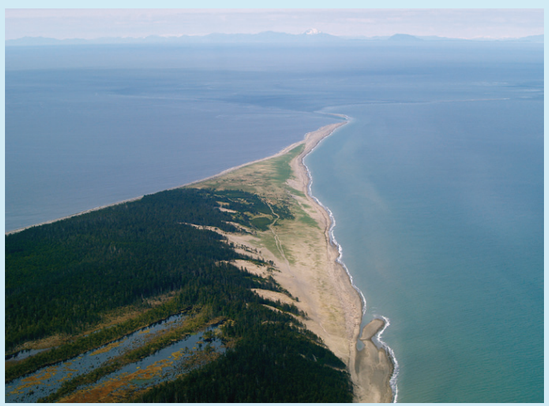

PHOTO: MIKE AMBACH

data sources

- Parks Canada – Oceanographic Regions
- Report was peer- reviewed and revised 2013; regions renamed Upper Ocean Sub Regions
- Report – Robinson and McBlane 2013 – is available for download with the feature data

data resolution

- None provided.

date of analysis

- Original analysis 2009
- Peer-reviewed and revised 2013

reviewers

- Frank Whitney, emeritus, Fisheries and Oceans Canada
- Mike Foreman, Fisheries and Oceans Canada

reviewer comments

- The major qualifier for this analysis is that "oceanographic" properties are assessed for the surface layer (upper 20 m) in summer. Regions are therefore delimited largely on the basis of summer nutrient supply which is governed by various mixing processes. Ignored are processes e.g. transporting oxygen to basin habitat where waters can be well oxygenated to anoxic depending on restrictions to deep water circulation (or silt to the sediment surface, or wave energy to the benthos, etc.) Any attempt to identify potential conservation areas would need to also assess subsurface habitat to see if it held representative benthic communities.
- Accepting this caveat, delimiting oceanographic regions based on primary productivity has merit. High productivity regions support complex food webs which produce abundant fish, seabird and mammal communities. Ware and Thomson (2005) showed how strongly primary productivity (chlorophyll) is associated with resident fish production along the northwest coast of North America. Robinson and McBlane have expanded this approach to identify smaller regions of exceptional productivity on a scale suitable in considering the creation of conservation areas.
- This is a reasonable assessment of spatial variability. On a smaller scale, individual bays within specific inlets may have uniqueness. But an analysis on this level adds tremendous complexity and lacks sufficient data to cover the entire north coast.

caveats of use

- It is an assessment strictly of differences in surface productivity in summer.
- Recommended date of expiry for use of these data in a Marine Planning Context: 2023

map, feature data and metadata access

- Visit *www.bcmca.ca/maps-data* for more information

references

- Robinson, C. and L. McBlane. 2013. A summary of major upper ocean sub regions found within Parks Canada's five Natural Marine Regions on the Pacific coast of Canada. 40p. (available for download with feature data at *www.bcmca.ca/maps-data*)
- Ware, D. M., and R. E. Thomson. 2005. Bottom-up ecosystem trophic dynamics determine fish production in the northeast Pacific. Science, 308(5726), 1280-1284.

BCMCA Atlas

Physical Representation

Upper Ocean Sub Regions

Legend

- Aristazabal Upwelling Region
- Cape St. James Tidal Mixing
- Cape Scott Tidal Mixing
- Central Strait of Georgia
- Coastal Mixing Region
- Dixon Entrance Coastal Flow Region
- Dogfish Bank Frontal Region
- Eastern Queen Charlotte Sound
- Haro Strait and Rosario Passage
- Hecate Strait
- Interior Gulf Islands
- Johnstone Strait
- Juan de Fuca Eddy
- Juan de Fuca Strait
- Low Flow Nearshore
- Mainland Fjords
- Northern Strait of Georgia
- Offshore Pacific Ocean
- Rose Spit
- SE Alaska Mixing Region
- Southern Strait of Georgia
- Vancouver Island Inner Shelf
- Vancouver Island Shelf Break
- West Coast QCI Upwelling Region

Data Sources:
Parks Canada

Base Data:
ESRI Base Data, GeoBase, GeoBC, NOAA, Natural Resources Canada, USGS, Washington State Government

Thematic Data:
For more information on data sources and methods please refer to the facing page to this map

Projection: BC Albers NAD83

0 25 50 75 100 125 150
Kilometres

0 25 50 75
Nautical Miles

1:4,250,000
* Written scales are approximate and are based on a 11 x 17 inch paper size.

Prepared for:

BC Marine Conservation Analysis

Map template by Caslys Consulting Ltd.

April 5, 2013

142°W 140°W 138°W 136°W 134°W 132°W 130°W 128°W 126°W 124°W 122°W

54°N 52°N 50°N 48°N 46°N

Alaska
Nass River
Skeena River
Haida Gwaii
British Columbia
Fraser River
PACIFIC OCEAN
Vancouver Island
Washington