

MASTER  
COPY

DRAFT 1

FBCN MARINE ECOSYSTEMS  
POLICY

MAY 2000

<b><i>FBCN MARINE ECOSYSTEMS POLICY</i></b>	<b>2</b>
<b><i>Part 1. Ecology</i></b>	<b>2</b>
1.1 Classification of marine ecosystems	2
1.2 Estuaries	3
1.3 The Intertidal and Subtidal zone	4
1.4 Fiords	5
1.5 Pelagic Waters	5
<b><i>Part 2. Marine Ecosystem Conservation issues</i></b>	<b>7</b>
2.1 Habitat loss	7
2.1.1 Urban development	7
2.1.2 Degradation of habitat	7
2.1.3 Changes of Habitat	8
2.2 Pollution	9
2.3 Alien Species	9
2.4 Recreation	10
2.5 Global climate change	10
2.6 Organizational and Planning Problems	11
<b><i>Part 3. FBCN Marine Ecosystems Policy</i></b>	<b>12</b>
3.1 FBCN Goals for Conservation of Marine Ecosystems	12
3.2 Strategies for achievement of these goals	12
3.2.1 Marine Protected Areas	12
3.2.2 Preventing Habitat Loss	13
3.2.3 Preventing Pollution	13
3.2.4 Control of Alien Species	13
3.2.5 Recreation	13
3.2.6 Global Climate change	14
3.2.7 Organizational and Planning Problems	14
<b><i>Part 4. Procedures associated with this policy</i></b>	<b>15</b>
4.1 Work cooperatively	15
4.2 Promote marine conservation	15
4.3 Advocate designation and acquisition of marine protected areas	15
4.4 Educate about marine ecosystems	15
4.5 Support sustainable use of marine resources	15
4.6 Establishing new or amended policies	15
Bibliography	15
<b><i>Appendix 1. Previous FBCN Resolutions on Marine Ecosystems</i></b>	<b>16</b>
<b><i>Appendix 2. Conservation Organizations interested in marine issues</i></b>	<b>17</b>
<b><i>Appendix 3: Marine Programs</i></b>	<b>18</b>
<b><i>Appendix 4. Designated &amp; Proposed Marine Protected Areas</i></b>	<b>18</b>

## FBCN MARINE ECOSYSTEMS POLICY

British Columbia lies beside the Pacific Ocean and encompasses 29,500 kilometers of ocean coastline, 450,000 square kilometres of internal and offshore marine waters, and more than 6,500 coastal islands. The temperate waters of the northeast Pacific Ocean were isolated from the Arctic Ocean during the Pleistocene ice age and evolved an exceptionally rich and diverse fauna and flora. Wildlife specific to the marine ecosystem includes 29 mammals, 161 birds, 400 fish, and over 6,550 invertebrates. 80% of the world's population of Cassin's auklet and 60 - 90% of Barrow's goldeneye breed in British Columbia. The world's heaviest recorded sea star and largest octopus, sea slug, and barnacle all occur in BC waters.

### PART I. ECOLOGY

The British Columbia marine environment has numerous components: shallow estuarine and intertidal areas, sandy bays, surf-swept rocky shores, deep, cold fiords, the sheltered seas of the Strait of Georgia, the deep waters of Queen Charlotte Sound and the open pelagic environment of the Pacific Ocean. The ecology of each component varies with climate, latitude, nutrients, water depth, salinity, currents, and other physical features. Each ecosystem has its own unique assemblage of species, attuned to life in that particular habitat.

#### 1.1 Classification of marine ecosystems

Classification of marine ecosystems is complex and scale-dependent. At the global level, coastal British Columbia occurs in the Western Temperate Coastal Realm and the Subpolar Realm<sup>1</sup>. Using a worldwide fisheries classification, which lists 49 regions, BC waters are in the Gulf of Alaska Large Marine Ecosystem.

Environment Canada developed the Marine Ecological Classification for Canada, which divides ecosystems into increasingly smaller groupings: marine ecozones, ecoprovinces, ecoregions, and ecodistricts. Within British Columbia this system was modified in 1995 to establish the BC Marine Ecosystem Classification, with 3 ecoprovinces, (Subarctic Pacific Basin, Transitional Pacific Basin, Pacific Shelf), 5 ecoregions, 12 ecosections (replacing ecodistricts), and a further sub-group: 619 ecounits. The ecosections are: Johnstone Strait, Continental Slope, Dixon Entrance, Strait of Georgia, Juan de Fuca Strait, Queen Charlotte Strait, North Coast Fiords, Hecate Strait, Subarctic Pacific, Queen Charlotte Sound, Transitional Pacific, and Vancouver Island Shelf.

Parks Canada (1995) identifies 5 National Marine Conservation Area Natural Regions in British Columbia, which are similar in scale to marine ecoregions, but cover somewhat different areas.

At the ecounit level, detailed habitat and physiographical knowledge is required for useful classifications to be made. The Canadian wetland classification system has 5 major

<sup>1</sup> Classification adopted by the International Union for the Conservation of Nature (IUCN)

classes of wetlands, based on wetland functions. The State of Washington Marine and Estuarine system, applicable in Puget Sound and Olympic Peninsula waters, is based on physical variables and diagnostic species, and includes the energy level of the site. The Department of Fisheries and Oceans' coastal classification identifies marine and estuarine habitats for fish, and uses physical criteria. Revisions to the BC Estuarine Classification system, based on habitats, are underway to incorporate the BC Marine Ecosystem framework. Coastal Resource Inventory work is in progress to systematically map the shoreline's physical and biological components.

From a naturalist's perspective, we may simplify the issue by looking at four generalised habitat types: estuaries, intertidal and subtidal zones, fiords and pelagic areas.

## 1.2 Estuaries

Estuaries are characterised by the presence of fresh water within the marine environment. Fast-flowing British Columbia rivers carry mud and silts and an abundance of nutrients, particularly in early summer when the snow melts from the mountains. Deltas have extensive sediment deposits threaded with river channels, a rich brackish mix of fresh and salt waters, and seasonal and tidal inundation of marshes and foreshores. This estuarine habitat is twice as productive as the best farmland, and attracts spectacular concentrations of wildlife at certain seasons of the year. They make up less than 3% of British Columbia's shoreline but are used by 80% of coastal wildlife<sup>2</sup>.

Estuarine habitats are found throughout the Strait of Georgia, in the Dixon Entrance and in the Juan de Fuca Strait, which has an estuarine-like outflow current.

In the Strait of Georgia, the largest estuary is that of the Fraser River. Tens of thousands of waterfowl and millions of shorebirds, in migratory flocks that exceed Ramsar criteria for internationally important wetlands by 60-fold, use the Fraser River delta every year. Boundary Bay is one of the few areas of the Fraser delta which has not been completely built up, and the open fields around its shores attract the greatest diversity of wintering raptors in Canada. Eelgrass beds and mudflats in Boundary Bay and on Roberts and Sturgeon Banks are the nursery grounds for many species of fish and shellfish, and provide feeding and loafing areas for huge flocks of wintering and migrating waterfowl and shorebirds. The largest colony of great blue heron in the Pacific northwest is found at Point Roberts, WA, on the Tsawwassen peninsula adjacent to Roberts Bank. The Alaksen National Wildlife Area on Westham Island is one of British Columbia's two Ramsar sites<sup>3</sup> and is a key site for tens of thousands of migrating and wintering lesser snow geese.

Other estuaries along the Strait of Georgia also attract thousands of birds as well as such marine mammals as harbour seals and California and Steller's sea lions. The Nanaimo River estuary, Vancouver Island's largest, supports over 200 species of birds, significant salmon stocks and the rare field crescent butterfly. The Comox estuary has a thousand wintering trumpeter swans, and western grebes occur in large flocks on spring and fall migration. The Englishman River estuary at Parksville is famous for the 20,000 black brant that are among the more than 225 species of birds that have been recorded there. Further north, the Salmon River estuary provides a lowland break in a rocky shoreline, and is used by wintering trumpeter swans, gulls, shorebirds and raptors. The Squamish River estuary at

<sup>2</sup> Pacific Estuary Conservation Program

<sup>3</sup> see Appendix 3

the head of Howe Sound has a wintering population of hundreds of bald eagles, together with many species of waterfowl and alcids.

In the Bentinck Arm area of the mid-coast, the estuaries of the Asseek, Taleomay, Ickna and Noeick are a prime spawning area for pink salmon and significant grizzly bear habitat. The Bella Coola estuary has pinks, coho, chinooks, steelhead and cutthroat trout and is used by migratory waterfowl. Delkatla Slough, at Masset in the Queen Charlotte Islands has over 140 bird species, many of them migrating on the Pacific flyway.

In the Dixon Entrance, the Skeena and Nass River estuaries attract shoals of eulachon in the spring. These small fish are followed by hundreds of thousands of gulls, as well as mergansers, sea ducks, harbour seals and sea lions. Shorebirds and waterfowl use the Skeena River delta as a stop-over and bears and moose frequent the shore. The Nass River estuary has hundreds of bald eagles in March and April. The Dixon Entrance is also important for spawning herring and as a migratory corridor for Pacific salmon.

### 1.3 The Intertidal and Subtidal zone

The ebb and flow of the tides affect all coastal flora and fauna, and are one of the determining factors for species' distribution on the shoreline. The vertical height of the intertidal area between the high tide and low tide zones averages between 2 and 7 metres. The severity of the wave and current action, the fetch and height of waves, the exposure of the shore and the geologic composition vary enormously among eco-sections, creating many different habitats. Some shores, especially on the sheltered east side of Vancouver Island, are predominantly sandy, while others, typically on the west coast, are rocky and surf-swept.

Sandy beaches attract species such as dunlins, sanderling, western sandpiper and black-bellied plover which feed on amphipods, nematodes and other small invertebrates buried in the sand at low tide. Gulls search for clams, crabs and carcasses along the shore line. Eelgrass flourishes on some sheltered intertidal areas, providing important habitat for microscopic plankton, roe and larvae, as well as small fish, such as sand sole, sculpin and flounder, and grazing birds, like the black brant. These are the basis of a complex food web, supporting a great diversity of marine species.

Rocky shores need species which can withstand the pounding of the surf, and typically host hard-shelled crustaceans like barnacles, mussels, chitons and limpets, together with sea urchins, shore crabs, and sea stars. Bird species include cormorants, rock sandpiper, turnstone, black oystercatcher and sea ducks, eg. harlequins and surf scoters. River otters, seals and sea lions are often observed along rocky shore lines. Marine plants flourish in intertidal and sub-tidal waters, to a depth of about 40 metres, beyond which light cannot penetrate. There are over 600 species of seaweed or benthic algae. The green algae are ancestors of terrestrial plants, brown algae include the giant and bull kelps, and red algae are the most numerous and occur at the greatest depth. Golden algae and seagrasses are other types of marine flora.

Intertidal habitats occur in parts of all British Columbia marine eco-sections other than the Subarctic Pacific and the Transitional Pacific. The intertidal shellfish industry in British Columbia is the major supply source of manila and littleneck clams for North America.<sup>4</sup>

<sup>4</sup> Pacific Tidings, DFO publication, 1989

## 1.4 Fiords

Fiords are a very characteristic feature of much of the British Columbian coast, particularly the North Coast Fiord marine ecosystem. Deep, steep-sided valleys cut through the Coast Mountains, creating over 10,000 km of coastline. They may run as far as fifty to seventy miles inland, and their sides can rise in sheer slopes for 3,000 metres above sea level and 800 metres below. Fiords are typically half a mile to two miles wide. Sponges, corals, sea squirts, squat lobsters and sea anemones cling to the vertical rock faces while humpback and killer whales cruise the cold deep waters. Many species that live in coastal fiords are fairly sedentary in their habits and, possibly as a consequence, grow to a large size and live for a long time. The world's heaviest sea star, sea slug, chiton, and goose barnacle are all recorded in British Columbia. The Pacific octopus, weighing up to 45 kilograms, is also the largest in the world. Seapens, anemones, starfish, and nudibranchs all reach impressive dimensions. Rockfish, of which there are many species in British Columbia, including yelloweye, roughey and quillback rockfish, live until they are more than 80 years old, reproducing at the age of 20 to 25. Geoducks can live to be 140 years old.

## 1.5 Pelagic Waters

From the sheltered Georgia Depression to the outer Pacific Ocean, the pelagic waters of British Columbia thrive with life of every description.

The Strait of Georgia has a mean depth of more than 150 metres, with much of it greater than 200m. The water is relatively warm (20 degrees Centigrade in summer in the southern Strait), brackish, and full of plankton. In June, the Fraser River plume reaches its peak, creating a unique nutrient environment, very valuable for juvenile and adult fish. A tremendous variety of marine species use the pelagic waters of the Strait during part or all of their life cycles, including herring, hake, salmon, groundfish, diving ducks, cormorants, gulls, loons, sea lions, dolphins and harbour seals. Baynes Sound, along the east coast of Vancouver Island, has the most abundant assemblage of bivalve shellfish known on the BC coast.

The Strait of Georgia has numerous small, rocky islands. At Mitlenatch Island, there is a colony of more than 15,000 nesting seabirds. 13 species of starfish have been found in the surrounding waters. 10,000 Bonaparte's gulls, 7,000 Brandt's cormorant and 5,000 Arctic loons, can be observed seasonally in Active Pass, between Mayne and Galiano Islands. Schools of herring and salmon migrate through, and killer whales, harbour porpoises and sea lions are regularly seen. Bald eagles both nest and winter in the Pass.

The Strait of Georgia extends north into Johnstone Strait, where killer whales congregate at Robson Bight for feeding and rubbing beaches, and then into Queen Charlotte Strait, a more marine environment, which is heavily used by seabirds, including Cassin's and rhinoceros auklets, and by mammals such as harbour seal, Steller's sea lion, Dall's porpoise, and Pacific white-sided dolphin.

The broader areas of Queen Charlotte Sound, Hecate Strait and Dixon Entrance, lying to the south, east and north of the Queen Charlotte Islands respectively, provide deep open water and protected bays. Vast kelp forests, island colonies of puffins, Cassin's and rhinoceros auklets, pigeon guillemots, and other alcids, cormorants and gulls, and many marine mammals are all found in this area. Alcid breeding cycles fluctuate with the

availability of Pacific sand lance, which in turn are affected by sea surface temperatures. Sand lance are also a key dietary item for many fish, eg. herring, cod, pollock and salmon.

Similar species assemblages occur in the pelagic waters of the continental shelf and along the western coastlines. Triangle Island in the Scott Archipelago, has one million nesting Cassin's auklets, comprising 70% of the world's population, 52,000 tufted puffins, 12,000 common murrelets and a breeding colony of Steller's sea lions.

The giant kelp forests of the west coast form a magnificent and very productive ecosystem, with species such as kelp perch, kelp crabs, sea urchins and sea otters. Sea otters were hunted to near extinction by the early 1900s, which caused a proliferation of sea urchins and the decimation of the kelp on which they fed. Sea otters were reintroduced to the kelp beds of Vancouver Island in 1968 and the ecosystem is slowly recovering.

Open ocean areas in British Columbia lie in the Subarctic Pacific and the Transitional Pacific marine ecosystems. These deep sea areas are summer feeding grounds for Pacific salmon and habitat for shearwaters, storm-petrels, northern fulmar, albatrosses, 10 metre long basking sharks and twenty species of whales. 20,000 grey whales migrate up the Pacific coast between Baja California and Alaska. Large underwater volcanoes are a feature of the Pacific Ocean floor and a number of them occur in BC waters. Some, for example Bowie Seamount, 220 km west of the Queen Charlotte Islands, rise to within metres of the surface, and these shallow waters attract distinct populations of rockfish and other species, as well as seabirds. Deep sea hydrothermal vents are another geological phenomenon found off the BC coast. Sulphur compounds issuing from these vents provide energy for bacteria specialised to this environment, and these bacteria form the basis of a food web for over 230 species of marine life. Endeavour Hot Vents is one example of a hydrothermal area off the BC coast.

**PART 2. MARINE ECOSYSTEM CONSERVATION ISSUES****2.1 Habitat loss**

In the last 150 years, there has been a profound loss of habitat in estuarine and low lying coastal regions. 80% of the Fraser River estuary has been drained, dyked, filled and developed. Vast areas of Fraser delta marsh have been drained, including the 8,000 ha Sumas Lake, which was pumped dry in 1928. 40% of the habitat in Howe Sound has been altered or degraded. Habitat loss can be caused in several ways: outright coverage of shore lands and intertidal areas, degradation by removal of natural vegetation, dredging of sediments or dumping, and conversion of habitat to an alternative, possibly less valuable, habitat.

**2.1.1 Urban development**

Outright coverage of shore lands and intertidal areas is usually caused by urban development. There is a great human desire to live close to the water, and waterfront property consequently has a high market value. All too often, ecological values are not given any consideration, or attempts are made at "mitigation", which is seldom successful. One need not look far to find examples of urban development which have caused the destruction of coastal habitat. Only a tiny fraction of the original Fraser estuary remains as salt marshes, with many houses and industrial complexes built right up to the high water mark, and shore lines heavily reinforced with riprap and concrete.

Industrial and recreational development in the form of wharves, ports, pulp mills, airports, log booming, and bridges also contribute to the loss of shoreline habitat. The construction of riprap banks, jetties, marinas and other structures, disrupt current patterns in intertidal and subtidal regions, threatening the survival of shellfish, sea plants, juvenile fish, and shorebirds.

**2.1.2 Degradation of habitat**

Industrial impacts such as dumping, dredging, erosion and sedimentation all contribute significantly to habitat loss. The loss of forest habitat directly affects many marine species. For example, marbled murrelets nest in old growth forest in areas such as the Carmanah Valley, the Walbran Valley and the Caren Range. They feed and winter out on the ocean, but fly long distances into the forest during the breeding season. Their nests are well-concealed, high up in old growth fir, cedar and hemlock. Forest clearcutting completely destroys the habitat of this species and many others. Clearcutting on steep hillsides also causes land slides and excess siltation, with consequent impacts on spawning anadromous fish and water quality in rivers and estuaries. Road-building, poor culverting and logging of banks and shorelines, increases erosion and sedimentation of rivers and streams. Log booming grounds cover and shade valuable areas of inshore waters, and wasted logs, washed down by the rivers, suffocate intertidal zones and foreshores. Barge traffic through ecological reserves creates disturbance to sensitive areas.

Ocean dumping attempts to dispose of waste materials out of sight, without consideration for the pelagic ecosystems affected. Boat anchors can scour the sea floor, and

oil spills kill thousands of sea birds and marine mammals on a regular basis. Major oil spills occurred from Cherry Point, WA in 1972, at Steveston in 1977, and in Gray's Harbour, WA in 1988. This latter spill contaminated Pacific Rim National Park, and beaches in Victoria, Sooke, Washington and Oregon. A few months later, the Exxon Valdez ran aground spilling 45 million litres of oil. New regulations and practices for handling oil cargoes and spills are beginning to address this problem, but proposals for large scale offshore oil and gas exploration continue. A federal government moratorium on West Coast oil and gas reserve development was imposed in 1971, but pressure is mounting to lift it, despite widespread concerns from environmentalists and coastal communities.

While conservation concerns are paramount for many British Columbian fishers, habitat can be degraded by industrial fishing methods. These include trawling, which strips the ocean bed, and gill netting which results in indiscriminate bycatches of non-commercial fish, seabirds and dolphins. Fishing quotas are often unsustainable, given the lack of undisturbed source areas, the poor condition of many stocks, and other threats to the fishery. Inappropriate harvesting methods and controls cause population imbalances, extirpation of stocks and loss of genetic diversity. Until very recently, whales and other large sea mammals, for example, the now extinct Steller's sea cow, were systematically slaughtered. The removal of large predators changed and disrupted the food chain. Shellfish beds are cleared aggressively of high priced species, such as abalone.

The recent increase in fish farms has introduced new hazards for marine life, including acoustic harassment devices that disturb and disorient whales, and the outright shooting of predators such as seals and sea lions. Other problems associated with fish farms and aquaculture are toxic algae blooms, and an overabundance of waste sludge. Shellfish operations are frequently in areas with large populations of sea birds, for example Baynes Sound. Recent initiatives such as the Shellfish Growers Association's work with the BC Important Bird Areas Program, of which the FBCN is a lead partner, could lead to voluntary stewardship and adoption of best management practices by the industry.

### 2.1.3 Changes of Habitat

The original Fraser delta was a vast marsh, seasonally inundated and full of wildfowl. 75% of the delta was dyked, drained and converted to agriculture, as was much of the lower Fraser River valley. In the course of the last hundred years, this farmland has gradually been sold, subdivided and built on, until the Agricultural Land Reserve Act slowed the conversion. Remaining farmland in Delta, and parts of Surrey and Richmond, provide habitat for waterfowl, shorebirds, raptors and various small mammals. Since the flat delta fields tend to flood in winter, and fallow fields grow a variety of grasses and small shrubs, the habitat conditions approximate to the original marsh. The whole area, however, remains very vulnerable to change in zoning and use.

On Roberts Bank, the Vancouver Port Corporation operates a container terminal and coal port at the end of a long jetty. Habitat mitigation programs provided fish refugia and lingcod habitat in the riprap supporting the port structure. While this has increased the number of species which require a rocky habitat, the fact that the jetty and port were built over important mud flat habitat and that the causeway seriously affected current flow across the Bank, means that habitat was lost even while new (and less rare) habitat was created.

Without baseline data for shoreline studies, issues of changing habitat and changing uses can become quite controversial, even among scientists.

## 2.2 Pollution

The degree of pollution to which we are subjecting our marine waters is astounding. There are 75,000 synthetic compounds, many of which are in regular household and industrial use, and these make their way in a toxic brew through rivers and into the ocean. Sewage regularly includes more than 200 chemicals, pulp mills contribute dioxins, furans and sulphite waste, chlorine from tap water mixes with algae to form cancer-causing trihalomethanes, heavy metals, such as lead and mercury, and polychlorinated biphenyls (PCBs) are biproducts of many industrial processes and products and tributyltin occurs in antifouling paint and salmon pen nets. Fish farms use antibiotics, pesticides, anaesthetics, hormones and disinfectants and contribute fecal waste sludge. Agricultural fertilizers, manure, pesticides and herbicides concentrate in farm ditches and make their way through estuarine ecosystems. Population wastes are steadily increasing, and tertiary sewage treatment is rare. Soaps, bleaches, ammonia, paints and cleaners are only some of the household products that pollute the water. Mine tailings, especially from abandoned mines, can be acidic and persist for years in the ecosystem. Oil spills, whether crude oil or canola, suffocate and kill seabirds and mammals, smother shorelines and destroy recreational values.

Persistence, bioaccumulation and multiple effects are all problems associated with chemical pollution. Toxic wastes can remain in the ecosystem long after the source polluter has ceased production. Britannia Beach was still polluted 12 years after the mine on Howe Sound closed. Victoria Harbour has numerous heavy metals. Tributyltin has been discontinued for use, but its effects linger on.

Some organic pollutants are extremely persistent in the food chain, particularly in the top predators. Bioaccumulation is the increase in concentration of chemicals in moving up the food chain. For example, weak concentrations of a compound in water become concentrated in plankton, thousands of which are then eaten by fish, which might then be consumed by a great blue heron or a whale. The highly increased concentration results in physiological affects such as thin egg shells, or cancers.

No chemist could predict the multiple effects from the random combinations of chemicals that we throw into our marine environment. It is an experiment without a "control". Even combining regular household chemicals can be very toxic, but most people appear to believe that the ocean is so vast that it can dilute all the problems away. This is very far from the case, as is clearly indicated by the dead whales washed onto the beaches, and the tumours and endocrine disruptions appearing in fish.

Pollution is gradually destroying marine ecosystems, compromising the future health of our province and costing British Columbians millions of dollars in lost income from fisheries and recreation opportunities.

## 2.3 Alien Species

Numerous alien (exotic) species have already been introduced into BC marine waters. In some locations, the most abundant crustaceans, molluscs and shore line plants and grasses, are non-native species. Some crustaceans were introduced accidentally by the shellfish industry, with oyster spat brought originally from Japan in 1914. The water in BC was too cool for Pacific oyster reproduction to be successful, so spat continued to be imported, unregulated until 1940, bringing with it at least six species of bivalves, seven species of snails, four polychaete worms and dozens of other crustaceans, algae, plants and

fish. Species such as the Japanese drill, which preys on oysters, *Batillaria cumingi*, Eastern mud snail, Manila littleneck clam and Japanese eelgrass are all aliens. Not all exotics are harmful, but there is no doubt that all intertidal areas around the Georgia Strait have been substantially altered in species composition over the last 100 years.

Fish farming introduces alien species. Atlantic salmon were originally introduced in 1905 but the experiment was a failure. Now they are regularly farmed in marine pens in much denser concentrations than is normal in nature. Escaped fish, disease, pollution and wastes can cause serious problems to wild stocks.

Ballast water exchange in BC ports is another source of alien marine species. Fish and invertebrate species do not make their way unaided from shallow Asian waters, across the Pacific Ocean, to British Columbia. The different conditions of the deep mid-ocean completely preclude this. However, many species survive successfully in ballast water tanks and get discharged with the water in inshore waters. At least 100 species have been introduced to San Francisco harbour this way, but no comprehensive study has been done for BC. Recent awareness of this problem has led to new regulations in use by the Port of Vancouver, but research on this issue is lacking in western Canada.

## 2.4 Recreation

While recreational activities are relatively less of a problem than urban and industrial effects, there are still some issues which the responsible user will need to consider. Recreational boating and marinas can contribute to oil spills, noise pollution, sewage disposal problems, and chemical pollution. Artificial reefs are created for divers to enjoy underwater wildlife, but these can displace existing habitats or introduce pollutants. Hunting for waterfowl is necessarily consumptive, and in areas of increasing habitat loss, conservation activities may be insufficient compensation. The recreational fishery similarly uses the resource, and catch and release methods may not be totally benign. Whale watching is enjoyed by many residents and visitors, but not all operators are attentive to guidelines, and whales can become very disturbed by crowding noisy boats and circling aircraft. Even kayaking may contribute to over-use of certain areas and beaches.

## 2.5 Global climate change

Human activities, such as the burning of fossil fuels, have caused a steady increase in the concentration of carbon dioxide to its highest level in 400,000 years. The last fifty years has seen a particularly steep increase. Carbon dioxide, methane and other gases form a layer in the atmosphere which traps infra-red radiation and, similar to the glass of a greenhouse, causes the temperature below it to rise. This global warming is real and measurable, but its effects on the weather are likely to be complex and are hard to predict. Different latitudes may well experience quite different effects, and some areas may have extra precipitation while others suffer droughts.

Temperatures in the Fraser River have already been increasing steadily for years, and can reach 22 degrees in the headwaters in summer. Sea surface temperatures will also increase. It is known that this will directly affect key species such as sand lance, herring and salmon. The temperature increase is likely to be more severe in the Arctic latitudes, with some scientists predicting an average of between 5 and 7 degrees Centigrade in the next 100

years. Sea levels will rise as the ice caps melt and low lying areas will be at increased risk from storm damage. The combined effect of all these changes on marine ecosystems and food chains is hard to predict. The federal Climate Change Secretariat believes that the west coast salmon fishery would be the first casualty and that thinner sea ice and inundation of marshes in the Arctic will change wildlife breeding, hunting and migration patterns.

## 2.6 Organizational and Planning Problems

There are very few protected areas for marine ecosystems in British Columbia. Of 450,000 square kilometres of inshore and marine waters, a total of 1955 square kilometres are in 106 marine parks and protected areas, and 3050 square kilometres are scheduled for the Gwaii Haanas Marine Conservation Area. Only one of these marine parks, Whytecliff Park in West Vancouver, consisting of 2 kilometres of shoreline, is a completely 'no-take' area. This means that only about 1% by area of the marine ecosystem has some degree of present or planned protection. This is clearly insufficient, given the many threats outlined above. There is an urgent need for refuge areas, closed to harvesting, which can act as sources for eggs, larvae and young of marine species and "control" areas for scientific research. Scenic areas also need protection as do nesting grounds for sea birds and important congregation areas for fish, birds and mammals.<sup>5</sup>

Jurisdictional conflicts between federal, provincial, regional, First Nations and municipal governments create stale-mate and lack of coordinated action. For example, raptors are under provincial jurisdiction, migratory birds, anadromous and marine fish are federal, and marine conservation areas are under Parks Canada. Regional districts handle sewage treatment, but the province sets environmental standards, which are not always enforced. Treaty negotiations means current uncertainty over the future of some foreshore and estuary lands, and the allocation and management of fish stocks. Management of wildlife is on a species by species level instead of a holistic ecosystem approach. Historically, this has led to extraordinary actions on the part of government. For instance, between 1913 and 1938 the Department of Fisheries and Oceans machine gunned 29,800 Steller's sea lions at Scott Islands because they were seen as a threat to economic fisheries. Communication and coordination between departments and ministries responsible for the various species is still a major challenge.

The provincial government does not have an overall Wetland Policy for British Columbia. No clear goals and strategies for protection of shore lines or estuaries has been established. Wetlands are frequently undervalued and considered to be wastelands. Their important ecological values need to be recognized and protected. There is no comprehensive Coastal Zone Management Plan and basic inventory work, while underway, is not yet completed. The complexity of existing programs and the lack of coordination can be frustrating and confusing.

---

<sup>5</sup> see Appendix 4 for some areas which have been identified already for protection.

## PART 3. FBCN MARINE ECOSYSTEMS POLICY

On the basis of the above background and rationale for FBCN interest in marine ecosystems, the FBCN has adopted the following policy to give directions for future action. This policy was approved by the FBCN membership/Board of Directors on xxxxxxxx and it forms the basis for FBCN statements and actions on marine ecosystems. It may be reviewed and amended from time to time by the Board of Directors.

### 3.1 FBCN Goals for Conservation of Marine Ecosystems

The FBCN goals for conservation of marine ecosystems are:

- Maintain and restore ecological processes within all British Columbian marine ecosystems;
- Maintain and restore biodiversity within all British Columbian marine ecosystems;
- Ensure that all uses of marine wildlife are sustainable;
- Educate the public and decision makers on the intrinsic value of all marine life.

The first three goals follow those adopted by the World Conservation Strategy in 1980 and by the conference of Wildlife Ministers in "A Wildlife Policy for Canada" in 1990. The FBCN will work towards these goals by cooperating with the relevant government agencies, landowners and non-government organizations that share our concerns.

The FBCN recognizes that a holistic approach to marine ecosystems is necessary for management and restoration plans to be successful. Regulatory systems must be put in place that value the intrinsic worth of the sea, that are designed to protect complete marine ecosystems, not just economic species, that appreciate unrecognized benefits, not just recognized users, and that take responsibility for prevention of adverse effects, not just damage control.

### 3.2 Strategies for achievement of these goals

#### 3.2.1 Marine Protected Areas

The FBCN strongly advocates for the immediate **creation of a comprehensive Marine Protected Area system** for the British Columbia coast and ocean. This system must provide a complete network of refugia and harvest-free areas for replenishment of stocks, i.e. no-take zones. The value of such a network and its acceptance by resource users has been illustrated by the New Zealand experience (Ballantine 1992) and that in Washington State. Refugia provide opportunities for species recovery, life stage protection, adult recruitment, genetic reservoirs, insurance against future problems, and "control" areas for scientific research. The latter point is crucial for sustainability, because without a baseline natural ecosystem, effects of resource use cannot be ascertained.

In view of the poor state of many shellfish and fish stocks and the many stresses being put on marine ecosystems, the FBCN recommends that the Marine Protected Area system should cover 20% of the coastal and inshore waters, that is 90,000 square kilometres, and that the system should be put in place by the year 2005.

### 3.2.2 Preventing Habitat Loss

In addition to the creation of a network of Marine Protected Areas, the FBCN encourages and advocates for:

- the creation and implementation of a provincial Wetland Policy, which would put primary emphasis on conservation of wetlands and wetland functions.
- creation of a provincial Shoreline Reserve.
- enforcement of the Forest Practices Code to prevent stream and river bank degradation.
- prohibition of indiscriminate fishing practices such as bottom trawling and gill netting.
- regulation of barge traffic routes to avoid protected areas.
- prohibition of ocean dumping.
- assessment and introduction of more ecologically sensitive fish farm predator control methods.
- education of municipal governments, staff and the general public on the implications for the ecosystem of poor urban planning.

### 3.2.3 Preventing Pollution

The FBCN encourages and advocates for

- improved public education on the effects of pollution on marine ecosystems, making the link between household and industrial behaviour and the effects on wildlife.
- immediate upgrading of sewage treatment for all coastal communities, with particular emphasis on Greater Vancouver, Victoria and others on Vancouver Island.<sup>6</sup>
- enforcement of existing regulations, for example the federal Fisheries Act, which provides for penalties for discharge of "deleterious substances" into fish-bearing waters, and the provincial Waste Management Act, which requires all municipalities to have a Liquid Waste Management Plan.
- the creation of laws which prohibit pollution rather than simply permitting specified amounts of pollutants into the environment.
- imposition of tighter controls on fish farms and aquaculture.
- continued regulation and enforcement of point source pollution rather than reliance on voluntary compliance.
- research and development into pollution treatment and non-toxic alternatives.

### 3.2.4 Control of Alien Species

The FBCN encourages and advocates for:

- creation of a joint federal-provincial alien species policy.
- control on the introduction of alien species of wildlife or plants.
- better regulation of fish farming and aquaculture.
- control of ballast water discharge in inshore waters, and adoption of mid-ocean ballast exchange.

### 3.2.5 Recreation

The FBCN encourages and advocates for:

---

<sup>6</sup> Vancouver received a C- grade and Victoria an F- in the Sierra Legal Defence Fund 1999 National Sewage Report Card (Number Two)

- education of recreation user groups on the importance and care of marine ecosystems.  
The FBCN will cooperate with recreational organizations, wilderness tour operators, wildlife viewing operators and organizations to develop codes of behaviour for use in marine situations.

### **3.2.6 Global Climate change**

The FBCN encourages and advocates for:

- implementation of the Kyoto agreement.
- increased public education on global warming, its causes and effects.

### **3.2.7 Organizational and Planning Problems**

In addition to the creation of a network of Marine Protected Areas and a provincial Wetland Policy, the FBCN encourages and advocates for:

- a holistic approach to marine ecosystem management.
- improved coordination and communication between government agencies and departments.
- completion of initial coastal inventories and continued government funding for further mapping, research and monitoring.
- creation of Coastal Zone Management Plans, that take into account ecological and landscape values as well as socio-economic ones.
- settlement of Treaty Negotiations with First Nations to provide certainty and cooperation on land use and fishing issues.

**PART 4. PROCEDURES ASSOCIATED WITH THIS POLICY**

This section shows how the FBCN and clubs can work towards the goals and strategies outlined above.

**4.1 Work cooperatively**

The FBCN believes in working cooperatively with member clubs and other organizations with similar marine ecosystem goals (see Appendix 2 for list of groups). The FBCN is currently a formal participant in the following organizations and projects which address marine and related issues.

- B.C. Endangered Species Coalition
- Nootka Resource Board
- B.C. Waterfowl Society
- Alaksen Wildlife Management Area Advisory Committee
- BC Fisheries Survival Coalition
- Fraser River Coalition
- Important Bird Areas
- Outdoor Recreation Council
- Pacific Coast Joint Venture
- Puget Sound/Georgia Basin International Task Force

**4.2 Promote marine conservation**

----to be completed-----

**4.3 Advocate designation and acquisition of marine protected areas**

----to be completed-----

**4.4 Educate about marine ecosystems**

----to be completed-----

**4.5 Support sustainable use of marine resources**

----to be completed-----

**4.6 Establishing new or amended policies**

----to be completed-----

**Bibliography**

----to be completed-----

Acknowledgements

----to be completed-----

**APPENDIX 1. PREVIOUS FBCN RESOLUTIONS ON MARINE ECOSYSTEMS**

The FBCN has passed a number of resolutions pertaining to Marine Ecosystems. The most recent on each topic is summarized (note: this is not the full text of each resolution), with dates of similar resolutions given in brackets. Only resolutions since 1988 are considered. Consult Resolutions Manual, annual Resolutions list or AGM minutes for exact text of each resolution.

FBCN RESOLUTIONS	UPDATE May 2000
<b>Mitlenatch Island:</b> urge a ban on intertidal harvesting and further trail development. AGM 1994 (1993)	Oyster harvest closed 1993
<b>Vancouver Island marinas:</b> that the Federal & Provincial governments institute environmental assessments and a Coastal Zone Management plan to protect Georgia Strait AGM 1989	Both Canadian and B.C. Environmental Assessment Acts can apply to developments in the Georgia Strait
<b>Mariculture:</b> that the results of Coastal Resource Identification studies are respected in awarding foreshore leases for mariculture. AGM 1989	Salmon Aquaculture Review recommendations of 1998 capped salmon farm tenures at existing 122 (of which about 50 are active) and put in place a Fish Farm Review Cttee and a new regulatory regime. CRI studies and other data will be used to evaluate sites.
<b>Shoreline Survey:</b> that MELP collate existing shoreline survey data and survey marine shores AGM 1992	Coastal Resource Atlas in preparation by MELP, surveys & research ongoing, currently focused on North Coast. Funding for several more years.
<b>Oil Spills:</b> that the federal government develop a plan and hold a public inquiry into the effects of oil spills. AGM 1989	Canada Shipping Act passed 1993 made oil response plan mandatory for ships and oil handling facilities. Burrard Clean certified by Canadian Coast Guard to respond, all oil companies legislated as members.
<b>Oil Tanker traffic:</b> that governments phase out crude oil tanker traffic in inshore waters and identify more acceptable methods of transportation. AGM 1991	Canada Shipping Act, 1993 controls ??? Can't travel through Dixon entrance, Hecate St, Queen Charlotte Sound
<b>DFO mandate &amp; Ecological Reserves:</b> to urge an extension of mandate to establish ecological reserves including saline marshes, coastal shorelines, and expressing concern over DFO mandate with respect to conservation & allocation AGM 1993, (1991)	Canada Oceans Act passed in 1996 allows DFO to establish ecological reserves and other Marine Protected Areas.
<b>Marine Habitat:</b> that DFO direct staff and resources to protection of marine species and physical coast environment. AGM 1993	Joint fed/prov. Strategy for creation of Marine Protected Areas agreed in 1996. Minimal action on designation.

FBCN CONSERVATION POLICY: MARINE ECOSYSTEMS

<p><b>Marine Parks:</b> that governments establish a system of marine parks and sanctuaries. AGM 1993</p>	<p>National Marine Pk proposed for southern Gulf Islands. 2 MPA pilots. Identification &amp; designation of new MPAs very slow. Need action plan.</p>
<p><b>Canada Oceans Act:</b> urge Minister of Fisheries and Oceans to reintroduce Canada Oceans Bill and develop a national Oceans management strategy as stipulated. AGM 1996</p>	<p>Canada Oceans Act passed in 1996.</p>
<p><b>Beluga and killer whales:</b> that FBCN opposes capture for purpose of aquarium displays and urges ban on acquisition, export. AGM 1993 (AGM 1992)</p>	
<p><b>Tahsish Estuary:</b> that the FBCN oppose along Kwois Ck and in the Tahsish estuary. AGM 1992</p>	<p>Protected under the Protected Areas Strategy 199xx</p>
<p><b>Squamish:</b> supporting SECS in opposition to further industrial and commercial development in the estuary. AGM 1993 (1992)</p>	<p>SECS management plan introduced...</p>
<p><b>Arctic Ocean:</b> that fed. government require a bond to be posted to ensure exploration waste is removed AGM 1993</p>	
<p><b>Storm Water &amp; sewage:</b> that municipal and regional liquid waste management plans include action programs to eliminate pollution, protect fish streams and treat stormwater/sewer overflows. AGM 1993</p>	<p>Minimal progress on liquid waste management plans. Victoria received F- and Vancouver C- in the 1999 SLDF report on sewage processing. Sewage and chemical pollution from cities continues to be a major problem.</p>

APPENDIX 2. CONSERVATION ORGANIZATIONS INTERESTED IN MARINE ISSUES

Georgia Strait Alliance

CPAWS

### APPENDIX 3: MARINE PROGRAMS

Some examples of existing international, government or partnership programs are:

- Georgia Basin Ecosystem Initiative (GBE Conservation Partnership)
- Pacific Coast Joint Venture (North American Waterfowl Management Plan)
- Pacific Estuary conservation program
- Pacific Marine Heritage Legacy Program
- Marine Conservation Areas (Parks Canada)
- Marine Protected Areas
- Green Boating Program (Coastguard Canada)
- Waterbird monitoring program (Canadian Wildlife Service)
- Western Hemispheric Shorebird Reserve Network (
- Ramsar Site (UN designation)
- Man and the Biosphere Program, Biosphere Reserve (UN designation)
- Important Bird Areas Program (non-government, BirdLife International program)
- coastal National Wildlife Area (Environment Canada)
- coastal Wildlife Management Area (Ministry of Environment, Lands and Parks)
- Marine Ecological Reserve
- Provincial Marine Park
- Wildlife Sanctuary
- International Code of the Sea
- Rio Convention
- 

Planning regions for MPAs:

1. North Coast
2. Queen Charlotte Islands
3. Central Coast
4. West Coast of Vancouver Island
5. Strait of Georgia
6. Offshore

### APPENDIX 4. DESIGNATED & PROPOSED MARINE PROTECTED AREAS