



## Glossary

### “Asking the Auks About Climate Change in the Arctic”

Lecture, May 28, 2009

**A acclimatization** – the gradual adjustment of the body to new climatic or other environmental conditions, for example, the adjustment to low levels of oxygen at high altitudes.

**adaptation** – reduction of vulnerability of natural and human systems against change.

**albedo** – the percentage of solar radiation that is reflected relative to the total incoming radiation.

**alcid** – a taxonomic term at the Family level used to refer to auks, murre and puffins.

**algae** – single-celled, multi-celled or colonial marine or freshwater plants that contain chlorophyll; they don't have true roots, stems or leaves and also do not flower or contain seeds.

**anemometer** – an instrument designed to measure wind speed.

**anomalies** – departures of temperature, precipitation, or other weather elements from long-term averages at a given location.

**anthropogenic** – generated by the actions of humans.

**apex predator** – an organism (predator) that has virtually no predators of its own, occupying one of the top spots in its particular food web.

**Arctic Ocean** – the smallest of the four “oceans,” this ocean lies almost entirely above the Arctic Circle (66.5°N). It is almost completely surrounded by land, with its only outlets being the Bering Strait, the Davis Strait, the Denmark Strait and the Norwegian Sea.

**atmosphere** – entire mass of gases surrounding the earth or other celestial bodies. Today's atmosphere is made up primarily of nitrogen (78%), free oxygen (21%) and greenhouse gases which can capture solar radiation: water vapor, which ranges from less than 1% in arid regions to over 3% in moist areas, carbon dioxide (0.035%) and methane (0.00018%).

**auk** – any of the 22 species (21 extant) of diving birds of the family Alcidae (order Charadriiformes). They have short wings and legs and webbed feet. Limited in distribution to Arctic, subarctic and north temperate regions (with a few species south to Baja, CA), they nest colonially on ledges of cliffs and in rock crevices or burrows adjacent to the sea and spend their winter months far from land. They eat fish, crustaceans, mollusks and plankton.

**autotroph** – organisms that are able to produce their own food through processes such as photosynthesis.

**B Beaufort scale** – scale of wind strength based on visual assessment of the effects of wind on seas and vegetation.



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**baseline** – measurable quantities from which an alternative outcome can be measured.

**biodiversity** – range or variety of all organisms and ecosystems.

**boreal** – of or relating to the forest areas of the northern North Temperate Zone, dominated by coniferous trees such as spruce, fir and pine.

**brooding** – immediately after hatching, the chick requires protection from the elements (e.g., heat, cold) and predators - during the brooding (or brood guard) stage of the breeding season, one albatross parent always remains with the chick at the nest.

**bycatch** – also termed incidental catch, is defined as the unintended capture of non-target size classes (ages) and species in a fishery.

**C carbon cycle** – the flow of carbon through the atmosphere, ocean, terrestrial and lithosphere.

**carbon dioxide (CO<sub>2</sub>)** – naturally occurring gas; also by-product of burning fossil fuels. The principal anthropogenic greenhouse gas effecting climate change. Is essential for photosynthesis.

**climate** – accumulation of daily and seasonal weather events over a long period of time. A description of aggregate weather conditions; the sum of all statistical weather information that helps describe a region.

**climate change** – refers to the variation in the Earth’s global climate or in regional climates over time. It describes changes in the variability of average state of the atmosphere (or average weather) over time scales ranging from decades to millions of years.

**climatic feedback mechanisms** – an enhancement (positive feedback) or a damping (negative feedback) of an initial change, in this case in the climate system. For example, when less energy reaches the earth, temperature decreases and the area covered by snow increases. The albedo of the planet increases, reflecting more solar energy back into space. Consequently less energy is absorbed at the surface, and temperature further decreases. The whole "cycle" from the initial cooling to the further cooling is a feedback. It is a positive feedback in this example.

**climatology** – quantitative description of climate showing the characteristic values of climate variables over a region. Climate refers to the statistical collection of weather conditions over a specified period of time. Note that the climate taken over different periods of time (30 years, 1000 years) may be different.

**copepod** – a planktonic crustacean that can be found almost wherever water is available (both fresh and marine), however, most are found in the marine environment. Also famous for being SpongeBob’s nemesis “Plankton” on the cartoon show.



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**Corticosteroid hormone** – any of the steroid hormones produced by the adrenal cortex or their synthetic equivalents (like cortisol and aldosterone).

**CTD** – Conductivity, Temperature and Depth. An instrument that is lowered into the ocean that records the conductivity (salinity) of the water, the temperature and the depth. These instruments can be set to take readings every specified time interval for a specified length of time, etc. Scientists can create vertical profiles of the ocean at a particular spot at a particular time, or over a period of time.

**D debris** – also termed marine litter, is defined as any *that does not naturally occur in the marine environment*, including articles that have been made or used by people and deliberately discarded or accidentally lost.

**Dovekie** – also known as the little auk, *Plautus alle*. Breeding colonies can be found on islands in the high Arctic. They feed mainly on crustaceans, especially copepods and other small invertebrates and fish.

**E ecosystem** – relationships between and among living organisms and their non-living environment. □□

**eddy** – small volume of air (or any fluid) that behaves differently from the larger flow in which it exists.

**emissions** – pollutants released into the air or waterways from industrial processes, households or transportation vehicles. *Air emissions* pertain to atmospheric air pollution; *water emissions* refer to pollutants released into waterways.

**El Niño** – appearance of unusually warm waters in the eastern Pacific; termed the "Christ child," because of the time of year it effects the South American coastline. **ENSO** - acronym for El Niño Southern Oscillation. ENSO occurs when the easterly equatorial surface winds weaken, or reverse and the warm water in the western equatorial Pacific Ocean moves to the central and eastern Pacific Ocean. This flow is accompanied by heavy rainfall along the coast of Peru, California and Mexico.

**F fledge** – when the hatched chick is mature enough to leave the nest and its dependence on its parents for food.

**fossil fuels** – include coal, petroleum and natural gas.

**fjord** – a narrow inlet of the sea between cliffs or steep slopes, created in a valley carved by glacial activity.



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**G glacier** – river of ice (on land) that under pressure can deform and flow plastically. When glaciers melt, the water that results contributes to sea level rise (as opposed to icebergs, see below).

**global warming** – an increase in the average temperature of the Earth’s atmosphere, great enough to cause changes in the global climate. This change occurs globally such as the interglacial warming period the earth experienced after the last Ice Age. The current increase is brought about by increased levels of greenhouse gases due to effects of human industry and agriculture. Expected long-term effects are sea level rise, flooding, melting of polar ice and glaciers, fluctuations in temperature and precipitation, drought, heat waves and forest fires.

**greenhouse effect** – the progressive, gradual warming of the earth's atmospheric temperature, caused by the insulating effect of carbon dioxide and other greenhouse gases that have proportionately increased in the atmosphere. The sun’s energy, mostly in the form of short-wavelength visible radiation penetrates the atmosphere and is absorbed by the Earth’s surface. The heated surface then radiates some of the energy into the atmosphere in the form of longer-wavelength infrared radiation. Much of the radiation is absorbed by greenhouse gases in the lower atmosphere, which in turn radiates some of it back to earth. The greenhouse effect is essential to life on Earth; however, its intensification due to increased levels of greenhouse gases in the atmosphere is considered to be the main contributing factor to global warming.

**greenhouse gases (GHG)** – include the common gases of carbon dioxide and water vapor, but also rarer gases such as methane and chlorofluorocarbons (CFCs) whose properties relate to the transmission or reflection of different types of radiation. The increase in such gases in the atmosphere, which contributes to global warming, is a result of the burning of fossil fuels, the emissions of pollutants into the atmosphere, and deforestation. The greenhouse gases found in the atmosphere (including CO<sub>2</sub>, H<sub>2</sub>O, CH<sub>4</sub>) that act to allow short wave radiation from the sun to reach the earth, but which absorbs outgoing long wave radiation from the earth surface. □

**greenhouse effect** – process by which the equilibrium temperature of the earth is increased due to presence of gases in the atmosphere that absorb outgoing longwave radiation. □

**I iceberg** - a large floating mass of ice, detached from a glacier and carried out to sea. When an iceberg melts, it does not contribute to sea level rise (as opposed to glaciers, see above).

**incubating** – to protect and keep an egg warm by sitting on it.

**IPCC** – the International Panel on Climate Change is a scientific intergovernmental body set up by the World Meteorological Organization (WMO) and by the United Nations Environment Programme (UNEP) to provide the decision-makers and others interested in climate change with an objective source of information about climate change.

**L latitude** – the angular distance north or south from the Earth’s equator, measured in degrees, minutes, and seconds of arc



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**littoral zone** – area of shore between mean high water and mean low water.

**longitude** – the angular distance east or west from the Prime Meridian, which passes from pole to pole through Greenwich (England), measured in degrees, minutes, and seconds of arc

**M marine climate** – climate dominated by the ocean, because of the moderating effect of water, sites having this climate are considered relatively mild.

**N North Atlantic Oscillation (NAO)** – the dominant mode of winter climate variability in the North Atlantic region ranging from central North America to Europe and into Northern Asia. The NAO is a large-scale seesaw in atmospheric pressure between a subtropical high and a polar low (above Iceland).

- During a positive NAO index: there is a stronger than usual subtropical high-pressure center and a deeper than normal Icelandic low. Increased pressure differences result in more and strong winter storms crossing the Atlantic Ocean on a more northerly track. This results in warm, wet winters in Europe and cold, dry winters in northern Canada and Greenland. The eastern United State experiences mild, wet winter conditions.

- During a negative NAO index: there is a weak subtropical high and weak Icelandic low. This reduced pressure gradient results in fewer and weaker winter storms crossing on a more west-east pathway. This brings moist air into the Mediterranean and cold air into northern Europe. The east coast of the U.S. experiences cold air outbreaks and snowy weather conditions. Greenland experiences milder winter temperatures.

**P pair bond** – two mated animals that mate for life.

**pelagic** – the open area of the ocean that is not associated with the sea floor or coastline.

**permafrost** – layer of soil beneath the earth's surface that remains frozen throughout the year.

**photosynthesis** – process in green plants and certain other organisms by which carbohydrates are synthesized from carbon dioxide and water using light as an energy source.  $\text{CO}_2$  and  $\text{H}_2\text{O}$  are combined in the presence of sunlight and the green pigment chlorophyll, to produce food ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) and  $\text{O}_2$ .

**phytoplankton** – microscopic plants that photosynthesize and create organic matter using energy from the Sun.

**plankton** – small or microscopic organisms, including algae and protozoan, that float or drift in great numbers in fresh or salt water, especially at or near the surface, and serve as food for fish and other larger organisms.



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**primary productivity** – the rate at which energy is converted by autotrophs (such as phytoplankton and other algae in the ocean) to organic substances.

**S salinity** – a measure of the quantity of dissolved salts in ocean water. About 90% of that salt is sodium chloride. The other major dissolved salts in sea water are chlorine, sodium, magnesium sulfur and potassium. Ocean water is about 3.5% or 35 ppt salt.

**seabird** – any bird that has adapted to life living on or in coastal waters and the open ocean, such as gulls; pelicans; gannets; cormorants; albatrosses; petrels; etc.

**sea level rise** – is the long term increase in the mean sea level resulting from a combination of local or regional geological movements and global climate change, such as sinking of the land, increased volume of the ocean due to thermal expansion, or addition of water to the ocean from melting glaciers.

**sea surface temperature (sst)** – temperature of the ocean's surface used in collaboration with other data to predict an El Nino occurrence.

**Spitsbergen** – a Norwegian island, the largest island of the Svalbard archipelago in the Arctic Ocean. Since Spitsbergen lies far within the arctic circle, the sun is above the horizon for 24hrs a day from late April to late August. From mid-October to early February the sun is continuously below the horizon.

**U upwelling** – the upward motion of sub-surface seawater toward the surface of the ocean. This is often a source of cold, nutrient-rich water. Strong upwelling occurs along the equator where easterly winds are present. Upwelling also can occur along coastlines, and is important to fisheries in California and Peru.

**Z zooplankton** – a heterotrophic type of plankton. Most are microscopic in size, but some are large enough to be seen with the unaided eye (jellies, salps, etc.).