

Icebergs grounded on an island remind you how recently the world of ice prevailed in Glacier Bay.  
Tom Bean

Streams immediately below glaciers often exhibit this characteristic braided pattern.  
Tom Bean

The Glacier Bay landscape can dwarf even the largest ships that enter its waters.  
Ruth and Louis Kirk

Pan ice shimmers on Johns Hopkins Inlet.  
Bruce Paige

Arc-shaped stress patterns on McBride Glacier hint at a glacier's powers.  
Jim Luthy

A mature spruce-hemlock forest carpets Bartlett Cove.  
Greg Streveller

This Bartlett Cove rain forest is 200 years old. Forests get younger as you travel up the bay.  
Tom Bean

Cover: Sunset from Beardslee Island. Photo by Tom Bean.

## Tidewater Glaciers

Enter Glacier Bay and you boat or cruise along shorelines completely covered by ice just 200 years ago. Explorer Capt. George Vancouver found Icy Strait (see map) choked with ice in 1794, and Glacier Bay was a barely indented glacier. That glacier was more than 1,200 meters (4,000 feet) thick, up to 32 kilometers (20 miles) or more wide, and extended more than 160 kilometers (100 miles) to the St. Elias Range of mountains. But by 1879 naturalist John Muir found that the ice had retreated 77 kilometers (48 miles) up the bay. By 1916 the Grand Pacific Glacier headed Tarr Inlet 105 kilometers (65 miles) from Glacier Bay's mouth. Such rapid retreat is known nowhere else. Scientists have documented it, hoping to learn how glacial activity relates to climate changes. The bewildering diversity of glacial activity patterns so far eludes overall explanation.

Worldwide, the glacial facts are staggering. Glaciers and polar ice store more water than lakes and rivers, groundwater, and the atmosphere combined. Ten percent of our world is under ice today, equaling the percent being farmed. If the world's ice caps thawed completely, sea level

would rise enough to inundate half the world's cities. The Greenland and Antarctic ice caps are generally 3.2 kilometers (2 miles) thick; the Ice Age hasn't ended for Antarctic penguins! And Alaska is four percent ice.

Glaciers form because the snowfall in the high mountains exceeds snowmelt. The snowflakes first change to granular snow—round ice grains—but the accumulating weight soon presses it into solid ice. Eventually, gravity sets the ice mass flowing downslope, usually far less than a meter or two (4 to 7 feet) per day. The point at which the rate of melt equals the rate of accumulation is the glacier's terminus or snout. If the glacier's snout reaches tidal waters, we call it a tidewater glacier. The park encompasses 16 tidewater glaciers actively calving icebergs into the bay. The show can be spectacular. As water undermines some ice fronts, great blocks of ice up to 60 meters (200 feet) high break loose and crash into the water. The Johns Hopkins Glacier calves such volumes of ice that it is seldom possible to approach its ice cliffs closer than 3 kilometers (about 2 miles). The glaciers seen here today are remnants of a general

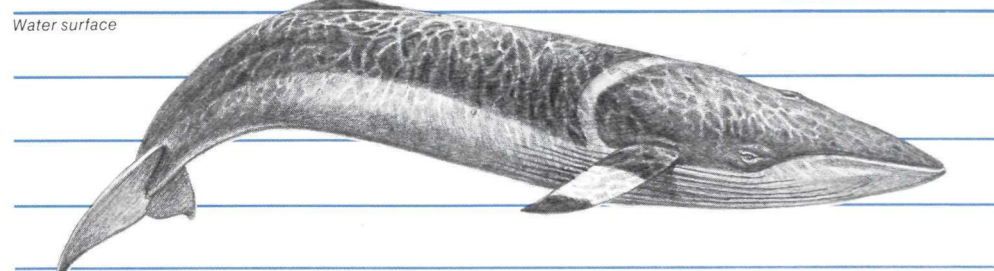
ice advance—the Little Ice Age—that began about 4,000 years ago. This advance in no way approached the extent of continental glaciation during Pleistocene time. The Little Ice Age reached its maximum extent here about 1750, when general melting began. Today's advance or retreat of a glacier snout reflects many factors: snowfall rate, topography, and climate trends. Glacial retreat continues today on the bay's east and southwest sides, but on its west side several glaciers are advancing.

The snowcapped and ice-clad Fairweather mountains supply moisture to all glaciers on the peninsula separating Glacier Bay from the Gulf of Alaska. Mount Fairweather, the range's highest peak, stands at 4,670 meters (15,320 feet). In Johns Hopkins Inlet, several peaks rise from sea level to 2,000 meters (6,520 feet) within just 6.5 kilometers (4 miles) of shore. The great glaciers of the past carved these fjords, or drowned valleys, out of the mountains like great troughs. Landslides help widen the troughs as the glaciers remove the bedrock support of soils on upper slopes.

Huge icebergs may last a week or more. Close by, kayakers have heard the stress and strain of melting: water drips, air bubbles pop, and cracks develop. Colors betray a berg's nature or origin. White bergs hold many trapped air bubbles. Blue bergs are dense. Greenish-black bergs calved off of glacier bottoms. Dark-striped brown bergs carry morainal rubble from the joining of tributary glaciers, or other sources. How high bergs—favored perches for bald eagles, cormorants, and gulls—float depends on size, ice density, and the water's density. Bergs may be weighed down, submerged even, by rock and rubble. A modest-looking berg may suddenly loom enormous, and endanger small craft, when it rolls over. Keep in mind that what you see is "just the tip of the iceberg."

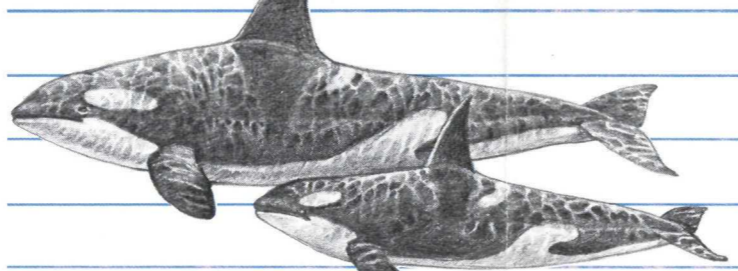
## Minke

Minke whales occur throughout many oceans and are common from southern California to the Bering Sea and Chukchi Sea. They are relatively uncommon in the Glacier Bay area. In diving, the minke shows its relatively small dorsal fin last above water.



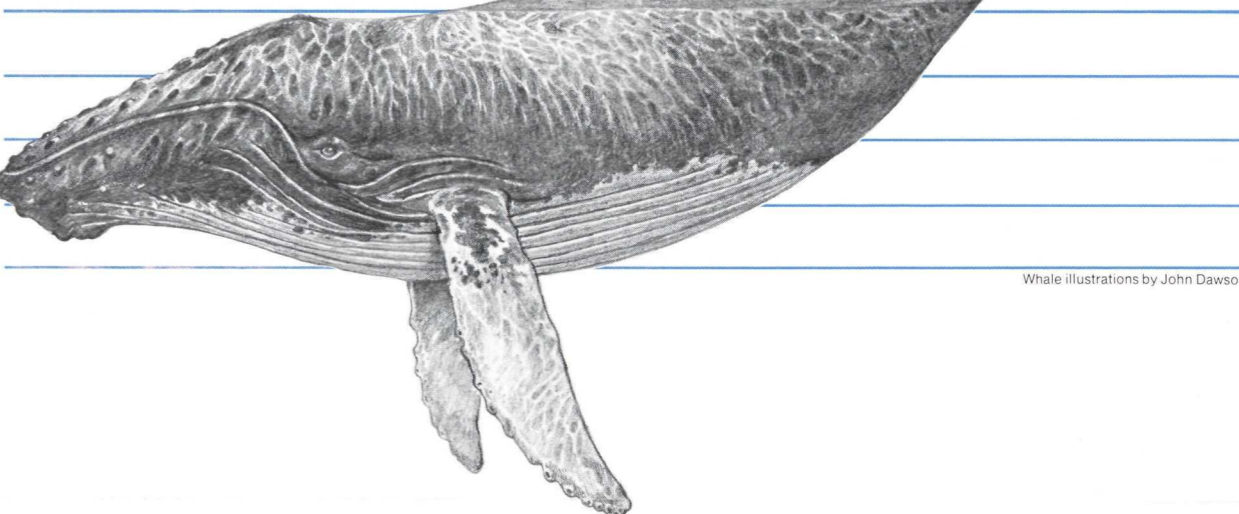
## Orca

Orcas, also known as killer whales or wolves of the sea, show distinctive black-and-white markings. Their large dorsal fin is also distinctive. Carnivores, orcas feed on fish and many other marine animals.



## Humpback

Humpback whales show their enormous fluke—tail fin—last in diving. An endangered species, the much-diminished humpback whale is now protected from whaling. The park's humpbacks migrate as far as Hawaii each winter.



# The World of Whales

Whales, symbolizing the struggle to preserve nature, include the largest creatures our world has known. Blue whales weighed up to 200 tons before whaling days. Sixty to 100 million years ago the ancestors of today's whales were land-dwelling, warm-blooded, air-breathing mammals who successfully returned to the seas to live. Alaskan waters boast ten species of great whales and five smaller whales. Glacier Bay waters boast two of the great whales, the minke and humpback, and one smaller, the orca. The whales' appeal mixes familiarity and strangeness. Whales live in family groups, aid each other in distress, and talk to each other. Some serious observers credit whales with rational thought.

Minke whales are thought to be quite migratory and are more at home in cold northern waters than most baleen whales. (Baleen whales are named for how they feed, which is described below, under the entry for humpback whales.) Cod, herring, and pollock are their main diet here. Farther south minkes favor krill. The upper size limit of minke whales in northern waters is 10 meters (33 feet). Among large whales, minkes are fast swimmers, making speeds up to 32 kilometers per hour (20 mph). As whaling has depleted more favored species, the rich-meated minke has become the most heavily taken of baleen whales today. Their North Pacific population appears to have declined to between one-fourth and one-third its pre-whaling numbers.

Orca whales feed on various marine animals, including fish, sea lions, seals, porpoises, sharks, squid, and other whales. Also called killer whales, orcas can hunt in teams and have killed blue whales, the world's largest animals. Male orca whales average about 7 meters (23 feet) long; the females less. They have no natural enemies. Thought to be highly intelligent, orcas are readily trained in captivity. They can swim at a steady 46 kilometers per hour (29 mph). Their distinctive, largely triangular dorsal fin may reach nearly 2 meters (6 feet) high on old males.

Humpbacks are the most acrobatic of whales, heaving their massive selves by leaps and turns out of the

water. Humpbacks are both cosmopolitan—found in all oceans—and endangered. Only about seven percent of their pre-whaling numbers remain. Coastal feeders who love shorelines, bays, and fjords, they are naturalists for Alaska, which boasts nearly 55,000 kilometers (34,000 miles) of tidal shoreline. Humpbacks feed here on krill, shrimp, and various fish, including herring and capelin. Humpbacks feed heavily because, unlike most birds and mammals, they do not feed year round. Humpbacks must store enough fat in summer to last the rest of the year. Adults average 12 to 15 meters (40 to 50 feet) long, females being the larger. Adults weigh in at about three-quarters of a ton per running foot. An adult humpback has from 600 to 800

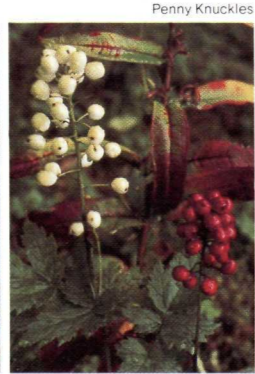
baleen plates in its mouth. These plates end in bristles. In the feeding process, huge masses of sea organisms are scooped into the mouth. Then the water, some 600 liters (150 gallons) at a shot, is expelled while the plates filter in the edibles. Were you to stare into a humpback's mouth—which opens to 90 degrees—you might not readily discount the Biblical mishaps of Jonah. Glacier Bay humpbacks have been observed working singly or in pairs to cast a "net" of bubbles about their prey and then harvesting the hapless creatures—probably shrimp and other slower-moving organisms—caught in this airy illusion. To see these large whales in their native habitat surely counts as one of the great experiences of a lifetime.

In recent years the situation of whales, and particularly of the endangered humpback whales, in Glacier Bay has been under intensive scrutiny by scientists. The purpose of the studies has been to learn enough about these awe-inspiring creatures to protect them. The numbers of whales present can vary dramatically from year to year. Whether these variations are wholly natural or not is uncertain. Historically, most of our information about whales derives from attempts to harvest them, not to save them from extinction.

Whale range information copyright 1978. The Alaska Geographic Society. Reprinted by permission from ALASKA WHALES AND WHALING.



Horned grebe



Baneberry



Moose



Red columbine



Wolf tracks



Skunk cabbage



Guillemots

## Plants and Animals Return to the Land

The world of science came to Glacier Bay to observe the great glaciers and found here the ideal natural laboratory for the study of the infant theory of plant succession. How do plants recover a raw landscape? What happens where nature wipes the slate clean and starts over from scratch? The glacier and plant studies go hand in hand. The rapid vegetation change following the glaciers' speedy retreat has enabled us to map and photograph the course of plant succession. When naturalist John Muir came to Glacier Bay in 1879 he was seeking corroboration of the continental glaciation theories of Louis Agassiz, whose controversial *Études sur les Glaciers* was published in 1840. Here, in the aftermath of retreating glaciers, Muir found original nature, a landscape like a thought not yet formed. It was like seeing an owl with no feathers. At Glacier Bay you watch a vegetative wilderness being created—and also see its culmination in coastal forest. A trip up bay mimics glacial retreat and rolls back plant succession, from the mature forest at Bartlett Cove to the naked Earth structure at the fjord's farthest reaches. Biological succession produces profound change here in a mere decade. Earnest, long-range stud-

ies of plant succession began in Glacier Bay in 1916, with the work of Prof. William S. Cooper. His plant studies were continued in 1941 by Prof. Donald Lawrence and others. Plant recovery may begin here with no more than "black crust," a mostly algal, feltlike nap that stabilizes the silt and retains water. Moss will begin to add more conspicuous tufts. Next come scouring rush and fireweed, dryas, alder, willows, then spruce, and finally hemlock forest. (On the park's outer coast the final or climax stage of plant succession may be muskeg, because soil packing causes poor drainage.) Where plants' seeds happen to land, of course, can be critical. The chaotic rock-and-rubble aftermath of a glacial romp is deficient in nitrogen. Alder and dryas are important pioneers because they improve the soil by adding to it nitrogen from the air. Much of northern Europe and America were pioneered by dryas when the last Ice Age ended. Sitka alder eventually forms dense entanglements that are the bane of hikers. But these alders also fix nitrogen in their root nodules, and drop leaves that add valuable nitrogen to the soil. This enables spruce to take hold and eventually shade out the alder. A forest commu-

nity is begun. Each successive plant community leading up to the climax community creates new conditions that lead to its replacement by plants more competitive under those new conditions. The theory holds that plant competition modifies the environment—light and moisture availability, and soil nutrients—so that plant populations also change. Over time, successive plant communities will occupy the environment, hence *plant succession*. The time from naked rock to revegetation is not necessarily long. A naturalist doing field studies here about 1920 collected bird specimens of willow ptarmigan so gorged on plump ripe strawberries that juice ran out of their mouths when they were held up by the legs.

The patterns by which animals re-inhabit the land after glaciers retreat are not as neat as with plant succession. There are no true pioneer species paving the way for succeeding species. Land mammals must either walk or swim. They cannot, as plant seeds and spores do, hitch rides on wind and waves or with birds. Extensive water, ice, or mountains loom as impassable barriers. Low mountain passes are often the conduits through

ridges the ice exposed early in its retreat. Whales, Dall porpoises, and harbor porpoises find open marine corridors to the tidewater glacier fronts. Harbor seals pup on

densely packed icebergs, an apparently new adaptation. These animals are already widespread in the park. Others—moose and coyotes—are common in some

places, absent in others. Scarce or absent here now, but expected eventually, are deer, beaver, lynx, and snowshoe hare. Capable of flight, birds do not experience ice and

open water as barriers to recolonization.

which land mammals begin to repopulate the park. Usually they will live off this young terrain only part of the year at first. Then resident populations may gradually build. The problem at Glacier Bay and throughout Southeast Alaska is compounded by the fact that mammals in general have not had enough time since the Wisconsinan Ice Age wound down to recolonize the land.



# Glacier Bay



Boats operating as park concessions will drop off and pick up campers.



Photography in this wet but cloudy-bright landscape poses special challenges.



Several salmon species spawn in park streams. They are important seasonal protein for many park predators.



Hiking or packing over glaciers requires special skills and equipment.



One last itinerary check before your pilot leaves in the backcountry.



Both camper and dog tent convey meditative postures near Riggs Glacier.

## Access and Services Information

Glacier Bay National Park and Preserve, west of Juneau in Southeast Alaska, can be reached only by plane or boat. Options include scheduled and charter air services, cruise ships, and charter boats. Write

the superintendent—address below—for a list of these services. Boating distance from Juneau is about 160 kilometers (100 miles). Flying time from Juneau to Gustavus airfield is about 30 minutes. Ground transportation to the park meets scheduled flights. For any other aircraft landings within park and preserve boundaries, please contact the park



superintendent. No aircraft fuel is available at Bartlett Cove.

**Park Handbook.** Detailed information about services, facilities, and activities appears in the *Glacier Bay Handbook*. You can purchase this full-color guidebook—and maps, charts, tide tables, and other publications—by mail from: Alaska Natural History

Association, Glacier Bay National Park and Preserve, Gustavus, AK 99826.

**For Information.** Please write: Superintendent, Glacier Bay National Park and Preserve, Gustavus, AK 99826, or phone 907-697-3341.

**Glacier Bay Lodge.** The lodge operates from mid-May to mid-September at Bartlett Cove. Reserve rooms well in advance. Write Glacier Bay Lodge at the park address in the operating season; at 312 Park Place Bldg., Seattle, WA 98101 the rest of the year. Meal and bar services are open to non-lodge guests.

**Campground.** The park's one campground, at Bartlett Cove, provides bearproof food cache, fire pits, and firewood. (No reservations or fees; 14-day limit.) Bring all equipment and supplies. Juneau is the nearest full-supply point. Airlines prohibit fuel transport—see **Cooking Fuel**, below. *There is no place to store extra gear while you are in the backcountry.* Camping orientations are given daily at Bartlett Cove. Backcountry use registration is voluntary; write the park address for forms.

**Naturalist Activities.** Park naturalists lead hikes in summer from the lodge, where films are shown daily and slide-illustrated evening talks

are given. There are exhibits about the park and its glaciers, wildlife, and marine energy cycles at the lodge and on the Bartlett Cove dock.

**Tours Up-Bay.** To see tidewater glaciers—the nearest is 70 kilometers (43 miles) from Bartlett Cove—you must travel up the bay. A concessioner's tour boat (fee charged) leaves the lodge each morning for an 8- to 9-hour trip up the bay. A park naturalist is aboard. The concessioner's overnight boat trips are heavily booked; reserve well ahead, at the lodge address. Aerial tours are available through Glacier Bay Airways, P.O. Box 1, Gustavus, AK 99826, or phone 907-697-3331.

## Backcountry Travel

Access to the backcountry is usually by the tour boat (See **Accommodations and Services**), which will drop off and pick up campers, hikers, and kayakers by advance arrangement; reserve ahead, at the lodge address. Glacier Bay Yacht Tours (76 Egan Dr., Juneau, AK 99801) also offers such service. You can also get up the bay by your own craft, charter air service, or guided kayak tour. (See **Access and Information**.)

**Camping and Hiking.** Ample shorelines, islands, and alpine meadows offer unlimited camping and hiking; avoid brush-entangled lowlands. Get local information from a ranger to plan your trip. Topo-

graphic maps and a hiker's guide are sold at Bartlett Cove. Also get advice on shorelines and terrain to *avoid as camp-sites* because of tides, icefalls, and such. You must be fully equipped and self-sufficient—but not overburdened—for backcountry travel here. Bring waterproof clothing, tent with waterproof fly, rain cover for your pack, waterproof matches, and waterproof food bags. You must have clothing that stays warm while wet, or carefully keep extra clothing dry, to avoid hypothermia, the critical loss of body heat. It can strike any time of year and be fatal.

You are totally on your own in this expansive wilderness. Do not travel

alone. First-timers should gain experience elsewhere before cutting loose from civilization here.

*All backcountry users must read Hazards, Ashore and Afloat, and be prepared to cope with emergencies.*

**Cooking Fuel.** Firewood is not available in the upper bay. Do not burn the fossil wood there! Bring stove and fuel bottle for white gas only. White gas is sold in Gustavus and at Glacier Bay Lodge. Airlines prohibit carrying flammables. Pack out everything you pack in.

## Boating

Interesting areas are easily reached by boat on Glacier Bay. Do not try to navigate without nautical charts, tide tables, and local knowledge. Get all three at Bartlett Cove. Park rangers are there to help you. Several radio frequencies are monitored. **Boating Permits.** Park waters are subject to special regulations to protect endangered humpback whales. A boating permit is required for entering Glacier Bay. Check with rangers for current information. Boaters can get gasoline, #2 diesel fuel, and water at Bartlett Cove, the park's only public boat facilities. Kayakers are preferable to canoes—they ride lower, so you don't fight winds as much. (See **Hazards**.)

## Hazards Ashore and Afloat

**Bears.** Black bears and brown/grizzly bears should always be considered dangerous. Keep food supplies separate from your campsite and equipment. Make noise when hiking, so you don't startle bears. Photograph wildlife with a telephoto lens; don't try to get close. Do not feed wild animals. This is unsafe and sets up dangerous behavior patterns. **Glacial Streams and Tides.** Glacial streams small in the morning may become uncrossable torrents by afternoon. Tides fluctuate as much as 7 meters (25 feet) daily. **Glaciers.** Avoid crossing or approaching steep glacial interfaces. Some stagnant ice bodies may be safely crossed, but take care. **Cold Water.** Water

temperatures here are only a few degrees above freezing. Prolonged immersions is usually fatal. **Floating Ice.** Floating icebergs are often unstable and roll easily. Stay away from large bergs. You can push through smaller pieces of floating ice but be cautious. **Waves.** Don't approach tidewater glacier faces closer than 0.75 kilometer (about 0.5 mile). Waves from icefalls and the masses boiling to the surface can swamp you. Don't beach boats on shorelines subject to such waves. Tidal movements at inlet mouths and other narrow poses acute boating hazards.

## Weather/Fishing

**Weather.** Warm clothing and rain gear are essential. Summer temperatures rarely exceed 24°C (72°F). Long periods of wet, cool weather must be expected. The ground usually remains moist. Choose footwear accordingly. **Insects.** Higher country is worse for bugs than lower down. Mosquitoes, deer and horse flies, white sox, and no-see-ums can be ferocious. Bring ample repellent and adequate screening for tents. **Fishing.** Insects don't hurt the fishing—for trailboat salmon, Dolly Varden, and cutthroat trout (Alaska fishing license required). Ask for tips. Charter a boat at Bartlett Cove.

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