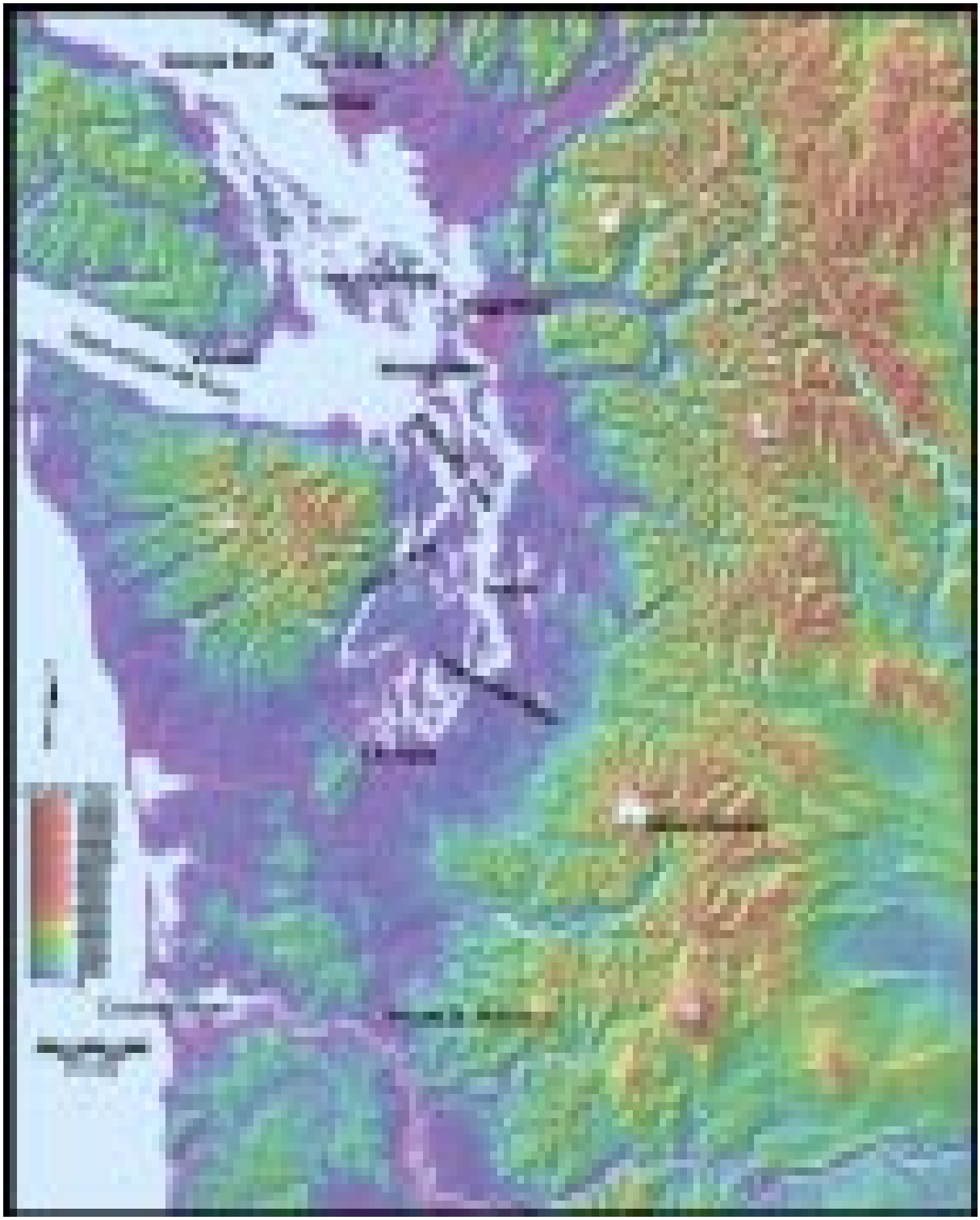
Orcas
In Our Midst

The whales who share our inland waters

Volume 2: The next generation



Salish Sea Watershed and Columbia Basin

The Salish Sea includes marine waters from Puget Sound, Washington to Georgia Strait, British Columbia. Orcas forage and travel throughout these inland waters, and also depend on salmon returning to the Columbia River, especially in winter months. Map courtesy of Harvey Greenberg, Department of Earth and Space Sciences, University of Washington (from USGS data).

Orcas In Our Midst

The Whales Who Share Our Inland Waters

J pod, with some L pod orcas, in a formation known as "resting." In this pattern, pods travel slowly in tight lines just under the surface for a few minutes, then rise for a series of blows for a minute or two. Photo by Jeff Hogan.

Volume 2: *The Next Generation*

Second Edition, March, 2006, updated August 2010

First edition funded by Puget Sound Action Team's Public Involvement and Education Program

by Howard Garrett
Orca Network

Whidbey Island, Washington
www.orcanetwork.org

Olympia, Washington
www.psat.wa.gov

Teachers: **Student Activity guides by Jeff Hogan, Killer Whale Tales, Vashon, WA available at *www.killerwhaletales.org* or contact *info@orcanetwork.org*.**

Orca Network is dedicated to raising awareness about the whales of the Pacific Northwest and the importance of providing them healthy and safe habitats.

*COVER: "**Salmon Hunter**" by Randall Scott*
Courtesy of Wild Wings, LLC.Lake City, MN 55041
Prints by the artist may be ordered by calling 1-800-445-4833

J1, at over 50 years old, swims in the center of a tight group of close family including newborn J38, at right. Photo by Jeff Hogan, Killer Whale Tales.

Dedication

To the mysterious orcas roaming these bountiful waters, to readers of all ages who seek to understand wildlife in their natural settings, to celebrate the whales' presence here, and to help protect and restore the habitats we share with our orca neighbors. This second edition is also dedicated to the memory of L98/Luna, lost from his mom and family in Nootka Sound, B.C. for five years until his death March 2006.

Orcas In Our Midst

HE GLIDES ON SWIFT, tumbling currents along the western bluffs of San Juan Island. Gracefully parting dense kelp strands, he slightly rolls his streamlined form to scan with sound for fish in the shadows. He hears echoes off a rocky point he knows well from his 20 years of searching for salmon along these cliffs. Snails on broad kelp ribbons trace along his sides as he turns down the canyon wall past purple seastars, spiny urchins and undulating jellies.

He slows his heartbeat and with a few strokes of his flukes, plummets hundreds of feet to a granite overhang where he recalls a tasty silver salmon once hid. His short bursts of ultrasonic sonar cut through the darkness, reflecting on a huge octopus slithering its way to a crab, a rockfish hovering where shrimp larvae float by, and an old halibut flattened in a patch of sand. Then the echoed pings of salmon scales emerge from 50 feet away in the blackness. A flick of his flukes and the plump treat is pinned in his teeth. A quick shake removes its head and the fish goes down his throat while he beams to the surface for a breath.

He calls out, then joins his mother and siblings who have also been foraging, and together they meander northward along the cliffs of Haro Strait. As they round Kellet Bluff and aim for Turn Point across seven miles of open water, they join other members of J pod and step up the pace to a full gallop, stroking powerfully just below the surface, rising together to breathe every few minutes. Ranging in age from a few months to over 90 years, they know every rock and kelp forest for miles around and know they will find more salmon along the steep walls of Stuart Island.

J10, Tahoma, in 1996, about 34 years old, in typical travel with her son J18, Everett, at 18. Photo by David Ellifrit, Center for Whale Research.

The orca, or killer whale, is a wondrous and impressive creature by any measure. Animated in our collective imagination along the Pacific coast of North America, orcas are masters of their realm. Incredibly swift and supple, and steeped in precision teamwork, there is not a predator in the sea that can touch *Orcinus orca*. And yet, there is no recorded case of a free-ranging orca ever harming a human. How are we to know and understand these extremely powerful, yet peaceful whales?

In 1977 a male orca was born into his extended family, known as the *Southern Resident orca community* (SRC), made up of J, K and L pods. He was given the scientific name J18 to indicate his pod and birth order. His mother, J10, later known as Tahoma, was among the first orcas identified in the mid-1970s during early field studies of the J clan, as the community became known scientifically. She was usually found close to her own mother, J9. Tahoma was 15 when Everett, as he was later named, was born, and with J9's guidance she was attentive and nurturing toward him. J9 died in her late 60s in 1985, the same year that Tahoma's third offspring was born. In early 1998 Tahoma and Everett, along with his two younger sisters and their two kids, seemed to be a healthy orca matriline.

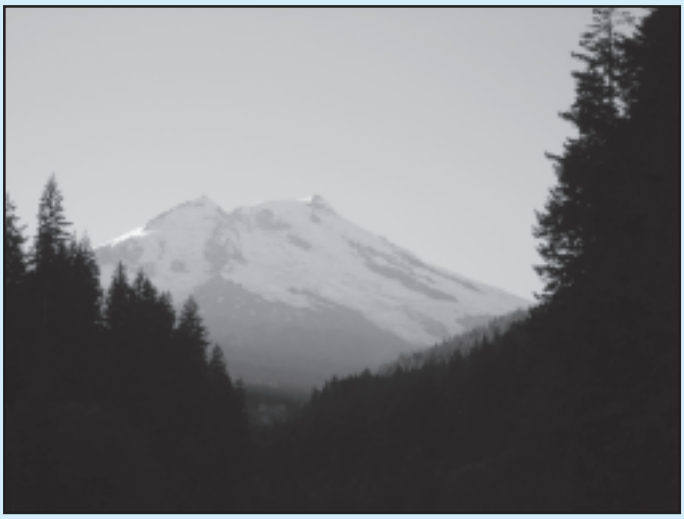
Scientists estimate that Tahoma was born in 1962. In her early years, between 1966 and 1973, about 58 of the very young — almost half the Southern Residents — were caught in nets and removed for display in marine parks or killed during 13 capture operations. By the mid-1970s only about 70 remained in the community. Tahoma must have been slightly too big to be captured, or her story might have ended years ago, and Everett, his sisters and their young ones might never have been born.

Back when Tahoma was born we knew them only as

The Habitat

ORCAS OF THE SALISH SEA must possess deep knowledge of their surroundings. They share information over generations and their ancestors have probably lived here since the glaciers retreated and salmon appeared well over 10 thousand years ago. To locate their food the whales need to know the pulses of salmon migrations and where salmon travel, rest and hide as they return to the streams where they began life. But regardless of how well the orcas understand the workings of the Salish sea, without healthy and productive habitats throughout the watershed, including far upstream, the orcas can't continue to live here.

For the past 150,000 years waves of glaciers have sculpted deep chasms and left mountains of glacial sediment, gravel and rock. Around 13,000 years ago the ice began to melt again and new streams poured more silt into valleys and wetlands. Thousands of years of heavy rain and snow created a rainforest of massive cedars, spruce and fir that sheltered streambeds coursing with cool water. Then, as now, a few "pioneer salmon" found rivers and streams suitable for the ancient ritual of scooping out redds to deposit and fertilize their eggs.



The east face of Mount Baker. The Salish Watershed rises to mountains that shed water into rivers and streams. Salmon need clear, shady streams to spawn and nurture young fish, and orcas need abundant salmon to survive. Photo by Howard Garrett.

Evolution quickly designs salmon to fit the conditions in each streambed. Native salmon runs interweave to produce a symphony of salmonids heading up and downstream, virtually all year round. Salmon smolts and fingerlings need winding streams shaded by humid forests, with calm pools full of woody debris where insects swarm. Moving downstream at varied paces and seeking different niches, some salmon make the transition from freshwater to seawater in a few days, while others need weeks or months in shallow, shaded, protected waters to grow large and adjust to ocean conditions. In delta estuaries where rivers meet and mix with ocean water, fish pause in grassy shallows and briney bays filled with worms, plankton, crustaceans and insects to eat as they prepare for life at sea.

After two to five years growing in the open Pacific, salmon return to the Salish Sea before heading upstream to spawn. Here, as they await the right conditions while morphing their color, shape and metabolism to re-enter their natal streams to spawn, they provide essential meals and vital energy for orcas. Young, rain-soaked mountains combine with the vast estuary known as the Salish Sea to provide the most ideal salmon habitat anywhere on Earth.

The Salish Sea food web is shaped a bit like an hourglass. At the bottom are a wondrous abundance of small to microscopic plant and animal life, all grazing on sun-powered algae or each other. At the top are a great variety of large predators — eagles and herons and multitudes of seabirds, salmon, otters, seals, sea lions, porpoise and orcas. Between the large predators and the small ones, a very few species of fish transfer the diverse food energy at the bottom of the web to the big fish, birds and mammals at the top. Three species are particularly important—*herring, smelt and sand lance*. These small forage fish, or baitfish, swim in schools from a few dozen to countless millions. Each species needs its own vast expanses of sandy or gravel beaches, eelgrass beds, kelp forests, wetlands or shaded shoreline to multiply into the massive schools needed by large predators.

In the waters of the Salish Sea, orcas found a habitat that assured them a plentiful food source. Though the Southern Resident orcas may also eat a variety of other fish, they depend primarily on vast and reliable salmon runs. In the past hundred years human activity has disrupted and degraded too many streams, wetlands and shorelines, and many native salmon stocks are now severely depleted or extinct. We are just learning the value of the Salish Sea ecosystem for future generations of both orcas and humans.

K16, Opus, in a full breach. Breaching may be to communicate or to look around, or to alleviate irritations, or it may simply be a jump for joy. Photo by Jeff Hogan, Killer Whale Tales.

killer whales, and it was common to shoot them because people thought they would tear humans to shreds, or because they were eating too many valuable fish. The first captive orcas helped change those perceptions by their talented performances, creativity and intelligence, and by how deeply they bonded with other orcas and even with their human caretakers. We now know they rarely have any intention of hurting anyone, or each other. And we've learned they seldom survive long when confined in small tanks.

By the mid-1980s many people around the Salish Sea (Puget Sound to Georgia Strait) had discovered that a large population of orcas lived just off our shores. Whale watching became popular, while scientists continued to conduct annual surveys of the Southern Residents.

Based on a method called "individual recognition," pioneered in the mid-1960s by Jane Goodall in her studies of chimpanzees, researchers have documented each member of Washington's orca population since 1974, recording births, deaths, travels and association patterns. Similar methods have now been used to study many other orca populations around the world, resulting in some astound-

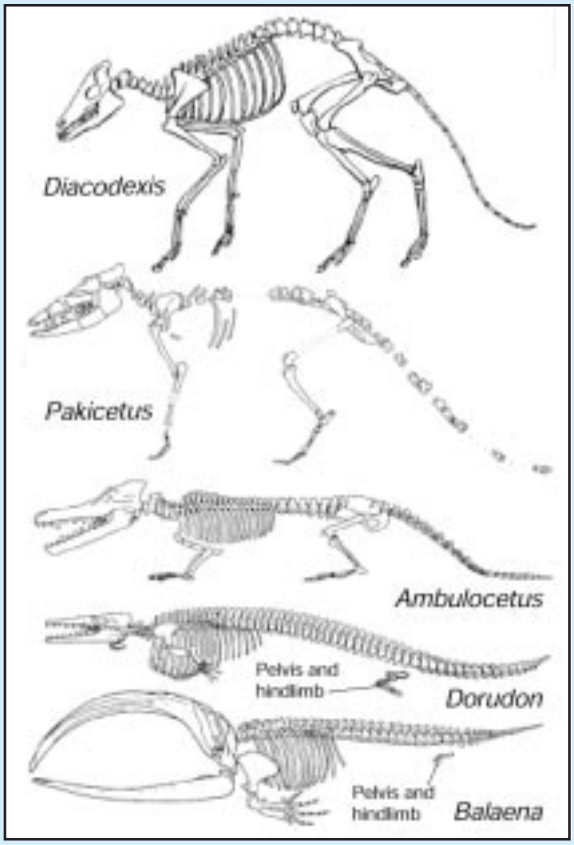
Cetacean Evolution

50 MILLION YEARS AGO the ancient ancestors of today's cetaceans (whales, dolphins and porpoise) were furry, four-footed land mammals about the size of a large deer. These "even-toed ungulates" (or *artiodactyls*), grazed on lush, tropical vegetation. Those that stayed on land eventually became sheep, pigs, cows, camels, deer and hippos. Fierce competition on land and abundant food in the sea may explain why some of these early land dwellers became marine mammals.

As they adapted their physical forms to make their living at sea, they left behind one of the most complete examples of an evolutionary transition in any fossil record. Ancient whales, called *archeocetes* (ark-ee-o-seets), began their oceanic ways when they waded into the warm, shallow waters of the Sea of Tethys, a vast inland sea that extended from the Mediterranean to the Himalayas. To swim well and catch fast-moving food, they lost their fur while their tails broadened into flukes. Their front feet became fins and their nostrils moved to the tops of their heads for quick breathing while swimming. Nearly weightless in the water, they grew large while their bones became more flexible. Eventually their hind legs disappeared except for remnants of hipbones that are still found in the flanks of whales today. To hear well underwater they developed air-filled sacs that insulate each ear from sound except from the sides, allowing high-definition, directional hearing underwater, much as our eyes allow stereoscopic vision.

Beyond these physical changes, early whales had to *learn* to hold their breath to dive for food. It is a feat they have mastered so well that whales have lost the automatic breathing reflex that remains built into the nervous system of land mammals, including humans. For whales, each breath is a deliberate action, carefully timed with thrusts to the surface. Heartbeat and body temperature may also be under partial conscious control.

Around 30 million years ago archeocetes branched into two groups, the *mysticetes* (mist-i-seets), or baleen whales, and *odontocetes* (o-dont-o-seets), or toothed whales. Sperm whales appeared around 24 million years ago, dolphins about 14 million years ago, and orcas may have arrived at their present size and form between 10 and 15 million years ago, probably already the top predator of the sea.



Becoming a whale. Diacodexis and Pakicetus were land-dwellers, Ambulocetus was amphibious, and Durodon was fully aquatic. Balaena is a modern whale. The fossil record shows the transition from land to sea. Not drawn to scale. Graphics courtesy of the Thewissen Lab.

At some point in their evolutionary journey *Orcinus orca* took a tangent that distinguishes them from almost all other mammals except humans. *Cultural* isolation, rather than geographic separation, now drives the evolution of new orca species by limiting mating to others within each community. Cultural adaptation has helped orcas to colonize virtually every ocean habitat, and has made them the most widely distributed mammal other than humans.

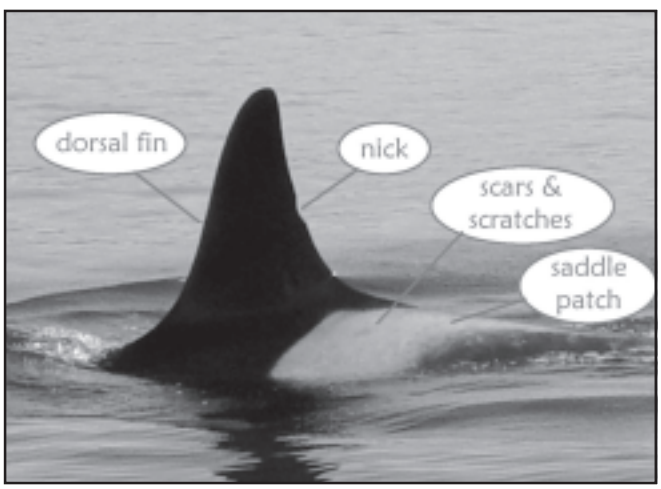
Along the Pacific Northwest coast there are at least eight orca communities — Northern and Southern residents, Prince William Sound, Southeast Alaska and Bering Sea residents, transients, Alaskan transients, and offshores. Each group uses its own distinct vocalizations. Around two dozen orca communities have been identified worldwide, and there may be more in remote locations.

ing new findings about the whales' highly varied lifestyles and social systems.

By 1980 it was clear that there were two types of orcas inhabiting the Salish Sea, each behaving according to its own set of rules governing the most fundamental aspects of their lives, including diet, habitat range, social behavior, kinship system, group size, vocalizations and even mating.

Resident orcas, for example, eat only fish, primarily salmon, and squid, while "transient" orcas, which often travel the same inland waters as residents, prey only on warm-blooded marine mammals such as seals, sea lions, porpoise and whales. Residents travel in large groups numbering a dozen or more, with all three pods occasionally joining together. They tend to travel where the tidal currents are filled with salmon migrating home to streams and rivers. Two distinct groups of resident orcas were identified in the mid-1970s: the Southern Resident community in the Salish Sea and beyond, and the Northern Resident community, inhabiting the north end of Vancouver Island and points north. Each community uses its own native language.

Transients typically move in much smaller pods of around three to six individuals, although they occasionally gather into larger groups and sometimes celebrate with exuberant, and highly vocal activity after a hearty meal. Transients are usually found near rocky shorelines, silently stalking their more wary mammalian prey. They often surround their prospective meal using well practiced cooperative strategies. They generally range much further and less predictably than residents, with the result that far less is known about their travels or family histories. Transients also communicate with their own set of calls.



Each orca can be recognized by its dorsal fin and saddle patch. In the photo is J2, Granny, estimated to be over 90 years old. Photo by Howard Garrett.

A transient orca tosses her food, in this case a porpoise, near Victoria, British Columbia. Photo by David Ellifrit, Center for Whale Research.

By ignoring one another's food supply residents and transients avoid competition and aggression. This practical coexistence has continued for thousands of years without commingling or mating across communities, to the point that each group has developed its own genetic profile and is on its way to becoming a new species, even while crossing paths almost daily.

Recent research around the globe has expanded this multi-cultural picture of *Orcinus orca* by showing a wide variety of elaborate behaviors found in diverse populations. Orca societies have now been found in all the world's oceans, each with its own particular diet, vocal tradition and genetic makeup. Such dissimilar, stable cultural communities, sharing habitats with distinctly different groups of the same species, have so far been found only among humans and orcas.

There are at least eight orca communities along the Eastern Pacific coast between Mexico and the Aleutian Islands, and at least a dozen more worldwide. Though their habitats overlap, the cultural and genetic integrity of each community is believed to have remained intact for millennia. Modern science is only beginning to explain such a flourishing of distinct and separate tradition-based societies among non-human animals.

In the summer of 1998, Tahoma, at 36, was in the prime of her life, always accompanied by her family of three generations. Everett was a powerful 21-year-old male who had sprouted a tall and distinctive dorsal fin. He nearly always swam within a few hundred yards of his mom, usually by her side, while his sisters and their babies swam nearby.

Deaths among Southern Residents had begun to outnumber births, and in late 1998 tragedy struck when something killed Everett's sister, J20, Ewok, leaving her two-year-old calf, J32, Rhapsody, without a mom. Ewok's

Cetacean Species

WHALES, DOLPHINS AND PORPOISE belong to the scientific order Cetacea (se-tay-sha). Soon after cetaceans adapted to catch food and reproduce in the marine habitat around 50 million years ago, they ventured far and wide into the world's diverse ocean habitats, radically altering their behavior and physical forms to make their living in sometimes extreme conditions. The more than 75 species of cetaceans have refined their bodies and capabilities to occupy nearly every niche in the world's oceans, even including several rivers and lake habitats.

As the name implies, all toothed whales (*odontocetes*) have teeth. They also have only one blowhole. There are six odontocete families: sperm whales, beaked whales, oceanic dolphins, freshwater dolphins, belugas and narwhals, and porpoise. Although orcas are often called whales, they are actually the largest member of the dolphin family. The 60-foot sperm whale, capable of diving a mile deep to catch large squid, is by far the largest of all toothed whales. Intermediate in size are beaked whales, pilot whales and the more than 40 species of dolphins. Smallest is the five-foot long harbor porpoise. Odontocetes usually live in tightly knit social groups, called pods, which may join together to form groups of several hundred or even thousands in the case of oceanic dolphins.

A gray whale breaches in Saratoga Passage, east of Greenbank, Whidbey Is. Photo by Tom Colegrove.

There is often confusion about the proper use of the terms "dolphin" and "porpoise." In general, porpoise are smaller (under six feet), have rounded snouts, and are found in coastal waters. Dolphins usually range from seven to 12 feet in length and have beaks. Porpoise also have tiny, flat teeth, while dolphins have rounded, or cone-shaped teeth.

Baleen whales (*mysticetes*) tend to be larger than toothed whales. Like the 90+ foot long, 100-ton blue whales, baleen whales have no teeth at all, but instead use fringed plates of baleen (three inches to 12 feet long) to strain small fish, shrimp and plankton, which are the foundation of the ocean food chain, where overall biomass is greatest. Most baleen whales migrate great distances each year, spending spring through fall in cool subpolar waters where food is plentiful, then journeying during winter to warmer climates to mate and have their calves. All baleen whales have two blowholes.

Baleen whales' social systems remain mysterious. It is not known, for instance, where most baleen whales spend their winter months. Some congregate in large groups, especially during feeding, only to disperse, usually in pairs or trios, within a few hours. Their low, rumbling calls, however, may be audible for hundreds or even thousands of miles.

Locally, about a dozen resident gray whales appear each year from early March until June along the Camano and Whidbey Island shorelines. Here they dine on ghost shrimp, worms and other invertebrates they suck up from shallow mud banks. Other gray whales may stray into Puget Sound, apparently unaware of the best food sources. 30' long **minke whales** may be seen streaking around wherever they find large schools of small forage fish, such as herring or sand lance.

Humpback whales were common in the Salish Sea until they were killed off by commercial whaling operations a century ago. Now they are occasionally spotted near Victoria, BC and in Georgia Strait, and a few have recently appeared in lower Puget Sound. The North Pacific humpback population has been increasing recently, so we may be seeing more of these acrobatic whales in coming years. Ferry passengers throughout the Salish Sea often see small groups of porpoise popping up for a quick breath. Five foot long **harbor porpoise** are grayish brown with a small triangular dorsal fin. The slightly larger **Dall's porpoise** are black with white bellies and usually have a small white patch on their dorsal fins, and often make a "rooster tail" splash with each breath at the surface. Dall's porpoise are sometimes mistaken for baby orcas.

The distinctive saddle patch "finger" on L77, Matia, born in 1987, is used to identify her. Photo by Howard Garrett.

death at 17 years old was especially disturbing because until then, in over 20 years of studies, females between 12 and 40 years old virtually never died. Everett, along with his mother and younger sister J22, Oreo, now caring for her own first baby, took care of little Rhapsody, teaching her the family traditions as they guided and played with her.

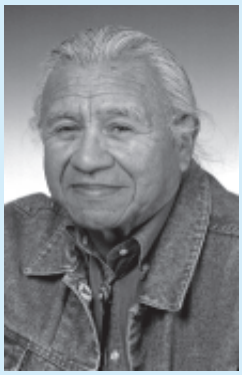
Worse news came a year later when both Tahoma, at only 37, and then Everett, a young adult at 22, also died, leaving a gaping hole at the core of the family. Tahoma was never seen after the summer of 1999, and Everett's body washed up near Vancouver, BC in March of 2000. Overall, by 1999 the population had dropped from 99 whales to only 84 in just three years.

Everett had become much loved by whale watchers and scientists alike. Researchers had observed him from his birth to early adulthood. As a youngster, he was energetic, eager to play with family members or driftwood. He seemed to have fun chasing and eating speedy salmon. Even as he grew into maturity he would drape kelp strands over his back and in the notch of his tail. With the recent drastic losses in his community, great hopes for their future rested on him becoming father to many new calves over the following decades. When he died Everett should have been just entering the prime years of his life. Worried and saddened, scientists, government officials, lawmakers, journalists and whale watchers began to wonder, "What is killing the whales?" Gradually, the answers have begun to emerge.

Southern Resident orcas need plentiful salmon year round to stay healthy. During winter the orcas are believed to have depended for millennia on salmon from the Columbia River, which produced two million spring chinook annually until a century ago. Fattened up to run hundreds of miles upriver, the fish were famous for their oil-rich flesh. But in the mid- to late-1990s salmon runs were at historic low levels throughout the Salish Sea and Columbia River watershed. By 1999, upper Columbia spring chinook had collapsed to near extinction and were listed as endangered under the federal Endangered Species Act (ESA). According to the Washington Dept. of Fish and Wildlife (WDFW), **"the single greatest loss of food for Southern Resident killer whales in the past 50 years may have been from the decline of salmon in the Columbia River basin."** Overall salmon returns during the 1990s averaged only 1.1 million fish each year, a decline of 90% from historic levels, leaving this tight-knit extended orca family undernourished month after month. Puget

Hatcheries Are Not Habitat

by Billy Frank Jr., chairman of the Northwest Indian Fisheries Commission (www.nwifc.org).



There's no question that hatcheries have a role to play in salmon recovery, but hatchery fish aren't wild fish, just like hatcheries aren't habitat. Hatcheries are absolutely needed to support some wild salmon stocks. Without them, those fish would disappear. Hatcheries make sure we have fish to catch. If we didn't have hatchery salmon, no one would be fishing. Tribal treaty fishing rights would be meaningless.

Yes, hatchery fish are part of the answer to salmon recovery. Hatchery fish were never meant to replace wild fish, though, and we have to make sure that never happens. Only wild fish can carry us into the next century and beyond.

One of the main reasons hatcheries were built in the first place was to replace natural salmon production lost to dams, development, logging and other factors. But hatcheries can't really make up for the habitat we've already lost — and the habitat we continue to lose every day. All hatcheries do is hide the problem for awhile.

Lost and damaged spawning and rearing habitat are the main reasons why wild salmon stocks have declined. If we want to fix the salmon problem, we have to fix salmon habitat. We have to protect it. Restore it. Buy more of it. Cherish it. We have to remember that even a hatchery fish, once released, has the same habitat needs as a wild fish: lots of cool, clean water, diverse habitat with plenty of food, and access to and from the sea.

Hatcheries are not a substitute for habitat. Loss and degradation of good spawning and rearing habitat are the single most significant factors contributing to the decline of wild salmon.

sand lance surf smelt herring

Sound chinook also fell far below earlier counts and are listed as threatened under the ESA. The chinook and coho that remain are also much smaller than they were just 20 years ago.

When fish are few and far between, resident orcas tend to split into smaller groups and spread out miles apart, searching high and low and moving great distances to find food, and hunger begins to take its toll.

Beginning in 2000 a significant upswing in salmon returns began when more chinook swam up the Columbia River than had been seen for the previous 20 years. Puget Sound has also seen improved returns of chinook, coho, pink and chum salmon and steelhead, and runs have continued to grow each year between 2000 and 2005. These increased salmon runs are related to a large scale weather cycle of 20-plus years, called a "decadal oscillation," that has been occurring for possibly thousands of years but was only recently recognized. Cooler ocean temperatures along Washington's coast have provided more food for salmon, dramatically increasing their growth and survival, in turn providing needed food for orcas. The cooling trend has also offered a natural experiment to test the correlation of orca survival with salmon abundance. Since the 2001 low point of only 78 members in the SRC, the total population since early 2006 has been in the upper 80's. Hopefully all the newborns will survive to become reproductive adults in 15 to 25 years, but ocean conditions may return unpredictably to El Niño-like warming, again decimating salmon runs and depriving So. Residents of needed food.

Even with improved salmon runs the orcas may have problems finding enough to eat. Most of the increased runs are hatchery fish, not the hundreds of smaller runs of diverse wild salmon subspecies that once thrived, each superbly adapted to a particular river and stream system. While hatchery-bred salmon runs occur sporadically in large numbers, wild salmon endlessly adapt to spawn in every streambed niche and season in nature. For more than 10 thousand years, until about 100 years ago, there were salmon aplenty in the Salish Sea virtually 12 months a year, and many more along the outer coast.

The orcas are certainly benefiting from current ocean

Sept. 17, 2004

I know it's not correct to ascribe human feelings to animals but **the whales seemed content**. They were well fed and still feeding as they grazed on the incoming fish. I had visions of a 1/2 mile wide swath cut out of the school of silvers as they headed in to spawn.

–Cap'n Greg, captain

Columbia and Snake River Salmon

A Treasure on the Verge of Extinction

Two hundred years ago, when Lewis and Clark entered the Northwest, up to 16 million salmon filled the Snake and Columbia Rivers every year. It was the greatest salmon watershed on earth. Since salmon support a profusion of other communities — including orcas and humans — as they live and die, it was also one of the world's richest, most productive river basins.

But no longer. 12 species of Columbia and Snake River salmon are now listed as endangered or threatened, on the brink of extinction. In the 30 years since the installation of the four lower Snake River dams obstructed 140 miles of free-flowing river and migratory passage for salmon and steelhead, their numbers have plummeted nearly 90%.

Four Lower Snake Dams Too Much for Salmon

Scientists agree that dams are primarily responsible for bringing Snake River salmon to extinction's edge. Each dam blocks salmon migration twice, when tiny juveniles head to the ocean, and when adults head back upriver. Dams also transform the cold rushing rivers where salmon thrive into warm, slow, and deadly reservoirs.

The four dams on the lower Snake River have particularly devastated salmon. Salmon can survive some dams. Columbia River species that face three or four dams are healthier than the Snake's salmon, which now run a gauntlet of eight: the four on the Snake, plus four on the Columbia. Most scientists have concluded that these last four barriers — the lower Snake River dams — are too many for even the resilient salmon to overcome. The 90% decline in wild salmon since their construction confirms that verdict. Snake River coho are now gone forever and all remaining Snake stocks are in danger of extinction.

A Failed Experiment and a Lasting Solution

For a quarter century, federal agencies have experimented with schemes to help salmon survive the deadly dams. The most elaborate is collecting tiny, young salmon headed downstream, and barging and trucking them around the dams. Unfortunately, this artificial transportation program has never once generated adult returns at high enough rates to sustain, much less rebuild, these depressed populations. Not surprisingly, studies confirm that packing salmon into barges and trucks traumatizes them, and disrupts their internal clocks and homing instincts. Return rates from these failed programs fall significantly below the 4-6% needed to rebuild populations for fishing, or even the 2% needed to sustain salmon at their current endangered levels.

A young orca positions a salmon for eating, after biting its head off. Photo by Karl Solomon, courtesy of the Center for Whale Research.

This river is remarkably Clear and Crouded with Salmon in maney places, I observe in assending great numbers of salmon...
— William Clark, 1805

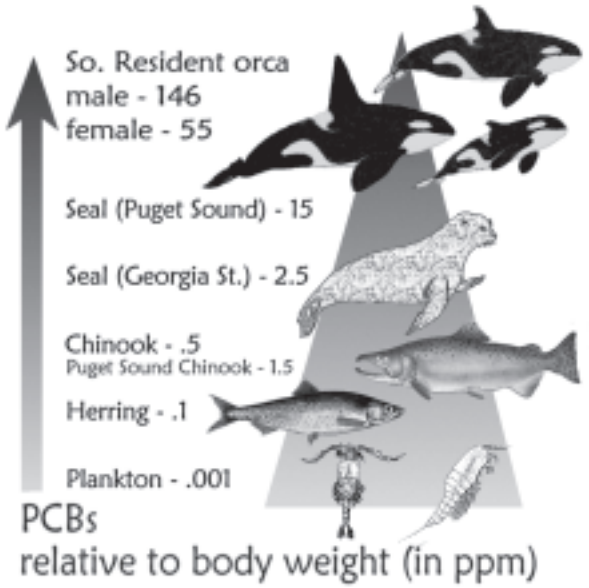
Bypassing the four lower Snake dams would restore 140 miles of free-flowing river habitat for Snake River salmon and revive a central building block to the region's food web, and would cost far less than the federal government's failed strategies. Only the dirt bank connecting the dam to the riverbank needs to be removed. A three-year study by a renowned, independent scientific team gives dam bypass an 80-99% probability of successfully restoring salmon, while no other option examined reached even a 50% probability. Coast to coast - proof keeps mounting that dam removal works. If we can provide wild salmon and steelhead access to quality habitat, they know what to do from there. Restoring a healthy Snake River is one of our region's and nation's greatest river recovery opportunities.

Information provided by
Columbia & Snake Rivers Campaign
1-800-SOS-SALMON
www.wildsalmon.org

conditions during peak runs, but even in these bountiful years some weeks and possibly months go by with very slim pickings between hatchery runs, leaving the whales without sufficient food for long periods.

Lack of food causes whales to draw from the energy contained in their insulating blubber to survive. When their blubber layers are partly consumed due to starvation, the bioaccumulated toxic chemicals such as polychlorinated biphenyls (PCBs) that have built up in the blubber are flushed into the whales' bloodstreams. There they mimic and displace normal hormones, reducing the body's immunity to infection and disease and disrupting reproductive and neurological systems. It is this double-whammy effect of malnourishment compounded by toxic contamination that likely led to many (we'll never know how many) of the deaths of 32 Southern Resident whales from 1995 through 2000, based on data from the Center for Whale Research.

PCBs are chemicals once used for electrical insulation that were discarded in massive quantities into landfills, lagoons and tidelands in Puget Sound from the 1940s to the early 80s. Disposal records were not kept because we simply did not know that dumping PCBs was a harmful practice. Though not produced in North America since 1978, PCBs still seep out of Puget Sound sediments and are still produced in Asia, ending up in North America via air and sea currents. The toxic molecules attach to cell walls and fatty tissues of every living thing from algae to humans.

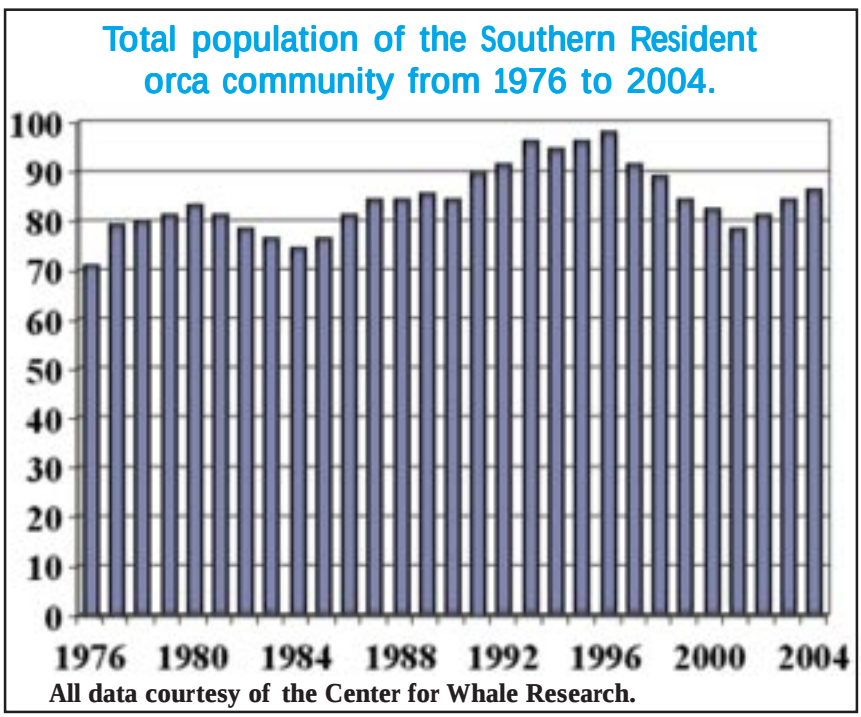


PCB molecules attach to lipids (fat cells) found in all plants and animals. When organisms are eaten, the PCBs lodge in the new host. Long-lived animals at the top of the food web accumulate PCBs from the food they eat their entire lives. Female orcas transfer much of their PCB load to their offspring in the womb and through their milk.

Other persistent chemicals, pesticides, and heavy metals like lead and mercury, also do their damage when released in the blood of hungry whales. In addition, resident orcas may turn to eating bottomfish such as halibut or flounder, which are believed to contain even larger amounts of toxins than salmon because they forage off sediments where the pollutants are found in greatest concentrations. There are nearly 500 hot spots still leaching poisons into Puget Sound and Lake Washington.

Extremely dangerous levels tend to build up over the years in long-lived mammals like orcas. Females dispense up to 90% of their contaminants to their firstborn calf as it begins life in the womb, then directly into the babies' mouths in their high-fat milk. Those babies are hit with enormous poisonous loads just as their organs are in the initial stages of development, when they are most susceptible to hormone disruption. Southern Resident orcas now in their 30s and 40s, who should be in the reproductive prime of their lives, were exposed to enormous quantities of toxins from birth, and may have been permanently harmed.

When they find enough to eat not only are the orcas healthier, they also tend to travel



All data courtesy of the Center for Whale Research.

The Center for Whale Research

UNTIL 1973 NO ONE KNEW how many orcas lived here, how long they lived or if they traveled in cohesive groups. That year the Canadian government asked biologist Mike Bigg to find out how many orcas were in these waters and whether they could sustain continued captures for marine parks. Bigg enlisted public support for his survey and arrived at an amazingly accurate count of around 300 in total, from northern Vancouver Island to the Strait of Juan de Fuca.
At that time the distinctions between orca communities were unknown. Using the whales' "saddle patch" and dorsal fin like a fingerprint to identify each one, Bigg gave each a scientific notation for future reference. He began in northern BC waters, calling the first pod he found "A pod," and added a number for each orca in the pod. When he moved south he was at "J" in the alphabet. Hence, we now have J, K and L pods in the Southern Resident community.

In 1976 the National Marine Fisheries Service contracted biologist Ken Balcomb to survey the whales on the US side. Under the name "Orca Survey" Balcomb confirmed that a small population, then just 71 individuals, used these waters, and that almost half of the population had already been removed for marine parks. The captures were halted that year as a result of a court settlement against Sea World, and in September

The Center for Whale Research, San Juan Island.

Balcomb's contract with NMFS ended.
Balcomb realized that to begin to understand anything about these whales the survey would need to continue for many years, in fact for generations. So he continued the field research, and in the early 1980s Balcomb founded the nonprofit Center for Whale Research to oversee Orca Survey and other whale research projects. Dedication to scientific methods, photographic skills, endless boat maintenance and sheer perseverance have resulted in the annual documentation of

Ken Balcomb, founder and director of the Center for Whale Research, documenting orcas in Haro Strait.

each orca in the Southern Resident community since 1976. Balcomb and hundreds of dedicated volunteers over the years have recorded vital statistics, associations and a wide range of weather and sea conditions, boat traffic and numerous other factors that might help us learn about the whales. Since 1987 a yearly influx of Earthwatch volunteers has assisted with the research, including field work, analysis, data entry and financial support.

In virtually every episode in the ongoing story of the Southern Resident orcas, as their numbers have fluctuated and the public's involvement in their welfare has grown, the Center has played an essential role in our understanding of what's going on. Birth and death rates, longevity, age at maturity, lifetime maternal bonding and patterns of habitat use would be poorly understood without the Center's non-intrusive documentation over the decades. The alarming mortality rates of the late 1990s would not have been documented, and there would be little public response to address the whales' problems, without the comprehensive surveys and analysis conducted annually by the Center for Whale Research.

For more, go to: www.whaleresearch.com or www.earthwatch.org/expeditions/balcomb.html.

State sees decline in toxic chemicals, but...

The amount of toxic chemicals released in Washington state declined 7% in 2002 compared with the year before, according to state Department of Ecology officials.

Officials said nearly 20 million pounds of toxic chemicals were released by permit in 2002, but the total was 2.5 million pounds less than 2001.

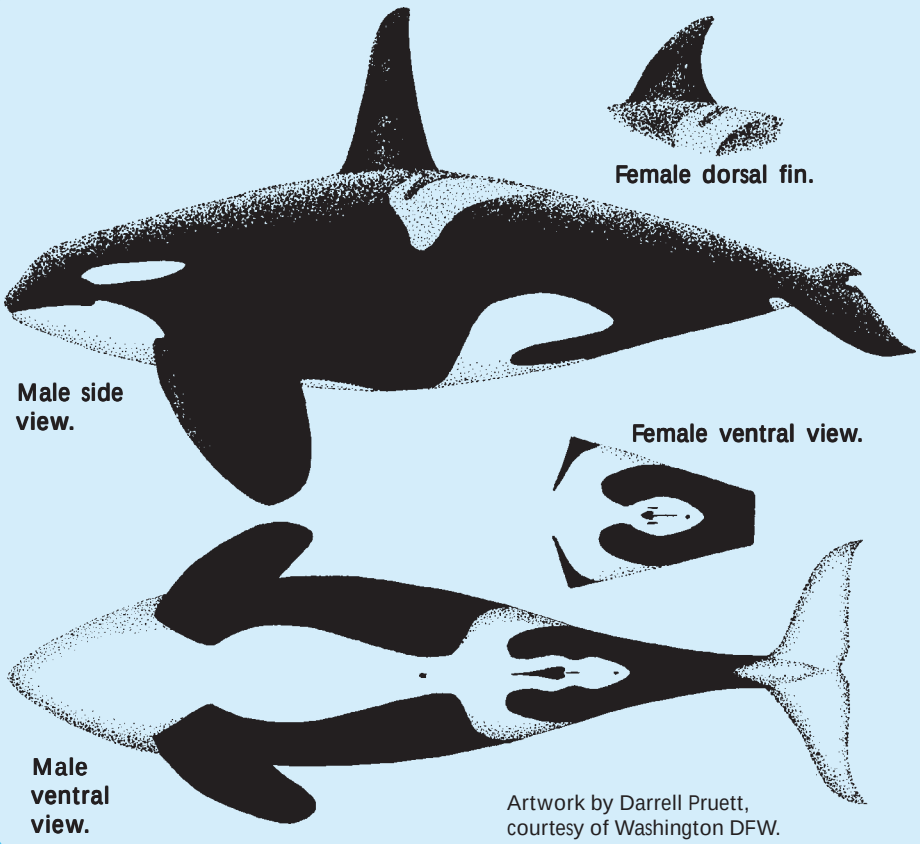
According to the department's annual report for 2002, 12 million pounds were released into the air, 6 million on land and more than 1.5 million pounds in water. Since 1995, total chemical releases at manufacturing facilities in the state have decreased by more than 46%, officials said.

But...

The list of polluters leaves out a B.C. smelter. The Washington Public Interest Research Group (WashPIRG) says the report ignored the biggest source of pollution in the state's waters. The Teck Cominco lead-zinc smelter, just over the border in Trail, B.C., dumped more toxic waste into Washington waters than all the other polluters combined, according to an analysis by WashPIRG. But because the plant is located in Canada, it is not part of the U.S. Environmental Protection Agency's annual Toxic Release Inventory. More info at: *www.washpirg.org.*

Some fascinating facts about orcas

- Newborn orcas are seven to eight feet long, 300-400 lbs; adult females are 17-24 feet, 5,000-9,000 lbs; adult males are 22-30 feet, 8,000-12,000 lbs.
- Orcas have a 16-17 month gestation period.
- Males usually live into their 30s and females into their 50s (data from Southern and Northern Residents from 1974 to 1987).
- Maximum longevity for males is 60+ years; for females longevity is 90+ years.
- Orca females live decades after menopause.
- Orcas have no predators.
- Orcas can swim up to 30 mph and travel 75-100 miles per day.
- An adult orca requires 200-300 pounds of food, about 28-34 salmon, per day.
- Adult orca brains weigh 16-20 pounds, possibly the largest brain of any animal.
- Like all whales, orcas are voluntary breathers and need to be at least "half awake" at all times to breathe. They rest half their brain while the other half maintains breathing and movements.
- Orcas are the largest members of the dolphin family, called *delphinidae*.
- Like all toothed whales and dolphins, orcas use complex biological sonar, called echolocation.
- Orcas live in matrilineal family groups, likely led by elder matriarchs who maintain cultural traditions. One or more "matrilines" may form a pod. Pods or matrilines that share vocalizations are considered a "clan," and clans that socialize or travel together are known as a "community."
- In at least some communities both male and female offspring remain with their maternal family for life.
- A pod's or matriline's unique repertoire of calls is called a dialect.
- Each orca in the Southern Resident community is photographically identified each year by the shape of the dorsal fin and by gray markings, called the "saddle patch" behind the dorsal fin.
- Genetic evidence indicates that mating occurs within communities, but across pods.
- When pods of the same clan or community meet after separation, they may intermingle and engage in vigorous activity, often accompanied by almost non-stop vocalizations.
- Communities don't mingle or interbreed with one another, and each uses completely distinct vocalizations, although they may occupy the same habitat.
- Orcas are found throughout the world's oceans, but tend to prefer the cooler, more productive polar and temperate waters.
- A wide variety of types of orcas have been observed worldwide, with orcas of each community varying by size, shape of fins and markings, range of habitat, diet, vocalizations and social behavior.
- Approximately 50,000 orcas are estimated to live in all the oceans of the world.



Artwork by Darrell Pruett, courtesy of Washington DFW.

It can be difficult to distinguish young male orcas from females. Male and female dorsal fins look the same until males are in their early teens, when the dorsal fin begins to "sprout." The fin doesn't reach full height until males are in their early 20s. Male pectoral fins are also proportionally bigger than female pectoral fins. As adults, males are two to six feet longer than females.

From birth until early teens, the best way to tell males from females is the white marking on their underside. The male pattern is more elongated, while the female marking is more rounded, with two mammary slits beside the genital slit.

in tighter groups, and rest, play and socialize more often. In the past few years orca families have often travelled in large groups, and sometimes engage in festive gatherings known as "superpods" when pods meet up after a time apart.

July 8, 2004
Welcome back K pod! A day of celebration for all....we had the great fortune to be out with the **J's and K's** within the **first few hours of their summer reunion** here in the islands! When we got there (1545, south of Pt. Roberts), they were all **traveling together, spread out in small groups** all across the Strait of Georgia. **There was a LOT of breaching, spyhops, tail lobs, porpoising, and swimming upside down going on.**
We watched an interesting encounter for a while that involved Ruffles, Capuccino and an un-ID'ed female - **they were all rolling around each other, sideways, upside down, chasing - though I have to say it looked like ol' Ruffles (J1) was doing most of the work and Capuccino was more on the sidelines (tho close) "observing"...**They were quite far off from the rest of the group and most intent on their private "party." **Then out of nowhere, another young male showed up speeding towards their little group and joined up with the festivities.** He followed along with Capuccino behind Ruffles and lady friend. Was there some kind of lesson going on? hmmmm...

–Penny Stone, naturalist

Superpod is a word used to describe occasions when the Southern Resident pods gather for a few hours or sometimes a few days, actively mingling, bumping and rolling over each other. Most of the action takes place below the surface, but sometimes they form into facing lines, each made up of a pod or matriline, as if formally greeting one another for brief periods before dissolving into vigorous activity. Small groups of a dozen or so may come together, with members of all three pods often present in each group, seemingly reinforcing bonds across pods. Superpod sessions are often accompanied by energetic aerial acrobatics like breaches, spyhops, lobtailing and a multitude of unusual behaviors.

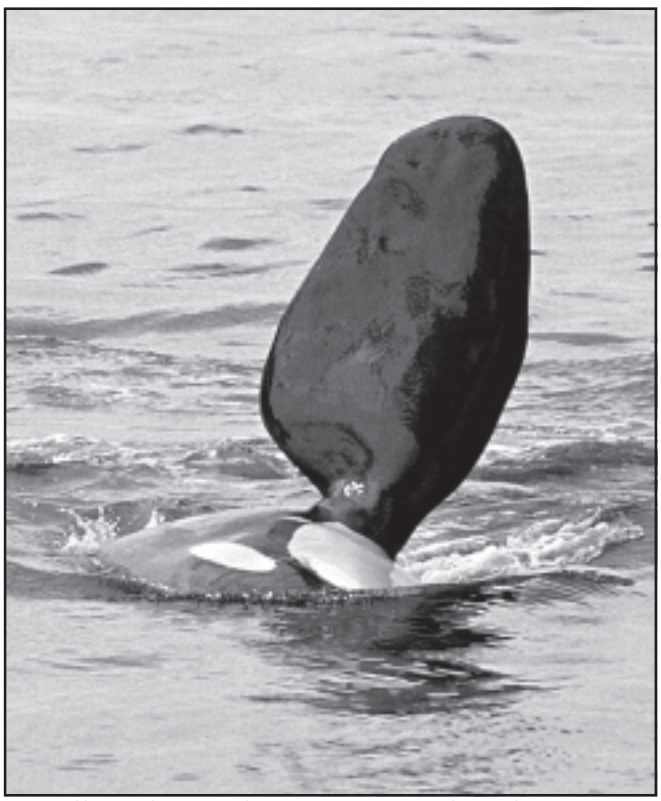
Below, unseen in their weightless, three-dimensional world, the whales' voices often blend in a steady stream of harmonic melodies, chirps and burps, like loud party chatter. When the group needs a breath of air, the sur-

face erupts in multiple powerful blows as they take a series of breaths before heading out in all directions to form new groups and commence mingling again.

For Southern Residents, DNA studies indicate that mating occurs within the community but outside one's own pod. Obvious sexual play suggests that superpods may provide an occasion for conception of the next generation.

From the orcas' perspective, superpod encounters appear to be very joyful and possibly essential social events, which call for *our fundamental respect for the orcas* to avoid disturbing them. Boat traffic in the midst of a group of orcas can disrupt their communication and social activities and possibly impair their ability to forage. Studies have shown that Southern Residents have increased the intensity and duration of their calls as boat noise in their habitat has increased. For the whales' sake, and to get a better sense of the whole social event, the best views can be appreciated from some distance, often from shore at lookout points such as Lime Kiln Park on San Juan Island.

As the orcas have become better known over the years, crowding by boaters intent on getting close to the whales has sometimes created a cacophony of piercing engine noises. Since the mid-1990s the Soundwatch Boater Education Program of The Whale Museum has observed and educated boaters around the San Juan Islands. The goal is to inform recreational and commercial operators about whale-watching etiquette to minimize disruptions from underwater noise and surface traffic.



J1, Ruffles, lifts his 6-foot-long pectoral fin before slapping it hard on the water. Photo by Jeff Hogan, KWT.

Be Whale Wise

Guidelines for safe, enjoyable and courteous whale watching

- **Be cautious and courteous:** approach areas of known or suspected marine mammal activity with extreme caution. Look in all directions before planning your approach or departure.
- **Slow down:** reduce speed to under seven knots when within 400 meters/yards of the nearest whale. Avoid abrupt course or speed changes.
- **Avoid approaching closer** than 100 meters/yards to any whale.
- **If your vessel** is unexpectedly within 100 meters/yards, **stop immediately** and allow the whales to pass.
- **Avoid approaching** whales from the front or behind. Always approach and depart whales from the side, moving in a direction parallel to the direction of the whales.
- **Keep clear** of the whales' path. Stay at least 400 meters/yards ahead of their path of travel.
- **Stay on the offshore** side of the whales when they are travelling close to shore. Remain at least 200 meters/yards offshore at all times.
- **Limit your viewing** time to a maximum of 30 minutes. This will minimize the impact of many vessels and give consideration to other viewers.
- **Do not try to swim** with or feed whales.

You'll find a printable version of the Be Whale Wise poster at: www.BeWhaleWise.org

Our attitudes and perspectives toward orcas have changed tremendously in the past few decades, and are still changing. In just the past few years the steep drop in their numbers and a variety of well publicized stories about the whales have drawn attention to them from around the region and beyond. These events have taught people about the whales' complex family systems, their cultural traditions and the environmental hazards they face.

In the fall of 1997, 19 members of the L25 subpod followed a run of chum salmon into Dyes Inlet near Bremerton, and stayed for 30 days. Never before had so many whales remained so long in a highly populated area. To explain what L pod was, media reports described the three pods of the Southern Resident community, and how

Immersed in Sound

ALL ANIMALS MUST USE THIER SENSES to find the necessities of life. In most terrestrial habitats, sight and smell are crucial for such purposes. Toothed whales have almost no sense of smell, and in the ocean, sunlight is diminished, even near the surface in clear tropical waters. Any object more than 10 or 15 feet away, even one as large as a whale, becomes obscured in the emerald duskiness of algae soup.

Instead, sound is the primary medium cetaceans use to stay in touch with one another and aware of the world around them. Water is a dense, almost incompressible substance, which makes it a superb medium for the transmission of sound. Sound waves in water, travel almost ***five times faster*** than through the air and are sustained for tremendous distances. Blue whales are known to broadcast their voices more than 1,000 miles. At the water's surface, sound waves reflect back downward, making them almost inaudible in the air above.

A group of Northern Residents seems to be playing in the rain, or possibly escaping the loud noise made by a heavy squall. Photo by Ellen Hartlmeier.

It was once believed that the oceans were a silent world, interrupted only by ships' noises or earthquakes. The reality is much more noisy and complex, and we are only beginning to realize how many and varied are the sounds beneath the waves. Seals and sea lions are highly vocal underwater. Fish and crustaceans combine to make a cacophony of sounds throughout most of the marine world. The sounds of the surf pounding the shores or breaking on the surface also carry far into the depths, and rain is surprisingly noisy underwater. The sources of many other sounds remain unknown. In parts of the ocean distinct boundaries between layers of different temperatures, called **thermoclines,** form undersea waveguides which can carry loud, low-frequency sounds incredible distances, possibly thousands of miles. Whales have no doubt mastered the use of thermoclines, as well as undersea canyons and currents, to broadcast calls vast distances. When an orca pod spreads out for miles across Haro Strait, for instance, they can probably all hear each other easily.

Using echolocation, dolphins (including orcas) are able to identify prey at great distances using sound pulses, or clicks of variable frequencies, most far above the range of human hearing. These echolocation clicks are directed and focussed through the "melon," a reservoir of highly specialized oil prominent on the foreheads of odontocetes. By also modulating the click frequency and volume, odontocetes are able to find and catch fish in the darkness of deep water or at night.

Echolocation clicks not only reflect off the outer surface of other animals, including other dolphins or whales, they also outline skeletal structures and pockets of air in the lungs, ears or stomachs of cetaceans, or the air sacs in fish. The ability to locate and pursue prey by the use of sound allows toothed whales to take full advantage of the abundant supplies of fish and squid that make up **deep scattering layers, or DSLs**. DSLs are immense assemblages of predator and prey, found throughout the world's oceans, that remain far below the sunlit surface by day but rise at night to feed on algae and other plankton. Since dolphins can catch fish easily in the dark, the DSLs provide a seafood smorgasbord that comes to the surface for each evening meal.

Humans often disrupt this ancient acoustic world, as vessel traffic, shoreline construction and other disturbances increase worldwide. Powerful military sonars and seismic airguns used in oil exploration not only interfere with cetacean communication and navigation, but are known to have caused severe and sometimes lethal abrasions to their delicate hearing systems and lungs. For a whale or dolphin, loss of hearing almost certainly leads to death.

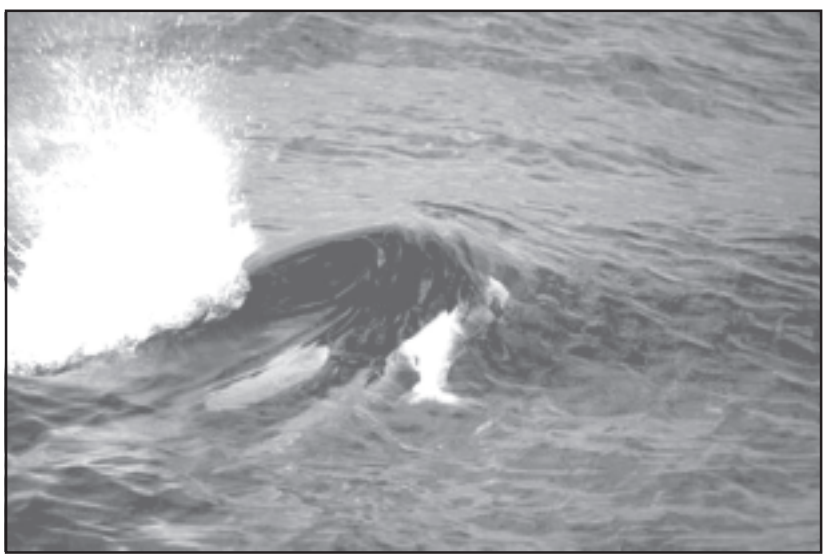
they converse with shared calls, while other orca communities express themselves with completely different sounds. People also learned that too much boat traffic around the whales could strain their ability to communicate or catch fish.

Many of the news reports were more alarming. Mortality rates began to increase in 1994, but initially births more than made up for the losses. Then in 1997 five Residents died, and none were born. The next year two calves were born, but five more died, bringing the total down from 97 to 88 in just two years. Most of the decline in calving occurred in L pod. Of special concern was the failure of most of the females born in the 1960s to reproduce successfully, a sign of PCB contamination.

In 1999 four calves were born, but seven Southern Residents died, bringing the total down to 85. The disturbing news of increasing mortalities began to spread to state and federal agencies, conservation groups and media outlets. PCBs were implicated in the 1999 death of L51, Nootka, a 26-year-old female who died of reproductive complications before washing up near Victoria, BC. Her newborn calf's brother and uncle tried to nudge bits of salmon into its mouth before it too died. That year Canada listed Southern Resident orcas as "threatened."

Everett's untimely death in March, 2000 may also have been the result of toxic contamination. His reproductive system was severely damaged to the point that he could not have fathered a calf had he lived. His sperm count was zero, and he died of common infections that his immune system should have easily defeated, all telltale signs of PCB poisoning.

Also in 2000, Dr. Peter Ross of Canada Fisheries sent



A young orca grabs a large salmon. Photo by Bart Rulon.

A member of J pod looks around. Photo by Joseph Alicea.

shockwaves among conservationists with research showing that transients and Southern Resident orcas are among the most contaminated cetaceans in the world. Dr. Ross described the chronic effects of PCBs, including shortened lifespan, weakened immunity and lower fertility. His studies showed that Southern Resident orcas have accumulated PCBs to a level of almost 150 parts per million (ppm), 10 times more than the amount known to damage hormonal systems in other marine mammals. Ross added that PCBs are just one of a cocktail of pollutants such as pesticides, dioxins and heavy metals, plus human medications and hormonal supplements, that find their way into the ecosystem, all stressing the whales' health. Traces of an industrial fire retardant, polybrominated diphenyl ether (PBDE), have also recently turned up in salmon, marine mammals and humans. PBDEs can harm development in babies and young children, much like mercury and PCBs.

Tahoma, Everett, Ewok, Nootka, and many other orcas who died in the late 1990s were in their early formative years just when those toxins were working their way up the Puget Sound food web. Though PCB and DDT levels in Puget Sound harbor seals have dropped since the 1970s, as of the mid-1980s they have held constant at levels that can cause injury and immune deficiency. In longer-lived orcas the poisonous accumulations that began over 50 years ago continue to build up.

Two more whales were born in 2000, but four died, leaving only 83 members in the community.

As the steep decline in Southern Resident whales continued, alarm bells rang ever louder among environmentalists, government agencies, lawmakers and the media. In response to the dramatic decline, in May, 2001 the Center for Biological Diversity (CBD) and others filed a petition to list the orca community under the ESA. CBD showed that if current population trends continue, Southern Resident orcas will go extinct within 100 years, possibly as soon as 30 years. Just one or two oil spills, strandings, or disease outbreaks would dramatically increase the risk of extinction.

Listing under the ESA is an important step to recovery not only for the orcas, but for the entire Puget Sound ecosystem, which is deteriorating under the pressure of shoreline development, pollution, loss of watersheds and wetlands, logging, dams, overfishing, and marine traffic. The ESA is designed to protect essential habitats, which includes not only where the whales swim, but also the upstream habitat needed by their prey and the entire food web those salmon depend on. Whales are intimately linked to salmon, and salmon depend on an abundance of herring, surf smelt and sand lance. Those forage fish in turn require thriving ecosystems full of plankton and insects, which in turn need productive streams, wetlands, estuaries and clean, uncontaminated seawater.

By the summer of 2001, two more orcas were born, but *seven more died*. Unaware that L98, Luna, had wandered alone into Nootka Sound, BC, and not including Lolita, the L pod orca captured in 1970 and still alive in a marine park in Miami, the Center for Whale Research announced in June that ***only 78 Southern Resident orcas remained.*** L pod now had 41 members, K pod had 17, and J pod had 20. In November, 2001 Canada strengthened their listing of Southern Residents from *threatened* to *endangered*.

August 3, 2004
Nothing prepares you for the first sight and sound of a killer whale or whales coming out of the fog.
We have electronic gadgets to help us but **they just sail along so confident and with full knowledge of where they are and what they are doing.**
Maybe someday we will understand more.
—Ron Bates, researcher

2002 was a remarkable year for orca awareness. On January 2 a female orca died near Dungeness Spit on the Olympic Peninsula, leaving an apparently dazed adult male wandering aimlessly for several days. TV reports showed the male repeatedly swimming directly onto a beach as the tide went out. He remained there overnight, while volunteers kept him moist and tried to comfort him. Eventually photographic records identified the two as transients, possibly a mother and her grown son. Although no cause of death was determined, the female was so full of PCBs — tests showed over 1,000 ppm — the equipment had to be recalibrated to read such high levels. Pesticides and other contaminants were also found in her tissues. Transients tend to have higher toxic loads from the marine mammals they eat, which are already dangerously contaminated, but this female had a higher PCB count than any marine mammal previously found.

As this story played out more people learned the difference between transients and residents. Each community's specialized diets, ranges and distinctive vocalizations were discussed at length in the media. Transients were sometimes referred to as "out of town" whales. A rescue effort

On the far left is J17, a female born in 1977. To her left is J1, a male born about 1951, and on her right is J2, a great-grandmother over 90 years old. Ahead of J2 is a newborn calf, all traveling together in a tight group. Photo by Jeff Hogan.

Back with family! Orphan calf A73, Springer, in July, 2002, with family members A61, A51, A43, A60 and A69. Photo by Ellen Hartlemier.

finally managed to lead the male out to open water and release him, and radio tag data showed he made it to the ocean. People cared, people learned, people helped, and the whale was saved.

Two weeks later Orca Network's Sighting Network received reports of a lone orca calf in Swinomish Channel and alongside a tugboat in Edmonds. The young orca calf, barely two years old, then turned up in a busy ferry lane south of Seattle. Based on photographic documents, she was identified as A73, Springer, an orphan from the Northern Resident community, which seldom ventures within 400 miles of Seattle. Springer had somehow become separated from her family and meandered far into the range of the Southern Residents, where she managed to catch all the fish she needed while engaging hundreds of ferry passengers on a daily basis. To explain where Springer was from, reports described the differences between Southern Residents and Northern Residents.

At first several marine parks offered to capture Springer for permanent display, but public outcry against that idea soon quieted the parks. For six months Springer's problems were the topic of continuous media coverage, much debate and sometimes strained collaboration by conservation groups, elected officials and federal agencies in the US and Canada. In June 2002, Springer was captured and held for a month of medical tests, then taken by boat 400 miles north to meet up with her family. The young orca almost immediately made vocal contact with her close relatives and was released to them within 24 hours. Springer rejoined her pod and has remained by their side ever since.

As international attention closely followed her successful reunification, the little calf demonstrated the resilience of orca kinship. Again, people cared, people learned, people helped, and the whale was saved.

Also in January, 2002, reports became public about yet another lost orca calf far to the north in Nootka Sound, Vancouver Island. This calf was from the Southern Resident community, but was in the usual range of the Northern Residents, as if the two calves were swapped in a baby exchange program. Known as L98, or Luna, this youngster was not an orphan, but at the tender age of about 20 months had became separated from his mom and swam deep inside a remote fjord, out of vocal range from the open Pacific where he might hear his family traveling by. Like Springer, Luna showed he could catch all the fish he needed on his own at less than two years of age. As he grew into a robust young male, Luna frequently seemed desperate for company, pushing boats and floatplanes around near the small town of Gold River. He sometimes disabled boats by breaking their rudders or fishfinders, or swamping dinghies.

At first Luna's precarious situation was overshadowed by Springer's saga playing out in Puget Sound, but by the end of 2002 pressure began to mount on Canadian officials to somehow help Luna reunite with his family, if only to stop him from harassing boaters. In June, 2004 a capture was attempted, but First Nations canoe paddlers, who opposed interfering with Luna's freedom to go wherever he chose, attracted Luna away from the capture team by singing and drumming.

Luna's story ended sadly. On March 10, 2006 Luna was

L41, Mega, with a distinctive nick in his dorsal fin, swimming beside his younger sister, L77, Matia. Photo by Jeff Hogan, Killer Whale Tales.

August 11, 2004
I picked up the **T18's (transients) between Albert Head and William Head**. They were **leaping around and vocalizing at the surface.** I had some incredible vocalizing coming up through the hull of the boat. They were acting very proud. It was interesting that **the whole time the T18's were vocalizing, J Clan without the L 12's were 2 or 3 miles away resting.**

–Mark Malleson, naturalist

accidentally killed in the propellors of a large tug boat.

In May, 2002, while these wayward calf dramas were playing out, a 30-year-old Southern Resident female, L60, was found dead on Washington's outer coast. L60 was in the prime of her life and should have lived another 30 to 50 years, but tests showed she carried dangerous loads of PCBs. Her oldest son died in 1997 at seven years of age but her second son, born in 1995, still survives.

In June, 2002 the National Marine Fisheries Service (NMFS) disappointed conservationists when they determined that the Southern Resident orca community did not qualify for protection under the ESA. Instead, the Residents were designated *depleted* under the Marine Mammal Protection Act (MMPA). This decision launched a series of public workshops to develop a recovery plan that included salmon restoration, pollution prevention and vessel traffic mitigation, but any legal enforcement was limited to protecting individual animals from harassment, rather than protecting the habitat they ultimately depend on.

NMFS explained that although the Southern Residents compose a distinct population, and face a relatively high risk of extinction, they were not *significant* to the species worldwide. Based on classifications made in 1758 by Linneaus, only one species of orca, *Orcinus orca*, is recognized, and NMFS presumed that if the Southern Residents were to go extinct, other orcas would fill in and colonize their habitat. Although NMFS' Biological Review Team agreed that calling all orcas a single species "does not accurately reflect the biology of the species and that more than one species exists globally," they concluded that "classifying the Southern Residents into a particular distinct population cannot be resolved until the taxonomic structure of *O. orca* is clarified."

No one knows quite how to classify the Southern Resident orca community. Although scientists and the public alike now understand that each orca community has a unique social system, language, rituals, behaviors and knowledge of habitat, the difficult question of what to call these culturally defined populations is only beginning to be debated by the scientific community. Before the Southern Residents could be listed under the ESA, the obsolete classification system needed to be revised.

As if to further illustrate the differences between residents and transients, on January 3, 2003 a group of 11 transient killer whales arrived in Hood Canal and stayed for two months, putting a big dent in the harbor seal population. Hood Canal residents and visitors lined the shores to see the whales and occasionally watch them catch and consume harbor seals. Like the transient stranding at Dungeness Spit a year earlier, the extended Hood Canal visit introduced hundreds of people directly, and thousands more via the media, to the behavior and biology of transient orcas. In early 2005 six transients foraged in Hood Canal for six months.

Hood Canal, February 16, 2005, two of the six transients (two females, each with two juveniles) first seen in Hood Canal January 24. Photo by Kyla Graham, Center for Whale Research.

Yet another orca community, with its own unique behaviors and vocalizations was often mentioned in reports about transients and residents. The "offshores," usually found 10 to 30 miles offshore from California to Alaska, were first discovered in the early 1990s. They tend to travel in large groups of 30 or more, a clue that they may eat fish, but whether they also feast on marine mammals remains unknown. On rare occasions they have been seen inside the Strait of Juan de Fuca as far as Port Townsend. People in the Pacific Northwest were becoming aware that *no other inland waterway in the world* is known to be home to such a variety of distinct orca communities.

By this time the public was becoming very worried about the loss of so many Southern Resident orcas, and lawmakers responded accordingly. In February, 2003 Senator Maria Cantwell announced that the federal government had allocated $750,000 to help determine why the orcas were declining in number. This was the first federal expenditure for research on Southern Residents since 1976, when bi-

The USS Shoup on the horizon in Haro Strait, using sonar as J pod huddles near the surface. Photo by Ken Balcomb, Center for Whale Research.

ologist Ken Balcomb was contracted for seven months to conduct a survey to determine how many orcas could safely be captured for the public display industry.

Also in February, 2003 Washington Governor Gary Locke dedicated $100,000 to the orca recovery effort. Gov. Locke approved partial funding for a rescue tug at Neah Bay to help prevent oil spills, and he strengthened the state's salmon restoration strategy. Cleanup of toxic chemicals and preventing polluted stormwater runoff were cited as especially important. Washington's Fish and Wildlife Commission began the process of adding orcas to the state's endangered species list.

Complicating efforts to protect the Southern Residents, on May 5, 2003, the USS Shoup conducted Navy sonar operations for five hours in Haro Strait. The whales and porpoise in Haro Strait could not escape the high-volume, long duration "pings" from the ship's sonar. At least a dozen porpoise stranded and died following the sonar event, though the Navy denies the deaths were related to the sonar exercise. J pod's 22 members, ranging in age from one month to over 90 years, were near San Juan Island as the screeching intensified. They abruptly stopped their feeding and gathered in a tight group, milling close to shore at the surface, where they were most protected from the blasts. The pings could be heard in the air by visitors along the shoreline miles away. Gov. Locke wrote a letter to the Navy requesting they refrain from using sonars in the whales' critical habitat. Biologists noted that sonar operations and airgun blasts for seismic exploration continue largely unregulated along Washington's outer coastline, and may have led to untold casualties among marine wildlife.

Signs of ever-expanding human settlements are easy to find along nearly every stretch of shoreline and watershed throughout the Salish Sea basin. Each day more land is cleared for homes, roads and businesses. River valleys are dredged and diked, wetlands are drained or filled, while across verdant foothills forest, grass and cropland are steadily replaced with impermeable surfaces. As a result, floods occur more often and develop more rapidly. These hydrologic changes, along with pollutants picked up by water as it pours across urban and suburban landscapes, wreak havoc on aquatic systems and damage shoreline habitats. Toxic residues drain, inevitably, into the mouths of fish, and therefore into orcas and humans.

The Salish Sea is not the only marine habitat that is suffering from environmental degradation. In June, 2003, after three years studying coastal development, pollution, overfishing and other threats to sea life and ocean ecosystems nationally, the Pew Charitable Trusts (www.pewtrusts.com) reported: "What we once considered inexhaustible and resilient is, in fact, finite and fragile." The report painted a bleak picture of ocean health but listed dozens of opportunities to turn things around. It said Americans need to rethink fishing limits, set aside large areas where no fishing occurs, establish an independent national agency to govern oceans, halt construction of fish farms until their effects are better understood and control the noxious mix that washes off farms, streets and

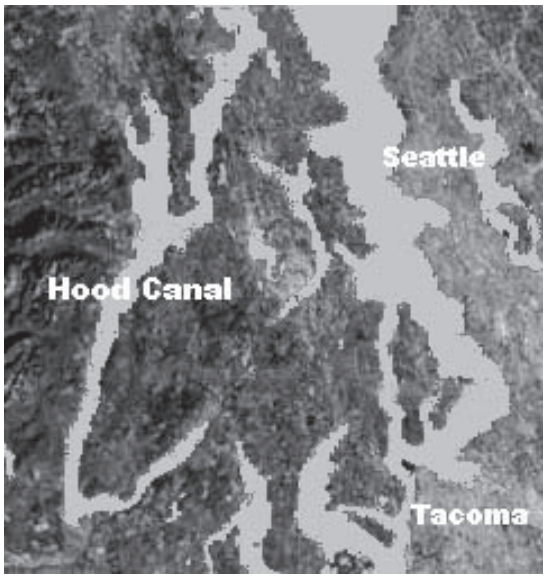
We should pledge to restore the environment to the status of a major concern, putting a new Department of the Environment on a par with State and Defense. At its heart will be a blue-ribbon panel of distinguished scientists who will identify the most pressing environmental problems and prioritize the deparment's attacks upon them.
The Secretary of the Environment should be an individual with a national reputation as one long dedicated to the cause, fearless in condemning the special interests and their political lackeys.
The Administration should protect our forests, marshes, lakes, rivers, coasts and wildlife from industrial and commercial development and oil exploration, while recognizing the value of every living thing placed in our care.

—Walter Cronkite

Hood Canal dead zone grows

ONCE A THRIVING CORNUCOPIA nestled between the Olympic Range and Kitsap Peninsula, Hood Canal is choking to death. The water looks beautiful, but now septic seepage and stormwater runoff are shedding excessive nitrogen and other nutrients into Hood Canal, stimulating algae growth. When algae die and sink to the bottom, they decompose, using up oxygen needed by fish and invertebrates, which then die and rot on the bottom, removing more oxygen.

Divers have reported shrimp that were lethargic and swimming around at shallow depths. Dive surveys by WDFW found abnormal behavior in other invertebrate species and fish.



Fish kills in Hood Canal's south end go back to the 1950s and earlier, especially during late summer, but now low dissolved oxygen is year round. For three years state officials periodically closed Hood Canal to most fishing. In spring, 2004, fisheries for lingcod, halibut, herring, smelt, squid, octopus, sea cucumbers and most other species of bottomfish were closed because of continuing problems with low oxygen levels.

It starts with people flushing toilets and fertilizing lawns, and rain washing animal waste into marine waters, all of which feeds algae blooms. At least three fish kills in the canal were attributed to oxygen depletion since 2002. In September 2003 thousands of perch washed up on the shore. Some of the richest shellfish beds in Puget Sound are also threatened.

The fjord stretches 62 miles north to south, about a mile-and-a-half wide, surrounded on all sides by lush forests. Because of its bathymetry, 600 feet deep in some places, mixing and flushing are slow compared with other parts of Puget Sound.

An estimated 54,000 people live in the Hood Canal watershed, about 20,000 in the Belfair area, near the tip of the hook. Cabins and vacation homes line the shore on both sides, all on septic systems, many of them decades old. There are an estimated 5,500 septic systems in the lower canal. According to the Puget Sound Action Team, leaching septic systems are estimated to contribute up to 240 tons of nitrogen a year to Hood Canal, or possibly 60% of the human contribution to the problem. Agricultural fertilizer and manure are listed at 14% of the problem. Discarded salmon carcasses are the third source, at 13%, followed by polluted stormwater at 11%.

In addition, several Hood Canal streams and rivers consistently get too hot for fish, according to the Port Gamble S'Klallam Tribe. Hillsides stripped of trees provide little shade, and warm water contains less oxygen than cool water.

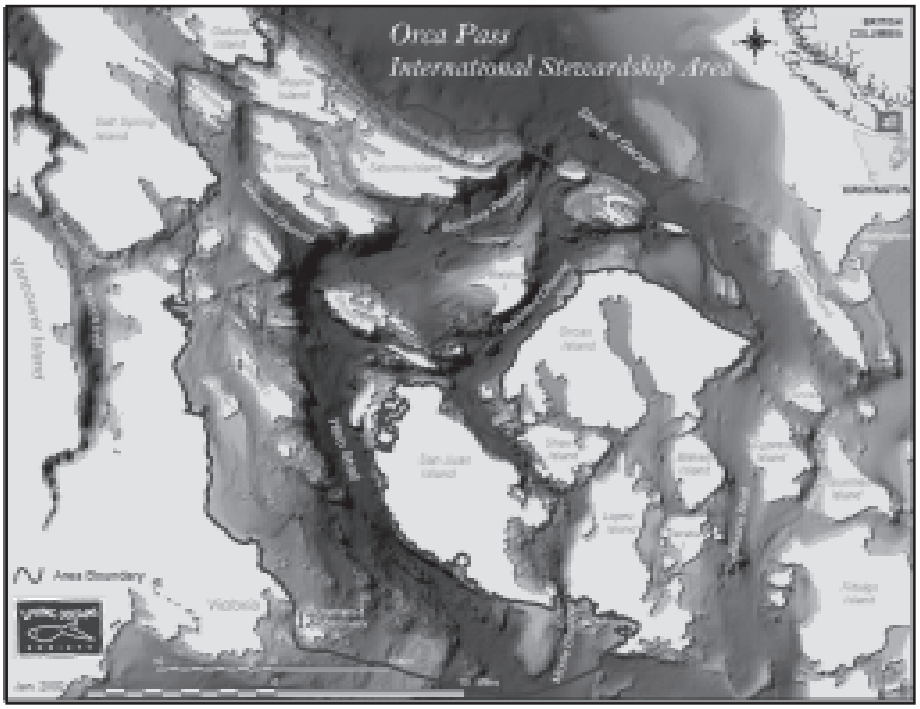
Students, teachers and community volunteers now collect water samples to be tested for pollution from streams that drain into the canal. Salmon recovery groups have signed up with the state to take measurements of the canal's oxygen levels. The results will be submitted to experts who are studying the water quality problems. Residents are encouraged to service their septic tanks and avoid lawn fertilizers. Salmon carcasses will no longer be dumped in waterways.

Actions Needed:

- **Upgrade septic systems** to remove nitrogen from the effluent.
- **Drastically reduce stormwater pollution** through holding ponds and buffers.
- **Stop using fertilizer** where its runoff can enter Hood Canal.

For more information, see Puget Sound Action Team's Hood Canal Program at:

www.psat.wa.gov/Programs/hood_canal.htm



The Orca Pass International Stewardship Area. These vital marine waters are proposed for conservation by organizations in the US and Canada, including People for Puget Sound and Georgia Strait Alliance (www.georgiastrait.org / orcapass.php). Chart courtesy of J. Ardron, Living Oceans Society, BC, Canada.

lawns with each rain.

In September, 2003, the federal government added $1.5 million for research to study the decline in the Southern Resident orca population and to support ongoing recovery efforts. But problems continued. In late December, 2003, 4,800 gallons of oil spilled from a loading dock in Edmonds, just north of Seattle. The oil drifted westward into the sands of a critical and traditional shellfishing beach near Indianola considered sacred by Suquamish Tribe members. At the same time, K pod was traveling less than 10 miles from the spill with a new baby, K37, barely a week old. The pod was headed into the spill just hours after it occurred, then turned back north toward Whidbey Island. If the winds pushing the oil had turned north instead of west, or if K pod had continued south, they might have been caught in the spill.

There is tremendous popular support in the Pacific Northwest for protecting wilderness areas and natural environments, and a great many effective restoration efforts are underway at all scales of government and society. But still missing is widespread appreciation of the value of natural abundance and realization of the long-term dangers of environmental degradation. From corporate boardrooms to political caucuses to classrooms and coffee houses, dedicated collaboration is needed to better care for Puget Sound and beyond, especially considering almost inevitable long-term population growth and rising global temperatures.

Much needs to be done at all levels, but before NMFS could invoke the federal ESA to help the Southern Residents, they needed to find a new way to classify the orca community. The debate over how to label the Southern Residents began in earnest in December, 2003 when a U.S. District Judge ruled that NMFS ignored available evi-

Cedar River comes back to life

A century ago thousands of chinook salmon spawned in the Cedar River, but since 1900 a dam has blocked chinook from 17 miles of pristine upper stretches shaded by overhanging maples and towering firs. Thanks to a new $3.7 million fish ladder built by Seattle Public Utilities, the native chinook will once again spawn in their home waters.

Before the dam was built, the fish migrated up the Duwamish River, then turned up the Black River to the Cedar. In 1912 the Cedar was diverted into Lake Washington.

About half of the wild chinook runs in the Puget Sound region have been improving, but not in the Cedar. The number of chinook returning to spawn in the river has dwindled to about 240 a year, earning "threatened" status under the federal Endangered Species Act. The ESA calls for efforts to help chinook salmon and state laws forbid the blockage of rivers.

To get access to the Cedar watershed, salmon will still need to run a gauntlet of urban pollution, the Ballard locks, predation and reduced flow during droughts. And the river-adapted chinook will still be forced to cross the lake to find the Cedar.

Around 20,000 chinook made it through in 2004, most of those hatchery-bred. Lake-loving sockeye greatly outnumber them, with about 400,000 passing through Ballard Locks.

Pacific Salmon and Wildlife:

Ecological Contexts, Relationships, and Implications for Management

(http://wdfw.wa.gov/hab/salmonwild)

As a seasonal resource, salmon directly affect the ecology of many aquatic and terrestrial consumers, and indirectly affect the entire food web. Many species of wildlife for which hard earned environmental laws and significant conservation efforts have been established (e.g., grizzly bears, bald eagles, river otters, killer whales, beaver), play key roles in providing for the health and sustainability of the ecosystems upon which salmon depend. As the health of salmon populations improves, increases in the populations of many of the associated wildlife species would be expected. Salmon and wildlife are important co-dependent components of regional biodiversity, and deserve far greater joint consideration in land-management planning, fishery management strategies, and ecological studies than they have received in the past.

—Jeff Cedarholm, fisheries biologist

dence in 2002 when it decided against listing the orca community under the ESA. The judge ruled that the agency was wrong when it ignored established evidence that the whales base their behavior on culture, thus defining their uniqueness and significance. He asked NMFS to consider that the extinction of the Southern Residents would result in the loss of the only resident orcas in the continental United States. The federal agency was given 12 months to review its earlier decision and issue a new finding, and it agreed to comply.

In early 2004, the US Commission on Ocean Policy, created by Congress in 2000, reported that increased coastal development, sediment flow, overfishing and dramatic declines in water quality have all damaged the health and safety of our nation's oceans and beaches. Though lacking a strategy for revitalizing the oceans, the report brought attention to deteriorating marine ecosystems. Among the more shocking conclusions was that despite a national "no net loss" policy, coastal wetlands are disappearing at a rate of 20,000 acres per year (www.oceancommission.gov).

One-third of the shoreline habitat in Puget Sound has already been permanently altered, removing hundreds of miles of critical habitat for fish and wildlife. Over the last three decades the shoreline habitat from Bellingham Bay to the Canadian border used for spawning by Cherry Point herring — once the largest and most prolific herring population in Washington State — has decreased by 80%. Mature Cherry Point herring have in turn plummeted by 90%. This subspecies of herring spawn during spring, rather than in winter when all other Pacific herring stocks spawn. The late spawn once brought thousands of tons of adult herring plump with eggs into the Salish Sea, precisely when spring salmon runs are headed for the Fraser and Skagit rivers, and when J pod traditionally forages around the San Juan Islands. Abundant herring are essential if salmon populations are to be restored, and without enough salmon the orcas cannot recover.

More protection followed from the state government. In April, 2004, after a year's examination and publication of a detailed orca status report, Washington's Fish and Wildlife Commission listed the Southern Resident orcas, along with transients and offshores, as *endangered* species. In May, 2004, the state legislature partially funded the Washington Dept. of Ecology's plan to identify and clean up contaminated sediments in Puget Sound.

Conservationists rejoiced in August, 2004 when the City of Port Angeles, the National Park Service and the Lower Elwha Klallam Tribe signed an agreement to allow the two fish-blocking dams on the Elwha River to be removed. The Elwha Restoration Project, the largest dam removal project in US history, can now go forward, more than a dozen years after Congress approved the removals. Starting in early 2008, the 108-foot-tall Elwha Dam and the 210-foot-tall Glines Canyon Dam will be dismantled in stages, reopening 70 miles of prime salmon and steelhead spawning habitat. Nearly all of the river's watershed is preserved in Olympic National Park, away from human impacts, but populations of at least 22 species of wildlife within the Elwha basin have declined due in part to a lack

An orca in hot pursuit flips a fish. Orcas often seem to play with their food. Photo by Jim Maya.

> Our Creator gave us this fish to live on...
> and we cherished it, and we respected it...
> we didn't waste it, we used every bit of it...
> I may not see the abundance of fish come
> back in my lifetime, but I would like to
> see it come back for my grandchildren,
> my great-grandchildren, and the rest
> of my people, the following generations
> to come. It was a gift from our creator,
> it was our culture and heritage.
>
> *–Beatrice Charles, Klallam tribal elder*

of salmon carcasses in the middle and upper river. Among these are bald eagles, black bear, bobcat, coyote, raccoon, weasel, mink and river otter. Grazing habitats for Roosevelt elk and black-tailed deer have also been inundated.

For millennia, Klallam Indians have lived and fished along the Elwha's banks and tributaries. Like the Klallams, the Southern Resident orcas depend on native fish runs that once populated this river year round. Sea-run cutthroat trout, native char, winter and summer runs of steelhead swam in these glacier fed waters. Coho, pink, chum, sockeye, spring and summer/fall chinook returned by the hundreds of thousands, with individual chinook sometimes exceeding 100 pounds! Dam removal could produce 390,000 salmon and steelhead per year in about 30 years.

In September, 2004, Senator Cantwell announced another $1.5 million appropriation to study the causes of the orcas' population decline and to support efforts to restore habitat. Two more calves were born in L pod in October, and in December J pod and K pod each added a new member. The only loss reported in 2004 was 55 year old female K18, Kiska, missing from K pod since late 2003 and presumed dead. With the absence of one individual and the addition of five calves, assuming they all survive their perilous first year, the total population for the southern community has rebounded to the upper 80's, but still fewer than in 1996. In early 2006 J pod had 24 members, K pod had 20, and L pod had 43 (not including Lolita, still captive in Miami). Whether this apparently improved prospect for recovery can be maintained in years to come remains to be seen. El Nino conditions, global warming, and further damage to salmon habitat continue to threaten orca survival.

Also in October, 2004 an oil spill estimated at 1,000 gallons of heavy oil spread across southern Puget Sound, coating shorelines and shellfish beds along southern Vashon and Maury Islands. The spill was first reported shortly after 1 am on October 14 (a time of year when orcas typically circumnavigate Vashon Island) but darkness and fog delayed containment of the spill until mid-morning.

The Puget Sound Action Team (PSAT), reporting from the Office of the Governor, has formulated a detailed two year plan to conserve and recover the waters of Puget Sound. In a proposal submitted on December 1, 2004 to the State Legislature, PSAT focused on seven priorities to respond to the many critical threats to the ecosystem:

- **Clean up contaminated sites and sediments.**
- **Reduce continuing toxic contamination and prevent future contamination.**

J22, Oreo, born in 1985, with her firstborn, J34, a male born in 1998, at five years old. Photo by Jeff Hogan, KWT.

- **Reduce the harm from stormwater runoff.**
- **Prevent nutrient and pathogen pollution caused by human and animal wastes.**
- **Protect shorelines and other critical areas that provide important ecological functions.**
- **Restore degraded nearshore and freshwater habitats.**
- **Conserve and recover orca, salmon, forage fish and groundfish.**

Advocates for the Southern Resident orcas got an early Christmas present on December 16, 2004 when NMFS proposed that the whales would be listed as "threatened" under the ESA. NMFS found that the Southern Residents are a "distinct population segment," because even though scientists are unable to say whether there are multiple species of orcas worldwide, they believe there are different subspecies. North Pacific resident orcas (Northern, Southern, Western Alaska, Prince William Sound and Southeast Alaska residents) are likely a subspecies, they determined, and Southern Residents are significant to North Pacific residents, thus qualifying them for listing under the ESA. NMFS regional director Bob Lohn said the whales' "distinct habits and language" make them significant.

Orcas moving slowly at rest. Photo by Stefan Jacobs, CWR.

Also on December 16, Gov. Locke specified for NMFS how many more salmon will be needed in streams and rivers in the lower Columbia River to get the fish off the Endangered Species List: an *average* of 10 times as many chinook salmon as are currently found in key spawning areas. The plan divided salmon into small subpopulations, sorted by the streams and creeks where adults return to spawn. They then assigned recovery goals for each of the

Actions Washington State can do to prevent pollution

To ensure that Puget Sound has water quality that provides for the protection and propagation of fish, shellfish, and wildlife, including orcas — and provides for recreation in and on the water — People For Puget Sound (www.pugetsound.org) recommends that:

- WA Dept. of Ecology must continue to strengthen its enforcement and inspection programs.
- Penalties must be sufficient to deter improper practices and encourage businesses and residents to prevent violations from occurring.
- Inspections must continue to include sampling and testing of effluents to verify the information submitted by the facilities.
- Funding for enforcement and inspection activities must be provided at 100% of the level necessary to carry out this vital activity.
- Ecology must establish permit limits that truly reflect the best job that these facilities can do to reduce the amount of pollution they generate.
- These facilities must continue to reduce their discharge of pollution to meet the Clean Water Act goal of zero discharge of toxic pollutants.
- Pollution prevention options must be considered the highest priority and first choice for reducing the flow of toxic chemicals from these facilities.
- If a facility discharges a chemical above water quality standards, they must prove that they have implemented all reasonable pollution prevention opportunities to control the release of that specific chemical.
- Washington State should consider expanding its pollution prevention planning law to include water and air discharges and should expand its Community Right-To-Know reporting requirements to provide more information about the use and through-put of toxic chemicals.
- Ecology must improve and expand public education, public access to information and public involvement in review of NPDES permits.

Killer whales are known as a "cosmopolitan species" because they've learned to survive in diverse habitats around the globe. Off the New Zealand coast, they eat stingrays. In the Antarctic they eat whales and penguins. Off the coast of Norway, they eat herring; in Patagonia, sea lions; in the open Pacific, sharks; in Japan, squid; in the Antilles, sea turtles; in the Indian Ocean, tuna. Just as human hunter-gatherer societies differed from one another based on their geography, climate, and food source, so have the different conditions faced by various orca populations given rise to differing orca "cultures."

—Alexandra Morton, author/researcher

subpopulations. The goal is rivers churning with enough coho, chinook and steelhead not only to avoid extinction, but also support viable fisheries for tribes, commercial fleets and sport anglers. And, one might add, for orcas. Southern Residents need about 800,000 salmon per year.

We've opened a new chapter in Human/Orca relationships. In the past 10 years we've learned volumes about the Southern Resident orcas, and about other communities of orcas worldwide. We've rejoiced over births and mourned each death. We've thrilled to the sight of orcas on the move and marveled at their mastery of ocean conditions, and we've learned about their deep family bonds.

The steep decline of the Southern Resident community in the late 1990s galvanized public, local, state and federal efforts to find and address the root causes of the whales' alarming mortalities before the entire community slips away. We've learned much in recent years, and we obviously care about, and are trying to save our orca neighbors, but can we rescue these unique and precious Northwest residents?

The call to help the orcas has indirectly prompted a fundamental reconsideration of what kind of animal we see when we look at an orca. In early 2006 NMFS listed Southern Resident orcas *endangered* under the ESA, as a *culturally* distinct and significant orca population, something never before recognized by the scientific community.

A Few Things You Can Do to Help the Orcas

Take ACTION at home:
Save Energy*:* Turn off lights and appliances not in use. Use cold water when possible. Run dishwashers and clothes washers only when full.
Save Water: Take quick showers instead of baths. Install water-efficient showerheads, faucets and toilets. Collect rainwater for your garden. Plant native plants rather than lawn. Use compost and mulch to keep plantings moist.
Save Resources: Recycle, reduce & reuse. Use recycled paper or tree-free, unbleached paper alternatives. Bring cloth bags to the grocery store. Leave or plant trees and shrubs for wildlife. Volunteer to help a local restoration project.
Don't Pollute: Use biodegradable detergents. Use alternatives such as vinegar and baking soda instead of chemical household cleaners. Avoid using pesticides or chemical fertilizers.
Take ACTION at work: Start a recycling program at your workplace. Encourage conservation of energy and water at work.
Take ACTION when you shop: Buy recyled, reused or low impact products.
Take ACTION when you travel: Walk or bike when traveling shorter distances. Buy a fuel-efficient or hybrid car. Convert to biodiesel. Maintain your vehicle for better gas mileage. Try not to spill or drip fuel. Organize carpools.
Get INFORMED and INVOLVED: Learn about local and regional issues and projects. Follow the news and legislative actions regarding the environment. Learn more about toxic chemicals. Read, browse websites, attend meetings, join email lists concerning issues important to you. Volunteer to restore salmon habitat. Join Orca Network's Whale Sighting Network and help track the whales.
GIVE: Support your favorite environmental programs. If you can't give financially, give of your time and talents — volunteer.
SPEAK OUT: Write or speak to your elected officials about issues affecting salmon, marine habitats, wildlife, toxic pollution, and shoreline development. Write letters to the editor of local papers. Share your concerns with friends, family, co-workers and email lists.
VOTE: Make informed choices when voting for local and federal officials. The whales and salmon have no vote, so we must speak and act for them.

For more information, go to:
www.orcanetwork.org/help/help.html or
www.psat.wa.gov/you_can_do/10_things.htm

"Trees for Streams" Project: *A Success Story*

Note from Jeremy Brown, commercial fisher:
The message I see for all marine issues today is the little known scientific fact that water runs downhill! Not only the quality of the water that orcas swim in but their whole food chain is driven and impacted by what happens upshore.

Salmon of course tie this together; orcas eat salmon, salmon need good freshwater habitat etc.

For an inspirational restoration story, there is a great one in the Nooksack basin. Dorie Belisle, who with her husband John, run a small apple orchard, decided rather than snorting and stamping with their neighbors over salmon stream issues on their land, they would 'get ahead of the curve' by taking the initiative themselves. By recruiting other farmers in the Ten Mile Creek drainage, Dorie has built a remarkable movement to restore salmon habitat and provide the continuity necessary to ultimately feed more orcas.

Dorie Belisle was "Trees for Streams" project coordinator and project manager for the Ten Mile Creek watershed restoration pilot program, a community based effort to have healthy streams in the watershed through education, empowerment and financial assistance She writes:

It takes a community to raise a tree! This past March, we saw the community of Whatcom County not only raise a tree, but also raise and replant 5,239 trees along streams that run through Whatcom County. 121 families gave up their Saturdays to plant trees on their property. These are the unsung heroes of stream restoration. Through the "Trees for Streams" project, landowners came for 10, 25, 50 or 100 trees to replant along their stream, pond, river or wetland. Over 20 sub-basins were improved. Ponds and wetlands now have a greater chance to be shaded. The Nooksack River and the Lummi River now have more trees. 2004 is the third year of the "Trees for Streams" giveaway.

Native trees and shrubs help the land and water in many ways. They help provide a healthy riparian area along the waterways. Many of our low-lying streams are overgrown with reed canary grass — an exotic grass that takes over the stream banks and will eventually grow throughout the stream. This leaves the streams clogged with grass that prevents good drainage of our fields. It also leaves the water depleted of oxygen as it grows, dies and rots in the water. Reed canary grass does not like shade, so trees and shrubs are a natural deterrent to this grass.

Trees and native plants also provide shade over the water, which helps to keep the temperature cool. They provide a natural purification system that takes up extra nitrogen and other impurities to keep our water clean. They provide complexity to our water ecosystem as leaves and branches fall into the water. This "litter" provides food for the important bug life in the stream, which of course provides food for fish. They also provide beauty and a sense of life to us. We know that the trees we plant today will be here long after we are gone.

Local farmers and landowners grew these trees. *These farmers believe that we can make a greater impact on the health of our streams as neighbors working together than we can alone*, waiting for regulation to dictate how big a buffer area we have to give. You too can participate in the "Trees for Streams" tree giveaway. Call Dorie Belisle at 360-398-9187. Our watersheds are important to us and to our grandchildren.

Duwamish habitat project gives lift to both creek, volunteers

Seattle Times - October 31, 2004

Jessica Hing, 13, was among some 70 volunteers with People for Puget Sound, a Seattle nonprofit, planting 1,000 trees and shrubs in the Hamm Creek area in South Seattle. The area is home to bald eagles, ospreys, red-tail hawks, river otters and coho salmon. By planting the trees, donated by the King County Conservation District, the volunteers were building a healthy home for migrating birds and for insects that the salmon eat.

Founded in 1991, People for Puget Sound oversees about half a dozen sites along the Duwamish. Each year, a total of about 700 people volunteer at monthly large-group habitat-restoration events from March to October, she said.

"I think it's amazing," Anne Hing said. "It's pretty thoughtful what folks are doing."

For more info, go to: www.pugetsound.org.

Communication

IN THEIR OCEANIC SURROUNDINGS, whales know no boundaries, no easily marked territories, no dens, no nests. Their prey are fast-moving fish or squid or shoals of plankton (or for transients, other marine mammals) that shift ceaselessly with currents and migrations. And yet even among mammals, most cetaceans are highly social animals, traveling in groups and often coordinating their feeding and other activities, all in a world where the use of sound is the only means of maintaining contact. It's no surprise that whales and dolphins are well known for their harmonic and often booming vocalizations.

Do orcas wonder about us when they spyhop? Photo by Joseph Alicea.

The ability to communicate complex information is believed to be related to an animal's overall intelligence, which in turn may be related to brain size. Cetaceans are generally large-brained, and orcas and sperm whales are known to possess the largest brains of any animal on earth — almost 20 pounds (human brains weigh about 3.5 pounds). The question that intrigues observers and researchers is: *What are cetaceans doing with all that brainpower?* Though it is safe to say that whales' intelligence is at least partly devoted to interpreting sounds and maintaining social relationships, the complexity of their social and communication systems remains a matter of great scientific interest.

The noted anthropologist Gregory Bateson speculated that the majority of cetacean communication may be to reaffirm social bonds and relationships. Indeed, studies with dolphins have shown that each dolphin continually repeats its own unique "signature whistle." With their powerful siren-like voices, dolphins, including orcas, are able to maintain a "picture-in-sound" of the whereabouts of all other pod members.

Studies of grammatical proficiency in dolphins show they can use artificial languages and abstract representations of objects. Bottlenosed dolphins use more than 100 different whistle calls, ranging from high-pitched screeches to short clicks. Some sound like rusty hinges and others like rapid drumming. Just as human babies babble, newborn dolphins mimic adults' whistles and make hundreds of random sounds, until they eventually narrow their repertoire to the sounds used by adults.

Among resident orcas, each pod has a distinctive set of 7-17 characteristic calls, plus a wide range of calls that are heard during greetings and energetic socializing. These pod-specific dialects are maintained over generations despite extensive associations between pods. Some pods share certain calls and are grouped together in acoustic 'clans.' The Northern Resident community is made up of three such clans, while the calls of all three Southern Resident pods are more closely related and are considered only one clan. Similarity of calls appears to reflect shared matrilineal ancestry.

Adult males often travel together. Here three males from the A36 pod of Northern Residents move in a tight group. Photo by Joseph Alicea.

Orcas sometimes show surprising curiosity. Photo by Joseph Alicea.

The way is now clear for a vigorous discussion among scientists and the media about the cultural capabilities of orcas. Boiled down to their essence, new studies have shown that "the complex and stable vocal and behavioural cultures of sympatric groups of killer whales (*Orcinus orca*) appear to have no parallel outside humans and represent an independent evolution of cultural faculties" (Rendell and Whitehead, 2001) and that "culture should be integrated into conservation biology when considering populations with such attributes" (Whitehead, et al. 2004).

While science searches for a suitable description of the Southern Residents, the finding that orcas live in culture-based societies gives us a new vantage point for understanding the Orca. According to John Ford of Canada Fisheries, orca social systems are "unlike those of any other mammal." At least some orca communities are made up of clans, in turn made up of pods, *based on related dialects within groups*, much like Romance languages represent branches of historic human languages. Use of these dialects assures each member a place in their society. Among mammals, only humans exhibit similar use of symbols as the foundation of culture.

Transient and resident orcas produce three different types of vocalizations: echolocation clicks, whistles and pulsed calls. Echolocation is used for orientation and detecting prey. Whistles are simple tones believed used in close-range communication. The most commonly used are harmonic pulsed calls, which occur in three categories: "discrete," "aberrant" and "variable" (Ford, 1991). Discrete calls are the approximately 7-17 typical calls by which a pod can be identified acoustically. They may be repeated every few seconds. Aberrant calls are based on discrete calls but with some degree of modification. Variable calls are seldom repeated and have so far defied classification, but are used most often during active socialization.

Does all this mean orcas talk to each other? Do they use some kind of symbolic language to plan strategies, share experiences or memories or to maintain relationships? Do they convey their observations or feelings among themselves? Do they consider alternatives and plan their movements together? It often seems so. Examples of orca teamwork and food-sharing are legendary, and in their normal activities they almost always act in concert with other family members.

July 18, 2004
The whales are always coming up with things I haven't seen them do before. Today is one of those days. **J's, K's & L's spread out over several miles along the west side of San Juan Island.** As they approached, we were able to ID **J-28** (Polaris). As she passed by the boat, she **began to vocalize in a way that I have never heard.** We were all surprised and our guests thought maybe I was fooling around with the microphone but it wasn't me — Polaris did a call that can be **best described as a whale imitation of Curly from the 3 Stooges.** About 7 short woo woo woo type sounds.

–John Boyd, naturalist

A K pod orca swims near Bainbridge Island on November 18, 2004. Photo by Josh Thompson.

Orcas also often seem to have an affinity for humans, as Springer and Luna, among many others, have amply demonstrated, and there is no record of an orca harming a human except in captivity. Do they sense that we are thinking animals? Are they aware of our attitudes toward them? Do they develop cultural identities and attitudes, and know who they are as members of their families and communities? Have we found intelligent life in the universe, merely by looking down at the sea instead of up at the stars?

These questions remain unanswered, but at the least we now understand that the orcas of the Salish Sea are long term residents of these waters and deserve our care and respect. Looking at the big picture of the natural world, and considering the long view of the future ahead, we owe it to our future generations and theirs to prevent the extinction of the unique cultural community known as the Southern Resident orcas.

> Let man heal the hurt places and revere whatever is still miraculously pristine.
>
> ***–David Brower, environmentalist***

We live in a region washed daily by currents flowing across the Pacific Ocean. Just as salmon climb from ocean depths high into surrounding peaks, our climate is moderated with cool humidity pulled from seawater, keeping the land moist. The water's surface is like a perfect disguise from above — we see blue when the sun shines and steel-gray when clouds roll by. But just below the surface, beyond our view, dwells a vast and intricate network of living beings and natural forces, far more complex and ancient than any life on land. Unchallenged from within these liquid depths, yet totally dependent on the health of the marine ecosystem, is the Orca, possibly the most highly refined and exquisitely adapted expression of life in the sea. Nowhere else on Earth but here along the shores of the Salish Sea are multiple communities of orcas so visible and accessible to humans. Their presence here is a blessing that may be lost unless we help them survive.

As we look upon them from our cities, towns and suburbs that surround their vital habitat, we're beginning to realize that we have an obligation to do no harm to the orcas in our midst. We're learning to care for the waters that are their home, and increasingly we're trying to clean up and repair the damage we've done. The orcas now depend on our awareness and protection if they are to continue to make their home here.

Though orcas have no known predators other than man, they avoid overpopulating their habitats. They pose no threat to humans, and in fact aggression of any kind is extremely rare among them. Their physical and cultural adaptations have evolved in harmony with their environment to a peak of sensory acuity, metabolic strength and social cohesion.

The fate of Pacific Northwest orcas, like all other whales around the globe, ultimately depends on the health of their marine ecosystems. These intelligent and resourceful creatures will do well as long as they are safe, their basic food source is plentiful and their waters are healthy.

A Native American proverb says: "We do not inherit the Earth from our ancestors, we borrow it from our children." We also borrow the Earth, and the waters of the Salish Sea, from the next generation of orcas of the Southern Resident community.

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Orca Network Whale Sighting Network

ORCA NETWORK'S WHALE SIGHTING Network began in the mid-1990s when a small group of friends and volunteers on Whidbey Island, WA realized orcas and other cetaceans often travel along the island's many miles of shoreline. Susan Berta then worked out of the Admiralty Head Lighthouse, a perfect whale lookout. Whenever a pod of orcas or other whales were spotted, Susan would call nearby volunteers and friends so they could share in the thrill of watching whales from the many vantage points along the 60 mile long island. With the advent of email, and a growing number of people to notify about sightings, Susan began sending out whale alerts via an email list. Through word of mouth, the list grew, and soon whenever whales were seen off Whidbey Island, calls would come to Susan, and she would send out the reports. Researchers began to join the list, and by working together, travels of the Southern Resident orcas could be more consistently tracked during fall and winter, and Gray whales could be tracked in spring.

By 2001 the informal network of friends and volunteers had grown into a full-fledged Whale Sighting Network encompassing all of the Salish Sea and beyond. More researchers from both sides of the border joined the network, as well as staff from National Marine Fisheries Service, Canada's Fisheries and Oceans, and WA Fish and Wildlife.

Susan Berta and Howard Garrett co-founded Orca Network to educate and advocate for whales, with a toll-free whale report number and website. Through the interactive email list and website, information is shared between researchers, sighting networks, agencies and the whale-loving public, providing a forum for whale-related information. This sharing of information motivates people to report sightings, and has created a cyber community of people who feel and share the joy of seeing whales and want to learn more.

As of 2010, the Whale Sighting Network is over 4800 participants, including researchers, agencies, non-profits, naturalists, citizens, businesses, boat operators, media, elected officials, military, teachers and students, tribes, and whale watchers of every age.

Orca Network helps researchers track the Southern Residents as they traverse their winter habitat in coastal waters from California to Canada.

When an oil spill occurs, Orca Network's data is used to assess if whales are nearby, and Orca Network helps track L pod's travels up Vancouver Island, with hope of a reunion for Luna and his pod.

From its beginning as an informal network among friends to share the thrill of watching whales from Whidbey Island, the Whale Sighting Network has grown into a family that spans the globe and loves to share every glimpse of our finned neighbors.

Whales often pass by Lime Kiln Park on San Juan Island. Photo by Joseph Alicea.

This 1990 photo by David Ellifrit of the Center for Whale Research includes J18 (male) at 13 years old, in the foreground, with K12 (female) at about 18, above and to his left, and in the background, left to right, are K40 (female) at about 27, K5 (male) at about 37, and K17 (male) at about 24 years of age.

Have we found intelligent life in the universe, merely by looking down at the sea instead of up at the stars?