

Preface



Sockeye salmon in the Richmond Cannery, 1913. Until very recently, the ocean was viewed as an unlimited pool of resources, the exploitation of which measured the success of an enterprising economy. PHOTO: ROYAL BC MUSEUM ARCHIVES E-05033



A humpback whale feeds on BC's central coast. The return of some large whales to inside coastal waters gives us hope that actions to protect marine species and habitats can be successful. PHOTO C.T. DARIMONT

The BC coast is a fragile labyrinth of geography and diversity. Woven between inlets, straits, channels and sounds, its beauty and abundance have captivated and sustained people for millennia, unfailingly offering spiritual and physical sustenance. The ocean, islands, and adjoining lands have formed the basis of survival for countless cultures, plants, and animals. Yet, over the last 200 years, Canada's Pacific coast has been modified by an economy that ignored the tapestry of ecology, or worse, viewed the environment as an obstacle to overcome.

For many, the exploitation of coastal ecosystems measured the success of an enterprising economy. Accordingly, our historic and contemporary activities have gradually altered the diversity, abundance, and resilience of the species, communities, and ecosystems that constitute and define our coast. The consequences of this transformation seemingly grow irreversible and unsolvable, underscoring the fragile nature of our environment.

Yet, in recent years awareness has grown of the fundamental conflict between unbridled commerce and healthy ecosystems.¹ Protecting and restoring habitats has become a matter of principle, unmistakably distinguished from matters of price. Many people now understand that, although the Pacific Coast is a shadow of what it once was, it remains full of potential.

We know that at least 27 species of marine mammals have been observed along the Pacific coast. Fourteen of them are found regularly, and for them our coastal waters serve a multitude of purposes – for breeding, foraging, resting, overwintering, or simply as a migratory corridor. Some species, such as killer whales and Pacific white-sided dolphins, range widely, but others, such as sea otters, are much more closely tied to specific areas of the coast.



“Hecate Strait is the most important body of water for seabirds on the Canadian Pacific Coast.” Gary Kaiser, former population biologist for the Canadian Wildlife Service²

The silver wave. As one of the great, historically abundant and heavily exploited fishes of the North Pacific Ocean, Pacific herring still underpin much of the coastal foodweb. Each spring, their presence signals the end of winter for coastal birds and mammals who join this wave of migrating fish. Below, sooty shearwaters and humpback whales compete for herring along their route. PHOTOS: (ABOVE) G.MAZILLE, (BELOW) J. TOWER.



Marine birds rely on healthy oceans as well. Over 120 species of marine birds have been identified in BC’s coastal waters, and while all return to land to nest, they spend much of their lives at sea. From flocks of tiny phalaropes spinning on the water’s surface to the majestic soaring of giant albatross, they hold much fascination both for those who spend much time at sea, and those who observe it from shore.

Essential to the ocean’s recovery, however, is reformed ocean and fisheries management. Conservation and restoration efforts have noticeably improved the status of some marine species. The results thus far have been limited but encouraging – especially for marine mammals such as sea otters, sea lions, and some whale species. The growing presence of these marine mammals offers no guarantee of the occurrence of other species, but inspires confidence and hope that recovery is possible.

Raincoast’s goals are to restore, sustain, and enhance the coastal environment by defending against impending threats, while building on the conservation gains of recent years.

Although BC is shouldering a substantial ecological debt, Raincoast believes that we now have the promising opportunity to focus on prosperity without destructive growth, helping to ensure the future of our children without compromising the land and ocean that ultimately will sustain them.

To best ensure healthy coastal environments, ocean management must integrate ecosystem complexities with socio-economics and conservation principles. Accordingly, Raincoast continues efforts to conserve and protect marine birds, mammals, and fish in Canada’s Pacific waters. Our research aims to improve our understanding of their biology, habitat and food requirements, and potential threats from human activities. Raincoast science is applied to management plans, policies and public education, which we hope will ensure the long-term survival of all species, including humans.

1. Why Survey for Marine Animals?



The lack of published information on the abundance and distribution of many whales, dolphins, porpoises, and sea birds spurred Raincoast to undertake five years of surveys. This information is critical to making informed decisions about the risks and costs of oil development on the BC coast. PHOTO: O. ANDREWS



Surveys continue through the evening on an unusually calm Hecate Strait. PHOTO: S. HEINRICH

The growing emphasis on BC's coast as an energy corridor has spurred substantial concerns from coastal communities and the public about the impacts and risks associated with large-scale oil operations and spills. Properly assessing these impacts requires a species inventory and knowledge of where each fits in the grand web of ocean processes and biological production. Generally, we lack this fundamental understanding of the functions and processes that underpin natural systems. But we need to start somewhere. At the most basic level, managing and protecting species requires two essential pieces of information: how many animals there are (abundance) and where they can be found (distribution).

Although information on animal distribution and abundance is integral to wildlife conservation and management, surprisingly few data have been collected on marine animal distribution and abundance in the waters of Canada's Pacific coast. Killer whales in this region are particularly well studied, but there is comparatively little information on other cetaceans (dolphins, porpoises and whales) many of which were heavily depleted by commercial exploitation.

Limited information often reflects the expense of collecting data, and generally, gathering data from marine environments is far more expensive than from land. Further, the value in collecting data for purposes of understanding populations lies in doing repeated surveys, which translates into additional costs.

Having information on distribution and abundance provides insight into why animals occur in certain places. These habitat preferences represent an important part of a "species niche" – in other words, where an organism fits in relation to other species in the food web. A shorthand definition of niche is how an organism makes a living. For example, humpback



Killer whales surface. PHOTO: G.MAZILLE



Figure 1. Raincoast’s Marine Survey Study Area. In 2004, we surveyed from the Strait of Juan de Fuca (BC-Washington border) to Dixon Entrance (BC-Alaska border). In 2005-2008, we focused our efforts in the Queen Charlotte Basin, surveying from Johnstone Strait to Dixon Entrance. Track lines and inlets were systematically assigned, yet randomly generated each year.⁵

whales, which are filter feeders, occupy a different niche than killer whales, which have teeth and eat salmon. Although a species’ distribution may change in the short-term as local conditions change or food resources move, its niche is likely to remain unchanged.³ Hence, an understanding of a species niche can be used to predict how it might react to changes in its local environment over time. Raincoast’s goal is to build species models that help us understand the factors that determine marine mammal abundance and distribution.

In 2003, decisions to explore, develop, and move oil through BC’s coastal waters were gaining momentum.⁴ Yet, systematically collected information about the distribution and abundance of the marine animals and birds that would be put in jeopardy if these developments were approved was not available. Realizing that a properly informed debate over the future of BC’s coast needed such information, Raincoast committed to going out and collecting these crucial data.

In 2004 we began five years of gruelling systematic line transect surveys, covering 14,000 kilometres (8,700 miles) of ocean track line, logging over 2,000 sightings of marine mammals and close to 15,000 sightings of marine birds. We weathered hurricane force winds along the proposed tanker routes, 18-hour days were common place, low budgets were a given, and high seas repairs part of the job. But we fell asleep to singing humpbacks, woke to the blows

of killer whales in the dense fog, travelled the days with leaping dolphins, and watched the sun set on thousands of sooty shearwaters. Our experiences have instilled in us a deep understanding of the risks associated with oil tankers traversing our rocky waters and an unwavering commitment to protect this precious coast.

A global context for marine research and conservation

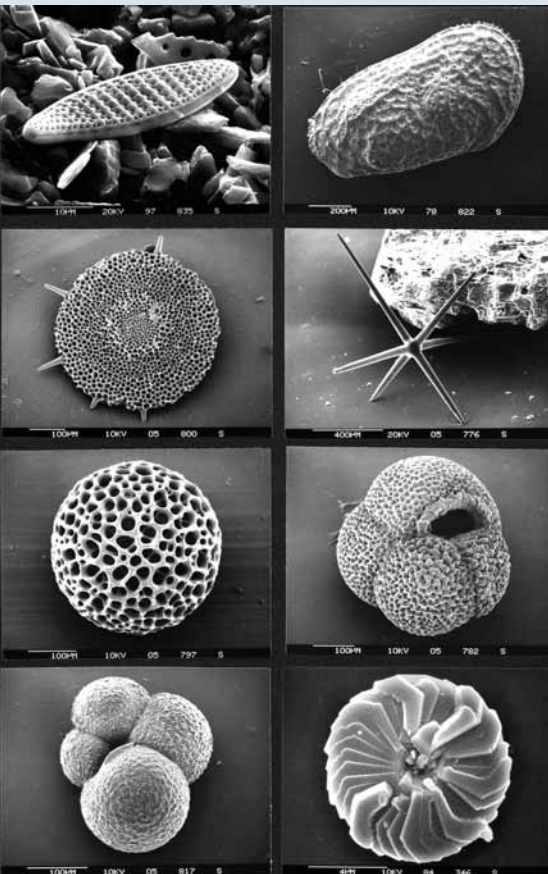
Awareness is growing of the fundamental conflict that exists between our economic growth model and the ecological services, processes and features that underpin our economy. This conflict exists because as the economy grows (typically measured by GDP), natural capital is re-allocated from a physical habitat to the human economy.⁶ Increasingly, the cost of this approach is seen in rising numbers of endangered species, loss of biodiversity, pollinator decline, climate change, limits to waste absorption, fisheries collapse, declining farmland and forest cover, and declining water and air quality.⁷

Globally, few places are immune from the ever-growing imprint of the human enterprise. Significantly, the human population worldwide and within Canada is concentrated near coasts – about 60% within 100 kilometres (62 miles). Moreover, a recent analysis suggests that although humans use about 8% of the primary production of the oceans, that fraction grows to more than 25% for upwelling areas and to 35% for temperate continental shelf systems.⁸

Although the north and central coasts of British Columbia sustained First Nation cultures for thousands of years, these regions still appear rugged and wild, seemingly untouched by the march of “progress.” We are truly fortunate to have such a visibly pristine coastline. Yet, superficial appearances aside, it is not unmarked by the ravages of industry, and now lurking at its door is the unsustainable growth economy that has visibly consumed so much of the globe’s coastlines and resources.

Shifting baselines

Canada’s Pacific coastal waters have been changing for the last two centuries. Because none of us grew up knowing the abundance of whales, salmon, and herring before commercial exploitation, we are inclined to infer their current status relative to changes we have witnessed in our own lifetimes. This is



Major groups of phytoplankton (diatom, ostracod, radiolaria, sponge spicule, radiolaria, foraminifera (2), coccolith).

PHOTO: HANNES GROBE/CREATIVE COMMONS



Cumulative impacts. The southern resident killer whale population numbers less than 100 whales. They are exposed to a wide range of stressors (reduced food supply, toxins that bioaccumulate, increased disturbance and underwater noise) that cumulatively may affect the ability of the population to grow.

PHOTO: G. ELLIS

also true for politicians and resource managers who think and work on very short timelines. The concept of *shifting baselines*⁹, first described by marine scientist Dr. Daniel Pauly, refers to the incremental lowering of standards in which each new generation assesses environmental decline only in the context of their own lifetimes. More broadly, this idea explains our inability to recognize ailing ecosystems, as our only reference is what preceding generations left behind.

Cumulative effects: The “tyranny of small decisions”¹⁰

Small, seemingly independent decisions or actions can accumulate into large, undesirable consequences over the long term.¹¹ In coastal waters, the incremental and combined effects of human activities are compiling. For example, the extraction of marine species, destruction of the seabed, persistent addition of airborne and aquatic pollution, introduced species and diseases, and increased inputs of carbon dioxide to the atmosphere and ocean have all created multiple lines of threats to marine ecosystems. Acting synergistically, their effect is to compromise ecological processes such as primary production and species interactions, which results in an altered coastal environment.

The importance of primary productivity

Through the processes of photosynthesis, primary production is the creation of energy from CO₂ in the air and the ocean. In the ocean, the primary producers are mostly phytoplankton, on land, they are vascular plants. All life on earth relies on them, both for food and CO₂ conversion. By far, most of the ocean’s productivity occurs along the coasts. Our actions – from removing living creatures and altering the shoreline, to inputs of toxins and increasing CO₂ can affect the rate of primary production.