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PACIFIC COASTAL RESOURCES ATLAS

FOR

BRITISH COLUMBIA



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INTRODUCTION

The **Pacific Coastal Resources Atlas** (PCRA) for British Columbia, Canada, was developed in response to the expressed need for creating easy access to information that can be used by anyone with an interest in Coastal Marine Resources Planning. The goal of the PCRA is to provide Government agencies, Regional and Community Governments and NGO's access to the best available coastal resources datasets; an additional benefit is that in this way, all interest groups will be “working from the same page” of information.

To date, both freshwater and coastal resources fishery information has been housed in a huge variety of data warehouses; some of these are digital, some are available in hardcopy form only, and much of our coastal resources knowledge still remains in the form of unwritten Local and Traditional Ecological Knowledge (LEK and TEK). The PCRA brings together information on the spatial distribution of coastal marine resource and resource use from these various sources in a format that allows the user to easily access and overlay relevant data layers. Although the individual databases and GIS layers may reside on different computers in a range of agency data warehouses, the PCRA system is designed to make all of the information accessible to information users and providers at one specific location through the Internet.

The Pacific Coastal Resources Atlas is available through the Community Mapping Network (CMN). The Community Mapping Network was created to share a wealth of natural resource information and maps with communities in British Columbia, Canada. Government and community natural resource information is integrated and made accessible through a user friendly, interactive mapping system called Autodesk Mapguide. A series of servers are utilized to share the workload for serving province-wide topographical base maps, high resolution orthophotography, Canadian Hydrographic Service Charts and selected resource information. Maps and natural resource information are “web-served” to assist communities and local governments with landuse planning, to promote conservation and protection of sensitive habitats and to raise awareness and respect for ecological values.

Uses and Benefits of the PCRA

There are many uses for spatially georeferenced marine habitat and fishery information. Some examples of the business needs for this information include:

- Habitat referrals for foreshore leases and licences;
- Oil spill contingency planning and response;
- Community shoreline planning and zoning;
- Provincial coastal planning;
- Provincial and Federal Marine Protected Area analysis;
- Fisheries research which looks for correlation of marine resources with habitat.

The benefits to Governments and Communities are significant; requests for existing information from Government agencies will be greatly reduced (with associated cost savings) – community members will have a greater sense of ownership and stewardship of natural resources and will be better informed when resource use conflict decisions are being made.

Incorporation of Local and Traditional Ecological Knowledge

While both the federal and provincial governments have collected a wealth of information on coastal resources and resource use along the BC coast, there critical information gaps for certain resources and little information collected at detailed scales of resolution. The cost of doing detailed surveys in this huge coastal area would be phenomenal, (at a recent conference at the Institute of Ocean Sciences one participant estimated it would take 60+ years using the best available technology just to accurately map the BC coastal seafloor and inshore). The ability to map additional coastal resources using Local Ecological Knowledge (LEK and Traditional Ecological Knowledge (TEK) will greatly assist BC residents in making responsible resource use decisions. The Community Mapping Network (CMN) allows authorized users to add new LEK / TEK as it becomes available using “on-line” data entry tools. This initiative is presently the only marine resource information system in BC that allows on-line data entry.

Metadata

Metadata is the “data about the data” – who collected it, and when, how and why it was collected. The PCRA system allows the user to access the accuracy of both the spatial and non-spatial information about a feature (habitat/fishery/species) by providing metadata in the data records about who collected the information, how it was collected and when it was collected.

The on-line data entry tools allow for the input of new information that will come from a variety of sources with an associated variety of accuracy and completeness, (as is the case with most existing information sources). The system allows anyone who views the maps and data reports to review the sources of the information and the relative accuracy of the observations. By including detailed metadata in the PCRA, users are informed as to the accuracy and precision of an observation and where needed use the PCRA to focus their survey efforts to improve these. In the meantime as coastal resource use planning decisions are being considered, crudely georeferenced or “suspected presence” of a species, fishery or habitat is better than no information at all.

Fisheries Resource Information

One of the main sources of information included in the PCRA is regional Fisheries Resource Information collected and maintained under the joint efforts of the BC Provincial Government and Fisheries and Oceans Canada (DFO).

In the late 1980s the Environmental Emergency Services Branch of the BC Ministry of Environment, began the process of compiling marine biological information for Biological sensitivity mapping for oil spill response. This included information the distribution of species, a comprehensive mapping of shoreline physical characteristics and the locations where fisheries took place. In reality there is little information on the distributions of individual marine species other than for birds and mammals. Most of our understanding of the distributions of fish and invertebrates is inferred from the locations of commercial and recreational fisheries for those species. The distributions of species that we do not exploit are mostly unknown or extrapolated from what we know of their habitat preferences.

DFO had long recognized that a significant proportion of the existing fisheries and fish habitat information for the BC coast comes from the personal knowledge and experience of district fisheries staff or on unpublished file material in district fisheries offices. In 1993, the South Coast Division of DFO initiated the development of a standardized system to collect, organize and report information pertinent to oil spill planning from fisheries staff (Booth and Rueggeberg 1994; Booth et al. 1995). This collection of Fisheries Resource Information was continued through the 1990s and is still ongoing with regional updates roughly every five years. The database is currently (2005) maintained and updated jointly by Decision Support Services (under the Ministry of Sustainable Resource Management) and Fisheries and Oceans Canada's Habitat and Enhancement Branch. Current regional compilations include:

Region	Years collected/ updated
Strait of Georgia	1992/93, 2002-2004
Johnstone Strait	1994/95, 2002-2004
North Island Straits	1994/95, 2002
West Coast Vancouver Island	1994/95
Quatsino Sound	2002
Central Coast	1994/95, 2003
North Mainland Coast	1997, 2002
Queen Charlotte Islands	1997, 2002

The data sources used in the Fisheries Resource Information compilations include:

- Interviews with regional DFO fisheries staff familiar with their region; the nature of their experience and number of years associated with the study area are noted, as indicators of the comprehensiveness of the data being provided.
- Reports and existing databases based at least in part on personal knowledge of regional DFO fisheries staff; these include Records of Management Strategies, annual fisheries management strategies, and other such documents.

A standard and methodology is used for all interviews and all interviews are conducted by a qualified fisheries biologist. Each interviewee is provided with a series of Canadian Hydrographic Service charts covering their area of interest and was then asked to identify specific fish¹ habitats², fish distributions³ or areas of fishing activity. Where practical, the largest scale charts available are used (usually 1:40,000 scale) used for compilation; however in the case of fisheries that covered a broad geographical extent (e.g. offshore groundfish trawl and salmon troll fisheries) a smaller scale chart may be used. As each area is delineated, it is assigned an identifier and the interviewee is queried to collect relevant information concerning the area or fishery. Interviews are conducted with at most one or two interviewees at a time. When returning to an area for updates, the interviewees are asked to verify or comment on the old datasets. Interviewees are also asked to search their files and archives for relevant hard copy or digital information that may supplement their verbal knowledge.

After completion of the interviews the maps and data forms are entered into a Geographic Information System and verified. If there is overlap or discrepancies in the information obtained from different sources the data are scrutinized and in most instances are merged into a single observation with two sources. The criteria used to make such decisions are (1) to give preference to the information obtained from the individual with the most direct knowledge and experience of the specific fishery, (2) to give preference to the information from the larger scale chart, and (3) to preserve detail. In instances where one of the data points is part of a coastwide dataset (e.g. the distribution of herring spawn, clam beds or kelp beds) the coastwide dataset is kept intact and the information from other sources is maintained but kept as a separate entity. These discrepancies are flagged to be sorted out by further field studies.

The data included in the marine fishery resources are a series of polygon, line or point themes with common data structures. The spatial format of the theme was decided based on the nature and precision of the georeferencing. For example, seal and sea lion haul outs are represented by a point, coastline with herring spawn recorded as present as a line and areas where the offshore and along shore distribution of herring spawn has been mapped are represented by a polygon theme. The majority of layers representing fisheries are represented as polygons.

Each polygon, point or line represents an area where a particular habitat is located or type of fishery operates. Since 2000, all data records include information that allows the user to judge the accuracy of the mapped data (see details in following section on Metadata). Prior to this time data formats were less standardized in terms of both metadata recorded and separation of data layers. It is hoped that in future the format will maintain the current format.

The marine fishery resources of the BC Coast that are included in the compilations of Fisheries and Habitat Resource Information are listed in Appendix A.

¹ “Fish” and “Fish Habitats” refer here to both fish and invertebrate species and their habitats.

² Fish habitats include eelgrass and kelp beds.

³ Fish distributions that are mapped include herring spawning areas, mouths of rivers where anadromous fish spawn and known spawning grounds or pre-spawn holding areas of other demersal or pelagic fishes.

DATA LAYERS

The PCRA system has been designed to include a wide variety of information on the distribution, abundance and relative importance of marine flora and fauna, fish habitat and fisheries. A complete list of all the data layers and their file names is included in Appendix A of this report. The data are grouped into the following categories:

Fish Habitat Features

Kelp beds

Kelp mapped from surveys

MAFF completed aerial surveys of kelp beds for selected areas of the province including:

Region	Year(s)
NE Vancouver Island (Port Hardy to Port McNeill)	1974, '78, '83, and '89
Nootka Snd & Hesquiate Peninsula	1975
Estevan Group and Campania Is	1978
Dundas Group	1978
N&W Graham Is	1976
Goschen Is to Tree Nob Group	1976
NW Vancouver Is (Nigei to Cape Scott)	1978
Juan De Fuca Strait	1988
Hakai Passage to Bardswell Group	1993

Kelp mapped from CHS Charts

In addition all kelp on the CHS charts (indicated by an icon of a kelp fond) was digitized for the Johnstone Strait and Central Coast regions. The centre of each icon was digitized and then buffered by 50 m. The resulting buffers were then joined. This data was collected as part of the LUCO coastal data collection process and is in the DFO data warehouse.

Additional information on location of kelp beds

Additional information on locations of kelp beds has been collected from DFO regional staff as part of the Fisheries Resource Information collection. This data layer includes kelp beds that do not appear in either of the above two data layers are included as a separate data layer.

Eelgrass and other marine intertidal/shallow subtidal vegetation

Intertidal vegetation mapping by DFO Herring Section

The Department of Fisheries and Oceans (then referred to as the Department of Environment, Fisheries and Marine Service) undertook eelgrass mapping from the 1970's until the early 1980's on British Columbia's West Coast. The Pacific Biological Station in Nanaimo, BC initiated the project to map the shoreline marine vegetation on herring spawning grounds from aerial photographs. The original data set was compiled with the purpose of gathering "knowledge on the extent and type of shoreline vegetation on which Pacific herring annually deposit adhesive eggs" (Haegele, 1975). This knowledge was to be used to estimate the size of the spawning population (Haegele, 1975). Methods were developed for mapping in 1973 and 1974, applying

the use of low level colour infrared and colour aerial photographs. In total, 16 sites along the West Coast of British Columbia's coastline were photographed and mapped between the years of 1974 and 1983. Species were classified as either Rockweed, Kelp (Brown Algae), Red Algae, Green Algae, or Sea grasses. In cases where no distinct uni-species vegetation zones was evident, vegetation zones were plotted according to either the:

- Single dominant type (if it occupied not less than 80% of the total area)
- Mixed vegetation zones (if two or more vegetation types each occupied more than 20% of the total area)
- Vegetation types covering less than 20% of a zone were not included in zone identification.

The maps from these surveys were digitized in 2002/2003 and details of the conversion process along with a summary of the original surveys can be found on the CMN maps site:

<http://www.shim.bc.ca/atlasses/Eelgrass/Eelgrassmetafn.pdf>

Province wide eelgrass mapping by BC Provincial Government

The only broad scale mapping project in British Columbia that includes eelgrass is the Provincial Shoreline Mapping project, currently named CRIS (Coastal Resource Inventory Study). This information was gathered from Oblique Aerial Video flown at tides less than one metre tide. Eelgrass presence was rated for each shoreline unit in a somewhat subjective manner. The rating might vary depending on the length of the unit. For example, a 10 km unit with a 500m eelgrass bed (5%) might be classified as patchy but a unit of 1 km with 5% eelgrass (5 m) would not be classified as present. Roughly the classes are defined as:

- Continuous: >50% of unit has eelgrass
- Patchy: 10 – 50 % of unit has eelgrass
- None: <10% (but see note above)

This method can be used to identify areas where eelgrass is present as seen at low tide periods. It can also be used to predict the presence of eelgrass subtidally, however it cannot be used to infer its absence. While this information can be viewed on the CMN site, data requests should be directed towards the Ministry of Sustainable Resource Management, Decision Support Services: <http://srmwww.gov.bc.ca/dss/>

Community eelgrass mapping

DFO in conjunction with Environment Canada has developed a methodology for mapping and monitoring of eelgrass. The manual for this methodology is available on CMN site:

Precision Identification, 2002. Field Manual for mapping and monitoring eelgrass habitat in British Columbia. Prepared for environment Canada.

The CMN site also shows community eelgrass mapping projects in BC.

Environment Canada eelgrass mapping

Environment Canada has completed extensive high resolution mapping of eelgrass in Boundary Bay, BC using a combination of aerial photographs and ground truthing by boat. This was a one time mapping project of the extensive eelgrass beds in this region in 1992/93. Other areas of the province may be mapped in future. The data custodian is Michael Dunn, Pacific Wildlife Research Centre, Environment Canada, 5421 Robertson Road, RR#1, Delta, BC, V4K 3N2. (ph) 604-940-4700, (fax) 604-940-7022, (email) Michael.Dunn.moore@ec.gc.ca.

Additional information on location of eelgrass beds

Additional information on locations of eelgrass beds has been collected from DFO regional staff as part of the Fisheries Resource Information collection. This data layer named “Herring_Spawn_FO” contains information on locations where herring spawn has occurred but for some reason has not been recorded in one of the other compilations of herring spawn. Typically these include small spawns in remote locations or spawns that have occurred rarely in that location.

Special shorelines

During the collection of LEK from DFO regional staff it became apparent that they often had intuitive knowledge of shorelines that were of special significance. This information was recorded and linked to linear shoreline segments. The categories of “special shorelines” that have been recorded to date include highly productive salt marshes, tidal flats and estuaries. An additional feature recorded was an inlet locally important on the central coast for its blue clay substrates. The list of special shoreline categories can be added to if new ones are identified.

Fish and Invertebrate Distributions

Generally, the distribution of marine fish or invertebrates are not monitored directly but inferred from the areas where fisheries take place. There are however a few exceptions, including:

- Locations of clam beds;
- Location and intensity of Herring spawn;
- Estuaries of eulachon bearing streams;
- Estuaries of salmon bearing streams;
- Locations of pre-spawn holding areas for salmon and herring;
- Migration routes for returning salmon;
- Locations where juvenile fish concentrate;
- Unusual concentrations of fish and invertebrates.

Some of these distributions have been mapped on a systematic basis (e.g. herring spawn, salmon escapement and clam beds) while others are done on an opportunistic basis where a fortuitous field observation was made (e.g. concentrations of juvenile fish or unusual concentrations of fish or invertebrates). These are described more fully in the following sections.

Clams beds

DFO maintains a *Clam Atlas* of clam beds on the south coast of BC. The *Atlas* maps clam beds identified by DFO regional staff. Currently the *Atlas* only maps beds south of Cape Caution. Ric Harbo (South Coast 250-756-7268) manages this database. A series of three documents catalogue clam beds identified prior to 1997.

R. Harbo, K. Marcus and T. Boxwell. 1997. Intertidal Clam Resources (Manila, Littleneck and Butter Clam).

- *Volume I: The West Coast of Vancouver Island. Can. M Rpt. Fish. Aquat. Sci. No. 2416: vii + 116 p.*

- *Volume II: The Southern Inside Waters of Vancouver Island and the British Columbia Mainland. Can. M Rpt. Fish. Aquat. Sci. No. 2417: viii + 245 p.*
- *Volume III: The Northern Inside Waters of Vancouver Island and the British Columbia Mainland. Can. M Rpt. Fish. Aquat. Sci. No. 2418: viii + 79 p.*

Additional beds have been identified and added to the data layer from interviews with DFO regional staff as part of the Fisheries Resource Information collection. Where it exists, the original clam atlas beach number as listed in the 1997 publications is cross-reference in this database. As part of the updating of fisheries information the clam atlas digital files were fitted to the TRIM base map.

Herring Spawn

Herring spawn 1 km segments

The main database layer is based on a DFO in house dataset which references all recorded occurrences of herring spawn since 1928 referenced to points which roughly divide the coast into 1 km segments. For Statistical Areas 1-6, 12 and 27 these points have been reviewed and moved so that they are georeferenced to the provincial TRIM coastline. Other areas of the coast are referenced to an old (and not too accurate CHS coastline). There are plans to eventually reference the remaining herring spawn segments but there is no funding for this a present (and none in the foreseeable future). Once the segments have been attached to the TRIM shoreline they can be used to cut the shoreline into linear segments with the above attributes. The structure of this database is listed below. Bruce McCarter at PBS (250-756-7198) is the current manager of this database. Further information is available in Hay et al. (1989) and Hay and McCarter (2001).

Fields in the herring spawn database (as represented by points or dive transects).

Field Name	Description of the Field
KMLOCATION	Unique DFO code for individual points
HER_SECTION	DFO Herring Section statistical area
SUB_AREA	DFO statistical area number
KM	DFO km segment number within Herring Section
DOY	Mean weighted date
FREQ	Number of years spawn recorded between 1928 and 2001
INDEX	Spawn Habitat index (function of coverage, intensity and frequency)
RANK	Relative importance of spawn compared to all other rated spawns on the BC coast

This database includes both information collected from dedicated spawn surveys as well as anecdotal observations of DFO regional staff. The positions and extent of spawn may therefore not always be exact. The fact that the database consists of over 50 years of records for many areas does compensate for this lack of precision.

Polygons of Herring Spawn

While surveying for herring spawn, DFO regional staff often make sketch maps of the distribution of spawn in areas with significant spawn. These are passed on to the DFO Herring section where they have been converted into digital polygons referenced to the TRIM coastline. The sketch maps from which these polygons were created were only available only for selected areas and were not produced every year. They tend to be located in areas of the most consistent and abundant spawn. In some areas there are 20 or more years of polygons.

Polygons of herring spawn have been stored both as separate layers representing spawn in a single year as well as a layer where polygon from every year have been overlain. The associated database includes one field for each year that indicates if spawn was present in that year (or not) and a summary field that indicates how many of the years spawn was present for. By displaying the layer with a graduated colour based on this field you can get a visual representation of the relative abundance of spawn. However, to get information on the intensity of the spawn you will need to refer back to the km segment database.

Herring spawn dive survey transects

The DFO Herring Section currently organizes annual dive surveys for herring spawn in those areas with consistent, significant spawn. These transects have been digitized and are referenced to CHS charts. Locations of transects have been digitized for surveys prior to 1997 for most of the coast and up to 2002 for the SoG. Eventually the herring section hopes to convert these into areas of spawn rather than just the transects with spawn along them. The same attributes as are attached to the herring spawn km database are attached to points along these transects. This dataset, based on actual survey data, may eventually take over from the km segments dataset which is based primarily on anecdotal information.

Additional information on locations of herring spawn

Additional information on shorelines where herring spawn has been observed by DFO regional staff has been recorded as part of the Fisheries Resource Information collection. This data layer contains information on locations where herring spawn has occurred but for some reason has not been recorded in one of the other compilations of herring spawn. Typically these include small spawns in remote locations or spawns that have occurred rarely in that location.

Estuaries of eulachon bearing streams

These locations have been mapped from the DFO and Royal BC Museum databases of eulachon bearing streams. The streams themselves are based on the provincial TRIM base map.

Estuaries of salmon bearing streams

The streams are identified from the DFO salmon escapement database which gives the estimated annual escapement of each salmon species by stream segment. The streams themselves are based on the provincial TRIM base map.

Adult salmon migration routes and holding areas

Migration routes and holding areas of adult salmon on their way back to their natal rivers to spawn are mapped from interviews with regional DFO staff as part of the Fisheries Resource Information. Migration routes tend to be better known and delineated in restricted coastal

waterways such as along channels and passages than in open waters such as the Strait of Georgia.

Locations where juvenile fish concentrate

During interviews with regional DFO staff as part of the Fisheries Resource Information data collection, staff members occasionally identified sites where they had opportunistically observed large concentrations of juvenile fish. Species observed included Herring, Salmon (unspecified), Coho Salmon, Chinook Salmon, Chum Salmon, Pink Salmon, Sockeye Salmon, Rockfish, and Eulachon. While DFO does occasionally carry out surveys of juvenile fish, this information has not been incorporated into the Pacific Coastal Atlas.

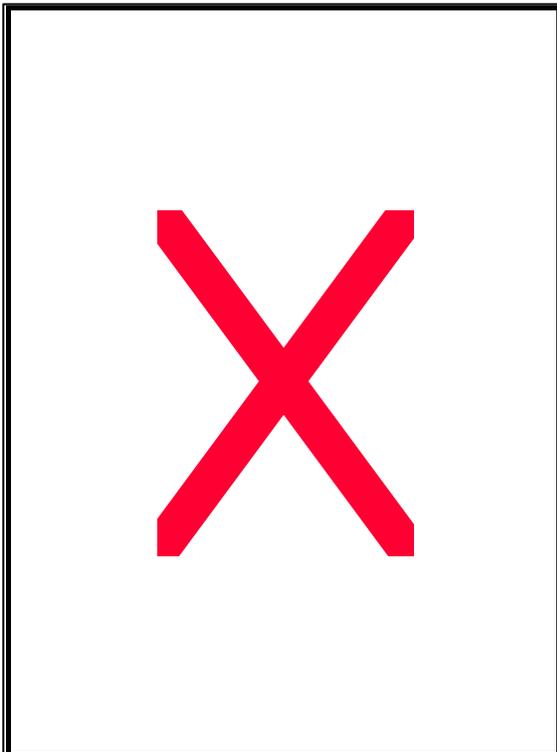
Unusual concentrations of fish and invertebrates

Another set of opportunistic observation collected from DFO regional staff included sightings of unusual concentrations of fish or invertebrates while out in the field. To date the types of concentrations observed include:

- Areas where squid concentrate for spawning
- Areas where jellyfish concentrations have been observed
- Beaches which have large seed populations of clams but which are not harvested
- Urchin barrens (areas where urchins have concentrated in such large numbers that the bottom is barren of marine algae)
- Locations of bioherm forming sponges
- Intertidal concentrations of sandlance

Marine Mammal Distributions

Where possible, marine mammals were mapped from known distributions based on survey and



other sighting data. Where this data was not available, habitat models were used to predict the relative abundance in various areas. Knowledge of marine mammals is limited, and species will likely occur in many areas not identified.

Harbour seals

DFO harbour seal surveys

DFO conducts Harbour seal surveys from overflights in selected regions of the province (see figure below). Seals are counted on their haulouts during low tides during the summer months. These surveys are primarily done to assess population numbers and do not identify every haulout on the coast. The surveys are generally repeated every 5 years. The surveys and databases are managed by Peter Olesiuk at the Pacific Biological Station (250-756-7254).

Sea lions

DFO sea lion surveys

DFO conducts sea lion surveys from over-flights of known seal haulout locations. Seals are counted on their haulouts during low tides during the summer months. These surveys are primarily done to access population numbers and do not identify every haulout on the coast. The surveys are generally repeated every 5 years. The surveys and databases are managed by Peter Olesiuk at the Pacific Biological Station (250-756-7254). Databases of numbers Steller and California sea lions at rookeries, haulouts and rafting sites is maintained by DFO marine Mammal unit at PBS based on surveys of known locations. Census data separate sea lions by species and provide separate numbers for pups.

Additional information on the distribution of seals and sea lions

Additional information on where seal and sea lions concentrate has been mapped from LEK of DFO regional staff. Only those sites not included in DFO Marine Mammal Unit surveys are included in this dataset and they are likely to be minor concentrations.

Cetaceans

Information on the distribution of Cetaceans is less readily available than for other marine mammals as they tend to be highly mobile and do not haul out on land. For most cetacean species their distributions are mapped from a combination of LEK of DFO researchers, sighting data and habitat models derived from what we know of a species habitat preference. From this areas of probable high, low and moderate use have been derived for the following species:

Common Name	Scientific Name	Comments
Killer whale	<i>Orcinus orca</i>	Three races in BC – transient, resident and offshore. Only the distribution of the resident race is currently mapped.
Gray whale	<i>Eschrichtius robustus</i>	A fair number of sightings for these species, supplemented by habitat models.
Humpback whale	<i>Megaptera novaeangliae</i>	
Pacific white-sided dolphin	<i>Lagenorhynchus obliquidens</i>	Species tends to form large concentrations but location of these concentrations change dramatically over time.
Harbour porpoise	<i>Phocoena phocoena</i>	Poor sighting database for these species; distribution based largely on know habitat preferences.
Dall’s porpoise	<i>Phocoenoides dalli</i>	

Fisheries

With the exception of herring spawning, clam beds and rivers that support anadromous fish stocks, the only available systematic information we have on the distribution of fish species is harvesting data. While we do have some understanding of the habitat preferences of harvested

species, it is insufficient to allow estimation of species distributions with any confidence. The distributions of these fisheries resources have therefore been inferred from the intensity of harvesting. The weakness of this approach is that harvesting intensity in some areas is a reflection of quotas and management controls.

This information is also useful in coastal planning where it is important to know what areas are critical to a fishery when selecting areas for alternate uses such as protected areas or tenured activities such as fish farms or log handling. Two types of information on the locations of fisheries were collected:

- Anecdotal information on the locations where commercial, First Nations and sport fisheries take place as indicated by DFO regional staff. This also includes information on the locations in the Strait of Georgia frequented by sport fishermen during the summer months as observed from DFO aerial creel surveys.
- Extrapolation of the distribution of fisheries from commercial landing data tabulated by DFO statistical sub-areas. Currently this information is only available for DFO statistical area 12 (NE Vancouver Island).

Anecdotal information on the location of fisheries

The layers mapping the location of fishing areas include information on the timing and intensity of use specific to that location. In most instances, a single fishery consists of a series of locations (several polygons) with specific timing and levels of resource use indicated for each location. Fisheries targeting the same species but with differences in harvesting methods and/or timing⁴ are kept as separate data layers. The fisheries mapped as part of the Pacific Coastal Atlas have been organized according to the following table:

Species	Gear types	Data Layer
Salmon	Gillnet, Seine	Salmon net
	Troll	Salmon Troll
	Sport	Sport Fishery
Groundfish: Rockfish, Ling cod, Sablefish, Dogfish, Halibut	Hook & Line	Groundfish Hook & Line
Groundfish: Rockfish, Ling cod, Sablefish, Pacific cod, Sole, Walleye Pollock, Hake	Trawl	Groundfish Trawl
Groundfish: Rockfish, Ling cod, Halibut	Sport	Sport Fishery
Dungeness Crab, Red rock crab, Box crab, Tanner crab	Trap	Crab Fishery
Shrimp and Prawns	Trap	Prawn Trap Fishery
	Trawl	Shrimp Trawl Fishery
Geoduck	Dive	Geoduck Dive Fishery

⁴ For example the herring spawn, food and bait fisheries and the salmon gillnet, seine and troll fisheries.

Species	Gear types	Data Layer
Clams (manila, littleneck, butter, razor)	Hand	Clam Beds
Sea urchins (red and green)	Dive	Urchins Dive
Sea cucumber	Dive	Cucumber Dive
Tuna	Hook & Line	Tuna troll fishery
Herring	Seine	Herring Fishery (food, roe and bait fisheries)
	Pens	Herring ROK fishery (roe on kelp)
Octopus	Dive, hand	Octopus fishery

First Nations food fisheries have been kept as a single layer for all species and compiled in a separate layer to commercial and recreational fisheries.

Locations of fisheries based commercial landing data

As part of the collection of information for the North Island Strait coastal planning process catch data for DFO statistical area 12 was compiled and mapped for 9 fisheries. This data is displayed as polygons based on DFO statistical sub-areas classified on the basis of the total landings in that sub-area from 1994-98. The catch data are displayed and normalized by the area of the sub-area that is within the depth range for that fishery and expressed as lbs/hectare.

Although the location of the fisheries within the sub-areas is proprietary data, available only from confidential log book records, it is known that several of the fisheries are limited to certain depth strata. The size (ha) of sub-areas was therefore determined for each fishery individually depending on the depth range of the fishery. Dive fishery catch data (sea cucumbers, geoducks, red urchins, green urchins, and octopus) were limited to those portions of the sub-area with depths <20m; Crab trap fishery catch data were limited to those portions of the sub-area with depths <50m and rockfish and prawn fishery data were limited to those portions of the sub-area with depths <100 m. The landings for the shrimp trawl fishery were applied to the entire subarea with no depth restriction.

DATA SOURCES

The data that has been incorporated into the Atlas has come from a number of sources. These include data that have already been georeferenced into a GIS during past one time data compilation projects, existing georeferenced databases that are part of an ongoing data collection system, and new data that are coming in from certified data providers. These data sources are summarized in Table 1 below and discussed in greater detail in the following sections.

Table 1: SHIM data sources.

Database	Source
Fisheries Resource Information – Strait of Georgia ⁵	One time data compilation in 1994 under contract to the Provincial Government
Fisheries Resource Information – West Coast Vancouver Island	One time data compilation in 1995 under contract to the Provincial Government
Fisheries Resource Information – Johnstone Strait	
Fisheries Resource Information – Central Coast	
Fisheries Resource Information – North Coast	One time data compilation in 1997 under contract to the Provincial Government
Fisheries Resource Information – Quatsino Sound	One time data compilation in 2002 under contract to DFO
Fisheries Resource Information – North Island Straits	One time data compilation in 2002 under contract to DFO
Kelp surveys	One time survey of Kelp beds in selected locations of the BC coast by the Provincial Government (MAFF)
Kelp beds from CHS charts	One time digitization of all kelp beds from CHS charts (1995-97)
Intertidal/shallow subtidal vegetation	One time survey of marine vegetation in areas of significant herring spawn. Produced by DFO staff in Herring Section at Pacific Biological Station and digitized by various agencies
Herring Spawn alongshore locations and importance index	Ongoing database maintained by DFO staff in Herring Section at Pacific Biological Station.
Herring Spawn extent	
“Clam Atlas” – location and level of use of clam beds	Ongoing database maintained by DFO staff in South Coast Division
Catch statistics for log book fisheries by sub-area	Ongoing database maintained by DFO staff in Biological Data and Analysis Division
Seal and Sea lion haulouts	Ongoing database maintained by DFO staff in Marine Mammal Group at Pacific

⁵ This dataset has not been incorporated at this time but it is hoped that it will be in the near future.

	Biological Station
Marine habitat, fish/invertebrate and fishery information	Proposed on-line data entry from certified individuals and organization into SHIM.

DATA ATTRIBUTES

A number of attributes are used to describe each data record. These include information on the location, timing and intensity of use as well as details on species, fishing gear used and other relevant information. Not all fields are used for all data layers, only those that are relevant. List all of the data description fields; the next section describes those data fields that describe how the information was collected and its accuracy and precision.

Table 2: Fields used to describe attributes of areas represented by individual data records.

Field Name	Description of the Field
CoastID	Unique coastwide ID (Stat-Area * 100000 + ID)
ID	Original source identification number
POLYGON/ LINE_NO	Unique polygon or line number
SITE_NO	Unique site # (use DFO official site # if available) (Seal or SeaLion layers only)
SURV_NO	DFO survey # if part of official survey (Sea_otter, Seal or SeaLion layers only)
CLAMATLAS	Number assigned in published clam atlas – for layer Clam_Beds only
LOCATION	Descriptive location
CHART_NO	CHS chart number
STAT_AREA	DFO statistical area number
SUB_AREA	DFO statistical sub-area number
HER_SECTION	DFO Herring Section statistical area number (herring spawn layers only)
SPECIES	List of species present; for each layer a specific pick list of available species is provided. Note individual logical (Yes/No) fields are added for each relevant species to aid in queries. See Table 3 for species fields for each fishery or resource.
SPECIES_OTHER	List of additional species present; as for the field SPECIES, for each layer a specific pick list of available species is provided.
RUN	Name of Salmon Run (for layers Salmon_Holding and Salmon_Migration_Route)
FISHERY_TYPE	Type of fishery, used in layer Herring_Fishery to distinguish roe, bait and food fisheries
GEAR	Gear type used in fishery; for each fishery a pick list of applicable gear is provided.
SPAWNING	Presence of spawning herring (Herring_Fishery layer only)
COMMERCIAL	Relative importance to the commercial fishery
SPORT	Relative importance to the aboriginal fishery
ABORIGINAL	Relative importance to the sport fishery
RI	Overall Relative importance of fishery, or species presence or concentration. This is a subjective measure and is relative to the DFO Staff persons area of experience – usually a DFO statistical area.

START	Julian day fishery, spawning, or concentration starts (1 if year round, 0 if no information)
CLOSE or END	Julian day fishery closes or, spawning, or concentration ends (365 if year round, 0 if no information)
TIMING	Description of when fishery takes place or when concentration or spawning occurs
COMMENTS	Any comments specific to record.

The layer used for identifying kelp beds has an additional fields to indicate if the area has been surveyed by the province in the past. This field “SURVEYED” is a logical field and can be entered by the compiler or by the database manager at a later date.

The following table (Table 3) lists the individual logical fields used to indicate which species are taken at the location described by a data record. This approach is only used in mixed species fisheries.

Table 3: Species selections and other fields for individual fisheries or resources.

Layer	Field Name	Description of the Field
Clam_Beds	MANILA	Presence of Manila Clams confirmed
	LITTLE_NECK	Presence of Little Neck Clams confirmed
	BUTTER	Presence of Butter Clams confirmed
	RAZOR	Presence of Razor Clams confirmed
Crab_Fishery	DUNGENESS	Presence of Dungeness crab fishery
	RED_ROCK	Presence of Red Rock crab fishery
	TANNER	Presence of Tanner crab fishery
Groundfish_Hook_Line	DOGFISH	Presence of Spiny dogfish longline fishery
	ROCKFISH	Presence of Rockfish hook & line fishery
	LINGCOD	Presence of Lingcod hook & line fishery
	SABLEFISH	Presence of Sablefish trap/longline fishery
	HAGFISH	Presence of Pacific hagfish fishery
	HALIBUT	Presence of Pacific halibut fishery
Eulachon_Holding	SCHOOL	Time when schooling eulachon are present
	SPAWN	Time when eulachon spawn in river
	LARVAE	Time when eulachon larvae are moving through area
Salmon_Holding	OTHER_SP	Salmon Species other than pink
	OTHER_TIM	Timing of concentrations of other species
	PINK_EVEN	Timing of Even Year Pink salmon
	PINK_ODD	Timing of Odd Year Pink salmon
Urchin_Fishery	UNSPECIFIED	Species harvested was not specified
	RED_URCHIN	Red Urchin harvested
	GREEN_URCHIN	Green Urchin harvested
	PURPLE_URCHIN	Purple Urchin harvested

The layer HSpawn_Pnt is based on a DFO in house dataset which references all observed occurrences of herring spawn since 1928 referenced to points which roughly divide the coast into 1 km segments. These points have been moved so that they are georeferenced to the provincial TRIM coastline. The structure of this database reflects the data recorded by the DFO Herring Section at the Pacific Biological Station and is listed below.

Table 4: Fields in the layer for herring spawn as represented by points (HSpawn_Pnt).

Field Name	Description of the Field
KMLOCATION	Unique DFO code for individual points
ACCURACY, LOCATION, STAT_AREA, SUB_AREA	See Table 2 and Table 8.
HER_SECTION	DFO Herring Section statistical area
SUB_AREA	DFO statistical area number
KM	DFO km segment number within Herring Section
DOY	Mean weighted date
FREQ	Number of years spawn recorded between 1928 and 2001
INDEX	Spawn Habitat index (function of coverage, intensity and frequency)
RANK	Relative importance of spawn compared to all other rated spawns on the BC coast
SOURCE_1, DATA_DTE, MAP_DTE, COMPILER	See Table 2 and Table 8.

A separate data layer *Hspawn_Shore*, was created to amalgamate all of the herring spawn into one layer referenced to shoreline segments. This layer is created by the manager of the Atlas and includes all available information on the location, timing, intensity and frequency of herring spawn. It is intended to be viewed but not updated by users of the atlas. The layer has all of the fields included in the layer *Hspawn_Pnt* as well as the following two additional fields:

- FOLOC_NO which links the coastal line segment to the layer *HSpawn_FO_shore*
- KMLOCATION which links the coastal line segment to the layer *HSpawn_Pnt*

The layer *Groundfish_Trawl* has a unique field structure as it tries to capture the nature of the trawl fishery which includes seasonal fishing to spread effort over the year and mixed species.

Table 5: Fields in the layer for Groundfish Trawl Fisheries (Groundfish_Trawl).

Field Name	Description of the Field
CoastID, ID, POLYGON, ACCURACY, OBS_METHOD, LOCATION, CHART_NO, STAT_AREA, SUB_AREA	See Table 2 and Table 8.
LICOD_UL	Use level rating for Lingcod
PACOD_UL	Use level rating for Pacific cod
ROCKF_UL	Use level rating for rockfish
ROCKF_SP	Rockfish species identified in fishery
SOLED_UL	Use level rating for deep water soles
SOLED_SP	Deep water soles species identified in fishery
SOLES_UL	Use level rating for shallow water soles
SOLES_SP	Shallow water soles species identified in fishery
HAKE_UL	Use level rating for Pacific hake
POLLOCK_UL	Use level rating for Walleye pollock
DOGF_UL	Use level rating for Spiny dogfish
SABLE_UL	Use level rating for Sablefish
Q1_UL, Q2_UL, Q3_UL, Q4_UL	Use level rating for polygon by year quarter
Q1_SPECIES, Q2_SPECIES, Q3_SPECIES, Q4_SPECIES	Species assemblage fished at location in by year quarter
COMMENTS, SOURCE_1, SOURCE_2, DATA_DTE, MAP_DTE, COMPILER	See Table 2 and Table 8.

The layers Salmon_Troll and Salmon_Net are also unique in that they have the capability of identifying the run (natal river) of salmon being targeted. This information can be important as openings for salmon fisheries are typically designed around the movements of returning salmon. The fields unique to these layers include:

Table 6: Fields in the layers for commercial salmon fisheries (Salmon_Net, Salmon_Troll)

Field Name	Description of the Field
CoastID, ID, POLYGON, ACCURACY, OBS_METHOD, LOCATION, CHART_NO, STAT_AREA, SUB_AREA	See Table 2 and Table 8.
FISHR_TYPE	Local name for fishery
SO_SEINE	Logical fields indicating the presence of Sockeye (SO), Chum (CM), Pink (PI), Coho (CO) and/or Steelhead (ST) in the catch at the location represented by the record for the Seine, Gillnet (GILL) or Troll Fishery.
SO_GILL	
SO_TROLL	
CM_SEINE	
CM_GILL	
CM_TROLL	
CH_SEINE	
CH_GILL	
CH_TROLL	
PI_SEINE	
PI_GILL	
PI_TROLL	
CO_SEINE	
CO_GILL	
CO_TROLL	
ST_SEINE	
ST_GILL	
ST_TROLL	
SEINE_SP	Comments on species targeted by seine, gillnet or troll fleet at the location represented by the record.
GILLNET_SP	
TRIOLL_SP	
SEINE_RI	Use level rating (RI) for seine fishery , gillnet fishery or for troll fishery
GILLNET_RI	
TROLL_RI	
RI, START, CLOSE, TIMING	See Table 2

RIV_LOC1, RIV_LOC2, RIV_LOC3, RIV_LOC4	Name of river salmon are returning to (1 to 4 rivers)
PERC1, PERC2, PERC3, PERC4	Percent salmon returning to river (1 to 4 rivers)
SPEC1, SPEC2, SPEC3, SPEC4	Species returning to river (1 to 4 rivers)
COMMENTS, SOURCE_1, SOURCE_2, DATA_DTE, MAP_DTE, COMPILER	See Table 2 and Table 8.

The seal and sea lion layer databases are designed with a unique structure to capture information on the behaviour and age structure (pups vs. adults) at individual locations. The fields for the point layers describing concentrations of seals or sea lion concentrations include:

Table 7: Fields used to describe Seal and Sea Lion concentrations.

Field Name	Description of the Field
CoastID, ID, SITE_NO, SURV_NO, ACCURACY, OBS_METHOD, FIELD_METHOD, PHOTO, GPS, GPS_DIFFERENTIAL, GPS_MODEL, LOCATION, CHART_NO, STAT_AREA, SUB_AREA	See Table 2 and Table 8.
NUM_SEALS	Maximum # of seals counted at site
S_STELLER	Maximum # of Steller sea lions recorded from summer surveys
S_PUPS	Maximum # of Steller sea lion pups recorded from summer surveys
W_STELLER	Maximum # Steller sea lions recorded from winter surveys
W_CALIFOR	Maximum # California sea lions recorded from winter surveys
W_SEALION	Maximum # of California and Steller sea lions combined recorded from surveys
ACIVITY	Activity of seals or sea lions around site
RI	Rating for relative importance of site based on the maximum number of seals or sea lions sited at site at any time.
TIMING	Description of when sea lions are present
START	Earliest day sea lions present (Julian Day - 1 if year round, 0 if no information)
END	Latest day sea lions present (Julian day 365 if year round, 0 if no information)
COMMENTS, SOURCE_1, SOURCE_2, DATA_DTE, MAP_DTE, COMPILER	See Table 2 and Table 8.

The RI ratings for seals and sea lions were based on the maximum number of animals observed at a site. The ratings were decided based on the typical numbers seen at sites coastwide.

Seals	Sea Lions
0= no seals observed	0= no sea lions observed
1= Low: Less than 30 Seals	1= Low: Less than 100 Sea lions
2= Moderate: 30 to 100 Seals	2= Moderate: 100 to 400 Sea lions
3= High: Greater than 100 Seals	3= High: Greater than 400 Sea lions

The activity of the seals or sea lions around the site is selected from a pick list that includes the following choices:

Activity
Hauled out
Swimming near haulout
Swimming in general area
Travelling
None recorded

METADATA

Metadata attached to each data record provide information that enables the user to judge the accuracy and precision of that record. The metadata includes the following fields that are described in more detail below:

Table 8: Fields used to describe the temporal, spatial and biological accuracy and precision of the data.

Field Name	Description of field
Accuracy	Spatial accuracy of the mapped data
Obs_Method	How did source gain their knowledge of this data record?
Field_Method	If data was collected by field survey, what type of survey was it?
Field_Sampling_Method	If samples were taken during field survey, what were they?
Photo	Was a photo taken to corroborate observation?
GPS	Was GPS used to map spatial location of observation?
GPS_Differential	If GPS was used was it differentially corrected
GPS_Model	If GPS was used what was the GPS model name?
Source (_1, _2, _3)	What was the main and corroborating sources of the data?
Data_Dte	On what time frame was this observations based?
Map_Dte	When was the data compiled into the Atlas?
Compiler	Who compiled the information into the Atlas?

Accuracy

The accuracy with which the data has been mapped is recorded as a subjective value in this field. If the data are added from an existing database, or if the data are digitized from hard copy CHS charts or other maps, then the following pick list is provided for selecting the data accuracy:

Code	Map Accuracy
1	Location measured using GPS (see GPS model and accuracy fields)
2	Location generalized from DFO log book lat/long positions
3	Location indicated to 2 mm on chart at chart scale
4	Alongshore location indicated to 2 mm on chart at chart scale; across shore accuracy unknown
5	General location only; rough sketch on chart or place name (5 mm on chart at chart scale)
6	Tied to shore unit or other shoreline segment
7	Tied to DFO Statistical Sub-area
8	Tied to DFO Statistical Area
9	Alongshore location indicated to 5 mm at chart scale, across shore accuracy unknown
10	Vague location only (1-2 cm on chart at chart scale)

The chart scale is linked to the CHS chart number that is recorded in a separate field. A list of all CHS charts and the associated scale are included in the Atlas database.

If, however, the data are entered on line via screen digitizing at the SHIM web site (and are therefore not linked to the accuracy of a chart or GPS, the following choices are provided for recording the spatial accuracy of a mapped location:

- General Location only (1 km accuracy)
- Good alongshore accuracy (10-20 m), offshore extent unknown or to 250 m
- Good alongshore and offshore accuracy (10-20 m in both directions)

Obs_Method

The method used to georeference and describe the area is also chosen from a pick list with the following choices:

Code	Method used to collect data
1	field work, measured directly
2	personal observations
3	second hand knowledge
4	published or compiled information
5	traditional knowledge

“Personal observations” are differentiated from “field work, measured directly” in that the first is an incidental observation while the latter is a dedicated field survey such as a habitat assessment or herring spawn dive survey. “Traditional knowledge” implies that it is a collective knowledge of a group of person such as a First Nations group. Both “second hand knowledge” and “published and compiled information” are one step removed from the original observer; the difference lies in that the former is verbal while the latter is based on a report, map or database. If the observation method is based on “published or compiled information” the details of source of that information should be contained in the “Source” field of the data record.

Field_Method

If the field “Obs_Method” is indicated as “Field_Work” (code 1)⁶ then the nature of the field work should be indicated in the field “Field_Sampling_Method” (see below).

⁶ This field can also be used if the “Obs_Method” is “published or compiled information” (code 4) and it is known that field work was used to originally collect the data.

Code	Field technique used to collect data
0	N/A
1	Shore based surveys
2	Aerial Surveys
3	Boat Surveys
4	Dive Surveys
5	Air photo interpretation
6	Aerial Video Interpretation

Field_Sampling_Method

If the field “Obs_Method” is indicated as “Field_Work” (code 1) then if field samples were collected the nature of these samples should be indicated. If no samples were taken or if the observation is not based on a field survey then the field should be left at its default value of “N/A” (code 0).

Code	Field Sampling Method
0	N/A
1	photos
2	video
3	transects
4	quadrats
5	seine net
6	dip net
7	trap
8	bottom grab

Photo

This is a logical field (Yes/No) that indicates if a photo has been taken of the habitat, fish or fishery being mapped at the location of a data record. This is provided as an additional method of data verification. Provision is made on the on line data entry site of the Atlas for submitting a digital photo over the Internet. This photo can then be displayed when the data record is queried.

GPS

This is a logical field (Yes/No) that indicates whether or not a GPS was used to georeference the spatial extents of the data record. It is intended that in the near future, provision will be made on the Atlas on line data entry site for submitting the spatial extents of a data record as a GPS file. At present this information gives some indication of the spatial accuracy of a data record and the spatial extents and attributes of records can be submitted digitally in standard GIS format.

GPS_Differential

This is a logical field (Yes/No) that indicates whether or not the GPS used had differential correction either in the field or back in the office.

GPS_Model

If a GPS was used in georeferencing the spatial extents of the data record, then the make and model number, plus any user modifications, should be indicated in this field.

Source

A main source (Source_1) and up to two corroborating sources (Source_2, Source_3) can be entered for every data record. A source can be a person, published or unpublished report or map, or a database. The details of each source must be added prior to use in a separate data file “Sources”. This file has the following data fields:

Field Name	Field Type	Field Length	Description:
Source	Text	25	Source Reference
Full Citation	Text	250	Full citation for report or publication or map
Name	Text	50	Name of person interviewed or custodian of data
Position	Text	100	Official Title of person
Organization	Text	100	Title of department, ministry or other organization
Sector	Number		Numeric code for sector person belongs to (see below)
Experience	Memo		Relevant Experience and Responsibilities
Year_Start	Number		Year started or # of years at current or related job in area

The pick list for the sector to which the source belongs is given below.

Sector	Description of Sector
11	Government - research
12	Government - management/enforcement
21	Traditional Knowledge - First Nations
51	ENGO
31	Non-government Expert - science research
41	Industry - commercial fisheries
42	Industry - recreational fisheries
43	Industry - aquaculture
44	Industry - ecotourism
61	Individual - recreational fisher
32	Non-government Expert - tourism research
22	Traditional Knowledge - Community

Data_Dte

Date of when the observations or field studies were made. May be a range of years if it is based on a time series of data or a period over which observations were made.

Map_Dte

Date when data were first gathered by Compiler from the data source. If the data were already in the atlas but have been updated or verified since the initial compilation, then this date should be recorded.

Compiler

Name of person responsible for compiling the information and submitting it to the Atlas. In order to submit information to the Atlas, a person must be certified by DFO. The certification process is under development but will include a training program and requires a certain degree of expertise or knowledge in marine resources, GIS and data management. Once certified an individual's name is added to the list they are provided with a user id and password for on line data entry over the CMN/PCRA web site. A data table with metadata on each compiler is required before a compiler can enter data. The fields in this database include the following details that indicate to the user who the compiler is and how to contact them.

- Name of compiler
- Position of compiler in organization
- Organization compiler belongs to
- Postal Address
- Email address
- Phone number

USERS MANUAL FOR ONLINE DATA ENTRY

The PCRA database should ideally be as up to date as possible. Habitat, fishery resources and fishing activity can change in location and intensity over time. It can be important to know both the current conditions and the way in which these features have changed over time. It is hoped that Fisheries and Oceans' staff and knowledgeable people living in coastal communities will utilize tools developed for online data entry. This will help ensure that important coastal resource information will be kept up to date and relevant.

Step1: Install the Autodesk Mapguide Viewer:

If you haven't already done so, download the Mapguide Viewer from Autodesk.

First time users:

Step 1 : To view these maps, you must download the latest version of the Autodesk Mapguide plug-in. Click the image below to go to the download page.



- Go to <http://www.mapguide.com/Downloads/>
- Fill-in the user information
- You must use Microsoft Internet Explorer AND ActiveX Control Viewer
- Download the file MGControl60.EXE onto a temp directory on your computer
- Once downloaded, locate the file on your computer and double-click on it to start the installation.
- You might have to close and re-open your browser after the installation is completed.
- You must set your browser security to Medium (Under "Tools, -> Internet Options, Security tab).
- If you are not familiar with the MapGuide Viewer, there is a comprehensive HELP library available, just click the right mouse button (while the mouse is over the map) and select About->Help Contents
- If you are using a computer behind a firewall, you might have trouble accessing the functions of the atlas. Ask your System Administrator for assistance.

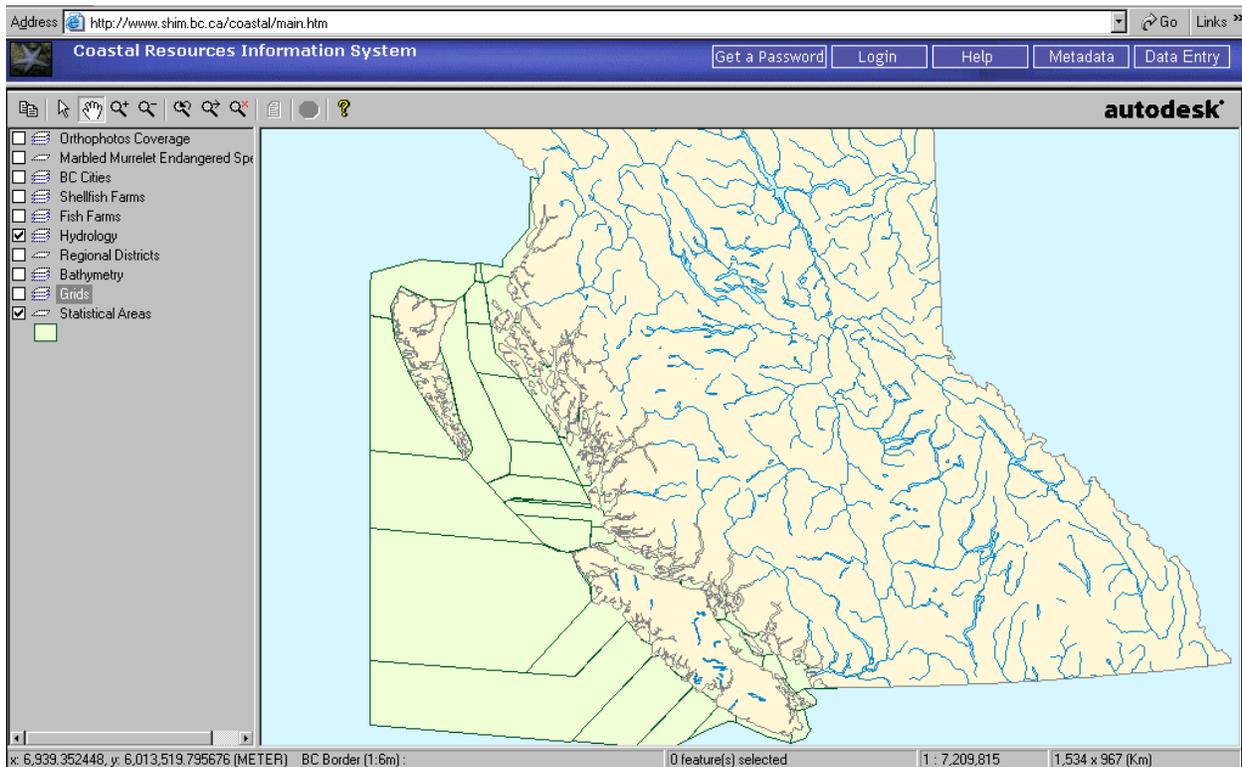
Step 2: Go to the Community Mapping Network:

Go to: www.shim.bc.ca:

Community Mapping Network

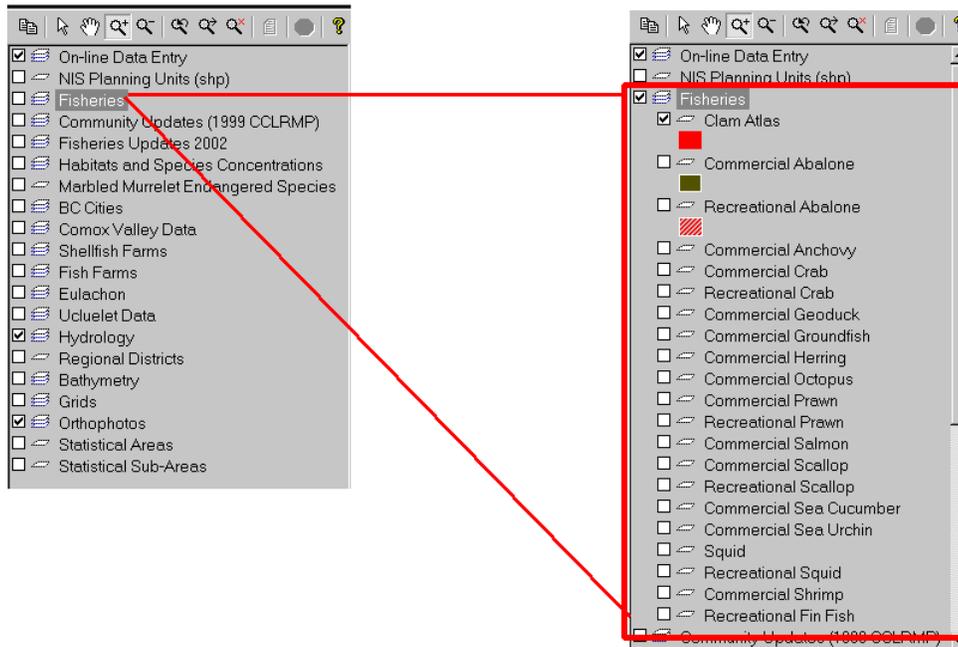


Select “**Maps and Data Entry**”, then select the “**Pacific Coastal Resources Atlas**”: The PCRA system will be available through a map showing the coast of British Columbia as seen below providing the Autodesk Mapguide Viewer was installed correctly. When the PCRA system is running you will be able to view all the spatial and attribute data by using the tools and functions described below.



LAYERS:

- In the left hand margin beside the map window (gray area), map layers are organized into layer groups. Layer groups can be collapsed or extended by double-clicking on the layer group's heading OR by right clicking on any layer and selecting Expand or Collapse from the drop down menu.



- Layers and layer groups can be turned on and off by toggling the square in front of them. Right-click on the layer's heading or the layer group's heading for more options (turn on and off, collapse, etc)
- More layers become available as you zoom in. To see the list of layers available, click on the "Metadata" tab.
- Contrary to the "base map" layers, the "Online Data Entry" layers are "updateable" -> new features can be added, updated, or deleted directly on the web.

STATUS BAR:

- Refer to the bottom off the viewer for additional information such as coordinates of the mouse location, number of features currently selected, the current scale and the size of the map area. If you don't see this information, right-click anywhere on the map and select About -> Preferences. You can toggle on and off the various elements on the status bar.



Coordinates of the mouse.

Number of features selected

Current scale

Size of map area

THE “RIGHT-CLICK” MENU:

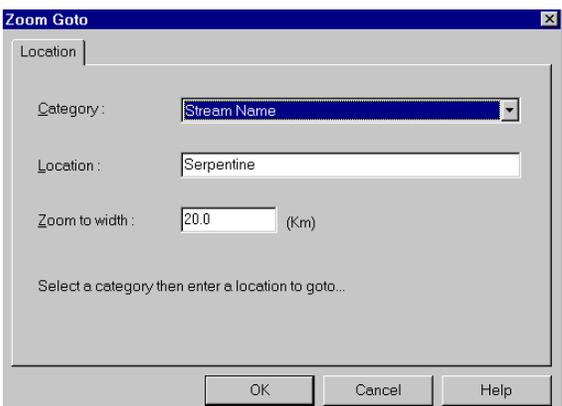
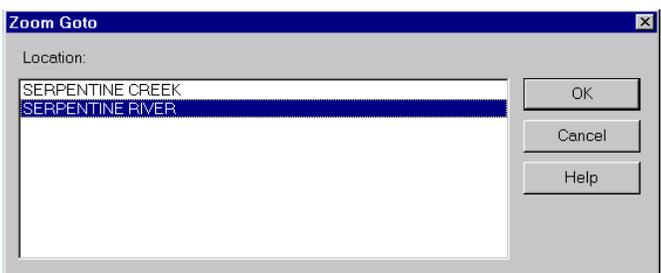
- Additional Options are available by right-clicking anywhere on the map.
- Print and Page Setup
- Copy (A very useful tool to copy the map image to the clipboard and then pasting the image into a Word or a Power Point presentation.) or Copy the URL and send it via e-mail to a colleague to direct him/her directly to the area of interest (like a bookmark)
- Bookmarks: add a bookmark so that you can return to the same area without having to zoom, pan etc.
- Select: Select elements on the map
- View: A report (you must select a feature on the map first), Distance (measure a distance from one point to another)
- Zoom: Zoom to a specific scale, or to a specific feature on the map
- About: Preferences: This allows you to choose whether you want the mouse position coordinates displayed in the bottom left corner of the screen, and whether you want your mouse position to appear as latitude and longitude or Projection (UTM) coordinates.

MAPPING TOOLS:

Button	Command	Description
	COPY > COPY	Copy the current map view to the Clipboard.
	SELECT	Select a feature in the map.
	PAN	Slide the map around to display areas that are outside of the current view.
	ZOOM > ZOOM	Zoom in by a magnification factor of two on the point that you click, or zoom in to the rectangular area you draw with the mouse.
	ZOOM > ZOOM OUT	Zoom out by a magnification factor of two from the point you click to display a larger area of the map.
	ZOOM > ZOOM PREVIOUS	Return to the previous zoom magnification and location.
	ZOOM > ZOOM GOTO	Zoom to a specified location.
	ZOOM > UNZOOM	Zoom out to display the entire map.
	VIEW > VIEW REPORTS	Generate a report for the selected map features.
	STOP	Stop or interrupt the map display from updating and dynamic map layers from downloading.
	HELP > HELP CONTENTS	Open the online help to get information about viewing maps. If you do not have the help installed on your computer, it will be opened from the Autodesk MapGuide web site.

Note: “Zoom Go To” is a very useful command. You can zoom to the following categories:

- 1:250,000 grid number
- 1:50,000 grid number
- 1:20,000 grid number
- Place Name
- Stream Name
- Stream Alias Name
- Watershed Code
- Watershed Group (4 letter code)
- Hatchery and Releases Sites
- Example (zoom to the mouth of the Serpentine River):

<ol style="list-style-type: none">1. Select the Category “Stream Name”.2. Enter “Serpentine” for the location3. Enter the width of the map area that you want.	<ol style="list-style-type: none">1. Select the “serpentine river” from the list and click OK.
	

VIEW FEATURES:

- Once zoomed in below 1:200,000 scale, the mouse cursor will display BC watershed codes and stream names as it is placed over the stream line.
 - At the 1:500,000 scale the habitat feature points appear. The mouse cursor provides some information on the point but a more complete report can be viewed by invoking a report (see next item for instructions).
-

VIEW A REPORT:

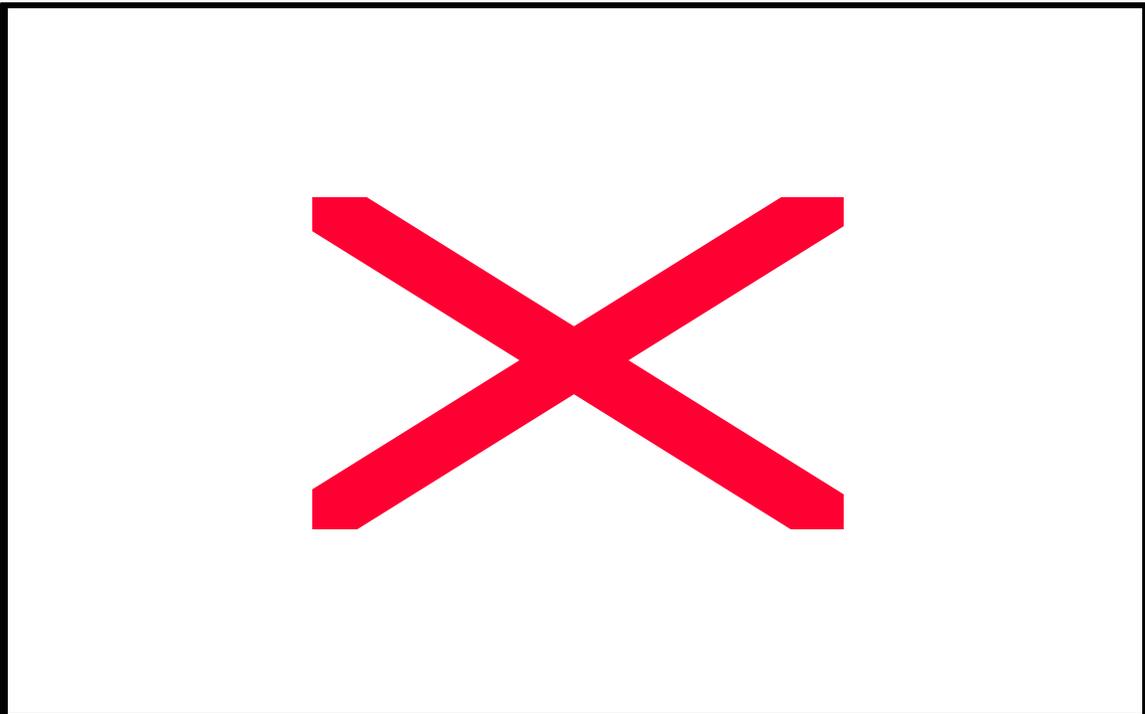
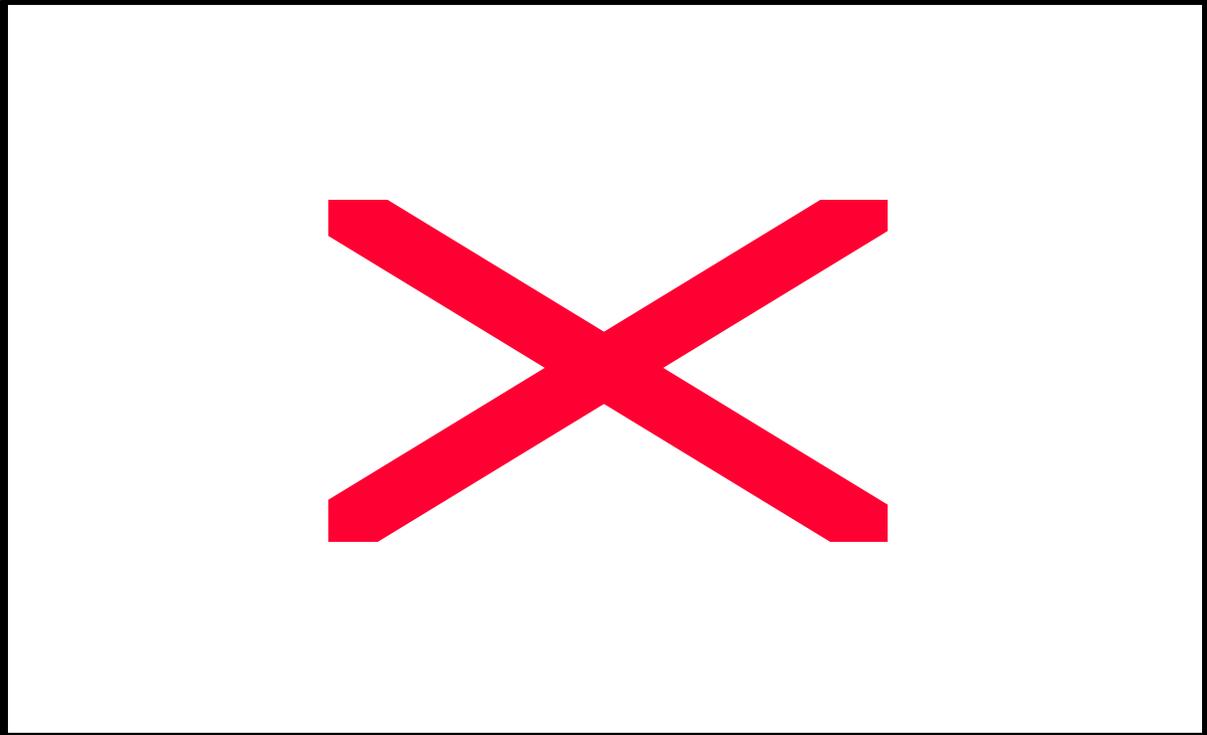
- Some features on the maps have reports attached to them (for example: the on-line data entry layers and all the Fisheries and Habitats layers).
 - There are three ways to invoke the reports:
 - 1) Double-click on the feature
 - 2) Highlight the feature and click on the report button:
 - 3) Right-click anywhere on the map and select View -> Reports
 - Once zoomed in below 1:200,000 scale, the rivers, lakes, wetlands etc are linked to the Fisheries Data Warehouse. Note: you can turn on the layer called “Rivers with FISS reports” under the “Hydrology” layer group. Those streams that have reports will display a magenta line. Switch off the magenta line “Rivers with FISS reports” function after you have reviewed or printed the selected reports.
-

1:20,000 FEATURES:

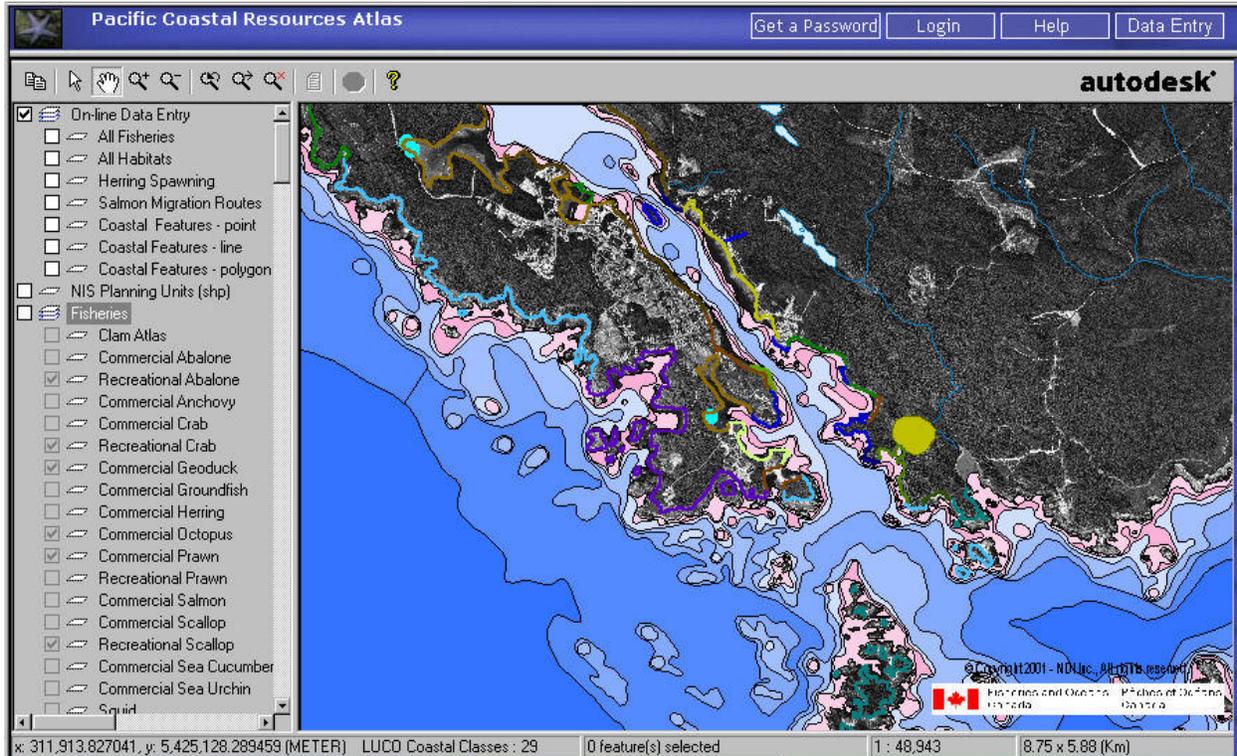
- Once you are zoomed in to at least 1:50,000 scale, a number of useful map display features become available. You can switch on 1:20k features such as contours, streamlines, roads, and other layers. These additional layers are being obtained on-line from another server at a different location in Vancouver, British Columbia.
 - The thin blue stream line that is visible on the base maps is the BC Watershed Atlas stream line. In many cases this line does not accurately represent the stream course. It is, however, the line that all the various reports are connected to. The 1:20k rivers lines appear as thicker blue lines when you switch on this feature. Although there are some inaccuracies, these lines depict the stream course more accurately. They cannot be highlighted and no reports are attached to them. They can be used to more accurately pinpoint your new data entry locations.
-

VIEW ORTHOPHOTOS:

- Once zoomed in you may also view orthophotos for selected areas and turn on and off coastal features as an overlay.



If you have a username and password you may also turn on the bathymetric information.



PRINTING MAPS:

- Set up the map display as you wish by zooming, panning and turning layers on and off.
- Right-click anywhere on the map and select “File -> Page Setup”. The page setup box will appear and you can enter a title, print just the map frame, print both map frame and legend frame etc. The printer setup tool should be used to make sure your paper size, orientation, colour choices etc. are set properly.
- Click on the Print Setup button and click OK on the next dialog box
- You can by-pass the Page Set-up by right-clicking and selecting File -> Print

To learn how to use the ActiveX Control:

- Right-click anywhere on the map
- Select Help-> Contents
or
- Click on the yellow Question Mark in the toolbar.

INITIAL MENU:



Get a password: Fill-in the information and someone will contact you to give you a username and password. Make sure that you have entered a valid e-mail address and phone number to ensure a prompt response.

Login: Enter your username and password to be able to add, update or delete data. No password is required to browse the map and get a report on a specific feature on the map.

Help: Instructions specific to the Pacific Coastal Resources Atlas.

Metadata: Listing of the layers available and the scale ranges at which they can be turned. Short description of the data contained in the layer and its source(s).

Data Entry: Brings up another set of customized options that will be described below.

THE “DATA ENTRY BUTTON:

Note that you must be logged on to have access to the data entry menu. Also, upon entering that menu, you will see a message stating that you must enter the source of your data before digitizing new features. Once the source is entered in the system, you can link any new features to it (see data entry form).



Data entry menu:



Select a feature type to digitize.

Click on the down arrow to view the list and select a feature type to digitize.

Map it

Click on that button after you have selected a feature type and move the mouse over the map area. You can now start digitizing your feature. Double-click to end the digitizing and a data entry form will open. Enter all the attributes information and click the submit button on the form.

Enter a Source

This will bring up a form where you can enter the source of your data. Once the source is in the system, you will be able to select it when you will be entering the attributes of your digitized feature(s).



Go back to previous menu.



Allows you to change the attributes information of a feature that you have previously digitized (not its geographic location). You must select the feature on the map before pressing that button (see heading: “Update Data”)



Allows you to delete a feature that you have previously digitized. You must select the feature on the map before pressing that button (see heading: “Delete Data”)



Refresh the layer(s) after a change (very important in order to see the change made).



Allows you to view the area of a polygon in square kilometers, square meters and acres. You must select a polygon before pressing this button.



To collapse the layers under each layer group.



To expand the layers under each layer group.

ENTERING A SOURCE IN THE PCRA DATABASE:

- Login
- Press the “Data Entry” button
- Press the “Enter a Source” button
- The following data entry form will appear:

The screenshot shows a web browser window titled 'Entry Form - Microsoft Internet Explorer'. The main content is a form titled 'Data Entry Form for Information Sources (Reports, Publications, Books, Maps, Persons)'. The form contains the following fields:

- Source (short form): [text input]
- Full Citation for reports, publications, books, maps, databases, or files: [text area]
- Name of Person Interviewed or custodian of data: [text input]
- Position held by source or custodian of data at time of interview: [text input]
- Organization to which source or data custodian belongs to: [text input]
- Experience of person relative to information provided or Information provided by report: [text area]
- Year person began relevant work experience: [text input]
- Sector to which source belongs: [dropdown menu]
- Submit button

- Make sure that you enter a meaningful name for the field “Source (short form)” as you will be required to select your source based on that field when you digitize new data. For example a source could be named: “Hay et al. 1989”. When you fill in the data for your new features, you would select Hay et al. 1989 from the pick-list as below:

The screenshot shows a web browser window titled 'Entry Form - Microsoft Internet Explorer'. The form contains the following fields:

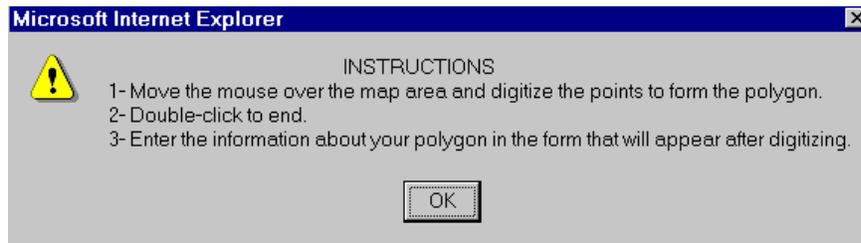
- Make and Model of GPS: [text input]
- Clam species present: [text input]
- RI Commercial: [dropdown menu with '0 - None' selected]
- RI Recreational: [dropdown menu with '0 - None' selected]
- RI Aboriginal: [dropdown menu with '0 - None' selected]
- Maximum RI: [dropdown menu with '0 - None' selected]
- Comments specific to polygon: [text area]
- Primary Source of Information: [dropdown menu with 'Hay et al. 1989' selected]
- Secondary Source of Information: [dropdown menu with 'Haegle and Hamey 1981' selected]
- Tertiary Source of Information: [text input]
- Time frame on which mapped data: [text input]
- Date when data was mapped or collected: [text input]

The dropdown menu for 'Primary Source of Information' is open, showing the following list of sources:

- Hay et al. 1989
- Haegle and Hamey 1980
- Haegle and Hamey 1981
- Hay et al. 1989
- Jacqueline Booth
- Jepps, S
- Johansson, T
- Koke, B
- Proctor, Billy
- Quatsino Band
- Sinclair, D
- Voysey, F

DIGITIZE A FEATURE (login required):

- Login
- If the source of your data is not in the system yet, enter your source (see heading : “Enter a Source” above).
- Zoom in to a scale below 1:100,000 around the area of your choice
- Press the “Data Entry” button
- Select a Feature Type from the drop down menu
- Press the “Map It” button, you are now in digitizing mode. A message with instructions will pop up:



- A data entry form similar to the one below will appear. Many of the fields in the form have “pull-down” lists – please fill in all the fields as completely as possible.

Data Entry Form for Clam Bed			
Date: 02-Jun-02	Person compiling the information: <input type="text"/>		
Descriptive Location: <input type="text"/>			
Polygon Identification Number: <input type="text"/>			
Method used to geo-reference and describe area: <input type="text" value="Select One"/>			
Data Confidence: <input type="text" value="Select One"/>			
Field Method used to map clam bed: <input type="text" value="0 - N/A"/>			
Was photograph taken? <input type="checkbox"/>		Was GPS used? <input type="checkbox"/>	
Make and Model of GPS: <input type="text"/>			
Clam species present: <input type="text"/>			
RI Commercial <input type="text" value="0 - None"/>	RI Recreational <input type="text" value="0 - None"/>	RI Aboriginal <input type="text" value="0 - None"/>	Maximum RI <input type="text" value="0 - None"/>

- Click “Submit” and your information will be included in the PCRA database.
- Click the “Refresh layer” tab in the top right corner. The map will be re-drawn with your new feature displayed.
- To review the information you just entered, click on your new feature to highlight it and then click on the view report button (or right click “view reports”, or double-click on it).

EDIT A FEATURE (login required):

- Change the attribute information about a feature (not its geographic location). Note that you can ONLY make changes to the features that you have entered and nobody else can change your data (except the Administrator).
 - Select the feature on the map (will be highlighted)
 - Click on “Update” button .
 - The same fields as the Data Entry Form are available and the existing values can be changed.
 - Submit
 - Refresh Layer
 - View report with updated values.
-

DELETE A FEATURE (login required):

- Delete a feature and its attribute information. Note that you can ONLY delete features that you have entered and nobody else can delete your data (except the Administrator).
- IMPORTANT!!!! There is no UNDO command so use this function with caution.
- Select the feature on the map (will be highlighted)
- Click on “Delete” button .
- A confirmation message will let you know that the point has been deleted.
- Refresh Layer

REFERENCES

- Booth, J. and H. Ruedgeberg. 1994. Consolidation of Fisheries Resource Information West Coast of Vancouver Island. Barkley Sound and Alberni Inlet. Can. Tech. Rpt. Fish. Aquat. Sci. No. 2002. 48 p + Appendices.
- Booth, J., H. Ruedgeberg and M. Wright. 1995. Consolidation of fisheries resource information West coast of Vancouver Island Offshore. Can. Tech. Rpt. Fish. Aquat. Sci. No. 2102. 78 p + Appendices.
- Harbo, R.M. 1997. Intertidal Clam Resources (Manila, littleneck, butter clam) Volume III: The Northern Inside Waters of Vancouver Island and the British Columbia Mainland. Can. MS Rpt. Fish. Aquat. Sci. 2418: vii + 79 p.
- Harbo, R.M., K. Marcus and T. Boxwell. 1997a. Intertidal Clam Resources (Manila, littleneck, butter clam) Volume I: The West Coast of Vancouver Island. Can. MS Rpt. Fish. Aquat. Sci. 2416: viii + 116 p.
- Harbo, R.M., K. Marcus and T. Boxwell. 1997b. Intertidal Clam Resources (Manila, littleneck, butter clam) Volume II: The Southern Inside Waters of Vancouver Island and the British Columbia Mainland. Can. MS Rpt. Fish. Aquat. Sci. 2417.
- Hay, D.E. and P.B. McCarter. 2001. Herring Spawn Areas of British Columbia: A review, geographic analysis and classification. Web page address:
<http://www.pac.dfo-mpo.gc.ca/sci/herspawn/herspawn/default.htm>
- Hay, D.E., P.B. McCarter, R. Kronland and C. Roy. 1989. Spawning Areas of British Columbia herring: A review, geographic analysis and classification. Volumes 1-6. Canadian MS Rep. Fish. Aquat. Sci. 2019.
- Lightly, M. 1996. Consolidation of Fisheries Resource Information West Coast of Vancouver Island. Clayquot Sound and Long Beach. Can. Tech. Rpt. Fish. Aquat. Sci. No. 2121. 63 p + Appendices.
- Lightly, M. and J. Hillaby. 1996. Consolidation of Fisheries Resource Information West Coast of Vancouver Island. Southwest Vancouver Island (Race Rocks to Cape Beale). Can. Tech. Rpt. Fish. Aquat. Sci. No. 2122. 48 p + Appendices.

APPENDIX A

Data layers included in the compilation of information of Fisheries Resource Information,

Herring Spawn Distribution	
Layer File Name	Description
hspawn_poly	Polygons of spawn mapped from maps created by Fishery officers or from dive surveys for the years 1942-97. This data was collected and digitized by Doug Hay's group at PBS. Not all spawn records were mapped. Accuracy varies depending on mapping method. This data is meant to be displayed with the legend provided but not queried. The more years a spawn has been mapped for an area the deeper red-brown colour applied by the legend. There is one field per year and a positive number for a field means that spawn was mapped for that polygon in that year. The final field is the total number of years that spawn was recorded for that field and is what is linked to the legend.
hspawn_FO_poly	Polygons of spawn mapped by DFO regional staff but maintained separately from the data collated by Doug Hay's group at PBS. This represents the DFO regional staff's opinion of the area covered by a typical spawn. This was used to capture spawn that might have been missed in the herring spawn database hspawn_poly.
hspawn_pnt	DFO maintains a database of Spawn timing, frequency and intensity. The data collection is ongoing and the current file is based on information from the years 1928 to 2001. The DFO table provided lat/long positions that represent the start point of a km segment of shoreline. However these positions are inaccurate and were therefore moved to match the TRIM shoreline with approx. 1 km spacing.
hspawn_fo_shore	DFO regional staff indicated the shorelines along which they had observed spawn. Some of these locations were not recorded in the above two data sets. A field gives the rough timing of the spawn in that location and comments indicate if it was a one-time event or if it was unconfirmed.
hspawn_shore	This file brings together all of the above herring data into attributes of the TRIM shoreline. The point file "hspawn_pnt" was used to cut the TRIM shoreline into segments with the attributes of the start point. Additional segments were added if spawn was indicated from any of the other sources and the attributes such as timing or comments were added from those sources. This layer is coloured a darker red-brown the greater the spawn index. The legend is based on a coast wide gradient where shorelines with an index in the top 3 rd coastwide are coloured the darkest. Areas with no index assigned are give a rating similar to those with a low index.

<u>Locations of Significant Concentrations of Fish/Invertebrates</u>	
<i>based on information provided by DFO regional staff</i>	
Layer File Name	Description
Eulachon_Holding	Areas where eulachon adults hold before spawning
Juvenile_Fish	Areas where concentrations of juvenile fish (herring, salmon, rockfish or eulachon) have been recorded.
Significant_Species _Concentrations	Significant concentrations of specific invertebrate species including (but not limited to): <ul style="list-style-type: none"> ▪ <i>Areas where squid concentrate for spawning</i> ▪ <i>Areas where jellyfish concentrations have been observed</i> ▪ <i>Beaches which have large seed populations of clam s but which are not harvested</i> ▪ <i>Urchin barrens</i> ▪ <i>Areas where sponge bioherms have been observed</i> ▪ <i>Sandlance concentrations</i> ▪ <i>Areas where capelin spawn</i>
Salmon_Holding	Areas where salmon hold before migrating up river
Salmon_Migration_Route	Salmon migration routes as line segments
Herring_Holding	Areas where herring concentrate prior to spawning.

<u>Locations of Fisheries - based on information provided by DFO regional staff</u>	
Unless otherwise stated areas are for rated for commercial and recreational fisheries	
Layer File Name	Description
Clam_Beds	Locations of clam beds (and use level where recorded)
Crab_Fishery	Areas where crabs are harvested (Dungeness, Red Rock, Tanner, Box)
Seacucumber_Fishery	Areas where sea cucumbers are harvested by divers
Geoduck_Fishery	Areas where geoducks and horse clams are harvested by divers
Octopus_Fishery	Areas where octopus are harvested by divers or hand
Prawn_Trap_Fishery	Areas where prawn trap fishery takes place
Shrimp_Trawl_Fishery	Areas where shrimp trawl fishery takes place
Urchin_Fishery	Areas where urchins are harvested by divers
Misc_Fishery	Areas where misc. species (abalone, mussels, gooseneck barnacles, chiton, welks...) are harvested.
Herring_ROK_Fishery	Locations of herring Roe-on-kelp impoundments
Herring_Fishery	Areas where Herring food, bait or spawn fishery takes place
Salmon_Troll	Areas where commercial salmon troll fishery takes place
Salmon_Net	Areas where commercial salmon gillnet/seine fisheries take place
Groundfish_Hook_Line	Areas where commercial groundfish hook & line fishing takes place
Groundfish_Trawl	Areas where commercial groundfish trawl fishing takes place
Tuna_Fishery	Areas where commercial tuna troll fishery takes place

Sport Fishing (finfish) and Diving - based on information provided by DFO regional staff	
Layer File Name	Description
Sport_fishery	Hot spots for Sport fishing (species noted); note that information from the Strait of Georgia aerial based surveys of summer sport fishing has been included in this data layer.
RecDive	Recreational dive sites (currently only DFO statistical area 12)

Habitat features - based on information provided by DFO regional staff	
Layer File Name	Description
Kelp	Kelp beds identified by DFO staff and not currently in other kelp inventories.
Eelgrass	Eelgrass beds identified by DFO staff and not currently in other eelgrass inventories.
Special_Shorelines	Shoreline segments identified as being special (salt marshes, tidal flats, highly productive estuaries)

Marine Mammals - based on information provided by DFO regional staff	
Layer File Name	Description
Seals	Points representing the locations of haulouts and rafting areas recorded during seal surveys.
Sealions	Points representing the locations of haulouts and rafting areas recorded during sea lion surveys.
SeaOtters	Areas of distribution, relative abundance
Humpback	Areas of concentration and/or high use as identified by DFO regional staff or marine mammal experts. For Humpback whales, Gary whales, resident race of Killer whales, Pacific whitesided dolphins, Dall's porpoise and Harbour porpoise
Gray	
Orcas_resident	
PWSD	
Dalls_P	
HarbourP	

<u>Fishery Distributions Based on Catch Data</u>	
<i>Currently only available for DFO Statistical Area 12 (NE Vancouver Island)</i>	
Layer File Name	Description
Crab_catch	<p>This data is displayed as polygons based on DFO statistical sub-areas classified on the basis of the total landings in that sub-area from 1994-98. The catch data are displayed and normalized by the area of the sub-area that is within the depth range for that fishery and expressed as lbs/hectare. Dive fishery catch data (sea cucumbers, geoducks, red urchins, green urchins, and octopus) are limited to portions of the sub-area with depths <20m; Crab trap fishery catch data are limited to portions of the sub-area with depths <50m and rockfish and prawn fishery data are limited to portions of the sub-area with depths <100 m. The landings for the shrimp trawl fishery are applied to all depths.</p>
Cukes_catch	
Geoduck_catch	
Grurchin_catch	
Redurchin_catch	
Octopus_catch	
Prawn_catch	
Shrimp_catch	
Rockfish_catch	

