Salmonid

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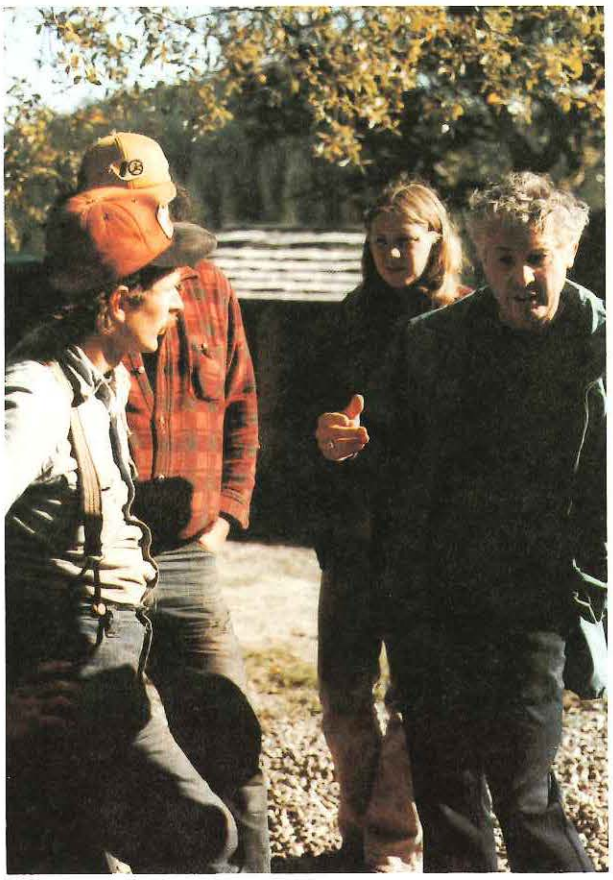
Granite Bay Sees New Life

For SEP community advisor Bob Hurst and the people of Quadra Island, October 7 was an important day; a day of renewal for the lost pink salmon in Granite Bay Creek.

Through a century of human activity, the tumbling waters of Granite Bay Creek have passed scenes of life and of death and finally, of rebirth. Once a thriving logging and fishing town of several thousand people, Granite Bay in its heyday was larger than Campbell River. But the town faded away decades ago with the decline of logging on Quadra Island. Only overgrown ruins of the town remain. Likewise, the population of pink salmon in Granite Bay Creek was wiped out by overfishing of the Johnstone Strait stock and by poor logging practices on the island.



Bob Hurst (right) discusses the pink salmon project with Quadra Island volunteers. Photo: Mike Youds

Several years ago, Danny Niedziejko and his family started their homestead amid the ruins of Granite Bay. Danny and other islanders knew of the potential of the tiny stream — a tributary of Granite Bay Creek — that ran through his property. They approached Bob, who is responsible for SEP public involvement on the northern half of Vancouver Island and the Powell River area, and formed the Granite Bay Conservation Society. Bob is a doer — he spurns delay of any kind — so the project took shape over the course of a single summer.

"On the island we have lots of really good tradesmen, and that's an excellent help. And we've got fishermen too, who are also good but they're seasonal," he said.

Yet he does not believe in pushing a group.

"I've got one rod and gun club now that I've called on. I just say, whenever you're ready, when you've got yourselves organized, then we'll start. It's quality rather than quantity."

On the day of the Granite Bay egg plant, Bob picked up two buckets containing 50,000 pink eggs, the product of 37 "ripe" females killed than morning at Quinsam hatchery near Campbell River. With the eggs came the milt taken from 20 males. In theory, the milt from two males would be enough to fertilize 50,000 eggs, but the number of donors was increased as a safeguard against the possible sterility of one of the males.

With his cargo packed in ice and shaded from sunshine, he headed over to Quadra. There, on the 20 km of gravel road into Niedziejko's farm, he met Sam Hooley. Sam is a retired construction contractor with a "heart of gold," Bob says. Sam's initiative and resources have been instrumental in the three Quadra Island projects undertaken so far. These include an incubation box built by the April Point Fly Fishers at Drew Harbour and a holding tank

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New Life

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being constructed at Hyacinth Creek by the newly-formed Quadra Island Salmonid Enhancement Society. Donations from a number of B.C. businessmen have made these projects possible.

Farther on down the Granite Bay road, Bob passed Bill Nelson, another islander and a long-time sport fisherman. Bill wheeled his truck around and followed Bob down the washboard. By the time they reached the farm, a crowd of twenty islanders had gathered in anticipation of the event. Among them were off-island relatives, a local fisherman and his wife, mothers and preschoolers, and three dogs.

Little time was wasted in planting the new generation of salmon. The milt was poured and gently stirred amongst the eggs. Next, the mixture was divided evenly into box trays and placed into the incubation box. The box, about two metres square, is unique in that it lies right in the stream. Brick and mortar construction carried out at low water levels made it possible. Two hinged lids cover the contents for safekeeping. Directly above the box is a small dam which serves to control water flow and siltation. Bob designed the system and it is now being used in three streams on northern Vancouver Island. Danny applied his skills as a cabinetmaker to build the Granite Bay Creek box.

"It's an experiment," he said, "we're not sure if it will be successful, but there's no reason why it shouldn't work. The only thing I'm worried about is freezing."

He will watch over the box on a daily basis. Later, eyed eggs will be added to the planted group as a safeguard against premature mortality among the eggs.

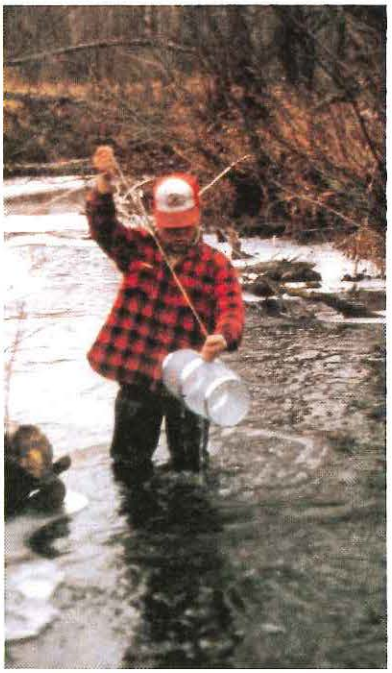
Next to the box, a thin grey chimney towered above clumps of blackberry bushes. It bore the scrawled inscription "March, 1918." The world has changed a lot since then, but if ghost towns prove anything, it is that man cannot go on using a resource for very long without putting something back. Sam Hooley first came to Quadra Island in the 1940s and he witnessed the destruction of heavy logging activity.

"But now we're looking at more than 40 years before any more logging. I was a commercial fisherman ten years ago," he explained. "That's how I got involved with this. Figured I killed enough of them."

Two years will bring adult pinks swimming up Granite Bay Creek, and the generation just planted will spawn another on its own.

Mike Youds

Kispiox Band Courts Success



Riley Turner checks a minnow trap for juvenile chinook or coho that rear in tributaries of the Kispiox River. Photo: Maurice Boisvert

A generation ago, the Kispiox River still supplied a bounty of chinook, coho and steelhead to the native people living along its shores. When the runs declined year by year, however, the traditional food fishery of the Kispiox Band was first moved downstream and then out into the mainstem Skeena River. Like some great tree aging first in its upper limbs, runs of silver salmon into the Skeena watershed failed to reach the upper tributaries in their former strength of numbers.

Members of the Kispiox Band were first employed by SEP in 1977 to conduct an inventory of remaining salmon stocks, and to remove beaver dams that blocked smaller tributaries to passage by coho.

Under contract to SEP in 1978, Band members built a large incubation box and installed it inside a heated building. By autumn of 1979, all was ready for the first egg-take from Kispiox River chinook. Earlier that summer, project manager Brian Williams and a crew of 10 men had completed a survey which indicated that chinook used 90 kilometres of the Kispiox River for spawning.

Owing to difficulties in locating and holding brood

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Blasting Opens Salmon River

The recent blasting of a huge boulder in Vancouver Island's Salmon River opened an additional 13 kilometres of spawning ground suitable for steelhead, but further work could double the length of the watershed available to these salmonids. The B.C. Fish and Wildlife Branch and Salmonid Enhancement Program staff will approach B.C. Hydro this year with plans to build a fishway around a Hydro diversion dam on the upper reaches of the river. It is estimated that up to 1,500 additional steelhead can be produced by building the fishway and so allow steelhead to spawn in the upper portion of the river. At the same time, steelhead fry hatched from Salmon River stock would be released above the fishway to expedite the colonization process.

During the past 12 years, the Salmon River near the town of Campbell River has had a winter steelhead run that averaged about 500 fish. There was a downward trend in the late 1970s until last year, when approximately 500 spawners returned as a result of stringent angling restrictions.

"Last year's encouraging run, however, was not related to removal of the five-metre waterfall which was blasted from a narrow canyon during the period 1975 to 1978," says Bob Hooton, a fisheries biologist with the Fish and Wildlife Branch in Nanaimo.

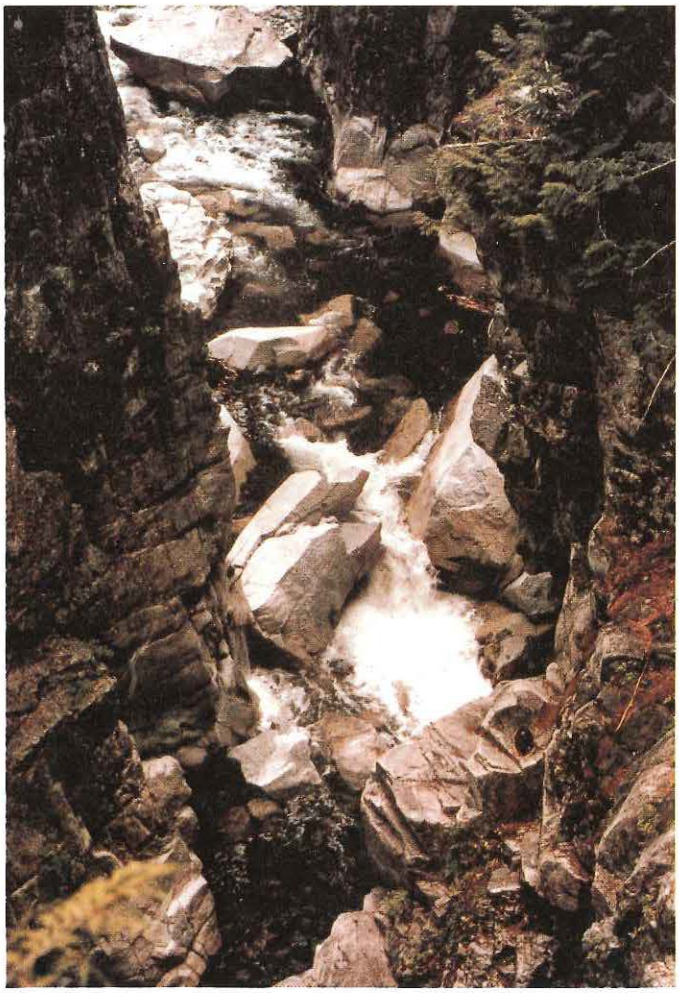
Fish and Wildlife engineer Don Hjorth, who removed the waterfall, says the work was spread over a four-year period because of fears that excessive blasting would cause portions of the canyon walls to tumble into the river. A logjam was loosened the first year, which allowed a buildup of sediment and gravel to wash downstream with winter floods. The main boulder was blasted the second year, which opened a passage, but not sufficiently wide for fish to swim upstream. Other rocks were broken up during the following two years, and although two large, car-sized boulders did fall from the canyon walls, Don says, they didn't block the river.

Dynamite is significantly cheaper than drilling since Don estimates the cost of the Salmon River project at $7,000. The estimated cost of a fishway around the falls, proposed in the early 1970s, was $250,000 at that time.

"The best spawning areas in the Salmon River, however, are above the Hydro dam beyond the newly accessible 13-kilometre stretch opened up by blasting," says Bob Hooton. "The problem is not so much for adult steelhead to get above the dam, but for smolts to migrate downstream without being drawn into the diversion system, and funnelled into an adjacent watershed."

"Once you get up in those areas above the waterfall, the system is much more stable, much better suited to producing steelhead," he says. "So even though it's only half the watershed, it's by far the best half from a quality standpoint."

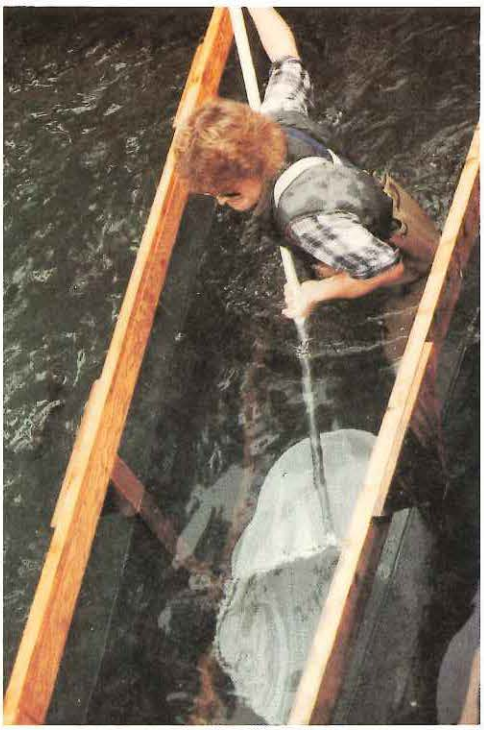
To gauge the success of the boulder removal, 16,000 steelhead smolts originating from the Quinsam River hatchery were released in 1977, before the obstruction was entirely eliminated. This year, 14 adult steelhead were seen above the falls, and five Quinsam River hatchery fish were among these. Nearly 25,000 steelhead fry of Salmon River stock were released last year in the newly accessible stretch above the former obstruction, says Bob, and as many as 60,000 will be planted in 1981.



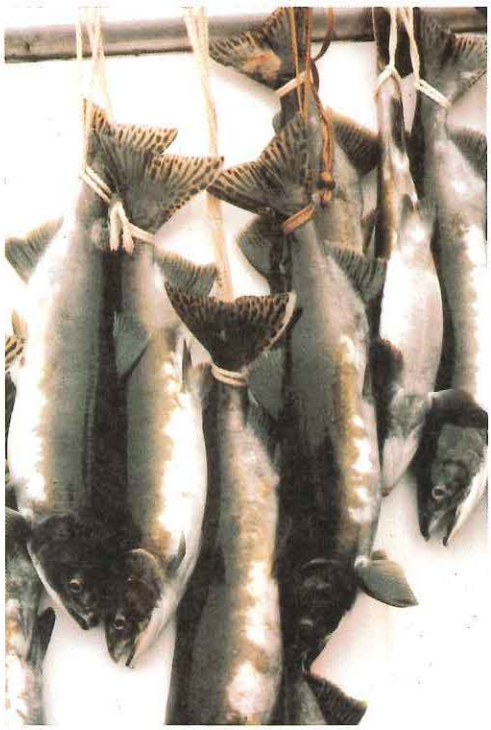
Blasting to remove the obstruction from the Salmon River was carried out in stages to prevent damage to the canyon walls. Photo: Fish and Wildlife Branch

"All the information we have collected, both from our own work on the Salmon River and from this type of program elsewhere, indicates that it can be extremely successful," Bob says. "That being the case, I think we're only three or four years away from seeing a really significant increase in the adult return of steelhead to the Salmon River."

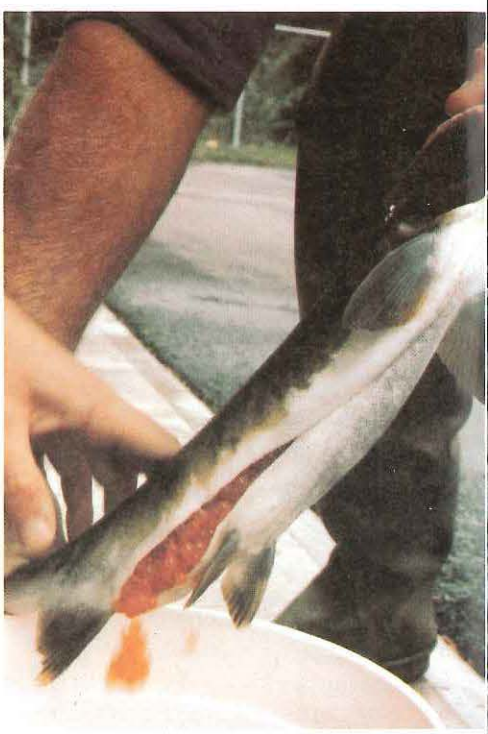
Bruce Obee



Salmon are transferred in dip nets from concrete holding ponds to a small water tank which contains anesthetic to calm the fish.



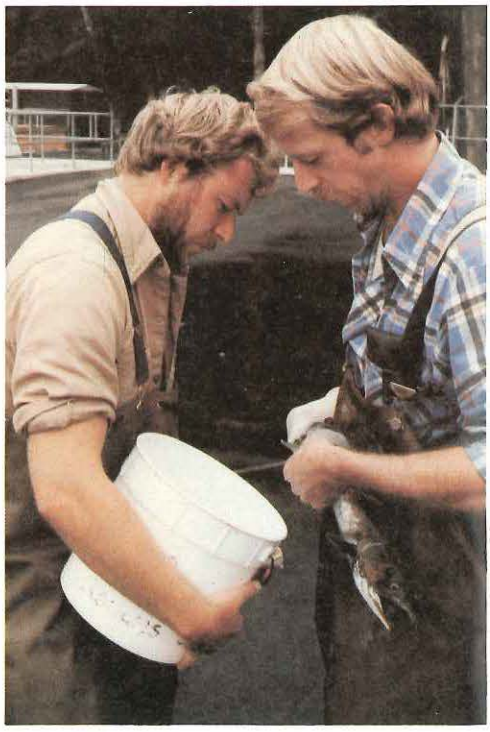
Only the ripe females that are ready to spawn are killed. The remaining females are returned to their holding pond until mature.



The belly of each dead female is slit open to remove some 1,500 orange-pink eggs.

Egg-Take At Puntledge

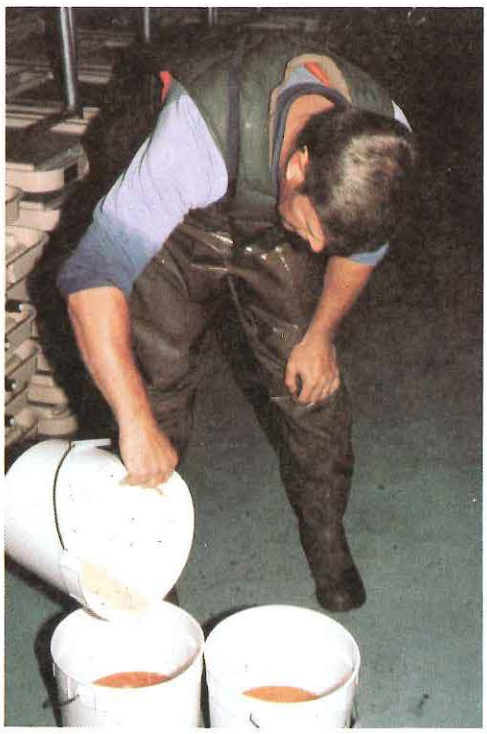
Pinks mature at two years of age, the earliest of the five Pacific Salmon.



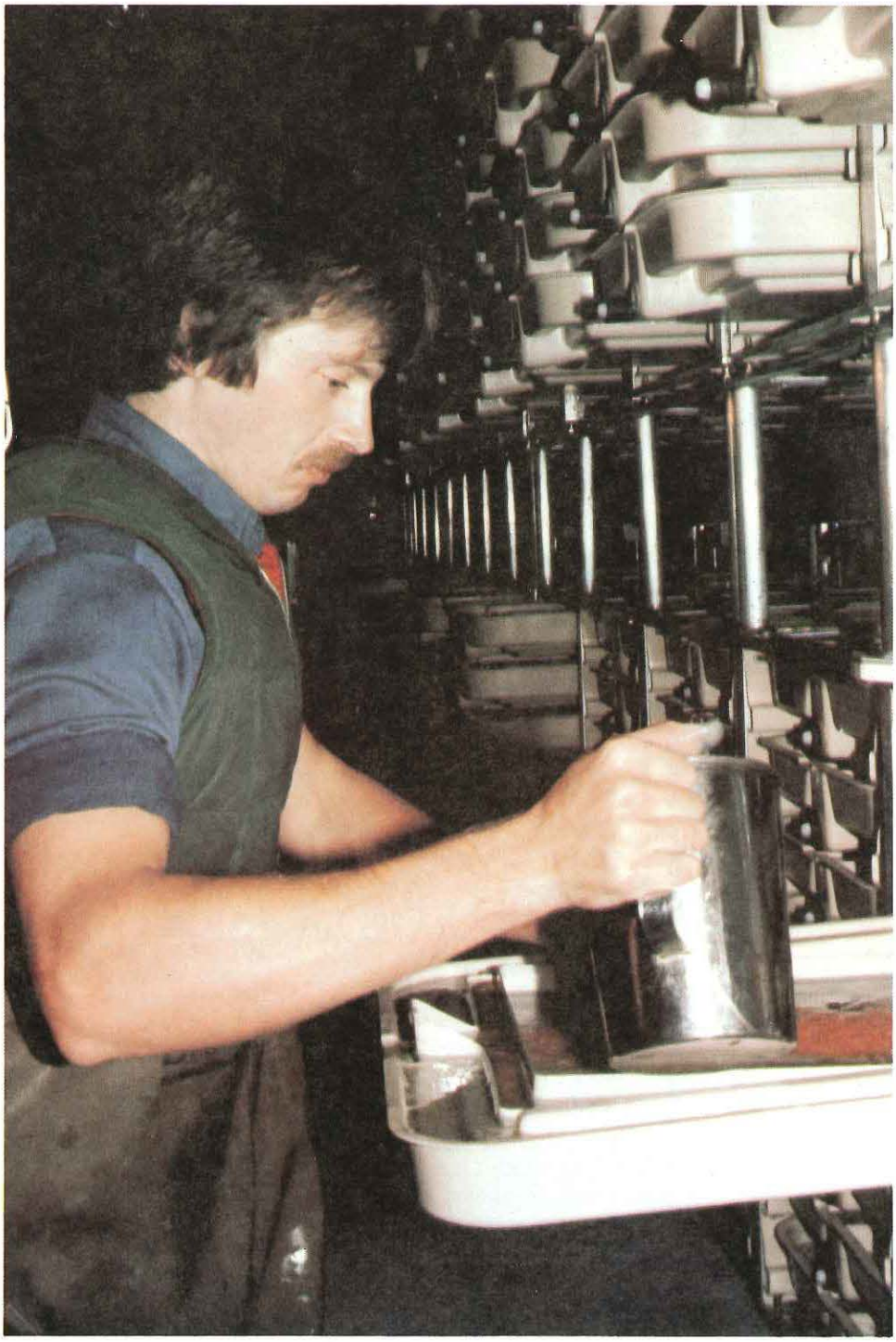
Males need not be killed to obtain their milt. The fish are returned to a holding pond but are separated from the females.

Salmonid Feature

The fish carcasses are weighed and measured before the bodies, which are not fit for human consumption, are returned to the river.



Inside the dark incubation room at Puntledge hatchery, buckets of eggs are fertilized with the milt.



The fertilized eggs are planted in stacks of Heath trays, about 10,000 eggs per tray. During the winter, a steady flow of cool, clean water through each tray supplies oxygen to the developing eggs.

Fish And Wildlife Branch

Within SEP, enhancement of sea-run trout is carried out primarily by the Province. Steelhead in particular are popular sport fish and are intercepted in the commercial salmon fisheries. In 1980, for example, some 4,000 adult steelhead returning to the Thompson and Chilcotin Rivers were intercepted in the Johnstone and Juan de Fuca salmon fisheries. It is for this reason that trout stocks must be enhanced alongside the five Pacific salmon.

From Fraser Valley Trout Hatchery in Abbotsford, 73,000 steelhead smolts and 119,000 fry were released into seven B.C. rivers in 1980. An additional 222,000 steelhead smolts and 85,000 fry were released from SEP facilities and projects on Vancouver Island.

Fish and Wildlife conducted habitat assessments on 39 small cutthroat streams of the Lower Mainland, and 11 steelhead rivers across the province.

Other trout releases were made from the Abbotsford hatchery by the Research Section. Vedder River steelhead fry overwintered successfully in net pens such that 27,000 smolts were released in 1980. Some 15,000 steelhead smolts were reared over the winter in O'Connor Lake and then released into the Keogh River. About 20 percent of these stocked smolts fail to migrate to sea, however, and compete with smaller, wild steelhead already in the river.

Cutthroat trout rear well in the Abbotsford hatchery showing both good growth and a tolerance for crowding. Some 8,500 cutthroat released in 1980 into Hope Slough near Chilliwack provided a successful spring fishery for smolts and a fall fishery for the returning adults.

Fish Production

SPECIES	PROJECTED ADULT PRODUCTION 1979 BROOD	1980 BROOD
Coho	605,000	691,000
Chinook	459,000	474,000
Pink	75,000	204,000
Sockeye	1,575,000	1,070,000
Chum	493,000	793,000
Steelhead	7,700	10,500
TOTALS	**3,214,700**	**3,242,500**

With the exception of sockeye, production of the remaining four salmon and steelhead trout has increased in 1980. Sockeye production is down as a result of reduced escapement into the Babine Lake system.

At present 563 million eggs are incubated at major facilities. Juvenile releases projected for 1981 and 1982 are expected to be 261 million fish.

Three new SEP hatcheries have come on stream in 1980. Chilliwack hatchery will produce chum and coho in its first year of operation. Nitinat hatchery on the west coast of Vancouver Island will produce both chinook and chum salmon. Tsolum River facility, operated in conjunction with Puntledge hatchery near Courtenay, is used to hold, incubate and rear pink salmon.

Thornton Creek hatchery on Vancouver Island was reopened in 1980 after an excellent return of chum salmon and a successful commercial fishery for this stock. Bear River hatchery, originally a research facility, currently is operated as a production unit for pink salmon with an egg-take this year of 2,000,000.

To assist depleted chinook stocks in northern British Columbia and the upper Fraser system, three pilot projects were started in 1980. These are located on the Bowron River and Slim Creek of the upper Fraser, and on the Kalum River of the Skeena system. Each pilot facility is designed to test the suitability of that site for fish culture and the feasibility of rearing chinook in cold water. Coded wire tagging of each stock prior to its release from these three pilot projects will provide data on the ocean survival, marine distribution and timing of these important chinook stocks.

Public Involvement Program

To meet the public's growing enthusiasm for volunteer projects, two new community advisors, one based in Kamloops and the second in New Westminster, were added in 1980 to the previous complement of four CAs. About 7,500 volunteers worked on 100 different projects scattered across the province.

Success of the public involvement program has attracted attention in other parts of the world. Delegations from Norway, Great Britain, Japan, and the United States have travelled to British Columbia to experience program activities firsthand.

SEP's Educator's Package, "Salmonids in the Classroom," received follow-up in the form of questionnaires mailed out to participating teachers. Response was good. The package needs to be less bulky, and more support materials such as short film clips will be provided in 1981. Lessons for the primary grades also will be added to the package.

In April, the Salmonid Enhancement Task Group met in Terrace to examine the Kemano Completion project, and in August reviewed SEP plans for the fiscal year 1981/82 as well as plans proposed for Phase II of the program. In October 1980, the Task Group celebrated its fourth anniversary as the public advisory group to SEP.

In 1980, SEP Information redesigned the Salmonid Newsletter, launched a new series of fact sheets, and produced a slide show entitled "Benefits of SEP to Canadians." Work on a SEP film about the salmonid resource will continue into 1981.

SEP Research

Research at the Pacific Biological Station in Nanaimo and at Fisheries laboratories in West Vancouver serves three broad goals: to increase the efficiency of existing SEP facilities, to develop new ways of rearing salmonids, and to gain greater understanding of salmonid life processes.

What is the best time to release fry and smolts from the different hatcheries? What is the optimal weight for these juvenile fish at the time of release? How can outbreaks of disease among hatchery stocks best be controlled, or better yet, prevented? Answers to these and other questions are provided by painstaking research. These answers are important since they can boost fish production, improve ocean survival and increase the contribution of hatchery stocks to the various fisheries.

Since the amount of food produced naturally in streams and lakes limits the numbers of salmonids that can be reared, this topic is one of active research. By boosting natural food production with the addition of chemical fertilizers to streams or lakes, more juvenile fish can be produced to achieve greater adult returns. Lake fertilization is one enhancement technique that has demonstrated good potential for increasing sockeye production from British Columbia lakes.

SEP Projects

Fourteen projects distributed across the province are under contract to SEP to produce fish. Collectively, twelve of these projects have taken, in 1980, a total of 7,020,000 chum eggs, 903,000 chinook, 1,290,000 coho, 3,000,000 sockeye, and 5,000 cutthroat eggs for incubation in their various hatchery facilities.

At the Sechelt project, 10,000 chinook and 10,000 coho are reared in ocean pens, whereas 15,000 chinook are reared in pens in Vancouver's False Creek by students and staff from the British Columbia Institute of Technology.

Good progress particularly in project management, has been made in 1980. Success of the community development program is measured not only in fish production, but also by the personal growth of those people the program employs.

Kispiox

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Photo at right: Fish scales taken from chinook allow biologists to age these adults accurately. Photo: Maurice Boisvert

stocks, however, only 19,000 chinook eggs were incubated this past winter. The fry were reared for four months, and a total of 13,000 were released in August into Cullon Creek, a tributary of the Kispiox River.

"Also in 1979," Brian added, "we found four ripe coho in a field."

I reacted with some surprise and repeated, "in a field?"

Brian went on to explain. Beaver often construct long channels or runways into meadows that surround their ponds, as they range more widely to obtain their favourite food, aspen bark. These shallow runways are often only centimetres deep in water, and terminate eventually on dry land. As a result, coho salmon that ascend these beaver channels far enough upstream, end up in the meadow more out of water than in it.

These four ripe females yielded 29,000 eggs that were taken for incubation. The coho fry were reared at the hatchery site, and were released in late September when their commercial fish diet was used up.

The summer and fall of 1980 have been very successful for the fledgling Kispiox project. The run of chinook into the Kispiox River was larger this year than had been anticipated. Brian and his crew captured 30 females, and took from this brood stock a total of 153,000 eggs for incubation. This year's target of 100,000 coho eggs was taken in October when the coho returned to the Kispiox tributaries.

While I was talking with project manager Brian Williams and Riley Turner, who is in charge of maintenance at the Kispiox project, a fisherman visiting from Alberta joined our conversation.

"In the ten years that I have fished the mouth of the Kispiox River, steelhead have declined drastically," he volunteered. "I've caught but one in a week's fishing, and coho too, are going down, down, down." A grin played across Riley's face as he quickly responded, "the Kispiox project is going to bring stocks up, up, and up," his hand gestures emphasizing each step on an imaginary ladder of success.

The afternoon had slipped away to four o'clock. It was time to feed the fish. "In a week's time, they'll be looking for their own grub," Riley said, tossing handfuls of food pellets to the hungry coho. When he returned some minutes later to feed the fish an extra ration of food, the thought occurred to me that a man can get attached to fish he has fed numerous times daily for many months. Perhaps Riley was just a shade reluctant to release his charges to their natural fate.

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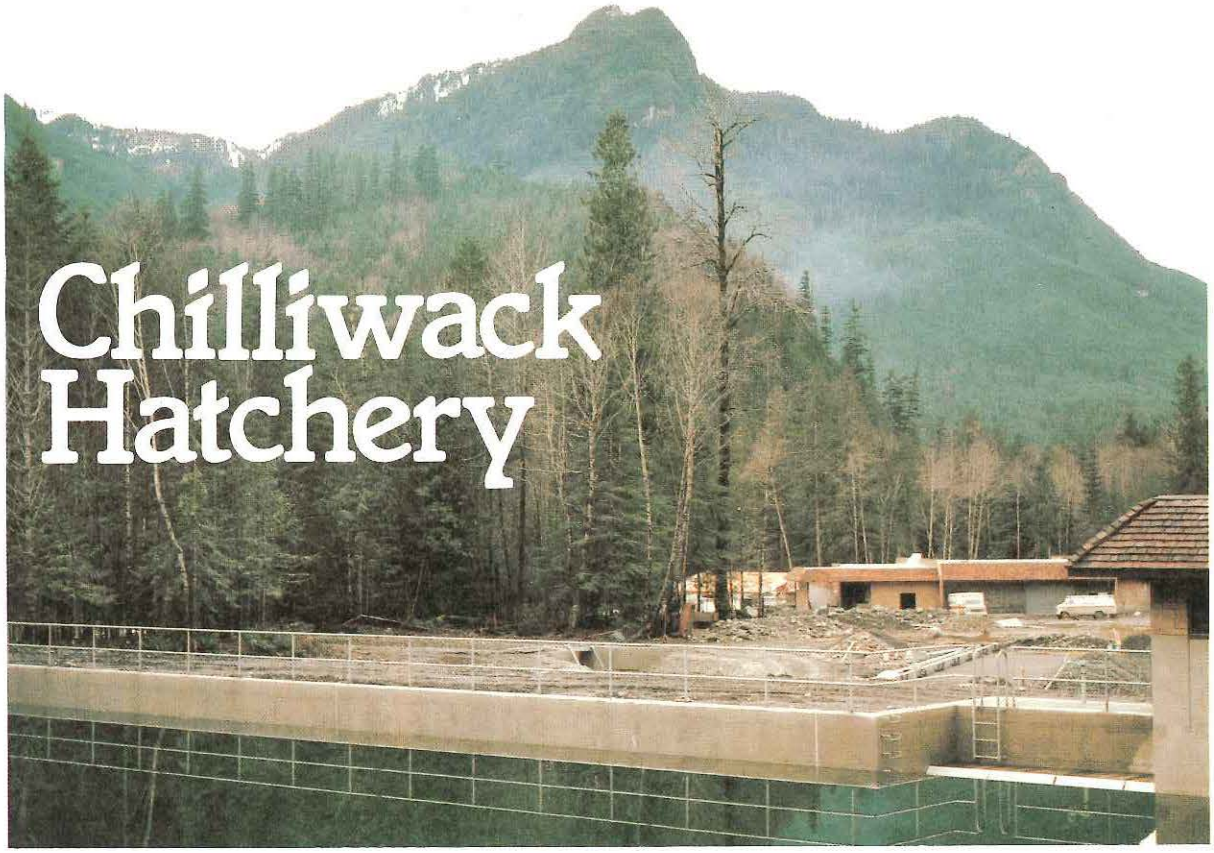
Chilliwack Hatchery



The hatchery will produce chum for the commercial fisheries, and coho and steelhead for anglers.

From its source lake nestled high in the Coast Mountains, a wild and scenic Chilliwack River brawls and tumbles down its narrow valley to meet the Vedder and mud-stained Fraser Rivers. Attracted to this river each summer are canoeing enthusiasts, and in winter, anglers eager to test their skills against coho and the steelhead trout that have entered the river in December. Small farms, and more recently, vacation cabins look down on the Chilliwack River from rising valley slopes.

At the junction of Slesse Creek and the Chilliwack River, the newest SEP facility is currently under construction.

"Chilliwack hatchery will be the most attractive facility designed and built to date," said hatchery manager Don Buxton, as we toured the well-treed site. The hatchery building, roofed in cedar shakes, is only partially completed, with chum and coho eggs already in incubation. Since construction is still in progress, the December floods that ravaged the Lower Mainland also affected Chilliwack hatchery. Silt-laden river water could not be diverted from the incubating eggs by switching to well water, so that some egg losses occurred due to silting.

At a public meeting held in 1978 before construction began, valley residents voiced their concerns that Chilliwack hatchery should blend in with the natural environment. "The public vetoed the weir called for in the original plans, as well as the concrete rearing ponds," said senior project engineer Wayne Peterson. "Without this weir across the river, we had to redesign the water intake to guarantee sufficient water to the hatchery site during periods of low flows," Wayne added, "and the rearing channels for steelhead and coho we redesigned using Big Qualicum as our model." Accordingly, fish will be reared seminaturally in gravel

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During construction of the chum rearing channels at Chilliwack, a makeshift canopy wards off December rains.

Chilliwack Hatchery

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channels that wind through the trees left intact on the hatchery site. At considerable cost, all electrical and water-delivery systems were buried.

"It is both challenging and rewarding to guide a project such as Chilliwack hatchery through from conception to construction," Wayne remarked, "and better yet to do so in the light of public approval."

Construction of this handsome new facility is welcome news for steelhead anglers of the Lower Mainland. The Chilliwack River is considered among the best in southern British Columbia for trophy steelhead.

After completion in 1981, Chilliwack hatchery will produce annually 150,000 steelhead smolts for release into tributaries of the Chilliwack River. Adult fish produced from these releases is expected to be 6,000 to 9,000 steelhead annually, the majority of which are then available to anglers from December through to April.

Other stocks to be enhanced at Chilliwack hatchery include chum and coho salmon native to the watershed. One million chum and 150,000 coho eggs currently are being incubated. Chinook may be transplanted to the Chilliwack River since its native populations are seriously depleted, and can no longer provide enough brood stock.

Don Buxton used to fish the Chilliwack River on his holidays. "I feel in some way that it's my river," Don says, "having fished it for steelhead these past ten years. With Chilliwack hatchery on stream, it may well be possible to fish the river for nine months of every year, starting with chinook in August and September, coho the following two months, and winter steelhead from December through to April."

Nimpkish

Across Nimpkish Lake and up over the "Burma Trail" to Willow Creek, Basil Ambers and his crew of ten ferried and backpacked all materials used to build a small hatchery and living quarters. Years earlier between 1903 and 1933, Willow Creek was the site of a sockeye hatchery operated by B.C. Packers as part of an agreement that gave the company exclusive fishing rights at the mouth of the Nimpkish River.

After exploring the entire watershed in 1978, project manager Basil Ambers concluded that Willow Creek, although lacking road access, was still the best location for the new Nimpkish Band facility.

For the first two years of their contract with SEP, the Band had only limited success with the incubation of chum and sockeye eggs at Willow Creek. The 1980 season, however, promises greater success. With assistance and technology supplied by Fisheries, the Band designed and installed a more dependable water supply to the renovated hatchery, and also built a sediment box to remove silt from the river water. The back-breaking portage of building materials across the "Burma Trail" was eliminated. All timber now is cut on site from a giant Douglas fir felled beside Willow Creek.

In the fall of 1980, a total of 2,800,000 sockeye eggs were taken from stock captured in the Woss River. The eggs were transported by helicopter to the hatchery, fertilized, and placed in boxes for incubation. When eye-spots have developed in the embryos, the eggs will be moved to outdoor boxes

Band Tackles Enhancement

containing gravel. From these boxes, sockeye fry are released naturally into Willow Creek to migrate to Nimpkish Lake for rearing. The Band estimates 25,000 adult sockeye will return in the autumn of 1984, doubling the size of the 1980 run.

When the lake is restocked with several million sockeye fry incubated at Willow Creek, Nimpkish Lake will become a candidate for fertilization. This technique has boosted sockeye production in other lakes such as Great Central Lake near Port Alberni.

Some 480,000 chum eggs taken in 1980 from fish that school near the mouth of the Nimpkish River are also incubated at Willow Creek. In spring, the chum fry will be moved by helicopter to pens in the lower Nimpkish River and fed for several weeks prior to their release. In the fall of 1984, an estimated 7,500 adults will return to spawn.

"The Nimpkish project is going well now," says Basil, "but much more work is needed to reduce the hazards and ensure success."

The main objective of the Nimpkish Band is to restore their traditional food fishery for sockeye and chum in the Nimpkish system. In years to come it is hoped the project will be scaled up to its full capacity of 7,000,000 eggs, with both eyed eggs and fry transplanted into streams throughout the Nimpkish watershed. Chinook stocks will receive more attention after the Nimpkish project has come of age.

Using a net stretched across the Nimpkish River, Band members capture brood stock near the river mouth.

Chum salmon in spawning condition supply eggs for the Nimpkish hatchery on Willow Creek. Photos: Alf Stefanson

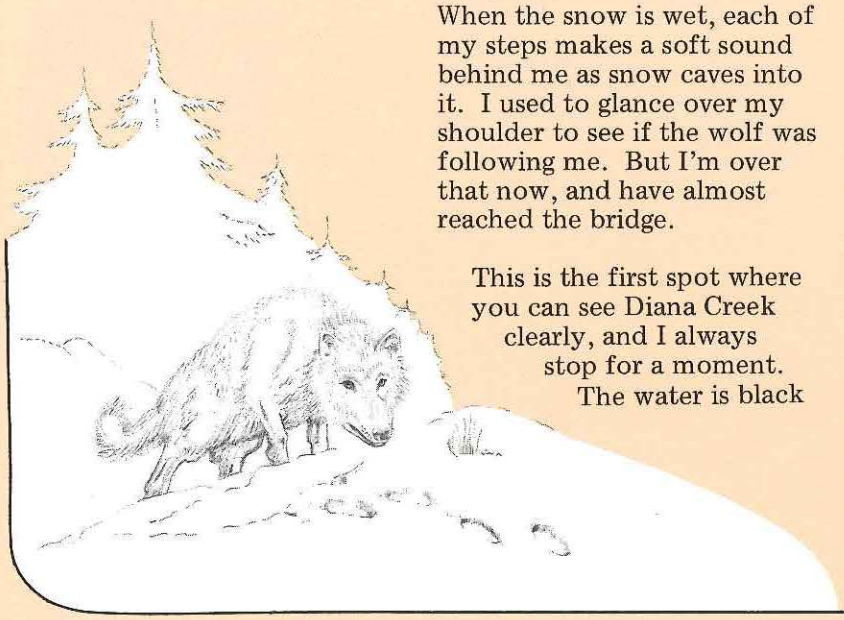
Diana Creek~ New Life In Late Winter

I am standing in slush at the Diana Creek turnoff, clutching in my hands a bag of frozen brine shrimp, and staring at the sky. No matter how optimistically I judge the weather back in Prince Rupert, at Diana Creek it is always colder, or snowier, or rainier.

I don't know how far it is to the falls and the incubation box. I know only that I must check the salmon eggs in the box, and am glad I am not in an office. If I knew exactly how far away the box was, getting there might seem impossible some mornings. But I am used to walking up the trail now. Familiarity makes it possible. I stare at my gumboots tramping through the snow. I am very familiar with my gumboots; sometimes I think they are permanently attached to me. Last summer, creek water overflowed into them so often my feet were white and wrinkled every night. I skid over an iced puddle, and my toes curl at the thought of wet feet again today.

Here is the turn-around where I got the car stuck last week. It will not happen again. I had to walk back to the highway, almost to the Port Edward road, before I got a lift with an old man who kept his heater on full blast because his feet — also in gumboots — were cold. He kept calling me Diana, the only good thing that happened all day.

I walk on, watching for animal tracks. A wolf hunts in the vicinity, and his paw prints, the width of my hand, cross my tracks every night. Once, he left a pile of droppings beside the trail, and another time, blood stained the snow. I never see him. When the snow is wet, each of my steps makes a soft sound behind me as snow caves into it. I used to glance over my shoulder to see if the wolf was following me. But I'm over that now, and have almost reached the bridge.



This is the first spot where you can see Diana Creek clearly, and I always stop for a moment. The water is black against the white snow, and flows very fast. I can hear the muffled roar of the falls from the point where the trail begins to climb. The mountains are so near and dark, the sky is narrowed, that I feel I am descending, not climbing. At the top of the trail, I pigeon-toe down the side hill and jump down from the deadfall that juts over the incubation box.

I barely glance at the falls. The styrofoam insulation on the box is frozen brittle so I lift it off gingerly, and then remove the heavy wooden cover. I step back quickly so my shadow will not fall across the rock-lined tray of water, and wait for a moment. Now I look at the rush of foam over the rocks. Sometimes when I watch the rate of flow over the falls, or the debris washed down, or check the pipe that channels water into the incubation box, I forget that the falls are beautiful. Further down the creek the mist is lifting off the water. Soon, when the fry are more active, I will place a screen over the box and leave them in daylight.

Today the brine shrimp is a frozen slab. Some days it is mush. I pull off my gloves with my teeth and fumble with a knife to shave off bits of shrimp. Thinking how silly I must look, I bend over to toss the shrimp bits at the front of the box where the gentle water flow will carry them long enough until they are water-soaked and sink.

> **"It always takes me a while to find the fry; their markings blend so well into the colours and shadows of their world."**

I wait until this disturbance is accepted before moving in close to the box.

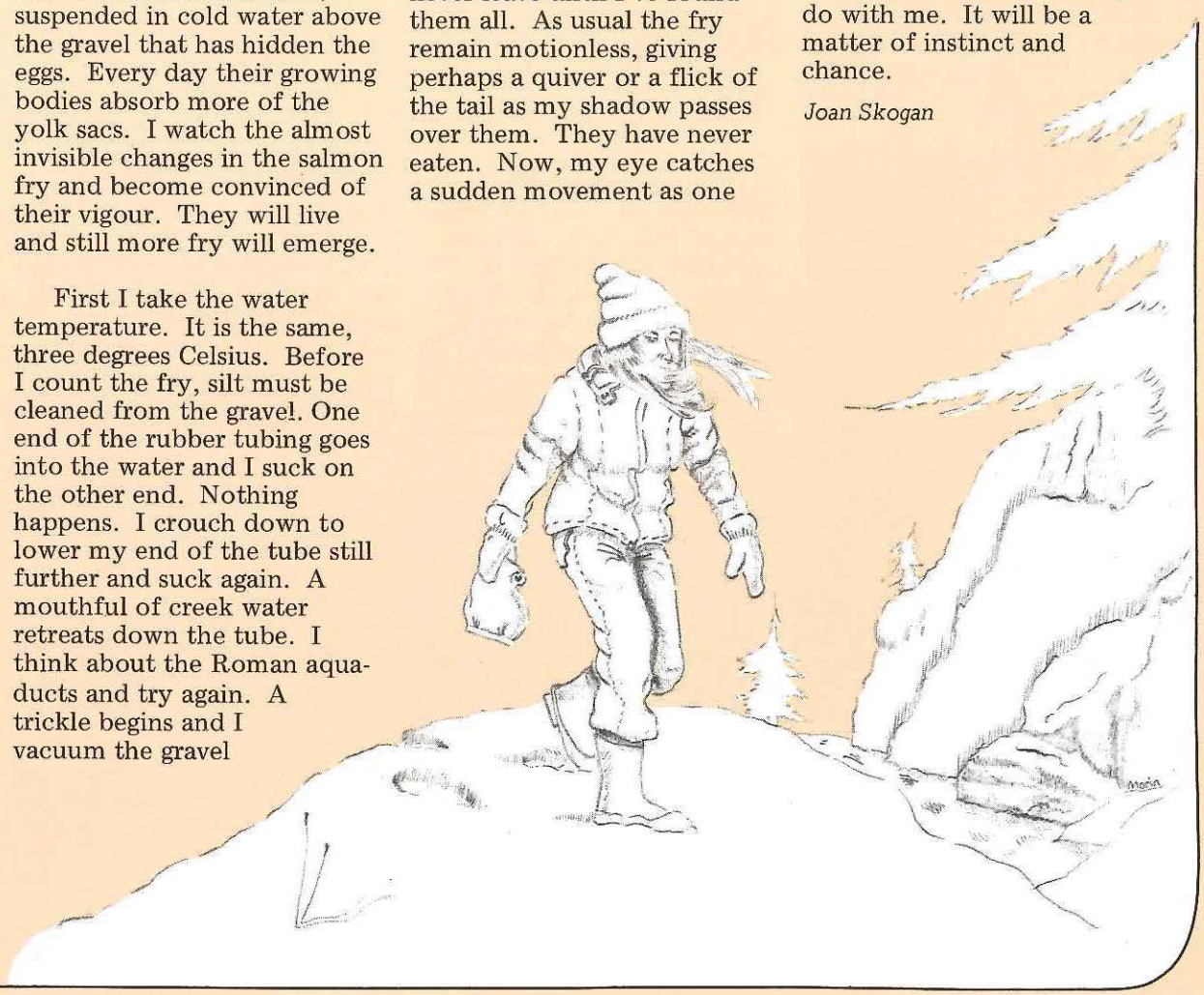
Through the midwinter months, the chinook eggs have incubated here in darkness, below a layer of gravel with water flowing slowly above them. Now the first alevins are hatching. Their transparent yolk sacs bulge alarmingly below their bellies. Their existence seems tenuous. But they know this better than I do and remain still, suspended in cold water above the gravel that has hidden the eggs. Every day their growing bodies absorb more of the yolk sacs. I watch the almost invisible changes in the salmon fry and become convinced of their vigour. They will live and still more fry will emerge.

First I take the water temperature. It is the same, three degrees Celsius. Before I count the fry, silt must be cleaned from the gravel. One end of the rubber tubing goes into the water and I suck on the other end. Nothing happens. I crouch down to lower my end of the tube still further and suck again. A mouthful of creek water retreats down the tube. I think about the Roman aqueducts and try again. A trickle begins and I vacuum the gravel with the suction. I concentrate and forget that my hands and feet are numb until I stumble over my own boots. Half the job is finished; the rest can wait until tomorrow.

I inch my way around the box peering through its clear waters to the grey, green and brown gravel below. It always takes me a while to find the fry; their markings blend so well into the colours and shadows of their world. I never leave until I've found them all. As usual the fry remain motionless, giving perhaps a quiver or a flick of the tail as my shadow passes over them. They have never eaten. Now, my eye catches a sudden movement as one fry snaps up a morsel of shrimp. He rolls, and his tiny body arches in imitation of the thrusting leap of adult chinook. Above him my grin is reflected from the water surface.

I run most of the way back to the highway. My imagination transforms the few fry into hundreds that will be released to the dangerous freedom of Diana Creek. Their survival in the creek and later in the sea will have nothing to do with me. It will be a matter of instinct and chance.

Joan Skogan



An Ideal Fish For Children

Encouraging results from research carried out at Hope Slough, on the outskirts of Chilliwack, could lead to the development of an improved children's fishery for sea-run cutthroat in the Lower Mainland. Dr. Art Tautz, head of the Fish and Wildlife Branch's research section at the University of British Columbia, says an egg supply from the Hope Slough system has been assured by the return last winter of about 300 adults. They were the first spawners to mature from a 1978 planting of about 15,000 smolts.

Art, who is the first biologist to rear sea-run cutthroat in a B.C. hatchery, says 12 females were taken from the slough in 1977, and their eggs hatched at the Abbotsford hatchery for release the following spring.

"They did really well," says Art. "The fish appeared well adapted to hatchery conditions. They gained weight more quickly than do steelhead under similar conditions. We were exceptionally pleased.

"Our project was basically designed to see whether or not we could culture cutthroat trout in a hatchery situation, to determine when the fish were running, how available they were as a brood stock, and where one would collect them. Our second objective was to find out more about the life history of wild cutthroat. This species had been neglected in fisheries management since we had very little information about its life history, and they had not been cultured in hatcheries."

After the first planting, Art found that some of the fish stayed an entire year in the slough, while others moved into tributaries or the Fraser River nearby. Still others migrated to the estuary.

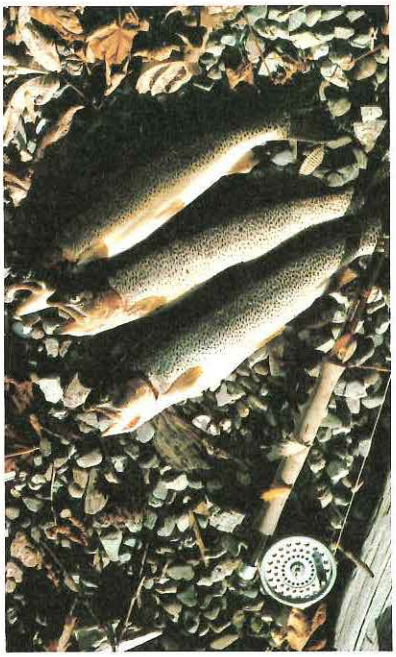


Photo at right: Cutthroat trout are handsome fish of excellent table quality—and not hard to catch. Photo: Ron Ptolemy

"Their homing behavior, well, who knows what they're doing," says Art. "They are certainly not as precise as most of the other salmonids. They're sort of a laid-back fish, I guess, in that they have a flexible life history. They seem to be able to stay in fresh water or salt water whichever they prefer. That's one of our problems — they seem to be less predictable than steelhead."

Between 10,000 and 15,000 smolts have been stocked each year since 1977, so that the slough system has become a popular fishing spot among young anglers. Before the second planting, Art received reports of anglers catching 25 to 30-centimetre cutthroat, those which had remained in the slough over the winter. It is estimated that some 2,000 of the fish originally planted were caught prior to migrating to the sea. Last winter, however, the first adults returned, each weighing between one and two kilograms.

"The species has got a lot going for it from the point of view of improving urban recreation, and for that reason we don't want to write the cutthroat off without giving it a good trial," says Art. "They're easily caught, and seem well adapted to the kind of environment we have on the Lower Mainland. For the sloughs and back channels in the Fraser Valley, I don't think one could find a more promising species than the sea-run cutthroat."

Another advantage of developing fisheries for cutthroat is the number of opportunities that exist to catch these fish. Youngsters can take them at the 15-centimetre stage when they are first planted, and right through to the following summer. Those that overwinter in the slough can be fished in spring before they migrate. Cutthroat trout can be caught from beaches in saltwater, along the river bars, and in the sloughs after they return to spawn.

"We're not interested in developing a trophy-type fishery for these trout. There are few places on the Lower Mainland where a kid can go and have a good chance of catching a fish to take home and eat. Cutthroat are nice critters for that kind of experience, and I think it's something we could spend some money on to promote."

Bruce Obee

December Floods

The floods on Boxing Day that ruined the Christmas travel plans of many British Columbians have caused serious losses of wild salmon stocks. Estimates of damage range from 50 to 90 percent loss of the 1980 spawn. Regions of the province that were hardest hit include Vancouver Island, the central coast, and southwestern British Columbia. The Queen Charlotte Islands, north coast, and upper Fraser watershed were not subject to serious flooding.

Major SEP facilities are designed and built to specifications that take into account the fluctuating levels of British Columbia rivers, and therefore were not damaged by the 1980 floods. In addition, community development projects report no significant egg losses as a result of rising waters. Credit is also due to hatchery and project personnel who worked round the clock to keep intake screens clear of debris.

Fish production from enhancement facilities will be especially important in the years when natural production of wild stocks is low. Chinook, for example, that spawn as five-year-old fish in the Campbell River on Vancouver Island were hard hit by floods in 1975 which reduced the escapement in 1980 to 1,000 adults from 3,000 fish in 1975. Again in 1980, floods have dealt this valuable stock another serious blow which is expected to reduce escapement in 1985 to only 300 adults. It will be several cycles before this and other Island chinook stocks recover their former strength of numbers. In the meantime, chinook production from Quinsam, Puntledge, Capilano and other SEP facilities will help to offset losses of these wild stocks in the commercial, sport and native food fisheries.

Flooding that occurred after chum spawning was completed in rivers of the Lower Mainland will reduce the returns of wild chum stocks in 1983 and 1984 by about 50 percent. Four SEP facilities in the Lower Mainland, Chilliwack hatchery, Blaney and Inches Creeks, and the Alouette project incubate a combined total of 4.25 million chum eggs. In 1983 and 1984, these returning hatchery stocks will contribute to the commercial fisheries.

Wild coho stocks have also been reduced due to flooding, although some adults spawn in southern rivers as late as January. Hatchery coho stocks are incubated currently at Chilliwack hatchery and the Chehalis River project on the lower Fraser.

In general, steelhead were not seriously affected by the floods. Adult fish were present in the swollen rivers in December, but do not spawn until early spring.

Although effects of the 1980 floods on wild fish stocks are certain to be felt in the commercial, sport and native food fisheries years from now, fish production from SEP facilities and projects will help bridge the consequences of this natural disaster.

Above: Using the concrete fish ladder as their vantage point, Quinsam staff look out over brown floodwaters diverted around the counting fence.

Left: One result of the December floods was logging debris piled high against the counting fence at Quinsam hatchery. Photos: Greg Bonnell

January Meeting Of Board With SETG

At their joint meeting held in Vancouver on January 24, the Salmonid Enhancement Board (SEB) informed the Task Group (SETG) that additional funds will be sought to assist the Salmonid Enhancement Program (SEP) attain its original goals.

The Board will recommend that $15.5 million be added to the SEP budget for Phase I which ends in March 1984. An additional $2.5 million will be requested to begin planning for Phase II of the Salmonid Enhancement Program, and so avoid interruptions in the program's continuity.

Several weeks prior to the joint meeting, the SETG had presented briefs to provincial environment minister Stephen Rogers and federal fisheries minister Romeo LeBlanc requesting that a total of $127 million be added to the SEP budget. Since its inception in 1977, Phase I of Salmonid Enhancement Program has been extended to seven years from five, and has also felt the effects of inflation.

Gordon Mackie, past chairman of the SETG, indicated the Task Group was pleased that the Board also recognized the need for additional funding, and described results of the January joint meeting as "a realistic compromise."

Letters

Editor:

Your display at the recent Science Fair held at Robson Square has aroused my interest in salmonids as a precious resource which must be managed and protected. Your newsletter is both attractive and interesting. Please place me on your mailing list.

Milt Hammerly,
Port Coquitlam, B.C.

Editor:

I thoroughly enjoyed your November newsletter (Vol.V No.6), especially the article on Indian Arm coho. I saw these fish in net pens during a pleasure trip up the Arm to the Wigwam Inn in the fall of 1979, but there was no attendant present. From your article I learned the full story. Hopefully in some future issue, you will report the results of this coho project.

James Campbell,
Coquitlam, B.C.

Editor:

I and my school group are very interested in salmon so we picked a project to do. Actually we aren't that interested, but our teacher made us interested. She said that we would get a sticker so we decided to go along. Our group thought it over whether we were going to do a good job or a bad job, and we decided to do a good job. So we would really appreciate it if you would send us 15 decals and information on salmon. Thank you.

Steve Humphrey,
Kamloops, B.C.

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Salmonid

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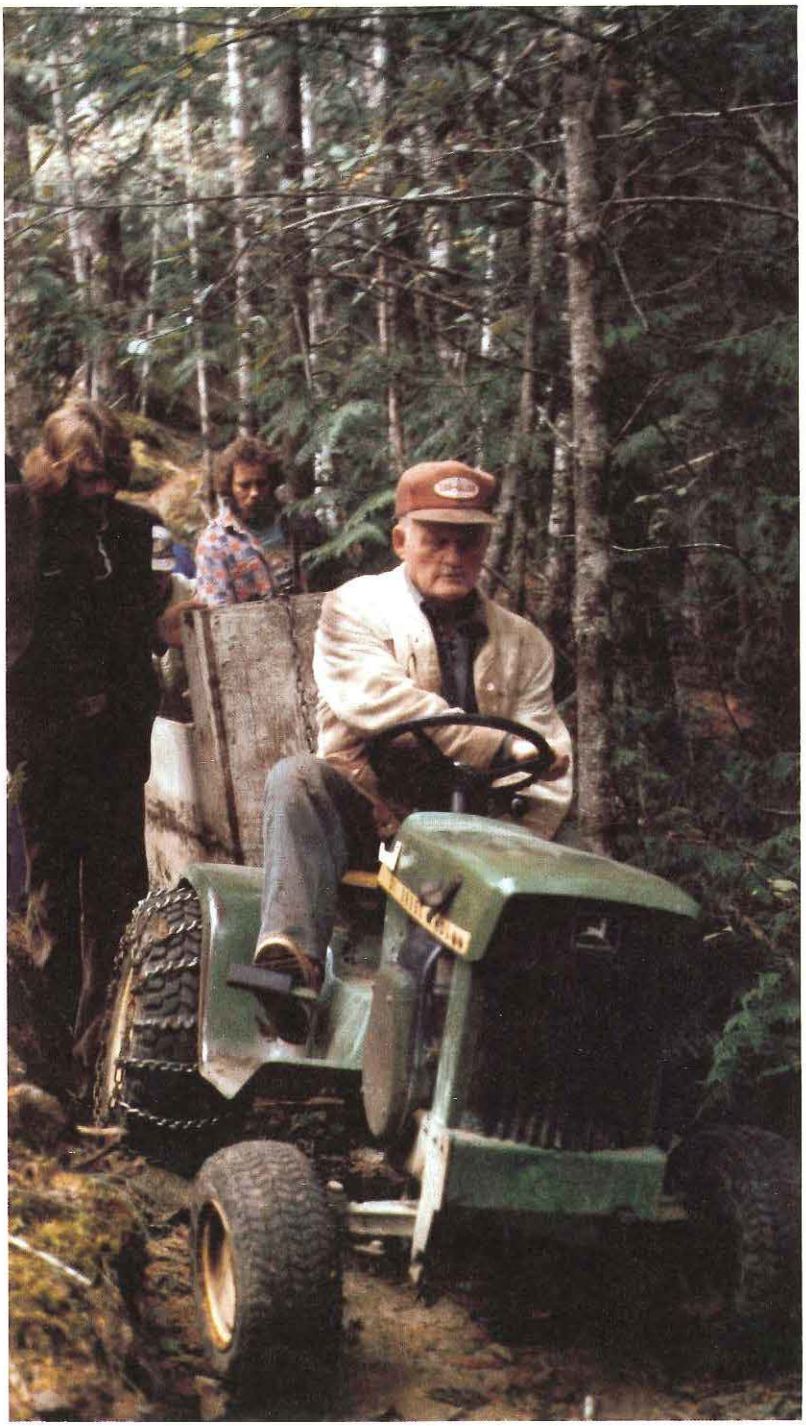
Enhancing Away The Weekend



Seated on his tractor, retired prairie farmer Leroux Jackson manoeuvres an old incubation box along a narrow forest trail. Photo: M. Youds

The two Lerouxs, Leroux Jackson and Leroux Smith, live on either side of Demamiel Creek in Sooke and make up the Demamiel Creek salmonid enhancement project. Their initiative is indispensable.

When SEP community advisor Trevor Morris drove up to Leroux Jackson's home one weekend, the retired prairie farmer was already atop his John Deere tractor, stone boat in tow. Trevor was taking advantage of the weekend — when volunteers are available — to visit several public involvement projects in the Victoria region. He is responsible for co-ordinating projects on the southern half of Vancouver Island, a job that requires a mixture of teacher, technician and labourer. There is always something that urgently needs doing, as the rules of salmon culture demand good timing. The task at hand on Leroux Jackson's property was to haul a 400-kg incubation box, now disused, one-half kilometre out of the bush along a narrow forest path.

"You've got to follow through with activities," Trevor said, "otherwise you'll quickly lose credibility among volunteers."

Fortunately, Trevor had also the help of Alex McLennan, corrections officer, and three inmates from the Greater Victoria Regional Corrections Centre. The men

Continued on page 2 see "Victoria Area Volunteers"

Victoria Area Volunteers

Continued from page 1. . .

serve weekend sentences at the "blue house" and often lend a hand to Trevor to occupy their time. In addition, the prison workshop builds incubation boxes, holding pens and water intakes at cost and Trevor transports them to various projects. This morning, he delivered a 50,000-egg incubation box to Jan Eilersten in Sooke. Although busily constructing a home, Jan is installing a water intake and supply line from Veitch Creek to operate the coho incubation box. A 20,000-egg cutthroat or steelhead incubation box will be added later.

Trevor Morris (right) discusses placement of the incubation boxes built for the Demamiel Creek project. Photo: M. Youds

The Demamiel Creek project already is in operation. Last summer, the two Lerouxs installed a 50,000-egg incubation box (which Leroux Smith paid for) and a 20,000-egg incubation box, built a pump system for water supply and constructed sheds to house the system. The quality and ingenuity of the finished product attests to the enthusiasm that the two neighbours, both in their late sixties, share for enhancement efforts. Trevor likes to encourage this kind of personal interest.

"I don't like rushing projects," he said, "if you do they always bloody well foul up on you." Unless volunteers are keen on achieving results a project may never get underway. Volunteers must take the initiative, Trevor said.

With Leroux Jackson's tractor, moving the old incubation box out of the woods was short work. Leroux still found time, before Trevor had to rush to another project, to demonstrate the use of his homemade, fully-automated wood-splitter.

Afterwards, the group drove out to Mill Bay and met with the Mill Bay and District Conservation Society. The Society, which operates two incubation boxes on Shawnigan Creek, is composed of volunteers from the local community and students from George Bonner Secondary School, Brentwood College and Shawnigan Lake Boys' School. Schools offer an enthusiastic group of volunteers, Trevor said, and because of this he enjoys working with them.

"I've been interested in public involvement since 1971 when the first busload of school kids went to Bush Creek in Ladysmith. I've found I can get more co-operation from kids just by talking and explaining to them rather than trying to have them do the actual work."

Nevertheless, Trevor will soon begin working with Victoria students on stream improvements to Craigflower and Colquitz Creeks, two major streams in the area. The provincial Fish and Wildlife Branch has recently completed experiments with cutthroat trout enhancement techniques on the two streams.

Gradually, Trevor said, communities are growing aware of SEP and becoming involved with enhancement projects. But the community advisor's role goes far beyond production goals, he explained.

"In my view it is public education and hands-on involvement. If we produce fish — fine, but if we have failures, we may not like them, but that's fine too. Public involvement is making people aware of the environment — the salmon's environment and needs."

Mike Youds is a contributing writer.

"Salmonid" Reader Survey

You may be one of our readers who received in the mail a short questionnaire about the "Salmonid" newsletter. If you have already responded, we thank you for your assistance.

A second mailing of identical questionnaires was sent out in March, not all of which have been returned. If you received a questionnaire, please take a few moments now to complete it and drop it in the nearest mailbox. The results of this survey will influence the content and direction of future issues of the "Salmonid".

Steelhead Experience Priceless

What is the value of a steelhead trout to anglers in British Columbia? Economists employed by the provincial Fish and Wildlife Branch conducted a survey to find out. The results were a little surprising.

If present steelhead stocks were doubled by enhancement, fishermen would be willing to pay only a little extra to fish for them, even if their chances of catching a trout were twice as good. Anglers, however, would increase the number of days in a year that they went fishing. This in turn would increase substantially the economic benefits or revenues received by the Province and help offset the costs of steelhead enhancement. Fishermen also indicated that no amount of money would be adequate compensation for the loss of all opportunities to fish for steelhead.

The study, based on 1,717 streamside interviews with steelhead anglers, was conducted in 1978 and 1979 on seven different steelhead rivers in British Columbia. The differences in amount of money that anglers would pay before and after enhancement varied depending on the river.

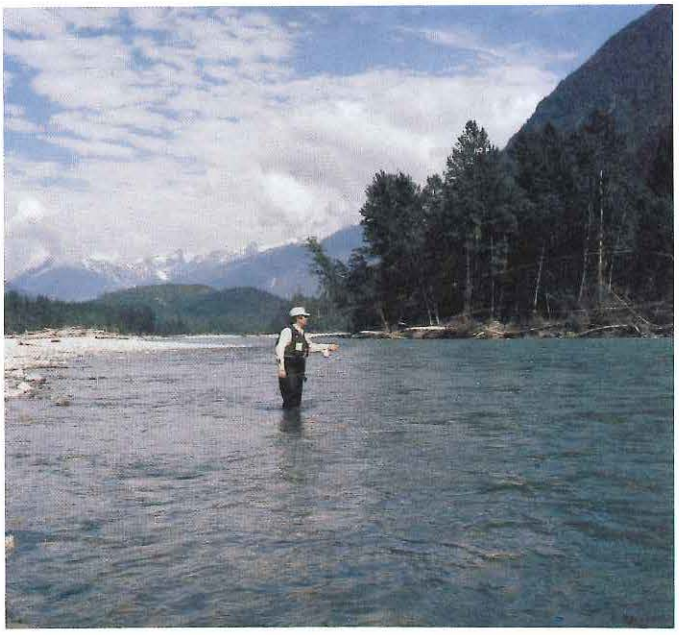
On the Thompson, considered the best all-round steelhead river, anglers would be willing to pay an average of $12.30 per day before enhancement, but only 40 cents per day more if their chances of catching a trout were improved twofold. The largest before and after enhancement difference that anglers were willing to pay was $3.60 per day to fish the Dean River in northern British Columbia.

When anglers were asked how much it would cost to buy from them their privilege to fish for steelhead, almost every fisherman replied that this fishing opportunity was priceless. In the survey, fishermen were offered hypothetical sums of money ranging from $100 to $50,000. No way, the majority said. When asked the minimum amount of cash they would accept, the answer was — sorry, not for sale.

Although the before and after enhancement differences were lower than anticipated, the probability of catching more fish after enhancement would encourage anglers to spend more time fishing. According to the survey, the number of days an angler would fish seemed closely linked to the accessibility of of the river. Anglers fishing the Dean River, which is accessible only by plane and boat, indicated they fished four days a year, but would fish an average of 5.3 days if their chances were improved. Along the Cowichan which can be reached at numerous points by road, anglers fished an average of 14 days a year and would fish 18 days if the river offered a better chance.

Fact Sheet Available

A new fact sheet (No.102) entitled "Small Streams" is currently available, and may be obtained from the Information Branch, Fisheries and Oceans, 1090 West Pender Street, Vancouver, B.C. V6E 2P1.



On the Dean River in northern British Columbia, an angler enjoys the steelhead experience. Photo: J. Wright

Attitudes among nonresident steelheaders were similar to those of local fishermen. Daily expenditures for anglers from Washington, Oregon, Alberta, and Europe ranged from $16.90 on the Cowichan to $118 on the Dean. Most nonresidents said they would extend their trips by a few days if fishing were better.

The most valuable information derived from this survey was the establishment of average values for a day spent fishing for steelhead on seven different rivers. On the Dean River: $18.60; Cowichan: $7.00; Bella Coola: $11.10; Copper: $7.10; Nanaimo: $5.97; Kispiox: $6.24; and Thompson: $12.30. These values can be used to predict the increase in angling days as a result of increases in the number of steelhead. In this way, the survey can provide an estimated value in dollars of steelhead enhancement in British Columbia.

Bruce Obee is a freelance writer living in Brentwood, B.C.

The Fraser Delta - Crucial To Fish And Wildlife

Salmonid Feature

In the cold drizzle of an October afternoon, I stood alone on the dyke when thin, wavering lines of geese appeared on the northwest horizon. A high-pitched barking rolling down from the overcast skies identified the migrants as snow geese long before the white birds dropped down into the marshes along the foreshore. In family groups of white adults and gray juveniles, the great flock — estimated 250,000 strong — converged on the Fraser delta. It was a wildlife drama thousands of years old, as geese continued to arrive and others departed throughout the chill afternoon and into twilight. The snow geese had returned once again from their northern nesting grounds on Wrangel Island off the coast of Siberia.

The majority of snow geese — white except for black wingtips — stop only briefly to rest and feed before flying on to the agricultural valleys of California. Some 10,000 of the quarter million geese shuttle between the Fraser delta and Washington's Skagit River valley throughout the winter. And a stirring sight it is, when all 10,000 birds take wing, their clamorous chorus swelling inland across the delta like a rushing wind.

In the saltmarsh, the heron preys on salmonid smolts and other small fish.

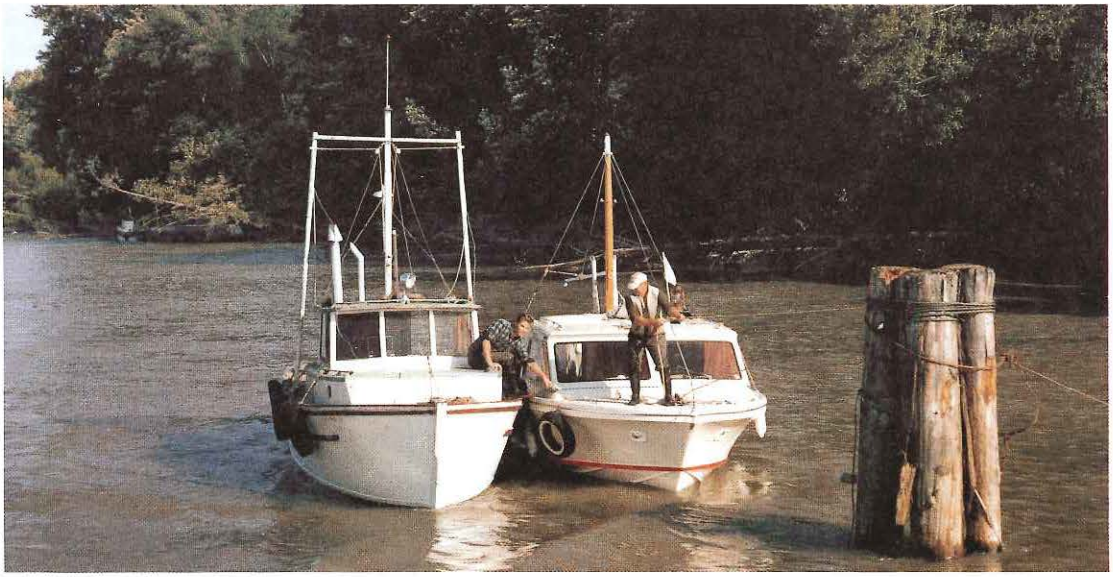
Each year, millions of shorebirds pass through the delta during spring and fall migrations. They include flocks of yellowlegs, dowitchers, dunlin, sanderling, and western sandpipers. Less common migrants are the dainty phalaropes, whimbrels, surfbirds, turnstones, oystercatchers and plovers.

In the air, shorebirds display a superb synchrony and precision. Hundreds, sometimes thousands of individual birds in a flock move as one coordinated whole, although no leader is apparent. Their survival depends on flock integrity. No peregrine or gyrfalcon would risk serious injury by diving into the middle of such a compact flock.

Less visible migrants into the Fraser River estuary are the millions of juvenile salmonids that arrive in spring after most waterfowl have already started their return migration to northern and inland nesting areas. From scores of Fraser River tributaries, salmonid fry and

Below: Dowitchers feed on the tidal mud flats.

From late spring to early winter, thousands of adult salmon and sea-run trout return to the Fraser River.



On the lower Fraser River, a fleet of small boats fish the Fraser stocks. Photo: DFO Files

Left: Every spring, millions of fry and smolts migrate into the Fraser estuary to feed and grow, before moving out to sea. Photo: Marj Trim

smolts migrate downstream under cover of darkness. All must run the gauntlet of heavy industry that crowds the banks of the Fraser River.

In the estuary, the juvenile fish adjust their bodies to salt water, and feed voraciously on small crustaceans that hide among the marsh plants. Size and silver colouring are their main defenses against the many predators that live in the sea.

From late spring through to autumn, adult salmonids move into the vast Fraser River watershed through the estuary. Fish that must return the longest distances to spawning streams of the upper Fraser enter the river earliest. Stocks that spawn in rivers and streams of the lower Fraser Valley pass through the estuary in autumn. As a result, a large, commercial fleet of small gillnetters operates in the Fraser estuary itself and upstream as far as the Mission bridge. Fraser River stocks are the livelihood of these commercial fishermen and also contribute to the native food fishery long distances inland.

On the doorstep of Vancouver, Canada's third-largest city, the Fraser estuary remains a habitat that is crucial to both fish and overwintering waterfowl. It is our challenge to preserve the delta from increasing pressures due to industrial expansion and urban development.

Salmonid Head Recovery

$500 Winners Tell Fish Story

Trolling with a green and white flashtail off Coho Point in Georgia Strait, Linda LaVoie hooked and landed a coho salmon that weighed 1.8 kilograms. It was not an exceptional fish by most standards — until Linda learned several months later that this fish had won her first prize of $500 in the July 1980 draw sponsored by SEP's Head Recovery Program.

Some hatchery chinook, coho and steelhead produced by SEP, as well as some wild stocks, have a tiny coded wire inserted into their nose cartilage just prior to release. The information coded on this tag indicates the fish species, its age, and point of origin.

To indicate that a fish is nose-tagged, the small adipose fin on its back is clipped as a signal to fishermen that capture the fish as an adult. When the head of a marked fish containing the coded wire is turned in by a fisherman at one of the 150 fish head depots established across the province, he or she becomes eligible to win prizes of $50 or $500 in draws held eight times annually. Linda won first prize of $500 and intends using her winnings to upgrade her ticket in Industrial First Aid.

"The fish put up a real fight and my arms got very tired," recalled Jason Sarach of Edmonton, Alberta, "but I brought in the 2.7 kilogram coho all by myself." Jason is 13 years old, and proud winner of the $500 first prize in the August draw. Jason admits to "bragging about it to his friends for a whole week." Not until he was back in the trailer park near Campbell River where his family was staying, did a stranger remark to Jason and his dad that the coho had its tiny adipose fin clipped. The stranger's suggestion that Jason turn in the coho's head at a depot back in Campbell River earned the young lad his $500 prize.

Anne Cordes was on holiday to Vancouver Island from San Francisco when friends urged her to try her luck fishing for salmon. Enough said? Anne walked away with first prize in the June 1980 draw with a coho that weighed 2.7 kilograms. When I telephoned Anne in San Francisco she remarked of her win, "frosting on the cake after an excellent holiday in British Columbia." And where will Anne holiday in 1981? "Why Canada of course!" Anne laughed.

	PRIZE WINNERS	BROOD YEAR	ORIGIN	SPECIES
AUGUST draw held Nov. 27, 1980	*J. Sarach, Edmonton	1977	Quinsam Hatchery	coho
	R. Fersch, Kelsey Bay	1976	Puntledge Hatchery	chinook
	A. Wilms, Parksville	1977	Capilano Hatchery	coho
	P. Brumley, Galt (CA)	1977	Big Qualicum Hatchery	coho
	H. Stich, Delta	1978	Capilano Hatchery	coho
	W. Wilks, Parksville	1978	Puntledge Hatchery	chinook
	M. Laxton, Campbell River	—	Pin Lost	—
	*Dept. of Fisheries and Oceans, Campbell River (no award)			
	Kelsey Bay Shell, Sayward			
	Schooner's Cove, Nanoose			
JULY draw held Oct. 22, 1980	*L. LaVoie, Powell River	1977	Salmon River	wild coho
	D. Palmer, Ottawa	1977	Quinsam Hatchery	coho
	H. Moxley, Huntington Beach	1977	Quinsam Hatchery	coho
	R. Riehl, Duncan	1975	Nooksack Hatchery(USA)	chinook
	T. McCredie, Qualicum Beach	—	Pin Lost	—
	J. Horsland, Qualicum Beach	1977	Capilano Hatchery	coho
	K. Newbury, Powell River	1978	Rosewall Creek Hatchery	coho
	*Marine Traders, Powell River			
	Painters Lodge, Campbell River			
	Salmon Point Resort, Campbell River			

Individuals and depots marked with an asterisk received first prizes of $500 and $100 respectively. All other winners received $50.

Nose-Tagging Of Smolts In Spring

Salmonid smolts have a tiny coded wire inserted in their nose prior to release from SEP facilities. The tag yields valuable data when recovered from the adults. Photo: Joe Kambeitz

It's spring, and millions of wild salmonid fry and smolts are moving downstream into the brackish river estuaries. Millions more fish are released from SEP facilities and projects and also journey to the sea.

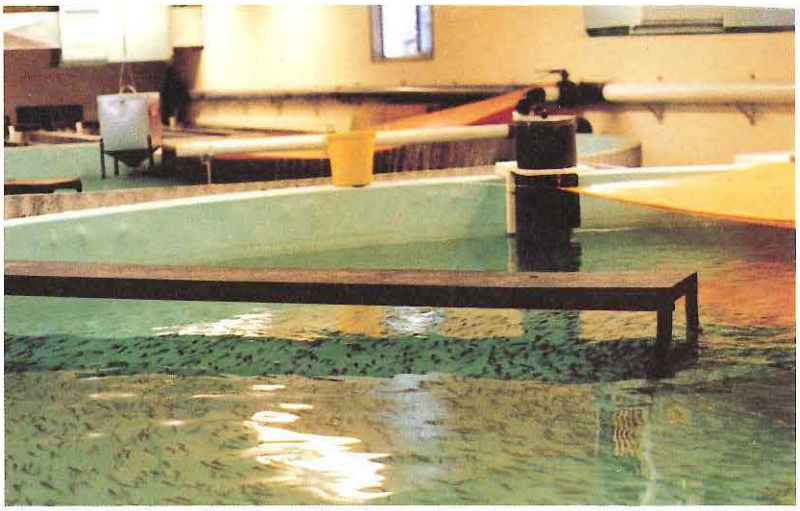
The important task of nose-tagging thousands of hatchery smolts was completed before these juveniles were released. In many streams across British Columbia, wild smolts are funnelled into traps as they swim downstream. Each is nose-tagged and then released to continue its migration.

Much valuable information is gained by nose-tagging and fin-clipping both wild and hatchery coho, chinook and steelhead stocks. When the tiny coded wire that is inserted in the smolt's nose is recovered from the adult fish years later, biologists can readily determine the age and origin of the fish. We also learn where a particular wild or hatchery stock is feeding in the sea, and how this stock returns to the spawning stream.

Each year that the head recovery program continues to receive public support from both commercial and sport fishermen, our knowledge of B.C. salmonid stocks grows. Year by year, a more detailed map emerges of how stocks are distributed in the sea, and the pattern of their movements. This information is invaluable for proper management of the salmonid resource.

	PRIZE WINNERS	BROOD YEAR	ORIGIN	SPECIES
NOV – DEC draw held Jan. 23, 1981	*K. Duke, Ganges	1978	Rosewall Creek Hatchery	coho
	J. Monjar, Lund	1977	Salmon River	wild coho
	J. Dillabaugh, Calgary	1978	Rosewall Creek Hatchery	coho
	L. Parks, Calgary	1978	Rosewall Creek Hatchery	coho
	M. Lasure, Ioco	1977	Big Qualicum Hatchery	coho
	B. Cook, Port Moody	1977	Quinsam Hatchery	coho
	B. Matterson, N.Vancouver	1978	Big Qualicum Hatchery	coho
	* Painters Lodge, Campbell River Lund Breakwater Inn, Lund Campbell River Sportfishing Centre, Campbell River			
SEPT – OCT draw held Jan. 23, 1981	* N. Luoma, Royston	1977	Black Creek	wild coho
	R. Wallis, Victoria	1977	Capilano Hatchery	coho
	R. Cooper, Qualicum Beach	1978	Puntledge Hatchery	chinook
	W. Koch, Vancouver	—	Pin Lost	—
	S. Bahr, Terrace	1978	Kitimat Hatchery	chinook
	M. Hamelin, Comox	1978	Puntledge Hatchery	chinook
	W. McGee, Scottsdale (AZ)	—	Pin Lost	—
	* Tee Pee Park (L. Luoma), Royston Qualicum Beach Marina, Qualicum Beach Dept. of Fisheries and Oceans, Victoria (no award)			

Thompson Stocks Rescued



At the rebuilt Loon Creek hatchery, steelhead fry are reared in fiberglass tubs. Photo: J. Cartwright

The Thompson River downstream from Kamloops Lake is renowned among sport fishermen for its large, summer-run steelhead trout and chinook salmon. Late in the 1960s, however, both species began to decline seriously. Year after year, interception of these fish in commercial net fisheries along the coast reduced adult escapement to the spawning areas. Traditional runs of steelhead and chinook into the Deadman River, the lower Bonaparte River and tributaries of the Nicola River were in jeopardy.

One solution to this pressing conservation problem was to expand an existing trout hatchery operated by the provincial Fish and Wildlife Branch on Loon Creek, a tributary of the upper Bonaparte River. With some design modifications and new construction, Loon Creek hatchery, built in 1952 to hatch and rear the eggs and fry of rainbow trout, could accommodate the threatened chinook and steelhead stocks.

The Bonaparte River is accessible to steelhead and chinook for only about two kilometres of its total length. A six-metre waterfall two kilometres upstream from the confluence of the Bonaparte with the Thompson blocks fish access to the remaining 60 kilometres of the Bonaparte which is suitable for spawning and rearing of salmonids. Recognizing this potential, SEP funded the reconstruction of Loon Creek hatchery to produce both chinook and steelhead in addition to the existing stocking program for rainbow trout.

Early in 1980, 100,000 eggs were obtained from steelhead native to the Deadman River. By fall, 40,000 advanced fry were released into Deadman River. The remaining 45,000 fry were reared at the hatchery for release into the upper Bonaparte as one-year-old smolts.

Also in 1980, Loon Creek hatchery incubated the first 50,000 chinook eggs taken from 32 adults captured below the Bonaparte falls. At 5 grams, the 45,000 chinook fry will be released into the upper Bonaparte.

The first steelhead are expected to return to the Bonaparte in spring 1983, and the first chinook in fall of the same year. Should these first fish releases from Loon Creek hatchery prove successful, the falls on the Bonaparte River will be removed by blasting, or bypassed with a fishway to open this productive river to spawning adults. Hatchery staff can then turn their attention to depleted stocks in the Nicola River watershed.

John Cartwright is regional fisheries biologist for the Province in Kamloops, B.C.

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Sunshine Coast In Good Hands

"Just look at all that crystal-clear groundwater pouring out of the hillsides and away into roadside ditches," said Bryan Allen, community advisor for SEP's public participation program. "On the Sunshine Coast we still have an excellent opportunity for natural enhancement. The creeks here are still in good shape, much like the streams on the north side of the Fraser River were 20 or 30 years ago."

We were driving to Granthams Landing to meet with Bill Chinnick of the Granthams Landing Residents' Association, whose members will start a chum project on Soames Creek this summer. With a youth employment grant, Bill has hired three summer students to help with cleanup, building and installation on the site. An old concrete tank already in place will be used to hold, incubate and rear cutthroat trout, a popular species among anglers along the Sunshine Coast.

After examining the groundwater source that will be used to supply the chum incubation box, we walked down to a point below the highway where Soames Creek exits from a culvert. "Below the culvert we can build a jump pool," Bryan said, "to give the coho salmon access to the upper creek."

At Chaster Creek, Bryan and I walked down a steep forest trail to inspect a chum incubation box operated by students at Elphinstone Secondary School. During last December's floods, a clay slide above the water intake silted up the box, killing the chum eggs. Inside the box however, we found two chum fry swimming in tiny pools of clear, upwelling water. The rest of the eggs were covered in a layer of brown silt. This summer, the incubation box or the water intake will have to be moved to prevent the silting problem from recurring.

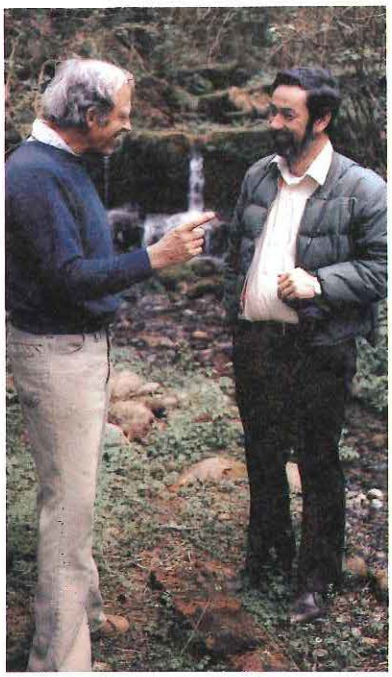
This incubation box was the scene of a small disaster for some high school students. Silt caused by December floods wiped out most of the incubating eggs.

At the mouth of Flume Creek last summer the Sechelt Rod and Gun Club had blasted

Continued on page 2 see "Volunteers Rescue Creeks"

Volunteers Rescue Creeks

Continued from page 1. . .



Bill Chinnick (left) is one of many volunteers on the Sunshine Coast who is using the advice and expertise offered by SEP's community advisor Bryan Allen (right).

a passageway past a small waterfall to give coho easier access to their spawning grounds. Upstream, the Club maintained a chum incubation box that had also silted up last winter, with only 30 percent survival of the eggs.

Our next stop was Wilson Creek, in which the Gibson Wildlife Association had rebuilt, last summer, an old concrete fishway originally installed by Fisheries. Coho use the fishway to return further upstream, but the creek's chum salmon spawn in gravel below the fishway. In a shallow side-channel of Wilson Creek, Bryan used a dip net to capture salmonid fry. Both coho and chum were present, survivors of the serious floods that scoured streams in southwestern British Columbia in December.

Since the Gibsons Wildlife Association had also expressed interest in operating a chum incubation box on Stevens Creek, Bryan walked a section of this stream with John Hind-Smith to assess its suitability for enhancement. In its upper reaches, stream clearance of natural debris will be needed to assist the creek's coho population. Lower reaches of the creek nearer the sea would be suitable for chum.

"Almost every creek on the Sunshine Coast has enhancement potential for chum, coho and cutthroat," Bryan said, "and public groups willing to adopt projects on them. Finding the time to co-ordinate existing projects and bring still others on stream both here and on the Lower Mainland, is the challenge."

Bryan Allen, one of six community advisors for SEP, co-ordinates 35 public participation projects located in the area north along the B.C. coast to the top of Jervis Inlet, across to Boston Bar and down the north shore of the Fraser River.

Some 650 volunteers are involved in these 35 projects. They include a residents' association, rod and gun clubs, wildlife associations, numerous schools, private citizens, scouts, the Sierra Club, an Indian band, a commercial trout farm and the Coast Steelheaders Club. An important aspect of the community advisor's work are the talks delivered to public meetings. Bryan has attended more than 150 meetings this year to speak about specific projects, the public participation program, or SEP in general.

The cost of these 35 projects to date has been $15,700. The volunteers involved have donated many more thousands of dollars in materials and equipment to ensure project success.

Although the primary goal of some of these public projects is education, they also produce fish. Some 320,000 eggs were incubated in the 35 projects combined. Adult returns from these projects are estimated at 1,300.

Changes In SETG Executive

The Salmonid Enhancement Task Group (SETG) has been the primary public advisory body to SEP since the Program's inception in 1977. At its first meeting of 1981, the Task Group agreed to submit a brief to the Pearse Commission on Pacific Fisheries Policy, and is now in the process of preparing a list of concerns. The SETG is scheduled to appear before Dr. Pearse on June 26.

At its April meeting, the Task Group approved a new executive structure, which pares down the executive from four people to two. Two vice-chairperson positions were eliminated, leaving the positions of an elected chairperson and a nonelected, "ambassadorial" past chairperson. George McKnight, a Prince George alderman and businessman, was re-elected by acclamation to the position of chairperson for 1981. Gordon Mackie, a businessman from Sicamous, retains the past-chairperson post.

Stretching The Enhancement Dollar

Pen-rearing of steelhead and cutthroat trout in British Columbia is proving to be a fairly inexpensive way of rearing smolts with minimal help from hatcheries. By using hatcheries to incubate the eggs and produce fry or fingerlings, trout weighing three to four grams can be transferred to pens and reared to smolts weighing 65 to 70 grams over a period of nine to eleven months.

Smolt rearing pens in a pond on Vancouver Island are used to raise Black Creek sea-run cutthroat trout. Photo: Fish and Wildlife Branch

"One of the main reasons we must do this now is due to a lack of space at our hatcheries for culturing fish over the winter, when space and water requirements are large," says Peter Brown, a fish culturist with the B.C. Fish and Wildlife Branch in Victoria. "Most of the hatcheries are running pretty much at optimum capacity Pen-rearing turned out to be a relatively cheap way of producing large numbers of smolts, after using hatcheries to incubate the eggs and supply fingerling fish to the pens."

Peter is in charge of pen-rearing facilities at Black Creek, Cowichan Lake and the Saanich Peninsula on Vancouver Island. While the initial emphasis was on anadromous cutthroat, the Cowichan operation is the newest of the three, and will be used to rear steelhead from brood stock collected in the Cowichan River. Provincial Environment Minister Stephen Rogers said last May that the Cowichan project would cost $35,000 initially with an estimated annual operating cost of $15,000.

"We'll have four pen enclosures at Cowichan this year," says Peter. "We've got about 30,000 fry on hand as of July 1980, and all going well we should produce about 25,000 smolts in the spring of 1981."

In the future, fish culturists hope to produce 100,000 steelhead smolts a year at Cowichan and eventually use the lake pens to rear cutthroat trout, also from the Cowichan system. Because of possible disease problems, says Peter, the Cowichan Lake pens will be used to produce fish only for the Cowichan system. Unlike other pen-rearing operations which involve the use of hatcheries, eggs obtained from Cowichan steelhead were hatched in the Cowichan system using space and well-water provided by North Cowichan municipal waterworks.

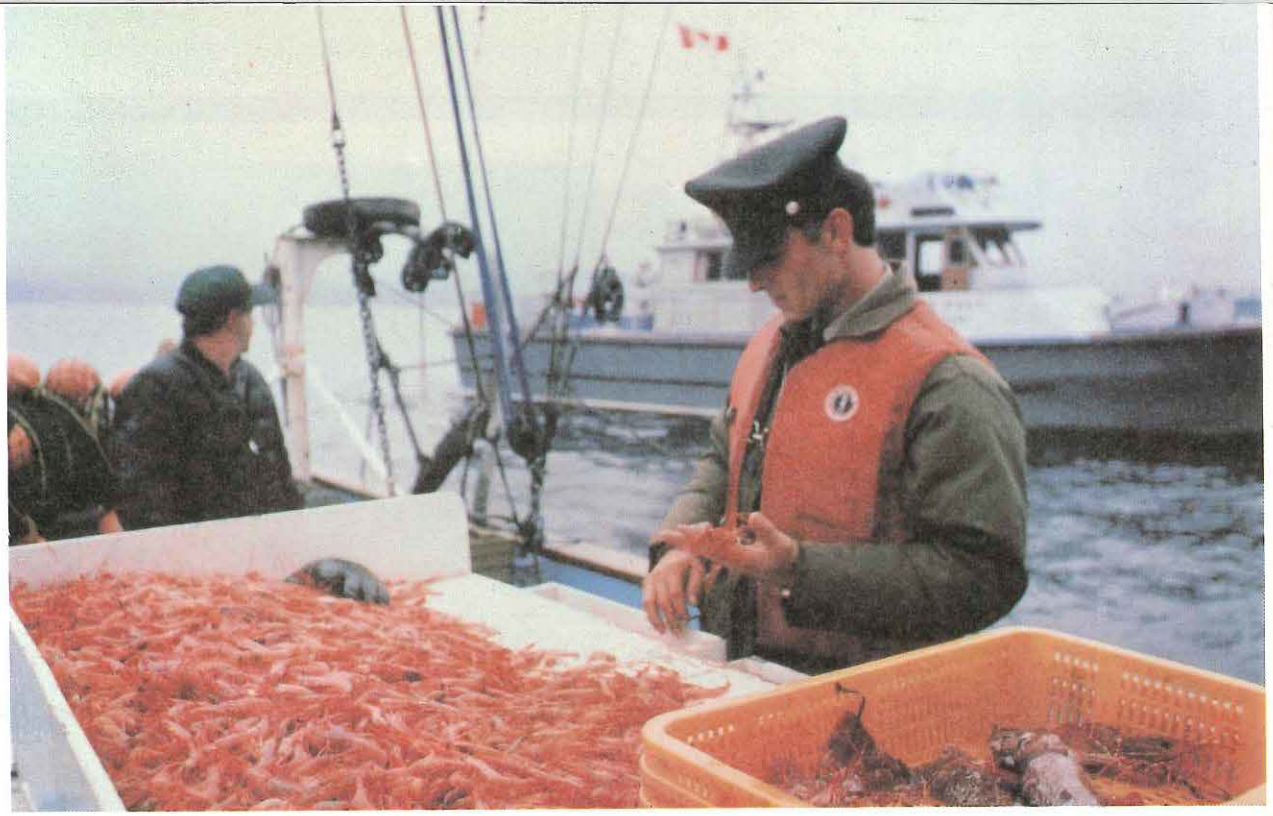
Six streams on Vancouver Island — Fulford, Sandhill, Colquitz, Craigflower, Black and Oyster River — are currently involved in the production of sea-run cutthroat. So far the results are encouraging.

Eggs obtained from brood stock collected in Fulford and Colquitz Creeks in 1979 were incubated at Fraser Valley Trout Hatchery in Abbotsford and about 23,000 smolts were reared in pens in an irrigation pond on the Saanich Peninsula. All of these smolts were returned to Fulford and Colquitz Creeks in May 1980. There was a similar success with the Black Creek operation, although only 4,700 smolts were released. In 1980, adults were collected also from Sandhill and Craigflower Creeks and the Oyster River.

"We're trying to keep as close to the natural cycle as we can," says Peter. "Basically what we have eliminated with our program is that rearing period in the stream which is critical for the continuation of the runs. Anadromous cutthroat require a minimum of one year, and more likely two, or possibly three years in the stream before they enter salt water. The critical factor is low flows throughout the summer period, which affects the number of fish those creeks can support."

"In order for pen-rearing to be cost efficient, we'd have to get into a large, central operation where we would be rearing many different fish stocks from all over the Island for eventual release back to their native streams."

Bruce Obee is a freelance writer living in Brentwood, B.C.



Not only salmon come under the watchful eye of fishery officers. Here, a shrimp catch is inspected. Photo: DFO Files

What Does A Fishery Officer Do?

Fishery Officer Don Ross removes an abandoned net from the river, this one containing dead and live sturgeon.

The green uniform that identifies a fishery officer stirs polite interest in some people, a casual respect in others, and frustration in at least some commercial fishermen. The officers who wear the uniform are the guardians of our fisheries and marine resources in British Columbia. They also represent fisheries management.

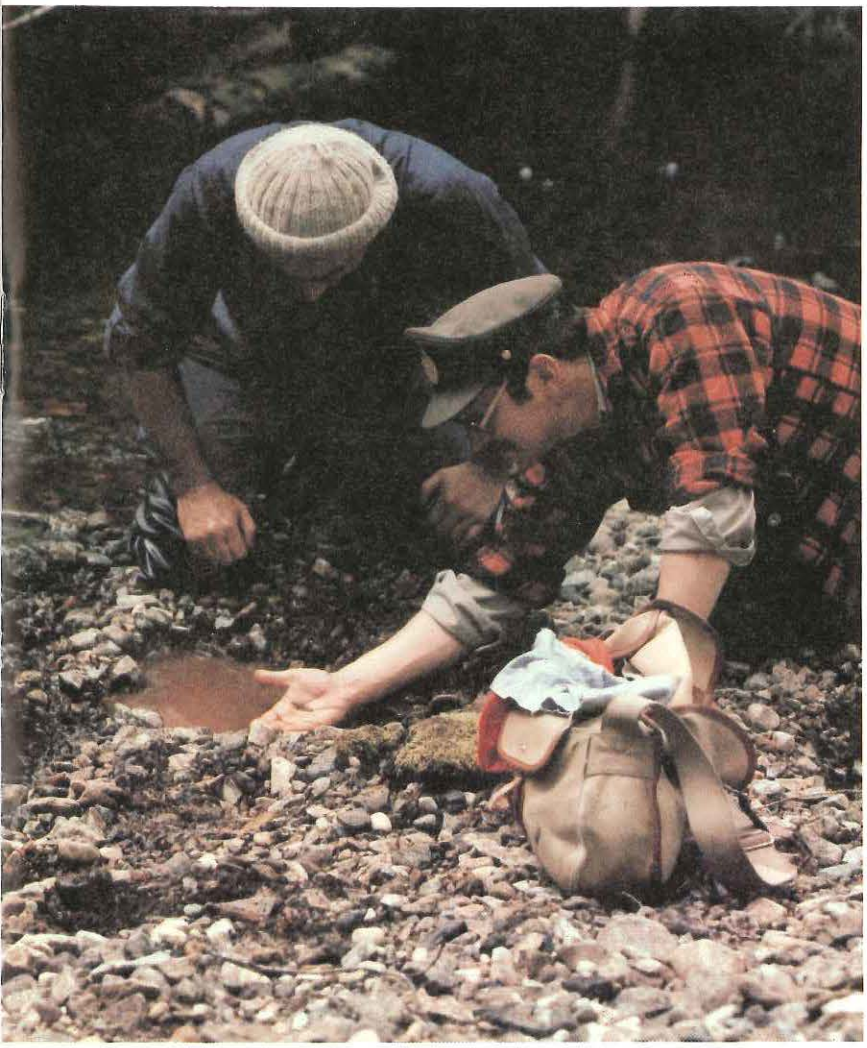
Don Ross, fishery officer for the Coquitlam subdistrict, and I were having lunch in Mission when two disgruntled fishermen joined us. Initial pleasantries and light banter were exchanged, followed by a pointed question.

"Why the hell does the Department allow fishing of mixed salmon stocks in Johnstone Strait," the more burly fisherman asked, "when Fraser River dog [chum] salmon are better caught by us in the Fraser itself?" The logic may appear inescapable, but a solution to the problem is far more complex.

Don had fielded similar questions before, and retorted, "Why don't you guys work that problem out yourselves in the United Fishermen and Allied Workers' Union?" It was a draw -- two sides of the same coin — and conversation fell away to silence.

After lunch, Don and I walked back to the patrol boat moored at the government dock in Mission.

Earlier that morning during the boat trip upstream from New Westminster, we had checked the banks of the Fraser for nets set from shore by native food fishermen to intercept late-running coho and steelhead trout. We had discovered a single, white float snagged on a deadhead. Don manoeuvred the patrol boat alongside, and pulled up a salmon net hand over hand. It was filled with debris and



Fishery officers check coho fry survival in a small creek subject to fluctuating water levels.
Photo: Jim Wright

four fish — three dead sturgeon and one still alive. The net had been abandoned after tearing loose from shore, but continued to kill fish. Don freed the four, 30 to 40-year-old sturgeon from the tangled net. The live sturgeon recovered its sense of equilibrium and swam down into the muddy green depths of the Fraser.

Whether checking for illegal salmon nets along the banks of the Fraser, or inspecting commercial fish catches, the job of a fishery officer is often one of enforcement.

One bright morning in November, I joined Don Ross down on the Vancouver waterfront. Since 4 a.m., he and several other officers had been checking fishboats just returned from the herring food fishery held the previous afternoon in Georgia Strait. So efficient are the purse seiners that the Tuesday opening on bait and food herring had lasted precisely 27 minutes.

Fisheries regulations permit each vessel a total catch quota of 22.7 tonnes. Early that morning, officer Bill Pastuch had seized, on behalf of the Government of Canada, one vessel's catch of 31.7 tonnes with a market value of about $5,200 for exceeding the legal catch quota. The cheque issued by the fish processing plant for the catch was made out to the Receiver General of Canada pending a court appearance by the vessel owner.

Not all contact between the public and a fishery officer passes without incident. Feelings can run high when salmon poaching or the sale of illegal food fish is the subject under investigation. Fishery officers have been threatened with shotguns, and patrol boats fired on from shore.

Fishery officers are also charged with the protection of habitat that is vital to fish. When application is made to the proper authority for filling-in of the Fraser foreshore, or for construction of a new subdivision on the banks of a salmon stream, for example, the fishery officer conducts an on-site inspection to determine likely impacts of the proposal. Often the decision on whether or not to grant an application is far from simple, for as Don said, "You have to strike a balance between people's livelihood and the fisheries resource."

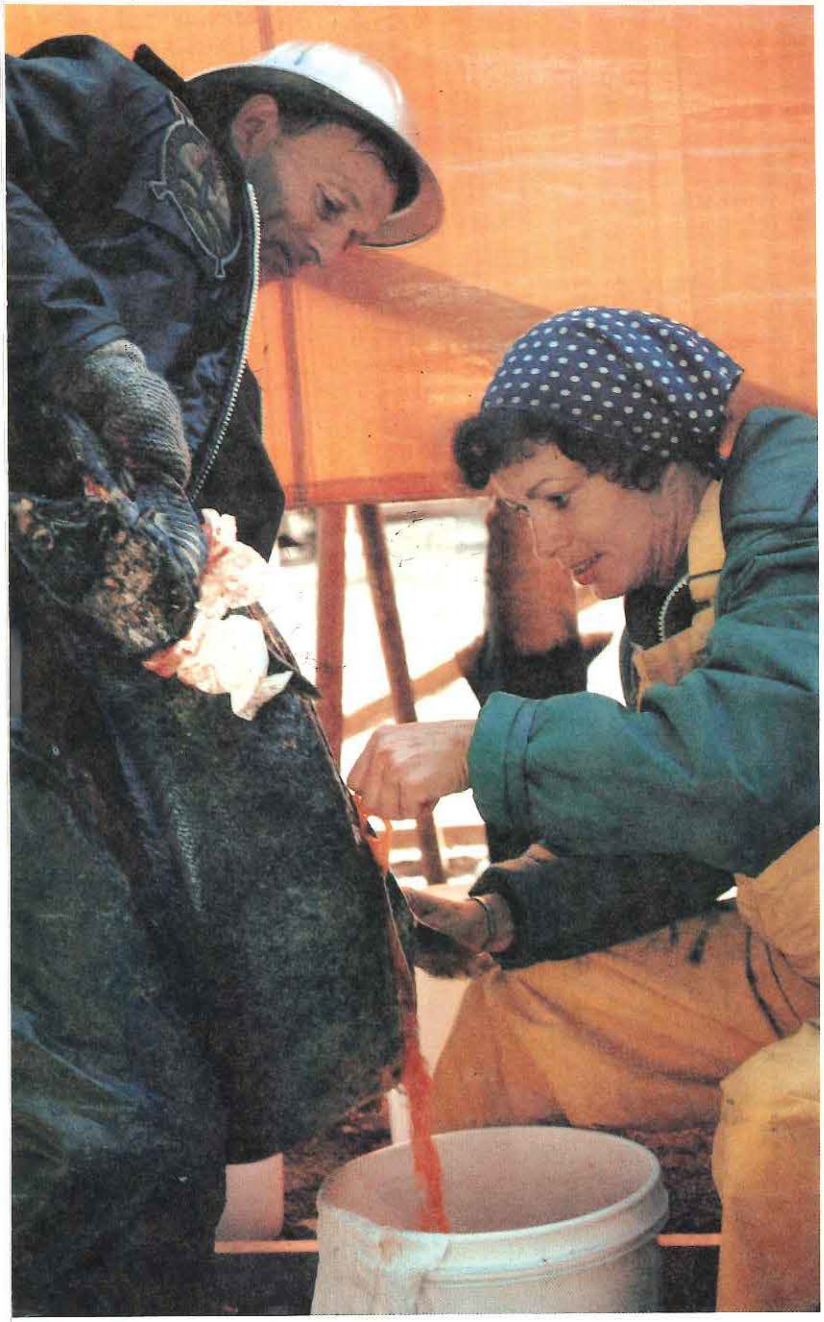
During the autumn months of October to December when salmon are returning to rivers and streams on the Lower Mainland, Don is busy counting spawners. This information is vital in predicting the size of salmon runs years later, and may also be used to determine the best times for commercial openings.

Along the South Alouette River in Maple Ridge, habitat protection and enforcement often go hand in hand when the chum return to spawn. "We reprimand the kids who strip roe from female chum to sell as bait to sport fishermen." Don explains, "and chew out adults who should know better than to chase the spawners up and down the river on horseback."

"Things are changing however," Don adds, "for kids are starting to police themselves after learning about salmon in school and on field trips."

Salmonid Feature

1981-82 SEP Contracts Enhance Local Fish Stocks



Large chinook salmon require a bit of hefting. Here, the eggs are removed for the incubation boxes near Port Renfrew. An average female chinook has about 4,800 eggs.

The Community Development Program within SEP serves important social goals established by the federal government. Most native projects are located in the more remote regions of the province, where each contributes to the economic and social stability of the local communities. Each project generates meaningful employment and provides valuable training in the technical skills of fish culture. Many projects not only produce fish but also work to restore the natural spawning and rearing habitat for wild salmonids in local watersheds.

Twelve Community Development contracts have been awarded for the fiscal year 1981-82. Each project employs a manager and one or more assistants full-time, with additional crew hired during busy periods when brood stocks are collected in autumn or juveniles are nose-tagged in spring. Total budget for the 12 projects combined is $1,863,700.

Present contracts with the Chehalis and Sechelt Bands do not expire until September, 1981 and will be renegotiated at that time.

San Juan Enhancement Society $ 96,400

This spring, 200,000 chinook were reared for 90 days prior to release, and 800,000 coho were released at the same time that wild stocks were migrating down the San Juan River near Port Renfrew. Chum fry were reared for about six weeks and released to migrate to sea. Production target for 1981-82 is about 1,000,000 eggs, preferably obtained from native chinook and coho stocks rather than chum salmon. The water supply to the incubation boxes will be upgraded this summer with construction of a 762-metre pipeline and twin self-cleaning water intakes. Project employs one person full-time and another part-time.

Masset Band $ 222,000

The Masset Band on the Queen Charlotte Islands will incubate 300,000 chinook and 50,000 coho eggs at a small hatchery built in 1979. Coho production will be augmented by two 50,000-egg incubation boxes to be constructed and installed on Gold and Wilson Creeks, both tributaries of the Yakoun River. A third box also installed on Gold Creek will incubate 50,000 sockeye eggs. This spring, 190,000 chinook and 20,000 coho will be reared in net pens in Marie Lake to a release weight of four to five grams. Some 50,000 chinook will be nose-tagged before release. The Band continues to study the Yakoun River watershed for additional enhancement potential. Project employs seven people full-time.

Kispiox Band $ 208,400

The Kispiox hatchery in northern British Columbia may be relocated when a more dependable water source is found. The incubation facility will be switched to Heath trays from the current gravel boxes, and troughs and lake pens will be installed to rear 200,000 chinook and 150,000 coho fry. The Band will monitor the timing of downstream migration by wild salmonids in the Kispiox River mainstem and collect brood stock in the fall to supply the hatchery with 150,000 chinook and 100,000 coho eggs in 1981-82. This summer, 50,000 coho and 50,000 chinook pre-smolts will be nose-tagged prior to release. Project employs six people, two full-time.

BCIT False Creek Project $ 61,100

Some 15,000 chinook smolts are reared in net pens in False Creek to supply a children's fishery scheduled for May 30, 31 and June 6, 7 this year. An additional 15,000 chinook fry hatched at Capilano hatchery will be transferred to the pens in False Creek for rearing until spring, 1982. Project employs a manager full-time and an assistant part-time.

Sliammon Band $ 166,800

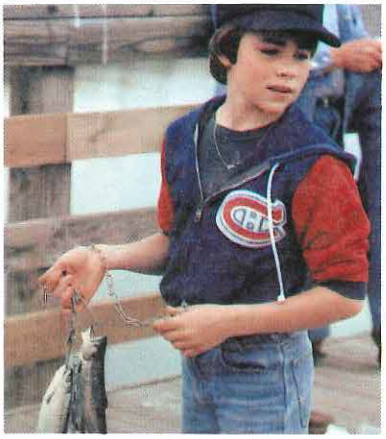
The Sliammon Band near Powell River will continue to operate a modified Japanese-style hatchery for 1,500,000 chum eggs, as well as a small facility for 100,000 coho. The Band will monitor the timing of downstream migration of wild salmonids in the Sliammon watershed. Stream clearance in the system will assist wild fish stocks. The counting fence across the Sliammon River will be rebuilt this summer, and plywood rearing ponds replaced with two concrete raceways. The Band will operate a 50,000-egg incubation box for coho at a remote site above Sliammon Lake in 1981-82. The tagged coho fry will be reared to a release weight of 25 grams in lake pens. Project employs five people full-time.

Cowichan Band $ 211,100

In 1981-82, the Cowichan Band on Vancouver Island expects to incubate 1,500,000 chum and 350,000 chinook eggs as well as rear some 100,000 wild coho fry salvaged from the Cowichan and Koksilah watersheds. The Band will install a fish trap at Skutz Falls fishway to capture chinook brood stock this fall, and upgrade both the existing hatchery building and water supply to bring the facility to full production capacity by next summer. The tagging program this past spring involved the release of 50,000 marked chum fry and 50,000 chinook and 30,000 coho smolts. Project employs six people full-time.

BCIT Seymour River Hatchery $ 50,500

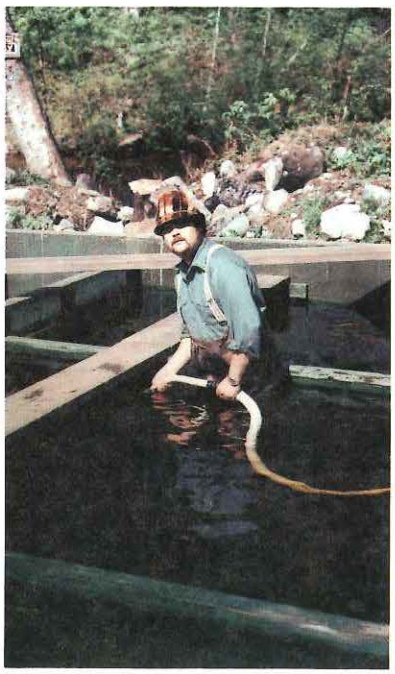
Under the direction of Dr. C. Chestnut and Dave Bates, BCIT students gain valuable experience in fish culture techniques at a small hatchery located on the Seymour River. Production targets for 1981-82 include 40,000 coho fry, 60,000 coho smolts, 30,000 chinook, 60,000 steelhead and 10,000 cutthroat trout.



BCIT students rear chinook salmon to pan size and then co-sponsor with SEP, a fishery in False Creek for children.

Nimpkish Band $ 248,500

Fish production at Willow Creek hatchery on northern Vancouver Island in 1981-82 is targeted for 3,000,000 sockeye, 500,000 chum and 50,000 chinook. Chum fry hatched this spring were reared to a release weight of one gram in net pens maintained at the outlet of Nimpkish Lake. The hatchery will be expanded this summer with the addition of eight modified Atkins incubators, nine Pallant boxes and seven rearing troughs. Minor modifications to the hatchery water supply are also scheduled for completion. Project employs six people full-time.



Chum rearing ponds at Powell River are "vacuum cleaned" before the chum fry are released into them for rearing.

Continued on page 8 see "Contracts Create Employment"

Contracts Create Employment

Continued from page 7 . . .

Alouette River Corrections Centre $25,000

To maintain the hatchery built on the grounds of the Corrections Centre two years ago, SEP funds in the amount of $25,000 will be used to purchase essential equipment. In 1981-82, some 1,300,000 chum and 100,000 coho eggs will be incubated at this project. An estimated 20,000 steelhead fry obtained from Abbotsford hatchery will be reared and released into the Alouette River.

Inmates from the Alouette River Corrections Centre use a beach seine to capture chum for an egg-take. Photo: Bryan Allen

Bella Bella Band $216,000

Hatchery production at this project along the central coast is expected to increase to 1,000,000 chum in 1981-82. Additional Atkins boxes and Pallant boxes will be installed for egg incubation, and fry rearing capacity will be increased by the use of aluminum troughs, plastic pools and sea pens. Chum fry are reared to a weight of one gram before they are released. Living quarters at the present hatchery site will be improved, and reconnaissance for a future site initiated this summer. Project employs four people full-time.

Kincolith Band $146,400

This summer, the Band will construct a small hatchery building with two stacks of Heath trays and two aluminum rearing troughs. Water delivery to the new hatchery will be upgraded to incubate 50,000 chinook and 100,000 coho eggs in 1981-82. The chinook fry will be reared 90 days prior to release. The project, located in northern British Columbia, employs two people full-time, with larger crews hired during the fall egg-take.

Nanaimo Community Employment Advisory Society $211,500

Production targets at the Nanaimo hatchery in 1981-82 will include 500,000 chinook, 100,000 coho, 100,000 steelhead and 1,000,000 chum eggs. The Society will monitor the success of fry transplants into the Nanaimo River watershed and identify additional habitat suitable for stocking with hatchery fry. Two new raceways will be constructed to accommodate steelhead and cutthroat fry in spring, 1982. Salvage of wild salmonid fry and smolts that have become trapped in isolated pools is an important enhancement technique in portions of the Nanaimo River watershed. Project employs seven people full-time.

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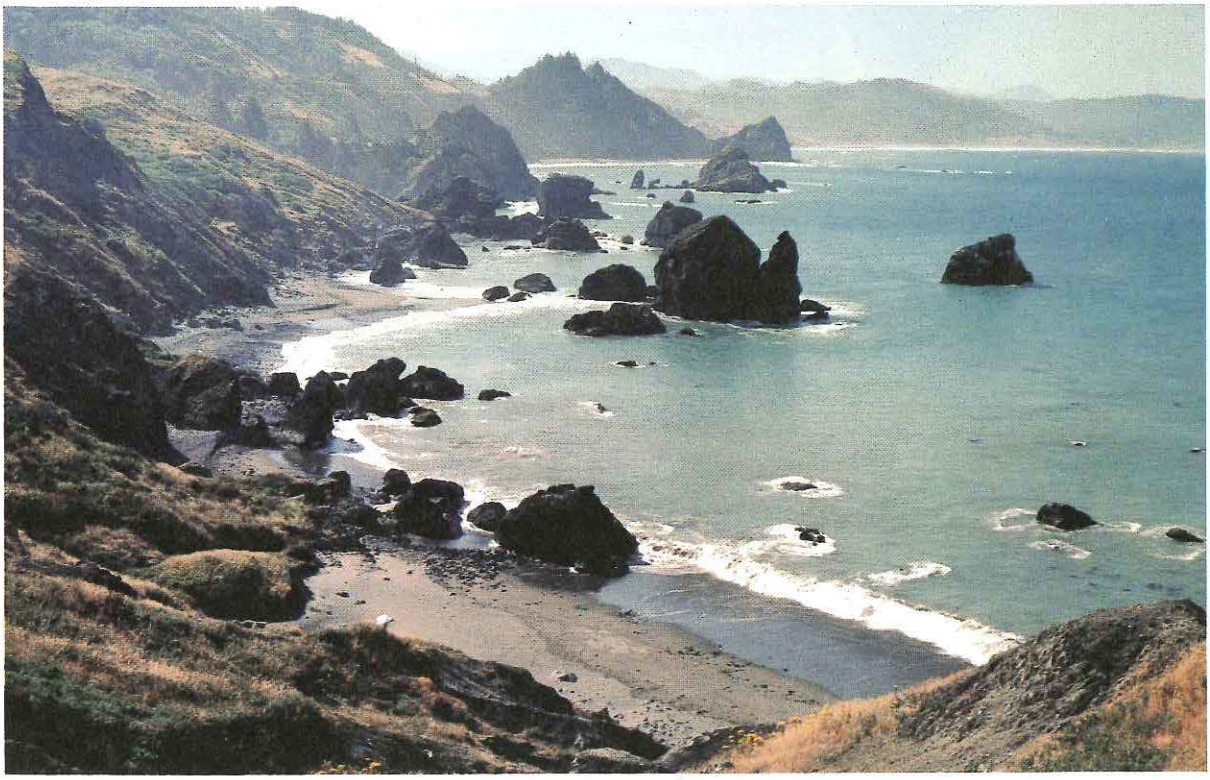


Strong upwelling currents along the exposed Oregon coast may influence the survival of hatchery coho.
Photo: Keith Sandercock

Are Hatchery Coho In Trouble?

A dilemma faces Oregon's hatchery program for coho salmon started in the 1950s. Although a record 60 million juvenile coho were released this year, the state's troll fishery has not experienced a corresponding increase in annual catch. In fact, the commercial harvest has declined from a record catch of some four million fish in 1976 to only about one million coho in more recent years.

In a seminar held in Vancouver recently, Dr. Harry Wagner, acting director of the fish section of the Oregon Fish and Game Commission, discussed possible reasons for the apparent decline in coho stocks. Is it a general reduction in quality of the hatchery smolts that are released, or is Oregon experiencing serious losses in its wild coho stocks due to habitat degradation? Is the series of hydroelectric dams built on the Columbia River responsible, or is it some environmental problem in the ocean?

Obviously, the answer is not a simple one, but Dr. Wagner points with some suspicion to an ocean-related phenomenon. Coho survival may be correlated with the presence of upwelling currents along the exposed Oregon coast. Under normal circumstances, strong winds blow out of the northeast in the spring and push surface waters offshore. Cooler water rich in organic nutrients replaces it from below. As a result, the growth of marine plankton is accelerated. The small animals which feed on the plankton are in turn the prey of juvenile salmon.

Upwelling must occur on a large scale, and begin at the right time each spring in order to benefit migrating smolts. Millions of coho are released from Oregon hatcheries over a relatively short time span of

Continued on page 8 see "Hatchery Coho In Oregon"

Ministers Open Puntledge

In May, Federal Minister of Fisheries and Oceans Romeo LeBlanc, (left) and provincial Minister of Environment Stephen Rogers officially opened Puntledge hatchery. Photo: Keith Sandercock

The $4 million Puntledge River lower hatchery, near Courtenay, was officially opened May 13, 1981 by federal Minister of Fisheries and Oceans Romeo LeBlanc and provincial Minister of the Environment Stephen Rogers. About 150 people attended the brief ceremony and heard impromptu speeches given by the ministers and Dr. Ward Falkner, executive director of SEP.

There was a touch of sadness, though, as the two ministers paid tribute and unveiled a plaque in honour of Jim Boffy, who passed away last year after thirty-two years as manager of B.C. Hydro's powerhouse on the Puntledge River. Boffy was dedicated to the task of rebuilding the once-renowned Puntledge salmon stocks. The Minister credited him with enabling the close cooperation to take place over the years between B.C. Hydro and the Department of Fisheries and Oceans. Boffy was able to see his goal achieved with the construction and final completion of the hatchery before his death.

The construction of hydro-electric facilities on the river during the 1950s resulted in the first serious declines for the stocks. Remedial measures were first taken in 1965, when B.C. Hydro financed the construction of a spawning channel. In 1971 the Department of Fisheries and Oceans

Continued on page 3 . . .

Hatchery Contracts Awarded

A $2.7 million contract to construct Nitinat hatchery on the west coast of Vancouver Island has been awarded to Cana Construction Company Ltd. of Victoria. Included are the main hatchery building, the water supply consisting of wells, a pumphouse and aeration tower, a fishway and holding facilities, the generator building and manager's residence.

Work on Quesnel hatchery in the upper Fraser system has been awarded jointly to Procon Builders Ltd., and Buhler Bros. Excavating Ltd. on a contract of $1.7 million. Included in the contract are the main hatchery building, the water supply system, and holding and rearing channels.

Voth Bros. Construction (1974) Ltd. is completing work on a $1.6 million contract to construct Chilliwack hatchery in the upper Fraser Valley. In addition to the main building, construction of chum keeper channels, holding and rearing ponds as well as final landscaping of the site are included.

A $677,000 contract has been awarded to Brown and Root Ltd. to develop a chum hatchery on Inches Creek. Terms of this contract include construction of the hatchery building, the water distribution system and chum rearing facilities.

Two contractors are currently working on the Chehalis hatchery. Goodbrand Construction Ltd. has recently completed the water pipeline to the hatchery site under a $450,000 contract, and Felix Construction Company is currently erecting the hatchery building under a separate $772,000 contract.

The Department has undertaken construction of a $400,000 pilot hatchery for chinook and coho salmon on the Eagle River, a tributary of the South Thompson. Construction of a small hatchery is also underway at Tenderfoot Creek, a tributary of the Cheakamus River north of Squamish. Several smaller contracts worth a total of $350,000 are to be awarded.

Continued from page 2 . . .

established a pilot hatchery on the river, although neither of the two early facilities had much success. Construction of the upper hatchery, nine kilometres above the lower, got underway in 1977.

The new hatchery will help restore depressed fall and summer runs of chinook salmon. Also enhanced are pink, chum, coho and steelhead stocks native to the Puntledge watershed.

In his prepared speech, the Minister of Fisheries and Oceans reflected on the progress of SEP since its commencement in 1977.

"What we see here today is the culmination of many years of study, planning, design work and about $3.5 million invested in actual construction. It is also the end result of a lot of dedication by a lot of people who believe in what they are doing, as well as an example of co-operation among groups who are often considered to have diverging or even opposing interests."

He paid particular tribute to Harry Genoe, the hatchery manager, and Jim Wild the senior engineer on the project. He went on the discuss fisheries issues in general.

"It is my hope to be present for the opening of many more hatcheries, because they are needed.

"But it won't be enough to say we have built large facilities and repaired damage; we must now prevent the damage from occurring," he said.

Mike Youds is a contributing writer.

Letters

Dear Editor:

I want to register my strong protest to laying the blame for the decimation of the Thompson River stocks of steelhead and chinook salmon to the "interception of these fish in commercial net fisheries along the coast . . ." (Salmonid, Vol.VI No.3)

This is the type of [thing] I expect to read in a sport fisherman's column, but to have it printed in a Fisheries Department publication is something else.

Elgin Neish,
Victoria, B.C.

John Cartwright, writer of the Thompson stocks article in "Salmonid," responds:

Dear Mr. Neish:

In response to your concern, I can provide you with some facts which will put my comments into perspective. Sampling of steelhead caught by net fisheries in Johnstone Strait during mid to late September has shown that high percentages of Thompson River steelhead are intercepted. In fact, approximately 30 percent of the Johnstone Strait steelhead caught are of Thompson origin. In total numbers, we can account for some 8,000 to 9,000 Thompson River steelhead caught incidentally in Johnstone Strait, Juan de Fuca and Fraser River commercial net fisheries every year, while at the same time, anglers on the Thompson take only about 1,000 trout annually.

John Cartwright,
Regional Fisheries Biologist,
Kamloops, B.C.

Dear Editor:

I belong to the 1st Yennadon Venturer Troop in Maple Ridge and we recently put on a public awareness display at the Home-A-Rama Show in Haney. Our booth was donated by Hayes and Associates Realty World and our information was supplied by Fisheries and Oceans. Thanks to Bryan Allen, community advisor for the Salmonid Enhancement Program, since he helped us with this display. We won best display in the entire Home-A-Rama Show, and the best community exhibit. Please place me on your mailing list for the Salmonid Enhancement Newsletter.

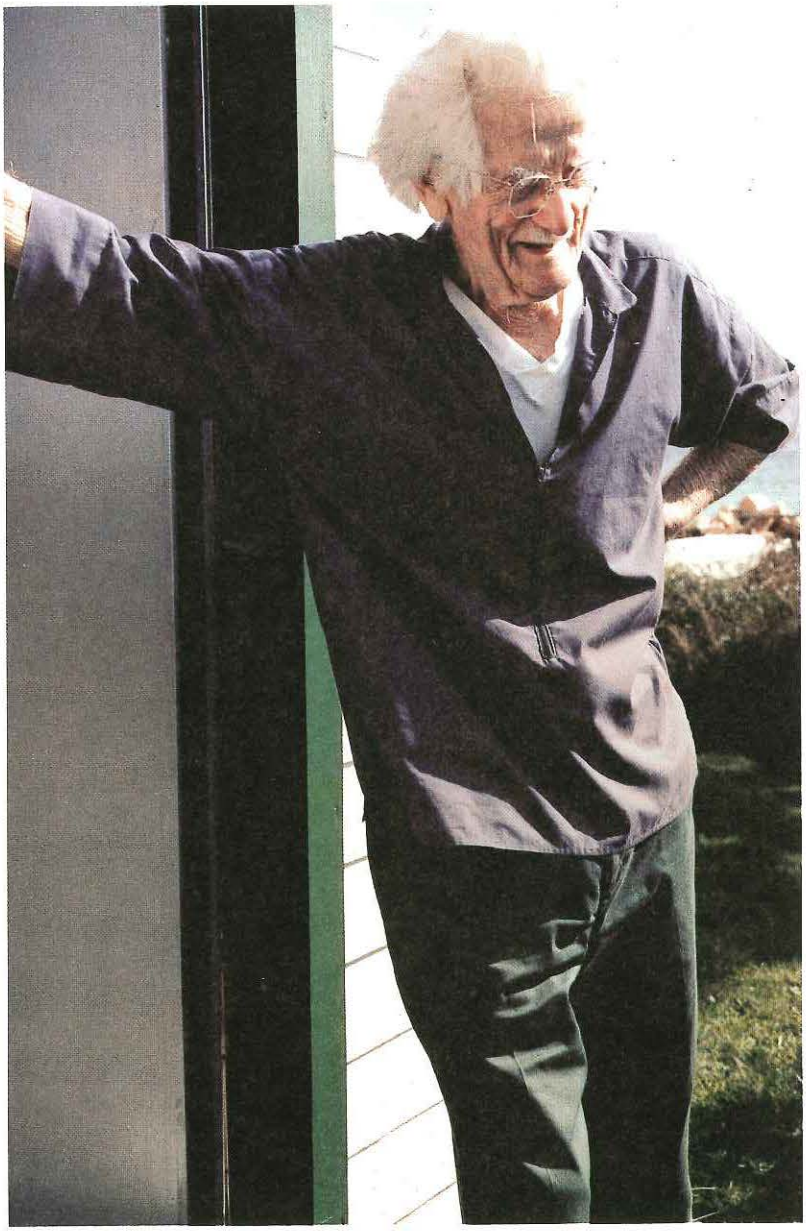
Richard Johnson,
Maple Ridge, B.C.

Editor's note: We extend our congratulations to the 1st Yennadon Venturer Troop for their initiative and creativity revealed at the Maple Ridge Mountain Festival.

1913 Strike Pushed Price Of Sockeye To 25 Cents A Fish

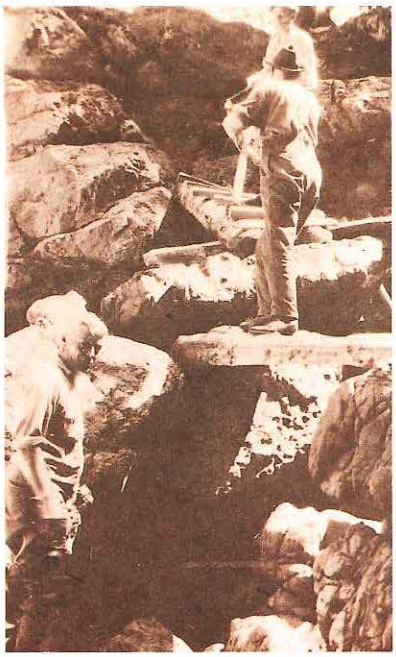
Salmonid Feature

Hubert Evans remembers a time when only sockeye salmon were harvested among Fraser River stocks, and the Steveston canneries used only the belly meat.



Hubert Evans is a free-lance writer now in his late eighties. He is working on a new book in his waterfront home on the Sunshine Coast. Hubert is an interesting man whose past includes work in forestry, prospecting, newspaper reporting — and fish culture work in salmon hatcheries on Cultus Lake and Lakelse Lake near Terrace.

One important chapter in his new book details the last great run of Fraser River sockeye in 1913, the year of the Hell's Gate slide. "There was a strike on at Steveston in 1913," Hubert explained, "the fishermen wanted 25 cents for every sockeye." Hubert covered the strike for a New Westminster paper. "When the strike was over, and the gun went off on a Sunday at 6 p.m.," Hubert continued, "scores of small rowboats set their gillnets. Some nets were full before they were set, so that the cork line sank out of sight. By 9 o'clock that Sunday night, the Steveston canneries were paying five cents per fish, and by dark no more were bought. Several days later, three 'gut scows' loaded with some 60,000 sockeye that had been lying in the sun for two days, were towed to the mouth of the Fraser River



Left: A chain of men used dipnets to transport sockeye salmon past the Falls during the period of peak migration.

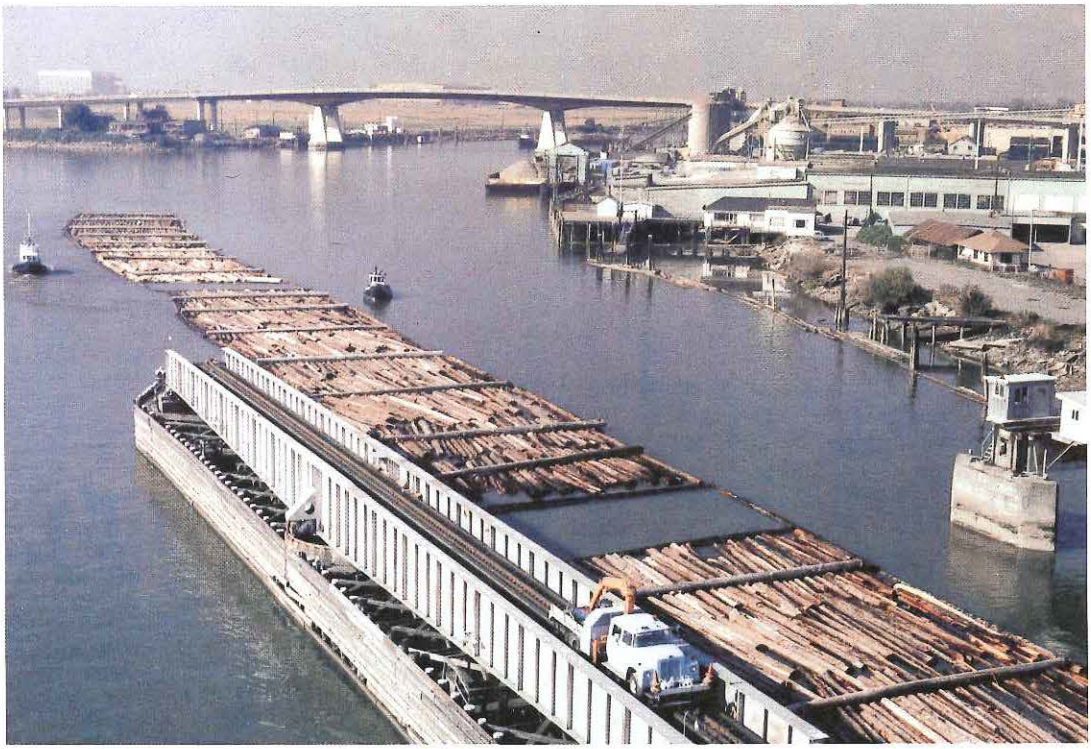
When water flow was too low, sockeye were held up in pools below Stamp Falls.

and dumped." After the Hell's Gate slide which blocked the upstream migration of spawners, tens of thousands of sockeye died on the gravel bars at Hope. "It was astounding you know," Hubert said, "but nobody really worried about it. The Fraser was the greatest salmon river in the world, and no one believed it would ever change."

Hubert also remembered early enhancement work. Through the 1920s and again in 1932, millions of sockeye eggs obtained from spawners in Henderson Lake were planted in streams at the head of Great Central Lake near Port Alberni. One year, Hubert was stationed at the outlet of the lake to count the smolts as they migrated downstream. No one seriously believed the sockeye would return as adults to Great Central Lake. "As a result of these early transplants though," Hubert recalled, "the older boys were often let out of Alberni High School to help dipnet the returning sockeye over Stamp Falls, a major obstruction to migration. When the spawning runs to Great Central Lake increased dramatically, a fish-ladder was built beside the Falls in 1927."

In May 1927, construction was started on a fishway past Stamp Falls.

In September of the same year, the fishway was completed. Sockeye could now pass Stamp Falls more easily on their return to Great Central Lake. Photos: DFO Files



Undoubtedly, the Fraser estuary will prove the greatest challenge to the co-operative planning process.

Estuaries - Planning Their Best Use

River estuaries have always been important centres of human activity. Today, urban expansion, industrial development and recreational use of these natural areas along the B.C. coast are growing. Growing also is public awareness of the value of these fertile estuaries to fish and wildlife. Estuarine marshes are vital rearing habitat for juvenile salmonids before they migrate further out to sea.

Since human activity and the needs of fish often come in direct conflict in the river estuaries of southwestern British Columbia, habitat specialists employed by federal fisheries have focused increasing attention on river deltas. In some instances, government agencies, industry and private groups that have a direct impact on, or are concerned about the future of a particular estuary are appointed to a task force to develop a land-use management plan for that estuary. In this planning phase, the task force endeavours to prevent serious resource conflicts.

"Development of a land-use plan for a specific estuary such as the Squamish River, gives private industry a framework within which to work, while at the same time ensuring adequate protection for fish habitat," says Rod Bell-Irving, chief of the water use unit within the habitat division of federal fisheries. Rod is a member of the Squamish Estuary Task Force which is presently drafting a land-use plan for the Squamish estuary. "Among other things, the plan identifies areas of the estuary that we consider highly productive fish habitat. One such area happens to be the site of a proposed expansion of an existing industrial site," Rod added.

The salmonid resource has already emerged a winner in other river estuaries. In 1978, the Nanaimo Estuary Task Force was instrumental in achieving a 28 percent reduction of log storage leases in this estuary, while at the same time relocating about 75 percent of existing leases to less productive areas.

At present, studies on the Campbell River estuary are being conducted with a view to recovering once productive fish habitat in that estuary.

Perhaps the most valuable and challenging estuary in southern British Columbia is the Fraser River delta. Ten times the size of most other estuaries, and with more than 300 kilometres of shoreline, the Fraser estuary also nurtures the salmonid production from rivers and streams located within a watershed 233,000 square kilometres in area. It will come as no surprise therefore, that years of effort and teamwork are required before the federal/provincial Fraser River Study Group can deliver its recommendations on how best to use and preserve the Fraser River wetlands that still remain intact.

Since virtually all salmonid stocks produced in British Columbia must migrate through river estuaries to mature at sea, these marshland habitats are absolutely vital to fish. Enhancement goals simply cannot be achieved unless we act now to hold the line on habitat degradation. In this regard, the contribution of the habitat division to estuary planning, and to the success of SEP, is crucial.

Coho Fry Vacate Pig Barn

"Education! That's the first goal of public participation. The future of the salmon resource rests in the hands of these kids," explained Dennis Demontier, community advisor for SEP in Kamloops.

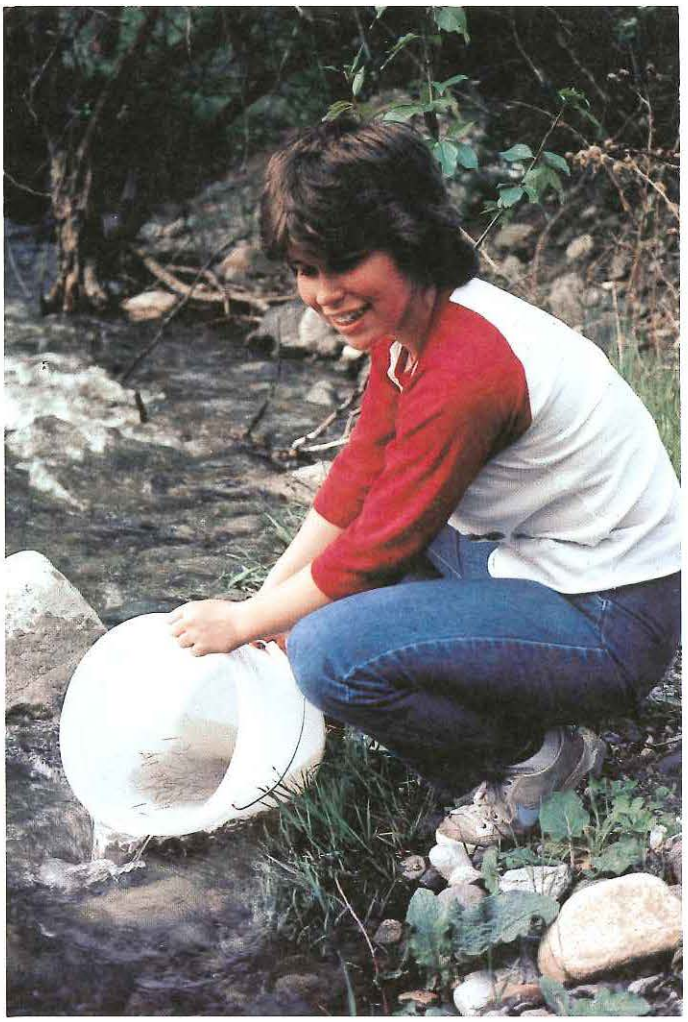
Dennis referred to the students from Brocklehurst Junior Secondary School and North Kamloops Elementary School who were helping him release about 2,000 coho fry into Noble Creek, a tributary of the South Thompson River.

From start to finish, the Noble Creek coho project has involved the active participation of no fewer than five Kamloops-area schools. Late last summer, students from North Kamloops Senior Secondary completed a stream survey of Louis Creek to find the spawning areas used by coho and chinook salmon. Pupils in Grades 5, 6 and 7 at Arthur Stevenson Elementary School had built rearing pools in Noble Creek in 1979, and improved them for fry rearing in 1980.

Don Bennison, a teacher at North Kamloops Elementary School, conceived the original idea to install a large 50,000-egg incubation box in an empty corner of the pig barn at the agricultural station just outside of Kamloops. The cool, clean water piped directly into the pig barn from a nearby creek would be an excellent source of running water for the incubation of coho eggs.

Under the supervision of teacher Dave Rolston, students at Brocklehurst Junior Secondary worked through their lunch hours and after school to build the 50,000-egg incubation box. And last but not least, pupils at McArthur Park Junior Secondary School helped stock the new box last fall with coho eggs obtained from brood stock in Louis Creek.

Teamwork has brought the Noble Creek project along to the stage where the first 2,000 fry were now ready to be released into Noble Creek. It was with an air of celebration that the students transferred the tiny fish from the old, enamel bathtub inside the pig barn to an aluminum tank on the back of a truck. Oxygen was bubbled into the water to guarantee survival of the fry during the short ride to Noble Creek. Two students rode with the fish in the back of the truck, and a third student Doug Mewhort, asked to ride in the cab.



Over the winter, the coho shared quarters in the pig barn. In May, the fry were released in Noble Creek.

"Can an incubation box be used again?" Doug asked me as we got underway to Noble Creek. "Sure," I said, "Although the gravel will probably need cleaning."

"That's good," Doug replied, "I'm sure glad we don't have to rebuild the box. Because I was the shortest guy on the project last year, the other guys held me upside-down inside the box to caulk all the seams with silicone."

Arriving at Noble Creek, the students carried the coho fry in buckets to the stream. Carefully, the tiny fish were tipped into quiet eddies of the creek. Students and teachers from five different schools had assisted the salmon of Noble Creek as much as they could. The rest is up to the fish.

Hatchery Coho In Oregon

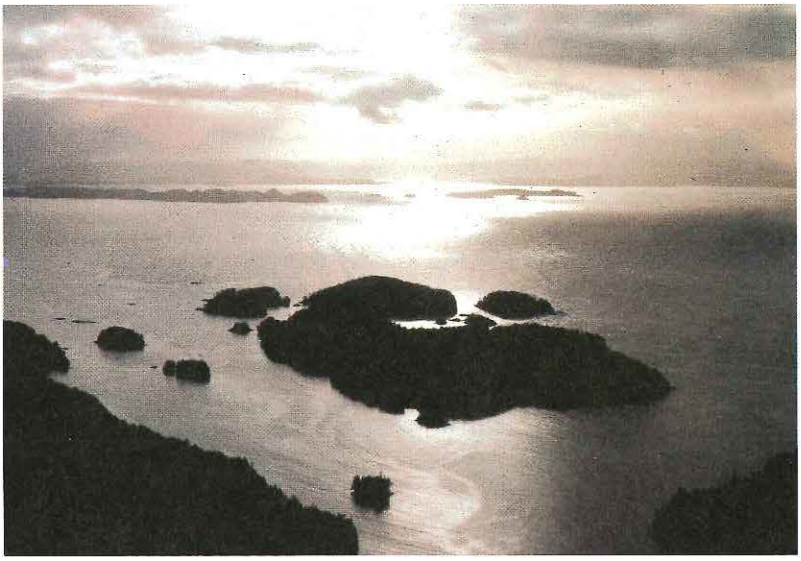
Continued from page 1 . . .

only several weeks. Unless abundant food is already available in the marine environment due to spring upwelling, many coho smolts will not survive those first critical weeks following their release.

Could this coho mortality now experienced by Oregon hatcheries occur in British Columbia? The answer is that it's not very likely. The reasons for this are largely geographical.

Although the vagaries of upwelling ocean currents may influence the marine survival of coho along the Oregon coast, this physical process is not considered crucial in British Columbia waters. Our long coastline is deeply indented with fjords and channels flushed by the discharge of numerous rivers and streams. Many fertile estuaries along the British Columbia coast such as those of the Fraser, Bella Coola and Skeena Rivers are important rearing areas for young salmonids. By contrast, the Oregon coastline is open and exposed, with comparatively few river estuaries. Whereas some 60 million coho smolts were released from Oregon hatcheries in 1981, only about six million coho were released from SEP facilities this past spring. If suitable rearing habitat is a limiting factor in early ocean survival of coho, one might expect proportionately greater mortality in Oregon waters, particularly if upwelling currents are weak.

The timing of coho releases may also influence early ocean survival. At SEP facilities, coho are reared for 13 months to their optimal release weight of between 20 and 25 g.



Mixing of fresh and saltwater in fjords and channels along the British Columbia coast produces good feeding grounds for many fish species.

Hatchery stocks are then released at the same time that wild coho smolts are migrating downstream. More than a third of the Oregon smolts, on the other hand, are released in the same year that they hatched from eggs. Their growth is accelerated by rearing the coho fry in warmer water. This program of accelerated growth often means, however, that hatchery stocks do not reach their optimal release weight until weeks after the wild coho have already migrated to sea. Late release of the smolts, or release of the hatchery coho at less than their optimal weight affects their marine survival.

The primary goal of SEP is to restore Pacific salmonids to historic levels of abundance. We know that our coast can produce about 136 million kilograms of salmon each year. The British Columbia coast has been capable of producing this amount of fish in the past, and we are confident that it can be done again, with the help of enhancement.

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Terry VanderSar
Design:
Bev Bowler

Government of Canada
Fisheries and Oceans

Province of British Columbia
Ministry of Environment

Canada

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Salmonid

Vol. VI No.6
Oct. 1981

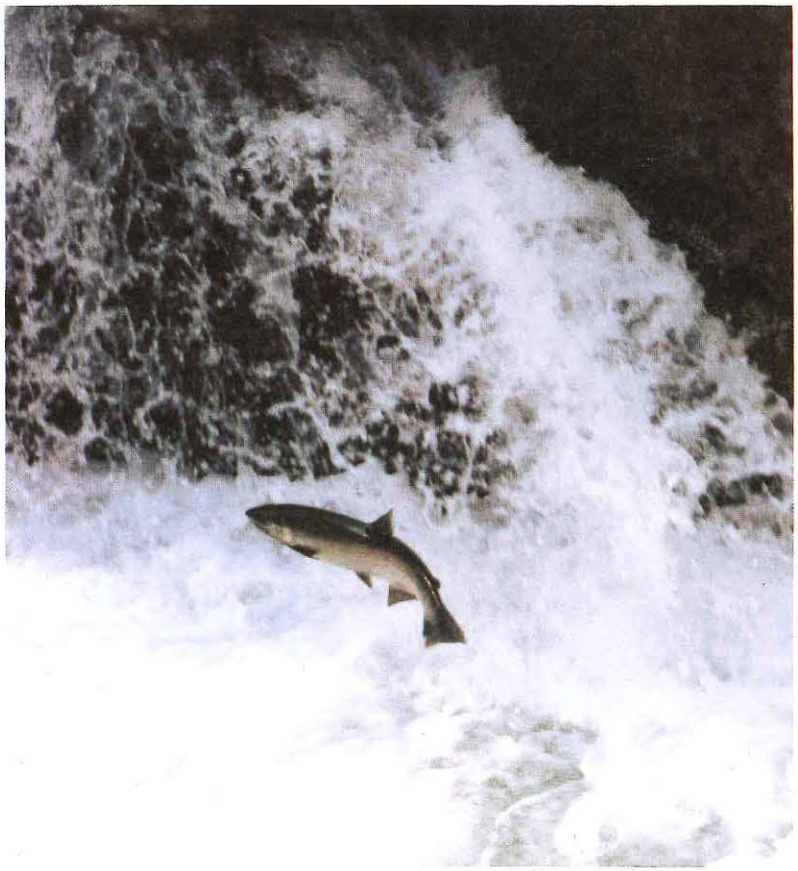
You Can Help Plan Phase II

Do you know of a waterfall where salmon encounter difficulty in passing upriver? Perhaps you work for a company willing to supply SEP with water and space for a small pilot hatchery. If so, here is the opportunity to do something about it. SEP staff are actively seeking your suggestions for enhancement projects for Phase II of the program.

Phase I of SEP is now winding down. Planning for Phase II, scheduled to begin in early 1984, is already underway. Practical suggestions for the restoration of natural streams and the colonization of new fish habitat are needed to round out a full picture of the potential for salmonid enhancement.

What, you ask, is a good enhancement opportunity? It might be a rapids or waterfall that can be bypassed with a fishway. Removal of an obstruction could open up many kilometres of good fish habitat not previously accessible to salmonids. An excellent source of clean, relatively warm groundwater, such as a natural spring could be an important breakthrough in the enhancement of fish stocks from a given area. In every case, the cost of enhancement must be reasonable in relation to the benefits that are achieved.

People who live or fish in less developed regions of British Columbia may know more about the rivers and streams in these areas than does SEP staff. Sharing the suggestions and information you have with SEP would be most fruitful.



If you know of areas where fish can be helped, or fish production could be increased, please tell SEP.

Here is what the Enhancement Opportunities Committee needs to know:

- Why you think an enhancement opportunity exists
- What needs to be done
- Where precisely does the enhancement opportunity exist
- When did the problem for salmonids first occur
- Who would be affected by this project if it went ahead (and, who could assist SEP).

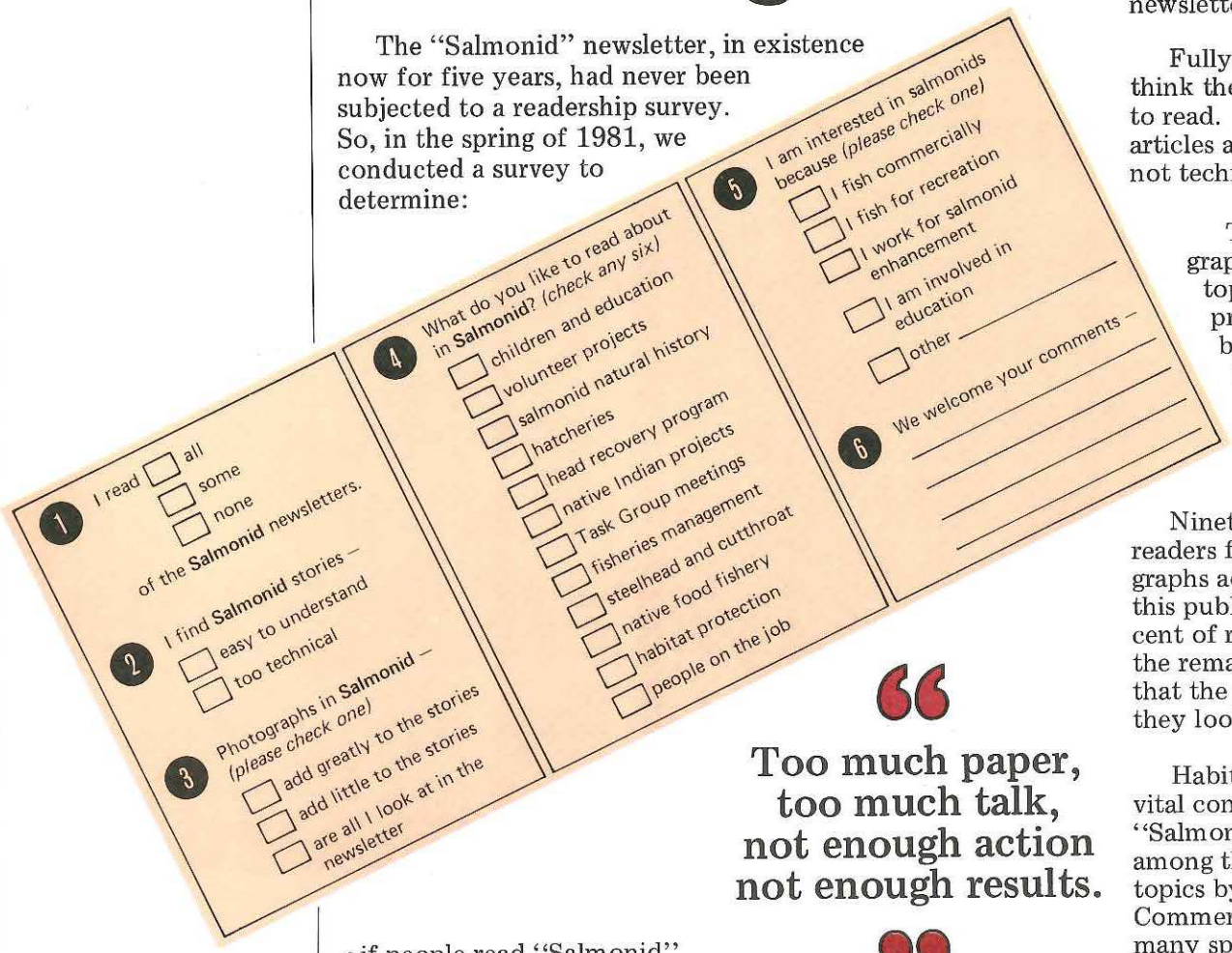
A good first step is to contact the community advisor who works in the city or town nearest you. SEP employs advisors in Victoria, New Westminster, Nanaimo, Kamloops and Terrace Fisheries offices. After discussing your project with a local advisor, please submit your suggestions in writing to Al Lill, address in margin on the right.

Al Lill, Chief, SEP Engineering

Al Lill,
Enhancement Opportunities Subcommittee,
Fisheries & Oceans,
1090 West Pender St.,
Vancouver, B.C.
V6E 2P1
Tel: 666-6629

Survey Results Say We're Doing OK!

The "Salmonid" newsletter, in existence now for five years, had never been subjected to a readership survey. So, in the spring of 1981, we conducted a survey to determine:



Replica of the postcard mailed to 1,663 readers of "Salmonid."

- if people read "Salmonid"
- how important are photographs
- what topics are preferred
- what kind of people read "Salmonid."

Armed with this information, we would try to give our readers what they want. A short questionnaire was mailed out to every tenth person on the "Salmonid" mailing list. Nearly half (49%) of the 1,663 readers polled responded to our survey.

Forty-one percent of the readers who responded were commercial fishermen, at least one with a sense of the poetic.

> **"Too much paper, too much talk, not enough action not enough results."**

The second largest group, loosely called the "interested public," comprised 22% of the respondents. Many sport fishermen are included in this category.

Teachers and school librarians comprise the third-largest group and account for 14% of the survey response.

The remaining 23% of responses were received from readers who belong to many smaller interest groups; namely, the media, government departments, Indian bands, tourist agencies and some wildlife clubs.

Sixty-nine percent of our readers indicate they read all of the newsletters. An additional 30% read only some of the issues, and the remaining 1% read none of the newsletters they receive.

Fully 97% of our readers think the newsletter is easy to read. Only 3% feel that articles are too technical or not technical enough.

The accompanying graph lists "Salmonid" topics in the order of preference expressed by our readers. The total percentage of readers that expressed interest in each topic is also given.

Ninety-one percent of readers feel that the photographs add a great deal to this publication. Eight percent of readers disagree, with the remaining 1% replying that the photographs are all they look at in "Salmonid."

Habitat protection is a vital concern for all "Salmonid" readers, ranking among the top three preferred topics by all interest groups. Commercial fishermen and many sport fishermen rank hatcheries and fisheries management among the topics of greatest interest. Teachers and school librarians expressed greater interest in children/education and the natural history of salmonids.

> **"Unless we protect the natural habitat and repair damage already done, we have lost the battle."**

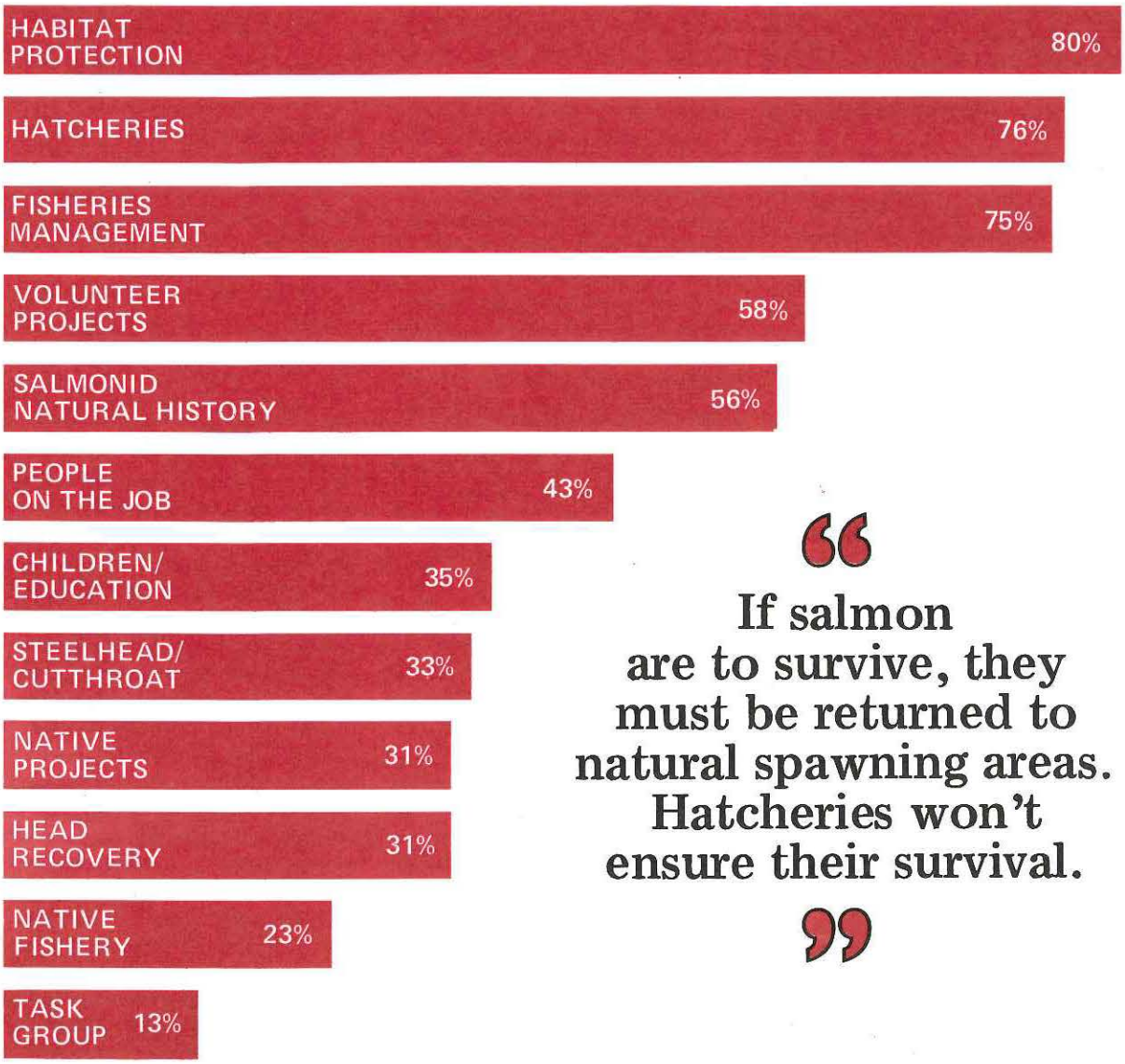
We also asked for additional comments. Somewhat surprisingly, 40% of these comments were not about the newsletter, but embraced instead the SEP program, or the Department of Fisheries and Oceans as a whole. The majority of comments that readers made about the quality and value of "Salmonid" was positive.

So, it was gratifying to learn that "Salmonid" is well-received by our readers, and considered by most to be an attractive, easy-to-read and interesting publication. As a result of this survey, we are going to feature more habitat and fisheries management stories. Topics currently under consideration include the Hat Creek coal project, the problem of mixed stock management, Canada/U.S. Fishing Agreement, status of natural stocks and first returns of fish to SEP facilities.

> "The newsletter is the best messenger of SEP."

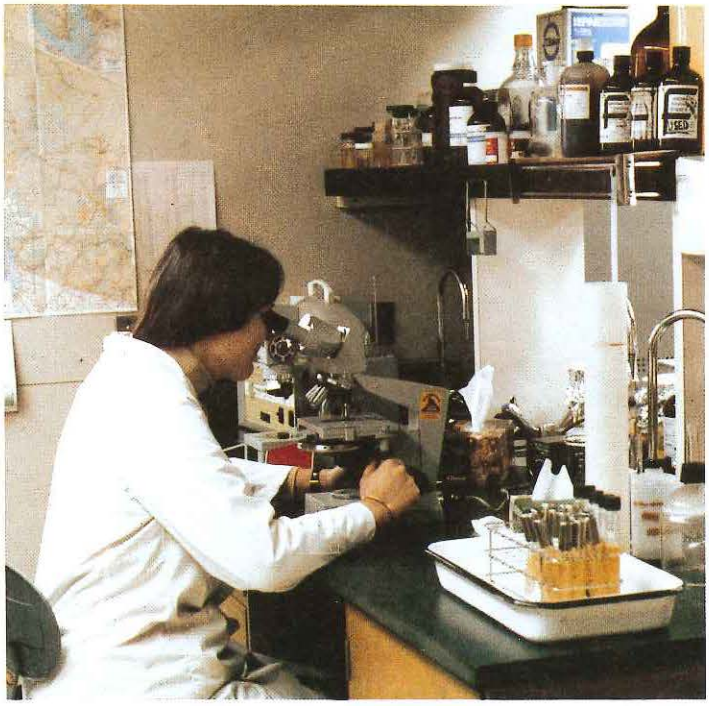
We thank those who responded to the survey. We hope you will notice improvements in "Salmonid" in the months to come. Your comments and suggestions are always welcome, and often are published as letters to the editor.

What You Want To Read About



> "If salmon are to survive, they must be returned to natural spawning areas. Hatcheries won't ensure their survival."

Doctors In The Hatchery



A technician at the Pacific Biological Station in Nanaimo examines gills of a fish for parasites. Photo: PBS Files

When a hatchery manager calls to report sick fish, the fish doctors at the Pacific Biological Station in Nanaimo hustle into their fish ambulance and snap into action.

"We're ready to jump, particularly at any sign of the start of a disease outbreak," says Dr. Gordon Bell, head of the Fish Health Program for Canada's Pacific region.

"For any problem at all, they contact us and provide information about the fish, or else we dispatch people to the hatchery to actually do diagnostic work on-site," adds Terry Shortt, a fish health pathologist with the British Columbia Ministry of Environment who works with Gordon at the station in Nanaimo. "As a result of our findings, we recommend a treatment or a means of control, whatever it may be."

The fish ambulance is actually a camper truck-turned laboratory which fish health specialists drive to the hatcheries to diagnose a problem quickly and recommend a solution. It is one of several examples of a new emphasis on the prevention of disease in fish that are produced in federal and provincial hatcheries on the West Coast. The Fish Health Program began in the early 1970s and has grown with the development of hatcheries and other enhancement projects operated under the Salmonid Enhancement Program. In 1977, new "Fish Health Protection Regulations" were implemented, which gives disease control a high priority among fish culturists and hatchery personnel in the Pacific region.

Bacterial, viral and parasitic diseases in both wild and hatchery salmonids are common, and until recently it was normal practice in hatcheries to anticipate a certain loss from disease and accept it, "without too much question," says Gordon. "They didn't critically examine the problem because there was little known about fish disease." But with a new understanding of disease problems, hatcheries can now produce not only more fish, but more healthy fish.

One of the goals of the Fish Health Program, Gordon explains, is to prevent, and when possible, eradicate diseases. By careful and regular screening of salmonids at hatcheries, fish health specialists can deal with disease problems at the source and prevent them from spreading into the wild.

Disease difficulties in the artificial production of salmonids can occur from the first step in the process — collection of brood stock — to the time when the fish reach the smolt stage. Furunculosis, a bacterial disease which affects the circulatory system, kidney failures, and parasites which attack the gills are among the most common diseases.

Many of these disorders now can be controlled through minimal handling of fish, careful monitoring of water conditions, chemical baths, antibiotics mixed with food and other methods. In recent years, hatchery personnel have taken short courses in fish health to help them identify potential disease problems in the early stages of development.

Scientists at the Pacific Biological Station are currently developing vaccines which will immunize salmon against the most common diseases. In 1980, the provincial government vaccinated 80,000 sea-run cutthroat trout to help fend off diseases normally contracted by these fish rearing in estuarine areas.

A federal-provincial transplant committee is also part of the Fish Health Program. The committee reviews proposals to introduce or transplant salmonids within B.C. If anyone, such as a government agency or private fish farmer, proposes to introduce a certain species from one watershed into another, the committee examines the biological effects of the transplant. Would any diseases be introduced or reintroduced? Would the new species compete with native stocks? Are there any native stocks in the system which have exceptional genetic qualities which would be lost through interbreeding with the introduced species?

SEP Facilities

Releases of fry and smolts from SEP facilities in spring 1981, totalled 266 million fish from 26 projects. Additional releases of approximately one million fingerling coho and steelhead will be made this fall. The projected return of adult salmonids from these releases is 3,719,800 fish.

Juveniles Released	Expected Adult Production*
4,848,400	756,000
20,431,900	568,000
92,001,000	911,000
6,711,000	208,000
141,000,000	1,269,000
270,150	7,800
265,262,450	3,719,800

*Catch plus escapement. These fish will return as adults in 1981-85, depending on the species. Some will be caught in the commercial, sport and native food fisheries, and the remainder will escape to their native rivers to spawn.

Four pilot projects designed to assess the feasibility of enhancement at new locations were in operation in 1981. At Bowron River, 29,000 chinook smolts were released in late August. Work at this particular site will be discontinued, since the water supply has proven colder than was first anticipated. Cool temperatures result in slow development of the eggs and fry.

Better success was achieved at another Upper Fraser project. Slim Creek chinook incubated and reared at the Penny facility have been nose-tagged and returned to Slim Creek. The Penny water supply is also colder than is considered optimal, but the Slim Creek fish appear to be well adapted to these cooler conditions. This year, 59,000 fry were released. Incubation and rearing facilities at the Penny site have been expanded to accommodate 100,000 chinook eggs from each of the Slim and Bowron stocks this fall.

The Kitsumkalum pilot on the Skeena system also resulted in the successful production of 66,500 chinook smolts. In 1981, aeration of the water supply and additional incubation and rearing facilities are being added to accommodate 100,000 chinook eggs from the Cedar River, a tributary of the upper Kalum, and 100,000 eggs from the lower Kalum chinook stock. Supplemental heating of the water supply is planned to assess the advantages of this technique. An extra 25,000 lower Kalum chinook eggs will be taken for incubation and rearing in water drained from a beaver pond which is warmed naturally during daylight hours.

Releases this spring of chum salmon at Mathers Creek on the Queen Charlotte Islands following their incubation at Pallant Creek hatchery totalled 380,000. Of these fry, 180,000 were released immediately, 100,000 fry were reared in a pond using groundwater, and 100,000 fry were reared in a pond using surface water from Mathers Creek. No significant differences in fry quality were found after rearing in these two water supplies, but final conclusions will depend on the return rates of marked adults. In 1981, incubation of 500,000 chum eggs will take place at Mathers Creek, with subsequent rearing of up to 600,000 chum fry from the Pallant and Mathers incubators.

A pilot project on the Stuart River near Fort St. James will test the suitability of using an artesian well for chinook incubation and rearing. Some preliminary studies were carried out with Slim Creek chinook at this site during the summer of 1981. Stuart River chinook will be incubated this fall.

"SEP Update" Continued on Pages 6, 7 and 8

Continued from page 4 ...

Another aspect of the Fish Health Program is a "Fish Health Data Base." Clinical information about transplants, diseases, success of treatments and other facts about various cases are gathered and stored for reference. Besides providing a central source of background information on specific streams and projects, this data base will give biologists a long-term look at correlations between disease outbreaks and environmental conditions. Information on more than 400 cases can accumulate in a year, says Terry, adding that the provincial Ministry of Environment, in 1980, handled 121 cases involving 2,100 samples.

"Some of the old, seat-of-the-pants methods that have been applied are disappearing," says Terry. "They were based on non-laboratory diagnostic work — just eyeballing — deciding that we should use the old standby chemical, the old cure-all. That type of thinking has been turned around somewhat, and with dramatically improved results."

Bruce Obee is a freelance writer living in Brentwood Bay, B.C.

SEP Engineering

The cost of construction of most SEP facilities is being adversely affected by the boom in B.C.'s construction industry, which has led to high prices and a shortage of skilled labour.

The Kitimat hatchery was redesigned to bring this project back on schedule and within the original budget. Work on Tenderfoot Creek hatchery is nearing completion. This $500,000 facility north of Squamish is expected to arrest the decline of chinook, coho and steelhead stocks in the Squamish River system.

Work on both the Quesnel and Nitinat hatcheries is nearing completion, with the first egg-take scheduled at the Quesnel facility this fall. The first chum fry were released from Nitinat hatchery this spring. Construction of the $7.5 million Chehalis hatchery is proceeding on schedule with the first egg-take planned for the fall 1982. SEP has received approval to construct an $8,245,000 spawning channel and small hatchery on the Glendale River in the Knight Inlet area, 240 km northwest of Vancouver. It is the last major project to be approved for construction in Phase I. About 1.1 million adult pink salmon will be produced on average each year, in addition to 20,000 coho, 59,000 chum, and 82,000 chinook. Preliminary contracts totalling $380,000 were awarded to B.C. Forest Products and to Chatwin Construction for road construction and rock work respectively.

The new Nitinat hatchery will enhance chum and chinook stocks of the Nitinat River system. Photo: Dick Harvey

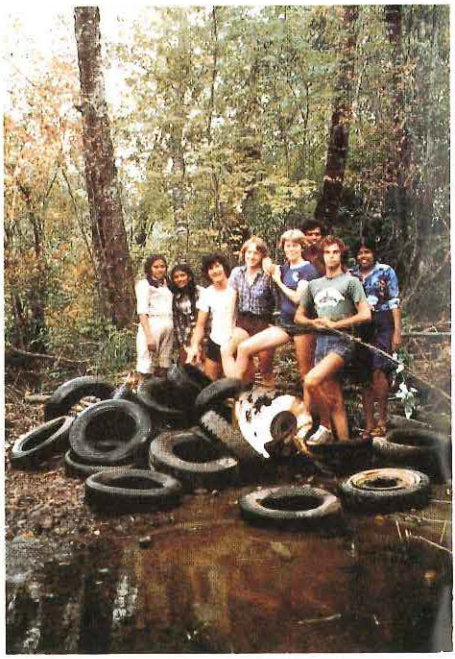
Public Involvement

In 1980-81, 7,500 volunteers worked on a total of 95 projects located across the province. Forty-three of these projects involved incubation facilities, which produced a total of 453,500 coho, 168,000 chum, 70,000 pink, 42,000 chinook and 10,000 juvenile cutthroat trout. Many projects will be upgraded after last December's floods, some vandalism and severe freezing conditions in northern and central British Columbia this past winter.

The Educators' Package, called "Salmonids in the Classroom," is being edited to a clear, concise format that will be easier to use. Three short films concerned with the commercial, sport and native food fisheries are being produced to complement "Salmonids in the Classroom."

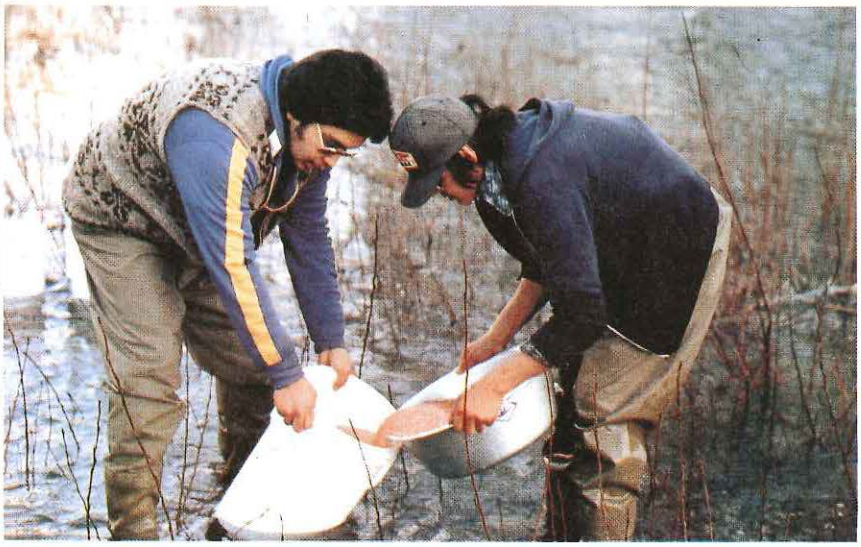
In June 1981, SEP's public advisory group, the Salmonid Enhancement Task Group (SETG), made an important presentation to the Pearse Commission on Pacific Fisheries policy. It called for more public participation in government programs. The Task Group also expressed concern about financial cutbacks affecting SEP.

A new SEP display has been produced and is available for use at fairs, exhibitions and shopping malls across British Columbia. An updated version of the brochure "Where and When To See Salmon" is now available. Slide presentations explaining the public involvement program and enhancement techniques will be produced this fall.



Proud students display their "booty" plundered from Bear Creek. Photo: Joe Kambeitz

Special Projects



The Cowichan band operates a small hatchery for chum and chinook. Photo: Bob Armstrong

In spring 1981, a total of 7,528,590 salmonid fry and smolts were released from community development projects across British Columbia. The adult returns anticipated from these releases during the period 1982-87 are just under 100,000 fish.

Small hatcheries have now been completed at the Cowichan and Nimpkish projects, with work in progress at Kincolith, Kispiox, Sliammon and Sechelt.

A total of 70 people is employed full-time and part-time in SEP's community development program which provides regional employment, economic stability and valuable training in techniques of fish culture.

A pilot chinook hatchery has been built on the Copper River in northern B.C., and the chum and pink facility on Vancouver River has been rebuilt after last December's disastrous flooding.

Across the province, stream clearance of major logjams has opened up several rivers to spawners this fall. Side channels of several rivers have also been rehabilitated to facilitate spawning and rearing of coho.

SEP Research Projects

Research projects involving techniques of fish production are designed to improve production efficiency and to reduce costs.

Recently experiments have been carried out to control the male/female sex ratio of salmonids, and it is now possible to produce all-female groups of salmon. If more females are produced and return to SEP facilities, more eggs are available to build up a particular fish stock more quickly. Females are also more valuable in the commercial fisheries because their roe is harvested and sold as a separate product.

Research in egg incubation and juvenile rearing techniques is also funded by SEP. Since the delivery of dissolved oxygen is vital to incubating eggs, SEP researchers have determined the minimum levels that are required under various production conditions. This information is used in hatcheries to solve problems in egg incubation before they become critical.

The best weight and time of release for coho smolts continues to receive research attention, since these two factors strongly influence adult returns.

To regulate the growth of juvenile coho, it was found that limiting food intake during early rearing, followed by a high feeding rate during the last months prior to release, produced smolts of optimal weight and uniform size.

Scientists are also trying to determine whether the ocean age of steelhead is genetically or environmentally determined, since hatchery steelhead tend to mature after two years in the ocean, whereas wild fish mature after two or three ocean-years at sea. Sport fishermen naturally prefer the larger, three ocean fish. The information gained from this study will result in improved hatchery techniques for steelhead.

Fish nutrition currently receives a great deal of attention in view of the blindness that afflicted hatchery fry this past spring. Cataracts in fish can be caused by nutritional deficiency. In the most recent outbreak, a deficiency of zinc in the commercial diet that is fed to hatchery fish is thought to have contributed to the problem.

Fish And Wildlife Branch

The effectiveness of boulder placement in a stream is tested by electrofishing.

In spring 1981, a total of 127,000 juvenile steelhead, 76,000 cutthroat and 40,000 chinook was released from provincial facilities. Research projects on the Keogh and Vedder Rivers contributed 20,000 and 30,000 steelhead smolts respectively.

The first adults from trout stocks enhanced under the SEP provincial program returned this past winter, with generally disappointing results. While the exact reasons for the low returns are still unknown, the time of smolt release, and high losses of smolts to predators may be contributing factors.

Some 50% of cutthroat trout released in 1980 as smolts into Vancouver Island rivers failed to migrate to sea or were taken by predators. On the Keogh River, 10 to 15% of steelhead smolts released from net pens remained in the river as resident fish rather than migrate to sea.

Although many wild and enhanced trout stocks have increased this past winter, natural fry production this spring was depressed as a result of high water associated with heavy spring rains.

For the remainder of Phase I, emphasis will be placed on a fry stocking program to take advantage of good rearing habitat that is underutilized by salmonids.

One other technique that shows promise is low-level fertilization of coastal streams to enhance trout production. Steelhead reared in fertilized sections of the Keogh River gained weight more quickly than did control fish rearing in unfertilized areas of this river.

Slide Show Available

A new audiovisual entitled "Benefits of SEP to Canadians" is now available in a slide show and tape, or 3/4-inch videotape format. Contact the Information Branch, Fisheries and Oceans, 1090 West Pender Street, Vancouver, B.C., V6E 2P1.

Where To See Fish

An updated brochure entitled "Where and When to See Salmon" is now available and may be obtained from the Information Branch, Fisheries and Oceans, 1090 W. Pender Street, Vancouver, B.C., V6E 2P1. The brochure lists over 40 locations province-wide where the public is invited to see fish. Check the brochure for the best times.

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Salmonid

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Ups And Downs In '81 Season

As trollers finished a poor season, net fishermen were blessed with the unexplained whims of the sockeye for one of their best catches on record. While some sport anglers hauled in their daily limits without sweating or fretting, others sat out the entire season with hardly a single bite.

This was a year of mixed results for sport and commercial salmon fishing along the B.C. coast. Reflected in those mixed catches are both good and bad prospects for the future well-being of salmon stocks.

To the Fraser River came the richest and the poorest returns of the season: sockeye and chinook.

"The International Pacific Salmon Fisheries Commission (IPSFC) predicted a return of six million sockeye this season but it was closer to eight million," said Robin Harrison, a senior biologist with the Fraser River Division of the Department of Fisheries and Oceans. "Most of the strength came from the Horsefly River run."

For the fourth year in a row, sockeye stocks that normally migrate south along the west coast of Vancouver Island and through the Strait of Juan de Fuca, chose instead to head through Johnstone Strait, where they were intercepted by the net fisheries. Had the stocks been intercepted in the Strait of Juan de Fuca, where the IPSFC manages pink and sockeye harvests for the equal benefit of Canadian and American fishermen, the Canadian catches would have been much lower. "The shift in migration seems to be associated with above normal ocean temperatures off the coast of Vancouver Island," Robin said.

Canneries in Port Hardy had a good year in 1981 as a result of record salmon catches in nearby Johnstone Strait.

Continued on page 2 see "Coho and Chinook Decline"

Coho And Chinook Decline

Commercial trollers fish for coho and chinook in Georgia Strait and along the west coast of Vancouver Island. Photo: C. Christenson

Continued from page 1 . . .

Pink salmon stocks migrated through the Strait of Juan de Fuca with even more vigor than the sockeye stocks through Johnstone Strait. The total catch of pink salmon for the season was almost 12 million fish, compared with an average catch of 7.5 million in previous years of the same cycle. On the other hand, sockeye catches have been rising steadily over the past few years.

Georgia Strait troll fishermen were faced with catches 20 to 30% lower in value in 1981. The troll season was complicated by late openings and early closures that were necessary to help conserve dwindling stocks and improve escapement of wild chinook. Incidental catches of wild chinook, those netted incidentally through the use of smaller mesh sizes for sockeye and pink salmon, were down from the previous year. This indicated that fewer chinook were present. In addition, fewer chinook were counted in the returns to the spawning grounds.

"The wild chinook runs for the Fraser look like a real disaster," Robin said.

Chinook sport fishing in the Strait of Georgia was good early in the season, but dropped off as the summer progressed. Some rumors blamed the incidental catches during the Johnstone Strait sockeye harvest for the unusually low catches of chinook and coho in the central area of the Strait of Georgia, but these rumors were without substance. To the beginning of October, the incidental catch of coho and chinook totalled 160,000 fish; not enough to have seriously affected the sport fishing elsewhere. Again, it was just an "off" year for Georgia Strait coho fishing, perhaps attributable to poor ocean survival.

"There is some correlation with freshwater discharge and marine conditions at the time," said Dennis Brock, head of the South Coast Division for the Department of Fisheries and Oceans. Dennis dismissed the theory that diminished catches of Georgia Strait chinook and coho are the result of the roe herring fishery. The roe herring stock resides on the outer coast he said, whereas the Georgia Strait salmon feed mainly on resident stocks of herring.

Dennis also mentioned the poor shape of the 1981 chum stocks. "Net fishing for chum has not materialized and test fishing has indicated low numbers of fish. It looks as though there will be no major chum fishery at this time."

Along the northern B.C. coast, the chum catch was slightly better, though it equaled only 50% of the ten-year average. As in southern areas, chinook and coho catches were lower than normal, but sockeye and pink catches were higher than expected. The return of sockeye to the Skeena River represented the best year on record, going back to 1954. As a result of the flourishing numbers of pink and sockeye, northern net fishermen had a very good year.

Despite individual disparities among commercial fishermen, the 1981 season proved to be an improvement over the 1980 season. The total 1981 seine and gillnet catch was almost 21 million fish compared to just over 19 million fish in 1980. Market reports provided by processing firms indicate that the troll fleet has felt the brunt of the poor chinook and coho catches. While the troll fleet's catch, totalling 14,500 metric tons to October 1981, was up from last year's 11,000 metric tons, the value of that catch had decreased. The difference between the landed value of pink and sockeye versus the landed value of chinook and coho explains the problem. The ups and downs that graphically represent the 1981 commercial salmon catch reveal the challenge of harnessing a complex resource.

Mike Youds is a contributing writer.

Barley Boosts Fish Production

Early results of the first stream fertilization project in B.C. look promising. Researchers who began adding small amounts of nutrients to a northern Vancouver Island river in mid-May found that within three months, fish in the fertilized section were larger than fish in an unfertilized section only a few hundred metres upstream.

Coastal streams generally contain about one-tenth the amount of nutrients found in interior streams of the province, and are therefore significantly less productive. Often, nutrient levels are below the detectable limits of chemical analysis. Biologists Pat Slaney and Chris Perrin, both with the B.C. Fish and Wildlife Branch's research division at the University of British Columbia, fertilized a 400-metre section of the Keogh River throughout the summer in an attempt to approximate nutrient levels normally found in interior streams.

There are two food chains in a stream, Chris explains. One is based on radiant energy from sunlight used by plants, mainly algae. Insects feed on the algae and fish, in turn, feed on the insects. The growth rate of these algae is enhanced by the addition of important nutrients, primarily nitrogen and phosphorus.

The other food chain, says Chris, is based on the decomposition of organic matter such as twigs, leaves and branches which fall into the river. Bacteria and fungi which speed the decomposition process in a stream become food for another group of insects on which fish then feed.

There is a critical food shortage for fish in late spring and summer when insects mature, emerge from the streams and fly away. Adding nutrients enhances the growth of the few remaining insects. With low summer flows, says Pat, nutrients added to a stream are more likely to be used rather than washed downstream. Long hours of sunlight in summer also assist plant growth.

Using a timer-controlled fish feeder, Pat and Chris increased the total phosphorus by eight to ten times the normal amount and the total nitrogen by five to six times the levels usually found in coastal streams, but still at very low concentrations.

Within two weeks, says Chris, the amount of algae in the test section of the Keogh River was 20 times that found in the unfertilized control area, and by July, it was 26 to 30 times higher. Insects, their growth lagging behind by several weeks, also increased markedly in numbers.

Juvenile coho, steelhead trout and Dolly Varden in the fertilized section of the river were twice the size of those in the control area by the end of July, and their numbers appeared to be greater; certainly, there were at least as many, says Pat.

The biologists have also added organic matter — barley, a low-grade grain — to a 200-metre stretch of the Keogh River between the control area and the fertilized section. The barley is decomposed by fungi which provide indirectly a food source for fish. Early results showed that the fish had grown about 20% larger than those in the control area, says Pat, but adding that this size difference is probably insignificant in such young fish.

Biologist Chris Perrin distributes barley in a test section of the Keogh River on northern Vancouver Island.
Photo: P. Northcote

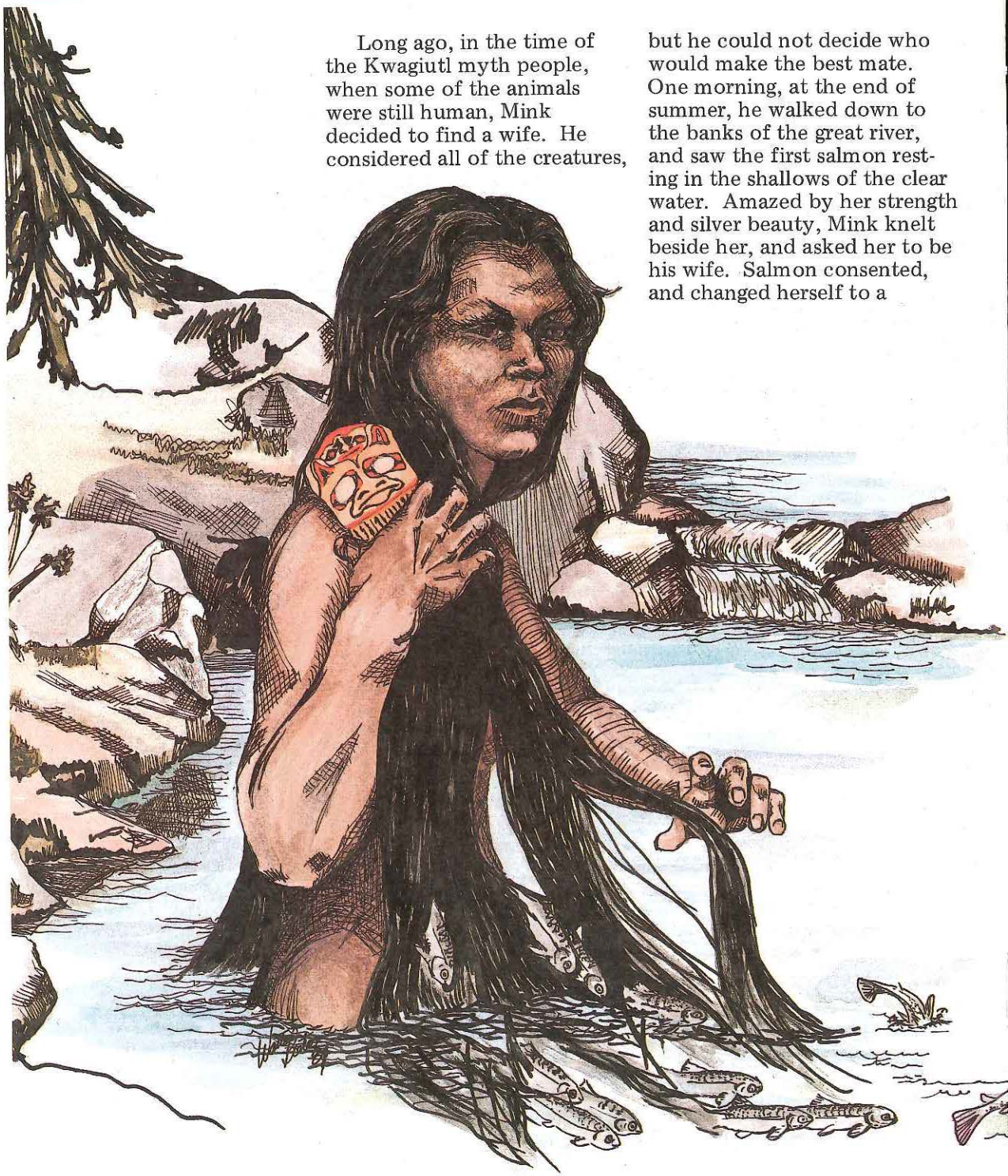
More research will be needed before fertilization of coastal streams could become common practice, says Pat.

"Lake enrichment had its research phase start in 1970-71, so we're a good five years behind where they were," he says. "Before stream fertilization could expand to a larger scale, all these experiments that we're talking about need testing on a pilot scale, which we're hoping to do it in two year's time."

It would also be impractical to use fish feeders to spread fertilizers in a large-scale program, so Chris and Pat are working with a private company to develop a pellet which will release slowly nutrients for a certain time after the pellets have been added in the river. If that kind of pellet can be produced, streams would need to be fertilized only twice a year, and preferably by aircraft.

Bruce Obee is a freelance writer living in Brentwood, B.C.

A Kwagiutl Legend: Mink Marries Salmon W



Long ago, in the time of the Kwagiutl myth people, when some of the animals were still human, Mink decided to find a wife. He considered all of the creatures, but he could not decide who would make the best mate. One morning, at the end of summer, he walked down to the banks of the great river, and saw the first salmon resting in the shallows of the clear water. Amazed by her strength and silver beauty, Mink knelt beside her, and asked her to be his wife. Salmon consented, and changed herself to a

oman

woman, and she and Mink lived together in his cedar house.

All went well for them until the following winter, when famine came to the village of the myth people. The dried halibut and shellfish and berry cakes were gone. The painted cedar storage boxes were empty, and the seal hunters returned from the hunt with no meat. The children whimpered in their sleep, and winter was long before the people, when Salmon Woman sat by the fire one night, with her long black hair gleaming in the firelight just as her scales used to shine in the sun. Mink sat beside his beautiful wife, and she smiled at him and daintily picked her teeth with a cedar splinter. After a time, she said, "Mink, will you fetch some water," and Salmon Woman threw the tiny pieces of flesh from her mouth into the water, and a salmon appeared.

"You must kill and cook the salmon," said Mink's wife, "I cannot, for it is my own flesh." All the people of the village ate, and their hunger was satisfied. And when Salmon Woman said to them, "Throw the fish bones into the fire," they did as she wished.

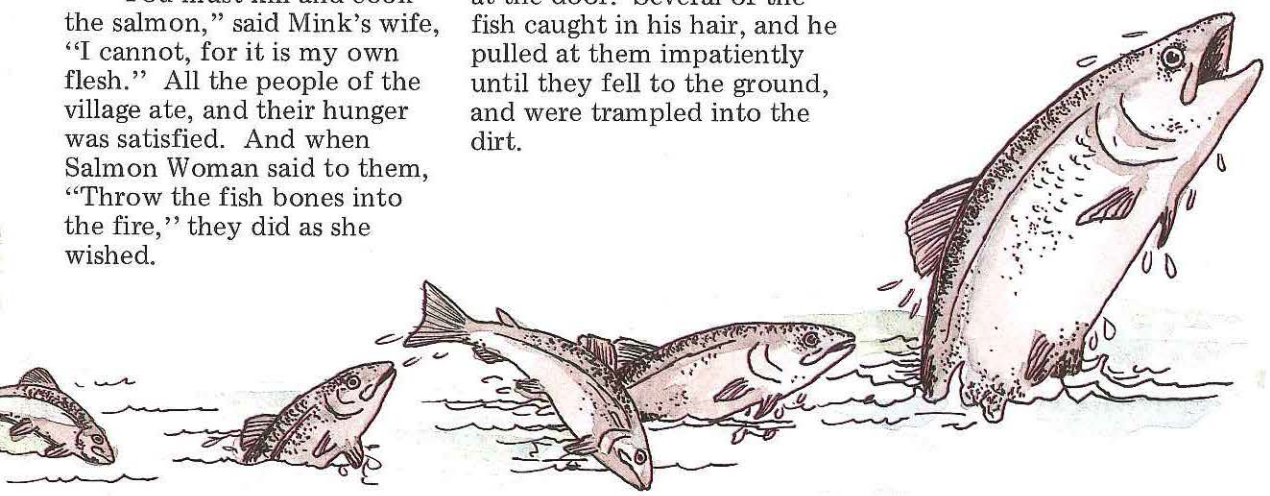
Mink pleaded with Salmon Woman to make more of the splendidly rich fish, and at last she agreed. They walked together to the great river, and Salmon Woman waded out to where the water begins to rush and deepen. She bent over until her long hair fell forward, and she pulled her hair four times against the current. The river filled with leaping silver salmon, and the people came and took what they needed, and the famine was no more.

The glory of the salmon harvest made much power for Mink, and be became a great chief. In time, he forgot that his supernatural wife had caused the salmon to come, and his heart grew proud. Once, in a temper, he beat Salmon Woman, and she cried out to him, "Never do that again. I am not one of your people, and I will not tolerate this from you." Mink rushed out of their house, brushing by the rack of drying salmon at the door. Several of the fish caught in his hair, and he pulled at them impatiently until they fell to the ground, and were trampled into the dirt.

This disrespect for her people angered Salmon Woman. She ran to the river and dove into the water and became a salmon again. Salmon Woman never returned to Mink, but the salmon come back to the rivers and streams every year, and sometimes even now, the Kwagiutl people still put the bones of the first sockeye into the fire.

Joan Skogan is a freelance writer who lives in Quathiaski Cove, B.C.

Editor's note: The legend "Mink Marries Salmon Woman" belongs to the Kwagiutl people and was first recorded by Franz Boas who published it along with other legends in 1895 under the title "Indianische Sagen von der Nord-Pacifischen Kuste." In her work, Joan Skogan received research assistance from the U'Mista Cultural Society in Alert Bay, B.C.



Dear Editor:

Editor's note: Abe Vanderhorst is a commercial troller who has given much thought to the hatchery production of coho and chinook.

Your article about the Oregon coho problem in the July 1981 edition of "Salmonid" is very disturbing, because you lay the blame for the problem on "natural" phenomena. If something is wrong with hatchery techniques, as I believe there very well could be, blaming a natural phemomenon only makes it harder to correct an incorrect technique. The results of the problem become more disastrous.

I have trolled commercially on the west coast of Vancouver Island for eight years. After visiting many hatcheries in Washington and Oregon, I realize just how important a contribution these hatcheries make to my livelihood and what a good hope they are for the future. I have also thought a lot about what could be wrong in Oregon.

Could it be the Oregon Moist Pellet (OMP) fish diet? Since Oregon first got their coho smolts growing the fastest, I guess any backfiring of the feeding technique should become most evident the earliest in Oregon.

I visited the Cowlitz hatchery during a tour of Washington and Oregon facilities in January 1979. There it was mentioned that the average size of coho returning to the hatchery was decreasing. Two possible explanations were given; namely, the interbreeding of stocks from streams and ocean conditions. One important thing I noted at Cowlitz was the explicit non-use of jacks. At other hatcheries, the return of large numbers of jacks was mentioned, and I found out that very large smolts would return as jacks.

I obtained studies of fish size and release experiments and in one study a very important sentence stood out. "Similar results were noted by Hager and Noble (1976) that large, fast-growing males were most likely to return as jacks." The answer could be there.

The hatchery is not just a hatchery but also a rearing facility, and by rearing with an overabundant food supply, the large, fast-growing male coho are made into jacks, which are then not used (whether they could be or not, I don't know). Thus, the feeding is causing culling of the large, fast-growing males. After many generations of feeding, of course the large, fast-growing genes would be culled out. Oregon has been at it the longest, so it should be most evident there and also in Washington.

Having participated in the tag recovery program, I noted that tagged hatchery fish were always more common when I was working on small-sized coho on the west coast. One could theorize that wild stocks there were bigger than the hatchery stocks.

On July 1, 1981, I had a good catch of coho on opening day, but their average weight was terrible and the tagged percentage was one of the highest I'd noticed. Some trollers even released some because they were not worth keeping. I kept just about everything though, in an attempt to show what a fiasco could be coming with these hatchery fish.

One may say, "Well, this year may have been a year for small coho everywhere because of ocean conditions." But there are not small coho everywhere. There are some coho which are huge and the size range is so pronounced this year, that for the first time my Prince Rupert Co-op camp in Ucluelet has had to grade coho size-wise and have a two-price structure so as to reflect the different sizes of coho. The Oregon problem is already here!

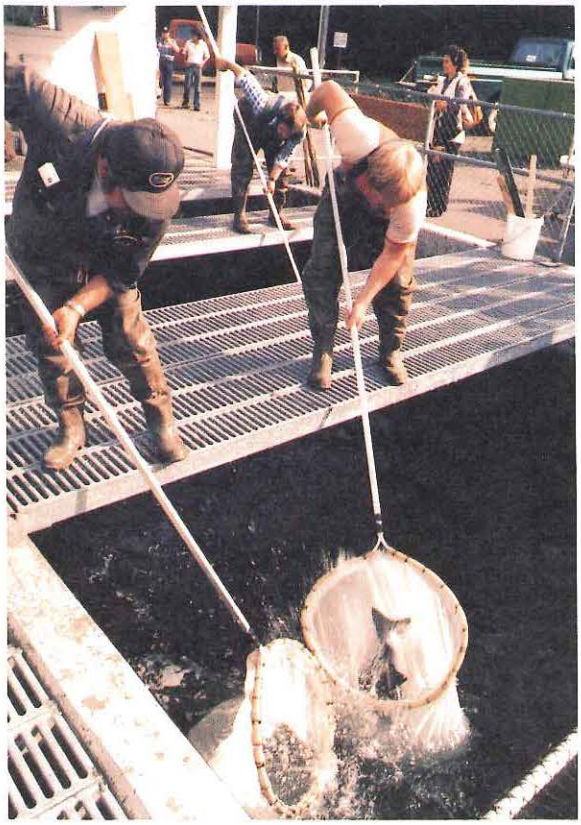
So let me briefly restate what seems to be wrong. The coho at the hatchery are very well fed. The strongest fish become big smolts and the weakest fish survive. The strongest males then return early as jacks and are culled out. The weakest return as well, as good-sized fish and perpetuate the species. The next generation, once again the strongest are culled out and the weakest are used to perpetuate the race. Carry this on as long as Oregon has and you definitely have a problem. The size will get smaller and smaller, and then must get to the point where survival is also affected.

Also in the July 1981 edition of "Salmonid," there is the article about the Noble Creek coho project [near Kamloops]. It seems that projects such as this one are the only way to go. Survival won't be as great but a stock will be genetically wiped out with too much loving care. Hatcheries are fine, but the rearing end of it must be dropped it seems, so that the strong survive and the weak die and the race can survive.

Abe Vanderhorst,
Nanaimo, B.C.

Salmonid Letters

Dear Mr. Vanderhorst:

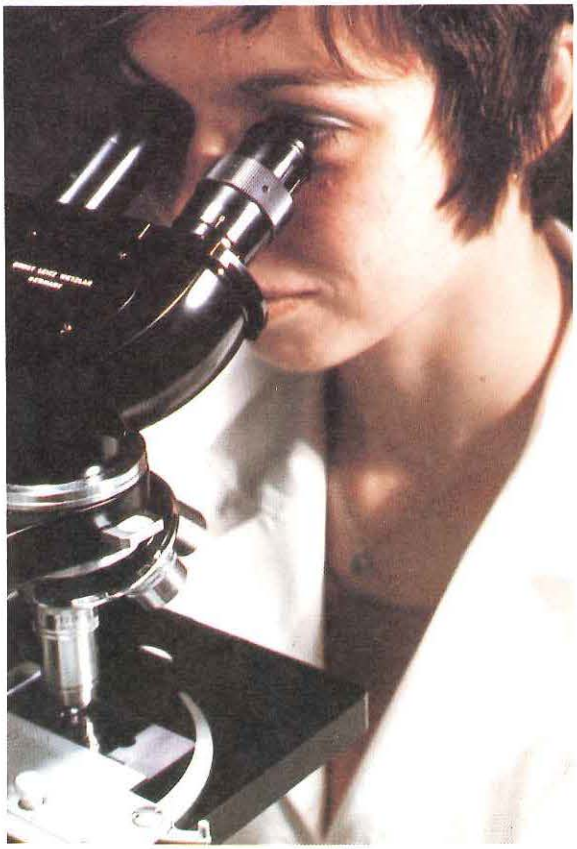


A fraction of the chinook that return to Big Qualicum hatchery are precocious males called jacks. Only the large males, however, are used as brood stock. Photo: K. Sandercock

Your letter to the editor of "Salmonid" raises some interesting questions and controversial issues.

As you are aware, jacks occur in many chinook and coho stocks. This is true whether a stock is produced in a hatchery or in the wild. The difference between hatchery and natural reproduction is, as you point out, that jacks do spawn in the wild, whereas hatcheries select against them unless large adult males are in short supply.

Selection against jacks is based largely on our desire to maximize contribution to the fisheries. Fish that mature as jacks are of limited availability to the fisheries and less desirable in the catch. Sperm from the jacks, or precocious males, is viable and there is no technical reason for restricting its use for spawn. However, research on steelhead trout and Atlantic salmon indicates that growth rate and age and size at maturity are at least partially inherited. Therefore, to keep jack production at as low a level as possible, we use large fish for spawn.



Research in salmon genetics is currently underway at the Pacific Biological Station in Nanaimo. Photo: DFO Files

With regard to a decrease in average size of fish, there is a trend to smaller fish evident in the catch of all species of Pacific salmon. This has been attributed to the elimination of large, late-maturing fish from the spawning population due to increased fishing pressure and the selective nature of the fishing gear used. The possibility of using hatcheries as a tool to increase average size at maturity, particularly for coho and chinook, has been discussed with geneticists. Their recommendation is selective breeding using only the larger adults. Considering the available research data and the opinion of professional geneticists, we intend to continue hatchery operations as in the past. Much more relevant information, particularly for Pacific salmon, is expected in the next few years, since there is now a genetics research team at the Pacific Biological Station in Nanaimo. Results of their studies may indicate the need for changes in operating strategy of SEP hatcheries.

Your experience in correlating smaller fish with hatchery marks is interesting, but unlikely to be a widespread phenomenon. In some instances, returning hatchery coho and chinook are exceptionally large fish, but most are similar in size to wild fish of the same stock. For example, early-returning coho

Continued on page 8 see "SEP Replies To Concerns"

SEP Replies To Concerns

Continued from page 7 . . .
to Capilano hatchery averaged 4.5 pounds in weight before the hatchery was built, and over the past 10 years of hatchery operation have maintained this same average. For Big Qualicum, the late-returning stock of coho averaged 6.0 - 6.5 pounds in pre-enhancement days, and hatchery returns continue this average weight.

Second, fluctuations in size do occur between stocks, between years (''ocean conditions''), and even within stocks in one brood year, so your observations of size discrepancy between marked and wild fish certainly are possible. But how do you distinguish unmarked hatchery fish from wild fish? Currently, we mark less than 15% of the chinook and coho released from SEP hatcheries.

As you may have noted while reading the time and size at release study, the size of returning fish is also a function of the release date. One simple explanation is that the length of the post-release saltwater rearing period is a major determinant of ultimate size. Wild coho and chinook smolts emigrate from B.C. streams during a two or three-month period with a peak in May or June. It is likely that the earliest wild migrants achieve greater body size than later migrants because of their slightly longer ocean-feeding period.

Hatchery releases are usually timed to coincide with the peak date of wild smolt migration. Thus the hatchery fish may have an ocean residence time one month or more shorter than the early wild smolts and may therefore be a smaller size at maturity than some of the wild fish. We could release hatchery smolts earlier in the spring to achieve greater body size, but this would cost us heavily in terms of overall survival. Earlier releases produce fewer, heavier adults (with proportionally more unharvestable jacks), whereas later releases produce slightly smaller adults, but a significantly greater number of them. Work to determine the optimal time of release to maximize benefits to the fisheries, taking into account both fish numbers and total biomass, is in progess at the Pacific Biological Station and two production hatcheries.

In conclusion, we do not have the "Oregon Problem," which, in a nutshell, is low coho survivals. Smolt to adult survival for Oregon coho is considerably less than 5%, whereas in SEP facilities we are averaging more than 15% survival and in experimental groups have achieved over 40% survival.

F.K. Sandercock, Ph.D.
Chief, Enhancement Operations

SEB Appointments

Cliff Atleo, a field worker for the Native Brotherhood, and George Olafson, representing commercial fishing interests in the north, have been appointed to the Salmonid Enhancement Board. They replace Rodney Pierce and Fred Carpenter, who have been members of the Board since its inception in 1978.

Cliff Atleo represents native fishermen in salmon pricing negotiations, on the Fishing Licence Appeals Board and on unemployment appeals. George Olafson is a commercial fisherman from the Prince Rupert Fishermen's Cooperative Association. Both new appointees are advisors to the Canadian delegates of the Canada/U.S. Salmon Negotiations.

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