The Log
www.ecoreserves.bc.ca
Winter 2008
FRIENDS OF ECOLOGICAL RESERVES NEWSLETTER

From Food Webs to Clarity on Warden Recruitment Process

By Mike Fenger, President FER

In the last issue of the LOG, we identified Jennifer Smith as a provincial contact person for FER and this raised our hopes for improved communications on provincial-level issues related to management of ERs. Sadly Jennifer is no longer with Parks and has moved to another section of the ministry. Thank you Jennifer for briefly helping us and your interest in attending our November board meeting.

The role of liaison with FERs has now passed to Eva Riccius who also attended the board meeting to discuss the warden program. We are pleased with the recent changes made to the MOE web site with regard to wardens (see inset page 7). To get there from the main B.C. Parks webpage: click 'Community Involvement' on right hand list (at bottom), then click on 'Becoming a B.C. Parks Partner', then scroll down to 'Become an ER Warden' and click – you're there! It's not very obvious so we have requested that a link be placed on the Ecological Reserves page where there is mention of the Warden's Handbook.

This issue of the LOG contains articles on food webs, both marine and terrestrial. There is a connection between the articles on resident Killer whales (top of the food chain) and Pacific sand lace and surf smelt (important elements of the nearshore food web). There is an up-date on the Salmon Forest Research Project linking the marine and terrestrial food webs. A change in the marine environment is also reported at Race Rocks ER with the birth of the first elephant seal since these seals first began to show up for a month or two in the 1980s. There is an article on organic arsenic MSMA (monosodium methanearsonate) and its use in forestry and uncertainties on effects on the food web of terrestrial species. Thanks to the contributors to the Winter LOG for their insight and time .

Good news – the proposed ER within the Spatsizi Park has moved to the next stage; it's now with Ministry of Environment Skeena Region, after receiving the support of the members of an advisory committee on Parks management.

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The Log

Winter 2008

The LOG is published 3 times a year by the Friends of Ecological Reserves to promote the establishment, management and maintenance of Ecological Reserves in British Columbia. *The LOG* is distributed to members, volunteer wardens, affiliates, supporters, government, friends and the enquiring public.
The views expressed in this newsletter are not necessarily those of the Friends.
Articles for publication are invited. The deadline for submissions for the Spring issue of *The LOG* is April, 2009.

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Resident Killer Whales Face Double Whammy

Toxins, low food supply bedevil orcas

By Suzanne Fournier, Canwest News Service
Excerpted from the January 16, 2009 edition of the *Times Colonist*

VANCOUVER — The killer whales of the Pacific coast are suffering a compounded crisis of toxic contamination made worse by the orcas' dwindling food supply.

The two populations of resident orcas that ply B.C. and Washington waters are among the most contaminated marine mammals in the world, partly because their chief source of food is laden with chemicals.

Chinook salmon, which make up about 70 per cent of the resident orcas' diet are heavily contaminated with what are called "persistent organic pollutants" like PCBs and flame retardants that concentrate in body fat, according to a new study by Donna Cullon and Peter Ross of the federal Institute of Ocean Sciences in Sidney.

The study's findings, coupled with orca observations, have whale-watching scientists along the coast worried.

"As long as there is plenty of food, the orcas can tolerate a lot of contamination," said Ken Balcomb of the Center for Whale Research at Friday Harbor in Washington's San Juan Islands. "But with the dwindling food supply, some of them are entering starvation mode and they start metabolizing body fat so the toxins are released."

Ross said killer whales are particularly vulnerable to PCBs because they feed at the top of the food chain, consuming up to 250 kilograms of fish a day, and they can live up to 90 years.

Ross said Puget Sound is seven times more contaminated than the Strait of Georgia with PCBs, the once widely used by now-banned electrical insulating fluid known as polychlorinated biphenyls.

The southern orcas that regularly cruise through Puget Sound had four times the PCB contamination of northern resident orcas, "placing them among the most PCB-contamined marine mammals in the world."

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Overview of the Salmon Forest Research Program

By T.E. Reimchen, Dept. of Biology, University of Victoria

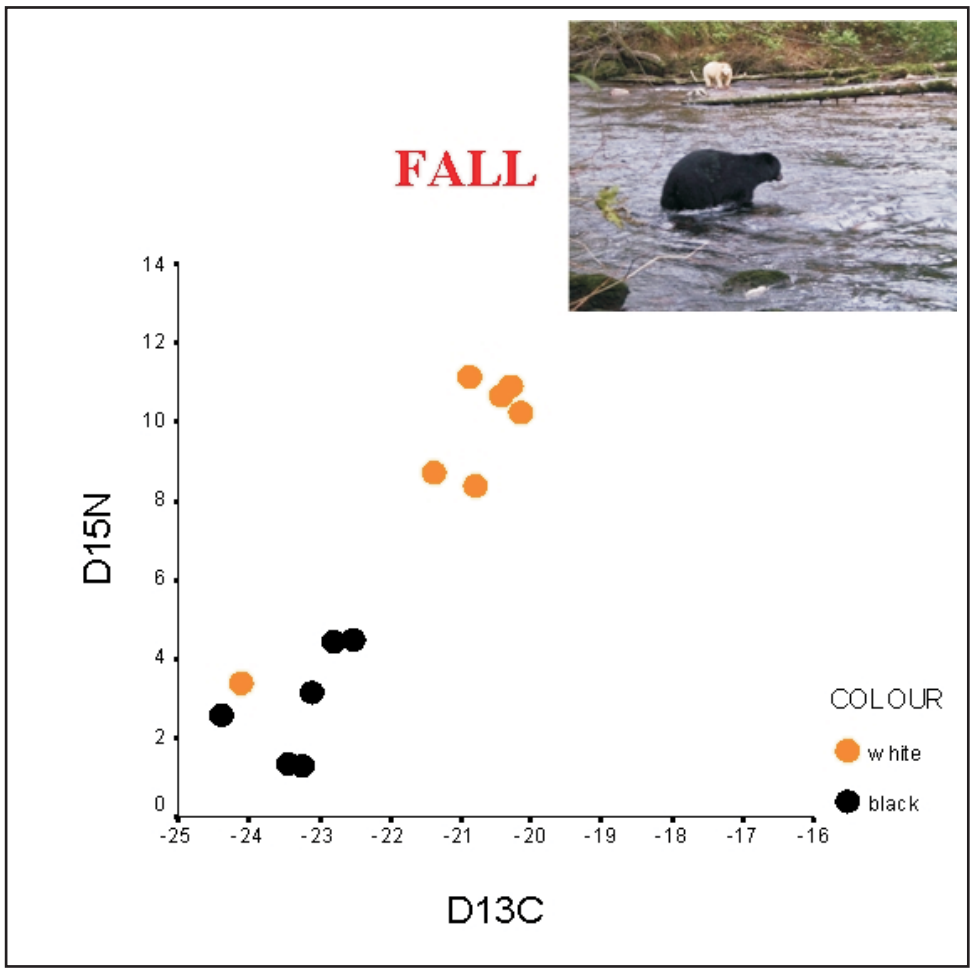
My research on the salmon-bear interactions that began in coastal forests of Haida Gwaii in 1992 has resulted in useful expansion of our understanding of the linkages between the open ocean and coastal forests. Funding from the David Suzuki Foundation and the Friends of the Ecological Reserves allowed considerable diversification of this original research to encompass the entire British Columbia coast and a wide diversity of species ranging from mosses, to flowering plants, to soil invertebrates through to song birds and bears.

The emergence of stable isotope techniques has allowed the tracking of nutrients between ecosystems and across trophic levels. Because marine-derived nutrients such as salmon are enriched in heavy isotopes of carbon (C13) and nitrogen (N15), we are able to identify the extent of uptake of these nutrients into the assemblage of plants and animals that live adjacent to the salmon streams on our coast.

This ongoing research shows that the isotopic signature of salmon is widespread throughout the riparian zone. Comparisons across sharp ecological boundaries of marine nutrients that occurs above and below waterfalls that are barriers to salmon migration indicates that 20-80% of the nitrogen in plants, from mosses through to ancients trees is derived from salmon nutrients originally sequestered in the mid-Pacific Ocean. Species diversity of mosses and liverworts is greater where salmon carcasses are common.

Insect diversity and biomass, as well as songbird densities, are greater below waterfalls where salmon carcasses are common.

Each of these results reinforces the emerging view that there is a major ecological integration between marine and terrestrial ecosystem. As well, the data raise significant concern that the collapse of salmon stocks over the last 5



Stable isotope values for hair from 7 Spirit Bear and 6 black bear from Gribbell Island. Higher values on both axis indicate a higher proportion of salmon in the diet. As such, the Spirit bear consumes much more salmon than does the black bear when they occur on the same stream. This, as well as other data, indicate that the Spirit bear is more coupled to marine resources than is the black bear from this island.

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"Salmon Forest Research"...cont'd. from page 3

decades will already have had substantive ecosystem level effects in forests adjacent to salmon rivers.

During the last 5 years, part of my research program has addressed the natural history and future prospects of the Spirit Bear on Gribbell and Princess Royal Islands. Initial work by Dan Klinka, who completed his MSc with me, discovered that the white and black bears on Gribbell Island differed in their salmon capture success with the white bear having higher success than the black during daylight but not during night. This was confirmed through analyses of stable isotope analyses of hair.

We also experimentally investigated salmon responses to the researchers that were draped in either black of white clothing. During darkness, salmon were largely unaffected by either black or white stimuli in the stream, but during daylight, salmon were twice as evasive to the black model as the white model. This was consistent with the direct observations on the bears in the stream and would account for the higher salmon capture rate by the white bear during daylight.

A second graduate student Denis Coopland constructed life-size model bears that were either white or black and evaluated salmon evasive responses confirming the original experiments. Basically, I suspect that the white bear is less conspicuous than the black bear when viewed from below the surface. These studies have

been submitted for publication (*Biological Journal* of the Linnaean Society) and are in review.

Yet based on the behavioral and stable isotope data, I suspect that the prospects for the persistence of the Spirit Bear are very limited. The elevated signatures of salmon in the diet of the Spirit Bear compared with the black bear from the same river, strongly suggests that the Spirit is much more closely linked to marine nutrients including salmon and intertidal species such as barnacles and crabs. The clear-cut logging in the 1980s on Riordin Creek, the major salmon river on Gribbell Island, has compromised the spawning areas and salmon numbers now entering this stream are less than 10% of the 1960s numbers.

The Queen of North Ferry, which lays submerged in 350 m of water, between Gill Island and Gribbell Island, continues to leak fuel oil which contaminates the intertidal on the west side of Gribbell Island where the Spirit bear and cubs have been recently observed. The Spirit Bear also occurs on the adjacent Princess Royal Island but at lower frequencies (10%) due to as yet unknown habitat differences between Gribbell Island and Princess Royal Island. The very low frequency (<1%) of the Spirit

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CALENDAR

Friends of Ecological Reserves Annual General Meeting

March 6, 2009 at 8:00 pm
(Meeting of the Board begins at 7:30 pm)

Location: David F. Strong Building, Room 122, University of Victoria.

Speaker: Briony Penn, artist, writer and teacher. Briony will be joined by Krista Roessingh, UVic Geography Department Grad student and together they will deliver a lecture on the Sandhill Cranes of the Fog Forest.

All members as well as those interested in becoming members are welcome.

For more info, call Tom Gillespie at (250) 361-1694

Trial Island ER Field Trip May 3, 2009

Join Volunteer Warden, Matt Fairbarns, on our annual outing to view the spectacular wildflower display on Trial Island. Matt has been working to eradicate invasive plants on the island and we'll see the results of his work.

Fee: FER members $10.00, Non-members $30.00, Seniors/students $25.00 (Fee includes a one-year membership to FER).

To register or for more information, call Marilyn at (250) 477-592

"Salmon Forest Research"...cont'd. from page 4

Bear anywhere on the mainland presumably indicates a lack of competitive ability with other bears.

Grizzly Bears successfully exclude Black bears from most salmon rivers as is evident from the low N15 signatures in Black Bear where both Grizzly Bear and Black Bear occur together. It seems that Gribbell Island historically offered a particular suitable set of conditions which probably included the absence of Grizzly Bears and the prevalence of marine-derived nutrients that allowed the Spirit Bear to persist.

One of the interesting novel discoveries in the salmon forest program was the identification of the salmon signature in the yearly growth rings of the ancient trees beside the salmon rivers.

There are very clear relationships between the average N15 signatures in wood and the current abundance of salmon both within and among rivers. However, the year by year signatures within trees over the time interval when salmon escapement data were obtained by Department of Fisheries and Oceans, is less predictable and currently I cannot reliably extrapolate N15 signatures prior to the earliest Fisheries data (mainly 1947). Only one in five trees shows a strong correlation between the number of salmon returning to the river and the lagged N15 signature in the rings (lagged from 1 to 4 years). At present, I have not been able to identify what constitutes a 'tracking' from a 'non-tracking' tree. The relative uptake of light and heavy nitrogen isotope by the trees is also influenced by multiple factors including rainfall, temperature, light availability and root depth and differentiating these from the direct contribution of salmon continues to confound the historical salmon estimates.

In some of the trees that I cored, the yearly rings were very large and I was able to secure sufficient material within each year to allow isotopic comparisons across seasons. This recent data shows unexpectedly large shifts in the isotope signatures between winter and spring which often exceed the differences among trees. As a result, I recently processed an additional series of trees with large rings from a different locality to determine whether seasonal trends are consistent. These samples are currently at University of California at Davis where the stable isotope analyses is carried out. If the data hold up, it will potentially give me the additional capacity to interpret tracking and non-tracking trees. My long-term goal for this part of the study is the identification of salmon escapement into past centuries.

The last 10 years have allowed us to identify many previously unknown interactions between bears, salmon and coastal forests in British Columbia and raises sensitivity as to what other interactions and linkages there are between marine and terrestrial ecosystems that are still unknown. In January of this year, I accepted a new PhD student, Caroline Fox, who will be examining whether the high densities of herring throughout our coast provide a significant nutrient pulse to subtidal, intertidal and coastal forests adjacent to the inshore spawning areas.

These areas have been extensively mapped by Department of Fisheries throughout the coast and as with most marine fisheries, the herring are seriously depleted from historical numbers. There is a reasonable amount of published information on herring interactions with seabirds and marine mammals but no information on potential terrestrial linkages.

Patterned on my early work at Bag Harbour, Haida Gwaii, Caroline will be making day and night time observations of shorelines with high herring spawn activity to determine the extent of terrestrial transfer by birds and terrestrial mammals as well as taking vegetation samples and coring trees for stable isotope analyses. She will also be comparing intertidal diversity in areas of high and low spawn density. Her first field season will be at Winter Harbour on the north-western corner of Vancouver Island where herring are common and old growth forests still occur adjacent to the spawning areas. I am hopeful that when combined with the salmon forest data, this 3-year PhD program will provide a much more robust understanding of the ecological interactions in the interface

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First Elephant Seal Born at Race Rocks

By Sarah Petrescu

Excerpted from the January , 2009 edition of the *Times Colonist*

A baby elephant seal born at Race Rocks a few nights ago is the ecological reserve's first, and might be the most northerly birth of the mammal recorded, say the area's guardians.

"This area has long been a place where elephant seals come, but we've never seen anything like this," said Garry Fletcher, a volunteer warden who manages racerocks.com. "Babies are usually born in Baja California, not this far north."

Fletcher has been involved with the provincial reserve since the mid-1970s as an instructor with Lester B. Pearson College of the Pacific, which uses the reserve — south of William Head near East Sooke — as a teaching site.

He said the elephant seals started showing up on the rocks in the '80s for a month or two. "Now there are seals here almost year-round," he said, adding animal populations often fluctuate for no clear reason.

Larry Paike, conservation protection supervisor for Fisheries and Oceans Canada, said he's never heard of an elephant seal being born here before. He said the elephant seal population has expanded "tremendously" over the last 20 years and moved north. Prior to that, they had almost been hunted to extinction and were living in small groups in Mexico, he said.

The past year has seen at least four elephant seal sightings on the Island, an unprecedented number, Paike said. While they were infrequent visitors before, "Now it's like they've taken up residence."

Ryan Murphy, the resident marine biologist at Race Rocks, was the first to spot the baby seal Friday morning (January 30) near the Race Rocks helicopter pad.

Murphy said he was going to investigate the scarring on an adult female when he saw another adult female with a young male that had been following her around. "Beside them was this tiny pup that must've been born sometime the night before," said Murphy, 26, who started his work at the site eight weeks ago. He's kept a

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"Elephant Seal".....continued from page 6

close watch on the newborn seal since. "This morning it had milk around its mouth, which is a good sign that he's feeding... The pup was the size of a small dog when he was born and now he's as big as a harbour seal."

The unusual birth is the latest indication of increased elephant seal activity on the Island.

"We are definitely getting more seals spotted around here moulting," said Fletcher, referring to the process in which elephant seals shed their skin and hair and grow a new layer. "But it's usually around June."

Earlier this month, a young elephant seal caused a commotion in upscale Ten Mile Point when it settled in a roadside ditch to moult, returning to the ocean a few days later.

In November of last year, the body of an enormous male elephant seal washed up on a Nanaimo beach. Biologists were doubly mystified by what killed the seal — weighing 2,700 kilograms and 4.1 metres long — and why it was there. The species had never been spotted in the Strait of Georgia before. Blunt force was ruled the likely cause of the animals's death, possibly due to a run-in with a boat or whale.

Ecological Reserve Wardens

http://www.env.gov.bc.ca/bcparks/partners/er_warden.html

Ecological Reserve (ER) Wardens are a team of dedicated volunteers across the province who make significant contributions to the parks and protected areas system. In partnership with BC Parks staff, ER Wardens provide an array of services that include: manual invasive plant control; inventory of flora and fauna; and, trespass monitoring. ER Wardens act as the overall eyes and ears for BC Parks in our ecological reserves. These dedicated volunteers care deeply for the ecological reserves they work in and serve an invaluable role in the long-term protection of the reserves.

How to become an ER Warden:

Visit the Friends of Ecological Reserves and the BC Parks ER web pages to familiarize yourself with ERs that either need a warden or might be of interest. (Even in areas that have wardens, additional wardens help to increase attention to these ecologically special places).

Next, download, print out and fill in the ER Warden application form. Then, send it in to BC Parks staff with your name, contact information and application.

Mail to:
Ecological Reserve Warden Program
BC Parks and Protected Areas Division
PO Box 9398 Stn Prov Govt
Victoria BC V8W 9M9

Fax to: 250-387-5757

Scan in completed form and e-mail to:
ParkInfo@Victoria1.gov.bc.ca

Please allow approximately four weeks for BC Parks staff to process your application.

If you are passionate about the environment and want to contribute your knowledge and enthusiasm to the continued success of B.C.'s protected areas system, becoming an Ecological Reserve Warden is a highly satisfying way to make a difference.

Forage Fish Matter

By Emily Beinhauer

If you visit the Metchosin shoreline this month and cast an inquisitive eye among the gravel, you might see some Pacific sand lance (*Ammodytes hexapterus*) or surf smelt (*Hypomesus pretiosus*) eggs. Both are species of forage fish, an extremely important component of the nearshore food web that includes Pacific herring (*Clupea pallasii*), sardines, northern anchovy (*Engraulis mordax*) and eulachon (*Thaleichthys pacificus*,) [1]. In an effort to better understand the breeding habits of these fish, sampling of Pacific sand lance and surf smelt spawning grounds is currently underway at Taylor Beach in Metchosin [2].

The Pacific sand lance (*Ammodytes hexapterus*), or "needle fish" is a slender fish with a pointed snout, forked caudal fin, extensive dorsal fin and an iridescent deep blue-green to bronze back and white belly [5]. Adults can reach 37 cm in length and live approximately 8 years [13]. The name Ammodytes means "sand burrower" (Gr.) and reflects the fish's unusual ability to bury itself into the sea floor, especially at night to avoid predation, or during high tide so that it can remain in the sand after the water has receded during low tide [3]. How it can survive out of the water for extended periods of time is not known.

Pacific sand lance
(http://www.seaotter.com/marine/research/ammodytes/hexapterus/html/hexapterus.jpg.html)

Pacific sand lance range from Southern California, north to the Arctic Ocean and west to the Sea of Japan [4] usually in shallow water along the coast or offshore banks at depths of up to 90 m [3]. During the day, adults form schools and feed in deeper water on plankton, particularly copepods [3]. In turn, the sand lance is an important prey item for hundreds of other species, including salmon, cutthroat trout (*Oncorhynchus clarki*), marine mammals and seabirds [1]. Some marine animals rely heavily on the forage fish as a food source. For example, 50% or more of the diets of marbled murrelets (*Brachyramphus marmoratus*) and rhinoceros auklets (*Cerorhinca monocerata*) are comprised of forage fish. Sand lance make up 50% and 60% of the diets of humpback whales (*Megaptera novaeangliae*) and Chinook salmon (*Oncorhynchus tshawytscha*), respectively [1]. Human exploitation of the Pacific sand lance is fairly low globally, with the exception of Japan, therefore human impact on populations is due mostly to habitat disruption [13].

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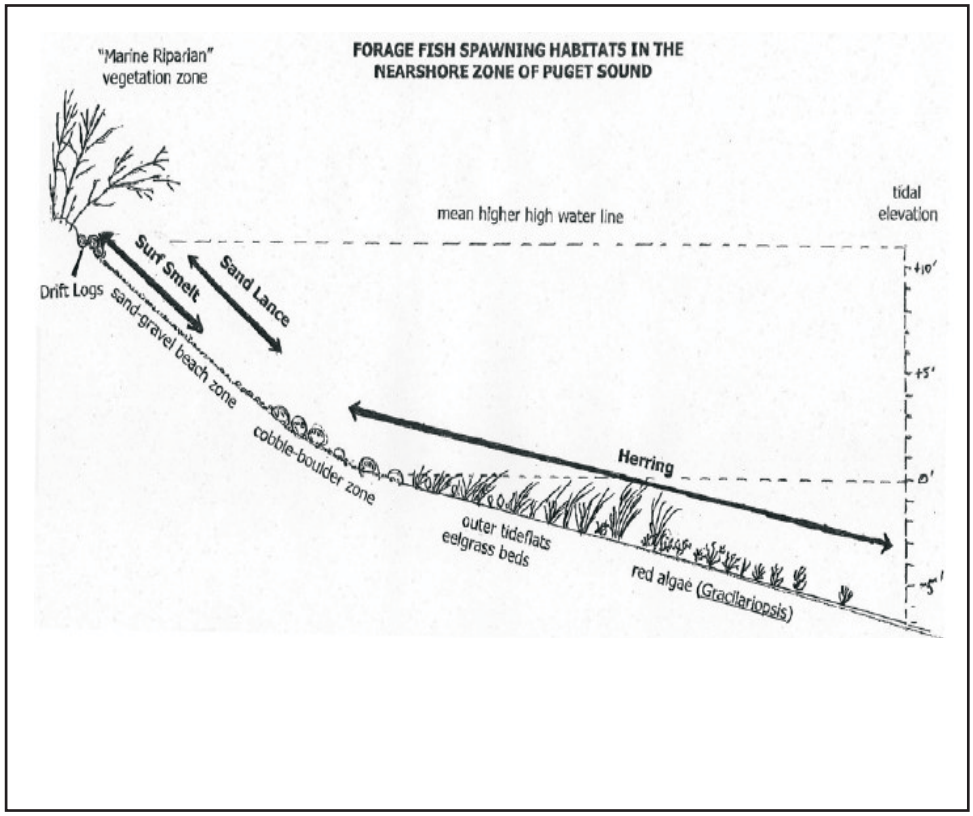
"Forage Fish Matter".....continued from page 8

During the fall and winter months from November to February, adult Pacific sand lance move to the high intertidal zone in order to breed (Figure2) [3]. Sand lance spawn at high tide in gravel or sand, where they dig small pits and deposit their eggs and sperm [1,3]. Females lay thousands of cream-coloured eggs that range from 0.7-0.9 mm in diameter [4]. The eggs are sticky all around and adhere to the substrate and are eventually buried beneath the sand and gravel by wave action, which may help to protect the eggs from desiccation during low tide [1,13].

The eggs hatch in 4-5 weeks and the larvae move to the surface where they feed on zooplankton [4,13]. After 130 days, juvenile Pacific sand lance form schools, often with adults and Pacific herring, where they feed on copepods in shallow bays and inlets [13]. After 1-3 years, adult fish will spawn, often at the beaches from which they were hatched; adults can return to spawn year after year [13].

The surf smelt (*Hypomesus pretiosus*) is a torpedo-shaped fish with tiny scales, a forked caudal fin and a small adipose fin [10]. The male is typically smaller than the female and has a brown back and a yellow belly, whereas the female has a bright green back and a white belly [12]. Adults can reach up to 25 cm in length and live up to five years [10,11].

Surf smelt range from Southern California north to Alaska along the coast and are generally an inshore pelagic species and often remain close to their spawning grounds for most of their lives [7,11].



Pacific sand lance and surf smelt spawning habitat
(http://racerocks.ca/metchosinmarine/foragefish/foragefish.htm)

Adults often school and they feed on plankton such as copepods, amphipods and krill [8]. Like Pacific sand lance, surf smelts are also an important component of the inshore food web and are preyed upon by hundreds of marine species, including flounder, perch, salmon, seals and marine birds [7]. Unlike the Pacific sand lance, however, surf smelts are fished commercially, for sport and by Native Americans; exact catch tallies are not known [12]. Other human activities, especially habitat alteration, can negatively impact surf smelt populations [12].

Surf smelts breed throughout the year, with periods of concentrated spawning during summer and winter [7]. Adults breed in the upper intertidal zone, within a metre of the log line, during high tide when there is less than 50 centimeters of water covering the beach[7,8]. The fish prefer to spawn in coarse sand and pea-sized gravel; individuals breeding in the summer often select areas with underground water movement and overhanging vegetation so that the eggs will remain moist and shaded [1].

During spawning, one female is accompanied by two or more males to the intertidal zone, where they release their gametes simultaneously [11].

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"Forage Fish Matter".....continued from page 10

Females may spawn for several consecutive days and fish often spawn in overlapping groups such that breeding grounds contain eggs for months at a time [11,12]. Females can lay up to 37,000 translucent eggs that are approximately 1 mm in diameter [12]; the eggs are distinctive in that they adhere to the sand and gravel by a single peduncle, rather than all the way around [12]. Wave action will bury the eggs beneath the beach substrate, helping to protect them from desiccation and predation [8]. Eggs laid in the summer hatch in 2 weeks whereas eggs laid in the winter hatch in 1-2 months and then the 3 mm long larvae emerge and forage inshore on zooplankton [14].

After three months, juvenile smelts begin to take on adult colouration and continue to forage close to their spawning grounds [14]. Within two years, most adults will spawn, often at the same beach from which they were hatched; adults can spawn for a few months for consecutive years once they have reached sexual maturity [14].

During the fall and winter months from November to February, the breeding grounds of the Pacific sand lance and the surf smelt can overlap, although smelts tend to prefer a coarser breeding substrate and may lay their eggs higher up in the intertidal zone than the Pacific sand lance [9]. Beaches with sand and pea-sized gravel are vital for the life cycles of these two species, which are an important food source for commercially valuable salmon species as well as many other marine animals.

Ramona de Graaf, Biologist at the Bamfield Marine Station, checking for sand lance egg locations along beach in Metchosin

Human development of the coastline can drastically alter Pacific sand lance and surf smelt breeding grounds, putting their populations, and thus the health of other marine animals, at risk. It is therefore important to understand how gravel beaches are formed and maintained and to take steps to protect them from degradation.

In general, gravel and sand beaches are formed from bluffs that are eroded by wave action [1]. Fluvial deposits may also contribute to beach formation, as well as the continued addition of material from the eroding bluffs [1]. Wave action helps to distribute the sediments along the shore. Human development along coastlines can disrupt beach formation, resulting in the loss of forage fish spawning grounds. For example, seawalls and bulkheads prevent the deposition of eroded materials onto beaches and change wave action, resulting in loss of fine sediments and eventually the beaches [2]. Boat ramps and piers can interrupt sediment distribution along shorelines, resulting in changes in breeding ground composition [2]. Loss of vegetation can decrease shade and result in increased egg mortality in summer breeding populations [2].

Development, pollution and overfishing can severely harm the populations of these valuable forage fish. Without Pacific sand lance and surf smelts, many marine animals would suffer population declines, especially those that rely heavily on these two species for food. Chinook salmon

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The MSMA Story

By Josette Wier, Smithers

MSMA (Monosodium methanearsonate) is a pesticide which contains arsenic, a form called organic arsenic because it is linked to carbon molecules, contrary to the inorganic arsenic found in rocks. In Canada, MSMA has been used for 20 years as a pesticide against Mountain Pine beetle infestations in BC. In the United States, it was spread extensively (3 million pounds a year) as a herbicide on cotton plantations and golf courses.

The Notice for Permit Application for MSMA in the local paper in 2000, was cause for alarm as 3,000kg of arsenic (active ingredient) was proposed to be injected in the trees of the Morice Forest District, an area located around Houston and near Smithers over a 3-year timeframe.

Dr. Cullen, professor of Chemistry at UBC, and a world expert on arsenic toxicity who was involved in the Great Slave Lake arsenic contamination in Yellowknife, from the Giant Gold Mine was contacted. When asked "should we concern ourselves with these injections?" he immediately replied "Yes".

He advised that recent scientific findings completely changed our views on arsenic toxicity. The "old" assumptions that organic arsenic was less toxic than inorganic arsenic and that the methylation process was a form of detoxification, no longer held. In fact, it was now considered that organic arsenic was lkely more toxic than inorganic arsenic, while a metabolized product of methylated compounds was found to be the most genotoxic product known to man.

A Ministry of Forests warning sign posted on an arsenic-treated tree.

Armed with such strong evidence from recent chemical publications, all agencies involved: Ministry of Forest and Range(Permit applicant); Ministry of Environment; and the branch of Health Canada which deals with the registration or approval of pesticides, the Pesticide Management Regulatory Agency or PMRA were approached. All agencies were thankful for the information. The provincial ones said they were unable to assess the significance of the new scientific findings but they would continue to use the product because it was registered by Health Canada. PMRA asserted that they already knew about the scientific findings, but this did not change their evaluation that the use of the product would result in any human health or environmental adverse effects.

The following efforts were then undertaken:

- An appeal was made to the Environmental Appeal Board in 2002 with the help of the West Coast Environmental Legal Society and Dr. Cullen as expert witness. The appeal was lost because it couldn't be proven that the injections were going to result in

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"The MSMA Story".....continued from page 11

environmental damage.

- A Judicial Review of the Appeal decision by the BC Supreme Court was successful. The Judge established that the Appeal Board had the duty to consider new scientific findings when those findings had appeared after federal registration or re-registration
- A complaint was lodged with the Environment and Sustainable Development Commissioner against Health Canada's position, which included Dr. Cullen's criticisms of their statements. This was a frustrating exercise because the Commissioner did not look at the validity of Health Canada's responses and but only with the fact that there were responses within 3 months of the questions being asked.
- A complaint against Canfor ISO 14001 certification was lodged because the logging company wanted to burn the contaminated bark. The Ministry of Environment, after much wavering , finally stated that the Canfor beehive burner air emission permit only allowed for the burning of uncontaminated wood. This led the KPMG auditor to identify a non-conformance issue with the certification and to ask Canfor to take measures to prevent the poisoned trees from being cut and processed, ultimately preventing them from being burned in the beehive burners.

"Axe frill", which is a cut in the tree where the product was injected

Judy Stratton, a resident of François Lake who was dismayed to have found injected trees in her backyard, contrary to what was indicated in the permit application that injections were to take place in remote and inaccessible areas, registered a complaint with the Forest Practices Board in 2003.

Among other recommendations, the Board asked that the Ministry of Forests provide a provincial policy for tracking MSMA-treated trees to ensure that they are neither harvested nor milled. This took 5 years to complete.

Meanwhile Environment Canada, informed about the injections, carried on a 3-year study culminating in the release of their report in 2006, *Assessing Forest Bird Exposure and Effects from Monosodium Methanearsonate (MSMA) during the Mountain Pine Beetle Epidemic in British Columbia.* The study found elevated levels of arsenic in the form of the MSMA metabolite MMAA (monomethyl arsonic acid) in three species of woodpeckers (range 0.05-2.14 µg/g dw, geometric mean 0.16) and Mountain Chickadees (range 0.02-2.20 geometric mean 0.21). Seventy-nine percent of the blood samples were above the 0.07 µg/g level identified as a mean reference value for blood arsenic in control birds. Arsenic concentrations were also elevated in beetles and non- beetle insects, and Mountain Pine beetles were found alive with high levels or arsenic.

The report concluded, in regard to woodpeckers, that "*exposure to MSMA is likely occurring and that there is potential for sublethal effects including mass loss and reduced growth under current environmental conditions*" and added that because most trees are not mapped, "*the extent of the impact to the environment*

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"MSMA Story".....continued from page 12

remains unknown."

As late as 2004, while preliminary results from the Environment Canada study were starting to come in, PMRA still maintained that MSMA is *"... unlikely to harm wildlife. In the 33 years since MSMA was first registered in Canada, there have not been any reported wildlife incidents. The lack of reported incidents in Canada is attributed to the precise and restricted application of MSMA and the consequent small contribution of arsenic relative to background concentrations."* (Petition No. 97 to the Commissioner on the Environment and Sustainable Development, March 4, 2004).

The agency continued to discount the ground-breaking scientific findings of 1999-2000 by a team including Dr. Cullen "*although the findings [of Dr. Cullen's team] are potentially important, these findings are not substantially new in the context of our existing knowledge of arsenic".* (Richard Aucoin, A/Chief Registrar in a letter to Josette Wier, July 18, 2001).

PMRA stuck by this decision for the following 5 years, satisfied to rely on an outdated commissioned study by a veterinarian, F. N. Dost, February 1995 "Public Health and Environmental Impacts of MSMA as used in Bark Beetle Control in BC." They kept repeating that total arsenic was a relevant indicator and there was so much arsenic in the Canadian environment that one should not worry about the effects of adding more!

It is only because the manufacturer of the pesticide, the large American agro-business United Agri-Product did not seek re-registration in Canada in 2004, that the product was no longer used. However, it still took a lot of vigilance to prevent the use of its stockpiles in BC after the product was no longer registered.

In 2006, the US-EPA de-registered the product on the grounds of elevated cancer risk to humans from contaminated drinking water alone and ecological risks to non granivorous terrestrial mammals and birds.

This brings us to the aseptically named "toxic legacy", which means the legacy of the poisoned forest. A multi-stakeholder meeting (Ministry of Forest, Ministry of Environment, Environment Canada, PMRA, Canfor, Houston Forest Products, and 3 members of the public) was convened in Smithers in January 2007. A consensus decision was made centered around three points:

1. A policy on how to deal with the toxic legacy had to be urgently issued;
2. Research gaps needed to be addressed and the policy revisited 2 years after issuance with the research results.
3 A website including maps and a database of the treated areas should be posted on the Ministry of Forests and Range website.

The policy was issued 6 months later in July 2007. It states that the poisoned trees should not be cut, removed, milled and/or burned. They should be conspicuously marked. They can be incorporated into leave areas and wildlife tree patches.

The website took one year to implement and is available at: http://www.for.gov.bc.ca/hfp/health/MSMA.htm. The maps were posted on the site in October 2008 without landmarks.

The research took 2 years to be undertaken; soil and vegetation sampling around the poisoned trees were conducted last August. Results of their analysis for arsenic content are due mid-March 2009.

Agencies' failures are glaring throughout this sad story. PMRA made repeated mistakes in its evaluation which have incurred tremendous costs (both financial as well as human and ecological) to British Columbians.

It has been impossible to estimate the total number of trees injected over the 20 years of use of MSMA in BC, because records were not kept. Environment Canada did a rough estimate of 500,000 trees, mostly in the Merritt and Morice Forest District. It is very likely that many of those trees have been cut, milled and burned and there has been risk of arsenic exposure to loggers, mill workers and communities in close proximity to beehive burners.

In 2004, a logger phoned me anonymously to let me know that he had been diagnosed with arsenicosis. He could not give his name because he was afraid

Continued on page 14

"MSMA Story".....continued from page 13

of reprisals and not being able to find another job if he complained. He had cut about 200 treated trees and worked around a fire of contaminated branches. After months of undefined symptoms of fatigue, skin redness and pain in his legs, his doctor did a urine analysis for arsenic which showed high levels. Unfortunately the South African doctor went back to South Africa, and this case was not pursued any further. I will continue to advocate for arsenic exposure research to be done in the communities at risk.

Finally and not least, environmental costs have yet to be assessed. We know about the contamination of woodpeckers, chickadees and secondary insects. A lot more needs to be done.

"Salmon Forest Research"...cont'd. from page 5

between the ocean and the forests in coastal British Columbia.

This ongoing research program would not have been possible without the assistance of the Friends, the logistic support from Raincoast as well as the earlier support from the David Suzuki Foundation. I am greatly indebted for your continued confidence in this program and hope that the ongoing research and results provide for a more ecologically informed evaluation of our impact on the planet.

"Forage Fish Matter".....continued from page 10

Surf smelt *(Hypomesus pretiosus)*

populations would be negatively impacted, which would be deleterious for the fishing industry as well as for populations of marine mammals, such as the killer whale (*Orcinus orca*). [See story on page 3] Loss of forage fish would cripple the marine food web.

The important role that these forage fish have in the marine food web and in human commercial endeavor has created a need for information regarding the breeding range of the Pacific sand lance and the surf smelt on Southern Vancouver Island. As such, a study is currently under way to determine if either species breeds along Taylor Beach in Metchosin [2]. In this study, Metchosin residents, led by marine biologist Ramona de Graaf are sampling gravel along transects in the intertidal zone for Pacific sand lance and surf smelt eggs [2]. A similar study is also planned for beaches along the Saanich Peninsula, which will be conducted by the Peninsula Streams Society in partnership with Shorekeepers and any other interested parties [6]. Both studies are being undertaken not only to gather information about these important species, but also to further public awareness of the species in an effort to foster conservation of coastal ecosystems.

If you are a Warden of an Ecological Reserve that has gravel or sand beaches and are willing to do the beach sediment sampling necessary for such a study, we encourage you to contact Ramona de Graaf at: rdegraaf@bms.bc.ca.

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Farewell Mike and Carol!

Long time Eco Guardians of Race Rocks Ecological Reserve retired in December 2008.

Mike and Carol Slater had lived on Race Rocks since the mid 80s. They were the lighthouse keepers until 1997 when the lighthouse became automated. They were asked to stay on as the Eco Guardians under a two-year agreement between Lester B. Pearson College and the Coast Guard. Race Rocks was to be used as an Education Centre. Ten years later, Pearson College is still managing the island on a long-term lease from the actual land owners, the Provincial Government. Race Rocks is now a Provincial Ecological Reserve with the Coast Guard still maintaining a sliver of land which includes the lighthouse itself.

Mike and Carol Slater have been hosts to much change and many guests and students over the last 11 years.

Among Mike's many duties, was the collection of sea water samples daily, an hour before high tide no matter the weather! The samples are tested for salinity and the temperature is recorded. This data has been kept since the early 1900s.

Carol was an effective spokesperson for the wildlife in the Ecological Reserve. She held strong views about the need to live in harmony with the nature that surrounds Race Rocks.

Together Mike and Carol have left many happy memories for students and staff of Lester B. Pearson College.

Ryan Murphy joined the staff at Pearson College in December and is now the Eco Guardian and resident marine scientist at Race Rocks. Check out Ryan's photographs posted on the Race Rocks website!
www.racerocks.com/racerock/contacts/rmurphy/ryan.htm

The Log

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