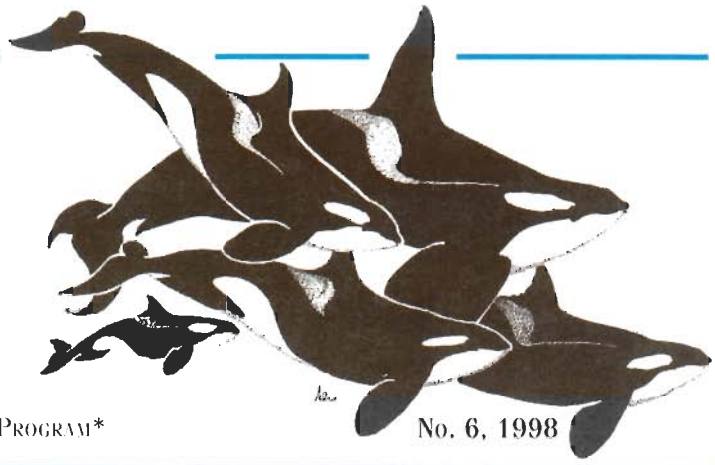
The Blackfish Sounder

THE NEWSLETTER OF THE BRITISH COLUMBIA WILD KILLER WHALE ADOPTION PROGRAM*

No. 6, 1998



*THE B.C. WILD KILLER WHALE ADOPTION PROGRAM, HOSTED BY THE VANCOUVER AQUARIUM, IS AN ONGOING RESEARCH AND CONSERVATION EFFORT FOR THE PROTECTION OF WILD KILLER WHALES AND THEIR HABITAT.

Vancouver Aquarium

ORCA FM hits the radio air 'waves'

Make way for Canada's newest and most unusual radio station. It has no music, no commercials, no studio, and no staff. But it *does* have a microphone, a phone line — and several hundred star 'personalities' who will hopefully make frequent guest appearances.

It's ORCA FM, the world's first killer whale radio station, featuring the whines, whistles and clicks of wild killer whales as they travel, feed, play and rub in Johnstone Strait off northeastern Vancouver Island. Station CJKW, at 88.5 on the FM dial, began broadcasting live, 24 hours a day, this spring.

"The idea of listening to whales chatting to each other without bothering them is pretty compelling," says Dr. John Ford, director of research and conservation at the Vancouver Aquarium and ORCA FM's creator. As an expert on killer whale acoustics, he's been eavesdropping on the whales for years. Last year, he decided it was time for the general public to listen in too.

In October, the Canadian Radio-television and Telecommunications Commission (CRTC) granted the Vancouver Aquarium a license to broadcast live underwater sounds from Johnstone Strait. Not surprisingly, the unusual CRTC application had its lighter moments. When the paperwork asked whether the main language used would be English, French, or 'other', Ford checked 'other' and wrote in 'whale.' "They didn't bat an eye," he says. "Everyone really liked the idea."

The ORCA FM signal can be picked up by any radio within a 10-kilometre radius of Robson Bight (Michael Bigg) Ecological Reserve in Johnstone Strait. This means that kayakers, boaters, and shore-based whalewatchers can tune in to the whales without having to buy expensive underwater recording gear. "Listening to the whales' underwater chatter adds so much more to the whalewatching experience," says Ford.

The ORCA FM signal is also being relayed via a high-quality B.C. Tel phone line to a new whale acoustics exhibit at the Vancouver Aquarium, where visitors can listen in to real-time whale calls. Even if the whales aren't in earshot, there are plenty of other sounds to hear, such as fish grunting, mussels popping — and a lot of boat noise. Johnstone Strait is one of the busiest waterways on the B.C. coast.

"When the whales aren't there, there's usually a roar of boat noise, and when the

...Continued on p.2

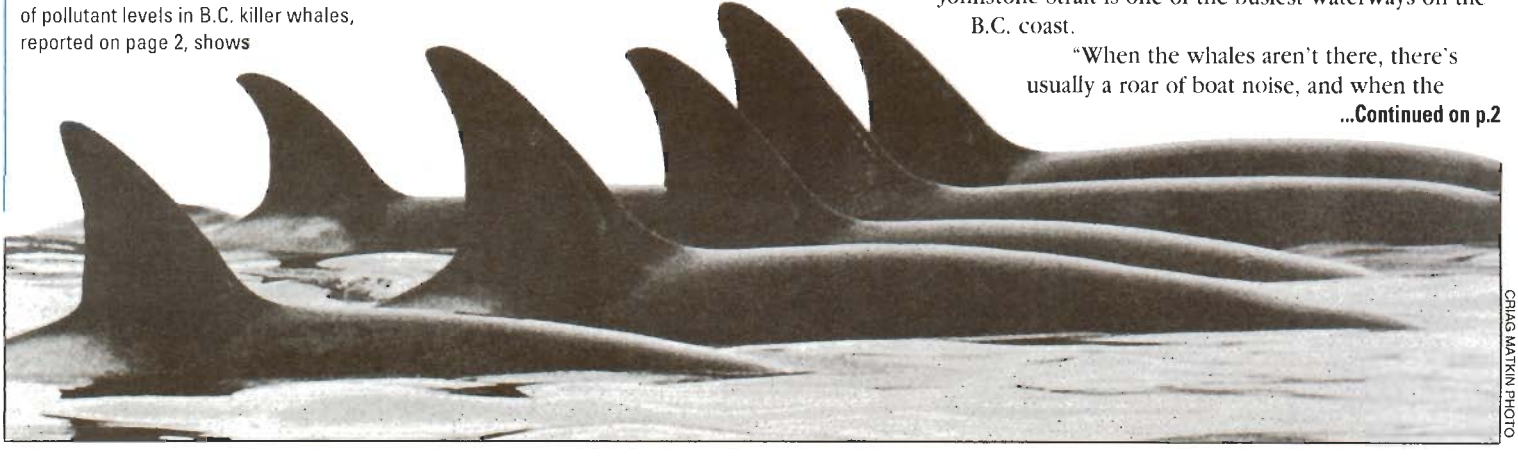
In this, our sixth edition of *The Blackfish Sounder*, we tell you about our newest project — ORCA FM, the world's first killer whale radio station. For many of you, it will be your first experience at listening to the live underwater sounds of wild killer whales. As we describe on pages 4-5, killer whales are exquisitely adapted for life in an underwater acoustic world. ORCA FM will help us all appreciate how important sound is to these animals and how the din from boat noise — which you'll also hear on ORCA FM — may be interfering with their ability to communicate, navigate and find food.

For those of you unable to come to B.C. to hear the whales, take note: we hope to have ORCA FM on the Internet, perhaps as early as this fall.

Like underwater noise, pollutants in the food chain may also be affecting the whales far more than we realize. A preliminary study of pollutant levels in B.C. killer whales, reported on page 2, shows cause for concern. We don't know what these chemicals might be doing to the whales in the long-term. In other species, effects such as poor reproductive success and increased disease have been observed. It's just one more reason why we need to closely monitor the whales from year to year to detect any subtle changes.

Our pollution — whether its chemical or noise — may seem like an insurmountable problem. But it's not. For many of us, it strikes home when we see the whales facing these kinds of pressures. Public opinion can motivate regulators to stop degradation of the marine environment. So let's spread the word.

Dr. John Ford
Director of Conservation and Research
Vancouver Aquarium



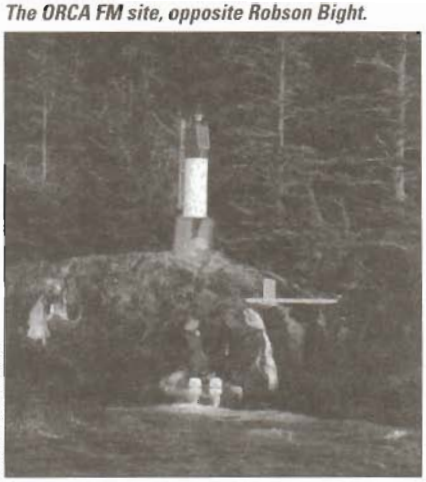
CRAIG MATKIN PHOTO

ORCA FM. . . *from p. 1*

whales are there, their sounds are often partly masked by all the noise in the background," says Ford. "The listening public is going to realize that the B.C. coast is not the unspoiled wilderness that they think it is."

ORCA FM is actually an offshoot of Ford's ongoing WhaleLink project, which involves a network of underwater listening posts at key killer whale 'intersections' along the B.C. coast. Researchers can identify pods and many subpods by their distinctive calls (see p. 5), and will use the WhaleLink network to help track the whereabouts of B.C.'s killer whales, day or night, summer or winter, in good or bad weather.

The ORCA FM site, opposite Robson Bight.



JOHN FORD PHOTO

Each listening post consists of an underwater microphone, or hydrophone, attached by cable to a land-based device programmed to turn on when it 'hears' killer whale calls. Once activated, the system transmits audio signals by cellular phone to a receiving station, where they're conveyed via a land telephone line to Ford's office at the Vancouver Aquarium.

The first WhaleLink listening post was installed opposite the rubbing beaches in Robson Bight in late 1996, and after a few bugs were worked out of the system, Ford got his first whale phonecall one afternoon last July. "It was the A30s," he says. "It was pretty exciting to be sitting in my office and listening to them, live."

The whales have phoned many times since, but so have boats. Because the voice recognition system is often fooled by nearby engines, Ford has decided to move the WhaleLink station further north — where boat traffic isn't as intense — and replace it with the ORCA FM feed. He also hopes to have a second WhaleLink site installed near Prince Rupert, on the north coast, by the end of this summer.

The WhaleLink project will gradually expand to include more sites as the technology is proven effective and arrangements are made to provide cellular, radio or even satellite phone service in areas not covered by a cellular network. Each site requires about $5,000 worth of equipment.

"Through the WhaleLink network we'll get a much better sense of how killer whales use the coast," says Ford. "And through ORCA FM, the public will get to listen to, and learn about, killer whale communication as it happens."

WhaleLink sponsors include B.C. TEL Mobility, the Canadian Coast Guard, the Department of Fisheries and Oceans, and the B.C. Wild Killer Whale Adoption Program. The voice recognition software continues to be improved by electronics technologists Peter Welk and Iain Macdonald. B.C. TEL is picking up the bill for the continuous ORCA FM feed and Total Point Inc., a Yukon company, has donated the station's radio transmitter.

Whales carry high toxin levels, study shows

BRITISH COLUMBIA'S KILLER WHALES are carrying around "worrisome" levels of dangerous chemical pollutants, an ongoing study shows.

The study, led by wildlife toxicologist Dr. Peter Ross, has analyzed blubber samples from 55 B.C. killer whales and finds that the whales are, in general, carrying toxin loads above levels known to cause immune system, hormonal and reproductive problems in other species.

"I would say that the levels are high enough to cause concern," says Ross, who is based at the Institute of Ocean Sciences (IOS) near Victoria, B.C. "It is clear evidence that B.C.'s killer whales are not living in the pristine environment or eating the clean food we think they are."

As top marine predators, killer whales are exposed to a wide range of manmade chemicals through their diet. Fat-soluble chemicals such as PCBs, dioxins, and furans seep into water systems and slowly work their way up the food chain, increasing in concentration as they go. First they bind to small particles, which are eaten by zooplankton, which in turn are consumed by small fish, then larger fish, and so on, up the line to killer whales.

Even though most of these chemicals are now banned or tightly regulated, they're still everywhere, says Ross. For example, the notorious pesticide DDT was banned in North America in the early '70s, but is still found in very high concentrations in some marine mammals. "It's still used in some countries, and all these chemicals can evaporate from the surface of water bodies and be transported thousands of kilometres," he notes.

Several years ago, Ross studied contaminant levels in harbour seals in Holland. Captive seals were fed herring from two locations, the Atlantic and the Baltic Sea, over a two-and-a-half year period. They found that the more contaminated herring from the Baltic affected immune and hormonal function in the seals. The herring were taken from catches destined for human consumption.

In 1996, Ross began a similar study on wild B.C. harbour seals. Age is a key factor, as is gender. Studies show that toxin concentrations in marine mammals increase with age, and that older males carry the highest load.

...Continued on p.7

The Blackfish Sounder
is the annual newsletter of the B.C. Killer Whale Adoption Program, c/o Vancouver Aquarium, P.O. Box 3232, Vancouver, B.C., V6B 3X8. Telephone (604) 631-2573, fax (604) 631-2529, or e-mail: adoption@vanaqua.org

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Vancouver Aquarium

Southern residents go a 'bridge too far'

A GROUP OF KILLER WHALES found themselves in a jam — in more ways than one — last fall when they spent 30 days in a tiny inlet in southern Puget Sound near Seattle, Washington.

On Oct. 21, the 19 whales of the L25 subpod in the southern resident community entered Port Washington Narrows, a long and winding channel spanned by two large and heavily travelled bridges. At the end of the narrows is Dyes Inlet, a small, lake-like inlet less than 13 sq km in area and up to 40 metres deep.

The whales were probably feeding on a chum salmon run in the inlet, and unconfirmed reports say they were initially accompanied by two other southern pods — J and K — which both left within hours. Those two pods are frequent visitors to southern Puget Sound; the L25s are are rarely, if ever, seen there. Not only are the L25s unfamiliar with the area, but most are young, relatively inexperienced whales.

As time went on, and the whales didn't leave Dyes Inlet, concern mounted. There have been several documented cases of killer whales becoming entrapped, often by psychological barriers such as kelp forests and tidal rapids. It's speculated that the Dyes Inlet whales were intimidated by the larger of the two bridges, which casts a wide shadow over the water and produces a steady drone of traffic noise. But these whales had to contend with another big problem — hundreds of boaters and kayakers who clogged up the inlet eager for a view of the spectacle.

"It was a free-for-all," says a disgusted Kelley Balcomb-Bartok of the Whale Museum on Washington State's San Juan Island. He and other researchers watched in dismay as, day after day, the whales were hounded by well-meaning, but "clueless" boaters. On one Sunday, 500 boats and kayaks surrounded the hapless whales. The museum's Soundwatch boat, which advises boaters on proper whalewatching etiquette, was doing its best, but sheer numbers ruled the day. "At one point," says Balcomb-Bartok, "the fisheries enforcement boat was on top of the whales, trying to push everyone back."

After 26 days of this, the stress began to show. Two whales had slight depressions near the blowhole, a sign of poor health. The whales didn't forage much anymore, except at night when the boats had left, and spent their days 'pacing' back and forth. Many times, Balcomb-Bartok saw them head toward the bridge and turn back, sometimes exhibiting "explosive" breaching. "I've never seen 45 breaches in a row before," he says.

K. BALCOMB-BARTOK PHOTO

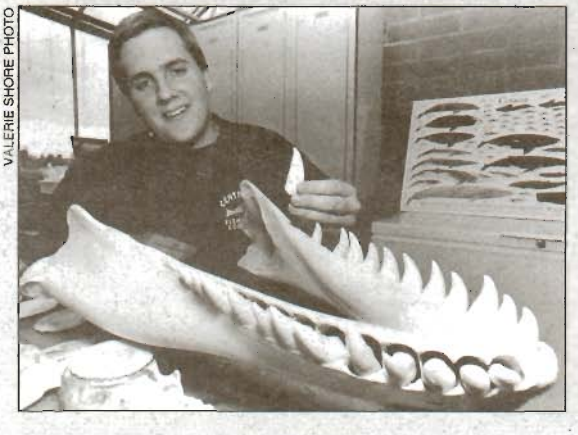
The whales finally go under the bridge.

Finally, on a very rainy Nov. 19, with few boats around, the whales made their move. Twice they headed to the bridge, and twice they turned around. "I got the sense there was an argument going on," says Balcomb-Bartok. Then something clicked. The whales regrouped, this time with a big male, L57, in front with the older females. Again, they hesitated at the bridge, but this time, two of the older females surged through the bridge shadow and breached on the other side. One by one, the other whales dove and reappeared on the other side of the bridge.

But then they stopped. Two whales — a mother and calf — had not come through. Two whales turned around, one of them the son of the reluctant female. With a huge splash, he breached at the bridge, and then all four whales disappeared. "When they surfaced two minutes later," smiles Balcomb-Bartok, "they were so far down along the shoreline they were almost at the second bridge."

Minutes later, all of the whales were out in deeper water, porpoising at high speed, 5-6 animals abreast. This sort of exuberance has been observed after other entrapment incidents. "I believe those whales were stuck," says Balcomb-Bartok, "and I hope we never see whalewatching like that again. The best thing we can do from this experience is learn how to properly understand the whales and their needs. If we'd done that, 30 days of harassment could have been avoided."

"If we'd properly understood the whales and their needs, 30 days of harassment could have been avoided."



VALERIE SHORE PHOTO

Young whale 'lives on' through education

Kyle Pilon, a Grade 12 student at Centennial High School in Coquitlam, B.C., poses with a tooth and the lower jaw of A57, a young northern resident killer whale that died in late 1996 of an infection. It's rare for researchers to find and recover the bodies of whales that die, so this case was seen as an excellent opportunity to learn more about killer whale anatomy. Whale researchers Graeme Ellis, of the Department of Fisheries and Oceans, and John Ford, of the Vancouver Aquarium, arranged for Centennial teacher Rod MacVicar and his students to prepare the skeleton for display.

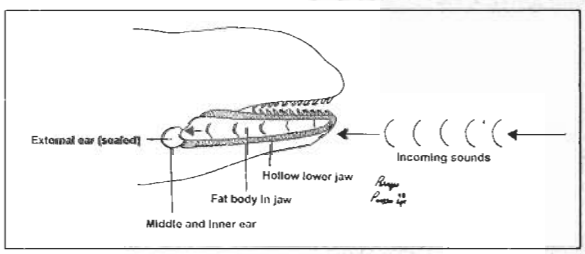
A57, known in our adoption program as *Kelkpa*, was the five-year-old daughter of *Sonora* (A42) in the A8 subpod. She was easily recognized because she had a mis-shaped nose, or rostrum, making her head appear blunt.

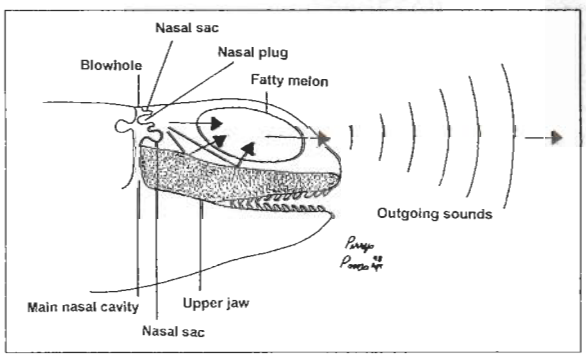
The skeleton is much more than a research tool to the students, says MacVicar. "It's generating discussion, raising levels of awareness, and creating feelings of empathy for the individual and its short life," he says. "All care is being taken to handle the remains as scientifically and respectfully as possible."

How do killer whales hear?

THIS IS AN OFTEN-ASKED question, since whales have no obvious ears that we can see. Yet killer whales have very acute hearing, and for good reason. Although they have good eyesight, killer whales use hearing to locate prey, listen to each other, and find their way around when it's dark or the water visibility is poor. They'd quite literally be lost without it.

For the record, killer whales do have ears, but they're so small externally that they're almost impossible to spot. From the outside, they're tiny, sealed pinholes located on either side of the head just below the white eye patches.





How killer whales hear (top) and how they make sound (bottom).

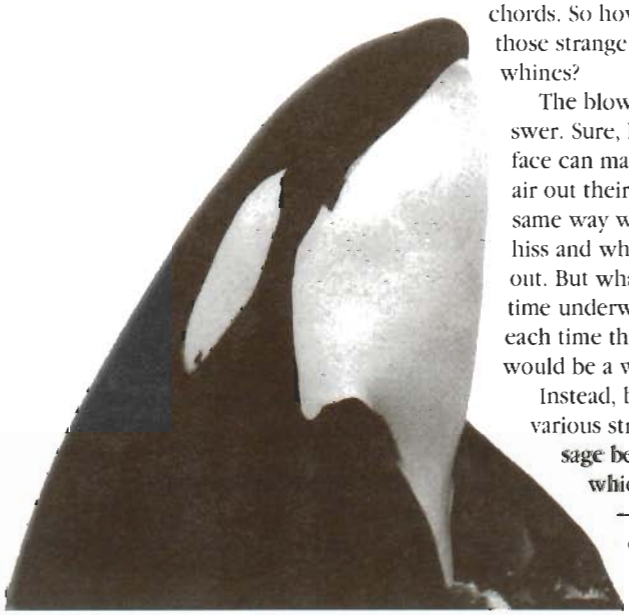
As you might imagine, if we had two pinholes for ears, we wouldn't be able to hear very well. Our external ears — and those of other land mammals — are shaped to collect and amplify sound waves in the air, directing them down into a canal inside the head, and to the eardrum. But flappy outer ears would interfere with a whale's hydrodynamic shape, and besides, sound travels so much better in water than on land. Since whales swim in a sea of sound, it makes sense that they'd have an even better way to hear the world around them.

And they do. Sounds are received through a whale's hollow lower jawbone, where they're picked up by fatty tissue and transmitted to the middle and inner ears, located at the hinge of the jaw. If you ever have the chance to examine the skull of a killer whale, look at the flat, thin area at the base of the lower jaw. This is the *acoustic window*, which is bone, but acts like an eardrum. The real eardrum is enclosed in the earbone — the hardest material in a whale's body — which is detached from the skull and surrounded by gas-filled tissue. This tissue counters the effects of pressure changes during dives and enhances the whale's ability to tell where a sound is coming from.

Killer whales can hear with exceptional sensitivity. Scientists, who measure sound frequency in units known as kilohertz (kHz), know that humans hear sounds as high as 16-20 kHz. Killer whales are known to detect sounds of up to 110 kHz — not bad for an animal with 'no' ears!

How do killer whales make sound?

IT'S VERY TEMPTING to think that killer whales 'speak' through their mouths, just like we do. After all, we usually see TV's *Flipper*, a bottlenosed dolphin, whistling and squealing with his long, toothy beak agape. But it's a misleading image, because whales and dolphins don't have vocal chords. So how do killer whales make those strange clicks, whistles and whines?



GRAEME ELLIS PHOTO

The blowhole isn't really the answer. Sure, killer whales at the surface can make sounds by squeezing air out their blowholes, in much the same way we can make a balloon hiss and whistle by slowly letting air out. But whales spend most of their time underwater. Blowing bubbles each time they want to 'speak' would be a waste of precious air.

Instead, by forcing air through various structures in the nasal passage beneath the blowhole — which is closed underwater — killer whales can generate an amazing assortment of noises: ultrasonic clicks less than a millisecond in duration; canary-like whistles more than 10 seconds long; and loud, complex calls that may be heard for 10 kilometres underwater.

Most of these sounds leave the head through a special body of fat within the *melon* — the fleshy bulge on top of the head — which acts like an acoustic lens, focusing the sounds into a cone-shaped beam directed in front of the whale.

Echolocation clicks, which sound a bit like a finger flicked along the edge of a comb, are produced when the whale opens and closes a muscle just below the blowhole, creating a popping sound. The clicks radiate out from the melon, bounce off objects such as rocks or fish, and reflect back to the whale. The sounds are received as described above, and the whale forms an acoustic 'photograph' of its surroundings. Resident killer whales are often heard echolocating at various rates and frequencies, probably to locate prey and find their way through the convoluted channels and passes along the coast.

Whistles and calls, on the other hand, seem to be used mainly for communication with other killer whales. Calls are the more common. Typically less than two seconds long, calls are made up of bursts of pulses generated up to several thousand times per second. What we hear are high-pitched squeals, squawks and whines very similar to those made by rusty hinges on a quickly closing door.

To most of us, these eerie, haunting tones are simply pleasant listening. But to the practised ear of a researcher who studies killer whale acoustics, they're much more.

What can we learn from killer whale calls?

GRAEME ELLIS PHOTO

WHAT CAN THE SQUEALS, squawks and whines of killer whales tell us? A lot. Just as human voices give us information about a person or group of people, killer whale 'language' speaks volumes about B.C.'s killer whales.

We've learned from 25 years of research on the B.C. coast that every pod of resident killer whales makes its own *discrete* calls — each distinct enough to be identified by a trained ear. Some pods use as few as seven discrete calls, and other pods as many as 17. Each whale in a group uses all or most of its family's repertoire of discrete calls, collectively known as a *dialect*. Because individual whales stay with their family group all their lives, calls may change very little through generations.

Researchers are able to identify calls to the pod (and sometimes subpod) level, so dialects are an excellent tool for tracking whale movement. Dialects have also been used to form a 'family tree' of how resident pods and subpods are related today and how they may have evolved over time. The more similar the dialects, the more related two groups are.

Dialects have told us a lot, so far. The 19 pods that make up B.C.'s resident killer whale population can be divided into two *communities* — northern and southern — which have never been seen to mingle. Within each community are groups of pods — called *clans* — which share a number of similar, but not identical, calls. Pods in each clan likely descended from a common ancestral pod. On the B.C. coast there are four clans; three in the northern community (A, G and R) and one in the southern community (J). Anyone can tell clan calls apart; they're very different from one another. For example, calls made by B1-pod in A-clan are strikingly different from K-pod in J-clan.

Within a clan, dialects are even more intriguing. They reveal a pattern of relatedness that sometimes doesn't match the way we see various pods and subpods spend time together. The calls of R and W pods, for instance, are distinctly R-clan, which means that they're close relatives. Yet they're rarely seen together. Instead, 50 per cent of R-pod sightings have been with the A5s, which are A-clan whales and 'speak' an entirely different language.

As for transient killer whales, they're not as 'talkative' as residents because they hunt prey that has very good hearing. But when they do vocalize, transients from Alaska to B.C. to California sound very different from residents, and make fewer types of calls. Furthermore, all transients share the same set of calls, with some minor regional differences. This isn't very surprising, since transient family units aren't as stable as resident pods, and members sometimes leave to join other transient groups.

Do we have any idea what killer whales are saying to each other? Not really. Calls are probably used to keep in touch when whales are out of eyeshot. They may also act as an acoustic 'family badge,' identifying who is a relative and who isn't. This may come in handy when pods meet, particularly at mating time.

How do we interpret killer whale calls?

TO ANALYZE KILLER WHALE calls, researchers need more than a practised ear. After recording a call, they make a voice picture — or sound spectrogram — which records the energy and frequency of the call over time.

Each call type is assigned a number. The spectrograms at right show two call types. To help you understand what all the squiggly lines mean, imagine the sound of a 'wolf' whistle: the spectrogram line would sweep up and then down, looking like an inverted V.

The top spectrogram is a call known as N2 and comes from the A8 subpod in A-pod. The other spectrogram is call N32 and comes from R1-pod. Notice how different they look. These pods belong to two different resident clans. You would be able to hear the difference.

To distinguish similar calls, researchers take measurements — such as length and height — of the various spectrogram components and compare them statistically to one another. This is how more than 100 discrete calls have been identified among B.C.'s resident killer whales, along with many subtypes.

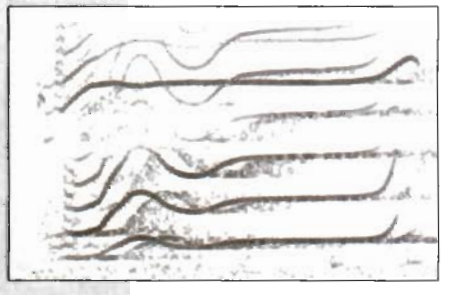
Not that long ago, specialized electro-mechanical equipment was needed to make a spectrogram. The sound image was burned onto a piece of paper, "usually accompanied by sparks and a great deal of smoke," says researcher John Ford, who in the 1980s was the first to identify and catalogue the discrete calls of B.C.'s resident killer whales. "It took five minutes to make one spectrogram of one call," he says.

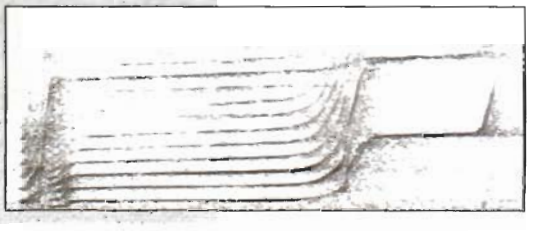
Times have changed. Now, any computer can be programmed to make a spectrogram. In real time, the sound is entered into the computer, digitized, analyzed and formatted into a spectrogram. With more advanced programming, the computer is able to take thousands of measurements of one call. "Basically, the computer learns how to distinguish the call types of different groups," says Ford, who runs the cetacean acoustics lab at the Vancouver Aquarium.

Funded in part by the B.C. Wild Killer Whale Adoption Program, Ford and several graduate students — including Volker Deecke and Harald Jurk — continue the quest to describe and understand the remarkable vocal traditions of killer whales.

Ford's ultimate goal? To amass an database of killer whale sounds from around the world — recorded by colleagues in such places as Norway, Iceland, Argentina, New Zealand, and the Azores. "We'd be able to go to any of these regions and recognize the sounds," he says. "Now that would be very useful."

Spectrograms of N2 (top) and N32 calls





VALERIE SHORE PHOTO

Deecke

Behind the scenes — with Volker Deecke

IF VOLKER DEECKE IS hearing killer whales in his sleep, it isn't very surprising. Over the past two years, the University of British Columbia master's student has spent hundreds of hours hunched in front of a computer, headphones on, immersed in the sounds of B.C.'s northern resident killer whales. His goal? To find out what, if any, call variation there is among the smallest social units in resident killer whale society.

The results of his work may surprise a few people. They certainly surprised him.

Deecke's research — supported in part by the B.C. Wild Killer Whale Adoption Program — is a natural follow-up to the landmark study by John Ford in the late 1970s and early '80s that defined call similarities and differences at the pod level. Deecke's went one step further, comparing calls made by family groups *within* pods.

Like other researchers, Deecke had assumed that the extraordinarily stable family structure of resident killer whale life led to very little, if any, changes in call structure over decades, perhaps even centuries. His study would confirm this, he thought. But it didn't. Deecke analyzed the calls of all the matrilines — closely related whales that always travel together — within A1, A4 and A5 pods. Some 200 hours of recordings, dating as far back as 1985, were supplied by a network of researchers.

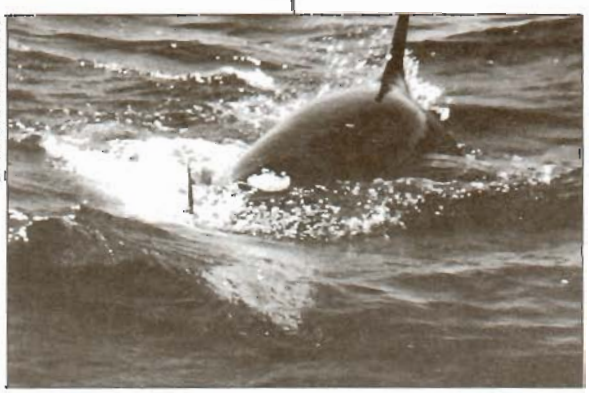
From the recordings, Deecke isolated and digitized more than 1,400 calls, and then created and trained a computer program to distinguish minute differences between call types. As a "reality check" he also enlisted three human volunteers to detect any differences by ear.

The results? Some call types aren't as stable as previously believed. For example, a call type known as N4, which the A12 and A30 matrilines each use in a distinctive way, has measurably changed in both groups since 1985. On the other hand, a call known as N9 didn't change at all over 12 years. "My guess is that different calls signal different things," speculates Deecke, who for most call types, found a strong link between call similarity and the time two groups spend together. "This suggests that transmission of call modifications is an important factor in dialect development in killer whales," he says.

Deecke plans to do a PhD, also in bioacoustics, but probably in other species. First, though, he has to get killer whale calls out of his head. At one point, he spent two months listening to one call for presentation at a conference. "Over and over, I'd hear '*Weeeow, weeeow*,'" he recalls. Then, while walking through an airport, he heard an all-too-familiar sound. "I hear '*Weeeow, weeeow*' and I think 'This is it, I'm going crazy.'" A nearby gift shop was playing a CD of killer whale sounds. But the joke wasn't over. The movie on Deecke's flight was *Free Willy*. "Just as Willy meets up with his family," grins Deecke, "he pokes his head out of the water and goes '*Weeeow*.'"

It's believed that killer whales, like humans, are among the few mammals that use true dialects among groups that interact with one another.

NOAA FISHERIES SERVICE



LORNE SWANETS PHOTO

Top photo: a sperm whale thrashes its large tail, centre, as several killer whales press the attack. Bottom photo: killer whale surfaces with great white shark (visible as fin and white area in front of whale) held crosswise in its jaws.

Field Notes

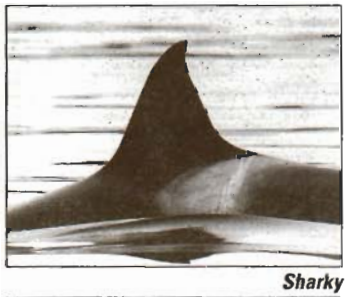
Whale of a meal ....A team of U.S. researchers saw first-hand last fall that it can be a whale-eat-whale world out there on the high seas. Scientists from the National Oceanic and Atmospheric Administration were observing the behaviour of a group of nine adult sperm whales about 95 km off the central California coast last October, when 25 killer whales appeared on the scene. For the next five hours, the killer whales repeatedly attacked the larger whales (see top photo, left), whose only defence was to lie on the surface in a 'wagon wheel' pattern with their heads together and their tails facing outward. Sperm whales are the largest of the toothed whales — they can reach 18 metres in length — and their huge flukes can be powerful weapons. "The defensive posturing of the sperm whales was very interesting, although rather ineffective in this encounter," says Susan Chivers, senior scientist on the cruise. One sperm whale was killed and eaten, and several others were seriously wounded, perhaps fatally. Observers were surprised that the incident happened at all. "Killer whales have occasionally been seen attacking small sperm whale calves, but never attacking and killing adults," says Chivers.

'Jaws' meets bigger jaws...It's long been thought that killer whales and great white sharks — as two top ocean predators — either avoided or ignored each other. But that definitely wasn't the case last October, when a killer whale and a great white shark met off the Farallon Islands, 30 km west of San Francisco. The strange encounter occurred during an Oceanic Society nature cruise, which had been alerted by fishermen to the presence of two killer whales in the area. Shortly after the nature cruise found the two whales, a 3-4 metre shark was seen swimming at the surface not far from the boat. Suddenly, one of the killer whales swam directly at the shark and struck it underwater. The whale then surfaced with the shark in its mouth (see bottom photo, left), held crosswise by its back near the dorsal fin. The shark didn't move at all, and may have been killed instantly when the whale hit it. For the next 15 minutes, the whale carried its trophy around like this, allowing observers to positively identify it as a great white shark. The whale then dropped the shark and began to eat parts of it. The whale was later identified as CA2, an adult female member of a group of killer whales known locally as the "L.A. pod." The other, slightly larger female with her may have been CA6, her usual travelling companion.

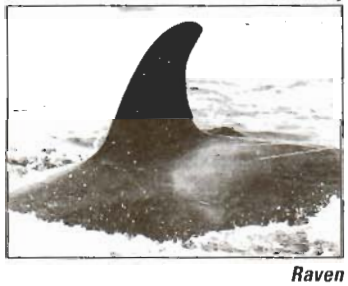
Population Update

THERE WAS GOOD NEWS and bad news in the 1997 field season.

On the positive side, the only whales on our adoption list that we didn't see this year were some members of the G16 and G24 subpods. It's likely that the other family members were spread out over a large distance, foraging, so managed to avoid being photographed. One whale we did get a good look at was nine-year-old *Whidbey* (G45), whose dorsal fin is beginning to grow, or 'sprout', which tells us he's a boy.



Sharky



Raven

Goodbyes

On a sad note, the northern resident population lost two key members in 1997. Many people will miss *Sharky* (A25), a 26-year-old adult female in A5 pod, who was often seen in the Johnstone Strait area and easily recognized by her triangular dorsal fin, for which she was named. Sharky was last seen with her family on May 15, 1997, but wasn't with them in June and all other encounters afterwards. She should have been with her two calves, 11-year-old daughter *Nodales* (A51) and three-year-old son *Surge* (A61), who were instead travelling with close relative *Licka* (A8) and her family.

And another well-known female, 14-year-old *Siwiti* (A48), also disappeared, along with her first calf, A65, born in early 1996. Siwiti was the star of an award-winning children's book about the everyday life of a killer whale, written by researcher Alexandra Morton in 1991.

The loss of these two young, breeding-age females is a surprise because their age class has the lowest death rate among B.C.'s resident killer whales. Sharky's death, in particular, is mystifying. "As far as I know, this is the first time in our 25-year study that a young mother has died leaving young calves," says researcher John Ford. "We'd like to know what happened — was it an accident, disease, a shooting? — but the range of these whales is so broad and we can't be everywhere."

Two other northern residents also disappeared in 1997: *Pulteney* (A31), the 39-year-old son of matriarch *Scimitar* (A12); and *Kwatna* (C5), a 73-year-old matriarch in C1-pod. Kwatna was most likely the mother of the famous whale known as *Namu*, who was captured in 1965 and taken to Seattle, where he died a year later. Both Pulteney and Kwatna exceeded the average life expectancy for B.C. killer whales, which is 29 for males and 50 for females.

Another older whale, 43-year-old *Ridley* (R1), was seen in June, but wasn't with his family, the R9 subpod, in July. He's considered 'missing' until we see the R9s again.

Hellos

On a much happier note, there was a batch of new northern resident babies in 1997, three of them among our adopted whales. They are: A68, a first calf for 14-year-old *Sutlej* (A45); C22, a fourth calf for *Lama* (C8); and I78, a second calf for *Loquillilla* (I12).

New names

Five youngsters have been seen for a second year — which means they've been named (after a place on the B.C. coast) and added to our list for you to adopt. They are: *Surf,* A66 (born to *Sonora,* A42); *Eclipse,* A67 (to *Simoom,* A34); *Midsummer,* A69 (to *Ripple,* A43); *Raven,* B15 (to *Scarlett,* B7), *Quadra,* C21 (to *Lama,* C8); *Salal,* D18 (to *Balaklava, D8*).

Whales carry high toxin levels. . . *from p. 2*

Female concentrations also climb with age, but drop off dramatically at reproductive age. "Females transfer most of their toxin burden through milk to their offspring, particularly the first-born," says Ross.

When Ross read through the data from small blubber samples taken from killer whales for a genetics study, he was shocked. "I thought, 'Wow, these whales are pretty contaminated, compared to what I was used to in harbour seals.'"

More samples were sent for analysis. Ross found that, among the fish-eating resident whales, animals from the southern pods (J,K and L) were the most contaminated. This isn't surprising, since they often travel in waters near urban areas. But what is shocking is that the toxin load carried by a typical middle-aged southern resident male is higher than the level that caused immunotoxic problems in the Dutch captive harbour seals.

Northern residents are a little cleaner, but still "pretty contaminated," reports Ross. And transients, particularly males, are the worst off of the lot, most likely because they prey on seals, porpoises and dolphins — all fish-eaters with their own high toxin loads.

What this means for the whales is hard to say. Effects observed in other species include increased vulnerability to infection, diminished reproductive success, developmental abnormalities, and behavioural disorders. That's something for us all to think about, says Ross, for the whales' sake — and ours.

"Like canaries in a coal mine, killer whales are telling us what's going on in the food chain beneath them," says Ross. "Remember, we eat much of the same food they do, so we're being exposed to the same contaminants."

Acknowledgements

Thank you to the following people who continue to lend their time and energy to the Killer Whale Adoption Program: **Graeme Ellis**, for organizing the ID photos; **Elwood Miles** for long hours in the dark room; **Lance Barrett-Lennard, Jim Borrowman, Randy Burke, Keechura Davidson, Graeme Ellis, Brian Falconer, Colin French, Kathy Heise, Alexandra Morton, Rod Palm, Bruce Paterson, Jane Watson,** and the many other contributors to the photo ID study that makes this program possible; **Volker Deecke**, for maintaining our Web site, **Perry Poon** for his artwork in this newsletter; and **Anne Bees, Bev Ford, Paul Hughes, Mona Martin, Candace Philpitt,** and **Chris Stairs** for their volunteer contributions. And a very special thank you to **all whale adopters** for continuing to make this program possible.

Kid's Page

Do killer whales sleep?

Yes, but not like we do. They have to think about every breath they take, which means they can only nap for short periods. Groups of killer whales may rest at the surface for several hours at a time, typically lining up in a row and often touching one another. You can see for yourself on the front page of this newsletter. Those are resting transient killer whales.

Sometimes resting killer whales will do slow dives all at the same time, surfacing every four to eight minutes for air. One dozing pod was seen entering a strong tidal current. They were actually pushed backwards for about 30 minutes before they 'woke up'!

What is it?

Here are some VERY close-up photos of a killer whale. Can you guess what body parts they are? Some of them are tricky, so we give hints for each one. The answers are at the bottom of this page. Good luck!

1 I spy with my little .....

2 It's time to dive!

3 Most mammals have one on their tummy

4 For baby whales this is a milk machine

5 Say aaaah! (there are more than 40 of them)

6 Take a deep breath and go to #2!

This drawing, left, was sent to us by eight-year-old Taylor Adams, who lives in Northampton, Massachusetts in the U.S.A. Thanks Taylor! We invite all of you to send your drawings in, and we'll use one in the next newsletter. And we'd also like to hear your questions about killer whales. Find out how to contact us on page 2.

Answers to WHAT IS IT?

1. eye 2. closed blowhole 3. belly button 4. mammary slit 5. teeth 6. open blowhole