

underwater naturalist



**Special Double Issue:
COLD COASTS**

Vol. 27, No. 4

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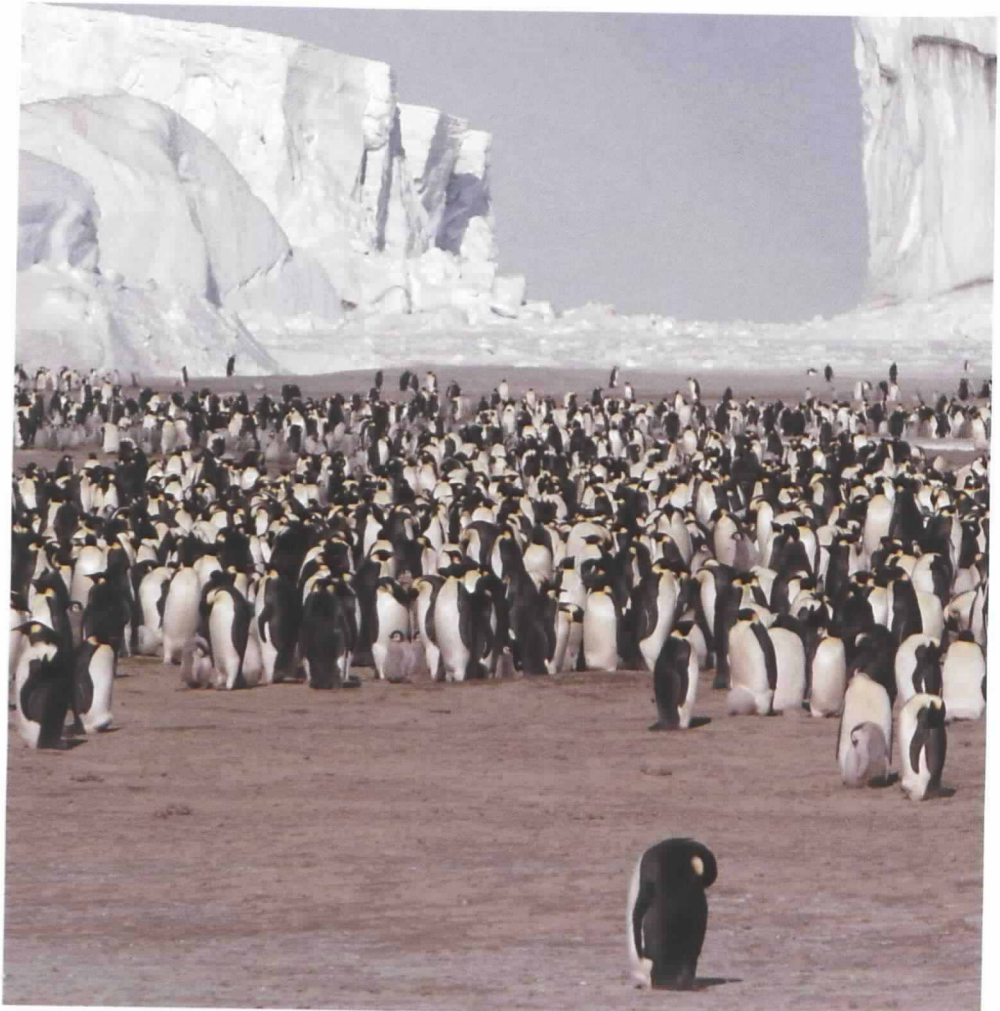
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BULLETIN

OF THE AMERICAN LITTORAL SOCIETY



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Cover Photo: by Torre Stockard
Emperor penguins at home and at ease on the cold
coast of Antarctica.

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CLAM EATING FISH

Re Al Anderson's field note on codfish eating clam siphons (*Underwater Naturalist* 27/3), he mentions it is well known that this is a favorite food of winter flounder. We mostly use bloodworms for bait around here but often scatter canned corn where we are fishing to attract flounders, on the theory that the corn looks like siphons. I don't know whether it helps but we keep doing it. By the way, I've always been interested how winter flounder, with no teeth, can nip siphons. I guess it's more like a grab and twist.

Rick Ebersol
Rye, NY

DOWN AMONG THOSE SHELTERING PINES

I enjoyed Jim Duggan's article on the invasive Australian pine (27,3). Cape Florida, in Biscayne Bay near Miami, was blessed (cursed?) with thousands of Australian pines before Hurricane Andrew came through and knocked most of them down. The Park there took advantage of the situation and has replaced them with native vegetation. It's still a struggle because the pines scatter so many seed cones that saplings by the hundreds have to be pulled up each year. As I recall, the American Littoral Society was a leader in this reforestation project with native trees and plants. Well done.

Alicia Newcombe
Coral Gables, FL

I OBJECT

In Holly Jantz's otherwise good field note, "Snapper Bluefish: The Crucial First Year (27,3), she perpetuates a shibboleth by quoting Bigelow & Schroeder who quoted Goode that bluefish are "perhaps the most ferocious and bloodthirsty fish in the sea..." Yes, they are aggressive, sharp-toothed predators and maybe even "ferocious" when they feed, but I don't think calling them "bloodthirsty" is the right word; it makes them sound like humans. They're just hungry fish.

There is another much-touted theory that bluefish are such maniacs they are known to eat their fill and then regurgitate so they can eat again. Roman emperors maybe, bluefish hardly. We may not think that nature is always pretty, but it is natural.

Tim Jensen
Ocean City, NJ

MORE ABOUT BRITISH FAT

In "Another Round of Questions to Be Answered" about fish & chips cookery (27,3) you suggested "...slices of white potato (cooked) in beef lard." Please be advised that the fat from beef (should be called) suet. You properly noted in the previous sentence that lard comes from pork. Just thought you'd like to know.

George Keller
Park Ridge, NJ

(Ed: Thanks. In your next communication, please explain trans-fat, partially hydrogenated fat, omega 3 fatty acids, low fat, fat free, bacon fat, butter, margarine, polyunsaturated fat, triglycerides, and oil -- corn, safflower, peanut, olive, coconut, rapeseed, soybean)

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COLD COASTS

The images of coasts crossing most people's minds in July probably don't involve a lot of snow, rocks or very cold waters. So what more logical subject matter for the Society to dedicate a special issue of the Underwater Naturalist to than "cold coasts?" In this issue are revealed ancient origins of celestial navigation, behaviors of a variety of uncommon wildlife, accidental tourist trading secrets, politically correct, incorrect and irrelevant topics of conversation above the Arctic Circle, four different pronunciations of *arctic*, and admissions of politically incorrect adventures with high explosives. Beneath an often monochromatic sky is, as Bruce Stutz describes, a landscape and ecology complex and varied enough to inspire "visions of vastness, brilliance, and timelessness." The articles that follow illuminate a part of the littoral that may be, unfortunately, rapidly changing. Today, however, the cold coasts (and the occasional mountain top) continue to hold a wide variety of interesting life, communities and peculiarities unique to them. We expect that reading this issue may reduce your own personal heat index on the beach this summer by a few degrees, as well as light a fire of curiosity about the further reaches of colder climes.

Tim Dillingham



Ukpiagvik: The Place I Hunted Snowy Owls

BY DAVE GRANT

*The ice was here, the ice was there,
The ice was all around:
It cracked and growled, and roared and howled,
Like noises in a swound!*

(Coleridge - Rhyme of the Ancient Mariner)

One of the sorriest shortcomings of America's educational system is graduates' lack of map reading skills. Give me any map, the older the better, and I'm an armchair explorer for the next hour. It's been that way since I was a kid, mentally traveling the ends of the earth, from Zanzibar to Agattu. Like Mark Twain: "When I am playful, I use the meridians of longitude and parallels of latitude for a seine, and drag the Atlantic Ocean for whales!"

I have discovered that most college students can draw a fairly good map of the resort islands of the Caribbean, but the rest of their world looks like a plate-tectonics portrait from the Permian. Also, it is not unusual for them and geographically-challenged friends to draw a blank about my travel destinations, so I've gotten used to replying: "Off your atlas" - which unfortunately, is usually enough to satisfy their curiosity. I once teased people with: "I'm headed for the Isles of Langerhans...you know, in Pancreas." But I don't run into many biology majors these days.

This year I finally reached Barrow, Alaska, one of those far-flung corners I've daydreamed about, courtesy of a cargo plane flown by a one-armed, one-eyed pilot. (not, really...but it's a great line fed

to me years ago by Littoral Society member Ken Gosner while encouraging me to retrace one of his adventures through the Arctic). It was an interesting trip nonetheless and the most memorable comment by one of the flight crew was, "We also transport the Iditarod dogs. They're cute and just pile up in the corner and go to sleep." Thus assured, I too settled in for the flight over some of the most remarkable scenery in North America.

The Arctic Coastal Plain

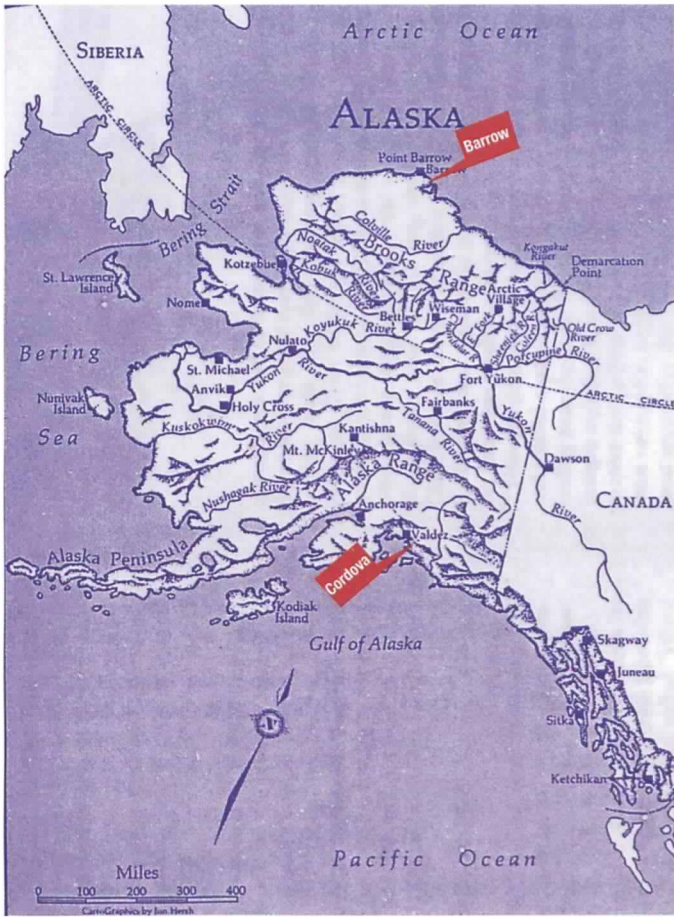
Barrow lies at the edge of the Arctic Coastal Plain (ACP); west of Prudhoe Bay and the Arctic National Wildlife Preserve (ANWR); and 330-miles north of the Arctic Circle.

It is the northernmost point of land in the United States. Beyond that, one must leap-frog over a thousand miles on slush and ice islands for the remaining trek to the North Pole.

This is a remarkably flat expanse of Tertiary sediments atop 100-million year-old oceanic crust thrust up from the Arctic Sea. Most of southern Alaska has its origins in the Pacific Ocean.

Barrow is the world's largest Eskimo village, home to more than half the 7000 residents of North Slope Borough. Bigger than Minnesota, it is the largest municipal government in the world. After flying over it, I am willing to wager that it rivals the number of water bodies that the "Land of

Dave Grant is a forensic ecologist and director of Brookdale College's Ocean Institute. His existence at Sandy Hook is depicted on the "department's pages" at: www.brookdalecc.edu.



10,000 Lakes” claims on its license plates. The majority of residents are native American *Inupiat*, and like many indigenous and isolated cultures, their ancient name boasts that they are “the real people” and their ancestors were the first to occupy this harsh region thousands of years ago.

Across the ACP are all the *thermo-erosional* (freezing-thawing induced) features I’ve taught about in Earth Science classes, but never seen first hand. Frost heaving creates ponds, and there are periglacial wind-scoured depressions that probably account for many of the shallow ephemeral wetlands (like “pingos”) back home in southern New Jersey. During the Pleistocene, New Jersey was also at the

periphery of the continental glaciers.

People think of this as a wet region but the moisture is locked up for most of the year in 2000 feet of frozen ground below the surface. The uppermost permafrost warms up for the shortest of summer seasons, just enough to melt and allow the veneer of tundra plants enough time for a burst of growth in the 24 hours of daylight between May 5 and August 18.

Barrow sits on the western coastline at the top of Alaska, bordering the Chukchi Sea. It’s shoreline is a series of low eroding bluffs, with bights that are partially enclosed by large spits growing to the northeast. Point Barrow is last and largest of these. Because of fairly stable sea levels for the last few thousand years; spits like it are the

most recent depositional structures along coasts.

The undulating shore east of Point Barrow borders the Beaufort Sea and is protected by the Plover Islands — a long, thin offshore chain stretching to the southeast and enclosing Elson Lagoon. The cusps on the coast are bisected portions of some of the vast number of tundra ponds on the coastal plain. With an erosion rate of up to 100 feet per year, Arctic shorelines experience the fastest coastal retreat in the world.

The beaches I was able to explore on both sides of Barrow are composed of smooth gravel and sand, with large blocks of grounded, shore-fast ice. The winter ice pushes the gravel into steep berms and the

beach slope and ice make for slow going in some spots. The coastline is interesting to a geologist but a bit disappointing to the serious beachcomber.

The Barrow Arch

Tectonic forces have created a bulge of crust beneath the sediments of the coastal plain north of the Brooks Range. Beneath this so-called *Barrow Arch*, oil and gas accumulated. Used wisely, I was told that the town's wells will supply natural gas to its residents for 150 years. The region also has mineral deposits and may contain 40% of the nation's coal reserves, so development is probably inevitable since those who influence the nation's energy policy seem to view conservation as just a curious pastime for a minority of people.

The Eskimos knew of local oil seeps and burned oil shale, but ships came to the far North in the mid-1800's because of diminishing stocks of whales and their oil needed to fuel the nation's lamps and lighthouses. This was the first contact with the outside world for the Inupiat, but after the whaling industry died out in the early 1900's these northern coastal Eskimos were generally left alone. Ironically, after WW II the next major contact involved the U.S. Navy, also worried about shortages of fuel. Searching for future oil sources, it set aside the region as one of several Naval Petroleum Reserves.

Frosty skies

As usually happens with me, I jumped at the chance to visit Barrow before gathering any information about the place. I became anxious about the weather because it was necessary for me to travel light before heading North. Since I did not have room for heavy clothing, I reasoned that if necessary, I could suit up in all the layers of the light clothes I carried and a water-resistant outer shell and hoped that would be sufficient for whatever conditions I encountered. As it turns out, I was

fortunate and visited during a week with fairly mild weather.

Any other misgivings about the trip vanished with the coastal fog as the pilot, preparing to land, dipped beneath it and circled out over the frozen waters of the Chukchi Sea. With my face pressed to the window to take in as much of the only overview I could expect to get here, I was elated with my first glimpse of Arctic waters.

It was no mistake to visit in July, the warmest month of the brief Arctic summer; however the maximum summer temperature is still below 45° F. Even though Barrow is above the Arctic Circle and has 24 hours of daylight for one-quarter of the year, when the sun does show, it warms the spirit more than the skin because of its low angle. There is no moderating effect from the icy sea, and unpredictable wind shifts cause the temperature to change abruptly. There is no relief from the south either since the Brooks Range — the continental divide between the Pacific and Arctic — blocks any warm air from the rest of the state.

When packing for the trip I wanted to be prepared for anything, including Alaska's notoriously high priced food, by filling empty space in my back-pack with a stock of energy-rich hiking snacks. I recalled the complaints of Shackleton's crew, stranded in Antarctica and surviving exclusively on a seal and penguin meat diet that left them with little energy and craving carbohydrates. As it turns out, food prices here aren't too exorbitant. Also, there is a convenience store near the beach, along with a few small restaurants: Arctic Pizza, Ken's ("...pretty good greasy place."), and Pepe's North of the Border ("The world's northernmost Mexican restaurant").

So, like most people on vacation, I ended up eating locally and sharing most of my snack bars with hikers and kids. Something I did not expect to find here is the corn-dog — that celebrated snack of the South, and I also noticed that there



The beachfront at Barrow, Alaska. Various shore protection devices - rocks, gabions, and sand bags - have been placed at the beach's bluff to protect the town.

was always a line of locals at the “slushy” ice-drink machine. To me, this confirms that a high latitude carbo-craving exists...or perhaps like the rest of the country, locals have become prisoners of sugar and modern processed junk food.

I always clean out the closet and bring gifts from home when I visit someplace off the beaten path. This time it was our college's logo t-shirts and wooden train whistles, courtesy of our PR department. Upon arriving in the “Last Frontier” I discovered that Barrow is a three-season town: Spring, Winter and Fall — sleet, snow and sunshine — all in the same day and sometimes within the same hour. I believe my tiny hiker's thermometer read 38° F at one point, but it was raining and hard to confirm it. At most times I could see my breath.

I was warned to bring a wide-brimmed hat with mosquito netting and cotton gloves to ward off the hordes of biting insects. In his classic, “The Arctic Prairies,” Ernest Thompson Seton (like

some Old Testament priest admonishing the congregation to never say the name of G_d) purposely did not mention mosquitoes throughout the book, explaining that to cite them in all his entries would have made “painful and dreary reading.” Instead, he reserved a chapter devoted entirely to what he called: “hell on earth ...a terror to man and beast...pests of the peace”...more numerous than... “in the worst part of the New Jersey marshes.”

When asked about the weather here, the default answer is, “It's an Arctic desert. Less than ten inches of precipitation falls each year.” This applies not only to questions about snow (“Very fine because it is so cold”), but also the giant snow fences at the outskirts of town (“And it blows around constantly”), travel (“In winter we can go in any direction”), seasonal activities, building design and temperature. After intermittent rain drenched me to the point where I was convinced half of the year's total had fallen, I asked about the forecast, if any...which merely produced a

shrug and, "It's summer, so it's raining." When pressed about the best weather of the year for visiting, a resident joked (like boat captains wise-cracking about the fishing), "Yesterday...and tomorrow."

During one of the moments when the sky opened overhead, we experienced what I'd call "sun-showers" back home in July, except it was frozen precipitation. In Sir John Franklin's journal (*Thirty Years in the Arctic Regions*) he describes this phenomenon, and what sailors call sun-dogs: "...the sky was clear ...but a kind of snow fell at intervals in the forenoon, its particles so minute as to be observed only in the sunshine. Toward noon the snow became more apparent, and the two limbs of a prismatic arch were visible, one on each side of the sun near its place in the heavens, the center being deficient."

Frozen sun-showers on July 4 weekend — how cool is that? "Make thou my spirit pure and clear...As are the frosty skies...Of the first snowdrop of the year." With Tennyson to lift my spirits, because the weather again turned rainy, I ventured out on my first beachwalk in the Arctic.

In spite of rain showers, Fourth-of-July celebrations were in full swing when I arrived. Fireworks were absent, along with sunset, but predictably young boys were experimenting with firecrackers on the beach. At the flattest spot near the shore, residents were competing in celebratory games. Most were the old standbys: Egg-toss, tug-of-war (Inupiaq women vs. Tanik men), foot races, face painting, nail pounding (must bring own hammer), Miss Top of the World (18-24 only). Regrettably, I was too late for Eskimo baseball and rock juggling, and was tempted to ask about it, but didn't want to look dumber than I did already, shivering in three layers of rain-soaked outer clothing covering another three perspiration-soaked layers.

Other competitions were new to me but predictable in this hunting culture: Eskimo dance, whaling crew races (traditional skin boats only), and *Manaq* —

tossing a grappling hook to retrieve a duffel-bag "seal" target. Proud of their culture, the locals enjoy games that test proficiencies at hunting skills. I was invited to have my picture taken with one of this year's winners, a bashful Mrs. Brower (a name many residents proudly bear.). Near this spot, Charles Brower (a self-described "King of the Arctic.") established the first whaling station, and the northern section of Barrow is called Browertown.

Hardy handshakes and "Happy Fourth of July" salutations made me feel welcome to observe. I looked for Eskimo stereotypes I had read about. The adults are cheerful and engaging, and the children are shy, but polite. Some look stocky because they have comparatively short limbs, but they are not overweight. Their faces look Asiatic to me, with high checks and round faces; not at all like the tall Icelanders I've met on the opposite side of the Arctic.

Certainly this must have interested explorer Vilhjalmur Stefansson (known locally as "Head Measure") who visited in 1906, trying to prove by physical features that, like him, some Eskimos are of Icelandic ancestry. Stefansson's accomplishments, documented in *My Life with the Eskimo*, are widely recognized. He was the last explorer to discover new lands in the Arctic, and the first to study an isolated group of Victoria Island Inuit with Caucasian features. They were still using primitive tools; some explorers believed they had Viking ancestors.

I had heard that Eskimos have developed increased blood circulation and enhanced temperature regulation in their hands and feet to maintain warmth, so when shaking hands I imagined that in a way, I was touching times past. Invited to get out of the wind, I noticed that indeed, their hands were warm (I seemed to be the only person in Barrow wearing gloves, and wanting to fit in, had removed mine earlier, after repacking the mosquito netting). Continued research into this vasodilation/constriction question is required

since I soon realized everyone was taking turns warming hands over an enormous BBQ grill. I was about to try to break the ice by asking if the model was "Texas or whale sized?" when I realized that the builder's nameplate (Oliver Leavitt) had a brace of ornamental whales.

Trying to be politically correct, I asked them to clarify some vocabulary for me. They explained that their eastern cousins are called *Inuit*, but "we are all Eskimos and speak Eskimo." Eskimo has its ori-

Dictionary). Since this is the latitude of the Eskimo, I am content to let them spell and pronounce it any way they wish.

Warmed up by the fire and some chit-chat, and familiarizing myself with some of the local lingo, I felt comfortable asking about life up here. I received an earful from some of the adults, especially one older gentleman with the habit of repeating things for effect. "We like the cold summers. When the heat comes, so do the biting bugs. They are awful, awful,



"An adventure is a poorly planned expedition." An inadequately dressed birder, in this case the article's author, ventures out on to the ice at the edge of the Arctic Ocean.

gins in the Algonquin language and means "eaters of raw meat."

A typographical error I regularly encounter is "Arctic." But I soon noticed that the local pronunciation is closer to "Ar-dic" so I've decided to ease up on correcting students' spelling. Arctic is originally from the Latin *Arctos* and refers to the Great Bear (Big Dipper, *Ursa Major*). *In the latitude in which astronomy was first cultivated, the great bear just swept the sea and did not set, whence the boundary circle (Arctic Circle) of the heavens obtained its name* (Oxford Universal

AWFUL!" I asked about winter and (predictably) he prefaced his response with: "We live in an *Ar-dic desert*." But added: "Last winter it was minus seventy-five, MINUS seventy-five! I stayed home from work and told my boss: I can't stand it! I can't stand it! I can't STAND it!"

We had a burst of snow flurries and hearing many times that Eskimos have scores of names for snow and ice, I had to ask them what they called it. The reply was: "Snow." (I think "stupid" was implied).

The discussion turned from holidays to

birthdays since one had just celebrated his that very week. I was startled when they calculated we were all about the same age; so much so that I began to think there must be a youthful portrait of me somewhere in the attic. My acquaintances obviously had lived tough and physically demanding lives here, although they were still jovial and energetic. It was difficult to ignore the poor condition of the teeth of some (scarce and loose), and I recalled our college classmate and dentist (Alan Anton) telling us that in the 1960's when he was in the Air Force and on duty in Alaska, Eskimos would beg him to pull teeth to ease their pain. Fortunately, modern dentistry has arrived in Barrow.

A great ridge of ice is visible from shore and at times through the mist there is the illusion that it is a mountain range on the horizon; at least until you gain perspective by picking out a sleeping seal or hunters in a boat. "The ice stays out longer each year and this makes access and hunting more difficult for us. The seals need it to rest too. It's thinner and softer these days." The ice pack is shrinking at an alarming rate, and may disappear by the end of the century. This will have a traumatic effect on the Arctic — shifting ecosystems and excluding seals from safe offshore birthing sites and polar bears from their feeding grounds.

(Just in case the big melt-down happens even sooner than is forecast and before my next visit, my first stop was out on the ice to taste it. I wanted to verify something I have taught to legions of oceanography students: that Arctic sea ice is freshwater and that the brine is forced out over time. The first chunk I tested was as smooth and transparent as a Cape May diamond. It tasted so pure that I began to think that if Barrow were not a "dry" town, residents could borrow ideas from Newfoundlanders in St. Johns and market distilled beverages made from iceberg water.)

I finally let it slip out but immediately felt foolish asking one question: What about igloos? I think they thought I was

joking, but politely replied, "It's an Arctic desert, so we get very little snow here...but come to our spring festival (*Piuraagiataqta*) in April and you can try making one at our contest."

Warily, I asked about whaling. "Have you read Harry Brower's book?" (The title sums it all up - *The Whales They Give Themselves: Conversations with Harry Brower, Sr.*) "The hunt is supervised by our own Alaska Eskimo Whaling Commission and we respect our whales. Scientists learn from us. Some whales we have captured still carry stone or ivory spear points in them, thrown by our ancestors. Scientists tell us our whales are the oldest living mammals, perhaps two centuries old!" It appears that this is not an exaggerated claim. Eskimos say a whale lives the life of two-and-a-half men, and this may help explain why some populations of these long-lived creatures have been slow to rebound since the end of commercial whaling.

On several occasions people reflected on the size of this season's catch..."Our (bowhead) whale was only 27'-5". I was tempted to be a wise guy and ask: "Fork length or total length?" Like any fisherman bragging-up his catch or child announcing his height, that extra five inches was not insignificant.). Over time, the diminishing size of game mammals and fishes is a clue that the population may be stressed as the largest specimens are cropped, but the main concern here seemed to be more basic...the "other village" took a larger whale. (It's always the other guy, isn't it?)

"We celebrate the seasons and the whales with festivals." The *Nalukataq* festivities are held at the conclusion of a successful spring whaling season when most whales are taken, and this includes the famous blanket toss, from which the ceremony takes its name. I didn't find it as touristy as feared and was informed that it had a practical use in this flat terrain; hunters used it to spot game in the distance.

There is always something good to learn from other cultures, and I would have enjoyed being here a century ago to observe one of their most refined traditions. Although conflict between coastal groups over hunting territories was not unknown, quarrels within groups were settled in *song duels*. During one, quarreling individuals would alternately sing their grievances before an amused audience of villagers, until one admitted defeat, which finally settled the matter. (Wouldn't that produce some memorable Presidential debates?)

Climate in the Cryosphere

The trackless coastal plain is awe-inspiring. Thousands of water bodies are present, the deeper ones ice-covered and scattered among shallow thaw ponds that are warmed enough by the sun to be ice free during the summer.

This is the *low Arctic*, which supports tundra plants atop deep, unyielding permafrost. Structures must be built on pilings sunk into the frozen earth or they will warm the ground and settle unevenly. A basement is impossible here; the best thing you can have under your house is a solid sheet of ice. Thawing, not freezing is the biggest peril for Barrow residents. (And much of humanity along the world's coasts).

The tundra and frozen grounds, which cover 20% of the earth's surface and 80% of Alaska, may sequester up to a third of the world's carbon. Defrosting this cryosphere and releasing carbon dioxide would transform these areas from carbon *sinks* into carbon *sources* for the atmosphere. Along with the CO₂ discharges, large amounts methane — an even more potent greenhouse gas that has more than doubled during industrial times — could overtax the atmosphere.

Unlike tropical regions where perpetual warmth allows decomposers to constantly

breakdown anything that falls to the ground, the short growing period here prevents decay of most of the plant material that has accumulated as peat for countless seasons. Releasing it in a geological heartbeat could be disruptive to the stable climate we are accustomed to, especially in the middle and higher latitudes.

Currents and Krill

Seal-watching on the beach, I came across a disposable Japanese lighter, along with other flotsam and jetsam. At the albatross colonies on Midway Island (in the Northwest Hawaiian chain), we found great numbers of these lighters and other floating threats to marinelife in the nests and bodies of birds. Drifting north on the Kuroshio Current (the Pacific's equivalent of the Gulf Stream) and mistaken for small squid, they are swallowed by these night-feeding birds that fly hundreds of miles toward Alaskan waters to gather food for their young. Did this odd piece of pollution work its way to Barrow in Pacific water that flows through the Bering Strait; or was it simply discarded by one of the number of tourists visiting here to see the frozen North and "catch a view of the Northern Lights and eat reindeer sausage?"

Tracing currents by temperature and salinity, oceanographers have determined that the Atlantic is the source of 80% of the Arctic basin's seawater. Indeed, physical oceanographers consider the Arctic "Ocean" to be a Sea, an arm of the Atlantic, like the Mediterranean and Caribbean basins. At Point Barrow the Pacific and the Atlantic meet and important physical and biological phenomena result from the marriage of these waters.

Atlantic water rises to the surface in the Arctic, carrying nutrients and fueling a productive food web near Point Barrow. This upwelling process may also help maintain ice-free areas where marine mammals congregate and feed. Traditionally, high latitude food webs

have been depicted as short and simple, but new opportunities for research, in response to climate concerns and more accessibility due to the shrinking ice pack, have revealed a more diverse (and threatened) community of plants and animals, even under the ice. At the Inupiat Heritage Center, I was proudly shown a jar of preserved Arctic krill (*Meganctiphanes norvegica*). “This is what our whales, fish, seabirds and even walrus eat.” As in the Antarctic, a *Euphausiid* shrimp is a keystone species that is direct or indirect food for just about every large creature in the Arctic.

Subsistence

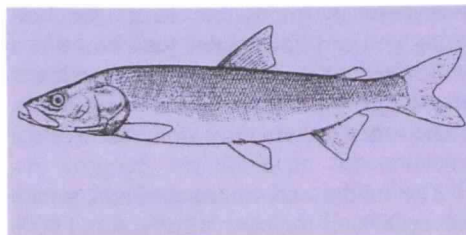
Subsistence hunting and fishing seems to be the local hot topic in Alaska and came up repeatedly in the few conversations I had with a taxi driver, bartender and motel clerk while I was on a layover in Fairbanks. (Before I continue, let me say that I found everyone I met in Alaska to be friendly, interesting and helpful; I'd probably move there tomorrow if I could.)

“Subsistence!?! Where do you draw the line? My family has been here for three generations. We are all living off the land here; we're all *natives!*” Everyone seemed to have a family member with a gold mine that was taken during government “land-grabs” from the Alaska Statehood Act (1958), or oil claims that led to the Alaska Native Claims Settlement Act (1971) or for parks in 1980. “Do you know we have a socialist government in Alaska.?” Nodding cautiously, and listening politely, I'd chuckle to myself; “Here we go again - *The Peoples' Republic of Permafrost!*...and the tirade would begin. However, like people everywhere, no one ever complains about the vast open spaces or the oil revenues that all residents share.

Conversations tended to drift toward the (government) need to clear the way for subsistence hunting and fishing for all, but invariably would lead to (government) threats to the Constitution and Bill of

Rights (Especially the Second Amendment — “a well-regulated militia and the right to bear arms”) and (government) threats to freedom from the Patriot Act, etc. Pro- or -anti-government, war or subsistence living; liberal or conservative...I didn't study enough Civics in high school to figure anyone out.

It might have been jet-lag or the 22 hours of daylight but my head was starting to spin. An astronomy teacher once tried unsuccessfully to explain to me the theory of a curved universe. She finally gave up and said, “If you could look far enough into space, you could see the back of your head.” The small sample of people I listened to seemed simultaneously so far right or left, that I began to believe that the physicists' theory about the curved universe might be applied to frontier politics as well, and that these people had somehow come full circle. I also began to imagine myself living up here during six months of darkness. I'd probably be the first one getting drawn into conspiracy theories, trying to authenticate stories about Bigfoot and sitting in a cabin writing my manifesto on UFO's and *Area-51*.



The inconnu or sheefish. A species of whitefish, they grow to 50 pounds.

Fishing

Once in Barrow, subsistence is not a subject for discussion, but a way of life. Hiking around salt and freshwater ponds, crossing outflow streams, and peering through the ice and along the pebbly sea beaches, you are unlikely to see fishes in



An enormous whale skull displayed at the front of the Barrow High School, "Home of the Whalers."

town, except on menus and dinner platters. However, the presence of loons and other diving birds confirms that at least small ones are present.

Anadromous and coastal species predominate in northern Alaska and Sub-Arctic waters in the Bering Sea. Salmon comprise almost 60% of the commercial catch, herring another third, and halibut about ten percent. Fishes make up about eight percent of the food supply of the coastal Eskimos; and after pestering some locals about peculiar fish names I had come across (sheefish and devilfish), I collected a score of Eskimo names; all of which are tongue-twisters that left me longing for Latin.

The sheefish or *inconnu* (*Stenodus leucichthys*) is one of the whitefish, a large anadromous species found from Siberia to Canada. A valued sport and food fish, its northern range helps insulate it from commercial exploitation. Remarkably, a police sketch I made from a local's description of the mysterious kanayuk or "devilfish" was enough for us to identify it as a sculpin.

About half the fish on my new list are salmon or their relatives, which are important to people, and of course bears and other wildlife. The slow-growing Arctic

char (*Iqalukpik*) is found farther north than any other freshwater or anadromous fish, and along with the grayling (*Sulakpaugaq*) is a celebrated sportsman's trophy fish. Some temperate freshwater species that work their way into northern Alaska's lakes and ponds include the familiar and widespread perches and pike.

The blackfish or *Iluuqiniq* (*Dallia pectoralis*) is a particularly interesting fish. Only a few inches long, this rugged little mudminnow can survive in very cold, oxygen-depleted and stagnant waters. It is rarely gathered for food.

Truly marine fish populations in the Arctic Basin are inadequately studied and have not been readily exploitable by commercial fishermen, although some like the herring and capelin, which are crucial to marine mammals like humpback whales, are harvested extensively in the southern parts of their ranges. Since the 1980's, capelin roe from Canada has been marketed to Japan. As the ice pack withdraws, fish and fishermen will follow it north. One hopes that, as conditions change in the Arctic, these important links in the food chain will not be over-fished like so many species to the south.

Eskimos and Orcas

The most controversial facet of Eskimo life along the coast is the harvest of marine mammals. Whales and seals make up about 60% of the catch each year, and hunting from small boats remains important to the whole community, especially the adults. But the modern world's conveniences and satellite dishes and MTV are catching up with Barrow.

Today, food, materials, vehicles and whole structures like the ("World's most northern *and* expensive") \$70,000,000 high school are brought in by barge during the summer thaw. But a popular local dish

buckets. Residents are not allowed to sell meat, but can share it (don't ask).

Eskimos still use bone and baleen of bowheads for an endless variety of things, especially carvings for tourists, but in the past, long bones like the 15-foot lower jaws became uprights, joists and rafters of the subterranean homes of the earliest residents who called this site Ukpiagvik ("Place to hunt snowy owls"). Bowheads have the longest baleen of any whale, over 12 feet, big enough for things like make-shift sleds, and although it is rigid when intact, peeled into thin strips it can be made into a variety of household utensils, decorations, artworks and commemorative items. Locals

fashion baleen into everything from bowls to a whimsical tree on the beach ("It's the northernmost palm tree in the world!").

One of the most interesting items I was offered is a wolf "repeller," a small wedge of baleen on string, that when rapidly swung over the head makes an eerie *whoo-whoo* sound, not unlike our college train whistles, but louder. I was told that the wolf is a competitor and enemy to the Eskimo, and that it is not eaten, used for fur or even dog food, but left where killed after a



Baleen still supports an important cottage industry in town.

among adults is still Muctuck, a local delicacy of whale blubber, skin, and "sometimes seal meat" that I saw fermenting in those ubiquitous white 5-gallon plastic

hunt.

Touring the Heritage Center gave me a better appreciation of the bowheads and the Eskimo's subsistence living,; and two things occurred to me: These people are



An umiak or traditional walrus-skin boat.

more in tune with the environment than I ever will be, and year-round living in the Arctic must have been difficult, if not impossible, until hunters mastered the harvest of whales. The whales provide more than food: large and small construction materials and a thread to bind the hunting community together. In Sanderson's *A History of Whaling*, one particular quote encourages me to think my latter assumption is reasonable.

"Our association with whales is extraordinary in that we have almost nothing in common apart from certain anatomical generalities and in some cases a liking for herrings, yet it began in the mists of prehistory and has continued unabated through the ages. The common denominator is the sea...To follow the whale is to follow the whole course of one of the most important and significant aspects of our own history. It is vir-

tually the story of the conquests of our planet."

Whaling remains a competitive undertaking within and between villages, but the catch is shared within the community. Tradition required that the spirit of the whale (*Mihiqaq*) should be respected and taboos were observed before and during the hunt to insure good luck, including:

- Women were not to sew — so that the harpoon lines would not have any chance of becoming tangled.
- Knives were not permitted — so the whale lines would not be cut accidentally.
- Certain furs and meats were not consumed — so as not to offend the whale.
- The captain of the boat was to wear an amulet, which to me appears to be a seal-like stone design.

Hunters still wear a cross-shaped amulet and when I asked about any prohi-

bitions or special preparations was told: "Before the hunt, we go to church and pray...After the whale is struck, we also pray while it dies." After seeing the small *umiaks*, the traditional hand-made walrus-skin boats, I could understand why.

The bowhead is not as aggressive as other whales, but is perfectly adapted to survive in this frozen sea and so is not entirely defenseless. The massive head makes up one-third of the body length, allowing it to break through several feet of ice when an opening to the surface is needed; when threatened by natural or human enemies, bowheads can escape by disappearing under the ice pack.

However, as Bullen reveals in *The Cruise of the Cachalot* (an authoritative, first-hand account of whaling in the late 1800's), they are fairly slow moving. Relatively docile too, they are perfect prey for aboriginal hunters and commercial whalers, especially when compared to the belligerent cachalot (sperm whale) his ship had previously battled.

"Strange as it may appear, the *Mysticetus*' best point of view is... in his wake, as we say...It is therefore part of the code to approach him from right ahead, in which direction he cannot see at all...(As the whale) became aware of our presence...but before he had made up his mind what to do we were upon him, with our harpoons buried in his back...(and) the whole affair was so tame that it was impossible to get up any fighting enthusiasm over it."

Bowheads were dubbed the "right" whale because with the highest blubber content of any whale — as high as 45% — they floated when killed. Sadly, although the market for whale oil was disappearing, the baleen was still prized.

"There was a marked difference between the quality of the lard enveloping this whale and those we had hitherto dealt with. It was nearly double the thickness. The upper

jaw was removed for its long pieces of whalebone or baleen — that valuable substance which alone makes it worth while nowadays to go after the *Mysticetus*, the price obtained for the oil being so low as to make it not worth while to fit out ships to go in search of it alone."

Orcas also take advantage of bowheads that cannot escape under the ice, and Bullen's graphic description of an attack is the oldest documentation I have found of their gruesome and most notorious behavior.

"The 'killer' or Orca gladiator is a true whale, but like the cachalot, has teeth. He differs from that great cetacean, though, in a most important particular; i.e. by having a complete set in both upper and lower jaws, like any carnivore. For a carnivore indeed is he, the very wolf of the ocean, and enjoying, by reason of his extraordinary agility as well as comparative worthlessness commercially, complete immunity from attack by man.

"A large bowhead rose near the ship...being harassed in some way by enemies...Three 'killers' were attacking him at once, like wolves worrying a bull, except that his motions were far less lively than those of any bull would have been...Again and again the aggressor leaped into the air, falling each time on the whale's back, as if to beat him into submission.

"The sea around us foamed and boiled like a caldron...Then the three joined their forces, and succeeded in dragging open his cavernous mouth, into which they freely entered, devouring his tongue...their sole object...for as soon as they had finished their barbarous feast they departed, leaving him helpless and dying to fall an easy prey to our returning boats."



Caribou and moose racks festoon a hunter's house.

The Friendly Arctic

Stefansson called this great northern expanse the "friendly Arctic" because of the abundance of game, and what it lacks in diversity, it makes up in abundance. I was assured that everything here is harvested in moderation, but I still have mixed feeling about some of the take.

Land mammals make up a third of the harvest by coastal inhabitants, and in Barrow the predominant skeletons in holding boxes around town are caribou. As is the custom of hunters everywhere, antlers of those and an occasional moose are displayed prominently on houses. More are kept secure on the flat roofs of many homes.

It is said that no animal in Alaska is as restless as the caribou, and I've decided that no hunter is as patient as an Eskimo.

Any time of the day that I was near the shore there was a hunter lying motionless on the beach waiting to spot a seal; so I can only imagine what a caribou hunt is like — except last winter.

Always curious about local lore and people-and-animal interactions, I asked about caribou and got another earful. "We hunt them in the winter and when we see ravens, we know they are near. Last winter they came right through town!" (I pictured a scene of town elders one day telling their grandchildren about roaring snowmobiles, barking dogs and stamped-hooves in the Winter of 2005 - "*The Year of the Caribou*").

To see what else is harvested here it is only necessary to visit the market where residents display and sell home-made objects. Most items are fairly intricate bowls and crafts that are representations of utilitarian articles that once were in use.

These are all woven from slender strips of baleen, and offered along with etchings on flat sections of baleen. Many of the pieces are quite impressive.

There are also ear-rings, necklaces and other ornaments festooned with the fur, fangs and feathers of birds, bear, walrus, moose, porcupine, wolverine, and fox. Being good traders, they politely reminded me that everything was for sale, *not for photographs*, but after I spread around a few college t-shirts and train whistles to their kids, things warmed up a bit.

Arguably, the most endearing predator is the Arctic fox, making a living stealing bird eggs in the spring, but most often shadowing polar bears to scavenge their kills. I was disappointed to learn that around the polar fringe, my favorite creature is the most heavily hunted animal. Fortunately, being short-lived to begin with, it is prolific and its population is stable, except where larger red foxes are encroaching northward with the warming trend.

Everyone knows that the fox's benefactor Nanook is the king of the north, but "a doubtful throne is ice on a summer sea." Although polar bears have had a good run since the last Ice Age, they too are threatened by a major warming trend in the Arctic.

Polar bears are thought to be the "newest" mammal; separating from their grizzly cousins, packing on a few hundred extra pounds, and moving out onto their frozen kingdom during the Ice Age. I like to describe them as the newest *marine* mammal too. Their great size, partially webbed toes, extraordinary swimming and seal-hunting abilities, and extended time at sea (particularly the males) fills a niche that distant ancestors of other marine mammals, like seals and whales, probably experimented with as they reinvaded the sea tens of millions of years ago.

Polar bears have been seen swimming more than 50 miles at sea, but there is a limit to how far even they can swim and

the distance across open water to the ice pack widens each year. Grizzly bears already occupy the home turf and high ground at the shoreline, and are the best "fit" there, so this makes the answer to the classic kids' question — "Who would win in a fight?" obvious if Darwinian rules hold true. The specialized lifestyle of the polar bear means its back is already to the wall as it loses its unique habitat.

In temperate areas of North America we can mitigate climate shifts (warmer or colder) by preserving parks and refuges, and providing plant and wildlife corridors that extend north-to-south between them. Unfortunately, the polar bear has nowhere to go and may disappear with the ice.

Birding Barrow

Birds make up about three percent of the harvest along the coast and these are shot from seasonal hunting stations out on Point Barrow and elsewhere. I found butchered remains of black brant and mergansers at the sites nearest town. Eggs (*Mannik*) of eider, geese, gulls and terns are collected at more distant nesting sites.

Visitors to the Point and out on the few short dead-end roads around Barrow include tourists searching out the "ends of the earth" or birdwatchers and naturalists trying to spot those few northern or Asiatic species that they are unlikely to see at home. I hoped to get close to many of these birds, but jaegers and short-eared owls were anything but tame and spotted only at a great distance, and I was disappointed to miss close-up views of the town's most famous resident, the snowy owl. "When there are many lemmings, we see owls perching on all the poles outside town." Although I did see my first lemming, obviously it was not enough to summon a parliament of owls.

Target species for birders that week included: species that migrate along the east coast (phalaropes, white-rumped sandpipers, Sabine's gulls and golden plovers); winter visitors (redpolls, tundra



A snow bunting ready to duck under a porch to its nest.

swans, common eiders); rare vagrants (king and Steller's eiders, Pacific and yellow-billed loons); and of course the ubiquitous sanderlings.

Most of these birds stay in the Northern Hemisphere but others, like the Arctic tern, are the greatest wanderers on earth — “the global wings” John Hay praises; crossing the Equator and wintering in South America or the Antarctic.

There are banner birds in town too. Perched on rooftops are snow buntings and Lapland longspurs. Snow buntings are particularly noteworthy to me because they are a precursor of winter weather back home. Nicknamed “snowflakes” because of the way they flutter down to the ground to feed on seeds, they are the palest winter land bird we see down south, and a striking white and black resident here at the breeding ground. It is a treat to see the “house sparrow of the Arctic” at its summer home and a great surprise to learn its clear and musical *turee-turee-turee*.

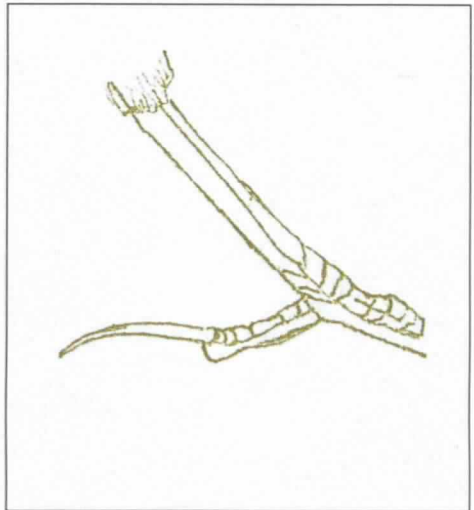
The longspur is even more common around town and its *tee-tooree, tee-tooree* is just as melodious.

Ernest Seton Thompson describes snowflakes the best:

“...this is the familiar little white bird of winter. As soon as the chill season comes on in icy rigors, the merry Snowflakes appear in great flocks...In midwinter...when the thermometer showed thirty degrees below zero, and the chill of the blizzard was blowing on the plains, I have seen this brave little bird gleefully chasing his fellows, and pouring out as he flew his sweet, voluble song with as much spirit as ever a Skylark has in the sunniest days of June.”

And the longspur:

“High in the air they fly in long straggling flocks, all singing together; a thousand voices, a tornado of whistling...When in the fields they have a curious habit of squatting just behind some clod, and, as their colors are nearly matched to the



Detail of Lapland longspur foot, Barrow, Alaska, 7/5/05, by Dave Grant.

soil, they are not easily observed, nor will they move until you are within a few feet; they then run a few feet and squat again.”

A bird I had hoped to spot was the rare, rosy-colored Ross’ gull from Siberia. Years ago I read somewhere that they are a common sight passing Point Barrow but apparently the birds are misinformed, and instead I had to be content picking out white glaucous gulls against the foggy background. (The standing joke among birders is “Don’t try to pet any thousand-pound white dogs you see out there on the ice.”)

The Belly Botanist

Plants make up only about one percent of the harvest in the northern areas, and collecting is done inland from the coast. Because the frozen ground precludes trees and taller plants from setting deep roots (and remember, this is an “Arctic desert”) blue, salmon, crow and cranberries are the few plants gathered and available for only

a very short time at the end of the summer.

Crowding what appears to be a featureless stretch to the horizon is a remarkable botanical mix. Although the dwarf willows may be the best known group in this lunatic fringe of the plant world, there are many other species in the Arctic, but the farther north you travel from the tree line and the closer to the cold sea, the more impoverished the plant community becomes.

There is “wet” and “dry” tundra, which is determined by slight differences in drainage and elevation, as well as true “Polar” desert in the farthest north (*high Arctic*) where the weather is so severe that only lichen survives on rocks. Desolate spots like this are not found in Barrow today, but in the last few decades researchers are concerned by a decline in wet areas around Barrow and an expansion of dry ones. This is one of many clues that a warming trend in the environment is occurring.

Tundra is from the Finnish and in Scandinavia refers to areas with dwarf



Arctic poppy

trees, but in North America it defines treeless areas around the Arctic Circle. This is a fitting place for the so-called "belly botanist," since plants are at most, knee-high. Arctic cotton (*Eriophorum*), something New England bog enthusiasts would quickly recognize as cottongrass, is quite common. I have never visited a spot in the world that is without some sort of sedge (*Carex*) and they are widespread in Alaska too, even in the tundra. There are also

plentiful lichens, grasses and wildflowers. The best known lichen is the reindeer "moss" (*Cladonia*). Some of the grasses, like fescue and *Poa* are recognizable because they are related to lawn grasses back home. The tundra is also noted for its carpet of wildflowers, like the rugged little Arctic poppy.

For my entertainment, the open tundra near town presented me with Baird's sandpipers, interspersed with longspurs

that, as promised by Thompson, were squatting until the last minute and almost getting underfoot. Baird's is just one of a number of that clan of "peep" sandpipers that I am rarely able to separate with confidence when we see them in New Jersey during the autumn passage. In fact, Baird's is probably the most difficult to identify, and among the rarest on the Atlantic coast in the fall. Most migrate through the western states, many skirting, at high altitude, the great Pacific mountain ranges leading all the way to their winter homes among the mountains and marshes of South America.

Their namesake, Spencer Fullerton Baird is described as "extraordinary...a particularly American genius." A colleague of Audubon, he influenced the U.S. Army to persuade doctors assigned to western frontier posts to send wildlife specimens back East. The Secretary of the Smithsonian in 1878,



Tiny flowers at the edge of town.

he also established the U.S. Commission of Fish and Fisheries, and the research laboratory at Woods Hole.

Like all birds, Baird's, even though drab and tundra-brown, is a delight to meet and quite a performer on its nesting ground. Many shore birds slink away from danger in *furtive abandonment* of the nest, which may also include a broken-wing act or *rodent-run* to sidetrack predators. In a protection strategy that Thomas Jefferson would have admired, in whichever direction I ventured, more birds would rise to the common defense, gently fluttering and gliding past me, moth-like and at eye level. Birds with young that are *precocial* (walk shortly after hatching) are most courageous with such *distraction displays* when the hatchlings are only a day or two old, so I knew to step carefully on the soft mat of stunted shrubbery.

Although John Hay tells me the sandpiper's Eskimo name *nuvuksruk* means "sounds like a man with a bad cold," I found their gentle *kreep...kreep* a pleasant diversion. The birds were good company in this silent, soggy terrain. Closely circling me, it would have been easier to catch one with a large butterfly net instead of my camera.

On the eastern side of Point Barrow, bordering Elson lagoon, I explored a great swath of grassy shoreline that resembles tidal marshes back home. Grasses are a challenge to identify, being classified by their seed stalks. The few stunted ones that had set seed looked familiar. (I've heard that a middle-aged Charles Darwin once remarked "...Oh my, I have finally identified a grass.") To my surprise, the ankle-high meadow grass is Sea Lyme (*Elymus*), a plant that I first encountered when working summers in Downeast Maine, where it grows as a sturdy and waist-high dune plant. It thrives here too; packed densely like typical marsh grasses, even though the presence of debris indicates the shore is regularly inundated by lagoon waters and winter ice.

On Point Barrow, the northernmost plant I found is sandwort (*Arenaria*) hugging the gravelly beach. Later, perusing my Atlas, it dawned on me that not only are Point Barrow and South Cape, Hawaii (*Ka Lae*) straddling nearly the same meridian of longitude; but that after visiting both spots, I can declare that I've seen the northernmost and southernmost individual plants in the United States. Each a rugged pioneer, pressed to the ground, surviving at windswept points, separated by 3600 miles, 52 degrees of Latitude and perhaps 150 degrees of temperature. Remarkably, these two environmental extremes are linked by some of the most vulnerable creatures on earth; shorebirds that somehow have the stamina to fly to wintering grounds in Hawaii and beyond.

Contact

Coastal sites like Barrow may have been occupied for over 3000 years. But the map-maker's name honors the English geographer Sir John Barrow (1764-1848). Thomas Elson and William Smythe were the first Europeans to make contact with the Inupiat and named Point Barrow after Sir John. Historian Daniel Boorstin, citing Barrow's work *Travels in China* (1804), describes him as a "self-made man who became one of the great explorers of his age." No armchair traveler, Barrow founded the Royal Geographical Society, was the chronicler of the mutiny on the *Bounty*, Ambassador to China and governor of the Cape of Good Hope colony. Not a stranger to the Arctic either, he was a Greenland whaler before joining the Royal Navy.

Obsessed with finding the Northwest Passage, he organized and sent off nine Royal Navy expeditions to search for it, including the final, ill-fated Franklin Expedition of the *Erebus* and *Terror*. Subsequent searches for Franklin and his crew in the 1850's resulted in a tremendous gain in knowledge of the northern

coast, and many geographical landmarks were named by or after the searchers. These rescue attempts heralded more extensive contact with the Inupiat, including: the arrival of whalers, the processing station and family dynasty established by Charles Brower in 1884; and flu epidemics. These northern coastal Eskimos were the last native populations to make contact with Americans and Europeans, who introduced guns and alcohol in exchange for furs, walrus ivory, and baleen.

Size: 10-1/2

Obsessed with seeing as much as possi-

ble of the western entrance to the Northwest Passage, I took every opportunity to strike out in different directions around Barrow. This time of year when the ice is out, you can "pay somebody eighty bucks for a jeep ride to the Point and have them tell you the white dot in the mist is a bear or snowy owl," or you can explore on your own. Patiently waiting for my ride back to town but growing bored watching an even more patient and motionless seal hunter lying farther down the beach, I tested myself to see how good a voyager I might have been centuries ago.

Without compass or sextant, the Inupiat would rely on subtle landmarks that I couldn't recognize out here, plus a sense



Severe erosion and shore ice on the Arctic beach in Barrow.

of direction that I lack, so it's safe to assume I wouldn't have had a long and fruitful life as an Eskimo. Without stars to see, I couldn't count seven-fists from the horizon to Polaris and estimate my latitude here (~70°). Fortunately I did get breaks in the clouds and a chance to "shoot" the sun at midday, and I had tools that were unavailable to earlier visitors.

Since I'm six-feet tall and my "Size:10-1/2" shoes are 12 inches long, I was able to accurately pace off my shadow at midday. Using all the available technology (the hands of my old watch to determine south, seal bones to mark off distance and draw in the sand) I could establish the elevation of the sun to determine latitude — as long as my memory of high school geometry was correct. Truth be told, I had to wait until returning home to my Bowditch (*The American Practical Navigator*) and Almanac to verify the exact declination of the sun on July 6 (22° 45'N), but I was confident that it had retreated about one degree from its Summer Solstice peak. My crude (and probably coincidental) calculations on the beach were not within the sailor's target of the *breadth of a hair* on a sextant vernier (1.25 miles), but still within about one degree (60 miles) of Barrow's actual location — 71° North. Perhaps I would have had a bit more success as a British sailor (If I could tolerate the "...rum and the lash.")...or maybe if I were a Viking...

Vikings released a raven to direct them to the nearest landfall east-or-west of their location, but who remembers to pack one these days? So, lacking a bird, sextant and ship's clock set to Greenwich,; determining longitude was out of the question, except that I had access to knowledge the Norsemen could never imagine — a time-zone map in a motel phone book. Since longitude is a measure of time, and the earth turns 1/24th of its circumference every hour (15°) and Barrow is about 10.5 time zones West of Greenwich; I estimated our longitude was about 157° W. (It's

actually about 156°).

I still needed to gauge the magnetic deviation of the North Pole with my pocket compass. The mysterious lodestone was the technological innovation that enabled Vikings to navigate in the misty northern seas when they could not see Polaris or estimate latitude by the length of the shadow on the rowing bench. Using my midday shadow as a line-of-sight pointing to True North, I set my compass on top of the sand line to measure the direction of the needle. The Barrow spit, like my compass needle, swings about two points east toward the Magnetic Pole — across Canada's northernmost islands and toward Greenland. Later, I verified on a chart that the value of the deviation is over 21° — enough to spoil any sailor's day. Fortunately I was already on land.

Politics on the Permafrost

On the obligatory tour of town in a tired





Fair trade on July 4, 2005: a train whistle for smiles and a photograph.

but serviceable school bus, visitors are taken by the town's schools (*Home of the Whalers*), the Will Rogers and Wiley Post crash-site memorial ("He died with a smile on his face"), "The world's northernmost stoplight," and *Piuraanvik* ("Place to play") recreation center. Adjacent to it is town hall. When a few of us grew tired of watching kids playing basketball "above the Arctic Circle" and wandered next door in search of mementos, the Mayor was gracious enough to greet us.

I've learned that the good guest (or at least a smart one) never discusses politics until after dinner; but in an awkward moment, a visitor asked if he was "Red state or Blue?" Recalling conversations in Fairbanks, I winced, but his quick and witty response greatly impressed me..."I like Ike!" As Army brats during the Eisenhower years (when Alaska achieved statehood), the Grant kids were regularly reminded by numerous keepsakes and photos, that our grandfather was the

General's classmate at West Point and that our father served with him in WW II, so my reaction to this come-back was Pavlovian. In an instant, the Mayor won my vote.

We exchanged handshakes, town pins and of course, college whistles. The pins feature the date of incorporation (1958) and images of a whale, walrus, caribou and bear. I held my breath, anticipating the next question.

"What does polar bear taste like?" This savvy politician didn't miss a beat..."Chicken!"

It was time to go back to exploring on my own.

Bully of the town

Since I had a few hours before going to the airfield, and sunset was still 55 days away, I decided to take one final walk on the beach. Tired, I took a short-cut through the cemetery between "downtown" Barrow and its northern "suburb" of Browertown.

Even in the summer it is impossible to dig down more than two feet through the permafrost, so burial plots must be built up into mounds and covered with tundra sod. Some are sectioned off with whale bones. Seeing me examining tombstones, a passerby stopped and engaged me by sharing facts about the deceased. "That is my grandmother's grave. She was married to a Brower. There was a flu epidemic in

the 1880's and 150 people died..." If you want to look good for centuries, get buried here. Unless the ground thaws, we look the same forever." (Eskimo humor?)

In such a small town where everyone knows each other and many are family, there is notable respect for the gravesites of residents, including those of centuries-old inhabitants. The largest concentration of people and vehicles in Barrow was a funeral procession. With the back of a pick-up truck serving as a hearse and over a hundred mourners following, it quietly passed by on the way to a different burial ground outside of town.

A particularly prominent and well-decorated tombstone caught my eye.

***They shall mount up with the wind
as eagles, and not be tired and
walk and not be faint.***

Isaiah 40:31

"That's my relative." (Another passer-by)

So with guidance from Browers and Biblical passages to invigorate me, I marched off to the beach. A teacher once remarked that my epitaph should read: "He liked trees. And students and dogs found him entertaining." Except for ankle-high willows, there are no trees within hundreds of miles, and I had already saturated the town's kids with Brookdale College train whistles, so this left only dogs to charm.

I expected to find the standard, fluffy sled-dog design up here, but Barrow has a large and diverse assortment of hounds. It seems half the houses have one kept outside; each looking wilder than its neighbor. Fortunately, all are securely chained in their yards, out of reach of each other, the road...and me. Their bite looks *much* worse than their bark.

Earlier, I asked a local what wisecracks are made behind the backs of tourists and non-natives. She made me promise never to speak the word, but joked (I think) "All white guys look the same," then flattered me (I think) with: "Is he single, and is he staying?" Walking through town and coming into the focus of a dog, or as it picked up my scent (perhaps all white guys smell the same too?), each raised up in succession, sized me up, growled, and then, as we made eye contact, let loose with threat barks.

I pitied their situation, presumably chained to a snowmobile or porch much of the time. It looked like a grim existence since none



A vacationing sled dog locks his stare on a stranger in town.



Cerberus sizes up a visitor to Barrow.

appeared to be an indoor pet. After traveling to less-developed countries, I've learned never to ask people what their yard-dogs are used for; but these looked like working dogs that meant business, and turned loose might be a threat to people (most notably, me), or a public nuisance, roving around town and wolfing down curing meat and skins.

It was not necessary to tip-toe along at midnight because previously I was informed that Barrow children "flip-flop" in the summer and are more active at "night" when the weather is often better. However, intimidated by the dogs and avoiding eye-contact, I kept a steady and unthreatening pace trudging down the gravel roads in the rain. I found myself humming a lively old Leadbelly ballad I had not heard since college days (sound of Dave clearing his throat and dropping an

octave):

"I'm lookin' for that bully, Mama;
Bully of the town.

I'm lookin' for that bully,
But that bully can't be found.

Yes, I'm looking for that bully of
the town."

I regretted passing on that wolf repeller, and quickly decided that if this pack were ever unleashed upon the town, my last labor on this adventure would be to scramble onto the nearest roof and let the biggest of the bullies sort things out, even if it meant missing my flight home. I'll put my money on a formidable short-haired beast I named *Cerberus*, the mythical hound guarding Hades.

Barrow beach walks: Past, present and future

All coastal towns have a benchmark storm and the greatest tempest "in living memory" stuck October 3, 1963. Curiously, in the last half-century, Barrow has experienced storm patterns similar to the hurricane patterns along the East Coast. Regular gales in the 1950's, then a calmer period through the late 1980's, and recently, more frequent storms. There is also more damage to the town because of new construction near the water; and since the ice stays out longer, less protection for the shoreline.

Here at the base of the spit, source material is removed from the bluffs and transported to the distal end by the waves and longshore drift. Short of building groins, the town seems to be trying most of the quick-fix approaches that other places use to reduce coastal erosion: pushing up protective berms, pounding in steel revetments, and placing gabions and even sand-bags in front of structures.

None seem to do be doing the trick and all take a beating when the winter ice pushes against the shore.

There is a remarkable sight on the bluff at the southern edge of town. Hanging from the lip are driftwood logs and bones of great whales, supports of the partially underground homes and burial mounds of the earliest inhabitants of Ukpiagvik that are still frozen in the permafrost and tundra soil. Here, the famous "frozen family" was unearthed after a big storm. Ice along the shoreline dampens the effect of waves and protects it, but sometimes the whole ocean of ice shifts and nothing can stop it. The inhabitants were crushed when an Ivu - a giant block of shorefast ice — was pushed up by the sea and collapsed on top of their lodge.

Steve Langdon describes the wealth of knowledge gleaned by scientists who studied this centuries-old archaeological treasure trove and occupants. Empty stomachs and full bladders indicate the disaster occurred in the early morning. The older women (aged 42 and 24, and thought to be mother-daughter) had growth lines on their leg bones that indicate food shortages every three-to-five years:

"The older woman suffered from a heart infection, arteriosclerosis and experienced pneumonia. Many of her teeth were gone and those which remained showed heavy evidence of wear. Both women suffered osteoporosis ...probably due to a lack of Vitamin-D in the diet...(and) suffered from severely blackened lungs due to the soot given off from the seal oil lamp. This was probably exacerbated by sleeping by the lamp and tending it through the night."

After examinations, the five were interred on the southern edge of town. Their tombstone is one of the largest stone monuments in Barrow.

The bluff continues to erode about ten feet a year from storms and ice movements, and a great assortment of mammal

bones is scattered on the beach. It has been a long time since I taught human anatomy, but some of them looked suspicious. Most are discolored and rusty in appearance from water leaching through the tundra soils at the crest, but otherwise they are in excellent shape.

Years ago on Cape Cod, when asked to move the jaw-bone of a whale, I discovered that the bones of marine mammals are light compared to terrestrial animals because the animals are supported by the water and not constantly fighting gravity. You probably don't want to hear this, but skulls tend to be thinner too, and this is why hunters club seals for a quick kill. As I discovered after my beachwalk, marine mammal skeletons also disarticulate easily, complicating the job of paleontologists, but making butchering easier for hunters.

The erosional scarp at the base of the bluff consists of many layers of foot-thick sand interspersed with inches-thick deposits of smooth pebbles. The orderly alignment is a clue that these are shallow-water coastal deposits from the Pleistocene. The bluff appears to be rebounding after the retreat of the heavy glacial ice sheets. This same material, washed by waves and ice, is being resorted to become today's beach.

Climbing up the bluff and through a dog-free yard, I came across a fresh seal carcass next to a front porch and was caught photographing it by the lady of the house. Embarrassed, I apologized, and dug into my backpack to offer her one of the last wooden train whistles. She thanked me, but added; "I have three children." (I encountered this polite request several times. The typical Barrow family is raising three or four kids in a home that is no larger than the multiple-bay garages in all the new waterfront mansions back home.) The deal consummated, I turned to depart, when she asked: "Will you help me with my seal?"

Who can resist an offer like that? (What's the old saying: "When in

Nome?...”). The seal *du jour* was a spotted and I was not surprised by the catch since these are the only ones I could identify out on the ice. Found all the way to China, the spotted (*Phoca largha*) is closely related to the harbor seal that is so common in New England. Like them, adults are four-to-five feet long and can weigh 200-pounds.

Spotted seals are more abundant in the Bering Sea, but after birthing in the spring, the population follows the harp seals and the retreating ice pack north in the summer. Although I saw only a few from the beach in town, eyed patiently by about the same number of hunters in small boats, they were much more abundant resting on the ice off Point Barrow.

Large scale commercial hunting has decreased since the 1980’s with the enforcement of economic exclusion zones in Russia and the U.S., although some “ice seals” are taken by the Japanese in years that the ice moves far enough south.

Russian hunters and subsistence gatherers in Alaska each take several thousand seals every year, but the world population of about 330,000 is considered stable. However, like many Arctic species, seals could be threatened by oil exploitation and competition from fishermen as both industries move farther north, also following the retreating ice pack.

In Barrow, harvested seals and whales are laid out on sheets of plastic to be prepared. Unless one is interested in anatomy and physiology, most of us would not find it appealing work. Chiropractors need not apply for work in “seal city.” The backbone is loosely articulated to allow flexibility in movement, but most of the heaviest bones in the body are the lumbar vertebrae, which anchor the powerful swimming muscles. A seal’s flippers and sinuous movements are perfect for swimming, but of little use on land; which increases their vulnerability to hunters and bears. They also are defenseless if stranded out

**Food and non-food harvest in Barrow, Alaska
(Estimates from different surveys in the 1990’s)**

Food species harvested	Pounds (Total)	Percent of harvest	Pounds per person
Whales (7)	184,626	30.0%	61.0
Caribou (1,500)	174,542	28.7%	58.0
Walrus (108)	79,996	13.0%	26.5
Whitefish (Species)	50,388	8.3%	7.0
Seals	*61,000	10.0%	*20.0
Moose	*25,000	4.0%	*8.0
Birds	*18,000	3.0%	*6.0
Bear, Dall sheep, porcupine, ground squirrel, fishes			
Totals (Estimated*)			
Fur (Non-food) species harvested			
Wolverine, red and Arctic fox	NA	NA	NA

From 937 households. 608,525 pounds total. 202 pounds of meat/capita (*Estimates)

of the water by freeze-ups and sudden ice movements.

Seals have less fat and more hair than cetaceans because they are a transition stage from land to sea. They represent the second mammalian invasion of the oceans during the Miocene and are an example of what 15 million years of evolutionary change can produce (my apologies to the Kansas School Board). Still tied to the land for rest and reproduction, pinnipeds managed to occupy most coastal areas, and like whales — which have a 30-million-year head-start on them — exploit a rich niche left vacant after the demise of sea-going reptiles at the end of the Cretaceous. Before humans came along, seals were destined to be the dominant fishermen in the sea.

Compared to their terrestrial cousins, marine mammals can stay underwater for an eternity by using several adaptations, but larger lung capacity is not one of them. This would introduce buoyancy and gas bubble problems that plague scuba divers. Instead, a marine mammal relies on more thorough ventilation of its lungs, a higher volume of blood, and the oxygen-binding protein myoglobin in its tissues. Like hemoglobin in red blood cells, myoglobin also stores oxygen. It turns dark when exposed to the air, and this helped me realize that the peculiar thick dark slabs that I saw around town earlier are not insulation or old tires, but whale meat and blubber.

Seal skin and thick fur are valuable raw materials for Eskimo boats and clothing for the same reasons that the seal needs them — strength, flexibility and insulation. Excess fat also helps seals store water, and because mammals lack salt excreting glands that are found in fish and birds, retaining water is a problem for sea-going mammals. Seals manage it with efficient kidneys, by taking in little seawater with their food, and by relying on the extraction of body fluids of their prey for water.

My hands-on class in marine mammal

anatomy over, it was time to clean up and pack for the flights home. Back-tracking through town the dogs did not seem any friendlier, and I still didn't see any tails a-waggin' so I wasn't about to try to make friends letting them lick the essence of *larcha* off my hands.

Cleaned and warmed up, my return trip was uneventful, except suffering a tourist's case of the affliction they call *Alaska time*, I missed the (12:55a.m.) second segment of my flights by 24-hours and had to make-do at the Fairbanks airport. ("Don't worry; it happens up here *all* the time!")

Homeward bound

A week later, driving home from work, a dozen shorebirds took flight over the bayside marshes at Sandy Hook, NJ, heading south and parallel to my car. As is my habit, I checked the speedometer and clocked them at 35mph (not remarkable for birds that have migration speeds of up to 50mph). *The Bird of Light* details the four-day flights of a ruddy turnstone from Alaska to a Pacific island (2750 miles) and a semi-palmated sandpiper from Massachusetts to Guyana (2800 miles), reminding us that Herculean efforts like this are "not exceptional but routine" for some birds.

Continuing on and doing some grocery-store math, I came up with the following: From Barrow, it would take those birds 100 hours of flight time to cover the 3500-miles to New Jersey. Using a standard engineering factor of 2.1 that I employ to estimate the completion of any of my own undertakings (and since even shorebirds need to rest, recharge, and avoid predators), I calculated that it was possible that birds in Barrow could be passing through here only a week after launching themselves from the Arctic shores I had just visited. Just in time to stock up on the last horseshoe crab hatchlings of the season, and to greet me upon my homecoming to Sandy Hook.

Chasing Spring

BY BRUCE STUTZ

The author follows the journey of the spring of 2005 north by plane, car (a borrowed, 1984 white, four-door Chevrolet Impala), foot, and kayak from the Middle Atlantic, southwest to Phoenix, back east to Oklahoma, across the Rockies from Cheyenne, looping north into Montana, over to Seattle, and up into Alaska to the Arctic Ocean. That's after some introductory side trips – to Louisiana for a non-New Orleans Mardi Gras, Punxsutawney, PA, for Groundhog Day, and upstate New York for an awakening vernal pond. The book he has written is "Chasing Spring, An American Journey Through a Changing Season," Scribner, New York 2006. In this excerpt, Stutz heads for the far north, Seattle to Anchorage, over to the fishing town of Cordova on Prince William Sound and up to a lodge on the Chitina River run by Paul and Donna Claus. From there, they board an Otter (a fly-anywhere, land-anywhere bush plane) and aim for the Brooks Range, the Arctic National Wildlife Refuge (ANWR), and the edge of the polar sea:

June 15 19 Hours, 19 Minutes of Daylight

With the Chevy sitting it out in the Seattle airport, I flew to Anchorage and

*Stutz is author of *Natural Lives*, *Modern Times*, about the Delaware River. The former editor in chief of *Natural History* magazine, he lives in Brooklyn, NY.*

this morning into Mudhole Smith's little airfield in Cordova, which is a fisherman's town on the eastern shore of Alaska's Prince William Sound. As the plane came in over the sound, I could see swirls of rich blue-green water, the reflected sheen of chlorophyll-laden phytoplankton, small marine plants such as algae that respond in spring to the increasing hours of daylight (back in Seattle today the sun sets four hours earlier than it does here), and the fresh spring runoff of glacial meltwaters flush with nutrients. These also bring the birds to the Copper River delta and to the tidal flats that surround Cordova. From mid-April to mid-May some million migrating shorebirds land each day in these wetlands, the most abundant being western sandpipers and dunlin, joined by dowitchers, least sandpipers, greater yellowlegs, and red-neck phalaropes—the birds with thin bills, long legs, and knuckly knees—making their final refueling stop before they reach their Arctic breeding grounds. I hope to see them there...

We fly at 500 feet above the Copper River in a light rain, tracking north then east along the Chitina, a course that provides Alaskan panoramas of high glacier-draped mountains and broad river valleys.

Spring runoff has been heavy and sudden and the glacial streams, wavering stripes of aquamarine, twist their way down mountainsides of dense spruce forests before spilling out between high beds of sand and gravel. Below us is the continent's largest assemblage of glaciers and peaks above 16,000 feet—the Chugach, Wrangell, and St. Elias mountains—which converge in the 13-million-acre Wrangell-St. Elias National Park and Preserve...we can see moose and buffalo hightail it from our shadow. Lifting above

a screen of trees we come down on the other side and land on a grass meadow...

(From there, another plane ride to the lodge of Paul and Donna Claus)

That night, around the long table in the main lodge where family and guests gather for dinner, we discuss our plan to explore ANWR, the 19-million-acre Arctic National Wildlife Refuge that lies in the remotest northeast corner of Alaska, some 800 miles to the north. ANWR (pronounced ann-wahr) is bordered on the north by the Arctic Ocean and on the east by Canada's Yukon Territory. On the map Paul traces a route across the east-west arc of the Brooks Mountain Range, a cold and jagged-peaked continental divide that bisects the refuge, north of which all rivers flow into the Arctic ocean...

We spend today gathering provisions, which out here requires flying from one place to another. Up along the river we check in on the Clauses' fishwheel. It is an antique device for catching fish in the current of a fast-moving river. It requires neither fuel nor electricity and has been used out here for salmon since at least the late 1800s and has not changed much since. In its most basic arrangement a fishwheel consists of two or three wire cages that revolve, Ferris wheel-like, around a center post that is suspended out into the river on floating pontoons. The river current turns the wheel's cages, which scoop up fish swimming upstream. As the cage rises out of the water the fish slide off down a chute and into a wood box or holding pen. Simple, cheap, effective, and even portable, Alaskans living along salmon-run rivers usually have their wheels up and running early in June for the first runs of chinook and sockeye salmon.

The Clauses haven't had the time since last season to set up their wheel properly and so there is no catch. It's not for lack of fish. At the fishwheel next to theirs stands a rather large red-faced man with a three-foot-long salmon laid out on his cutting board. Without stopping his fish-gutting, unable to speak for the cigarette pursed in

his lips, he lifts one leg and kicks open his cooler to show us three more salmon inside. Finished with the fish, he puts down his knife, takes out his cigarette, and lifts the fish by its gill flap for our consideration. Looking into his cooler and back at us, he says, "Take it. I've got plenty." We proffer polite demurals but, as we hope, he insists, takes a plastic bag out of his truck, slides the fish in, and hands it over. "Good eating..."

June 18 to 21 96 Hours of Daylight

First thing today is a fuel stop at Larry's Flying Service in Fort Yukon, where the sign reads:

Fort Yukon Inside the Arctic Circle Lat. 66.34 Long. 141.51 Pop. Summer 800 +/- Pop. Winter 700 +/-

Inside the office an old-timer, who looks like he stays around summer and winter, warns me with Alaskan bluntness that ANWR is not the blushing country that "it's made out to be by those environmentalists. It's bare and mosquito-ridden," and, echoing the Arctic's poet laureate Robert Service, he calls it a "godforsaken place."

"Well," I say, trying to keep things light, "godforsaken is okay with me."

This doesn't lighten things up at all. He nods as if I've just confirmed his sorry opinion of me, slaps his knees, stands, sighs, and shuffles out the door. I might have told him that I've traveled often in the north and have no illusions about what I'll find. But this would not be true since I have tremendous expectations, visions of vastness, brilliance, and timelessness. These hopes are not dashed as we fly north and get our first look at the Arctic.

Paul navigates along the river valleys. Heading up the Sheenjek River, the dense groves of black spruce that we'd been seeing thin out and then disappear altogether. Few trees can survive the winter cold and

dark this far north. Those hardy specimens that make it grow so slowly that after a hundred years they may be no more than several inches thick. When the trees vanish there is only taiga and potholes in which the water is a turbid lava-lamp green from the growth of spring algae.

The southern foothills appear like an ashen Sahara, where bare massive dunes of gray slag extend for miles. The only signs of life are sedges growing along the runnels of meltwater. Ahead of us the Brooks Range (named after geologist Alfred Hulse Brooks) rises to a 9,000-foot knife-edged crest, cold as cast iron.

If, as Service suggests, God created the Arctic and forsook it, His exasperation was nothing compared with that of the geologists who've tried to decipher this landscape's corrupted stratigraphies. Crumpled, twisted, shifted, uplifted, infused by lava flows, deformed, eroded, faulted, folded, flooded, obducted, metamorphosed, crystallized, recrystallized, and glaciated, the formations of the Brooks Range include rocks as old as 570 million years and as recent as 66 million years, although not necessarily in any particular order.

We tack east and cross the mountains' continental divide beyond which all rivers flow to the Arctic Ocean. I'm feeling pretty giddy from the whirl of scenery on our low and swooping flight path. And yet there's more. The Kongukut, the refuge's easternmost river, appears below and we dutifully follow its gleaming turquoise flow northward. The valley widens. We fly even lower. The river twines its way among sandbars and stalled ice floes. And Donna calls, "Caribou!"

We see them along the banks of the river, grazing singly or in small groups. Some stand on ice floes. We're right on the Porcupine herd's main route. The animals we see are on the final leg of a three-month-long spring migration that began in April when they left their Canadian wintering grounds. This long bend of the Kongukut is known as Caribou Pass. The

broad Arctic Ocean coastal plain that is their final destination lies some 25 miles farther north. There, for a day or two, the herd may number in the tens of thousands before they disperse to feed. If we're lucky, we'll meet up with them. The females needed to reach the plain early to give birth, so the animals we see here are most likely males straggling behind...

Like a butterfly from flower to flower, Paul wings the red plane from peak to peak until he decides to alight in the snow-covered glacial cirque of Mount Michelson, at 8,500 feet the next-highest point in ANWR. What's left of the glacier on Mount Michelson pours down from an

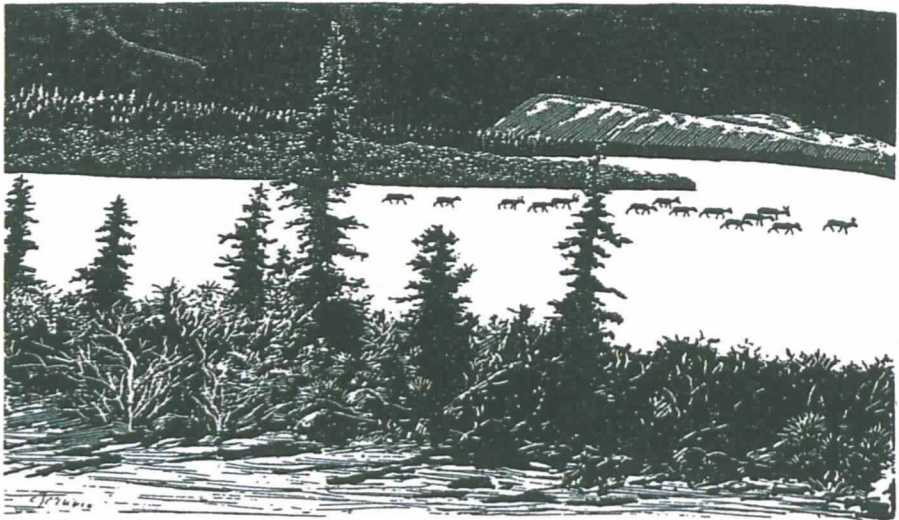


exposed crest of chiseled granite. nearly all of Alaska's glaciers are in retreat, the signature of a warming Arctic world, melting away and leaving bare rock behind.

Paul scans the glaring field of snow below while he works out a calculus of variables that, he tells me, include not only wind speed and direction—often errat-

ic up close the mountains—but also the outside temperature, which tells him the condition of the snow. He dips right down into the half hollow of the mountain, banks, veers off from the wall of rock, lifts the nose, and comes around again. His left hand on the wheel, his right hand quickly trims the flaps and brings the skis into position below the tires. Coming out of the sharp bank he drops onto the snow. We slide no more than 25 yards before coming to a gentle stop facing downslope. Paul proudly announces ours as probably the first-ever landing here of a fixed-wing aircraft...

nels that we're slogging through lies a low rise, a meadow of greening tundra. If we can reach the last hedgerow we'll be behind a blind barely a hundred yards from the herd. We stay low and say nothing. We're close enough now that we're practically crawling through the dense thickets. When we're as far as we can go we realize the only place to stand will be in mud and water, but we've come this far and the view through the blind is like peering into a great cathedral through the crack between the doors. As it turns out, we're just in time to see the congregation filing in.



We fly: down the summits of the Brooks Range across the rolling foothills and out onto other sprawling tundra of the coastal plain. Here, the many streams that rush off the mountains become mired in the sand and gravel they've pushed downstream ahead of them. They flow where they can amid dense thickets of dwarf willow. Paul spots some caribou and lands us on the lower Kongukut, about a half mile away from the herd. He gauges the direction of the wind to keep the caribou from smelling us and we begin our hike across gravel beds and through the streams that separate them. Beyond the braided chan-

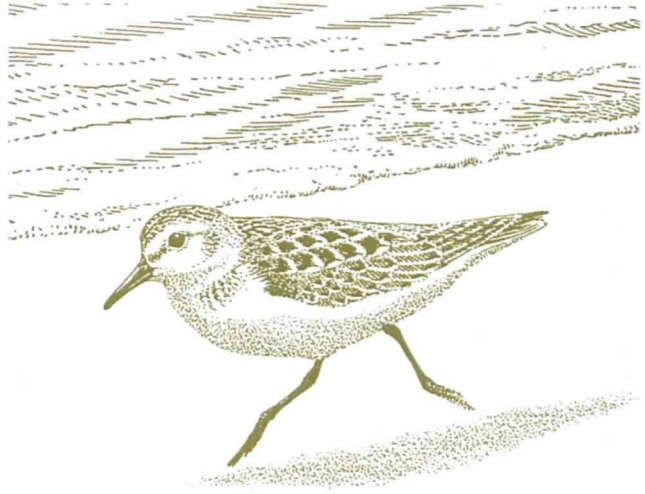
From every low slope we can see, we see them coming. Herds of hundreds joining the aggregation of thousands. They saunter in loose formation, large deer on gangly legs, many with fluff-tailed young—no more than a couple weeks old—scampering alongside, some trying to grab a teat and suckle on the run. Once and again an adult raises its head and pricks up its ears, seemingly aware of our presence, but then moves on, perhaps feeling safe among such numbers. Hunkered down below the willows, wet and cramped, we watch their march for hours.

And for hours under a vast blue sky they

continue to arrive, pass by our blind, and move toward the sea, gradually becoming silhouettes on the distant flat plain, the place where life is born. Their spring journeys began about the same time as mine, and here is where both our journeys end. The synchrony in this place in this time of never-ending sun fills me with inexpressible joy. My eyes burn from glare, wind, and tears.

We've been lucky to see them. Although most years half to three-quarters of the herd gathers near the Kongukut, exactly where they'll aggregate and when, when they'll move and to where, may change according to the herd's own demands. Efficient travelers, they won't remain gathered here for long. In a day, maybe two, they'll disperse along the coastal plain to graze on the shrubs and the tundra plants that have reached their peak of growth. Then they begin their long return migration south. Neither we nor they have yet been assaulted by the mosquitoes. When they are they'll go down close to the ocean for relief. This coastal plain makes up only 10 percent of ANWR and perhaps less than that of the Porcupine herd's range. But the herd's survival depends upon being able to freely graze these lands. How soon will they face the same fate as so many other species—forced to migrate through landscapes that humans have altered, constrained into ever smaller reserves until faced with extinction?

My last day in ANWR we take inflatable kayaks down the Canning River, the western border of the refuge. The water is swift, the rapids gentle, and only the upstream winds make the paddle challenging. The landscape, as everywhere, is daunting. But best of all I meet up with the birds whose journeys also end here. We drift past thousands of terns and gulls



nesting along the gravel bars in the river, sandpipers nestled side by side, their white heads lining the bars as if it were a parade route.

Time slows to a crawl or doesn't seem to move at all. We camp that night on the Canning and after dinner, after sleeping some, I awaken—perhaps in the middle of the night if it was night—and climb the low slope above the river. On the way I pass grizzly bear tracks. The tundra is greener than it was a day ago. The tussocks seem to have suddenly burst into bloom. There's a pleasant citrusy scent in the air. I sit—I now hardly notice the silence—and stare at the ground around me.

A half dozen and more species crowd onto each small tussock, and each is in flower. Lupine, forget-me-not, heather, anemone, campion, saxifrage, dryas, and poppy—a garden of miniature wildflowers that sprouts from a pincushion. I swear to myself that at my feet lay the most beautiful few square yards of ground I have ever seen. Unlike Robert Marshall, I feel more drawn to the depths of small worlds. Within them lie all the great complexities of vaster places. I hike higher. And I swear the flowers are blooming right before my eyes. And I think of the millions of acres of tundra meadow, and that across the

Arctic all of them on this last day of spring are in just as intense a bloom. Suddenly these tiny plants loom as large as the mountains on which they grow.

I think the difficulty that I face having reached the end of my journey is that I've begun to suffer a kind of Stockholm syndrome—so long in the thrall of spring that I've begun to identify my existence with that of the season's, imagining that all of spring's transformations, enticements, multivarious sensual and fragile beauties (for which I've been an obsequious sucker) have all been proffered for my benefit. Each day I watched light and saw it transmute into structures that, breath by minuscule breath, synthesize the earth's food and by their infinitesimal exhalations create its atmosphere. I've fallen in love with the spring of my own being. The easy part of this love is that it demands nothing of me. The hard part is that although it controls my life it has no interest in me at all...

I lie in my sleeping bag, the crystal blue river runs close by, terns and gulls wing low and skirt the wind. Above, the continuous sun, the yellow of powdered sulfur, as much light as aura, feels like a prize won. What is best about this place I've come to is that it is not meant for you or me at all. For us, it is a place where, for

the moment, past, present, and future are all one and inexorable, where the senses and the spirit find refuge.

But for how long?

Timelessness isn't what it used to be.

What will your and my children's and grandchildren's springs be like? Will the poetry of the season still make sense to them? Will spring remain as full of energy and omens and just as radiant and manifest? Will they be able to head out in spring to recover their hearts and find places like this to lie out alone in the open and ask themselves why things—why they themselves—are where they are?

As my grandmother would have put it, "I've been and gone," not "come and gone," but actually established my being somewhere before going. It won't make leaving this bright place, this luminous season, any easier, but come February when snowmelt begins, when the soil moistens, when the first warm rains fall, I know I'll be thinking salamander thoughts, ready for the vernal rush, more aware and more appreciative than ever of each new minute of light that marks the rising arc of the sun.

See spring for yourself. See spring now, because it is changing.

All things are changing beneath the sun. See it now.

GUIDELINES FOR SUBMISSION

UNDERWATER NATURALIST is the Society's journal. We encourage you to submit articles, pictures, observations, comments, compliments, or criticisms. Please follow these guidelines:

SUBJECT MATTER: Write about anything you think other members are interested in – fish behavior, habitats, sea birds, reefs, beaches and dunes, wetlands – basically, the littoral and its wildlife. Features articles run 2000-4000 words (5-10 double-spaced typed pages); field notes and other casuals can be up to 1500 words. Letters are always welcome.

ART WORK: We welcome photographs; color is our first choice, black and white is okay. In order of preference: color slides, color prints, and digital photos. At least up till now, we have had little luck getting good reproduction from emailed digitals. If you submit some, be ready to provide the highest definition possible. (Note: Unless otherwise requested, we keep all

accepted art until it is published).

HOW TO SUBMIT: Double-spaced manuscripts, a disk and a printed copy. Incorporate sources in your article. We edit for clarity using Strunk & White's "The Elements of Style" as our guide. We favor clear wording over specialized terminology. Send your work with a stamped, self-addressed envelope so we can acknowledge its receipt. Please include a daytime phone number, your email address, and one- or two-sentence biography. With permission we will include your email address in the biography.

We do not pay for articles but we do send you five author's copies when published.

13 Years of Travel & Exploration in Alaska

BY W.H. PIERCE

13 Years of Travel & Exploration in Alaska by W.H. Pierce, Alaska Northwest Publishing Co., Anchorage, 1977 (originally published in 1890):

Pierce went north to Alaska in 1877 to look for gold along the Tanana River. As he writes: "Well, as all things have an end, so did this long river, and we found ourselves once again on the shores of the briny ocean. Our boats were not fit for ocean traveling, so we got some logs of driftwood enough to make lumber.

We broke up our two river boats, and sawing some timber from the logs, we got enough to make one sea boat large enough to carry the whole party of six to St. Michaels, which was about ninety miles distant." But they hit bad weather, the boat broke apart on a rock, and all six floundered onto the beach. Here's how tough prospectors were 140 years ago:

WE STOOD ON THE SHORE and watched the boat, for it was now light enough to see a little. I was very anxious to get my rifle. It was tied in the boat, and the boat was already a wreck. To get our arms was impossible. The boat went entirely to pieces. We had lost everything — our boat, our tools, our beds, provisions, and even our arms. We were in a wretched plight. Not a match, nor anything to make a fire with; we had only the clothes we wore. We were landed, we knew not how far from St. Michaels — the nearest place that we had any knowledge of where we could get assistance. The worst loss was the boat.

As soon as it was light enough we commenced to explore the island, for an island it proved to be. There were no signs of

natives, although I saw plenty of deer tracks along the beach. However we had no way to kill them and no fire to cook them. We went around the upper part of the island. It was not more than three miles to the main land, the coast of Alaska further northwest.

I could not see any smoke or sign of inhabitants as I viewed the coast of the main land. We gathered clams and mussels and ate them raw, for we could not cook without a fire; but they kept us from starving to death at least. We thought it best to stay at the upper end of the island so we could watch both sides for natives who might be passing in canoes. It would be our only chance to get away.

It rained almost the whole day. We were very wet, cold, hungry and miserable. Now night came on. I can hardly tell how we lived. We tried to get a fire by rubbing two sticks together, but we did not succeed.

The next day the sun came out and dried our clothing. Fortunately for us the sun shone several days in succession. We gathered fallen timber and made a kind of a house. We roofed it with brush and such barks as we could find loose. Then we gathered leaves and moss and made a nest, and found it much better than no place. The clams and mussels were hard living, and especially so as they were raw.

We tried very hard to get a fire. We rubbed sticks together until they would smoke, but we could not make them burn...one day two canoes of natives, apparently a hunting party, came close to the island. We managed to attract their attention. They landed and were very much surprised to see us. They had fish and venison and also matches. They were

friendly and kind to us. They camped on the island two days and hunted deer. They gave us fish and venison. We made large fires and had large roasts. We had lived on raw shellfish and been without fire ten days. I thought the venison and fish were the finest I had ever eaten. I even felt as if the fire was of an



extra quality. In this manner will one appreciate the necessities of life if for a time they are deprived of them.

I then tried to hire them to take us to St. Michaels. They agreed to go, but wanted to know in what way and how much we would pay them.

After a good deal of dickering I made them understand that we could no spare our clothing, but if they would take us to St. Michaels I would get anything for them that they wanted that was there for sale. To this they agreed, and the next day we started. Those natives were clothed in furs and buckskins. They lived at some place on the Siberian coast.

From the island on which we were wrecked I could see far to the northwest into Alaska. The landscape sloped gradually back as far as the eye could reach. There were no signs of inhabitants on the land, that I could see. Near the coast it was covered with scrubby timber. Further back it had the appearance of a prairie. When the weather was good, the air was free from smoke, the sign that always indicates the presence of cities or a settled country. From the summit of a large hill I could see in the north and west the dim outline of a range of mountains. There was also a vast, level plain visible to the view.

We now embarked for St. Michaels and on the evening of the second day we

reached it. It is a trading post. The people were kind and hospitable and furnished us with a house to live in. We remained at St. Michaels nearly three weeks when a government revenue cutter stopped. The captain gave us a passage to Sitka, and my travels in interior of Alaska had ended.

I stayed at the coast several years, sometimes prospecting, at others in the employ of the different mining companies. I do not think that I shall ever again return to Alaska, although I consider it a good field for the prospector. My constitution is broken and I can no longer endure the hardships attending such a life.

In the fall of 1886, Pierce could be found running a music hall in Newtown (later called Douglas) near Juneau. His editors notes that, "Most of the saloons in Douglas at that time were, by all reports, pretty low dives and the music hall was probably no exception." Things got out of hand one night, Pierce shot and killed a man, was tried for murder in Sitka and acquitted by a jury after 23 minutes of deliberation, raised \$500 to leave Alaska, got to Denver where he opened a fruit and cigar store, and died around 1890. His editor noted: "It seems probable that he was not older than 40 when he died, and he may have ben considerably younger. It was not unusual for the miners and prospectors of the frontier North to die young."

Oil on Troubled Alaskan Waters

BY KEN ADAMS

Among the coastlines bordering North America's higher latitude ocean waters, the mountainous terrain of Alaska stands out as an example of incredible beauty and in some ways, controversy and industrial contradiction. There is probably no region in Alaska that this contradiction is truer than for Prince William Sound (PWS) in the south central part of the state. Here, surrounded by glaciers, fiords, and the mountains of the Chugach National Forest, fishermen make their living harvesting salmon and halibut from the Sound's cold waters. In stark contrast to fishermen's harvests, tankers, heavily laden with North Slope crude oil, depart from the Alyeska oil terminal in Port Valdez and transit the Sound headed to distant markets.

Located approximately 120 miles east of Anchorage and very close to the Sound, lies the "city" of Cordova, population 2500, not counting dogs. In some ways, Cordova is a reminder of how life used to be in much of coastal America. It is a true resource dependent community whose main industry is commercial fishing. It persists as the waterfronts of many historic fishing ports have been transformed to an assemblage of quaint restaurants, condos and tourist attractions. Diminished populations of formerly abundant fish stocks, pollution, reclamation of wetlands and other forms of habitat destruction have all taken their toll upon these former centers of fisheries commerce.

Cordova lies in the lee of the Heney Mountain Range to the south, and is afforded some shelter from the power of

massive storms transiting the Gulf of Alaska in wintertime. These moisture laden air masses originating in the tropics release an abundance of precipitation in the region. Much of coastal Alaska is truly northern rain forest country and not for the faint of heart. For example, Cordova's officially recorded annual rainfall is 92.5 inches. However, unofficial precipitation recordings made in town, on the back side of the Heney Range, reveal twice the amount recorded at the official weather station 13 miles distant. Here, temperatures are relatively mild due to proximity to the sea, but neighboring Valdez, located approximately 60 miles to the northwest, is farther from the sea and a few degrees cooler. Valdez has less rainfall but annual snows of approximately 225 inches!

This land of rain, lakes and streams is the natural domain of Pacific salmon, and five species are found in abundance in local waters. From Cordova, one can travel 25 miles eastward by boat along the barrier islands of the Copper River Delta and arrive at the major outflows of the broad, glacially silted Copper River. This is home to the legendary Sockeye or red salmon and Chinook or king salmon that send national markets into orbit when the harvested fish arrive beginning in mid-May. These fish are taken with floating drift gillnets by fishermen working alone in small boats in salt water under close management scrutiny of the Alaska Department of Fish and Game. The fishery is managed for resource sustainability and contributes millions to the economy of Cordova and smiles to the faces of diners fortunate enough to find these wild fish on their plates.

Leaving Cordova harbor and heading

Ken Adams is a commercial fisherman in Cordova. He is a Society member and helps serve as our eyes to the north.



The Cordova harbor chock full of commercial fishing vessels.

west and in the opposite direction from the Copper River, one can round Salmo Point on nearby Hawkins Island, and enter the waters of Prince William Sound. Here are home waters for pink and chum salmon and herring. The Sound's multitude of bays, fiords, and islands provide hundreds of streams and lakes for spawning. Plus two primarily pink salmon enhancement or ocean ranching programs contribute to average annual harvests of between twenty five to thirty million pink salmon. The harvests are highly variable however.

Located nearly equidistant from the Copper River to the east and the Sound to the west, Cordova is well situated as a fishery dependent community. The daily arrival of north and south bound jets and turbo prop airliners, plus a somewhat

irregular ferry service, provides opportunities for transportation of product to markets and arrival of visitors. There is no road linkage to the state highway system from Cordova. Most residents like it that way.

Against this seemingly bucolic backdrop where men and women of the fisheries pit their strengths and skills against nature emerges the vista of supertankers plying the waters of the Sound, the "other half of the story" as Paul Harvey would report. The fundamental incongruity of two disparate industries coexisting in delicate balance is the reality. The state derives nearly 85% of its operating revenues from oil related taxes and royalties from Alaska's North Slope (ANS) oil extraction activities. ANS oil provides approximately 20% of domestic crude oil

production. All of that oil is transported southward 800 miles through the Trans Alaska Pipeline System to its terminus at the Alyeska Marine Terminal at Port Valdez. Fishing organizations, conservationists, state and federal regulators and citizen industry oversight councils all work to help insure safe oil industry practices and maintenance of habitat integrity. All are aware that the PWS ecosystem provides for community sustainability, the subsistence harvests of both native and non-native people, and sport and commercial fishing activities. Reliance upon nature and a clean environment is a way of life for many in PWS but that lifestyle is threatened with the passage of every heavily laden outbound tanker transiting through the Sound.

When the pipeline and PWS marine terminal were selected as the route for transporting ANS crude oil to market in the early 70's, concerned state legislators, conservation organizations and fishermen fought vigorously in support of safeguards including double hulls for tankers that would be involved in this trade. However, the power of big oil prevailed and warning cries to adopt best practices to help insure safe operations fell upon deaf ears. Instead of double hulls, standard practices for tanker operations were adopted. The oil flowed to waiting tankers and markets began receiving Alaska's oil. Over time, legislators, regulators, and industry all seemed to lose sight of the fact that oil spills can and do happen.

In fact, Dr. Riki Ott, a Cordova fisherman and environmental toxicologist, prophetically warned the Valdez city council on the evening of March 23, 1989, that a future spill was not a question of if but when it would occur. Early in the morning of the following day, her prediction came true: the fully laden tanker Exxon Valdez swerved from the normal outbound vessel traffic lane to avoid icebergs and ran aground on adequately marked Bligh Reef. We know the spill report of 11 million gallons. What many

don't realize is that the reported volumes of recovered oil overlooked the fact that oil mix contained up to 65% water. The actual volume of crude oil spilled was probably somewhere between 25 and 30 million gallons. Another overlooked fact was the calm three-day period immediately following the spill that would have allowed significant mechanical recovery of oil had there been adequate spill response capabilities. All this attests to the state of laxity that prevailed prior to the spill among those charged with safeguarding the PWS environment from oil industry catastrophe. To be fair to at least a segment of that industry, credit should be given to the master and crew of the tanker Baton Rouge and others that acted to remove oil cargo still aboard the Exxon Valdez under dangerous conditions. They helped prevent an even worse disaster.

We've read about the fish and wildlife victims of the spill, the impacts upon habitat and city businesses, and the residents of Cordova and other towns in the region. It is honest to acknowledge that many townspeople were engaged in the spill clean up and compensated at handsome rates of pay. But that was all in the distant past. What stakeholders in the region also found was that the environmental response to the spill also revealed delayed impacts. After strong returns of salmon and herring in the early '90's, pink salmon returns failed in '92 and '93 and the herring population that plummeted in '93 hasn't recovered.

If anything at all positive can be said about the oil spill, it was that EVOS was the act needed to propel the passage of the Oil Pollution Act of 1990 (OPA90). Contained within that legislation were many provisions to secure the earlier sought but unattained changes that would help provide for safer oil transportation and other concerns. Also, and very noteworthy, was the provision for the establishment of citizen councils in PWS and Cook Inlet to oversee industry activities at the terminal and the tanker fleet. The



Salmon gill net bow pickers ashore for the winter.

councils have the same degree of access that state and federal regulators have. The involvement of stakeholders in oversight activities of industries that threaten their sustainability is an essential first step for maintaining habitat integrity, the resources upon which communities depend upon and human health.

So what's to be learned from EVOS in addition to what has been mentioned above? We have learned that oil persists in the substrate of PWS even after the 17th anniversary of the spill on March 24, 2006. Granted, the estimated 29 acres of combined subtidal and intertidal shorelines that remained oiled in 2004 are a much-diminished area compared to the total area originally oiled. However, some oil lodged under boulders and other surfaces will doubtlessly persist for years to come. It just doesn't disappear magically. Further, the toxicity of weathered crude oil is far greater than previously thought and can be harmful to fish eggs and embryos at concentrations measured in parts per billion, not parts per million as previously thought.

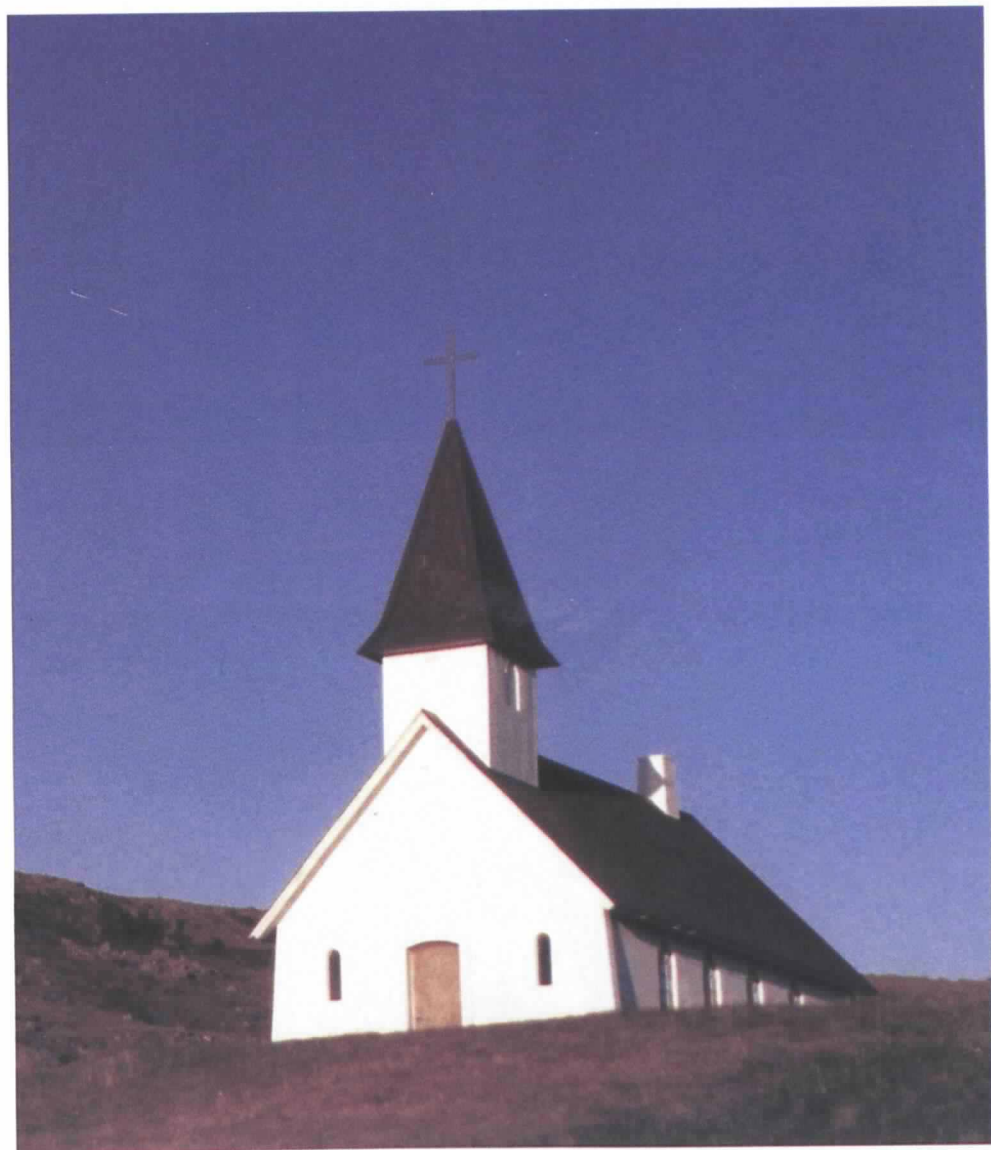
With respect to persistent damage to fish and wildlife, some species such as

Pacific herring, three species of cormorants, loons, pigeon guillemots and harbor seals and others are reported as non recovered by the EVOS Trustee Council. This organization was formed by agreement between the state and federal governments to manage the civil settlement made with Exxon to aid the restoration of the injured species, habitat and human services. Related to this federal and state agreement, a reopener clause provided for claims to be made to Exxon for up to \$100 million additional dollars for an anticipated damages at the time the settlement was made. We in the spill impacted region currently labor to construct restoration plans that will be responsive to the requirements of the reopener clause.

We have learned there is no rest, no cessation of the need for industry oversight. We have seen efforts to reduce services which compromise environmental quality even amidst record oil prices and profits. Not to participate as citizen stakeholders in the process of environmental defense cedes the playing field to industry. We can kiss environmental quality goodbye, but is that what we really want to leave behind for those who follow?

Portraits of Iceland

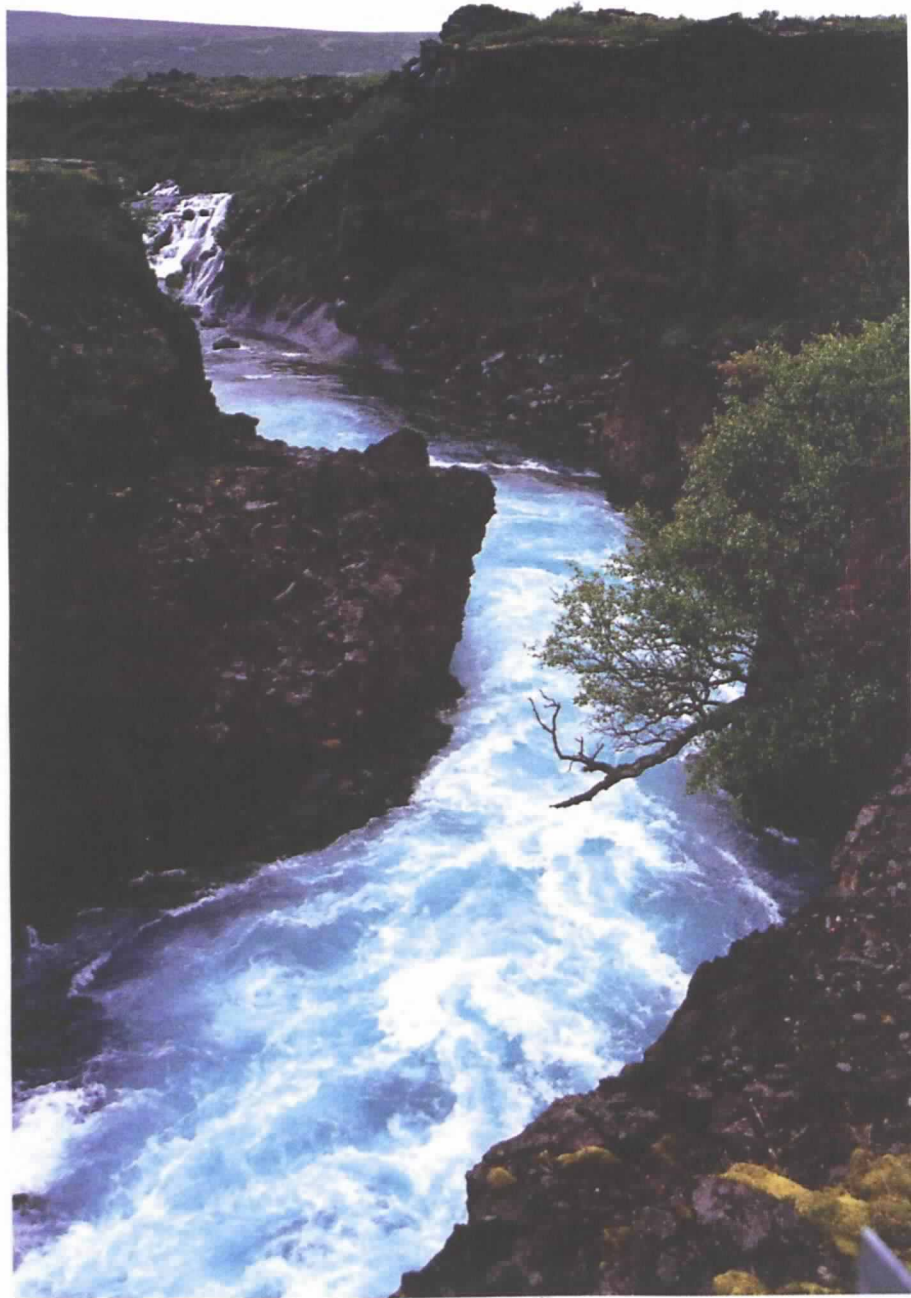
BY CAROLINE CARLSON



Caroline Carlson, a graphic designer and photographer, lives in Hoboken, NJ. She's been a member of the Littoral Society for 26 years.







Above the Arctic Circle: Greenland and Baffinland

BY MICHAEL BOITNOT

Join the Navy, see the world. Sometimes it works. It gave me a chance to venture to two unlikely places near and above the Arctic Circle. The lands and waters up there do not offer swaying palms and colorful tropical fishes or the sweeping quiet of a salt marsh in autumn. Instead, the region broods and threatens in its endless expanse of water, ice, and rock. It's hard to get to. You wouldn't call it hospitable. It's freezing in winter, mostly overcast and chilly in summer. Why not give it a try?

Greenland

The pilot finally managed to tune the four prop engines of the C-47 and the plane stopped vibrating, and leveled off at about 8,000 feet. We were a Navy detachment of 10 sailors trained in scuba diving and demolition, heading north on a mission that would turn out to be half work and half time off to explore the stark landscape of coastal Greenland. It was mid-June, the first of two Arctic jobs I shipped out on back in the early 50s. The experiences addicted me to cold coasts.

Our plane carried enough fuel to fly from Goose Bay, Labrador, 1700 miles to the Thule Air Base, up on the northwest corner of Greenland, and then back if Thule was weathered in (about half the time). This was a cargo plane, so we sat on bench seats in the cold, dark cabin with bologna sandwiches at the ready and cigarettes aglow. Onboard, we carried sur-

The author writes: "Navy, grad school, teaching, travel, now retired in Maine, a cold coast. I took the pictures with a one-dollar Baby Brownie - hope they turn out after 50 years in the bottom drawer."

veying equipment, camping gear, and three tons of plastic C-3 explosives. Best estimate of flight time to Thule: six hours. This was not a jet-powered aircraft.

Within minutes, we were over water and soon after as we progressed up Davis Strait there appeared small white things floating on the water below, our first ever sighting of sea ice. Some of the detachment smoked, complained, or slept, but most of us spent the next hours staring out of the plane's small windows at this mix of white ice on a gray-green sea. As we flew north, small and then larger icebergs came into view. Three days ago, we were in hot and humid Norfolk, Virginia. It was becoming obvious that the Arctic was a different place.

We reached Thule in heavy overcast, circled fruitlessly for an hour or so, then set a course back down the Greenland coast toward Goose Bay, but some 200 miles south of Thule we lucked out: the pilot managed to sneak up a fjord and drop onto an airfield. We sat while the plane refueled, sat some more, then took off, and flew down the fjord and up to Thule, landing at a vast expanse of landing strips and flat land of scraped dirt and rock dotted with buildings - low, flat roofed structures that looked like cargo containers set on short stilts.

We were at Latitude 75N, in Knud Rasmussen Land, 800 miles above the Arctic Circle. It was two in the morning and not dark. We grabbed our gear and started across the steel mat landing strip to waiting trucks that would take us some place to collapse and sleep. But, hold on a minute. There ahead of us, in the gray light, we recorded our first sighting of Arctic wildlife - 30 young women in evening gowns wafting down a wooden

boardwalk, holding their skirts above the dust. Nighttime in Thule was beginning to look okay. (It turned out this was a summer visit by a women's chorus to sing to and dance with the Air Force men stationed there. The singers/dancers flew back down south the next day.)

Our next travel was by truck about 60 miles southeast to a deep embayment where we were to spend the next weeks helping engineers site and begin construction of a radar station. It was part of what was called the Dew (Distant Early Warning) Line system, a string of stations from the Aleutians to Iceland to detect Cold War missile attacks from the Soviet Union over the North Pole. Our home away from home was a haphazard collection of quilted Quonset huts, a mess hall, and an outhouse. The fellow civilian

edge, erecting range markers and helping landing ships reach shore with supplies by blasting rock and ice out of the way. But there were many days and nights with nothing to do except hike the hills and shores, and our group included well conditioned outdoorsmen, campers, cooks, divers and swimmers, scavengers (known in the Navy as cumshaw artists) fishermen, and hunters – a willing group of wanderers. On government time, we wandered.

THE EDGE: The shoreline beaches were jumbles of rounded rocks and thick sheets and blocks of beach-stranded ice. The bay was dotted with floating ice and small, grounded icebergs. To check the channel to see if it needed clearing we climbed into dry suits and scuba gear and did a formal and accurate survey, and then



Our camp on the Greenland coast south of Thule on a typical gray day.

inhabitants were mostly big guys wearing suspenders.

Greenland is an island edged by mountain ranges that surround a 700,000-square-mile ice cap, as thick as 11,000 feet in places. We worked only along the

spent the rest of this first immersion chasing what we thought were big codfish (remember, all this was new to us) that turned out to be curious five-foot seals. We swam after them; they swam after us. They were better swimmers. Later some

of us swam around in shorts just because it seemed like the right thing to do.. Visibility underwater was almost unlimited, but there was little to see besides rock and ice and maybe a few jellyfish. There must have been fish, crabs, or mollusks or some such food for all the seals zapping around, but we didn't turn up any.

When additional idle time presented itself, we decided to conduct experiments with the various forms of ice nearby. We started by addressing a glacier with a 200-foot face that fed into the bay, ripe for calving. To hasten the event, we floated 100 pounds of plastic explosive up against its face and let it rip. Lots of smoke and noise, but the glacier held firm. We tried a pair of 10-pound shaped charges on a floating slab of ice and produced two six-inch holes; we were hoping for at least a split. Then we hung 20 pounds of plastic on a bridle under a small berg and rolled it



Almost naked sailor on ice for no apparent reason.

over – success at last, after a fashion.

On each tide, the sea ice would move around the bay, depending on the wind, and there were times when we had to get back in the water and re-blast new channels through the ice. The ocean water temperature was below 32F, and early in the morning after a windless night we would find a skim of ice on the bay, fresh glacier melt that had flowed out on top of the colder, denser seawater. It melted as the day warmed.

WEATHER: In any 24-hour period it was sunny, cloudy, foggy, windy, or still. While we were there the temperature ranged from 25 to 45 degrees. We could be sitting comfortably in the sun outside our hut having coffee when a batch of dark clouds approached from the west, bringing with it a three-minute snow squall, followed by more sun. We learned to enjoy or ignore these sudden climate changes. One thing for sure: on terrain dominated by rock and dirt, with little precipitation and almost no ground cover, temperatures can change drastically in a nod.

LAND ANIMALS: One of the construction workers discovered an Arctic fox den and dug out the pups – gray, kitten-size cuties, eyes open, not terribly mobile.



Clearing ice from the landing ship channel with explosives.



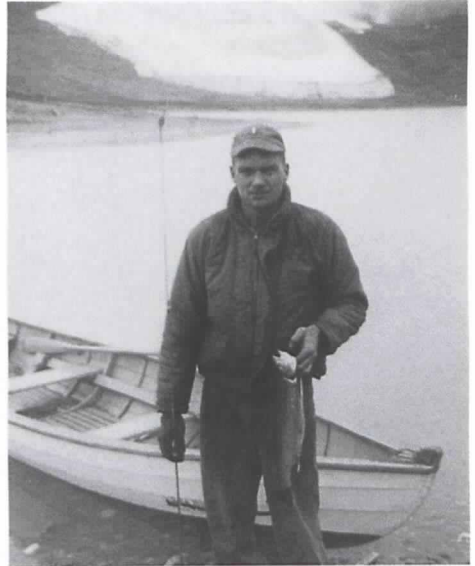
Two Arctic fox pups dug out of their den. They survived the ordeal.

We replanted them, and the parents were back parenting within 10 minutes. They spent most of their time trotting out on the rocky tundra and returning soon with what looked like small rodents – mice or voles. The gray-brown Arctic hares up on the sides of the hills were apparently too large prey for the foxes. The hares fed on mosses and plants, tearing them off the ground and pounding them together with their front feet to get rid of the dirt, as if they were banging cymbals. They created miniature dust storms. As naïve Arctic explorers, we had expected to be inundated by polar bears, wolves, and caribou, even to the point of carrying carbines when we wandered inland.

FISH: In our ignorance, we believed that the shore waters of Greenland would be teeming with cod, halibut, and salmon, which, of course, was not the case. We tried bottom fishing offshore one night (in daylight, remember) with hand lines and big hooks baited with squid (we routinely packed a quart mason jar of salted squid on all such deployments for situations just like this). We caught nothing then, but several days later two from our group took a long hike up into the hills and came upon a glacier-fed lake loaded with Arctic char that may not have ever before seen red and white Daredevils, a stateside

freshwater fishing lure that looks like a spoon without a handle. We may have put a permanent dent in the lake's char population; they tasted good cooked over an open fire and washed down with Tuborg beer. It should be mentioned that (1), we always carried a few pack rods with us, and (2) sailors usually know how to make or find some sort of alcoholic beverage. It was a welcome break from our normal rations – C, K, and 5-in-1 – which need not be described here beyond saying that you haven't seen big lima beans until you're popped open a C-ration can of ham-and-limas.

VEGETATION: Not much – mostly lichens and mosses. I don't recall any seed bearing plants, and we were way north of the tree line. This was permafrost country, after all. In our destructive way,



Arctic char, also known as dinner. Note small glacier in background.

we decided to examine the nature of permafrost by setting off a shaped charge on a patch of tundra. It blew a one-foot deep hole; when we put our hands down into it, we could feel the chill of soil and rock that hadn't experienced temperatures above freezing for a long, long time.

The Last King of Thule by Jean Malaurie, Dutton, New York 1982.

In 1950, Jean Malaurie, a young French scientist studying in the Sahara Desert, was granted permission to conduct an expedition to the "cold desert" around the North Pole. There he lived for a year among the northernmost people of the world, the Polar Eskimos of Thule, Greenland. He wrote about his experiences first in 1951, but later realized he should refine his reporting. The result is a full story of the Thule Eskimos. Here's a short excerpt:

"When adventure does not come to him, the Eskimo goes in search of it. In 1906, a group of eight families whom Peary had taken aboard his ship, left it one day because they found the monotony of life on board oppressive and its

comforts upsetting...The families spent eight months traveling on foot over the hundreds of miles that the ship covered in twenty-two days. Their trip was in many ways dramatic. The families suffered cruelly and often came close to death. When they reached Etah (on the northwest coast 120 miles north of Thule), they had only a few half-starved dogs. But all of them were ready to start out again. How can life be worth living if it offers no surprises or adventures?"

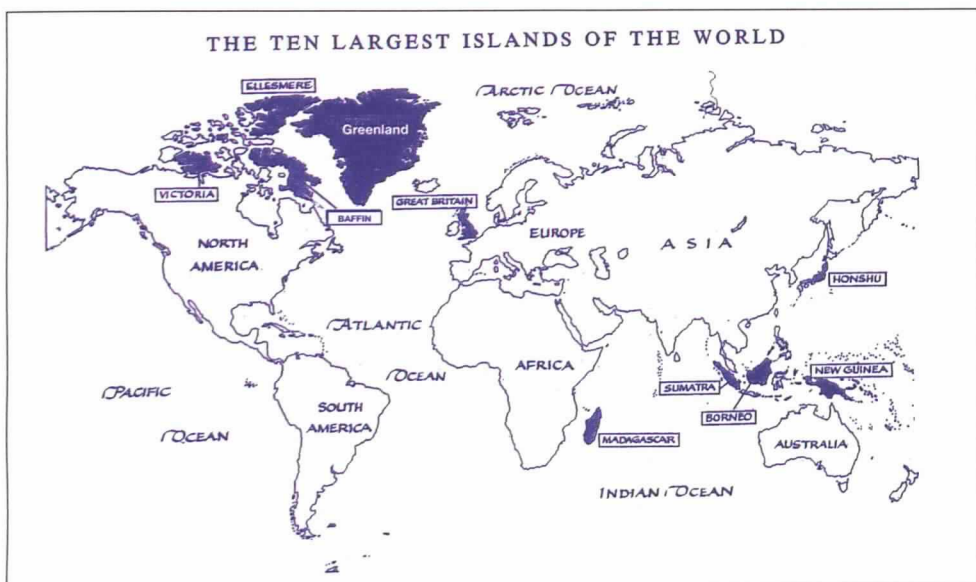
By 1950, Thule has become the largest Eskimo village in Greenland, with 137 inhabitants (by contrast, Etah had but 21). When the Americans arrived in Thule in 1951 to fight the Cold War, they simply shrugged the Eskimo village away to the north.

BIRDS: We didn't find this part of Greenland the birdiest spot in the world. There were gulls around and we may have kicked up a few rock ptarmigan, but the general impression was a silence of bird sounds and an absence of sightings. (I just looked in a bird book, 50 years too late. It says that if we had paid attention we might have seen or heard loon, brant, harlequin duck, eiders, oldsquaw, gyrfalcon, peregrine falcon, golden plover, ruddy turnstone, purple sandpiper, red knot, sanderling, phalarope, jaeger, murre, dovekie, guillemot, and puffin. We didn't; shame on us.)

AS WE TAKE LEAVE OF GREENLAND: When we started to break camp in mid-August, it was apparent that winter was on its way. Days get shorter fast near the poles and the wind brings an ominous kind of chill. All the gear got packed except for about two tons of unused but slightly damp C-3 explosive in 20-pound canvas packs, a cargo that the Air Force didn't particularly want to fly back to the lower 48. We couldn't take it with us and we couldn't leave it. Guess what the pre-

ferred, chosen third alternative was. It took half a day to load the packs on trucks for a five-mile trip up into the hills, where we piled them on a slightly sloping quarter acre of tundra, lit a 10-minute fuse, and retreated a mile downhill. The noise and dust put on a good show, along with flying rocks, and a few echoes. I suppose we blasted a permanent scar on the austere landscape of Greenland – maybe we even made a small lake. We didn't go back to find out.

Back at the Thule air base, we had half a day before our plane left for Goose Bay, so we hit the local pub (the enlisted men's club) for farewell drinks. In the entrance to the club, against one wall, was a mammoth polar bear skin with five feet of bent iron pipe mounted above it. A plaque below the skin claimed that the bear was encountered outside the club's entrance, some unpleasant words were exchanged, and the bear was dispatched by a blow to the head. It seemed a sad way for a polar bear to die, innocently blundering about in its strange new habitat of planes, missiles, bulldozers, and huts.



Baffin Island/Hudson Bay

Aboard the U.S. Coast Guard icebreaker Eastwind in the middle of Baffin Bay, Latitude 62N: We have been stuck in pack ice for three days. Actually, the icebreaker isn't stuck; it could break itself out with a few shrugs of its heavy shoulders. But the ship it is escorting, the Navy survey vessel Tanner, is too thin-skinned to chance a hull gash even if it hung right in close behind us. So both ships sit there, about a mile apart, waiting for the ice to move. The official end of the wait will be dictated by the ice pilot we have on board, a stocky, quiet, Canadian with an academic air. Every once in a while, he wanders up to the bridge, stares at the horizon, looks at the sky, sniffs the air, holds a wet finger to the wind, shakes his head, and goes below for another nap. The wait goes on.

This was the summer after the Greenland trip. The two-ship convoy was up there to survey the lands and waters of Ungava Bay, Hudson Strait, Foxe Basin, the western shore of Baffin Island, and the

northern reaches of Hudson Bay to refine the navigation charts for that region. We were working from a set of the most up-to-date charts, and it was frightening to see how far apart soundings were or, more to the point, where they were absent. There could have been small mountain ranges hiding down below, waiting to open up ship hulls. It was to be an eight-week job during Arctic summer when the ice was thin or gone and navigation was easy. Ha, ha: this was before GPS; the radars were primitive, and landmarks were unmapped, absent, or obscure. (It was even before xerox machines, PCs, and sushi, for those of you who keep track of this sort of thing.) So the job was to locate and chart the shallow water without running aground.

Our contingent of divers and blasters was again assigned two jobs: to clear channels of rocks and ice in shoal waters if needed and to go ashore in small landing craft to site and erect markers so the survey ship could locate itself while tak-



The Coast Guard ice breaker Eastwind at rest alongside the Tanner, waiting for the ice to move out.

ing soundings Onshore we would be equipped with the necessities: scuba gear, explosives, surveying equipment, lumber, tents, and food.

We headed up into Baffin Bay, did some survey work, and then got caught in the ice. On the Eastwind, in addition to the Coast Guard crew, we had a chaplain, two helicopter pilots, a six-foot-six, 230-pound officer in the Royal Canadian Mounted Police (but no mount), and the aforementioned ice pilot. We navigated up the Bay just fine until a change of wind pushed an enormous expanse of drift ice up against and all around us as far as we could see. Locked-in-the-ice practice was to shut down the main engines, post armed guards on the ship's stern in case polar bears paid a visit, and watch the ice pilot watching the ice. (Here a word about icebreakers – they look like big, fat, all-white tugboats, squat and beamy. They don't cut or crack ice; they ride up on it with an enormously heavy, cement-filled bow and break the ice with sheer weight. I think someone on board said the vessel had 12,000 horsepower diesel engines —

whatever, strong enough to pound through the three feet of ice we encountered. It's a noisy operation. The sterns of icebreakers sit low in the water; hence the concern about polar bears coming aboard while we were stuck in the ice, attracted to the garbage piled there for dumping when we were again in open water. (Polar bears have famous noses.)

To help kill locked-in-ice time, we played and replayed the only movie aboard. It was "Quo Vadis," and we watched it in full, we switched reels around, and we watched it without sound while we spoke the parts. In one scene, I played Deborah Kerr, lashed to a stake in the Colosseum of Rome at the mercy of a charging bull. I was saved only when loincloth-garbed Victor Mature, played by the ship's chaplain, who (Victor, not the chaplain) snapped the bull's neck with a great show of bulging veins, pectorals, and abs. As I recall, my lines were, "Help! Help!"

In time, the ice pilot announced from the bridge that the ice would go away in 12 hours, and it did. None of us ever



Cape Dyer on Baffin Island; again the weather is overcast. Despite the gloom, the cold coast has its charms.

found out how he knew.

The survey ship lined up behind the ice-breaker, and we continued the survey, sometimes in open water, sometimes through weak ice. We spooked many seals off ice flows and often passed blood stained flows (red = fresh kill, brown = old kill), but we never saw the polar bears that were doing the killing. Gulls picked at the seal scraps.

Our trips ashore to clear landings and erect survey markers were by small landing crafts (called LCVPs – Landing Craft Vehicle Personnel) that we ran up on the beach to unload; then we would alidade our way up to a high hill, build a 20-foot marker, and then move on to the next site. We had two close encounters with polar bears, one dirty bear, and one as white as a polar bear can get.

We met the dirty bear on a dusty trail. We had hiked up the trail about a mile, loaded down with lumber and surveying gear to put up a range marker. The bear was walking north and we were walking south. In the desert-like climate of Baffin Land, dust was everywhere, and the bear had seriously brown legs and belly, and lesser brown head and back. In human terms, she was a mess. But it was her trail

(“her” because she was smallish), so we dropped down to the water’s edge and gave her plenty of time and room to pass. (It had been made clear to us by the Canadian government that in any bear/man meeting, bears had the right of way; they were not to be harmed, especially by foreigners.) We watched as she passed us without a glance, gave her half an hour, and then went on up the trail and built our marker.

Polar Bear #2: Days later while crossing a bay by LCVP to put up another marker, we sighted what looked like a giant white beaver head leaving a wake on the calm surface. It was, of course, a polar bear, either just out for an early morning dip, or, more likely, making waves from Point A to Point B with something more serious in mind. Naturally, we changed course and pulled up alongside. The bear was pure white in the clear water. It had to be a male, maybe eight feet long, a massive body with the polar bear’s typically small head, dog paddling along at a healthy clip. As we drew close for a good look, he dived several feet below the surface, still paddling. He was underwater for maybe 20 seconds, and when he surfaced he let out a roaring snort of air, took

a quick breath, and dived again, paddled more, and resurfaced panting. It was then we remembered that the bear had the right of way (and, indeed, property rights) so we backed off and let the bear do whatever polar bears do while heading northwest in 30-degree water two miles from shore. When we described the incident later, it was explained that we had harassed the bear in violation of Canadian law. I like to believe that we paid a social call on the swimming bear out of awe rather than with malice.

Once we were out of the ice-jammed seas, we shed the ice breaker and "Quo Vadis" and from Baffin Bay turned south-west and headed into Hudson Bay, surveying along the western edge down to Eskimo Point, a compact village of about a dozen wooden cabins and a Mounted Police shack, right up against a rocky beach. We were not allowed to go ashore unless accompanied by our Mounted Policeman shipmate, the Canadian government wanting to buffer the native

Eskimos from the possibly (probably?) negative influences of Yankees, especially Yankee servicemen. We were introduced to the town's mayor and stood on the rocky beach and eyed each other in a friendly/wary way, if that's possible. The landscape was 360 degrees of flat.

The families here subsisted mostly on fish and seal and what supplies they could buy and get shipped in with their trapping proceeds. Strings of sled dogs were staked out all along the end of town, barking, howling, wagging their tails, sleeping. They were big, black, gray, and white, rangy, and friendly, seemingly eager for any attention, probably because, strictly laborers, they got little of it from their masters.

There was a beat up 30-foot deep-hulled wooden boat pulled up on a cradle down the beach with a ladder from the ground up to the deckhouse. I asked what it was and one of the natives said, "Seal meat for the dogs." I was given permission to take a look. Down the beach, up the ladder, a



The Royal Canadian Mounted Police Office at Eskimo Point - officers in uniform, helicopter pilots in survival suits. The sign reads "Royal Canadian Mounted Police - Customs, Excise - Canada."

peek into the boat's hold. Looking back up at me was a herd of seals, each one split in two lengthwise, floating in a glutinous soup of blood and blubber. I could make out snouts, whiskers, eyes, and flippers. Later in the day was dog-feeding time. We watched as a native yanked half a seal from the soup with a gaff, dragged it up the beach to a thick, greasy board, and had at the demi-carcass with an axe, producing giant pork chop-sized victuals, one for each barking sled dog that soon



An Eskimo sled dog pup, not a year old, craves attention.

stopped barking. The ground around the dogs was littered with seal bones.

Man Overboard: Half a day out of

Eskimo Point we lost a sailor from the survey ship in rough seas. I was on the bridge when the dreaded shout reached the wheelhouse: "Man overboard, starboard side!" In that situation, the standard drill is to twist the helm hard to starboard to kick the stern to port, away from the man in the sea, and create a large, visible swirl. Meantime, life rings are tossed over the side. Then the ship swings in a counter clockwise circle back to the swirl and the floating rings, and a search pattern starts from there. My station was in the lifeboat that we launched and the search was on – an unsuccessful two hours. The sailor was without a lifejacket and probably lasted only a few minutes in the choppy, freezing water.

We had just a few more transects to run, mostly in sloppy seas as the cold, blustery weather of winter hinted at its arrival, and then the work was done. We sailed south to Churchill with its mammoth grain elevators visible four hours before we got there. We dropped off the Mountie and the ice pilot, and turned for home.

I haven't been back to Greenland or Baffin Land since, but I remember the bears, the seals, the Arctic foxes and hares, the sled dogs, the glaciers, mountains, ice and rock, the Thule girls in evening gowns, and the sailor lost in the cold sea. The Arctic's chill vastness still haunts me.

AFTERWORD: Looking back, I realize we were not always environmentally friendly on these Arctic ventures. We bothered polar bears, de-nested foxes, slaughtered Arctic char, blew holes in the tundra, defaced a glacier, blasted rock, and threw trash into the sea. For sure, we didn't recycle. Nor were we especially politically correct – ogling women, drinking beer and harder stuff on government time, and smoking cigarettes; we even smoked on a plane full of explosives. My apologies to the Arctic for our anti-ecological transgressions. I have almost convinced myself that Greenland and Baffin Land erased our tracks.

On the Prowl for Falklands Mullet

BY STEPHEN C. SAUTNER

The oddball Falkland Islands, home to 2300 British colonials, along with five species of penguins, 7500-pound elephant seals, and a native prairie grass called diddle-dee, also support a little-known sport-fish known locally as a Falklands mullet (*Eleginops maclovinus*). A species of rock cod, mullet reportedly weigh up to 20 pounds and are frequently taken by anglers fishing for the far more glamorous but non-native sea-run brown trout, introduced in 1940. Others target them specifically, claiming the best bait is a piece of fresh mutton fished deep.

In February 2002, I visited the Falklands with a group of researchers from the Bronx Zoo-based Wildlife Conservation Society (WCS). A donor had just given WCS an eight-square mile island called Steeple Jason in the remote northwest corner of the archipelago. The Falklands lie at the gateway of the polar South Atlantic, and receive nutrient-rich upwellings from the Antarctic current. As a result, a variety of wildlife cram onto certain islands to breed. After spending three days wandering among 150,000 pairs of nesting black-browed albatross flanked by 80,000 pairs of rockhopper penguins, it was time to go fishing.

In Stanley, the capitol, (Latitude 51 South, population 1900), I hired a cab to drop me off a few miles from town where a small freshwater stream entered Stanley Harbour through a culvert that ran under a dirt road. I had originally thought the spot might hold sea trout, but an elderly man

cutting peat in a nearby field informed me the stream was too small. Nevertheless, I began to see wakes pushing along the rocky shoreline as groups of some unseen fish prowled the shallows with the flooding tide.

I strung up my fly rod in 60 degree temperatures and a light breeze and began casting a weighted streamer. At first, the fish seemed to be focusing on some unseen prey, rather than my fly. But persistence eventually paid off when I let the streamer sink deep and something grabbed it, then immediately began peeling line off my reel.

Much to my surprise, the line rose, and a dark fish cleared the water in a deliberate leap that would have made a bluefish proud. After that, it resorted to bulldogging off the bottom, before eventually tiring. A few minutes later, I slid a four-pound Falklands mullet onto the rocks.

The fish looked mostly like a redfish, with an under slung mouth and large head, but its elegant pointed pectoral fins resembled those of a jack crevalle. I had heard mullet were good to eat, but I had no means to clean or cook it, so I twisted the hook free, and let it go.

Later that night in a pub in Stanley, I found fresh mullet on the menu, which I ordered and found extremely tasty – a white-fleshed, meaty fish reminiscent of Atlantic cod, their distant relatives that live 6000 miles due north.



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The Lunenburg Fish Project

BY PHYLLIS MARSTELLER

This is a different kind of fish story. It's about fish that have disappeared from the sea and reappeared on telephone poles, in a town that used to be home to one of the largest fishing fleets in the North Atlantic.

Lunenburg, Nova Scotia, started sending fishermen to the Grand Banks in the 1850s. By the 1880s, over 800 schooners sailed from harbors in Nova Scotia, Newfoundland, and New England for fishing grounds that extended from the Grand Banks to Georges Bank and the Nantucket Shoals.

The typical schooner from those days resembled the *Bluenose*, the two-masted "banker" that appears on the Canadian dime. Although the *Bluenose* was built much later, in 1921, it was built in Lunenburg and was a symbol of the town's importance to shipbuilding and to the North Atlantic fishing fleet.

Fishing remained important to Lunenburg long after schooners disappeared and codtraps, trawlers, and draggers replaced hand lines dropped from dories. Larger ships and sophisticated technology meant much larger catches during the twentieth century.

Government restrictions, including a 200-mile territorial limit and quotas on groundfish (such as cod, halibut, and haddock), could not prevent overfishing, which eventually depleted fishing stocks in the North Atlantic. Herring, shrimp, crab, scallops, and lobster are still taken, but the fishing industry in Lunenburg has virtually come to an end.

Laurie Fisher, an aptly named sculptor,

The author, a photographer, lives in Rhinebeck, NY. She took the pictures: pjmarsteller@aol.com. For more information on Laurie Fisher Huck's sculptures, go to www.huckfisher.com.

was living in Lunenburg when its fishing industry died out. "At one point," she says, "I set up a studio in a vacant fish warehouse at the end of the waterfront, near the government wharf, where fish were still being off-loaded. Every day I'd walk out my door and see huge containers full of dead fish, their blood running onto the street. It wasn't difficult to imagine the entire waterfront lined with catch, billions of fish per year—year after year—for several generations. At one time, it must have been bathed in blood."

Fisher has special affection for fish and for their role in the life and economy of Lunenburg. In 1999 she began a series of paintings entitled "Someone has to Sing for the Fish," which grew out of her sense that too much attention was being given to "iron men and iron ships" and not enough to the fish that were the basis of Lunenburg's economy.

"To my eye," she says, "fish are incredibly beautiful beings shimmering with layers of color and life. They're worthy of great respect and gratitude, even if only in retrospect."

Her interests coincided with those of a Lunenburg official, a fisherman, who suggested that images of fish, instead of flower baskets, could decorate the town's utility poles during the summer. The town manager asked Fisher to submit a proposal for sculptures of 20 species of fish that could replace 44 flower baskets. Obviously, there would be some duplicates, placed a distance from each other.

"The town didn't want just any fish," Fisher notes. "They wanted sculptures depicting the port of Lunenburg's most landed species, the creatures that had provided the economic foundation of Lunenburg."

The 20 species, including crustaceans, mollusks, and cephalopods, that Lunenburg commissioned in 2002 were blue mussels, clams, cod, haddock, hake, halibut, herring, jonah crab, lobster, mackerel, mako shark, monkfish, pollock, porbeagle shark, redfish, scallops, squid, swordfish, yellowfin tuna, and yellowtail flounder.

Unlike the flower baskets, Fisher's sculptures are on display year-round, even in harsh winter weather. Each of her aluminum sculptures, cut to her specifications by a firm in Truro, Nova Scotia, was covered with special undercoatings before she applied multi-layers of paint, one floated on top of another, "to capture the depth of color, glimmer, movement, and shadow of each fish." For protection from the elements, the final coat of paint is covered with two coats of clear automotive lacquer.

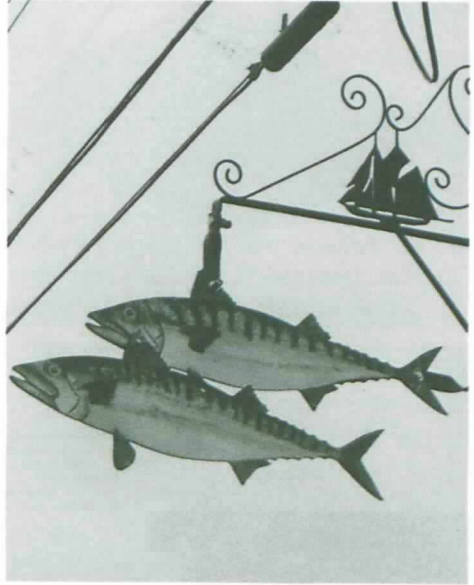
There is something magical about fish suspended from utility poles. But the fish can also be seen as symbols of a change that Marian Binkley, of Dalhousie University, Halifax, described in a lecture entitled "From Fishing Centre to Tourist Destination: The Restructuring of Lunenburg, Nova Scotia" (presented April 26, 2000 at the University of the Faeroe Islands). Her lecture described the type of transition that has occurred in coastal communities ranging from Havana and Reykjavik in the Atlantic to Borocay, The Philippines, in the Pacific, and Split in the Mediterranean.

Once dependent on fisheries, these communities now rely on tourism. "Fishing has changed," Binkley notes, "from a lived experience of many to that of a few. Fishing, as a way of life, has become a commodity, an historical artifact, a romantic adventure, which has been used to promote tourism."

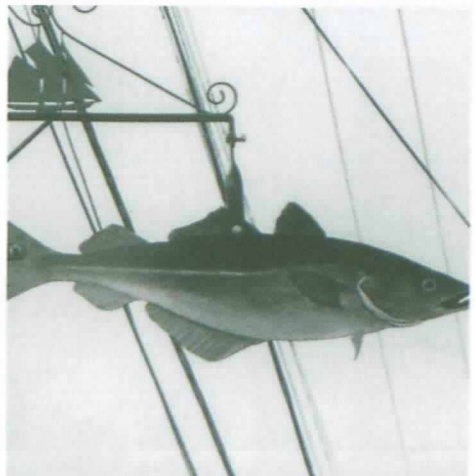
The old town section of Lunenburg, declared a world heritage site by UNESCO (the United Nations Educational, Scientific and Cultural Organisation) in 1995, has been gentrified and commercialized, Binkley notes, for

the sake of tourists, retirees (some from central Canada), and Europeans buying second homes. These newcomers have driven up the prices of real estate and rentals and the cost of living in general.

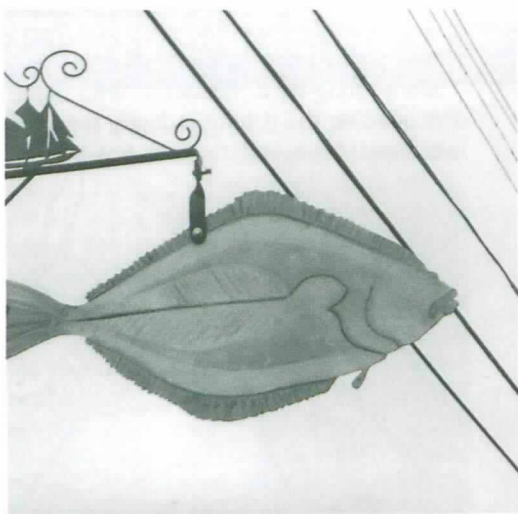
Many long-term residents who once depended on the fishing industry for their livelihood have had to take low-paying



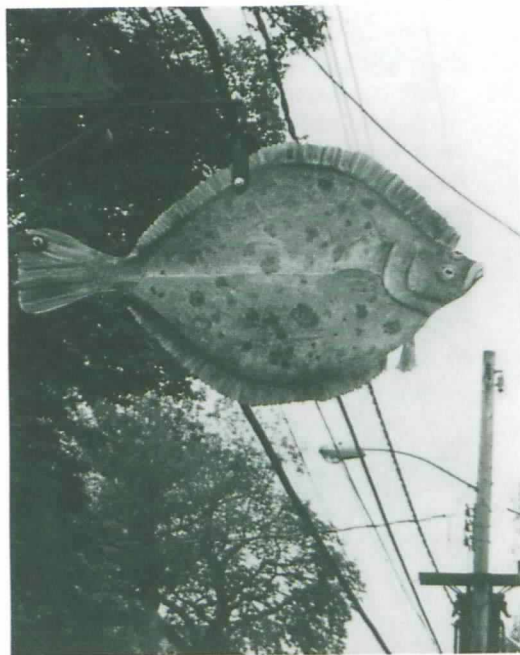
Mackerel



Pollock



Halibut



Yellowtail Flounder

jobs in the service sector, waiting on tourists. Many of the children of long-term residents know that they will not be able to afford to live in Lunenburg when they're ready to set up their own households.

In Newfoundland, Prince Edward Island, and other parts of the Maritimes, as in the town of Lunenburg, fishermen have had to find new sources of income, including fish farming, mussel farming, oystering, whale watching, and puffin tours. They've gentrified their towns, opened B&Bs, held folk festivals and craft festivals, and invited tourists to kitchen parties, their ceilidh (pronounced kay-lee), and screech-drinking contests.

They've adapted to new circumstances, but at what cost? Fishing used to be their way of life, but they've had to settle for make-do, stopgap measures. On the streets of Lunenburg's old town, Laurie Fisher's sculptures commemorate the old way of life.

Internet and Other Sources

Barss, Peter, and Creighton, Helen C. Images of Lunenburg County. Halifax, NS, Mount Saint Vincent University, 1976.

Binkley, Marian. From fishing centre to tourist destination: the restructuring of Lunenburg, Nova Scotia. Lecture given at University of the Faeroe Islands, April 26, 2000. http://www.region.fo/Smarit/Smarit_3_2000.pdf

Fisher, Laurie. The Lunenburg Fish Project. www.huckfisher.com

Gough, Joseph. Fisheries history. The Canadian Encyclopedia. <http://tceplus.com/index.cfm?PgNm=TCE&Params=A1SEC638195>

Pullen, H.F., and Jenson, L.B. Atlantic schooners. Fredericton, NB: Brunswick Press, 1967.

William J. Roué: Canada's first naval architect and designer of *Bluenose*. www.wjrout.com/Bluenose.html

United Nations. Educational, Scientific and Cultural Organisation. World Heritage List: Lunenburg. http://whc.unesco.org/archive/advisory_body_evaluation/741.pdf

Penguin Ranch: Scientists and Emperors in Antarctica

BY TORRE STOCKARD

"All the world loves a penguin: I think it is because in many respects they are like ourselves, and in many respects what we should like to be. Had we but half their physical courage none could stand against us... Their little bodies are so full of curiosity that they have no room for fear."

— *Apsley Cherry-Garrard* — *The Worst Journey in the World*

"Antarctica...the highest, driest, coldest, windiest, and emptiest place on earth." So begins the United States Antarctic Program (USAP) Participant Guide, designed to familiarize people with what to expect when they deploy to Antarctica for the first time. It was my starting point before my first trip to "the Ice" in 1999 to study the diving physiology of emperor penguins. Due to the success of the film "March of the Penguins," many people have gained a much clearer sense of the life cycle of these remarkable birds, and their reproduction during the coldest winter months at the bottom of the world. However, probably few people understand what it takes to do research in Antarctica, on emperor penguins or anything else. In this chapter on the theme "Cold Coasts," I hope to convey a sense of what that's like.

To begin with, even getting to Antarctica can be an adventure. The United States has three bases, managed by the National Science Foundation: Palmer, on the Antarctic peninsula, across from South America; McMurdo, on the Ross

Sea side, across from New Zealand; and Amundsen-Scott South Pole, another 850 miles inland from McMurdo. As part of the Antarctic Treaty, the US conducts only peaceful operations and research on the continent, and most of the plants, animals, historical artifacts, and even rocks and

The author has her PhD in marine biology and works at the Scripps Institution of Oceanography in San Diego, though she and her husband call Washington State their real home. They will be leading a tour to the Antarctic Peninsula and Falkland Islands in February 2007. "Thanks to Dave Grant who gave me my start in marine biology and reviewed an earlier draft of this piece." www.tstockard@ucsd.edu.





130 Happy Campers headed from Christchurch, New Zealand, to McMurdo - flight time: five hours.

meteorites are protected south of 60°S. The research team I'm on is based most of the year at the Scripps Institution of Oceanography, in San Diego, CA, but for three months during the austral spring, we conduct field work out of McMurdo Station, at 77°51' S, 166°40' E.

To get there, the personnel fly commercial airlines to Christchurch, New Zealand, while most of the scientific equipment goes by vessel and has to be shipped six weeks earlier in order to arrive in McMurdo on time. In Christchurch we are issued all our Extreme Cold Weather, or ECW, gear. When stepping through the

doors of the Clothing Distribution Center, one is immediately confronted with an entire wall full of all the types of clothing we will receive, from long underwear and fleece to parka, hats, and boots. You could literally show up in Christchurch with nothing on but your underwear and be quite amply outfitted to survive a field season in Antarctica. The National Science Foundation no doubt figured out early on that it was in their best interests to supply scientists and support staff with the appropriate clothing, rather than leave that to chance.

Next comes the ~2,400-mile flight from Christchurch to McMurdo, courtesy of the US Air Force. Until this year, this usually meant a very crowded sardine can called a C-141 ("Starlifter"), with four rows of webbing benches running the length of the fuselage and 130 folks dressed in bulky parkas and boots literally knee-to-knee for a 5+-hour flight. Need to hit the head, but you're unfortunate enough to be in the center or back of that morass? Tough luck—either hold it, or crawl across a sea of legs. Of course you have a lovely brown bag lunch supplied free-of-charge, and they encourage you to stay well-hydrated, but, well...I think most folks would rather endure the raging dehydration headache than have to make their way to the head. And I should mention, it's a 5-hour flight only if you actually manage



Cold weather clothing on display.

to land in McMurdo. If the weather gets nasty on the way, that brown sack contains a second sandwich that may well become your dinner should the plane "boomerang" back to Christchurch. I'm very happy to say that in the six years I've been going, I've never had to do that. Also, the last of the C-141's was decommissioned last year, and we now fly C-17's, which can actually accommodate pallets of real airplane seats. A huge improvement, though the sack lunches are the same.

One of the more surreal experiences of your Antarctic getaway is that you leave Christchurch at the beginning of October with spring in full force: bursting in bloom and new green growth, the air of the Botanic Gardens heady with fragrance and exploding in pre-dawn bird chatter. The airplane door shuts, and when it opens again five hours later, you step out into take-your-breath-away-and-freeze-your-eyelashes cold ($-22^{\circ}\text{F}/-30^{\circ}\text{C}$ is typical, not counting the windchill, which can make it feel like $-103^{\circ}\text{F}/-75^{\circ}\text{C}$). Plus it is blindingly bright, with intense sunlight reflecting off a vast whiteness of sea ice between Ross Island (where McMurdo Station lies) and the Antarctic continent proper. No color, no smells. But unbelievable awe-inspiring scenery, including the steaming plume rising from Mt. Erebus, the active volcano on Ross Island. Very overwhelming. You're tired, but you also cannot believe that three days ago you were in San Diego, and now you're at the bottom of the world.

As soon as you arrive, you begin a slew of orientations and safety training. Because our group works in a field camp on the McMurdo Sound sea ice, this means that neophytes have to go through survival training, affectionately (or not) known as "Happy Camper School." Your body already has no idea what time zone it's in, and you're aghast at how cold "cold" can actually be, and then they suddenly send you through a 2-day outdoor affair that includes an overnight stay in

tents. And it's still the beginning of spring, so it's, well, butt-cold. I confess I had my trepidations. Most of the course instructors lead mountain-climbing expeditions the rest of the year, and they structure the course around the contents of the all-important Survival Bag. Don't leave McMurdo without it. Everyone who travels outside of "town," from heavy equipment operators to pilots to science teams, is required to carry these suitcase-sized bags which somehow have crammed into them a tent, camp stove and fuel, sleeping bags for two, shovel, ice screws, food for two for a couple days (freeze-dried and some sort of foil-sealed block of fat), and (I am not making this up) a couple of trashy paperbacks.

Weather can change dramatically in as little as an hour, producing life-threatening conditions that could last for days. The contents of the survival bag are designed to keep you not necessarily comfortable, but alive, until a search and rescue team can reach you. So, the course teaches you how to survive if you get stranded in the boonies during a storm. I was impressed by how much I *didn't* know about how to dress properly (e.g., layers: yes; cotton: NO). And how important it is to stay hydrated, especially in a climate that's drier than the Sahara Desert. It was useful training, of course, and perhaps the biggest take-home message was: you now knew you *could* survive a couple of days in the cold out on your own, but more importantly: don't screw up, because, given how minimal the gear is in the survival bags, you really do not want to have to depend on it. I think I literally slept 12 hours straight (back in the warmth of my dorm room) after that course. I'm happy to say that you only have to go through that once. In subsequent years, you just get refresher training in the classroom.

Those of us who scuba dive also have to do our annual check-out dive the first week. To dive in the Antarctic, I had to learn how to use a dry suit, which is basi-



On the right, the author in her full dry suit ready for a scuba immersion through the diving hatch; the ice is six feet thick.

cally an inflatable, waterproof, vulcanized rubber suit. Not a fashion statement. A thick Thinsulate liner and a layer of air keep you warm, a big improvement over the old days when they wore wetsuits. Every part of your body is insulated and

when you get out. But while you're down there, it is a magical world.

The check-out dives are conducted in about 80 feet of water near an intake jetty. The sea ice the last several years has been about 15 ft. thick there; I really had to get



Panorama of the corral.

dry except: your lips. When you first get in the water (28° F/-2° C), they sting, but quickly go numb. One of the exercises we have to do at our safety stop at the end of the dive is switch out our primary regulator for the octopus. My first dive, the dive master told me, "You might be surprised how hard it is to find your mouth." No kidding. And you only talk gibberish

up my nerve to go through that the first time. And because of the ice and snow cover, it is extremely dark underneath. The good news, though, is that early in the spring, before the plankton bloom, the visibility is seemingly endless—several hundred feet. (In the middle of McMurdo Sound, where the depth averages 1600 feet, the water is the deepest, purest blue

I've ever seen—much richer than in the tropics.) Once on the bottom, your flashlight reveals that the rocks around the jetty are covered with critters, and the most surprising thing to me was how colorful they are. Bright reds, purples, oranges, yellows. And animals in cold water tend to be large. There were starfish, anemones, isopods several inches long, ice fish, urchins, sponges, pycnogonid sea spiders, and lots of things I couldn't identify. Most of our dives don't last more than 25 minutes, due to cold rather than air consumption. Surprisingly, my body stays toasty warm, but when my fingers start to fumble, it's time to surface.

After about a week of these training sessions and meetings, we're eager to head out onto the sea ice to search for the spot we will call home for the next two months. As you may have forgotten by now, we travel to Antarctica to study emperor penguins, and our field camp is affectionately known as "Penguin Ranch." The reason? We build a corral, about 50 feet across and 75 feet long, with four-foot high, one-inch-mesh metal fencing; drill

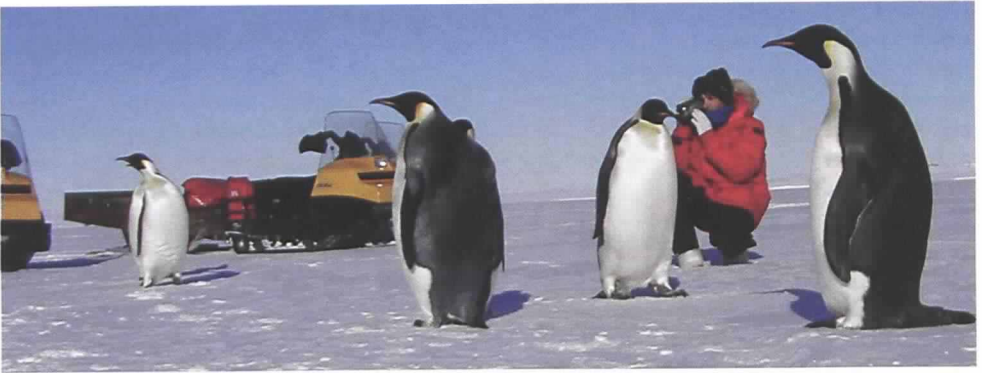
on one breath. This "isolated dive hole" method, developed by one of my mentors at Scripps, Dr. Gerald Kooyman, allows us to attach recorders to the birds to learn about their diving physiology and behavior, for we know we will get the recorders back when the birds return to those holes.

Once a site is selected (usually 12-17 miles from McMurdo), a considerable team of support personnel is mobilized to construct the camp. One of the first things that struck me about working in McMurdo is how much support there is for conducting scientific research. It is unlike anything in any university, government organization, or company I've ever worked for, which is to say: it's WAY more. The pursuit of knowledge rules all in the US Antarctic Program, and the National Science Foundation awards contracts to companies to provide all aspects of science support, including meals, vehicles and maintenance, a fully-equipped modern laboratory, radio and telephone communications, helicopters and fixed wing support, mountaineer guides, computer help, and yes, even recreation. To name



two holes through the sea ice inside it; and bring in 10-15 penguins to stay with us. The trick is to find a spot on the ice that is smooth, clear of snow, only 6-8 feet thick, and is at least one mile radius from any other hole or crack. That way, when the birds dive into the corral holes, they must return to those holes to breathe, as they are unable to swim more than a mile and back

just a few. It is incredible how they pamper the scientists (referred to as "beakers" in local parlance), and we Scripps folks go out of our way to thank these hard-working people. Our group is typically only 6-8 "beakers," but there may be 3-4 times that many workers required to set up our camp, including carpenters, electricians, mechanics, drillers, etc.



Emperors are curious and unafraid. Here they are attracted to snow vehicles and their passengers.

In recent years, Penguin Ranch has shifted away from tents and now consists of one Quonset-style hut for sleeping (a Jamesway, for you Korean War veterans) and three 12 x 16 or 16 x 24 ft. trailers on skis, used for a lab, kitchen, and anesthesia/surgical suite. The huts are arranged in a semicircle on the windward side of the corral, to protect it from filling up with snow each time a storm blows through. Each hut has a diesel-fueled heater, and we are able to power everything else by solar and wind, including such energy-intensive laboratory equipment as a temperature-controlled water bath and a microwave. The whole set-up process takes several days...IF there are no storms. Which is a big "if" in springtime McMurdo. When planning our research, we tend to write off October, since it mostly gets eaten up by courses, set-up, and storms. Many of our experiments get done in the last couple of weeks of November and early December, although the last two years have had milder weather, allowing us more work days.

Once camp is established, we are finally ready to get penguins. How this is accomplished varies from year-to-year, depending on how far away the ice edge is. Non-breeding penguins tend to wander along the ice edge, well away from the colonies, which makes it easy for us to know that we're not taking any parents.

Some years, the ice edge is close enough that we can set up camp just a few miles away, in which case, we capture penguins and bring them back by snowmobile, or ...they come to us. Most years recently, though, we've had to bring them in by helicopter, as the ice edge has been 60-100 miles away. (Yes, some penguins *do* fly.)

In either case, one of the most fascinating, and endearing, traits of emperor penguins is their great curiosity, and lack of fear of humans or machinery. Anything new on the horizon, such as a bright orange and white helicopter, a snowmobile, or a person, will attract the birds, and they will make their way toward it to check it out. I've been to the ice edge several times, seen birds scattered along the "shore" line, and shaken my head in amazement as they wander over after we pull up in our loud machines. One time, we wanted to dive with them, and a group of about 15 birds gathered close by as one of our guys chainsawed a hole in the ice. Loud machinery just doesn't seem to bother them at all, whether it's an engine, a chainsaw, generator, or helicopter. That's always struck me as surprising. Furthermore, if you lie still on the ice, they'll come right up and check you out, sometimes pecking at your boot. So, getting within a few feet of them is no problem. However, closing that last gap to

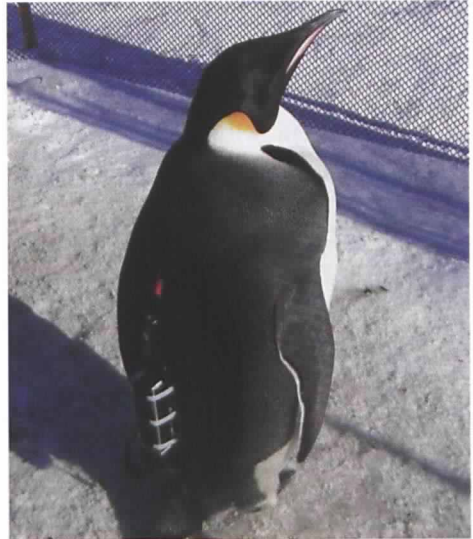
actually capture them is another story, which involves a shepherd's crook and a sort of bear-hug tackle. These birds typically weigh about 50-60 pounds at that time of year, and a great portion of that mass is pectoral muscle. Although they can peck you, by far the most damage they wreak is by flapping their wings, which are like stiff plywood boards. Given how powerful those wings have to be to propel them through water, you can imagine how much more powerful they feel in air. We've all ended up with bruises in strange places after penguin wrangling.

Another remarkable aspect of these birds is how accommodating they are to change. They're captured by a group of red parkas, hop a skidoo ride or helo flight, are introduced into a corral surrounded by huts andand within a day or so, they're diving through the holes as if nothing had happened. After awhile, they even learn our routines, and stand on the hole covers when they want them opened (often at 5:00 a.m., when they start calling). Almost every year, one or two birds will be particularly friendly, and will follow us around the corral as we shovel snow (or guano). You actually have to be careful not to step on them. On rare occasions, one will come up to the fence and let you pet it. This calm, go-with-the-flow personality makes them easy to work with. For the most part, they do not seem to mind having small recorders placed on their backs for a couple days, and will dive and forage as usual. This is a huge benefit not only for the quality of data we get, but also reassuring us that we're not stressing them unduly.

By this point, maybe three weeks of our field season have already gone by, and we feel the clock ticking for all the experiments we have yet to accomplish in the remaining six weeks. Most everything is weather-driven, so if the weather's good, we go all-out and do as many experiments as we can, seven days a week. To me, one of the most challenging, but also enjoyable, aspects of doing work in the "deep

South" is that you have to be flexible, and not get flustered when plans change due to weather or equipment failures. Which happens often.

Besides that, it helps to be a jack-of-all-trades, maintaining a creative, open mind about how to solve problems, often on-the-fly and (of course) in the cold, using the materials at hand. My "typical" duties while in the field run the gamut, including: driving snowmobiles or tracked vehicles, running drills and chain saws, shoveling snow, cooking, soldering electronics, scuba diving under the ice, anesthesia and surgical procedures on the penguins, sewing harnesses, taking helicopter flights to various penguin colonies, performing biochemical laboratory assays, mentoring grad students, and: just taking time to watch the marvelous penguins, and look around in awe at the vast beauty that is



A penguin showing recorder mounted on back.

like nothing else on earth. That's why a "typical" day can last 15 or 18 hours, every day of the week. Fortunately, we enjoy 24-hour daylight from about Oct. 22 to Feb. 22, which seems to make many of us feel as if we need less sleep.

Our research is focused primarily on



Ed Stockard

Underwater shot of Emperors around a corral hole.

learning how emperor penguins dive so long (nearly 30 minutes) and so deep (more than 500 meters/1600 ft.). We instrument them with data-loggers that record such things as body temperature, electrocardiogram (ECG) signals, or oxygen levels in the blood or air sacs. The birds are allowed to dive freely to catch their own fish, while the recorders log data continuously for the 1-3 days they are on the bird. Separate loggers keep track of when the bird is on the surface vs. in the water, and record the depth profiles of the dives. Finally, when blood samples are obtained, we take them into the lab hut to determine blood gases (oxygen and carbon dioxide tensions), oxygen content, pH, hemoglobin concentration, hematocrit, and amount of dissolved nitrogen.

But how does one do these things? The statement "put a data logger on a penguin" sounds innocuous enough, and probably warrants a mere sentence in a scientific journal, but...how does one actually do that?? Two of the biggest challenges we face continually are: how do you make something that will stand up to both saltwater and extreme cold? Either criterion

can be tricky enough by itself. And it's the little things that'll get you. For example, probably everyone knows how useful duct tape is, and we joke that duct tape holds the world together. However, duct tape in the cold? And when it's wet? Useless. We use a magical tape related to duct tape, made by a German company called Tesa, that is truly a wonder: it holds for days, even weeks, in saltwater, and withstands the -25°C windy cold without getting brittle and breaking. BUT: only if you apply it when it's warm and dry. Try to peel off a strip with your cold fingers when the wind is blowing snow and the temps are that cold, and you might as well be holding a strip of paper in your hand—no stick whatsoever. Often one person is designated as the tape-keeper, holding it in a parka pocket or under an armpit. A Japanese collaborator of ours came up with the cleverest solution, though: he fills a quart-size plastic water bottle with warm water and applies pre-cut strips to the outside of that. They're easy to peel off out in the field, and they work great. Besides Tesa tape, our fasteners of choice are Velcro, 5-minute epoxy, and plastic

cable ties to attach recorders to the feathers. After a few days, when the experiment is over, the recorder is easily detached from the Velcro, which itself peels off the feathers easily. A couple of months later, the birds molt, which gets rid of any residual glue.

Waterproofing is another big nemesis, largely due to the difficulty of finding cables and glues that won't get brittle and crack in cold air and water. Discovering materials and methods of waterproofing our oxygen probes and ECG leads has been one of my more time-consuming jobs. But when you travel thousands of miles just to get to Antarctica, and then you only have a few weeks to work with the birds and get your experiments done, it is dismaying to lose an entire experiment due to a shorted cable. Been there, done that, not fun. Batteries are another problem: they drain quickly in such extreme cold. When deploying satellite transmitters on migrating penguins, for example, we're lucky if they last even four or five months. Until that technology improves, mysteries remain as to where the adults go to molt, or the juveniles go for the first two years after they fledge.

Speaking of cold, one of our research projects involved measuring temperature in different parts of the emperor penguin's body, to determine if they were getting hypothermic, and thereby extending their dive time by slowing their metabolism. The short answer to that question is no, their core body temperature stays normal while they're diving, although their wings and feet get cold. However, one of the most fascinating things we learned is just how good an insulator their feathers are. Emperor feathers are packed densely and overlap tightly, forming a layer about an inch thick. They overlap so tightly, in fact, that the down layer next to the skin retains air and stays dry even at 1600-foot depths.

In one experiment, we attached a small thermistor to record temperature at the skin surface, at the base of the breast feathers. One night, the air temperature

dropped to $-22^{\circ}\text{F}/-30^{\circ}\text{C}$, yet when we checked the data, we found that the skin had only cooled to $93^{\circ}\text{F}/34^{\circ}\text{C}$, just a few degrees below normal body temperature. So there was a $115^{\circ}\text{F}/64^{\circ}\text{C}$ temperature differential across a mere one inch of feathers. Granted the emperor penguin must have an active metabolism to maintain that temperature, but it is remarkable how little is lost through the feathers. Some years later, we confirmed this with an infrared heat detector: when a bird comes back from a dive, for instance, it practically blends with the ambient air, there is so little heat lost, one of the many things that makes you realize how finely adapted these birds are for living in the Antarctic environment.

Finally, one of the more unusual challenges to doing experiments with emperor penguins involves one of the other common inhabitants of the McMurdo Sound fast ice: the Weddell seal. These large seals (800-1200 lbs) are masters of the fast ice due to their ability to locate even small holes or cracks to breathe through. They even have forward-projecting incisors which they use to ream openings in the ice. So when we drill two 4-foot diameter holes into the sea ice of our camp, they appear from underwater as bright beacons of breathing hole nirvana to these animals. Most years, the seals will find our holes within 24 hours of drilling. (We surmise that they may have learned the sounds of the machinery.) Weddells are territorial about their breathing holes, and due to their large size would be difficult to discourage. Although they will not eat or harm the emperors, their presence can be intimidating to the birds if they hover close to their exit holes. Our solution, therefore, is that we drill extra holes, specifically for them, and hope they will like those better than the ones in the penguin corral. (If a seal hauled out inside the corral, it could easily destroy the fencing, which would certainly slow down our day to say the least.) Two of our huts have trap doors in the



Ed Stockard

Weddell seal with an Antarctic "cod" (Dissostichus mawsoni); Weddells can weigh 1000 pounds, the "cod" 100 pounds.

floor, and we position those directly over the seal holes. The seals like them because they are large and protected from the weather. It's an amazing experience to sit in the hut, working on your computer or an experiment, or eating your lunch, while watching one of these large animals surface right next to you to breathe. They are generally unafraid, and uninterested in us. Sometimes they bring up very large Antarctic "cod" (*Dissostichus mawsoni*, related to the Patagonian Toothfish, and commonly known as Chilean Seabass in US markets), as large as five feet long and 100 pounds, and slowly consume them over the next hour or so. The toothfish species south of 60°S are currently protected by the Antarctic Treaty, but are under severe threat from poachers, as the northerly populations have now been overfished. We hope to use our observations of the Weddell seal consumption rates to bolster international efforts to protect these slow-reproducing fish.

We can watch Weddells and penguins swimming underwater from a sub-ice

observation chamber that gets lowered through a hole on the edge of the corral and frozen in place at the beginning of the season. Access is gained by climbing down a 24" diameter iron conduit – not for the claustrophobic at heart.

At the end of our field season, which is usually about the first week in December, when the sea ice starts to thaw, we pack up camp and bid au revoir to these fascinating birds and seals. If the ice edge is far away, we return the penguins by helicopter. If it's close, we simply open the corral, and they know exactly where to head, walking or tobogganing in single file toward the water. The beauty and unspoiled nature of the continent, the ice, and the wildlife always far outweigh the hardships of the cold. My wonder never ceases when I'm down there, and I always learn something new. I consider it a privilege and my great fortune to have had the opportunity to work in Antarctica, and I would encourage anyone to visit if they get the chance. Truly an experience of a lifetime.

Mount Washington: Not Coastal But Cold

BY GEORGE KOWALLIS



How cold is cold? One January night on a college outing club trip to Saranac Lake, NY, the temperature dropped to -40 degrees F. The lifts at nearby Whiteface Mountain would not start running until temperatures rose to -20. Avoiding frostbite while you were riding up on the chair lift was the main danger. The skiing wasn't bad at all.

The north and south polar regions and Siberia are chilly, of course. So are the inland cities of Moscow, Russia and

George Kowallis practices child, adolescent, and adult psychiatry in New York City. He is a trustee and past president of the Society. He enjoys marine biology, molecular genetics, winter mountaineering, and meteorology.

Fairbanks, Alaska, notable also for their correspondingly warm summers. Try Toronto on New Year's Eve for bone chilling cold. Not my choice for ringing in the New Year. Iceland in March is a bit on the numbing side; 20 degrees F. and blowing snow are common. Fortunately, there are the sturdy Icelandic ponies to carry you around and the geothermal springs to bathe in.

But what about Mount Washington, New Hampshire, "Home of the World's Worst Weather?" Mt. Washington is located at the confluence of three major storm tracks ensuring constantly changing weather. Add to this the Bernoulli effect of winds trying to get around a 6,288-foot mountain and you have the ingredients for record wind speeds. On April 12, 1934,

wind speed on the summit reached 231 This January, the ALS inaugurated its first excursion to the summit for a two-day EduTrip on global warming and climate change. On my four previous trips to the summit the weather had always been different so what would happen this time? Would it be -30 F in the parking lot and 0 on the summit which happens when a stable high pressure system sends the coldest air into the valleys? Or would the reverse be true?

Saturday, January 14, we started up the mountain in a Snowcat with outside temperatures in the 40s and rain falling. This would be true all the way to the summit.

Slush covered the Auto Road and even threatened to trap the Snowcat as it pooled unexpectedly a mile and a half below the summit. Wayne, the operator, is young and radiates good health as is true of so many of the local populace. He used to groom ski slopes but needed more excitement and changed to making the Mt. Washington run. In summer, he switches

to commercial diving or helping his mother run the family farm. He is clever in dealing with a slush-hole in the road and eventually we arrive at the top where temperatures will sit at 37 degrees all day with the rain still pouring and fog everywhere. When the eye of this southern, low pressure system passes overhead, the vistas open up for 45 minutes and all the stunning beauty of the White Mountains unfolds. It is addicting and I think this is what brings people back time and time again. Then back into the clouds and continuing warm weather for many more hours than predicted. But the approaching cold, high pressure system from the Arctic would quicken its assault. This change would produce a different kind of precipitation and stunning wind speeds.

When we awoke Sunday morning, January 15th, temperatures had fallen to 3 degrees F. and the wind, now roaring since 3 AM, rises to 80 mph. Wind driven snow makes it difficult to see very far but we suit up, step outside our bunker, and round





Postures when exposed to the wind's full force.

the concrete observation building. Still on our feet, we tour the outside of the other facilities topping the mountain. We conquer the 2-story snow drift at the Yankee building, and glimpse the unusual array of antennas here. Kind of spooky, these. Keeping your footing has become the main challenge. Face into the wind and it is hard to catch your breath. No wonder babies cry when held into the wind. Later, on the observation desk, it is all I can do to hold on to the railing with both hands. My heavy duty Gortex outer gear flapped furiously against my body. A meteorology intern had lost his footing and is now crawling back on his stomach using the spaces between the 40-pound floor tiles as hand holds. He makes it to the tower.

The next day, after our group had descended to the relative calm and now bitter cold of the valley, the winds would gust to 142 mph on the summit. A group

of interns who had gone out on the observation deck could not make it back to the tower entrance and had to work their way around to the front entrance used by the Snowcat when it delivers passengers and supplies. After a certain point, you can no longer win against the wind. You become no more than a leaf or, perhaps, more like a projectile. No wonder that not much snow can stick to the summit. It is driven into the ravines and makes for great spring skiing such as in Tuckerman's.

For Sunday, the wind-chill runs at -26 degrees F. This is dangerous weather and requires that every inch of your body be covered and that you wear multiple layers of synthetic fabrics. Keeping your goggles clear is no small matter. A product called "Cat Crap" is the recommended treatment by Ragged Mountain outfitters. Antifogging sprays don't work consistently. Sometimes, nothing works. These

severe weather conditions make for excellent training grounds for those wishing to attempt Denali or Everest. The IMAX film on Everest had the portions of the South Col high camp shot on the slopes of Mt. Washington.

The earliest observatory was a wooden building lashed down by huge chains. The present structure is reinforced concrete with bullet-proof windows. It is warm and secure inside. The building was designed to withstand the fiercest storms coming from the northwest. However, should a storm rage from the south with rain, then the tower building, with its weather and pollution probes on top, leaks through the doors and a pool of water accumulates at the bottom and has to be periodically drained with the sump pump. If not removed, an indoor ice rink would result when the weather cools. The food is good and there is even a television in the lounge. Cinema greats such as "Breakfast of Champions"—diner and waiter attempting breakfast in hurricane winds—and a young Ben Affleck's first trip to the summit are shown regularly.

In the observatory, a museum diorama shows how the White Mountains were formed by up-thrust of Littleton schist, a metamorphic rock. There is not much granite in this part of the granite state it would appear. The museum also contains a phenomenal collection of alpine plants embedded in plastic. The alpine flora have much the same problems as those living in the marsh, i.e., how to find enough liquid, fresh water to live. Hence, you see similar *Juncus* species, succulents, and so forth. The array of lichens and mosses is of special interest and worthy of a summer trip for further study. The alpine blooms of spring are legendary.

Hanging out in the weather room is a great place to watch developing storm patterns and the supercomputer models at work. Watching the weather observers perform their duties is a great learning experience. So, too, are the lectures given

by our leaders, Michelle Day and Kim McCracken. Michelle has drilled ice cores in the Antarctic and tells how the brittle, drilled cores, previously under tremendous pressure, have to be aged for a year before they can be moved to various labs around the world. The air bubbles trapped in the ice tell us much about the past. Kim reviews the evidence for global warming and prepares us for the prediction that by 2050 the American breadbasket will have moved to Canada. So, too, the beech trees and sugar maples, which will no longer be able to grow in New England. I already know that the surf in the Mid-Atlantic states will be breaking 100 yards inland by 2040.

While Mt. Washington can be biting cold, with global warming it can sometimes be surprisingly mild. Super Bowl Sunday, 2005, featured a record tying temperature of 42 degrees and no wind, excellent conditions for grilling your favorite cut of steak, chicken or fish. Wait a day or two and it is profoundly cold and windy again.

Each trip to the summit is a unique experience. You just never know quite what to expect. Join us sometime and share the weather. You be the judge of how cold is cold.



A mountain red fox, also fully furred for its habitat.



Tagging Report

by PAM CARLSEN,
ALS Tagging Director

It was Hillary Clinton, who said, "It takes a village to raise a child." Similarly in the winter, especially, it takes cooperation among many folks to complete a tag recapture. North Carolina has been the focal point of these returns for both striped bass and summer flounder. Two tagged striped bass (rockfish) caught in gill nets in Abermarle Sound in January by commercial fishermen, were boxed and landed in Wanchese, NC. There, the tags were pulled by fish house worker, Richard Moore, and were sent to Jeff Ferrence, NC Division of Marine Fisheries. Ferrence returned the tags and recapture information to us. One of these fish was tagged by Kevin Carrigan in August in Rockport, MA, the other in Raritan Bay in May by Frank Tellefsen. Two tagged summer flounder recaptured in January were caught by offshore trawlers at the Hudson Canyon in 40-43 fathoms. Both were boxed and landed in North Carolina, one in Englehard and the other in Oriental. Once again, these tags were pulled by fish house workers and were sent to Lele Judy of the Pamlico district of the NC Division of Marine Fisheries, who returned them to ALS with the recapture information. One of these fish was tagged 1.5 mi. E of Monmouth Beach, NJ, by Bob Slobodian in June, the other by Robert Anderson in Fire Island Inlet in May.

Another North Carolinian, Mark Hamric of the NC Fish House Survey, cooperates with us to return our tags. In March, he returned a fluke tag that had been caught by a trawler in the Hudson Canyon in 40 fathoms and landed in Atlantic Beach. This fish was tagged by James Hickey in July at Long Branch, NJ. When I spoke to Hamric, I inquired why

so many fish caught in Hudson Canyon are landed in North Carolina. He told me that the overabundance of spiny dogfish have fouled the trawler's nets in local waters. Commercial boats are travelling farther to catch fish. Winter in the offshore canyons is a hard way to make a living.

Men earning their living by the sea is part of our history and it continues to this day. Eugene Mayer, based in Seattle, sails onboard a container ship all over the Pacific. On recent trips, injured birds have landed on the deck of the ship. Even the toughest of seamen were concerned with the care of these creatures, though no one could identify the species. Pictures were taken and sent to ALS. With the help of Scott Barnes, of the Audubon field station, the birds were identified as mature and immature tropicbirds. These ternlike, fish eating birds, have four toes webbed and two very elongated tail feathers, which were evident in the photos. This

GET HOOKED ON FISH TAGGING

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MA. Before all this can happen, all “problem” tag data must be resolved. A tag card returned by Lloyd Vosseller, Harvey Cedars, NJ, had no information other than his name and address. In response to my inquiry, he wrote, “Sorry about that, don’t know how I missed filling in the card. Anyway, it was a nice evening, no bugs, in my favorite fishing hole back in the flats, relaxing after a hard day at work, all alone just drifting through the cut enjoying the scenery and life and the lack of the summer hubbub. Then BINGO, I started out catching

information has been forwarded to the crew.

Each year, Eugene returns in late spring to fish and tag with his father, Eugene Sr., on the north shore of Long Island, NY. In June of 2005, the Mayer team tagged a fluke in Huntington. In January, this fish was recaptured by a commercial trawler, offshore of New Jersey in 54 fathoms. This tag was removed and returned to us by a NMFS observer onboard the vessel.

April 15 is the BIG TAX deadline and is a self-imposed date to send the previous year’s tag data to NMFS, Woods Hole,

on swimmer and teaser then worms started coming through with the tide, dancing all over the top — POPPER time. I caught 20 bass 12” to 25”, tagged ten, ran out of tags on the boat. Right place, right time, great fun.” The date was 8/16/05, in Barnegat Bay behind the light-house and the striper was 15.5”.

This year, our taggers tagged 25,886 fish: 18,467 were striped bass, 3,370 summer flounder, 1,282 bluefish; the balance was a variety of saltwater species. We recorded 1,250 recaptures. All totals were up from 2004. Thanks to all.

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Book Reviews

BAYOU FAREWELL

By Mike Tidwell

Vintage Books, New York
333p. Paper.

This is a wonderful, sad book, for it describes, sometimes prophetically, what it is like to live and work in the marshy bayou country between New Orleans and the Gulf of Mexico. It's a land of alligators, nutria, and egrets, shrimpers, crabbers, and trappers, and Cajuns, good food, and music. It is also a land that is sinking, eroding, and cutting itself to shreds.

As the author writes, it took the Mississippi River seven centuries to create the 6000 square miles of the Louisiana wetlands known to exist in the 1880s. "Then, in the blink of an eye, in just over a century, almost a third of that land, 1800 square miles, disappeared due to human interference." The land the Mississippi created — just about a square mile a year — was sediment from a massive watershed that starts in Montana at the headwaters of the Missouri River and the upper reaches of the Mississippi in Minnesota. But dams on these rivers have cut sediment loads in half since the 1950s. Additionally, a system of levees and channel dredging has fouled up the system even more, and thousands of miles of canals dug by the oil industry through the Mississippi delta have lined up to provide the finishing touches.

As a consequence, the Mississippi delta has lost its barrier islands, and its wetlands have lost much of their capacity to absorb the force of storms coming in from the Gulf. Here's Tidwell, writing three years before Hurricane Katrina: "Time was also running out for about two million Louisianans who depend on the state's coastal wetlands as a buffer against hurricane damage...the marsh continues to disappear at a rate of 25 square miles per year. This...means that hundreds of Louisiana towns and cities, all just a few feet

above sea level, lie increasingly prone to that deadly wrecking ball of hurricane force known as the storm surge. Coastal wetlands, it turns out, provide more than just a critical nursery for shrimp, crabs, and fish. Every 2.7 miles of marsh grass absorbs a foot of a hurricane's storm surge... For New Orleans alone, hemmed in by levees and already on average eight feet below sea level, the apron of wetlands between it and the closest Gulf shore was, cumulatively, about 50 miles a century ago. Today that distance is perhaps 20 miles and shrinking fast. With very slow evacuation speed virtually guaranteed (there are only three major exit bridges that jump over the encircling levees for central New Orleans's 600,000 people), it's not implausible that a major hurricane approaching from the right direction could cause tens of thousands of deaths."

But the author's focus is on the Cajun bayou country downstream, settled by French citizens who fled France first for Acadian Canada before finding a Spanish welcome in Louisiana. Tidwell hitches rides in boats and cars, goes out to trawl for shrimp and pot crabs, goes dancing and hangs around docks. He gets to know a fisherman with "hands as thick as encyclopedias" who lost a finger to a catfish spine, the man who works on a shrimp boat barefoot and limps around the boat because he jammed a shrimp face into his foot, Americorps youngsters planting marsh grass to slow erosion, and up in New Orleans scientists trying to figure out ways to save the delta.

There appears to be no easy answer — or answer at all — to the problems drowning Louisiana's Cajun coast. Tidwell sees a way of life vanishing, and he doesn't like it.

STRIPER WARS: AN AMERICAN FISH STORY

By Dick Russell

Island Press, Washington, DC.
316 p. Cloth.

On the East Coast from the Canadian Maritimes to Cape Hatteras, the striped bass is the recreational shore fisherman's Holy Grail. Some may argue for the Atlantic

salmon up north but they are mostly gone, and you hear talk of bluefish, weakfish, fluke, and, farther south, channel bass. The offshore warriors are likely to be tuna people, but for the close-to-shore fisherman, the striper is king. And, why not? It grows fast, gets big, is strong as an ox, looks great, bites day and night, likes the surf, and, many believe, is good eating if not too big.

Striped bass chomp down on almost anything that moves. You can catch them with bait — eels, bunker chunks, clams, with surface plugs, swimming plugs, poppers, metal lures, bucktails, jigs, and saltwater flies from boats, from the banks of estuaries, and from a roaring surf. You can catch them up rivers and in lakes where they have been stocked. You can even catch striped bass on the West Coast after a successful stocking program 135 years ago (fingerlings out of the Navesink River, five miles upstream from the Society's office).

There are also times when you can't catch them, and that's where "Striper Wars" comes in. Like all fish, striper populations rise and fall naturally. There can be multiple factors — food, water temperature or salinity, disease, and predation. In the early 1970s, striped bass were up and doing fine; then the roof fell. What to blame? Commercial fishing, recreational fishing, habitat loss, PCBs, DDT, power plants, spawning failures? Probably, all of the above. One closely watched indicator has been the spawning success of Chesapeake Bay stripers — the record high number was 30 in 1970 to an all-time low of 1.2 in 1981. That was one signal nobody missed because the Chesapeake contributes hugely to the East Coast population.

Fishermen and fisheries scientists/managers went on high alert. Russell does a fine job explaining the issues — when the war started, who the warriors were, and whether there has been a winner. Striper passions ride high — Robert Boyle castigates Con Ed and General Electric; Bob Pond goes after chemicals in the Chesapeake; Frank Perdue tries to tame his chicken wastes. There are boycotts, moratoriums, state vs. state squabbles, curs-

ing matches, and fisticuffs. Fishing clubs come together and break apart over how many stripers of what size their members should be allowed to keep.

Russell tells an interesting story extremely well. He catches people's characters, and he seems to have been at every important striper meeting for 20 years. Even if you've never caught a striped bass or even gone fishing, this is a rousing tale of politics, chicanery, passion, lies, hyperbole, and even some laughs. The battle continues: mycobacterial infections that seem to have occurred first in the Chesapeake striped bass stock appear to be spreading. Man your battle stations.

OUT OF THE BLUE: A JOURNEY THROUGH THE WORLD'S OCEANS

By Paul Horsman

MIT Press, Cambridge, MA
157 p. Cloth.

In eight sections with wonderful photography, Horsman provides a good, non-technical description of why and how different things live in the ocean where they do. He starts at the lower end of the food chain with plankton and then clicks off migrants, coral reefs, fishes, and marine mammals and zeroes in on unusual adaptations and habitats: bioluminescence, deep oceans, and the Sargasso Sea.

There are especially interesting sections on the Sargasso and the variety of animals adapted to make a home there, on sea mounts, volcanoes rising above the ocean's floor, often at mid-ridge lines (Bermuda, the Azores, and Hawaii are sea mounts that made it to the surface), and sea vents, underwater geysers 7000 feet deep shooting 750-degree water, hydrogen sulfide gas, heavy metals, and extreme acidity, and still home to more than 300 species, including giant clams, blind shrimp, and tubeworms — some call them "extremophiles."

There is much to learn here for adults, and it would be especially attractive for the seventh grader who can't get enough information about what lives in the ocean.



RAPTURE OF THE DEEP: THE ART OF RAY TROLL

By Ray Troll and Brad Matsen

University of California Press,
Berkeley, CA
127 p. Cloth.

There is Ray Troll in his studio in Ketchikan, Alaska, surrounded by books about dinosaurs, fish and fishing gear, evolution (sorry, Kansas), sea shells, fossils, and boats. Skeletons hang from the rafters along with old t-shirts. On a nearby shelf lurk pickled specimens in dusty jars. Troll is at work in a world of his own, a world of weird creatures, pleasant dreams, nightmares, and a life-long interest in things that live (or used to live) in the sea.

His mind races as he attaches words to his art. You might have seen some of his t-shirts — bold and sometimes spooky colors with often ridiculous titles: “Fish Worship: Is it Wrong? (people praying to a salmon); “Weapons of Bass Destruction” (bass chasing fishing lures); “Rebel Without a Cod” (James Dean with an empty fish picker); “In Cod We Trust”; “Bassackwards” (bass in a boat fishing for people) and upside down bass. Of this picture, Troll comments: “I liked the idea going after the humans, using such things like

money, liquor, and — much less successfully — literature for bait.”). And his most famous shirt: “Spawn Till You Die,” a montage of spent sockeye salmon, nude humans, and a skull (on black, of course).

There are sharks running with dogs (Dogfish); Hell’s Angler, depicting a skeletal motorcyclist holding a spinning rod inside a fish’s mouth; and a man riding the back of a giant salmon across a night sky. And “Rapture of the Deep,” which Troll explains this way: “Scuba divers who get a

little too deep sometimes report an odd dreamlike sensation called ‘rapture of the deep’ or the ‘martini effect’. It’s caused by too much nitrogen building up in the blood, and it can cause divers to hallucinate. I’m only an ardent snorkeler, so I never experienced it, but this is my artistic interpretation of the experience. The dazed-looking helmeted diver in the lower right is surrounded by a whole menagerie of my deepwater favorites, from ratfish to coelacanths.” Troll neglects to mention other items in the picture: mermaid, cat, sunglasses, television set (with rabbit ears), loon, pencils, a pair of feet, a partial human skeleton, and a saxophone player.

Included are his wonderful paintings of the fishes of the Amazon River, Tlingit totem poles and masks, fossils, and sharks and skates. The body of work is kind of like a combination of Spiegleman, Mad Magazine, Magritte, and a skilled draftsman. The layout and illustrations are just right. And Brad Matsen deserves special mention as the book’s narrator, Troll associate, and maybe the only person equipped to handle the delicate job of keeping Troll’s eye on the job, creating just enough order to get it between covers without curbing Troll’s enthusiastic stream of consciousness.

The Last Page

EVERY QUESTION DESERVES AN ANSWER

The mailbag is overflowing with serious questions, well thought out and succinctly posed. Please don't be afraid to write for answers. Remember that tired cliché: "The only bad question is the question unasked." So here are some answers - keep those letters coming, or you can email to www.gofish@invertebrates.org.

Q: For a big seafood party we're throwing next week, I need to chop onions for a squid ceviche, but my eyes will water. Any suggestions?

A: The answer is right in front of you. Cut off the end of the squid so you have just the head, eyes, beak, and tentacles. Place the head of the squid between your nose and upper lip with the tentacles dangling over your mouth, and scrunch up your lip so you can hold the head between your lip and nose. Lean forward and down; the tentacles should droop out. Then chop the onions; the tentacles will protect your eyes from the onion fumes. Remove the squid head before your guests arrive.

Q: Have all the things that live in the ocean been discovered?

A: All but two.

Q: What's the best way to keep from getting seasick?

A: To avoid seasickness, stay on land, but if, for some silly reason, you decide to go out in a boat try the following: take seasick pills eight hours before sailing, or seven hours before sailing, or six hours, or five hours, etc., eat a full meal before sailing, don't eat before sailing, avoid greasy food, nibble on saltines, don't lie down, stare at the horizon, lie down, face the wind (but stay on the lee side), bind both wrists with duct tape, don't go in there where big guys in muscle T's are smoking cigars and drinking beer, suck on wedges of lemon or lime, chew ginger, drink ginger ale, don't drink carbonated beverages, don't get stuck next to the person gnawing on the super sub, chew gum, stand in the middle of the boat, or find a corner, lie down, assume the fetal position, and moan. If all else fails, buy the boat and order the captain to head for land.

Q: Here's a riddle: How did the skinny guy get stronger? (I'm seven years old).

A: He went down to the shore and came back with mussels. Even for a seven-year-old, this is a childish riddle. Might I suggest you load something more intellectually challenging on your iPod and do a little l-e-a-r-n-i-n-g. (P.S. I doubt you'll ever be Ivy League material.)

Q: We have some neat fish in our aquarium, but they are lazy and don't pay any attention to us. What should we do?

A: There's nothing worse than a bunch of indolent, self-centered fish. I have found I can get their attention best by rapping sharply on the aquarium glass with a fifty-cent piece or a teaspoon. Boy, do they react! I tried it on a zebra fish the other day and it jumped out of the tank and landed on the floor eight feet away...and lived. Looked like a salmon climbing a waterfall.

Q: What was the name of the fish who was a popular radio comedian back in the 40s?

A: Jack Blenny (2.7 on the laffometer).

Q: I don't believe your readers send in questions. I think you make them up and then give stupid answers. To test this, I dare you to print this fish question and answer it correctly: How can you tell a red hake from a white hake?

A: Red hake (*Urophycis chuss*) closely resemble white hake (*U. tenuis*); they differ primarily in having fewer lateral line scales (95-117 vs. 119-148). Plus, reds have three gill rakers on the upper gill arch while whites have two. Hey reader, how do you like dem apples?

Coming Next Issue: Twelve Uses for Old Seaweed

D.W. Bennett



AMERICAN LITTORIAL SOCIETY 2006 FIELD TRIP SCHEDULE

August 14-18 Gulf of Maine Deep Water Cruise for Marine Mammals – Leader: Bob Quinn
Not your typical whale watch. This is a 100-mile cruise offshore in the productive waters of the Gulf with scientists to look for whales, dolphins, sea turtles, sharks, and birds. Three nights onboard and a day ashore.

August 17-20 Cape Ann Whale Watch – Leaders: Don Riepe, Mickey Cohen
Onshore and offshore around historic Gloucester. Canoeing on the Ipswich River, half-day whale watch trip, a sunset river cruise, and a visit to the Parker River Wildlife Refuge, with a lobster dinner in there somewhere.

September 12-18 Prince Edward Island and Bay of Fundy – Leader: Bob Quinn
The renowned high tides of the Bay of Fundy and the peaceful, sunny coast of Prince Edward Island for rocky shores, birds, and wildflowers, plus a charter boat trips (seals, whales, birds). The trip starts in Bangor, Maine.

October 12-15 45th Annual Meeting, Chincoteague VA
Once more to the Virginia coast – hikes, birds (during fall migration), beaches and dunes, wetlands, netting from boats, lighthouse, surf, tide flats, a seafood feast, and, yes, the Chincoteague ponies, all within the sprawling Chincoteague National Wildlife Refuge.

For details, check your field trip schedule, phone for another copy, or go to the Society's website (www.littoralsociety.org), or phone or email Pat at 732-291-0055; Pat@littoralsociety.org.

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