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The Atlantic Salmon Farming Industry

Past Performance and Future Potential

EXECUTIVE SUMMARY



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An Bord Iascaigh Mhara/Irish Sea Fisheries Board
Crofton Road, Dun Laoghaire, Co. Dublin

THE ATLANTIC SALMON FARMING INDUSTRY:

PAST PERFORMANCE AND FUTURE POTENTIAL

EXECUTIVE SUMMARY

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FOREWORD

Successful salmon farming in Ireland will be governed in the years ahead by the harsh reality of a highly competitive marketplace. To take this view is not alone prudent but to take any other view would be to ignore indicators which are already evident.

Although less than 1500 tonnes of farmed salmon will be produced in Ireland in 1986, the emerging industry has nevertheless already come through two phases successfully. During the first phase, technical and production problems were successfully overcome leading to a highly profitable second phase during which market demand kept pace with expanding production.

The salmon farming industry is now entering a new era where growth in production is leading to reduced prices and tightening margins. For the future given the prospect of rapidly increasing supplies, there will be a need for increasing emphasis on marketing with effective performance in this area making the difference between success and failure.

Notwithstanding these constraints Ireland can still become a substantial and profitable producer of farmed salmon during the next decade, provided that it recognizes the market realities and responds by developing an agreed strategic plan for the industry.

The basis to successful planning is sound research and during 1986 BIM has attempted to create a sound information base by analysing both production and market trends internationally.

These analyses had the aim of establishing:-

(a) the quantity of farmed salmon that will be available over the next decade

(b) the response of the marketplace to this increased production.

In establishing these key variables, topics such as production and technical developments, future production capacity and the economics of salmon production have necessarily been addressed.

A resumé of the results of these investigations and the conclusions drawn are presented in this summary report. It is hoped that this will provide a focus of attention which will act as a catalyst for debate leading to agreement on a framework within which all concerned with the development of salmon farming can agree on a common approach. This in my view will enhance the chances of successful growth in the years ahead.

R.A. Meaney
CHIEF EXECUTIVE.

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1. THE SPEED OF DEVELOPMENT: AN OVERVIEW

1.1 Origins

Salmon farming in Europe has only a short history, but a spectacular one. It commenced in the early 1970s in Norway, where fjords on the west coast and local fishing traditions conferred natural advantages which were rapidly exploited by a combination of small-scale crofter fishermen, dynamic corporate enterprises and a generous government offering financial incentives. Although less endowed with natural advantages, the west coasts of Scotland and Ireland became sources of interest to salmon farmers at about the same time. In contrast to the Norwegian pattern, the origins of Scottish salmon farming were largely corporate based and initially neither sought nor received substantial crofter collaboration. As with Norway, however, official support from government and the EEC was evident from the outset. In both Norway and Scotland that support has paid off handsomely. In ten years, production of fresh salmon from farms in Norway and Scotland has risen from less than a thousand tonnes to over forty times that figure. The affluent markets of Europe and the United States have readily absorbed farmed Atlantic salmon, employment has been maintained or created in the farming areas and profits have been high. Growth of salmon output in Norway, Scotland and other countries in the immediate future is guaranteed. The question is, can a further rapid rise in production be absorbed into the world market without inducing severe price falls and more arduous conditions for salmon farmers? The answer appears to be a qualified no.

Although salmon farming in Europe is comparatively new, the Pacific coast of North America has over twenty years of experience in this kind of aquaculture. Unlike many modern developments, the experience of salmon farming in the new world is probably a poor guide to the destiny of its recent old world imitators because of perceived differences in product quality and real differences in scale of exploitation. Very broadly, there are two kinds of salmon in the world; Atlantic salmon and Pacific salmon. The life cycle of both salmon types begins in the fresh waters of rivers, streams and lakes. Young salmon or smolt then migrate to the sea where they congregate in feeding grounds in the high latitudes of the North Atlantic or the North Pacific. Usually after about two years in sea water, mature salmon return to the rivers in which they were born to spawn another generation of salmon. Knowledge of this life-cycle has won a living for fishermen down the ages. In the approaches to the spawning estuaries of the North Pacific and the North Atlantic, salmon have been caught by net and line by generations of commercial fishermen and sports fishermen. Landings of wild Atlantic salmon have always been considerably less than the landings of wild Pacific salmon. The total world catch of the former is about 10,000 tonnes a year whereas the total of the latter is about 500,000 tonnes a year. Consequently, Atlantic salmon has always been an expensive rarity aimed at the affluent minority. In contrast, most Pacific salmon (but not all) is canned and sold around the world at competitive prices through a wide range of retail outlets.

During the early 1960s states in the north western USA attempted to increase the yield of fisheries for the two most rare and valuable species of Pacific salmon - the coho and chinook - which are not canned but which are consumed as prestigious smoked or fresh fish. Fish hatchery schemes were initiated and smolt release programmes began, usually within the public sector of the economy. Two interesting entrepreneurial developments followed: the idea of 'ocean ranching' was conceived whereby fish were bred and released commercially in the hope that after a few years they would return to their release point where they would be netted by those who bred and released them; secondly, the concept of salmon farming based on 'pens' or sea cages evolved. The second idea proved to be more successful than the first. Located in suitable inlets on the Pacific coast of the USA, salmon pen farming appeared to take-off rapidly. By the mid-1970s production from this source was estimated at between 7,000 and 11,000 tonnes of small 'pan size' fish. Subsequently, production fell to 1,900 tonnes by the early 1980s but has since recovered to former levels. Meanwhile, the initiative in salmon farming technology passed to the Europeans and the Japanese. Two factors may have accounted for the attenuation of salmon farming development in the USA. First, it was entrepreneur-based rather than government assisted and could only proceed as long as profits were in prospect. Second, as Table 1 shows, the wild salmon supply of even the rare coho and chinook species, at 60,000 tonnes, was high, which presumably kept salmon farmers' profit margins low and ultimately hindered their expansion.

1.2 Techniques

Future growth of production of farmed Pacific salmon is expected to come from Japanese producers rather than North American. At least one development introduced by the Japanese has been adopted by several Atlantic salmon producers in Europe. That is the Bridgestone cage - a large-volume rubberised sea cage for raising smolt to mature salmon. The experience of both Pacific and Atlantic salmon farmers shows that there are considerable savings in capital costs if salmon are raised in sea cages anchored in suitable off-shore sites instead of in land-based sea water tanks. Norway has tended to lead the field in European sea cage development but because it has an abundance of suitable fjordic sites and a small-scale crofter approach to salmon farming development, it has limited the size of sea cages. In other parts of Europe capable of producing salmon, such as Scotland and Ireland, there are fewer protected sites and already there is a need for larger, more robust sea cages, capable of withstanding the conditions in exposed locations. The Japanese Bridgestone cage appears to be meeting this need.

TABLE 1 WORLD PRODUCTION OF WILD AND FARMED SALMON - SELECTED YEARS

	Wild		Farmed	
	1976 (tonnes)	1984 (tonnes)	1976 (tonnes)	1985 (tonnes)
Atlantic salmon	12,200	9,300*	1,571	37,349
Pacific salmon (all species)	397,600	582,400	11,000(E)	11,000(E)
chinook & coho	62,000	58,400	11,000(E)	11,000(E)

* = 1982
E = estimated

Source: Annex 1 of main report

During the year or so that very young salmon (parr) spend in fresh water tanks, and the subsequent one to two years that they spend in sea water cages maturing to harvestable fish, food is the single most significant item of a farmer's costs. In the early days of Norwegian salmon farming, low-cost wet fish were used as feed. With the spread of Atlantic salmon farming to areas where abundant low-cost wet fish feeds were not available, a more appropriate feed was required. The animal feed industry responded by producing a high protein product, based on fish meal and soya bean. With modern fish feeds, the ratio of food consumed to harvested fish weight is between 1:1 and 2:1. Comparable food conversion ratios for domestic animals are higher than this; for example, broiler chickens (usually considered to be a good food converter) have a feed conversion ratio of about 2.5:1, pigs about 3:1 and cattle about 5:1. The very positive developments in fish feeds of the last ten years still have some way to go however. One major problem yet to be solved is the development of an appropriate feed additive responsible for the pink or red colour of salmon flesh. Currently, feed compounders use the artificial carotenoid common to pig and poultry feeds, namely canthaxanthin. Unfortunately, salmon feeds containing canthaxanthin produce flesh which loses its pink or red colour after prolonged freezing. The market for farmed salmon is a little constrained as a result.

Technical developments in salmon farming, especially in the areas of disease control and breeding, have been, and are being assisted by research stations in Norway, in the United Kingdom (at Aberdeen and Lowestoft), and in Ireland. The rate of developmental research has probably matched the rate of farm development, and progress has been notable in controlling the major diseases of Atlantic salmon (furunculosis of smolt and vibrio diseases). Attention in salmon breeding has been given to the development of late maturing fish so that maximum harvest weight is achieved for each smolt reared. The speed of technical developments has outpaced the technical training facilities required by fish farm personnel. In the United Kingdom at least, it takes about two years to train a fish farm employee. Growth in the business has been so rapid that by 1986, there was a shortage of trained employees. In all, Scotland employed about 700 people at an

annual output per head of about 10 tonnes. This compared with about 2,000 people employed in the industry in Norway, each of whom produced an average of 14 tonnes a year. In Ireland, employment is at an early stage, with only about 80 persons engaged, each producing between 9 and 12 tonnes of salmon a year (Table 2).

TABLE 2 MANPOWER AND OUTPUT IN EUROPEAN SALMON FARMS - 1985

	Norway	Scotland	Ireland
Total output - tonnes	28,656	6,92[illegible]	722
No. of employees (approx)	2,000	630	80
Output per employee per year	14	11	9 to 12

Source: Annex 1, Table 2.15, main report

The speed of salmon farming development in Norway, and the social and political restrictions imposed on farm scale and farm location, contributed to a 'Klondyke' spirit. Many small crofter-type fish farms were started only to be sold to large corporate interests at very high values. The profits of Norwegian fish farms have generally been high because of favourable producer prices achieved through the discipline and promotional activities of the farmers' and wholesalers' organisation, the Fish Farmers' Sales Organisation (FFSO). Farmers' profits have recently been at the expense of fish wholesalers and traders. A joint levy on farmers' and wholesalers' turnover pays for the FFSO's promotional and other work. Continued official restrictions on Norwegian farm size have frustrated some fish multinationals who have sought expansion of salmon farming in New Zealand, Chile, Tasmania, Scotland and Ireland.

Like Norway, Scotland has experienced a phenomenally high rate of growth in salmon production in the last ten years, but unlike Norway, it is already running short of suitable salmon farming sites. Scottish producers have formed a Scottish Salmon Growers' Association which co-ordinates promotional and political activities but lacks the market strength of the Norwegian FFSO. Even with government and EEC support, Scottish salmon farms have probably been less successful financially than their Norwegian counterparts, but have earned high rates of return nevertheless.

Irish salmon farming was established about 1977 with much help and influence from the Electricity Supply Board, whose job it was to re-stock salmon rivers after they had been used for electricity generation. Because of warm sea water around the Irish coast, wild caught Irish salmon have a high proportion of young (therefore small in weight) precocious salmon (grilse). Irish salmon farms are also characterised by a high proportion of grilse. Government support to the Irish industry, through An Bord Iascaigh Mhara (the BIM or Irish Sea Fisheries Board), and Udaras na Gaeltachta (agency for Irish speaking areas), is significant and includes financial support, research and promotional activities.

1.3 The market - present and future

Norway, Scotland and Ireland are the main producers of farmed Atlantic salmon; they accounted for 97% of total production in 1985. Other minor producers include Faroes, Iceland and North America. Because of the four year cycle from egg to parr to smolt to salmon, the probable scale of production for 1990 was, by 1986, already apparent. It is clear that producers intend to continue the exceptionally high rate of growth in salmon production which has been generally evident for the ten years to 1985. Farmed salmon supplies in that year were 37,599 tonnes. In 1986, the expectation for total farmed production is 51,000 tonnes. By 1990, this is expected to grow to 153,100 tonnes - an annual growth rate of over 30% from 1985. Norway alone is expected to produce 100,000 tonnes (65% of the total) by 1990, with Scotland producing about 25,000 tonnes and Ireland about 10,000 tonnes. The question which many producers are asking is can this volume of production be sold without seriously reducing selling prices and profit margins?

When considering the world market for salmon, three clear layman's distinctions can be made at the outset. The first is that the relatively inexpensive pink and red salmon produced for canning is perceived by consumers as a totally different product from the more prestigious fresh or processed forms of salmon. The second distinction is that consumers tend not to discriminate between the expensive kinds of salmon; to western consumers, Pacific chinook or coho, when smoked or marinated or cut into steaks, is much the same as Atlantic salmon prepared in the same way. Effectively, expensive Pacific or Atlantic salmon are almost mutual substitutes. Indeed, consumer awareness is such that in some countries, sea trout may also be a substitute for high quality salmon. The third layman's distinction about salmon is that there is a ritual quality about its consumption. Salmon is not eaten primarily to satisfy hunger; it is eaten, or presented for eating, to bestow prestige.

Predictably, the markets for smoked, fresh and frozen salmon are located in countries with high per capita incomes. Within those countries, those with the highest incomes are likely to be salmon consumers. Among the top producers of farmed Atlantic salmon, neither Norway nor Ireland is a large consumer. The USA is a major producer of Pacific salmon (33,000 tonnes of high value chinook and coho salmon in 1984) but is also a significant importer of Pacific and Atlantic salmon. In the European market, France and West Germany are the chief salmon consumers (and importers, as neither of these countries has any substantive indigenous production), with the United Kingdom and Sweden also prominent. Principal importers of salmon (Table 3) include Denmark which re-exports most of its imports (after processing) to West Germany and other European countries.

TABLE 3 PRINCIPAL IMPORTERS OF FRESH, FROZEN AND SMOKED SALMON - 1984

Country	Atlantic Salmon (tonnes)	Pacific Salmon (tonnes)
USA	5,700	6,400
France	8,200	16,400
West Germany	5,200	1,600
Denmark	3,700	2,700
United Kingdom	2,900	3,800
Sweden	900	5,500
Japan	300	82,200
Others	3,000	3,100
	29,900	121,100

Source: Tables 4.2, 4.4 and 4.6 of main report. Smoked salmon included above is not adjusted to fresh weight.

In the five years to 1984, the countries listed in Table 3 increased their imports at a similar rate to the increase in world production of salmon. Of European imports, perhaps as much as 60% are eventually consumed as smoked salmon, which, of all the marketable high value salmon products (ie; salmon steaks, fillets, pate and marinated salmon), has probably the lowest price elasticity of demand - ie; a substantial price fall will not induce a large increase in demand. In most salmon consuming countries, sales of fresh and frozen salmon have increased at a faster rate than sales of smoked salmon, which is particularly heartening in view of the higher price elasticity of demand for those products - ie; a large increase in demand can be triggered by a small reduction in price. Falling real price trends for fresh and frozen salmon products are already evident in most European and North American countries which, if continued, will induce greater consumption. Growing awareness of salmon's health value (low in cholesterol and high in unsaturated fats) will add to its marketability. However, the total world demand for Atlantic salmon by 1990, after considering present trends in individual consumer-country markets (and particularly the possibility of displacing Pacific salmon), is likely to be only 130,000 tonnes, which is 23,000 tonnes less than forecast production in 1990.

1.4 Imbalance and implications

The implications of the imbalance of projected supply and demand by 1990 are that reductions in prices and margins will be greater than farmers and traders currently envisage. Lower margins particularly will mean that the least efficient producers will leave the industry and potential small-scale new entrants will be deterred. Because a growing proportion of Atlantic salmon is likely to be consumed fresh or frozen, as steaks, fillets, joints, etc., there could be advantages in producing smaller fish - say up to 3kg - which would allow more appropriately sized portions for sale to a wider market. Consequently, the present tendency to avoid production of grilse may be reversed, giving high grilse producers such as Ireland, a natural advantage.

Greater efficiency in production will demand high standards of technology and training, and a larger minimum-volume production unit. Salmon farms based on integrated smolt and sea cage production are unlikely to be less than 500 tonnes a year capacity. The investment needed for such a project, including working capital to finance recurrent and overhead costs in the opening years, is in the order of UK£2 million and is capable of earning 18% internal rate of return. The investment is risky; a mere 10% reduction in real revenues through excessively low prices would halve the rate of return, and a stock loss say every five years (through disease or unusual weather conditions) would reduce this return to zero.

Thus the European salmon farming industry will continue to experience high rates of growth up to 1990 but lower prices and lower margins are likely to take their toll of small-scale inefficient producers. At the right scale, individual operators will make profits but will also face growing risks arising from production problems as well as marketing problems. Those problems can be better understood by looking in a little more detail at salmon production and salmon marketing, which is done in the next two sections of this executive summary.

2. SALMON AND THE SALMON INDUSTRY

2.1 Atlantic and Pacific differences

Although the two salmon groups, Atlantic and Pacific, have similar life cycles involving birth and early life in fresh water, migration to oceanic feeding grounds at high latitudes, and subsequent returns to their fresh water origins to breed and eventually die, Pacific salmon have a fundamental difference when compared to their Atlantic counterparts. They consist of six species, whereas Atlantic salmon consist of only one. Pacific salmon form the basis of one of the world's more important fisheries. Three of the six Pacific salmon species (sockeye, pink and chum) are caught in relative abundance by fishermen from the USA, Canada, the USSR, Japan and Korea. Of comparatively low value, sockeye, pink and chum salmon are at the heart of the salmon canning industry. Chinook or king salmon, and coho or silver salmon are relatively rare species of Pacific salmon and consequently are of a higher value and compete directly with Atlantic salmon on world markets. The sixth species of Pacific salmon is cherry salmon, caught only in small quantities for a specialised market in Japan. The rare species of Pacific salmon (chinook and coho) and the single species of Atlantic salmon are the subject of fish farming in coastal waters of the North Pacific and the North Atlantic, and more recently in the South Pacific, for chinook and coho.

Traditionally, both Pacific and Atlantic salmon were caught as they returned up-river to breed. Capture techniques varied for each fishery, but usually involved gill nets, traps, trolls (baited hooks on lines), drift gill nets, and highly efficient monofilament nets. The effects of last two are accredited with recent recorded reductions in catches from English, Scottish and Irish fisheries. Wild salmon fisheries are seasonal fisheries by nature, but also by regulation. Atlantic salmon is scarce during the winter months. Landings increase during March and peak in July and August, when catches are swollen by the arrival of grilse (young precocious fish weighing less than 3kg).

By October, wild Atlantic salmon are again very scarce. The Pacific salmon season starts in May, with landings of chinook and sockeye, and continues until about September. The canning industry is a natural corollary to the bulk landings of Pacific sockeye, pink and chum salmon (a combined total of about 400,000 tonnes a year); fish caught over a three month period when canned, are marketed continuously over a twelve month period. The traditional seasonal shortage of high value fish was one factor which contributed to the establishment of salmon farming.

The other significant factor which ultimately led to salmon farming in the Pacific was the attempt, first for sporting or state-supported, and then for commercial reasons, to hatch, breed and release young salmon in order to increase natural stocks and, in time, harvestable returns. Fish stocks benefited from these releases and increments in commercial fish landings were recorded in due course. However, the necessary increment returns from this kind of 'ocean ranching' had to be between 2% and 6% of all smolt released if the operation was to break even. Most commercial producers found that their fish returns, and incremental catches, were only 1% or less of their releases. Consequently some ranchers left the industry while others attempted new developments aimed at augmenting fish returns. The one exception to the doubtful results of ocean ranching was the Japanese Fish Agency which claimed that salmon catches increased by 200% in 1983 (from 39,000 tonnes to 120,000 tonnes) following a five year salmon release programme.

In the Atlantic salmon fishery, only Iceland has operated an ocean ranching programme, experimentally from the late 1960s and commercially from 1981. Their experimental evidence appears to show that fish returns of between 5% and 10% are possible compared to commerical viability rates of between 3.5% and 7%. As yet, the Icelandic commercial ranching operations have not demonstrated viability, although they are continuing in conjunction with commercial salmon farming interests. Other Atlantic countries such as Norway, Scotland and Ireland operate salmon release programmes which are not commercial in nature. It is reasonably certain that neither Atlantic nor Pacific ocean ranching operations will result in large, commercially sustainable increases in wild salmon landings. It is clear however that spin-offs from ocean ranching provided the initial impetus for salmon farming.

Commencing on the west coast of North America in the 1960s, Pacific salmon farming followed as a natural development of hatchery stock release programmes. Coho was the species of greatest interest to salmon farmers, with chinook attracting less attention. Culture was cage or 'pen' based with most producers aiming at small 'pan size' fish of between 0.25kg and 0.4kg. Production flourished for a while in the USA, reputedly reaching 11,000 tonnes in the mid-1970s. Presumably increasing costs of farmed production and incessent competition from traditional fisheries contributed to reduced margins during the late 1970s which led to a significant fall in farmed salmon output. By the early 1980s, that output was only 2,000 tonnes. The USA's main producer was Domsea, a subsidiary of Campbell Soups, which operated sea cages in Puget Sound and other locations in Washington state. Nine other salmon farms operate in Washington state and one ocean ranching unit in Oregon recently started a land-based coho-producing unit. In

neighbouring British Columbia, 40 farms had commenced salmon production by 1984, some of which produced Atlantic salmon. Pacific salmon output in British Columbia is set to expand from 1986 with an expected production of 5 million chinook eggs to yield 5,000 tonnes of salmon.

From the north western coast of North America, Pacific salmon farming has spread to Chile, Japan and New Zealand. In Chile, disappointing results of ocean ranching led to the development of cage culture. By 1986, 15 companies were in operation there, and production was expected to be about 1,300 tonnes. By 1990 it is likely to exceed 3,000 tonnes, most of which will be directed to the North American market. Despite encouraging growth of the industry in Chile, Japan dominates Pacific salmon farming. In 1985 their production of coho salmon reached 6,800 tonnes after several years of 50% annual growth, and despite a difficult start because of problems involving the fresh water stage of culture. The three leading salmon farming companies in Japan are Nichiro (2,500 tonnes), Taiyo (1,000 tonnes) and Nichimo (500 tonnes). Even though the Japanese industry is denied government financial incentives of any kind, production is expected to increase to 8,000 tonnes by 1990, most of which will be absorbed by the Japanese market. In contrast to Japan, New Zealand was the smallest producer of farmed Pacific salmon in 1986. The government of New Zealand established a chinook hatchery programme in South Island in the 1960s to create wild salmon runs. The programme has been reasonably successful, but more importantly, three salmon farms use output from the hatchery to produce a combined total of 250 tonnes of exportable fish. Production is likely to grow; the market in North America is likely to be the target.

In the foreseeable future, although production from Pacific salmon farms will increase, there will continue to be substantial quantities of wild chinook and coho fish, which will clearly influence prices and production of farmed fish. Different conditions prevail, however, in the case of Atlantic salmon. The average commercial catch of Atlantic salmon in the 29 years to 1984 was about 12,000 tonnes a year - that is about one fifth of the commercial catch of the high value Pacific species (chinook and coho). The fear of reduced commercial catches of Atlantic salmon, through improper fishing or pollution of estuaries, stimulated interest in hatcheries and fish release programmes. Stable low-volume commercial catches of Atlantic salmon also presented a golden opportunity to Atlantic salmon farming. In the ten years between 1976 and 1985, production of farmed Atlantic salmon rose from 1,571 tonnes to 37,549 tonnes. In 1986, production is expected to exceed 51,000 tonnes, with Norway producing 74% of output, Scotland 19% and Ireland 3%.

2.2 Evolution of technology

Although salmon farming technology is still developing and improving, the physical requirements for salmon culture are well established. They are:

i) a well protected (ideally fjordic) coastline, with (for cage culture) areas of water of at least 10m depth and no more than a 3km to 5km fetch;

ii) clean, unpolluted, cool sea water, which is not subject to extreme

variations in salinity and not liable to be invaded by ice;

iii) access to essential support infrastructure (power, feed supplies, expertise, communications, etc);

iv) reasonable proximity to a suitable fresh water smolt site.

Atlantic salmon farming in Europe is limited by these physical requirements to certain parts of the Norwegian west coast, the west coast of Scotland, the west coast of Ireland and possibly the coast of north west Spain, where there is a limited area of cold sea water currents. In North America, Atlantic salmon farming is feasible on the seaboards of New Brunswick and Maine. The 1970s saw the introduction of Atlantic salmon farming to Pacific coast areas in Washington, Alaska and British Columbia. It may also be possible in Japan, Tasmania and the Falkland Islands.

The technology which has evolved in Atlantic salmon farming falls into two stages; namely smolt production in fresh water and on-growing of maturing fish in sea water. Smolt are young river salmon, about 14 months old, and about to change to a salt water environment. A smolt unit generally aims at producing about 200,000 smolt a year, although smaller units exist, where integrated with salmon on-growing units. A smolt unit consists of a hatchery to rear fry, and parr tanks or cages, to rear smolt. A hatchery requires brood stock, ie; sexually mature male and female salmon, which are kept in sea cages and from which eggs and milt (sperm) are stripped in the autumn of each year. The eggs and milt are mixed and hatching occurs after about three months, depending on water temperature. The fry which hatch can then be reared in relatively cool water (as practised in Scotland and Ireland) or warmed water (as practised in Norway), with commensurate differences in rate of growth. When fry are 3cm to 3.5cm long (parr), they are placed in outdoor tanks (or cages) until their second spring, one set of tanks (or cages) accommodating small parr and another larger set accommodating large parr. By about May of their second year, smolting occurs and the young salmon enter sea cages and their salt water environment. Mortality between the egg and the smolting stage is between 30% and 40%. Food conversion ratios in smolt units are usually about 1:1 with average smolt size varying between 35gm and 50gm, depending on site. A convenient batch size for smolt production is about 20,000 fish; smolt tanks or cages are tailored accordingly.

Smolt units are frequently located at some distance from the on-growing units. Transportation can be either by truck or boat. Oxygenated tanks containing 1.5cu m to 2.5cu m of water and 2,000 to 4,000 smolt per tank can be readily conveyed by truck for several hundred miles with only low mortalities. In Norway, 'well boats' with flooded sea water tanks in the hold (developed from traditional systems of transporting fish) typically transport 90,000 to 100,000 smolt per trip with even lower mortalities.

Smolt are delivered to on-growing units which mainly consist of sea cages, although some land-based sea water tanks are still in use. Sea cages vary widely in size, siting and design, but three properties are common to all: polypropylene or nylon net cages, which are now commonly rectangular; a frame for the nets which holds them in shape and provides floatation and access; and a mooring system with anchors, ropes and wave shock-absorbers. Elaborations on these basic requirements include a central walkway or raft to give working space

and access to groups of cages, a tender vessel, external protective netting or booms where cages are at risk either from seals or floating ice, automatic feeding and cage monitoring equipment, and shore-based facilities such as workshop, vehicles, laboratory, stores and offices.

Despite the variation in cage design and size, a new Norwegian standard design is emerging with 12m sides and 5m to 6m depth, enclosing about 750cu m of sea water. The allowable stock density in these cages is 25kg/cu m which gives a maximum of 20 tonnes of harvestable fish. The cage frame, or 'collar', consists of a floating walkway of expanded polystyrene enclosed within a box section of wood or metal beams on which are attached slatted planks. These collars are usually arranged to form common boundaries between adjacent cages. They are designed in sectional form to give them flexibility to ride out sea swells. Cage mooring systems also require flexibility to allow for wave height and tidal range. Wave shock-absorbers on the mooring system are needed in exposed conditions. The moorings themselves usually consist of concrete block weights to which the cage ropes are attached by chains. The walkways between cages, as well as the cages themselves, are moored, although in some cases, a centre pivot mooring is employed which permits cages to align themselves in response to wind or current and thus reduce stress on the structure.

Ideal sites for sea cage salmon culture are becoming scarce. Attempts are now being made to expand the range of salmon farming areas through the use of more robust sea cages. In Norway, the conventional rectangular design of cage was simply strengthened to withstand more exposed conditions. Elsewhere, particularly in Ireland, the Faroes and Iceland, salmon farms have adopted the Bridgestone cage for use in semi-exposed locations. Bridgestone, the Japanese tyre company, originally developed Bridgestone cages for use in aquaculture in Japan. The collar of the Bridgestone cage is constructed of heavy duty rubber tubing, joined by massive angled steel brackets, and fitted with expanded polythene sheaths at the joints to provide additional buoyancy. Hexagonal in shape, each collar section is 16m long. The complete collar encloses an area of about 750sq m. The net has an inverted conical shape with a depth of 10m at the edges and 14m at the centre. In all, the cage encloses 9,500cu m of water, enough for up to 100 tonnes of salmon. These large cage units clearly impose a high risk of loss should the unit fail for any reason, but experience in their use so far has been positive.

Shortage of ideal sea sites for salmon has instigated a re-examination of land-based salmon on-growing. A land-based unit must be near a reliable supply of clean sea water. The unit comprises circular tanks, pumps, drainage systems and back-up aeration systems. Initial capital requirements for land-based units are high compared to sea cage systems, but labour needs are reduced and better feed conversion ratios are often achieved. However, rapid improvement in sea cage techniques means that these advantages are being eroded.

As well as rapid improvement in sea cage design, Atlantic salmon farming has been greatly assisted by developments in feed compounding. Forty per cent of all costs in a fish farm consist of feed; it therefore lies at the centre of salmon farming economics. When salmon farming started in the early 1970s, in Norway, ground wet fish and

shrimp processing waste, enriched with key vitamins and minerals, were used as feed. Poor food conversion ratios of 6 or even 8 to 1 were common with such feed. High labour costs and high handling costs resulted in developments which reduced the water content of the feed, made it easier to deploy, easier to store and easier to handle. So-called 'moist' feeds were the first improvement, followed by 'dry' feeds. These are based on fish meal and soya bean meal with added fish oils, minerals and vitamins. One essential additive is the component which is responsible for Atlantic salmon's pink flesh. Wild salmon obtain this component - astaxanthin - from feeding on small crustacea, including shrimp. An artificial alternative to astaxanthin - canthaxanthin - is used in dry feed. Although canthaxanthin provides farmed salmon with pink flesh, the colour fades if the flesh is frozen for prolonged periods (three months or more). Variable doses of canthaxanthin (between 50ppm and 100ppm) produce varying degrees of pinkness in the flesh. To minimise feed-with-additive cost, canthaxanthin at the appropriate rate is included in feeds only during the last six months before slaughter.

Healthy competition between feed compounders such as Skretting (Norway), Ewos/Baker (Sweden and UK), Sjofor (Norway), BP Nutrition (UK) and Fulmar (UK) has resulted in three recent major improvements in feed. First, high energy feeds using relatively cheap fats or oils allow farmed salmon to use the full protein content of the feed in production of flesh and tissue. Second, a meal dried at low temperatures (LT meal) compares with the nutritional value of dry feed but retains volatile taste attractants which make the feed more palatable which in turn leads to faster growth. Third, the development of lower density 'slow sinking' food pellets has meant greater utilisation of food. With improved dry foods, food conversion ratios in commercial farms vary between 1.8:1 and 2:1 but are expected to decline to about 1.5:1. Similarly, the time needed to produce a 3 kg salmon from smolt is likely to decline from its present 20 or 22 months (Scotland and Ireland) to about 16 months.

So far, disease has not been a major problem in Atlantic salmon farming. Atlantic salmon is prone to several viral, bacterial and fungal diseases and can also be troubled by endo and ectoparasites. Two bacterial diseases, furunculosis in smolt and vibrio diseases in young and mature salmon, are the most troublesome. Also sea lice ectoparasites need attention in some areas. Recent cold weather in Norwegian waters appears to have caused increased incidence of vibrio diseases, but losses of fish have yet to reach significant levels. In general, mortality rates for the complete growth cycle, which historically were about 30%, have declined in recent years to 20% or less. Two environmental problems have had an effect on salmon farmers in Norway and parts of Scotland and Ireland. Firstly, 'red tides' of toxic dinoflagellates, caused by a combination of strong winds (which mix the water column) and clear summer weather, have occurred in a few protected lochs where the geomorphological facilities for mixing fresh water with open sea water were restricted. Prevention of this problem will pre-empt the need for a cure; careful site selection of salmon farms may avoid the red tide threat. Secondly, acid rain, particularly in Norway, damages fish by restricting oxygen uptake and salt excretion.

Stock improvement programmes for Atlantic salmon have been underway for some time. The Norwegians particularly have tended to concentrate on conventional stock selection and breeding at the Agricultural Research Council's Sunndalsora research station. Selected best performers under this programme are tested in fully commercial conditions. The programme has achieved measurable success in improving growth rate performance by about 4% per annum over the four years to 1986. Researchers in Scotland, England and Ireland, as well as in Norway, have attempted to produce late maturing salmon. When salmon mature, their appearance and flesh quality worsens, food conversion ratio deteriorates and mortality increases. The prevention of maturity therefore would clearly improve salmon stock. Female salmon are known to mature later than males. Much of the research has consequently focused on hormonal or genetic elements which produce all-female stock or sterile stock. The experimental work completed so far, and commercial tests, show considerable promise.

Salmon are harvested between their first sea spring and the end of their second sea year (ie; between 9 months and 22 months). Traditional price premiums for large fish meant that light-weight early maturing fish or grilse, were generally regarded as a sub-optimal use of feed and other inputs. The proportion of fish which grilse therefore is a key variable in the profitability of salmon farms. Use of improved stock has limited grilsing to about 15% in recent years, but with notable exceptions (eg; Ireland). Harvested fish are delivered live to packing stations where they are kept in pens until required. Prior to slaughter, the fish are starved to reduce gut content. Slaughtering may involve bleeding the fish to improve flesh quality (Norway), or use of a humane stunner (Scotland). After gutting (where necessary), the fish are iced and packed in styrofoam or polythene boxes of about 20kg for shipment to market. Special boxes have been developed to withstand prolonged air and surface freight.

There is a shortage of trained manpower in salmon farming. Experience in the United Kingdom and elsewhere points to a two year minimum training period for general farm hands, and longer for skilled personnel. Integrated salmon farm units in Norway achieve outputs of between 20 tonnes and 30 tonnes a year per man compared to the industry average of 14 tonnes a year per man. In Scotland, output from integrated farms is about 18 tonnes per man per year compared to the industry average of 11 tonnes per man per year. Irish productivity per man is below Scotland's, although both are thought to be improving with the advent of new technology.

Salmon farming by all the North Atlantic producers is commonly carried on in parallel with trout farming. Trout is frequently seen as a competititor to salmon, especially as it is often available when only small salmon are being harvested. European output of trout is about 150,000 tonnes a year. Japan and the USA produce a further 35,000 tonnes to 40,000 tonnes a year. European output has grown at a steady 10% a year whereas output in Japan and the USA has stagnated. Conventional trout products are firmly established in Europe with their own particular market niche, which does not overlap with salmon. Sea

trout however may genuinely compete with salmon. It offers a large (up to 4kg) fish with pink flesh for which both demand and supply appear to be growing. Current supply of large pink fleshed trout is between 30,000 tonnes and 40,000 tonnes a year which competes readily with small grilse salmon, especially when marketed during the second half of the year.

2.3 Main European Producers

The three principal producers of farmed Atlantic salmon are Norway, Scotland and Ireland, who all use a common technology similar to that described above. Their individual industries will bear further examination however, commencing with that of Norway.

i) Norway

Norway's progress from pioneer to dominant producer of farmed Atlantic salmon was engineered through major government intervention in the industry from 1973. A decline in traditional fisheries at that time created an imperative for rural development. Salmon farming became the vehicle for that rural development. The wide availability of good sites, good communications and the access to inexpensive fish as a basic source of salmon food were the foundations of the industry. Official regulations limiting farm sizes to 8,000cu m of water (originally enough to produce 60 tonnes of salmon a year) and smolt producers to one million smolt a year helped to determine the crofter pattern of the industry with its specialist services of feed compounding, harvesters, packers and transporters. The implementation of official policy has resulted in 603 salmonid farms (producing salmon and sea trout) and 327 hatcheries, most of whom rear parr through to smolt.

Areas less suited to salmon but socially disadvantaged have been favoured under these policies, they produced 25% of national salmon output in 1985. Ninety five per cent of Norway's farmed salmon is produced in sea cages; dammed enclosures and net impoundments account for the balance. The average sea cage farm uses 6,000cu m of water and produces between 50 tonnes and 60 tonnes of salmon a year. There are 3.4 million cu m of farms licensed. Improved technology has increased the potential for central and southern farms to about 200 tonnes per 8,000cu m, and to 150 tonnes per 8,000cu m in northern farms. Potential salmon production therefore currently stands at about 85,000 tonnes compared with present production estimates (1986) of 38,000 tonnes.

The potential productivity of crofter farms is reflected in their value. Sales of farms to small commercial enterprises are already occurring. Where possible, large-scale producers attempt to expand their Norwegian base by acquiring small units, despite their sometimes patchy profit performance. The largest salmon producers, with licences in excess of 8,000cu m granted before restrictions were imposed, have tended to become frustrated with Norwegian conditions and have sought expansion overseas. Two such operators are A/S Mowi and Sea Farm A/S.

A/S Mowi is a subsidiary of Norway's largest industrial concern, Norsk Hydro. They currently produce about 1,000 tonnes of salmon a year from two enclosures, and over one million smolt a year from three smolt units. They also conduct a certain amount of research on salmon and other fish species. Mowi has a majority shareholding in Fanad Fisheries in Ireland, Golden Sea Products in Scotland and a 45% holding in ISNO of Iceland. Their Irish and Scottish interests each produce about 600 tonnes of salmon a year with smolt production in Ireland, and the possibility of producing other fish in Scotland. Their Icelandic unit farms 100 tonnes to 200 tonnes of salmon a year and is experimenting with ocean ranching.

Sea Farm A/S is part of the Norwegian multinational I/S Sea Farm & Co. Sea Farm's primary Norwegian interests are in smolt production, for which they operate eight units. Current output is 2.9 million smolt a year, with an expectation of 6 million by 1989. Their single ongrowing salmon farm is used to improve the performance of their stock and as a brood holding facility. Since 1982, Sea Farm have made substantial acquisitions overseas, including Sea Farm Polly and Sea Farm Kerry, both in Scotland, producing a combined total of 1.5 million smolt a year, Sea Farm New Brunswick, Canada (smolt producer), Sea Farm of Norway Inc., in Washington, USA (cage farm for Atlantic salmon), Sea Farm (Shearwater) in the UK (fish processing and marketing), Ferme Marine de Douhet, France (turbot farm), Tinamenor SA, Spain (fish and shellfish farm) and Seconda Aquaculture in Greece (fish farm).

Other investors in Norwegian salmon farming include British Petroleum (smolt production and a small salmon farm) whose salmon interests extend also to North America. Two Norwegian companies have emulated BP and have invested in British Columbia and in Scotland. Several others have gone further afield, to Chile, Australia and the USA with the aim of producing Atlantic salmon.

If Norwegian salmon farmers have been successful, it is in part because of their marketing organisation, the Fish Farmers' Sales Organisation (FFSO). With its origins in the protective joint sales arrangements established in the 1930s, the FFSO co-ordinates production and maintains quality standards, regulates the first-hand sales of salmon and promotes salmon products, particularly in the export market. Acting almost as a cartel, the discipline and price arrangements of the FFSO have gained persistently good margins for its farmer-members at the expense of wholesalers and traders. The organisation is funded by a levy of 2.5% on salmon turnover, paid equally by producers and traders. About 500 farmers were members in 1986 and about 80 traders, and it is from these that its governing body is drawn.

As well as its three tier salmon grading system and its co-ordination of supply, the FFSO fixes minimum prices each year and helps to select and register buyers. Thus although domestic trade does not comprise an entirely free market, the FFSO recognises the need to compete in the international market. Its promotional material has created a positive, healthy, desirable image for Norwegian salmon, virtually all of which is marketed under the same logo. The physical distribution of Norwegian salmon

continues the quasi-cartel theme in that only one company - Sties Termo Transport of Oslo - predominates. With a fleet of 70 large trucks (24 tonnes), Sties Termo delivers throughout Europe and by air freight, throughout the world. Deliveries to all major markets are made within approximately one day after packing. The existence of only one distributor would normally connote uncompetitive pricing. That situation may change in 1986/87 when the Norwegian company Gods-Trans commissions a new twin-hulled high speed cargo ship for transporting salmon to European destinations.

Speed of delivery of Norwegian salmon exports is essential as they are nearly all fresh or chilled. Little smoked or processed salmon is exported because of generally high tariffs against such products. Most Norwegian farmers produce the largest fish possible because of price premiums in their favour. Over production of such fish is already evident, which may swing production towards small fish (3kg to 5kg) for smoking by importers. About half of all Norwegian salmon is eventually smoked, while half is consumed as fresh salmon. Future output may favour fish of 2kg to 3kg for the fresh market and 3kg to 4kg for the smokers' market.

Helped, no doubt, by favourable producer prices secured by the FPSO, nearly all Norwegian salmon farms were profitable in 1985. Average overall production costs were about UK£3.20/kg - about 75% of the producer price. Increasing capital costs for an 8,000cu m unit (which at 1985 prices was about UK£150,000 to UK£200,000) are partially alleviated by generous depreciation allowances and capital grants of between 10% and 35%. Capital costs are particularly high for smolt production units (between UK£1 and UK£2 per smolt produced) but a general shortage of smolt has kept prices and profits high. By 1989/90, smolt producer affluence may change for the worse when smolt availability is expected to match demand.

Profits earned by Norwegian salmon farmers also owe something to substantial government support. No less than three government institutions (encapsulating three non-research departments and two research institutes), and seven universities or colleges consume a research and development budget of UK£6.3 million. The technical, veterinary and breeding research, and training and extension services which result from this expenditure, contributed to an industry with a total value of about UK£130 million in 1985.

ii) Scotland

Limited numbers of sites, and the absence of large quantities of inexpensive fish as a food base, created conditions for Scottish salmon farming which were quite different to those prevailing in Norway. As a result, the limited sites have been subject to large-scale development by big corporations, with crofter participation occurring late in the development cycle and only in certain areas. Operating on the west coast, and in the western and northern isles, large corporation fish farm development has created integrated units of smolt production and on-growing farms, although some specialist smolt producers exist. Over 16 million

ova were laid down in 1985. About one third of these will be raised to smolt in fresh water cages moored in fresh water lochs, while the rest will be reared in fresh water land-based tanks. The majority of on-growing units employed sea cages, including Bridgestone cages, which have a capacity of 100 to 300 tonnes of salmon a year. The 128 on-growing units employed about 550 full and part-time staff while the 66 smolt units employed a further 171 full and part-time workers.

In 1985, Scottish salmon production amounted to 6,921 tonnes of which 2,659 tonnes were two-year-old salmon and 4,262 tonnes were one-year-old grilse. As with Norwegian production, about half of Scottish production is sold to smokers at first sale; the balance is sold fresh or frozen. Norwegian influence and investment is growing in the Scottish industry. The Scottish Salmon Growers' Association is concerned that Norwegian producers are privy to the Association's strategy for competing with Norwegian salmon. Currently, Scottish production is doubling every two years despite a shortage of smolt. The 6,900 tonnes of 1985 was worth about UK£30 millions. Continuation of the present growth rate will result in 25,000 tonnes production by the end of the decade.

The top ten salmon farmers in Scotland are responsible for most of the production. The largest producer is the Unilever-owned Marine Harvest Ltd, based in Edinburgh, with 13 sea cage units and six smolt production units. The company is also involved in salmon processing, which it is about to expand, and conducts its own salmon marketing and promotional schemes. Output in 1986 is expected to be in the region of 2,500 to 3,000 tonnes. McConnell Salmon Ltd, a subsidiary of Booker McConnell, operates six sea sites and two hatcheries in the Outer Hebrides, as well as a recently acquired sea cage unit on the Scottish mainland coast. Total production in 1986 is expected to be about 1,100 tonnes. The Norwegian-owned Golden Sea Produce Ltd of Oban has other fish interests besides salmon. However, its salmon output in 1986 is expected to be about 700 tonnes, most of which will be marketed through its holding company. Wester Ross Salmon Ltd of Ullapool produces about 600 tonnes of salmon a year but currently faces smolt problems which it has tried to solve by developing facilities in Dorset, England. Gilbert Johnson Ltd of Shetland, a relative newcomer to the salmon business, has expanded rapidly, producing 500 tonnes from three owned or partly-owned cage sites. The company possesses no hatcheries. Rostad Salmon Ltd, Shetland Salmon Producers Ltd and Shetland Norse Fish Farm Ltd are companies with substantial Norwegian interests producing respectively about 500, 400 and 400 tonnes a year. Highland Fish Farmers Ltd, owned by the Wood Group of Aberdeen, and Joseph Johnstone & Sons Ltd of Montrose, are each projected to produce about 300 tonnes of salmon in 1986 from marine sites and hatcheries. A further six smaller companies complete the roll-call of Scottish salmon on-growers.

Complimenting these on-growers are several specialist smolt producers such as Marine Harvest Ltd (already mentioned), Sea Farm (Polly) Ltd and Sea Farm (Kerry) Ltd - both with strong Norwegian interests - producing about 600,000 smolt in 1985 and the potential to double that in 1986. Landcatch of Argyll is jointly owned by a Scottish and Norwegian company and has, under Norwegian

influence, switched its substantial land-tank facilities from salmon on-growing to smolt production only. Output of one million smolt is expected in 1986. Lovat Estates Hatchery of Inverness is also expected to produce 0.5 million smolt a year for sale to on-growing farmers.

The limited number of good mainland sea sites for Scottish salmon production influenced past development. Land-based operations for on-growing salmon were tried by Fisons Ltd in the early days. The project failed, and salmon investors have been cautious ever since, although at least one on-grower in Argyll (Otter Ferry Salmon Ltd) continues to produce salmon successfully from land-tanks. Increasing interest is also being shown in potential salmon production in the outer islands. In the western isles, an Integrated Development Programme has assisted crofters to take up salmon farming, and in Shetland, Norwegian interests have co-operated with small-scale local interests to develop hatcheries and on-growing farms.

According to the cautious analysis of the Highlands and Islands Development Board (HIDB), production costs of Scottish farms in 1985 were about UK£3.20 to UK£3.40 per kg, and provided between UK£0.27 and UK£0.48 per kg profit. Scottish profit margins would appear to be considerably below Norwegian margins, which is hardly surprising given that many Scottish sites are less than ideal. However, the HIDB analysis is probably over-cautious, and deliberately under-states revenue and over-states costs. More efficient producers, operating fully integrated smolt and on-growing units, are capable of double the HIDB profit per kg.

Quality standards and promotional campaigns are conducted on behalf of Scottish mainland and western isle salmon farmers by the Scottish Salmon Growers' Association (SSGA). Farmers in the Shetland Isles have their own marketing organisation. The SSGA is funded by an annual levy on surviving smolt on each of its 70 members' farms. The Association also lays down a code of fish handling, covering harvest, slaughter, packing etc. Regular inspection ensures that standards are maintained. Fish meeting the standards can be sold under the Association's seal of approval. Its promotional campaigns cover advertising and education in the use and preparation of salmon. The Shetland Salmon Producers' Association performs similar functions. Physical distribution of Scottish salmon, in contrast to Norway, is mainly performed by a multitude of contract hauliers or farms' own transport.

Government support and regulation of the salmon industry takes the form of technical assistance, financial assistance and statutory obligations. The technical assistance is channelled through the Department of Agriculture and Fisheries for Scotland and a number of Scottish universities and marine research stations. The Department administers the Diseases of Fish Act and heads research into the main diseases and breed improvement. The University of Stirling and Heriot Watt University in Edinburgh offer veterinary support and engineering design support for fish farmers. There are three sources of financial assistance to the salmon industry. The first is through the HIDB which offers grants

and loans to individuals or companies concerned with salmon development. In 1985, 150 applications totalling UK£8 million were received, against the HIDB's budget of only UK£2.8 million. Preference is usually given to smolt producers rather than on-growers, and small crofters rather than large companies. The EEC offer a second source of financial assistance to salmon farmers in Scotland under the European Guidance and Guarantee Fund (FEOGA). Support from FEOGA has been conditional on at least 5% government support for a project, but is presently under review. The demand for FEOGA funds greatly exceeds supply. Recent experience indicates that grants are being reduced. Consequently, delays in servicing applications are increasing. Also available through the EEC is a third form of financial assistance, namely grants to salmon farmers in the western isles under the Integrated Development Programme. Although the programme is due to end in 1987, all its funds were committed by 1986. Other minor sources of financial assistance include the Scottish Development Agency and the Orkney and Shetland Islands Council.

The statutory obligations of potential salmon farmers are designed to satisfy, among others, the environmental lobby. To set up a sea cage unit, obligatory applications must be made to as many as five separate bodies (Crown Estates, Department of Trade, landlords, Regional Councils and local harbour authority). To set up a land-based hatchery, four obligatory applications are required; for fresh water cages, three obligatory applications. In addition, once established, all Scottish salmon farms must register with the Department of Agriculture and submit annual returns of fish movements.

iii) Ireland

Even more than Scotland, Ireland's salmon farming industry is limited by the availability of suitable sites. The establishment of large integrated smolt and on-growing farms has characterised the industry to date, making optimal use of the few good sites. Irish salmon producers are already seeking ways of overcoming site limitations. Bridgestone cages have been used in exposed sea conditions, with encouraging results, but inevitably with increased risk. Circumstances in Ireland contrived to involve government in smolt and salmon production at a very early stage of the industry's development. The main government agencies involved in pioneering salmon culture were BIM, the Electricity Supply Board (ESB) and Udaras na Gaeltachta. The ESB was required to re-stock waterways which were used in generating hydro-electricity, and ESB created four hatcheries as a result. In addition, the Salmon Research Trust, jointly funded by the Guiness Foundation and the Irish government, established a hatchery in County Mayo with the initial intention of restocking rivers, but in more recent years supplying smolt to salmon farmers, including a few small-scale producers. Those small-scale producers have grown with the industry and have attracted attention and capital from external investors.

There are 12 major on-growing salmon farms in Ireland, using conventional cage culture, with two or three sites per farm. Many of these farms are in the process of establishing smolt units;

some trout farms are even converting trout units to salmon smolt production. Seven hatcheries currently are in operation; the largest established being those of the ESB, the Salmon Research Trust and Fanad, with other hatcheries being at various stages of development. Supporting industry is also gaining confidence in salmon production. Irish producers of cages, netting, floating collars and feed are already orientating their businesses towards the salmon industry. Fish processing companies have made investments based on an anticipated rapid increase in salmon production over the next five years. In 1985, production doubled from the previous year to 722 tonnes. In 1986, it will almost double again to 1,300 tonnes. By 1990, production of 10,000 tonnes is expected.

Genetic characteristics and Ireland's warm coastal waters can combine to produce a high proportion of grilse in Irish farmed salmon (20%-30% on average but occasionally up to 80%). Although grilse are smaller in size than older salmon, emergent producers have accepted grilse readily in the knowledge that their early sale improves cash flow and business returns. Norwegian developments in Irish salmon farms have shown that low grilsing rates can be achieved with proper stock selection. Whether grilse or salmon however, Ireland's sea conditions should promote rapid growth to between 2kg and 3kg in the fish's first sea year.

Marketing of Irish salmon is still largely an individualistic, entrepreneurial activity, with each company making its own arrangements. Two of the larger companies (ESB and Fanad) market their fish individually while six of the mainly smaller producers opt to sell their salmon through the newly formed Irish Salmon producers' Group (ISPG). Promotion of Irish salmon on home and export markets is in the hands of BIM, in conjunction with the industry.

Government intervention in the Irish farmed salmon industry involves research and advisory services, veterinary services, licensing and provision of financial assistance. Research is carried out in the Fisheries Research Centre near Dublin, and the Salmon Research Trust. Veterinary support is provided by the Disease Diagnostic Service (DDS) jointly funded by government development agencies, and located in University College, Galway. Government licences or permits are required for fresh water hatchery units (one licence and one planning permit) and for marine on-growing units (two licences and one planning permit is required). Additional legal permits involving water rights may also be required. The licensing and legal routines are protracted. Once licences are obtained however, government grant aid can be generous, at up to 65% of capital costs. There are three sources of financial aid: BIM (which offers aid on a national basis, excluding the Irish speaking areas), Udaras na Gaeltachta (which offers aid to Irish-speaking areas), and EEC (through its FEOGA arm). BIM offers funding in three ways; as capital grants (up to 50% with a maximum of IR£20,000); grants of 10% of eligible fixed assets to commercial projects which will qualify a project for a further 40% grant from the EEC; and bridging loans while awaiting EEC funding (up to 20% of eligible fixed assets). Thus, immediate funding of 30% (ie loan of 20% and

grant of 10%) is available for salmon projects. BIM's maximium grant per project is IR£175,000. In addition, BIM provides a range of promotional and market information services. Udaras na Gaeltachta offers grants of up to 65% of capital costs for salmon projects in specified areas of Ireland, which are normally funded 25% by Udaras and 40% from FEOGA. In addition to the government grant agencies, the National Development Corporation has invested venture capital in projects ranging from hatcheries through grow-out to marketing. Training programmes are devised and funded by BIM and other government agencies.

The Irish farmed salmon industry appears to be set for a period of rapid growth which may require further government support in the form of a stock improvement programme and increased resources for export promotion. The development of a specifically Irish salmon stock capable of fast growth in the first sea year may ultimately allow Ireland to specialise in low-cost large grilse.

2.4 Projected Output 1990

This discussion of salmon and salmon producers can conclude with a forecast of production trends. Several factors make short-term forecasting reasonably accurate. The four year cycle of production, the lengthy process of obtaining licences and permits and the shortage of smolt means that present-day events will have a significant effect on output in 1990. Not only that, but a new type of investor is now interested in the farmed salmon industry; the conventional investor who looks for past performance as a guide to future prospects rather than the risk-taking pioneer investor. Salmon farming companies make their own forecasts with such an investor in mind.

Wild Atlantic salmon supplies are unlikely to increase beyond the consistent and stable 10,000 tonnes a year. Future farmed supplies however will be influenced by world salmon farming developments for both the Atlantic and Pacific types. Developments in Norway are particularly important for Atlantic salmon. Norway's industry currently produces at well below its licensed capacity and pressure is being applied to increase that capacity. Thus Norway could increase output at relatively low capital cost to on-growers, provided smolt shortages could be overcome and possible disease problems were solved. If increased output over the next few years had the effect of lowering producer prices, the reaction of large entrepreneurial producers in Norway would probably be to cut-back production. The crofter sector of the industry however may react differently in the short-term, choosing to increase production if price falls in order to meet target family incomes.

The world market for salmon will ultimately determine the limits to output, but the application of the latest technology suggests that Norway alone can produce up to 200,000 tonnes of salmon a year, the Faroes up to 10,000 tonnes a year (even when limited by smolt shortages), Scotland up to 30,000 tonnes and Ireland up to 15,000 tonnes. Consequently, Europe's technical maximum of farmed salmon output is in the order of 250,000 tonnes to 300,000 tonnes. Added to that would be the output from North America and the South Pacific, giving a very large figure for world output.

Competing with that world output of Atlantic salmon would be high value Pacific salmon, which with improved marketing, lower transport costs and a lower valued US dollar, could be highly competitive. Production from Japanese cage culture could also complicate the equation, although the results of Pacific salmon ranching and release programmes are unlikely to add large volumes of fish to the salmon market.

Various methods of forecasting future output of Atlantic salmon can be applied. As a result, the total farmed supplies of Atlantic salmon in 1990 are estimated here at 153,000 tonnes (Table 4). In contrast to this projection, the Norwegian Council for Scientific Research has forecast much less output by 1990, at 120,000 tonnes, because of 'market effects. It is those market effects and the total market for salmon, which must now be examined.

TABLE 4 ATLANTIC FARMED SALMON PRODUCTION AND PRODUCTION FORECASTS

Country	Forecast Production			
	1985 (tonnes)	1986 (tonnes)	1990 This report (tonnes)	1990 Norwegian CSR* (tonnes)
Norway	28,656	38,000	100,000	80,000
Scotland	6,921	9,700	25,000	13,000
Ireland	722	1,300	10,100	2,000
Faroes	600	1,200	6,000	10,000
Iceland	100	200	2,000	10,000
N America	100	500	7,000	2,000
Others	500	100	3,000	3,000
TOTAL	37,599	51,000	153,100	120,000

*Norwegian Council for Scientific Research

Source: Tables 3.20 and 3.21 of main report.

3. TRADE, MARKETS AND PROFITS

3.1 The Salmon Export Trade

Atlantic salmon are mostly sold fresh at the farm gate, weight graded in steps of 1kg, according to potential use. Grilse under 2kg are eventually sold as fresh, frozen or smoked salmon. Fish from 2kg to 3kg are sold fresh as salmon steaks or cutlets, or eventually smoked. Salmon between 3kg and 5kg are usually for the exclusive use of smokers whereas fish of 5kg or more are destined for caterers' displays. Fresh salmon has a shelf life of only 3 to 5 days at 1 deg C., whereas if it is subject to controlled atmospheric packaging (CAP), shelf-life is extended by up to two weeks. The product known as smoked salmon requires boned salmon to be smoked over burning hardwood chips. The end result is sold as sides, sides pre-sliced, or vacuum packed sliced pieces. Other ways of processing include marinating (gravad laks) and as recipe packs such as salmon and prawn crepe.

Five species of Pacific salmon are marketed in Europe and North America (the sixth, cherry salmon, is marketed only in Japan). Chinook or king

salmon, graded in 2kg steps, is ideally suited for smoking and is bought whole, dressed and frozen by the French, and headless by the Italians. Coho is graded to slightly smaller sizes (up to 6kg) and is highly prized either as a smoking fish or as a table fish. Troll caught chinook and coho usually realise the highest prices. Chum salmon (or keta, fall or dog salmon) is smaller on average than either chinook or coho (ie; up to 5kg) and much of it is canned. However, there is a fresh or frozen market for it in Sweden, France, West Germany and the UK. The remaining species, sockeye and pink salmon, are generally smaller fish than the other species and are the mainstay of the salmon canning industry.

No Atlantic salmon is canned, which means that international trade in the commodity is in the fresh, frozen or smoked forms. Trade in smoked salmon has grown slowly over the last few years compared to the substantial growth in trade in fresh and frozen salmon. Indigenous, under-utilised industries and tariffs against smoked salmon imports partially account for this. Of the seven principal exporters of Atlantic salmon, Norway is the chief, while Denmark (a non-producer) exports over 3,000 tonnes of fresh or frozen salmon and over 2,000 tonnes of smoked salmon. Denmark, of course, engages in entrepot trade, importing substantial quantities of Atlantic salmon from Norway and Pacific salmon from North America, and re-exporting processed produce. Denmark's classificatory labels of Atlantic and Pacific salmon may become a little blurred as a consequence. In all, over 31,000 tonnes of Atlantic salmon were exported in 1984 compared to only 11,000 tonnes in 1980 (Table 5).

Of the four nations which participate in the Pacific salmon fishery, only one (the USSR) does not engage substantially in international trade of that fish. Of the others, only the USA and Canada are exporters while Japan is a prominent importer. Exports of canned salmon have declined during recent years, partly due to an outbreak of botulism poisoning in 1981 which was traced to canned salmon. Fresh and frozen Pacific salmon exports however have grown at about 15% a year during the four years to 1984 (Table 5).

3.2 Imports, Present and Future

Atlantic salmon importers in 1984 were led by France (Table 6), but by 1985 they had been overtaken by the USA which imported 6,700 tonnes of Norwegian Atlantic salmon in that year. Fresh Atlantic salmon imports in all countries shown in Table 6 grew at a faster rate than either frozen or smoked imports. Pacific salmon imports are dominated by Japan whose purchases of frozen salmon grew by 23% a year in the four years to 1984. The remaining importers of frozen Pacific salmon appear to have stabilised their purchases during the four years to 1984 whereas imports of canned salmon appear to have declined during that period (Table 6). Japan mainly imports frozen sockeye and chum Pacific salmon while in Europe, France and Italy import coho and large chinook. Sweden, Denmark, Germany and the UK on the other hand favour lower-value species such as chum. Thus approximately half of Europe's imports of Pacific salmon are of high value species.

It is clear from Table 6 that the main growth in salmon imports is in Atlantic fresh and frozen, which when combined, have shown an average 33% increase in the four years to 1984. Pacific salmon imports in Europe, on the other hand, have languished. Although there is little probability that imported Atlantic salmon could make significant inroads into the

TABLE 5 MAIN EXPORTERS OF ATLANTIC AND PACIFIC SALMON
(in 000 tonnes)

Country	Product	Atlantic		Pacific	
		1980	1984	1980	1984
Norway	Fresh	3.0	17.5		
	Frozen	1.2	2.6		
	Smoked	0.1	0.3		
Denmark	Fresh	0.7	1.8		
	Frozen	1.2	1.3		
	Smoked	1.5	2.3		
Scotland	Fresh	0.3	1.8		
	Frozen	0.5	0.5		
	Smoked	0.3	0.6		
Ireland	Fresh	0.3	0.5		
	Frozen	0.4	0.1		
	Smoked	0.1	0.2		
France	Fresh	-	0.1		
	Frozen	0.2	0.4		
	Smoked	0.4	0.6		
Canada	Fresh	0.1	0.1		
	Frozen	0.5	0.3	17.8	25.0(e)
	Smoked	0.2	0.2		
	Canned	-	-	10.8	-
Netherlands	Fresh	-	0.1		
	Frozen	0.1	0.1		
	Smoked	0.2	0.1		
USA	Frozen	-	-	57.0	104.1
	Canned	-	-	33.6	22.3
TOTAL		11.4	31.7	119.2	151.4
	Fresh	4.5	22.0		
	Frozen	4.1	5.5	74.8	129.1
	Smoked	2.7	4.2		
	Canned	-	-	44.4	22.3

Note: Totals may not add exactly because of rounding.
e = estimated

Source : Tables 4.1 and 4.3 in main report

TABLE 6 MAIN IMPORTERS OF ATLANTIC AND PACIFIC SALMON
(in 000 tonnes)

Country	Product	Atlantic		Pacific	
		1980	1984	1980	1984
France	Fresh	1.5	5.4		
	Frozen	1.0	2.1	13.5	16.0
	Smoked	0.5	0.7		
	Canned	-	-	6.0	3.1
USA	Fresh	-	4.3		
	Frozen	-	1.1	2.6	6.4
	Smoked	-	0.3		
West Germany	Fresh	1.1	3.3		
	Frozen	0.7	0.6	2.6	1.6
	Smoked	0.9	1.3		
Denmark	Fresh	0.8	2.5		
	Frozen	1.7	1.2	2.6	2.7
	Smoked	-	-		
UK	Fresh	0.3	1.5		
	Frozen	0.9	1.3	4.0	3.8
	Smoked	-	0.1		
	Canned	-	-	25.9	22.2
Spain	Fresh	-	1.4		
Belgium/Lux	Fresh	0.3	1.1	17.8	25.0(e)
	Frozen	0.3	0.4	1.6	1.5
	Smoked	-	0.3	-	-
	Canned	-	-	-	3.6
Italy	Frozen	-	0.1	1.3	0.8
	Smoked	0.5	0.5		
Sweden	Frozen	-	-	4.6	5.5
Ireland	Canned	-	-	1.2	1.1
Japan	Frozen	-	-	35.6	82.2
TOTAL		10.5	29.9	114.7	157.8
	Fresh	4.0	19.9		
	Frozen	4.6	6.9	69.3	121.3
	Smoked	1.9	3.2		
	Canned	-	-	45.4	36.5

Note: Totals may not add exactly because of rounding.

Source : Tables 4.2, 4.4 and 4.5 of main report

Japanese market (where taste and cost factors appear to give the advantage to Pacific species) there is a strong possibility that Atlantic salmon could displace Pacific imports into Europe, especially into France. A simple forecast of imports is made here on the basis of extrapolating recent growth rates, but also assuming that Pacific salmon imports into France are displaced by Atlantic salmon to the extent of 50% and, as an alternative, 100%. Where direct extrapolation results are at odds with the known characteristics of the market, then adjustments are made; for example in the case of Japan and the USA. By 1990 therefore, total imports by the major consumers of Atlantic salmon will be between 150,000 and 180,000 tonnes, reflecting an overall annual growth rate of 30% (157,000 tonnes if Pacific salmon imports into Europe are not replaced by Atlantic salmon, 169,000 tonnes if 50% of French imports of Pacific salmon are replaced by Atlantic salmon, and 181,000 if 100% of French Pacific salmon imports are replaced by Atlantic salmon).

3.3 Consumption

In Europe as a whole, 1984 consumption of Atlantic salmon was 100gm per head; it was 90gm per head for Pacific salmon, including only high value species but excluding canned salmon. Highest consumer nation in that year was Sweden which averaged 110gm of Atlantic salmon per head and 660gm of Pacific salmon. In North America, USA consumed 20gm of Atlantic salmon per head but 360gm of Pacific salmon per head. Japan consumed 1.83kg of Pacific salmon per head in 1984.

In Europe at least, probably as much as 60% of all salmon (other than canned) is consumed as smoked salmon while 40% is retailed or consumed through the catering trade as fresh or frozen salmon. Salmon is 'cold smoked' (ie; at temperatures not sufficiently high to cook it) in smoke from burning hardwood chips. Texture and flavour are changed but shelf-life is still limited, ie; up to 21 days at 1 deg C. Although, traditionally, a high proportion of smoked salmon has been sold as whole sides, an increasing proportion is now sold in sliced or pre-sliced form; the latter being re-assembled into a whole side. Poor quality smoked salmon is frozen, so greatly enhancing its shelf-life. Peaks in the European smoked salmon market occur around Christmas and Easter, which implies processing peaks several weeks earlier. As a general rule, a gutted whole salmon yields only 65% of smoked product. Consequently, smoked salmon costs are very sensitive to the cost of whole salmon, which forms 75% of smoker's total costs. Most smokers in Europe appear to add a mark-up of 20% of sales price as their profit, provided they are selling a quality product. The high price of smoked Atlantic salmon (up to UK£13,00/kg ex factory in 1986) endows the product with prestige characteristics, although the price (which can vary substantially according to quality and presentation) must also create some consumer resistance.

Other fresh or frozen salmon products such as steaks, cutlets or joints, are currently benefiting from salmon's healthy image in the USA and Europe. The consuming public however has yet to discover that the meat yield from salmon is high compared to say chicken, which in effect means that salmon compares favourably in price with even the cheapest animal protein.

The generalised consumer response to price changes in fresh salmon is thought to be greater than their response to price changes in smoked salmon. Whereas smoked salmon demand is somewhat insensitive to price changes, fresh salmon demand appears to respond very positively to price changes. A Canadian study based on 1955-81 data for Atlantic salmon showed that a 1% fall in salmon price would lead to a 10% to 12% increase in demand - a price elasticity of demand of 10 or more. There is also a similar relationship to income and salmon consumption; a 1% rise in income will lead to a 3% - 6% rise in salmon demand. Salmon producers should be encouraged by these findings as they show that fresh salmon consumption will rise with income and that greatly increased quantities can be absorbed by the market with relatively small price declines.

3.4 National markets

Having considered the form in which salmon is sold and consumed, and the favourable relationship between price and consumption, and income and consumption, for fresh and frozen salmon, a brief survey of the principal national markets will prepare the way for a forecast of consumption in those markets.

i) United Kingdom

About 10,000 tonnes of fresh, frozen or smoked salmon and about 22,000 tonnes of canned salmon were consumed in the UK in 1984. Imports of fresh and frozen Atlantic and Pacific salmon exceeded exports of farmed Scottish salmon. In relative terms, smoked salmon accounts for a declining share of the market which, by 1985, was about 50% smoked and 50% fresh or frozen. Both Pacific salmon and farmed Atlantic salmon were favoured by smokers, which suggests that there is scope for replacing smokers' Pacific salmon with Atlantic farmed salmon. Production costs of smoked salmon varied between UK£8 and UK£13 per kg and high profit mark-ups were the rule. Smoked salmon retail prices were twice its cost price, depending on quality. The product appears to be price inelastic. The fresh and frozen sector of the market is growing, characterised by new retail outlets in supermarkets as well as traditional, but increasingly less important, fishmongers. In the catering sector, there appears to be growing demand for salmon in the pub food market, but a less buoyant demand in the up-market restaurants, where traditionally large fish are required. On balance, it seems reasonable to assume future growth in demand of 5% for smoked salmon, (with 75% of all Pacific salmon replaced by Atlantic salmon by 1990), 25% for retail sales (assuming a 5% price decline) and 25% for catering sales. By 1990, expected demand would be about 20,000 tonnes, of which 18,000 tonnes would be Atlantic salmon.

ii) France

Pacific salmon constitutes the bulk of French salmon consumption of about 30,000 tonnes a year, although Atlantic salmon accounts for an increasing proportion. About 70% of salmon is consumed as smoked salmon with particular areas preferring darker or lighter smoked colour. The major salmon smokers use 30% Atlantic and 70% Pacific salmon but the year-round availability of Atlantic salmon is leading to its increasing use by smokers. Although the highest grades of Pacific salmon will retain their market share, Atlantic salmon is likely to displace much of the lower value Pacific salmon. The best sliced smoked salmon retails for FFr450/kg (Scotch or Red King) whereas lower grade produce (smoked sliced coho or farmed Atlantic) sells for FFr220/kg to FFr260/kg. Price inelasticities are thought to exist for smoked salmon. Fresh salmon sales are almost exclusively Atlantic salmon; frozen salmon on the other hand tends to be low quality chum and pink salmon. The fresh market prefers fish under 3kg, for which there appears to be a somewhat price inelastic demand when sold through the traditional fishmongers. However, chain stores and hypermarkets are encroaching on traditional outlets and it is in this sector of the market where most growth is likely to occur. In the catering market, potential growth lies in the medium quality restaurants rather than the up-market or fast food establishments. Sold in steak form, cheap frozen Pacific salmon is generally perceived by the consumer to be inferior quality. Reasonably priced Atlantic salmon therefore could conceivably make inroads into the low price Pacific salmon market. Based on these observations, a forecast of future demand for Atlantic salmon can reasonably assume growth rates of 25% a year in sales of fresh Atlantic salmon, a maximum of 50% of the smokers market being captured by Atlantic salmon, growth of 2.5% a year for Atlantic smoked salmon in the medium price range and displacement of frozen Pacific salmon by competitively priced Atlantic salmon. Forecast demand by 1990 therefore is 46,000 tonnes, 35,000 tonnes of which will be Atlantic salmon.

iii) United States

As both producer and consumer of salmon, the USA ranks first in the world. From a total annual catch of over 300,000 tonnes, nearly 200,000 tonnes are consumed domestically, principally as canned salmon (116,000 tonnes). Exports of salmon, at about 130,000 tonnes annually, consist of frozen salmon (109 000 tonnes, 70% of which goes to Japan) and canned salmon (22,000 tonnes, 50% of which goes to UK). Domestic consumption of fresh or frozen salmon is about 70,000 tonnes while smoked or salted salmon consumption is only 6,000 tonnes. In 1985, the USA imported 14,200 tonnes of salmon, most of which was fresh, chilled or frozen (13,000 tonnes) with relatively small amounts of filleted (800 tonnes), smoked (320 tonnes) and preserved salmon (850 tonnes). The main foreign supplier was Norway (7,000 tonnes) followed by Canada. Salmon importers are concentrated in the Boston area from whence they supply wholesalers, distributors, hotels and restaurants. Several supermarket chains are investing in full seafood service sections in a bid to expand sales, but regularity and quality of supply are still of major concern to store buyers.

Importers responded to that concern with an 83% growth in 1984 and a 28% growth in 1985. Fresh salmon imports currently exceed frozen salmon imports and most of the increase is attributable to farmed Atlantic salmon from Norway. Smoked salmon imports, although of minute proportions, also increased between 1980 and 1985, Norway overtaking the UK as the largest import source followed by Canada and Ireland. The total smoked salmon market remains sluggish however, at only 8,000 tonnes and without special promotional effort may not be a future growth market. The quality and continuity of supply of farmed Atlantic salmon appeals to the USA market, particularly on the east coast where Atlantic salmon outsells the less expensive Pacific varieties and where the old seasonality of the market has almost disappeared. On the west coast, farmed Atlantic salmon is in demand during the Pacific salmon off-season (December to March). It is estimated that about 75% of farmed Atlantic salmon imports are sold through hotel and restaurant outlets and 25% through retail outlets. Generally, the US market seeks head-on gutted fish in grade sizes 2-3kg, 3-4kg and 5-6kg. Head-on fish exports to the USA are expensive in air freight, but the market judges the freshness of the fish by the gills. Imported fish, which is free of duty if fresh (5% ad valorem if smoked and 3.6% if prepared/preserved), requires a certificate that it is free of 'whirling disease'. Against a background of growing per capita fish consumption in the USA, the retail price of Atlantic salmon, sold as steaks or fillets, is between US$12.65 and US$16.20 per kg. This price is thought to be a factor limiting large increases in sales volume. Factors such as exchange rates and air freight costs may keep prices of imported salmon high, although Irish salmon air freighted to the USA by Aer Lingus pays a substantially lower freight charge than a similar product air freighted by SAS from Norway. These factors, and any others, such as increased competition from Pacific salmon producers, establishment of new Atlantic salmon farms on the east and west coasts, Chilean competition, the perceived ill-effects of the Chernobyl disaster on Norwegian salmon and the use of artificial colouring additives to salmon feeds, all subscribe to a less than optimistic prognosis for the US salmon market. Assuming demand for fresh imported salmon grows at 30% a year, that Chilean and New Zealand imports account for 6% of the market and that indigenous production of Atlantic salmon reaches 7,000 tonnes by 1990, then imports of farmed Atlantic salmon could be expected to rise to 21,000 tonnes by that year.

iv) West Germany

Over 77% of West Germany's 7,700 tonnes of imported salmon in 1985 was in fresh, chilled or frozen form, with the balance mainly in smoked form. With overall salmon imports (and therefore salmon demand) increasing at 14% a year, fresh salmon is gaining over frozen, and smoked salmon imports account for an increasing share of the total. As with the USA, Norway is Germany's main supplier of farmed Atlantic salmon, delivering to specialist importers in north German ports on a regular and reliable basis. Salmon smokers are normally responsible for their own imports which are either Atlantic salmon (mainly from Norway) or Pacific salmon (from North America). Smoked salmon accounts for 70% of salmon consumption, which helps to explain the doubling of smoked salmon

imports in the five years to 1985. Denmark has been the primary supplier of these increased imports, and is itself a large importer (and re-exporter) of Norwegian salmon. Fresh salmon is distributed throughout Germany by up to 200 fish wholesalers, supplying the retail and catering trades. The real price of all grades and types of salmon has fallen in the five years to 1985, perhaps reflecting partly the strength of the Deutsche mark in the foreign exchange market. Apart from a short-lived price surge in the early part of 1986, prices have recently fallen in line with trends in other countries. Seasonality accounts for some price variation over the year, with Christmas being the main consumption period. Fresh Atlantic salmon is not a strong retail product because of its high price. Its main outlet therefore is through up-market restaurants. What little retail fresh salmon demand there is appears to want a red coloured salmon rather than pink. Fish is supplied to the German market gutted with head-on, in sizes up to 3kg or 4kg for retail sale, and up to 7kg or 8kg for smokers. New suppliers to the West German market (such as potential Irish suppliers) must be able to match Norwegian reliability and cost of delivery if they are to compete successfully. Given the expected 2% or 3% growth in German per capita incomes up to 1990, demand for fresh salmon should grow by about 15% per year, and for smoked by about 8% per year. Atlantic salmon demand therefore by 1990 should be of the order of 7,200 tonnes.

iv) Denmark

Although a relatively insignificant consumer of salmon, Denmark has importance because of its entrepot trading and processing activities. Denmark's combined total of production and imports of salmon in 1985 amounted to 9,600 tonnes. Imported frozen Pacific salmon accounted for over 4,000 tonnes of this total. Traditional fish suppliers to northern Europe and expert fish processors, Danish smokers supply a competively priced smoked salmon based on chum Pacific salmon, imports of which increased markedly between 1984 and 1985. However, many Danish smokers are switching to farmed Atlantic salmon because of its regular availability, its quality and the decreasing price differential between it and the Pacific salmon. As Denmark's main market for smoked salmon (ie; West Germany) is very price-conscious, Danish smokers are also using an increasing amount of sea-trout, which is considerably cheaper than Pacific or Atlantic salmon, and which has been marketed as salmon (a practice which is now receiving the attention of West German authorities). The market for Danish smoked and other salmon is expanding while raw material costs are generally in decline. Producers however are less than ebullient at future prospects largely because their principal market in West Germany cannot be expanded indefinitely without serious deleterious effects, such as low-price supermarket chains threatening to dominate the market and demand substantial price cuts from suppliers. In effect, the Danes sense significant price inelasticities of demand in their main markets which makes them cautious, if not pessimistic, about the future.

iv) Spain

As one of the largest sea-food markets in western Europe, Spain is only just beginning to consume salmon in any significant quantity. Up to 1981, imports were largely frozen salmon from North America or Denmark, totalling about 400 tonnes a year. In 1981, Norway began supplying fresh farmed Atlantic salmon. By 1985, Norwegian and Danish exports to Spain for this product exceeded 1,400 tonnes, while frozen salmon imports (mainly North American) remained steady at about 400 tonnes. Three specialist importers, based in Barcelona and Madrid, organise the Spanish salmon trade and pay particular attention to the early summer and Christmas peak periods. Only about 10% of salmon imports are retailed; the remaining 90% are divided equally between caterers and smokers of whom there are six firms using fish sizes of 4kg or more. Caterers prefer smaller fish sizes (up to 4kg) and, because they tend to purchase smaller quantities, usually pay high prices for fresh salmon. Retail demand, such as it is, looks for fish in the 2kg to 4kg range with most fish being sold whole or steaked. The structure of retailing in Spain is generally less developed which means that retail fish sales rely on traditional fish shops and market stalls. The increased imports of (and presumably demand for) farmed Atlantic salmon have been earned at the expense of dramatic price falls. For example, Spanish wholesale prices fell by up to 40% between January and August 1986, mainly through intense competition between several Norwegian exporters. The Norwegian FFSO recently opened an office in Madrid which may result in a better co-ordination of exports in the future. Small amounts of Scottish salmon have been imported into Spain and salmon farming in a selected coastal area has commenced. Future growth in the Spanish salmon market will be assisted by the reduction of import duties on fresh salmon under the terms of Spain's EEC entry conditions. As members of the EEC, Scottish and Irish salmon farmers will benefit more than Norwegian salmon farmers, who must still face 2.5% duty on their salmon when EEC members' salmon will be duty free. The main future demand will be for fish of over 3kg, although there may be a growing retail market for smaller fish. An annual growth rate in the overall market of 35% is forecast here, making anticipated demand for Atlantic salmon about 7,000 tonnes by 1990.

3.5 Supply/demand imbalance and price effects

The country demand forecasts for Atlantic salmon up to 1990 suggest that world demand (including countries other than those summarised above, for whom a 20% per annum market growth is assumed) will be about 120,000 tonnes by that year, which is lower than the forecast made earlier by extrapolating import trends (150,000 to 180,000 tonnes). A qualified synthesis of both these forecasts would suggest that world demand for Atlantic salmon by 1990 is likely to be between 130,000 and 140,000 tonnes. The forecast of production given earlier (Table 4) suggests that nearly 160,000 tonnes will be supplied by 1990. Thus supply is likely to exceed demand by as much as 20,000 to 30,000 tonnes by the decade's end. The effects of such an excess of supply over demand could be felt by producers before 1990. In the short-term, it appears inevitable that there will be salmon business failures in all producer countries.

An apparent imbalance in projected demand and supply implies downward pressure on prices which in turn may mean reduced profitability for salmon farming enterprises. Future prices now need examination in the light of the market analysis.

Real prices for Atlantic salmon, based on CIF prices at Boulogne, have declined by an average of 3% a year for the last five years to 1985. The real price decline during 1986 is likely to be at least 15%. Part of this price decline can be attributed to a change in the price differentials between salmon grades, where recently the demand for very large fish (over 4kg) has slumped in the face of increasing supply. In Europe at least, over-valuation of the US dollar has reduced the price differential between Atlantic salmon and the most common Pacific salmon species (ie; coho and chum). Whereas coho (headed and gutted) once cost only 80% of Atlantic salmon sold round (ie; not headed and gutted), and chum only 50-60% of Atlantic salmon price, coho and chum since mid-1984 cost 95% and 75% respectively of Atlantic salmon prices. This movement in Pacific salmon prices has helped to expand the market for Atlantic salmon in Europe and could be an indication of the possible European floor price for Atlantic salmon. Norwegian and other exporters' experience in the USA suggests that if the dollar is over-valued (ie; worth more than US$1/UK£0.57 or UK£1/US$1.75), then exports to the USA will be encouraged. Conversely, if the US dollar is under-valued, exports to the USA will be jeopardised. Whether sold in Europe or North America, the lowest floor price of farmed Atlantic salmon cannot be less than the ex-farm production costs, including capital costs and adequate rewards for proprietors. Based on Norwegian and Scottish data, average ex-farm production costs are presently between UK£3.0 and UK£3.8 per kg. By the 1990s, new technology and the disappearance of less efficient producers is likely to bring down ex-farm production costs to about UK£3.0 to UK£3.12 per kg, in real terms.

Bearing in mind the estimates of total production of Atlantic salmon bearing up to 1990, the weakness in total demand and the probable price elasticities which apply, the real price forecast made in this report for the ten years to 1995 predicts substantial price falls up to 1989 (at least 25% in real terms), followed by a stabilisation of price reductions thereafter (about 1% a year - see Table 7). By 1990, the European wholesale price for Atlantic salmon is forecast at UK£3,496 per tonne (round) and by 1995, UK£3,324 per tonne (all in 1985 UK£s). These prices will be less than ex-farm cost prices for many smaller, less efficient farms, which means a contraction of the number of salmon producers, especially where they lack government support.

The effect of hardening real prices and narrowing margins over the next ten years will have profound effects on the attractiveness or otherwise of investment in salmon farms. In order to explore this effect, four 500 tonne/year salmon farm models were simulated on a computer, the first

TABLE 7 TEN YEAR PRODUCER PRICE FORECAST FOR ATLANTIC SALMON
(Fish delivered Boulogne)

Year	Assumed Annual Price Fall %	Salmon Price UK£/tonne	Grilse Price UK£/tonne
1985		4,600*	3,750*
1986	15.0	3,910	3,188
1987	5.0	3,715	3,028
1988	2.5	3,622	2,952
1989	2.5	3,531	2,879
1990	1.0	3,496	2,850
1991	1.0	3,461	2,821
1991	1.0	3,426	2,793
1993	1.0	3,392	2,765
1994	1.0	3,358	2,738
1995	1.0	3,324	2,710

* Base year historical price. For 1986 onwards, prices are in real terms, expressed in 1985 UK£s.

In late 1985, the exchange rate was about UK£1/US$1.40 (average for year UK£1/US$1.30). Up to October 1986, the observed real price fall was greater than the 15% shown above. Some of this was attributable to fluctuations in the values of European currencies.

Seasonal factors such as the Christmas demand were expected to lift the October 1986 price and reduce the extent of the annual fall for 1986.

Source : Table 5.3 in main report

three being integrated smolt and on-growing units employing different technologies, and the fourth being an on-growing unit only. The different integrated farm technologies were sea cages, Bridgestone cages and a land-based tank farm. The capital cost of the first model (sea cages) was UK£0.967 million, the second UK£1.279 million, the third UK£2.039 million and the fourth UK£0.804 million. The financial rates of return on each model were 18.8%, 14.9%, 3.6% and 16.2% repectively, with a fairly high risk factor in each case. For example, in the first model, the rate of return is halved if revenue falls by 10% (through a reduction in selling prices even greater than the 25% anticipated). In addition, should disease or unfavourable weather cause total stock losses periodically - say every five years - the rate of return becomes negative and the project loses all feasibility. Potential new entrants should therefore view the prospect of salmon farming with considerable caution; the days

of fast fortunes are over. The balance of advantage appears to lie with established efficient farms, which possess the resources needed for expansion, rather than with inexperienced new entrants with inferior sites and untrained personnel.

4. IMPLICATIONS FOR THE INDUSTRY

Because of rising output and generally falling real prices over the next five years, the established large producers of farmed salmon will be best able to reduce their operating costs in line with falling prices, and thus maintain to some extent, margins and profitability. In contrast, new entrants will experience high capital costs (as government grants become less generous), high operating costs (because of less favourable siting of farms and untrained personnel) and reduced margins as prices fall. There are several implications therefore for those concerned with running or encouraging the expansion of the salmon industry.

The price differential between salmon grades is shrinking, and smaller sizes of fish are likely to be in demand. The most cheaply produced small salmon is grilse whose production is favoured under Irish conditions. Therefore production policy needs to switch from trying to produce the largest possible fish per smolt, to producing the largest possible first sea year fish. Additional smolt production will be needed for this policy which may mean directing official support towards smolt producers. At the same time, salmon farmers using favourable sites should be encouraged to expand and gain maximum economies of scale from their existing work force and shore facilities.

The salmon market is rapidly becoming a buyers' market. Attention to every detail in selling the product will become crucial to success. The requirement is for carefully graded and handled fish, well iced, and moved rapidly to market with promptness and reliability. Quality standards must be maintained and consumer confidence in the product must be gained. To that end, an appropriate logo for a particular country's salmon acts as a focal point for promotional campaigns. The market holding the greatest scope for Irish sales expansion is that of the USA. However, the eventual value of this market will be dependent on the fate of the dollar and the degree of export co-ordination and market promotion directed to it.

Government support needs to concentrate on three areas; firstly the development of group marketing, secondly, state support for market promotion and development, and, thirdly, research into improved breeds of salmon, to select primarily for fast growing grilse which attain, say 3-4kg in their first sea year and which are tolerant of, or resistant, to the main diseases.

The Fisherman (B.C.) 6-23-89

LETTERS

The Fisherman welcomes letters to the editor. Letters must be signed and should be brief, if possible.

UFAWU stand on fish farms needs to be toughened

In a recent editorial entitled "Can the UFAWU represent salmon farm workers?" (April 21, 1989) union policy was outlined with respect to aquaculture — no ban on fish farming but strict regulations. Your position is reasonable and takes into consideration that workers in this industry require safe working conditions and decent wages.

However, it has now become apparent that salmon farming has become an even bigger problem than most had predicted in terms of mort disposal, industrial plastic garbage, destruction of marine wildlife, water pollution, antibiotics, price wars, fish escapement and numerous other problems.

The union's decision to embrace a "regulated" aquaculture industry does not take into account the burden that must be shouldered by the residents of the many communities that have to live with and pay for (through taxation) this new industry.

Our communities have lost funding in other areas, such as recycling, parks development and education as public money and expertise are poured into this industry.

We then must live with the mess created by people who don't care about local concerns and values and think that all you have to do is wave money in people's faces and they will swallow anything.

Both levels of government seem completely disinterested in regulating this industry. The new waste management laws for fish farms are not even worth the paper they are printed on. This industry is, and will continue to be, "self-regulating."

This industry has little respect for existing laws like the Fish and Wildlife Act or the Pest Control Products Act, so there is every possibility that new laws will be ignored as well.

In the wake of falling farm fish prices, many people are asking questions concerning the viability of fish farming. But regardless whether or not fish farming is sustainable or must continue to be subsidized by the public, there is no question the industry will continue to impact negatively on coastal communities.

The use of the biocide Nuvan 500 in Scotland to control sea lice is just one indication of what we can expect to see here if it hasn't already been used.

It is becoming more and more obvious that the economic benefits are confined to the fish farming industry while we must pay the social/economic and environmental costs borne out over the long term. Under these circumstances, phasing out fish farming during the next five years is become a more appealing and realistic alternative. Then we can get on with the real job at hand — rehabilitation and conservation of wild salmon stocks.

We would be pleased to present a slide show documenting industry abuses.

Claire Heffernan,
Citizens for Aquaculture Regulations,
POWELL RIVER

Puget Sound Fish Farms Challenged

By KEITH SCHNEIDER
Special to The New York Times

PORT ANGELES, Wash. — Salmon farmers in the Puget Sound region are encountering resistance this summer as they and a group of scientific critics clash over the safety of production practices, including the use of antibiotics.

The dispute, waged in public hearings around the sound, comes as the state's salmon farming industry is emerging from legal and legislative battles that have delayed its growth for two years. Local and state licensing panels are considering proposals that would expand the number of Puget Sound salmon farms to 20 from 13 in the next year.

The expansion here, however, and the prospects for the rest of the United States aquatic farm industry could turn on the ability to answer the critics and satisfy consumers that fish are safe to eat.

In 1969, when the first experiment in salmon farming was started in Puget Sound, aquaculture was seen as an intelligent, ecologically responsible way to raise food. The three million acres of Puget Sound offered deep clean water and many protected coves for raising fish in floating enclosures.

Aquatic farms produced 790 million pounds of fish and other seafood last year, or nearly 10 percent of the 8.1 billion pounds of fish and seafood consumed in the United States, the Federal Department of Agriculture says. But the growth in the $600 million aquaculture industry is slowing as Americans take a second look at the health attributes of fish.

Consumption Fell in '88

Last year, consumption of fish fell to about 15 pounds a person from 15.4 in 1987, the first decline since 1982. Experts attributed the drop largely to unease about ocean pollution.

Trout farmers and the South's catfish producers depend more than fish farmers here do on synthetic substances to control disease. Fungus, aquatic weeds and other threats to farm-raised fish thrive more readily in fresh water than in salt water, aquaculture specialists say. But the production practices in the other parts of the industry have not yet come under scrutiny as intense as salmon farmers now face in the well-populated Puget Sound area.

Though evidence is far from being clearly established, some biologists say antibiotics could be absorbed into shellfish and other organisms and make some bacteria resistant to the drugs.

Earlier this year, after a series of hearings by a House Merchant Marine and Fisheries subcommittee, the National Marine Fisheries Service began a study to develop new inspection procedures that would be modeled after existing systems that monitor for antibiotics in pork and beef. The study is scheduled to be completed in 1990.

of salmon, about equal to Washington's salmon harvest.

Maine's aquatic farms have also not been hampered by the intensity of the political conflicts of the industry in the Pacific Northwest. The northern Maine coast is less developed than the Puget Sound region, and many who live along the Maine coast make their living from the ocean.

"There is a highly vocal group of opponents who have argued for years that Puget Sound should not be developed for aquaculture," said Dr. Forster. "Now they are using the food safety issue as a point of argument.

The use of antibiotics worries some critics.

The real issue has always been aesthetic concerns about what should be the proper use of public waters."

Assurances From State

Since 1986, the State of Washington has set guidelines for establishing and managing fish farms and published a series of reports intended to answer questions and reduce anxieties. The reports provide evidence that fish farms properly situated in deep water with strong currents will not pose an environmental problem and have the potential to generate thousands of new jobs. The state's assurances have begun to persuade more counties and review panels to approve new fish farms.

Yet as the number of approvals increase, the dissent has also grown louder. And now critics are raising the safety of production practices to consumers as an important issue. The critics, led by Dr. Arthur H. Whiteley, a retired marine biologist from the University of Washington, assert that feed medicated with antibiotics is widely used on Washington State's 13 salmon farms to treat bacterial diseases.

Dr. Whiteley said that in some cases meat from fish treated with antibiotics may contain residues of the drugs, an assertion strenuously denied by salmon producers. In other cases, he said, antibiotics may be changing the genetic structure of aquatic bacteria infectious to other fish and to humans.

Critics Are Still Uneasy

It is well established scientifically that antibiotics fed to livestock and poultry cause bacteria to develop resistance to the drugs. The Federal Centers for Disease Control in Atlanta has traced some outbreaks of salmonella food poisoning in the Midwest to medicated cattle.

Three antibiotics are approved by the Food and Drug Adminstration for use on fish farms. The most commonly used is oxytetracycline. Fish farmers are required to stop using medicated feed weeks before salmon are sent to market, and residues are not present in the meat, said Dr. Forster and other industry executives.

But studies have shown that 90 percent of the antibiotics fed to fish are excreted in the feces. Last year researchers in Norway, the world's largest producer of farmed salmon, found that oxytetracycline persisted in the sediments below fish farms for months. Other studies have determined that aquatic bacteria developed resistance to the drugs.

Of particular concern to health specialists is the possibility that resistance to antibiotics could be transferred from bacteria that cause fish diseases to bacteria that cause illnesses in people. The most important of these is Vibrio parahaemolyticus, a bacterial strain known to cause severe digestive discomfort in people who have eaten infected shellfish.

In 1982, Japanese scientists showed that antibiotic resistance could be transferred to Vibrio parahaemolyticus, but the experiments were performed in very warm water. Kevin H. Amos, chief fish pathologist with the Washington State Department of Fisheries, said in an interview that Vibrio parahaemolyticus does not survive well in the cold waters of Puget Sound.

One of the most proficient of the Puget Sound area aquaculture farms is just on[illegible] geles harbor where Sea Farm Wash[illegible] ington built a four-acre salmon farm, one of the country's largest. Two 900-foot-long floating steel platforms are divided into 50-foot squares from which nylon nets are suspended to form pens 20 feet deep. Thousands of Atlantic salmon, a species more docile than the aggressive Pacific species, gleam in the clear, cold water like polished stones. This year, Sea Farm may sell more than 1 million pounds of salmon.

Dr. John Forster, who directs the Sea Farm operation here and is president of the Washington Fish Growers Association, a Seattle-based trade group, has worked for years to ease both technical and political problems. The Atlantic salmon, he said, has proved a delicate species in Pacific waters. Farms lose 40 percent of their fish, most of them when 15-month-old smolts, or young salmon, are transferred from freshwater hatcheries and put into saltwater net pens.

Washington's production problems are enabling Maine's aquatic farms to challenge Washington's for dominance in the domestic industry. The 7-year-old industry in Maine now numbers 18 to 20 farms, executives say. This year, Maine could produce 5 million pounds

New York Times

Alaska State Legislature

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Senate President Pro Tempore
Chairman, Senate Rules Committee

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Senate

M E M O R A N D U M March 14, 1989

TO: All Legislators

FROM: Senator Arliss Sturgulewski, Chairman
Senate Rules Committee

RE: Mariculture

Attached are two very informative articles on the issue of salmon farming. The first provides an overview of the Washington state experience written by Per O. Heggelund and published in the University of Washington Graduate School of Business magaz e "Executive."

The second is a U.S. Department of State current status report regarding salmon aquaculture in Chile.

Attachments

Salmon Farming In Washington: The Issues and the Potential

by Per O. Heggelund

A marine salmon farm, simply stated, is a floating structure of from one to 20 individual netpens (cages) that is anchored relatively close to shore. Salmon farmers can control the freshness, size, flesh color, fat content, and market availability of their products. During the off-season of commercially harvested Pacific species, for example, Washington's salmon farmers continue to supply consumers with fresh fish.

The saltwater farming operation actually begins in freshwater. Farmers strip ready-to-spawn broodstock salmon of eggs and sperm in the fall and winter months. Once fertilized, the eggs are stored in trays, boxes, or baskets fitted with mesh and are constantly flushed with water as they develop. The time from fertilization to hatching takes roughly 60 days, although the process varies with each species and is particularly sensitive to water temperature. When fry, or fingerlings, reach the feeding stage, they are moved to troughs or starting tanks.

Rearing fry to the smolt stage, at which time the fish are capable of adapting to a marine environment, takes from four to 15 months. Smoltification changes a fish's body shape and physical coloration. Once salmon reach this stage, the two- to three-ounce fish are transported to saltwater netpens to begin the grow-out phase, during which time they are given a commercial diet for from nine months (for coho) to two years (for Atlantic salmon). The fish are typically fed 2 percent of their body weight per day; between one and a half and two pounds of feed produce one pound of salmon.

Washington salmon farmers lose 50 percent, on average, of their salmon between the fertilization stage and the time when they can market fully developed fish. The common causes of loss are disease, predation, physiological maladjustment to seawater, escape from the netpens, stress, poor environmental conditions, and naturally occurring floating plants.

The Washington salmon farming industry is now at a crucial point in its development: the novelty of the process has worn off, farmers have been challenged by commercial fishermen and confronted by neighboring landowners, and the state's government has yet to commit itself to the support and promotion of the fledgling industry. At the same time, the demand for seafood continues to climb—both in the United States and the rest of the world.

Global Expansion

Salmon farming has experienced a remarkable global expansion in the last decade. The world production of salmon in netpens has increased more than tenfold, from 16 million pounds in 1980 to 215 million pounds in 1987. Industry projections for the next three years estimate that the amount of salmon raised in enclosures will burgeon to 490 million pounds. By 1990 the world production of farmed salmon will represent almost 25 percent of the total salmon harvest.

This increase in the production of farmed salmon has occurred during a period when traditional salmon fisheries hit an all-time high. This worldwide peak in the wild catch was recorded in 1985, when 1.8 billion pounds of salmon were taken. Since that time, the harvest has dropped to 1.5 million pounds, and most experts predict further declines by the beginning of the next decade.

The increase in aquaculture has been attributed to a jump in the production of Atlantic salmon—152 million pounds of Atlantics were farmed in 1986, compared to 26 million pounds of Pacific salmon. By 1990, if current trends continue, it is possible that the world farmed production of Atlantic salmon will exceed 320 million pounds and that the Pacific salmon total will hit the 140-million-pound mark.

The Scope of the Industry in Washington

The state of Washington's environmental assets and existing infrastructure make it an ideal area in which to establish a salmon farming industry for both Pacific and Atlantic species. The environment's physical and climactic characteristics are similar to such successful salmon growing areas as Norway and Chile. Numerous coastal inlets, fjords, and embayments provide sheltered areas for floating salmon farms. Ocean temperatures, which vary from 43 degrees to 61 degrees Fahrenheit, are within the optimal temperature range for salmon culture, and Atlantic salmon, for example, can grow to more than 80 percent of their annual maximum attainable weight. The Washington Salmon Growers Association estimates that the Puget Sound's 870,000 surface acres are

© Per O. Heggelund

capable of supporting at least 300 acres of farms, which could generate $225 million in revenue annually.

In addition to the state's geographical features, Washington's Department of Fisheries is noted for its salmon enhancement programs, and the region has well-developed academic, commercial, and scientific communities to support the salmon farming industry.

Atlantic salmon, Pacific salmon (chinook and coho), and Donaldson steelhead are grown in farms throughout the Puget Sound region. Pan-sized coho salmon weighing from one-half to three-quarters of a pound are produced in floating marine netpens or in freshwater ponds and raceways. Atlantic salmon, which were introduced from Eastern North America and Western Europe, are grown in netpens in the Puget Sound and are usually marketed in size lots of four to six pounds, six to nine pounds, and nine to 11 pounds per fish.

The largest producer of farmed salmon in the United States—and, perhaps, the world's most extensive salmon farm—is Domsea Farms, Inc., which operates at Clam Bay near Bremerton. Domsea, a subsidiary of Campbell Soup, produced 5.4 million pounds—58 percent of the state's salmon total—in 1987. There are 11 other commercial farms, which produced 4 million pounds of fish, in the Puget Sound, and applications for approximately 20 additional commercial farms are pending.

PAT CHAPIN

Looking for the Ideal Salmon

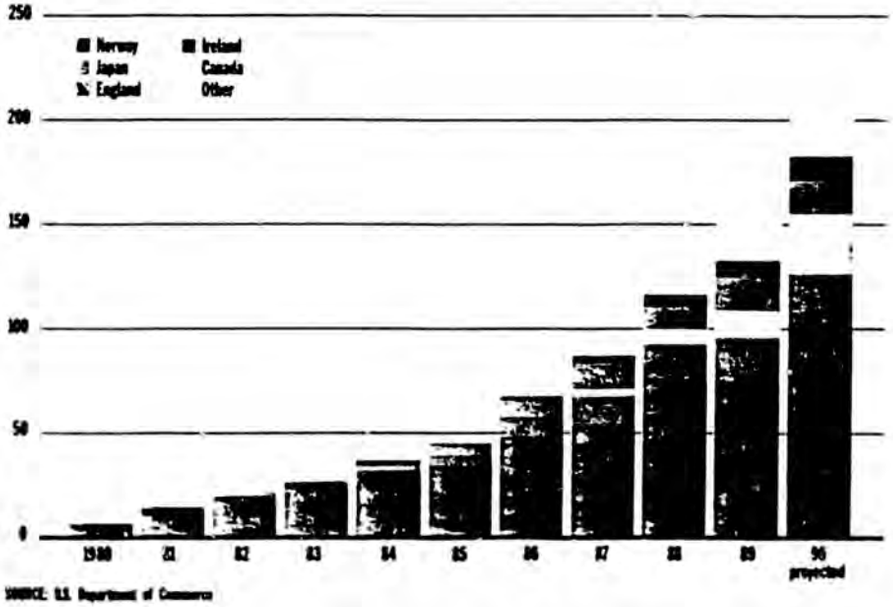
The ideal salmon probably doesn't exist, but researchers and growers have experimented with four different salmon species—coho, Atlantic, chinook, and Donaldson steelhead—to determine which is best suited for farming in the Puget Sound. The biology of salmon and trout is better understood than most other cultivated fish, and this scientific and technical insight has been used to manipulate and advance the aquaculture of these species.

The prominent status of salmon farming in Washington, relative to other regions, is based on the state's long history of scientific research in this field. In 1960 the first salmon farming experiments occurred simultaneously at the Department of Commerce's National Marine Fisheries Services (NMFS) in Seattle and at the Bergen Aquarium in Norway. In fact, a strain of rainbow trout developed by Professor Lauren Donaldson of the University of Washington gave Norway's commercial salmon farming industry its start.

Coho Salmon. In the late 1960s, Domsea Farms, in conjunction with the National Marine Fisheries Services, conducted a feasibility study to investigate the production and marketing of pan-sized salmon that had been raised in saltwater netpens. By the mid-1970s, Domsea Farms was joined by Pacific Ocean Farms, Mariculture N.W., and Aquasea. The Weyerhauser Corporation conducted its own feasibility study in Henderson Inlet near Olympia, and later purchased Oregon Aqua Foods, a large producer of pan-sized coho and a leader in the ocean ranching business. As the saltwater farming industry developed, the demand for coho smolt rose, and a number of small freshwater growers went into business.

Swecker Salmon Farm, located near Rochester, Washington, was one of the early leaders in freshwater smolt production; the operation began in 1974, with a contract to produce 200,000 half-ounce coho smolt. Today Dan and Debbie Swecker's annual production of coho totals 200,000 pounds of 7- to 12-ounce pan-sized salmon and 400,000 fingerlings and smolt. The Rochester area, known for its high-quality aquifer, is the site of three hatcheries, which produce smolt for

Farmed Salmon Production
In thousands metric tons



SOURCE: U.S. Department of Commerce

their own saltwater operations, and two other salmon farms that raise pan-sized salmon—Steelhammer Salmon Farms and Carlson Salmon Farms. The Rochester operations use circular ponds or tanks and pump ground water from local wells. Two other freshwater growers near Morton, Washington—Cascade Aqua Farms and Glenoma Trout Farms—divert stream water through manmade ponds to raise pan-sized salmon. Cascade, like most other salmon farms in Washington, has recently deemphasized its production of coho in favor of Atlantic salmon.

Atlantic Salmon. The National Marine Fisheries Service has selectively bred and domesticated Atlantic broodstock for more than 15 years. At the Manchester Research Station, which is headed by Conrad Mahnken, researchers have noted that Atlantics have a number of advantages over chinook and coho salmon. Mahnken reports that Atlantics grown in a netpen can weigh more than 20 pounds. Coho and chinook, however, are not likely to grow heavier than six pounds. Adult chinook can be afflicted by diseases that are foreign to Atlantics. The Atlantic salmon are tame, due to their long domesticated history, but the wilder chinook need deeper and wider netpens to mature. Both species are fed an identical diet, and they taste about the same. Given the Atlantic salmon's relative ease of farming and the similarity in taste, Mahnken comments, "Why farm peacocks, when you can farm chickens?" Most salmon farmers in the Puget Sound have taken that advice to heart.

The popularity of Atlantic salmon has a long legacy in the Pacific. Early in this century, biologists in British Columbia unsuccessfully introduced Atlantics in an effort to build additional wild salmon runs. Conrad Mahnken and his staff started farming Atlantic salmon in the Puget Sound in 1972, when the National Marine Fisheries Service began developing aquaculture. Mahnken obtained his first Atlantic, a Canadian strain from the Gaspe Peninsula in the Gulf of St. Lawrence, from the Wizard Falls hatchery in Oregon. The Wizard Falls hatchery had been raising salmon in ponds since the 1950s and used them to improve sportfishing in the area.

Washington's salmon farms have obtained Atlantic eggs for their hatcheries from Mahnken's project and from other superior overseas broodstock. Scan Am, one of the first farms in the Puget Sound to emphasize Atlantic salmon, plans to produce 4.5 million pounds annually within the next two to three years, and Seafarms of Washington, located in the Port Angeles harbor, intends to harvest approximately 1.5 million pounds in the same time period. Global Aqua, the new owner of Domsea's netpens and a supplier of salmon smolt for local farms, has abandoned coho smolt production in favor of Atlantic salmon. Swecker Salmon Farm plans to increase its production of smolt to 800,000 by 1989.

Chinook Salmon. The popularity and success of Atlantic salmon farming in Washington has created a demand for Atlantic smolt that has, during the last few years, far surpassed the local supply. This scarcity has prompted Northwest farmers to experiment with raising local chinook stocks in netpens.

The initial reports from the Washington and British Columbia farms express cautious optimism. Canadian salmon farmers, who are restricted by federal and provincial regulations from importing Atlantic salmon seed stock, are particularly hopeful about the commercial applications of chinook. Washington farmers have found that chinook salmon are a better alternative than coho for aquaculture, especially if Atlantic smolt are in limited quantities and part of the farmer's grow-out facility is idle.

The chinook is far from domesticated, and these salmon must be raised in conditions that provide them with a greater volume of water per fish than the Atlantics require. This drawback limits the number of chinook that can be raised per facility, because farms in Washington State are regulated as to the number of surface areas they can cover. In addition, salmon farmers typically sell chinook for 35 to 50 cents less per pound relative to Atlantics. Chinook are similarly priced with Donaldson steelhead.

Donaldson Steelhead. This steelhead is perhaps the first designer salmonid ever produced. The steelhead-rainbow trout hybrid has a genetic trail that leads back to Lauren Donaldson's superspawner, a fish named Susie, developed at the University of Washington. Donaldson produced his cross in the early 1960s, and fertilized eggs from the hybrid were exported to Scandinavia, where the steelhead has become an important contributor in the commercialization of the salmon farming industry, particularly in Finland.

Although the hybrid hasn't been fully commercialized in Washington, the Finns produced 30 million pounds of this species last year. In recent months, innovative Washington salmon farmers obtained permission to import Donaldson steelhead eggs from Finland. Dan Swecker of Swecker Salmon Farm has demonstrated that he can produce a Donaldson steelhead smolt in six months, which is less than half the time it takes to raise Atlantics to that same stage. In the Puget Sound, the steelhead has outperformed the predictions of the most optimistic experts, and the strain appears to be more disease resistant and faster growing than Atlantic salmon.

Markets and Competition

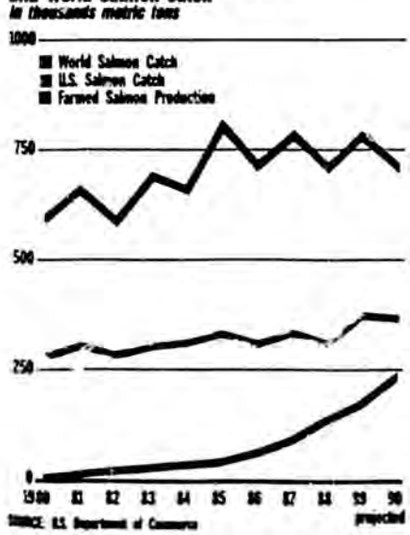
More than three decades ago, the oceans, we thought, contained an enormous untapped supply of seafood. Between 1950 and 1970, the world catch increased from 46 billion to 145 billion pounds, and per capita consumption grew from 19 to 39 pounds. The percentage of annual growth

in the total catch outpaced world population increases until 1970. From 1970 to 1985, the world's catch increased 29 percent, and population grew 33 percent. The Food and Agricultural Organization of the United Nations projects that global demand for aquatic species could reach 250 billion pounds by the end of the century, but production estimates for the same period total only 210 billion pounds. The seafood supply will need to grow at rates well above those of recent years to keep pace with anticipated increases in demand.

The global demand for seafood has important implications for U.S. markets. Consumer demand for seafood in the United States has grown steadily: between 1980 and 1986, per capita consumption rose from 13 to 15 pounds, an increase of almost 15 percent. The rise in consumption has been the result of increases in income, changing lifestyles, and a greater awareness of the health benefits of seafood.

America's growing appetite for seafood is satisfied by a combination of domestic supplies and imports. As U.S. catches of groundfish, salmon, shrimp, lobster, and crab have approached or exceeded the species' maximum biological limits, seafood from foreign fisheries and aquaculture has been imported to meet the increase in consumption. The net result is a persistent seafood trade deficit that has grown from $2.6 billion in 1980 to $7.1 billion in 1987 and shows no sign of diminishing.

Farmed salmon production, and U.S. and world salmon catch
In thousands metric tons



If the upward trend in seafood demand continues, the United States is going to need new sources for seafood in the 1990s. Based on recent projections by the Department of Agriculture, per capita seafood consumption will increase between 5 and 17 percent (above the 1986 base) by the century's end, boosting per capita consumption to between 16 and 18 pounds. In the last decade alone, U.S. imports of fresh farmed salmon rose from 1.6 million pounds (worth $3.9 million) in 1980 to more than 28 million pounds (almost $78 million) in 1986. The U.S. catch of salmon increased 60 percent between 1970 and 1986, but the quantity of salmon available for the domestic market actually declined. Salmon exports in those same 16 years jumped from 28 million pounds to 352 million pounds.

The world's leading salmon farming nations are Norway, the United Kingdom, and Japan. In 1986 these three countries produced approximately 90 percent of the world's farmed salmon. Norway's Atlantic salmon farms have shown the most dramatic growth—from 9 million pounds in 1980 to 100 million pounds in 1986—and that country's salmon farming industry accounts for 75 percent of the world's commercial production of Atlantic salmon.

The key to the short-term global production of salmon is Norway, which could farm as much as 220 million pounds of Atlantic salmon by 1990. The United Kingdom, too, has expanded its production and has superseded Japan as the second largest producer of farmed salmon. Other countries that are rapidly expanding their pen-farmed salmon industries are Ireland, Iceland, the Faroe Islands, Canada, and Chile.

Chile and British Columbia, in the future, are most likely to become Washington's strongest competitors in the U.S. market. British Columbia's advantage lies in the province's positive investment climate for salmon farming, effective trade barriers that protect the fledgling industry, and the region's proximity to the U.S. market. Chile's competitive status is based on low operating costs and its location in the Southern Hemisphere, which adds six months to the fish's growth cycle before it matures. As a result, Chilean salmon can be harvested at an ideal time for a northern market.

Chile's salmon farming industry has shown explosive growth in the 1980s: salmon farming was nonexistent five years ago, yet the industry will produce 18 million pounds in 1988-89. According to Chilean officials, the country now has 100 salmon farms and 25 hatcheries in operation, and these facilities represent an annual production capacity of 100 million pounds of salmon.

The country's geographic location makes it such a formidable competitor. Chile can produce a larger salmon in the off-season, and because of its proximity to the extensive anchovy resource off South America, local farmers have the advantage of low feed costs. In addition to these advantages and savings, Chilean labor costs are only 65 percent of those in North America and Europe.

Chile has the competitive advantage on the East Coast of the United States, and British Columbia holds the dominant position on the West Coast. In fact, when delivering to Western states, British Columbia can reduce its freight costs by 50 percent. These same delivery expenditures double for Chilean and European producers.

This competitive advantage has catalyzed the development of the British Columbia salmon farming industry, which parallels



that of Chile in many respects. The Canadian industry was virtually unknown prior to the 1980s. Today, 125 farms and 30 hatcheries are operating commercially in the province, and these facilities have a projected capacity of 70 million pounds of salmon, which is destined in large part for the U.S. West Coast market. This market focus by the B.C. salmon farmers may eventually create conflict with Washington's developing industry.

Conflicts and Issues

In Washington, the salmon farming industry has been confronted by a number of conflicting interests and major issues. Pacific Coast salmon fishermen, for example, are deeply concerned about the effects of salmon farming on their industry. They see the continued development of netpen farms as a source of competition, both in domestic and foreign markets and in the state's waterways. In some instances, farms occupy the same physical space that fishermen once considered theirs. Fishermen have also criticized salmon farms for the environmental damage that results from the organic wastes produced by floating netpens, for the genetic deterioration of native fish that results from interaction with farmed salmon that have broken free of their netpens, and for the introduction of exotic diseases from nonnative species.

Neighboring landowners argue that the existence of floating salmon farms and their shoreline support structures reduce local property values. Netpens, the landowners maintain, increase the risk of environmental pollution and visually mar the pristine waterways of the Puget Sound. The upland owners, in coalition with local salmon fishermen, have effectively lobbied the Washington State Department of Natural Resources to delay or prevent the department from issuing salmon farm licenses. The lobbying effort, in some cases, has been so thorough that local counties have issued moratoriums on salmon farms within their jurisdiction under the auspices of the Washington Shoreline Management Act.

In addition to these actions, salmon farmers in Washington face an increasing number of nontariff trade barriers. These restrictions stem from a multitude of inconsistent domestic and international regulations that govern the salmon industry. In general, the regulations have been created to protect and preserve the health and viability of marine species. Legislative inconsistencies, however, could pose a threat to the development of the state's salmon farming industry. The federal government, for example, lists salmon as the nation's principal commercial species, with a market value of $600 million, yet, under the terms of the Lacey Act, defines the fish as an "injurious wildlife" species, a designation that typically restricts trade. State regulations make it particularly difficult to trade live salmon products between East Coast and West Coast states. In Canada, federal and provincial regulations prohibit the importation of live fry, smolt, and broodstock from Washington. British Columbia can, however, export these same products to Washington and does so on a regular basis.

Future Prospects

Although these conflicts are troublesome and evoke strong emotions, it is unlikely that they will completely stall the growth of the state's salmon farming industry. To minimize the conflicts, Governor Gardner announced a policy in 1987 to promote aquaculture and, at the same time, maintain Washington's environmental safeguards. The governor also directed state agencies to develop a more coordinated siting process and to reduce current controversies.

While the governor's policy statement is being implemented, the state's salmon farming industry gradually expands. By 1990 the existing farms and the newcomers will harvest 25 million pounds, with a sale value of $75 million. If some of the proposed new technology for fish farming is implemented, this industry estimate may even prove conservative.

At Westport, for example, one company is proposing to establish a land-based salmon farm that will pump seawater into its facility. This venture will eliminate some of the environmental and esthetic objections. Another new high-tech project is proposed for the offshore waters of the Strait of Juan de Fuca. In this unprotected waterway, Seafarms of Washington has been permitted to install ocean netpens for salmon. These enclosures would be located so far offshore that conflicts with landowners would be minimized. Recreational and commercial fishermen, too, should be appeased by this venture's less controversial site.

At some point, however, the introduction of sophisticated technology offers only a marginal return, and salmon farming becomes uneconomical relative to the less technical operations that are based in Chile and British Columbia. Before that happens, Washington's political leadership should assert itself and avoid the narrow focus or half-solutions that have in the past been promoted by the state's regulatory agencies. The salmon farming industry needs a serious aquaculture development strategy based on a positive investment climate. In other states and nations, salmon farming has been successfully promoted and developed by the combined efforts of political and financial leaders. Such leadership could secure Washington's future as the world's foremost supplier of salmon.

Per O. Heggelund is the president of Aqua-Seed Corporation, which supplies seedstock to the aquaculture industry, and publisher of a quarterly industry newsletter. He received an M.Sc. in fisheries and an MBA from the University of Washington.

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SUBJ: CURRENT STATUS OF CHILEAN SALMON INDUSTRY

1. SUMMARY: SALMON AQUACULTURE IN CHILE SHOWS THE FASTEST GROWTH OF ALL ECONOMIC ACTIVITIES, AVERAGING 60 PERCENT GROWTH IN VOLUME, ANNUALLY. THE SALMON AQUACULTURE INDUSTRY IS STILL AT ITS EARLY STAGES OF DEVELOPMENT. NEVERTHELESS, LAST SEASON'S EXPORTS REACHED 3,500 MT WORTH US$20 MILLION. EXPERTS FORESEE THAT SALMON AQUACULTURE COULD GROW TO 25,000 MT BY 1990, EQUATING AT CURRENT PRICES TO MORE THAN US$100 MILLION. TWO THOUSAND WORKERS AND PROFESSIONALS ARE CURRENTLY INVOLVED IN AQUACULTURE ACTIVITIES. UNEMPLOYMENT DECLINES WHERE SALMON PRODUCING ACTIVITY STARTS. LABOR IS GETTING SOME 2% THE WEALTH GENERATED BY THE SALMON INDUSTRY AND WORKERS ARE BEING PAID ABOVE THE AVERAGE SALARY IN THE FISHING INDUSTRY. THE TENTH AND ELEVENTH REGION (LOCATED BETWEEN THE SAME LATITUDE AS PHILADELPHIA AND MAINE'S BORDER WITH CANADA) ARE FACING AN UNPRECEDENTED ECONOMIC BOOM: SERVICES ARE DEVELOPING AT A FAST PACE TO COPE WITH THE DEMAND GENERATED BY THE SALMON AQUACULTURE INDUSTRY. BANKING, COMMUNICATION, TRANSPORTATION, HOUSING AND SCHOOL SERVICES ARE ALL GROWING. THE EXPECTED FINAL EFFECT OF THIS GROWTH WILL BE AN INCORPORATION OF THESE CURRENTLY ISOLATED AREAS INTO THE MAINSTREAM OF THE CHILEAN ECONOMY.

2. BACKGROUND

-A) SALMON AQUACULTURE ECONOMICS: CHILE'S ECONOMY HAS BEEN GROWING AT A POSITIVE RATE FOR THE LAST THREE YEARS--BETWEEN 5 TO 6 PERCENT PER ANNUM--AND THE SALMON AQUACULTURE INDUSTRY IS CONTRIBUTING TO THIS GROWTH, AVERAGING 60 PERCENT PER L ANNUM IN VOLUME, RESULTING IN ONE OF THE FASTEST GROWING AREAS OF THE CHILEAN ECONOMY. CHILE DOES NOT HAVE A NATIVE SALMON POPULATION, SO ALL PRODUCTION COMES FROM NET PEN RAISED SALMON. INDUSTRIAL SALMON AQUACULTURE BEGAN ONLY SOME EIGHT YEARS AGO, HOWEVER, LAST SEASON (DECEMBER 1987 TO APRIL 1988) THE TOTAL HARVEST WAS 3,500 MT--WORTH SOME 20 MILLION DOLLARS IN EXPORTS--AS COMPARED TO EIGHT YEARS AGO WHEN THERE WERE NO SALMON TO EXPORT. EXPERTS AGREE THAT CHILE WILL PRODUCE NEARLY 25,000 MT BY 1990--WORTH 100 MILLION DOLLARS IN EXPORTS.

-B) SALMON SPECIES AND ITS MARKETS: CHILE'S SALMON INDUSTRY CULTIVATES PACIFIC AND ATLANTIC SALMON, BOTH ARE INTRODUCED SPECIES SINCE THERE ARE NO NATIVE SALMON SPECIES IN CHILE. THE INDUSTRY PRODUCTION IS ALL FOCUSED ON EXTERNAL MARKETS, WHERE THE U.S. AND JAPAN ARE CHILE'S LEADING BUYERS, WITH 78.8 PERCENT OF ALL CHILE'S SALMON EXPORTS. THE U.S. ALONE BOUGHT 45,6 PERCENT OF CHILE'S SALMON IN THE 1987/1988 SEASON.

-C) AQUACULTURE INDUSTRY: THE INDUSTRY IS LOCATED IN CHILOE (TENTH REGION) AND AYSEN (ELEVENTH REGION)--BETWEEN LATITUDE 42 AND 47 SOUTH, CORRESPONDING TO THE SAME LATITUDE OF PHILADELPHIA AND MAINE'S BORDER WITH CANADA. THE INDUSTRY IS CHARACTERIZED BY LARGE FIRMS--33 PERCENT OF THE PRODUCERS HAVE AN INSTALLED CAPACITY BETWEEN 300 AND 1,200 MT/YEAR--AND IN THE 1987/88 SEASON ONE FIRM ALONE EXPORTED ONE THIRD OF TOTAL SALMON EXPORTS. NEW FIRMS ENTERING THE INDUSTRY RANGE FROM THE SMALL TO THE VERY LARGE--THE FIRST BEING MAINLY LOCAL INVESTORS WHILE THE LATTER MOSTLY LARGE INTERNATIONAL SALMON AQUACULTURING COMPANIES--BRITISH, SCOTTISH, DANISH, NORWEGIAN, JAPANESE, US AND CANADIANS. AS FAR AS THE INDUSTRY'S FISH EGG SUPPLY IS CONCERNED, THE U.S. HAS AN IMPORTANT SHARE OF THE SUPPLIES IMPORTED BY CHILE FROM ABROAD--40 PERCENT OF FERTILIZED EGGS COME FROM THE U.S.--WHILE CANADA IS ANOTHER KEY SUPPLIER. SPECIALIZED MACHINERY AND EQUIPMENT COME MOSTLY FROM THE US AND EUROPE. JAPAN HAS NOT GAINED YET A NAME FOR AQUACULTURE EQUIPMENT.

-D) COMPARATIVE ADVANTAGES: THIS INDUSTRY HAS GROWN IN CHILE AS A CONSEQUENCE OF A PROPITIOUS CONFLUENCE OF: NATURAL CONDITIONS, UNPOLLUTED WATER IN THE SOUTHERNMOST REGIONS, ABUNDANT RAW MATERIAL TO FEED SALMON--FISH MEAL (CHILE IS THE LARGEST WORLD EXPORTER OF THIS FOODSTUFF), A FAVORABLE INVESTMENT CLIMATE, AND WELL TRAINED MANPOWER. THIS GROWTH IS OPENING NEW OPPORTUNITIES FOR PEOPLE FORMERLY PART OF A SUBSISTENCE ECONOMY COMPRISED OF AGRICULTURE AND FISHING ACTIVITIES. IN THESE REMOTE REGIONS ISOLATION IS FADING AWAY AS THE AQUACULTURE INDUSTRY HELPS IMPROVE COMMUNICATIONS.

-E) AN EXAMPLE OF THE GROWING INTEREST OF LOCAL AND FOREIGN COMPANIES: FUNDACION CHILE--A CHILEAN PRIVATE FOUNDATION FUNDED BY THE GOC AND ITT--ESTABLISHED "SALMONES ANTARTICA" (SA) AS A PILOT PROJECT FIRM TO DEMONSTRATE THE VIABILITY OF A SALMON INDUSTRY. SA STARTED IN 1988 A SALMON HATCHERY BY IMPORTING FERTILIZED SALMON EGGS FROM THE U.S.A. AND USING THEM ALONG WITH EXTENSIVE SALMON AQUACULTURE TECHNIQUES, I.E., OCEAN RANCHING. BUT LOW SALMON RETURNS AND THE LACK OF CLEAR LEGAL PROPERTY RIGHT RULES APPLICABLE TO THE RETURNING SALMON, MADE THIS COMPANY SWITCH IN 1983 TO INTENSIVE AQUACULTURE TECHNIQUES, I.E., NET PEN RAISING. HAVING THESE TWO TECHNOLOGIES TO DO RESEARCH, SA KEPT ADDING NEW ELEMENTS TO THEIR SYSTEM, MAKING IT A WHOLLY VERTICALLY INTEGRATED OPERATION, FROM FERTILIZED EGG PRODUCTION TO SPECIALIZED SALMON FOOD FORMULATION, TO PRODUCTION AND MARKETING. AS SA ADDED NEW AQUACULTURING AREAS--CHILOE, THEN AYSEN AND FINALLY MAGALLANES--THEY BEGAN DOING MARKETING RESEARCH, AND DEVELOPED THEIR OWN BRAND--GOURMET'S CHOICE--TO SELL FRESH, FROZEN OR SMOKED SALMON PRODUCTS. ALONG THIS PROCESS SA BUILT A SALMON FOOD PROCESSING PLANT--EXPERIMENTING AND RESEARCHING SALMON PROCESSING TECHNOLOGY--AND INSTALLED A FISH PROCESSING PLANT TO PRODUCE FRESH DRESSED AND FROZEN SALMON FOR EXPORTS. A SMALL PILOT PLANT TO PRODUCE SMOKED PRODUCTS WAS ALSO INSTALLED. AFTER FOUR YEARS OF HAVING STARTED THE INTENSIVE AQUACULTURE PRACTICE IN CHILE, SA BECAME THE LARGEST SALMON PRODUCER WITH A POTENTIAL TOTAL OUTPUT OF 1,500 MT OF SALMON PER ANNUM (CURRENTLY SA'S OUTPUT IS 50 PERCENT OF ITS POTENTIAL TOTAL OUTPUT). IN 1988, FUNDACION CHILE DECIDED TO SELL THEIR SALMON AQUACULTURE FACILITIES TO MEET THEIR MANDATE OF TRANSFERRING TECHNOLOGY AND EXPERTISE TO PRIVATE INDUSTRY. SA CHOSE CITICORP TO

HANDLE THE SALE. AFTER A LARGE ADVERTISING CAMPAIGN TO ATTRACT POTENTIAL BUYERS, 22 LARGE CHILEAN AND FOREIGN COMPANIES PARTICIPATED IN THE BIDDING PROCESS. PARTICIPATING BIDDERS WERE MOSTLY COMPANIES WITH KNOWN EXPERIENCE IN SALMON AQUACULTURE. MOST BIDS WERE IN THE RANGE OF 9 TO 10 MILLION DOLLARS, HOWEVER THE WINNING BIDDER--THE JAPANESE COMPANY NIPPON SUISAN KAISHA LTD. (NSK) OUTBID OTHERS BY OFFERING 22.3 MILLION DOLLARS. NSK IS THE PARENT COMPANY OF "EMPRESA DE DESARROLLO PESQUERO DE CHILE (EMDEPES)"--EMDEPES IS ONE OF THE OLDEST FISHING COMPANIES OPERATING IN CHILE WITH FACTORY VESSELS, HOWEVER, EMDEPES DID NOT PARTICIPATE IN THE BIDDING PROCESS ON BEHALF OF NSK, BUT NSK DID ITS BIDDING DIRECTLY. CURRENTLY THERE IS LOT OF TALKING ABOUT WHY THIS JAPANESE COMPANY PAID ALMOST 2.5 TIMES ABOVE FAIR VALUE, FAR BEYOND ITS NEAREST COMPETITORS--SOME OBSERVER SUGGEST ONE OR MORE OF THE FOLLOWING RATIONALES:

--NSK MUST HAVE A MUCH LONGER TIME HORIZON TO EVALUATE TEEIR INVESTMENTS THAN OTHER BIDDERS;
--NSK WANTED TO FRIGHTEN FUTURE BIDDERS AWAY ON OTHER PROJECTS THEY MIGHT BID ON; AND
--THE JAPANESE COMPANY HIGHLY VALUED THE POTENTIAL OF SA PRODUCT NAME.

THESE COULD HELP EXPLAINING WHY NSK PAID 4.5 TIMES THE START-UP COST OF INITIATING A SIMILAR OPERATION FROM SCRATCH. LOCAL INVESTORS THINK THAT THE RESULT OF THIS BID CAN BE COMPARED WITH SIMILAR STRATEGIES FOLLOWED BY JAPANESE INVESTING IN THE USA.

3. GROWTH POTENTIAL FOR SALMON AQUACULTURE

-A) PHYSICAL LOCATION: THE AQUACULTURE INDUSTRY HAS ONLY BEGUN TO TAP THE GREAT MARINA EXPANSES OF CHILE, HAVING EXPLOITED SO FAR ONLY A FEW PLACES OF THE SCARCELY POPULATED TENTH AND ELEVENTH REGIONS, BUT THIS IS CHANGING EACH DAY. AT PRESENT, MORE THAN 150 AQUACULTURE FACILITIES ARE RAISING PACIFIC AND ATLANTIC SALMON, AND MORE THAN 10 APPLICATIONS ARE SUBMITTED PER MONTH TO OBTAIN AUTHORIZATION TO START NEW AQUACULTURE FACILITIES. GIVEN THE AREAS SIZE, APT LOCATIONS WILL NOT BE A CONSTRAINT FOR GROWTH IN THE FORESEEABLE FUTURE. THE TWELFTH REGION OF CHILE--MAGALLANES--DOES NOT YET HAVE AN INDUSTRIAL SALMON AQUACULTURE, BUT IS PREPARING FOR ONE BY CARRYING OUT SALMON RESEARCH ACTIVITIES TO BETTER DEFINE THE MOST SUITABLE TECHNOLOGY TO PRODUCE IN THIS COLD-WATER REGION--LOCATED AT THE SAME LATITUDE AS THE SOUTHERNMOST PART OF ALASKA.

-B) MARKETING: LAST YEAR, CHILEAN SALMON AND TROUT PRODUCERS ORGANIZED A NATIONAL ASSOCIATION--COMPOSED OF 32 PERCENT OF THE LARGEST PRODUCERS AND ACCOUNTING FOR 95 PERCENT OF ALL CHILEAN SALMON EXPORTS--TO DEVELOP MARKETING CAMPAIGNS FOR CHILEAN SALMON ABROAD, AND TO DEVELOP A QUALITY CONTROL CERTIFICATION LABEL. DISEASE CONTROL AND PREVENTION IS ALSO INCLUDED AMONG THE OBJECTIVES OF THIS INDUSTRIAL ORGANIZATION.

- TOP FIVE SALMON PRODUCERS IN 1987-1988 SEASON

	COMPANY NAME	PRODUCTION MT)
1.	SALMONES ANTARTICA	749.4
2.	AQUASUR	349.5
3.	MAINSTREAM	241.7
4.	UNIMARC	178.8
5.	SALMONES AUCAR	175.8
	TOTAL'S FIVE PRODUCERS-	1,694.4
	PERCENTAGE OUT OF TOTAL PRODUCTION	48.4

SOURCE: CHILEAN SALMON AND TROUT PRODUCERS ASSOCIATION

-C) DISEASE CONTROL: ALL THE SALMON AQUACULTURED IN CHILE COME FROM FERTILIZED EGGS IMPORTED MAINLY FROM THE U.S. AND CANADA. BEFORE SALMON WERE INTRODUCED IN CHILE, THERE WERE NO FISH DISEASES SUCH AS THE WORLD KNOWN BKD (BACTERIAL KIDNEY DISEASE). ACKNOWLEDGING THE FACT THAT THERE IS NO WAY TO BUY VIABLE SALMON EGGS CERTIFIED TO BE FREE OF BKD, CHILEAN PRODUCERS HAVE EXPERIENCED SOME LOSSES. NEVERTHELESS, COMMON HEALTH CONTROL PRACTICES HAVE KEPT THIS PROBLEM FROM BEING A MAJOR CONCERN.

-D) PREPAREDNESS FOR ENVIRONMENTAL EMERGENCIES: CHILE IS AT THE EARLY STAGES OF DEVELOPMENT OF THE SALMON INDUSTRY AND A LOT HAS TO BE DONE TO UNDERSTAND THE IMPACT OF INTENSIVE AQUACULTURE PRACTICES UPON THE ENVIRONMENT. ALSO THE NATURAL ENVIRONMENTAL CYCLES HAVE TO BE STUDIED TO DEVISE THE APPROPRIATE PREVENTIVE ACTIONS. RECENTLY, THE GOC, SALMON GROWERS AND SEVERAL UNIVERSITIES INITIATED AN ENVIRONMENT MONITORING PROGRAM TO LEARN HOW TO PREVENT LOSSES CAUSED BY ENVIRONMENTAL CHANGES. JUST RECENTLY--EARLY SEPTEMBER 1988--CHILEAN SALMON GROWERS WERE SURPRISED BY A SUDDEN PHYTOPLANKTON BLOOM, A PHENOMENA UNKNOWN TO FISHERMEN, BUT FAMILIAR TO MARINE BIOLOGISTS. A "NON-TOXIC BROWN TIDE" GENERATED BY A MICROSCOPIC ALGAE--NORMALLY PRESENT IN SEA WATER--BLOOMED WITHOUT ANY WARNING DUE TO THE CONJUNCTION OF UNEXPECTED ENVIRONMENTAL CONDITIONS--HIGH SEA WATER TEMPERATURE, MILD WINDS AND HIGH ATMOSPHERIC INSOLATION. BEING THE FIRST "BROWN TIDE" FOR THE CHILEAN "SALMONEROS" (SALMON GROWERS), PANIC TOOK OVER AT A NUMBER OF LOCATIONS IN CHILOE (AYSEN IS TOO COLD FOR THIS ALGAE BLOOMING TO OCCUR)--ONE OR TWO "SALMONEROS" LOST ALL THEIR SALMON PRODUCTION, BUT OTHERS FARED BETTER BY WATCHING FOR DAYS THE EVOLUTION OF THIS PHENOMENA TO DETERMINE WHETHER TO MOVE THEIR PEN NETS TO A SAFER PLACE, TO SINK THE PEN NETS BELOW THE ALGAE LEVEL (4 METERS), OR TO HARVEST THE STILL UNDERSIZED AND WHITE-FLESHED SALMON. THE FINAL RESULT OF THIS "ACCIDENT" WAS THAT THE EQUIVALENT OF 2,000 MT OF SALMON (OUT OF 8,000 MT POTENTIALLY HARVESTABLE) WERE LOST, MOSTLY SUFFOCATED BY THE ALGAE, BUT LARGELY BY THE INEXPERIENCE AND PANIC OF SALMONEROS. DESPITE THE "BROWN TIDE", CHILEAN SALMON HARVEST WILL BE IN THE RANGE OF 6,000 MT FOR THE 1988/89 SEASON. THE MOST LIKELY EFFECT FOR CHILEAN PRODUCERS WILL BE A LOWER AVERAGE PRICE DUE TO THE REDUCED SIZE THE SALMON WILL ATTAIN AS A RESULT OF THE STRESS SUFFERED WHILE THE BROWN ALGAE BLOOMED.

4. LABOR

SOME 2,000 WORKERS ARE CURRENTLY WORKING IN THE AQUACULTURE INDUSTRY. IN THE TENTH AND ELEVENTH REGIONS, SALMON AQUACULTURE HAS HELPED TO DRIVE UNEMPLOYMENT TO THE LOWEST LEVEL IN THE WHOLE COUNTRY. FOR THE THIRD QUARTER OF 1983 UNEMPLOYMENT WAS 4.4 PERCENT IN CHILOE AND 6.2 PERCENT IN AYSEN. IN THE SAME QUARTER OF 1988, UNEMPLOYMENT IN THOSE TWO REGIONS WAS 3.1 AND 1.9 PERCENT, RESPECTIVELY. ALTHOUGH UNEMPLOYMENT HAS CLEARLY DROPPED, THESE STATISTICS COULD BE OVERSTATED. THE REASON IS THE REGIONAL ECONOMY IS STILL LARGELY CHARACTERIZED BY A SUBSTANTIAL SUBSISTENCE ECONOMY AND LABOR STATISTICS MAY NOT BE COUNTING THE WORKFORCE IN THE SUBSISTENCE SECTOR. NEVERTHELESS, THE SALMON INDUSTRY CLEARLY

HAS BROUGHT PROSPERITY TO MANY IN THE REGION. ADDITIONALLY, THE INDUSTRY HAS ATTRACTED SKILLED LABOR TO THE REGION. NEWNESS OF THIS INDUSTRY, AND THE SMALL POOL OF WELL TRAINED WORKERS AND PROFESSIONALS IN THESE AREAS HAS HELPED BOOST SALARIES SLIGHTLY HIGHER THAN THE AVERAGE WORKERS' SALARY IN THE FISHING INDUSTRY IN GENERAL. A THREE YEAR COLLEGE-TRAINED PROFESSIONAL, RESPONSIBLE FOR MANAGING A NET PEN SITE, RECEIVES A MONTHLY SALARY OF US$600 PLUS HOUSING, WHILE A FOREMAN MAKES US$400/MONTH PLUS HOUSING AND A SKILLED WORKER AT A SALMON AQUACULTURE FACILITY RECEIVES SOME US$150. THESE FIGURES COMPARE TO US$300, FOR A COMPARABLE THREE YEARS COLLEGE-TRAINED PROFESSIONAL IN THE REST OF THE FISHING INDUSTRY, AND US$100 THAT IS THE AVERAGE SALARY OF A BLUECOLLAR WORKER IN CHILE.

5. FISH PROCESSING

THE FISH PROCESSING INDUSTRY THAT PRODUCES FISH PRODUCTS FOR DIRECT HUMAN CONSUMPTION IS AN IMPORTANT INDUSTRIAL ACTIVITY IN THE TENTH AND ELEVENTH REGIONS. THIS ACTIVITY IS MOSTLY SUPPORTED BY TRADITIONAL FISH AND SHELLFISH SPECIES (SEE CHILEAN INDUSTRIAL OUTLOOK REPORT / FISHING 1987 (SPR 0404) PRODUCED BY THE US EMBASSY SANTIAGO). THESE TWO REGIONS COMPRISE MORE THAN 45 PERCENT OF ALL THE LABOR FORCE WORKING IN THE CHILEAN FISH PROCESSING INDUSTRY PRODUCING FISH PRODUCTS FOR DIRECT HUMAN CONSUMPTION. THE REGION'S SHARE OF THE NATIONS FISH PROCESSING CAPABILITY HAS EXPANDED FROM 48 PERCENT IN 1984 TO 62 PERCENT IN 1987. FOR BOTH REGIONS IT IS EXPECTED TO GROW FURTHER AS RESULT OF THE SALMON AQUACULTURE ACTIVITY AND A LONGLINE FISHERY, BOTH STARTED WITHIN THE LAST FIVE YEARS. THIS EMERGING INDUSTRIAL ACTIVITY IMPOSED "NEW" HYGIENE PRACTICES ON WORKERS LABORING IN LOCAL FISH PROCESSING PLANTS. LOCAL WORKERS' TRADITIONAL HYGIENE STANDARDS DID NOT MATCH AT THE BEGINNING THE HIGH QUALITY CONTROL STANDARDS DEMANDED BY FOREIGN BUYERS FOR PRODUCTS SUCH AS FROZEN FISH AND SHELLFISH, AND MOSTLY FOR FRESH SALMON. AS RESULT OF THE COMMITMENT CHILEAN PROCESSORS HAVE MADE TO ACCOMPLISH THE HIGHEST QUALITY STANDARD POSSIBLE, FISH PROCESSING PLANT MANAGERS IMPLEMENTED PROCEDURES TO TRAIN AND ENFORCE THEIR WORKERS' BASIC HYGIENE PRACTICES IN ORDER TO MEET THE QUALITY REQUIRED BY IMPORTERS FROM ABROAD.

6. REGIONAL IMPACT

THE CHILOE ISLAND (X REGION) AND AYSEN (XI REGION) WERE TRADITIONALLY ISOLATED WITH CLOSED SUBSISTENCE ECONOMIES. THE INTRODUCTION OF INDUSTRIAL FISHING ACTIVITIES, LARGELY DRIVEN BY SALMON AQUACULTURE) HAVE TURNED THE QUIETNESS AND SLOW PACE OF THESE REGIONS INTO FRANTIC CENTERS OF ACTIVITY FROM DECEMBER TO APRIL--CHILE'S AUSTRAL SUMMER--WHEN TOURISM AND AGRICULTURAL ACTIVITIES ARE AT THEIR PEAK.
-A) TRANSPORTATION: CHILOE ISLAND SALMON EXPORTERS HAVE TO CONTRACT WELL IN ADVANCE FOR FERRY AND ISOTHERMIC TRUCK SERVICES, AND AIRCARGO SPACE ON REGULAR OR CHARTERED PLANES TO GET THEIR SALMON ON THE BUYERS' TABLE NO MORE THAN 24 HOURS AFTER HARVESTING AND PROCESSING. AYSEN PRODUCERS ARE LOCATED ON THE CONTINENT SO UNLIKE CHILOE PRODUCERS THEY DON'T HAVE TO FIGHT FOR FERRY SPACE. STILL, SPECIALIZED TRUCKS ARE A SCARCE RESOURCE IN THE REGION. SALMON AIRSHIPPED FROM BALMACEDA AIRPORT ("THE" AIRPORT OF AYSEN) HAVE GENERATED A STRONG DEMAND FOR CHARTERED AIRCARGO PLANES DURING THE

SALMON HARVEST SEASON SINCE 1987. IN THE X AND XI REGIONS CUSTOM AND FREIGHT AGENCIES ARE MUSHROOMING TO COPE WITH THE DEMAND FOR THESE SERVICES.
-B) HOUSING: NEWLY ARRIVING MANAGERS (SOME ARE MBA'S TRAINED ABROAD), ICTYOPATHOLOGISTS, FOOD PROCESSING SPECIALISTS, CONSULTANTS, ENGINEERS AND MANY OTHER SOPHISTICATED SPECIALISTS AND PROFESSIONALS (SOPHISTICATED FOR WHAT THE REGION IS ACCUSTOMED TO) HAVE EXHAUSTED THE LOCAL HOUSING STOCK. GOOD QUALITY HOUSES ARE UNAVAILABLE. AS A RESULT OF THIS PHENOMENA, A CONSTRUCTION BOOM IS CURRENTLY TAKING PLACE, DISRUPTING AT THE SAME TIME THE REGION'S ARCHITECTURAL CHARACTERISTICS--MOSTLY WOOD-MADE--PUSHING STYLES, MATERIALS, AND BUILDING TECHNIQUES MORE COMMON TO THE REST OF CHILE.
C) SCHOOLS: CHILOE AND AYSEN'S HIGH SCHOOL STUDENTS USED TO GO TO SANTIAGO, PUERTO MONTT OR CONCEPCION TO GET THEIR EDUCATION. NEWCOMERS ARE DEVELOPING A MARKET FOR HIGH QUALITY HIGH SCHOOL EDUCATION. PRIVATE PROJECTS TO PROVIDE THESE SERVICES ARE UNDER STUDY.

7. THE FUTURE

IT CAN BE EXPECTED THAT THE "SUDDEN DISCOVERY" OF THE X AND XI REGION AS A SOURCE OF ECONOMIC GROWTH, WILL BRING THE NATURAL BEAUTY OF THE CHILOE ARCHIPELAGO AND THE UNTAPPED AYSEN'S FJORDS WITHIN REACH OF MORE PEOPLE. THE WHOLE INTERIOR SEA BETWEEN THE LARGE ISLAND OF CHILOE AND THE CONTINENT IS MAYBE THE LARGEST NATURAL MARINA IN THE WORLD AND IS WAITING FOR WEALTHY VISITORS AND THEIR YACHTS AND MOTORSPEED BOATS. ALL THIS COULD BE POSSIBLE AS A CONSEQUENCE OF THE MORE THAN 100 CHARTER FLIGHTS REQUIRED TO SHIP THE FRESH AND FROZEN SALMON PRODUCTION OUT OF THESE TWO REGIONS. DEPENDING UPON THE TYPE OF PLANES USED--WHETHER ARE MIXED CARGO/PASSENGER OR JUST CARGO PLANES--THEIR RETURNING FLIGHTS FROM THE US COULD HAVE EMPTY SEAT SPACE TO BE USED TO START FLYING US TOURISTS INTO THIS MOSTLY WILD AREA. IF CARRYING BACK PASSENGERS IS VIABLE, CHILE WILL BE EXPORTING--CHILEAN GOODS AND SERVICES--BOTH WAYS. GILLESPIE

Alaska's salmon could face tough competition from pen-reared fish

12/27/88

THE ASSOCIATED PRESS

FAIRBANKS – Pen-reared Atlantic salmon do not compete strongly with wild chinook and coho salmon from Alaska, but peace in the marketplace might not last for long, said economists who conducted studies for an Alaska research program.

The Alaska industry could face a surge in competition if Norway enters the United States' retail salmon market, as fish farmers in that Scandinavian country have indicated they might, said researchers for the Alaska Sea Grant College Program.

If farm production of Atlantic salmon continues to rise, the fish could expand from a menu item in restaurants to a competitive product in U.S. supermarkets, said economist Biing-Hwan Lin, co-author of a study published in the Canadian Journal of Agricultural Economics last month. The study was carried out for the Alaska Sea Grant program, which is based in Fairbanks and operates primarily with federal money.

"Since the average shopper does not know the difference between a chinook, sockeye, coho or Atlantic salmon, they will check the prices and buy the lowest priced salmon," Lin said.

Norway is the world's largest producer of farmed Atlantic salmon. Lin predicts that by 1990, that nation's harvest will nearly double to about 220 million pounds of the fish for sale on the world market.

If production by other fish-farming countries such as Sweden, Chile, Ireland, Scotland, New Zealand and Japan is figured in, the harvest of pen-reared salmon likely would equal the combined United States-Canada catch of chinook, coho and sockeye salmon, Lin said. Farms for the rearing of Atlantic salmon also operate in the United States.

Parts of Lin's study are disputed.

"Obviously, there will be competition between Atlantic and Alaska salmon, but I don't think we should exaggerate this," said Trond Bjorndal, associate professor of fisheries economics at the Norwegian School of Economics and Business Administration.

"I think Norwegian salmon will be sold in more European supermarkets and on the U.S. East Coast, but there will be more competition from Chile and British Columbia than from Norway and the U.S. West Coast salmon market."

The Juneau director of the Pacific Seafood Processors Association said he has heard forecasts of doom for the Alaska salmon industry over the years and remains skeptical.

"We have never seen as much farmed salmon on the market as we have recently, and yet the prices (for wild salmon) are as high as they have ever been," Rick Lauber said. "It seems like there is enough demand for salmon that I don't see that much impact on the overall market."

But a University of Rhode Island resource economist who has studied the impacts of farmed salmon on U.S. markets since 1981 said that for years, Alaska has watched its share of the market erode.

The state "has not done much to improve its marketing and quality until recently," Rhode Island economist James Anderson said. Alaska should legalize aquaculture "to regain market share, to improve the consistency of supply and to diversify the Alaska economy," he said.

Lauber said that would harm the market appeal of wild salmon.

"I don't see Alaska's problems being solved by raising more farmed salmon," he said.

Researchers also found Alaska's grip on the European smoked-salmon market is slipping. Quality and price are the reasons, said Brad Pierce, an analyst for a research agency of the Alaska Legislature.

Biologists battle lethal fish virus

The Associated Press

SEATTLE — A new and lethal fish virus from Europe may have infected Pacific Northwest salmon and trout, and federal regulators have begun an aggressive testing program to detect its presence in the wild.

Biologists said the virus — viral hemorrhagic septicemia or VHS — has never before been seen in North America and they fear it could spread rapidly in Northwest hatcheries, net pens and open waters.

Wild salmon and trout are being captured for the test, which takes about two weeks to produce results.

The virus led two Washington hatcheries to destroy 3.8 million fish and eggs this week, about one percent of the entire Washington state hatchery production.

NORTHWEST

"This is classed as an emergency disease. It's not to be taken lightly," said Jerry Grover, a Fish and Wildlife Service regional manager.

"There's a 50-50 chance" wild fish have been infected with the disease, said Ray Brunson, a fish pathologist with the service.

The virus is not considered dangerous to people even if they eat infected fish. VHS was found only in Europe before the state's Glenwood Springs Hatchery in Orcas Island and the federally run Makah National Fish Hatchery in the Olympic Peninsula detected it in routine sampling.

In Europe, infected coho salmon carried the virus with apparently no ill effects. But biologists worry whether the virus will be as benign for Pacific salmon. In laboratory tests, about 70 percent of the fish injected with heavy doses of the virus died.

A spokesman at Glenwood Springs said that fish had been transferred in and out of the hatchery prior to detection. Fish were still being killed at the two fisheries this week at the hatchery.

A "very aggressive" sampling schedule has been set up to detect the disease in wild fish, said Larry Peck, head of salmon-culture operations for the state Department of Fisheries.

Peck speculated by fish returning from the ocean brought the virus to the two hatcheries.

Seattle Post Intelligencer 2/25/89

Virus threatens state's salmon and steelhead hatcheries

By Jane Hadley
and George Foster
P-I Reporters

State and federal biologists have destroyed almost 4 million fish and eggs at two Washington state hatcheries because some of the fish were infected with a fatal viral disease that has never before occurred in North America.

The hatcheries have been quarantined, but the virus may already have spread into valuable Pacific salmon and steelhead stocks, alarmed fisheries experts say. The disease has previously infected European commercial trout operations.

"The worse-case scenario is that every hatchery would become infected," Joseph Blum, director of the Washington state Department of Fisheries, said yesterday.

"The hatchery world throughout the U.S. has been put on alert. The word is out and traveling quickly," said David Klinger, a spokesman for the U.S. Fish and Wildlife Service's regional headquarters in Portland.

The virus, which cannot be treated and is always fatal to infected fish, poses no risk to human health, even if a contaminated fish is eaten, according to the state fisheries department. Two hatcheries, the Makah Hatchery near Neah Bay and the Glenwood Springs Hatchery on Orcas Island, are being disinfected. No fish or eggs can enter or leave the facility, said Klinger.

Coho, chum, fall chinook, and steelhead were destroyed.

The virus first showed up in December at Glenwood Springs, a joint private-state salmon rearing operation.

A short time later the virus appeared at the U.S. Fish and Wildlife Service's Makah Hatch-

See **VIRUS**, Page A7

Virus: Threat to hatcheries

From Page 1

ery on the Olympic Peninsula. But the virus was not positively diagnosed until last week.

The disease, called viral hemorrhagic septicemia or "VHS," has previously been reported only in continental Europe, where it has caused "significant fisheries losses" at commercial trout operations, according to the fisheries department.

Blum said a little over 300 million young fish and 60 million eggs are produced annually in the state. The fish and eggs destroyed this week would amount to about 1 percent of that.

"Obviously, it's a significant number of fish," said Klinger. And the Makah hatchery fish also are considered especially valuable because the hatchery is so close to the open ocean that the fish have a very high survival rate, he said. But the possibility that the disease might spread to other hatcheries is now the main worry.

Glenn Yokoyama, manager of the University of Washington's fish hatchery on Portage Bay, said if fish and eggs were transferred into or out of the infected hatcheries after the virus discovered but before the quarantine was put into effect, it would heighten the chances the disease would spread.

Bob Byrne, a spokesman for the state Department of Wildlife, said department biologists are concerned that the virus will

"The likelihood of this virus showing up someplace else at some point is pretty high," he said..

Top fish disease experts throughout the Northwest met in Medford, Ore., this week to discuss the virus and other matters, according to the state fisheries department.

The disease causes the blood-forming tissues of the kidneys to degenerate.

The disease could have been introduced by certain fish species, or by ships or travelers carrying contaminated water.

"The possibilities are bilge water from vessels or that people who travel worldwide pick it up on their boots, or that other fish could have it," Blum said. "My understanding from our technical folks is that black sea bass are a carrier. Atlantic salmon have been known to have it."

The new disease may well fan the flames of the controversy over salmon net pens and other aquaculture operations in the state. Opponents have insisted that net pens pose the risk of introducing new fish diseases, while supporters have downplayed the risk. The favored fish at net pen operations is the Atlantic salmon.

The state has 13 net pen operations, most of which raise Atlantic salmon, and a number of new ones are proposed.

Hatcheries in this state have been plagued by a virus for many years known as IHN. Since 1982 the UW's hatchery has had to test each egg and young salmon individually for the presence of IHN.

Senator Eliason

The recent articles commenting on the success of Norway's fin fish farming industry have ignored the high price that Norway has paid in fish diseases that have ravaged their industry and destroyed thirty of their wild salmon rivers, and the very real fears their scientists have concerning genetic pollution of their wild stocks of salmon.

Norwegian salmon farmers, in the business for twenty years, find themselves continually fighting new diseases that have required the slaughter of tons of pen-farmed salmon. A group of farmers, who lost their harvest either to furunculosis (a disease that kills 60% of affected stocks) or to government control of diseased fish, is suing the Norwegian government for $25 million dollars. Farmers themselves are demanding that 100 more fish veterinarians specializing in disease control be hired before anymore fish farm permits are issued...those in addition to 60 fish disease specialists and nearly 150 fish veterinarians already working around the country.

Norway's use of antibiotics for controlling these diseases rose over 170% last year to reach 48 tons. This is more than the amount used for animal husbandry and humans combined. With our focus on health and nutrition how does this use of such large quantities of antibiotics affect our view of pen farmed salmon? Scientists have expressed concerns of effects on the food chain and the increase of human resistance to antibiotics.

Last summer in Norway 5,000 farmed salmon infected with the deadly furunculosis escaped into their waters. Despite their best efforts to blockade and capture the sick fish, an infected fish was found in one of their rivers. "If the disease spreads to natural stock, the situation may be out of control in Norway," their scientists warned. Studies by three Norwegian fish biologists conclude that disease in farms can lead to higher infection rates of wild stocks in the vicinity of the net pens even if the disease itself may already exist in the natural stocks.

The fish farm disease that kills wild salmon in rivers and has destroyed 30 wild salmon rivers in Norway is *Gryodactylus salaris*, a parasite that entered Norway via infected smolts from Sweden. The only way to clean up the rivers is by the use of a chemical called rotenone. Unfortunately along with killing the parasite, it also kills every other living thing in the river, including wild salmon. A top Norwegian scientist says, "I feel we are on a sharp edge with diseases. If we have the *Gryodactylus salaris* in more rivers we may just accept our wild salmon is extinct."

It has recently been suggested that one of the reasons that Alaskans might be interested in a pilot project in salt water would be to assess the probability of fish escaping. We don't have to experiment...it is documented. **At least** 13% of farmed salmon escape and there are occasionally very large numbers that escape. For instance, this last December in Jarvis Inlet, B.C. an estimated 300,000 fish escaped from their pens in winter storms and residents reported many net pens floating up and down the coast. Also, in Washington State, commerical fishermen have reported substantial numbers of escaped farmed salmon in their catches. Should these escapees concern Alaskans?

Svein Mehli, head of Norway's Directorate for Nature Management, which is responsible for protection of wild salmon, appeared in Washington State on December 14 as an expert witness on fish disease and genetic pollution. He testified that up to 40% of the fish in many of their rivers is now of farmed stock origin and says they are very concerned about the genetic effects of farmed salmon on wild stocks. "We are very afraid it could affect their ability to migrate," he said. Three major fisheries institutes in Norway have reported that escaped farmed salmon **do** spawn in rivers. In order to combat this threat, Norway has implemented new zoning regulations this year....**no salmon farms will be located within 20 kilometers of salmon rivers, and entire fjords will be closed to farming where salmon rivers are present.**

In Alaska, using indigenous species that would take at least three generations to tame (until they had lost their basic will to survive in the wild) and the resulting genetic pollution from escaped fish could pose the same threat. Although the magnitude of that threat would be related to the population size and density in individual streams, spawning escaped salmon would still be a danger, especially in streams with small populations.

Alaskans who imagine that we could control diseases better than other countries because we have a large hatchery system and would not be forced to import eggs or smolts need to examine the situation in Washington State and British Columbia. Both these areas have overturned strict fish regulations banning the importation of foreign stocks at the economic pressure of fish farmers who find that native wild stocks are slow to domesticate and growth rates are not rapid. The already domesticated Atlantic salmon is the economic savior of fish farmers. Fish biologists were mystified at the reversal of their regulations and a Canadian biologist wrote that his government was playing "Russian Roulette with our wild fish stocks." That same economic pressure forced Norway to lift their ban on importation and the result was the *Gryodactylus salaris* parasite that has caused such a tragedy in their country. Acquisition of eggs or smolts from hatcheries or river systems is also a major public policy issue for Alaskans to consider. The only experimental on-land tank farm in Alaska acquired its eggs from a northern sport fish hatchery....that may be fine as long as the public, through the Board of Fish process, has an opportunity to comment. The demand for eggs in British Columbia has created conflicts between sport and commerical fishermen and fish farmers.

In Washington, a local fish farmer is now suing in U.S. District Court alleging that foreign national interests, primarily Norwegian, have made an attempt to monopolize the commercial farming industry in his state. 80% to 95% of the fin fish farming industry in both Washington and British Columbia is owned by Norwegian Corporations. Could Alaska escape such a fate ? It's doubtful.

There seems to be a plentiful supply of pen-raised salmon these days...it's starting to go into freezers in Europe as well as being sold fresh. Alaska is presently the world leader in ocean ranching. The State's hatchery programs are responsible for at least 80 million dollars in resident income and 2300 resident jobs.

Last year's mariculture legislation, which addressed shellfish and aquatic plant farming, also called for an Alaska Mariculture Task Force to study the issues relating to fin fish farming (especially, salmon pen rearing). We believe that this Task Force should be funded now to give all concerned parties and the Legislature an approved forum in which to study and assess the impacts of fin fish farming on Alaska. Alaska contains 48% of the wild salmon in the world...we should not let the winds of economic development sway our way of thinking. It is imperative that we fully understand the consequences of our actions and protect the future of our unique and valuable resource.

Editor's Note: This article was provided by the United Fishermen of Alaska. Mariculture Committee. For more information, contact UFA's office in Juneau at 586-2820 or 1-800-478-FISH. ★

Seattle Post-Intelligencer

SECTION F

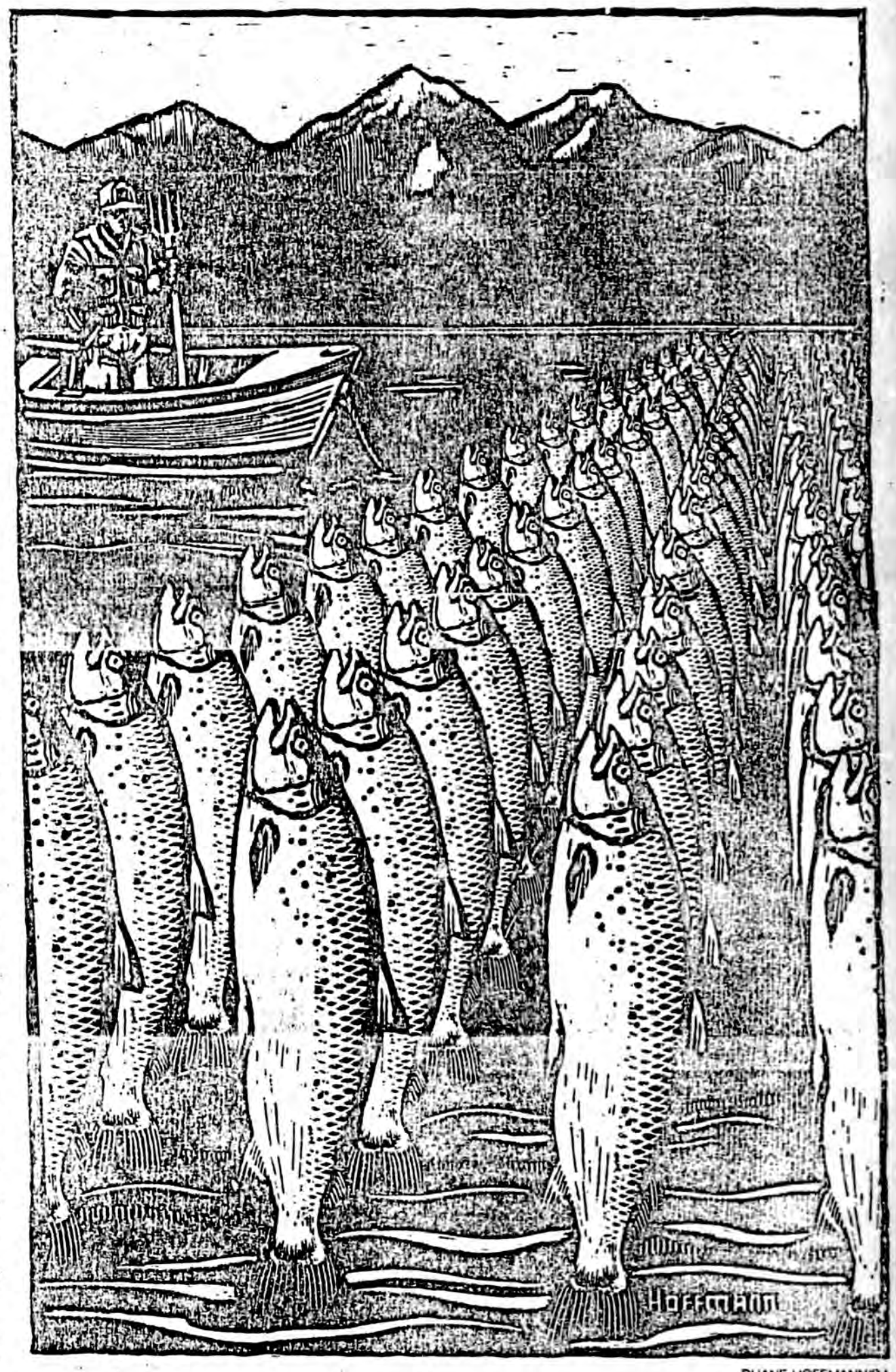
Sunday
March 5, 1989

P-I Focus

A HEARST NEWSPAPER

POLLUTION ISN'T A SOUND POLICY

Should corporations use public waters for private profit?



DUANE HOFFMANN/P-I

By John de Yonge
P-I Columnist

Consider these things about floating fish farms:

■ A typical net-pen fish farming operation on Puget Sound produces pollutants "equivalent to untreated sewage from approximately 10,000 persons." That's what a state report says. The pollution comes from fish feces, urine and food pellets deposited in the water and on the bottom of the Sound.

■ There are 13 commercial pens now operating over 69 acres of aquatic lands leased from the state. These 13 operations daily deposit to the bottom of Puget Sound nearly six times as much oxygen-demanding fecal matter and other wastes than does Metro's Renton Waste Water Treatment Plant, which serves 430,000 people. Materials that deplete oxygen can radically change or kill off the life forms in an unpolluted environment.

■ Siting 27 more fish farms, now delayed by opposition from upland property holders, environmentalists and county officials, would add a pollution load to Puget Sound equal to that from building four new cities the size of Everett.

■ The ". . . proper siting of 100 farms would not have significant impact on the aquatic environment." So says the state's just-issued environmental impact statement on floating net pens.

Those 100 fish farms would produce 55 metric tons of oxygen-demanding waste per day. That's 18 more tons a day than Metro's Renton and West Point treatment plants together produce from the sewage of 1 million people.

Analysis

The environmental impact statement was prepared by three private organizations that supply fish-farm companies with paid expert witnesses.

Under Gov. Booth Gardner, state policy is to hosanna any increase of fish farming in the state's waters and to downplay environmental problems that aquaculture may bring.

The official evangelist is the Department of Agriculture's Dr. John Pitts, veterinarian and former Jefferson County commissioner who appears at meetings and hearings — in one case, as a paid witness for a net-pen applicant — to pooh-pooh environmental objections raised by net-pen opponents.

Opponents are not just those who own shoreline property, who howl against a net pen being erected in their aquatic front yard. They've been fired up by what the state's environmental impact statement confirms: A new, nearby fish farm can give view property a one-time, financial knock.

Opponents include environmentalists like David Ortman of Friends of the Earth, who says: "Why should we be happy about fish farms that dump tons of fish poop every day into Puget Sound?"

They include commercial fishermen like the Puget Sound Gillnetters, who know something that has largely escaped the notice of sport anglers:

Atlantic salmon, not a salmon but a sea-run trout of the Atlantic seaboard, have escaped by the thousands from net pens here and in British Columbia. The B.C. government booms fish farms with a gusto exceeding even the ta-ra-ra-boom-de-ays from Gardner's men and from Brian Boyle, the separately elected head of the Department of Natural Resources, which manages shore bottoms and other public lands.

What's more, hundreds of thousands of Pacific salmon have also escaped from the pens, especially in British Columbia.

So what does that mean?

The state environmental impact statement points out that escaped exotic fish like the Atlantic salmon "could establish self sustaining populations and compete with indigenous fish," such as steelhead trout.

That may not be far off.

In the North Puget Sound last year, commercial and sports fisherman caught hundreds, probably thousands, of Atlantic salmon weighing up to 10 pounds.

More dangerous by far is that for the first time ever at least three sexually mature Atlantic salmon showed up miles from the sea in the Nooksack River last year, near Bellingham, and one in the Nisqually, near Olympia. Rumor has a fourth Atlantic netted in the Skagit River at Sedro-Woolley.

What's the worry about four fish, though they may be forerunners of thousands to come?

The environmental impact statement warns that accidental importation of "exotic" fish diseases associated with fish farms in Europe could devastate existing salmon and trout runs in state rivers.

Just in the past two weeks the public has learned that such a disease, viral hemorrhagic septicemia or VHS, has shown up at two hatcheries in state waters. It is the first time ever that VHS has been found in North America.

VHS, state fish-disease experts say, has never been found to occur naturally in Atlantic salmon. They say that the chance that Atlantic salmon in pens here are the source of the disease is "virtually zero." The disease was found in chinook and coho salmon, species raised extensively at federal, state and tribal hatcheries and at commercial net-pen operations.

The impact statement does not dwell on what has happened in Norway, where other diseases associated with that country's extensive net-pen industry have ravaged wild Atlantic salmon runs in 32 rivers. The government was forced to poison some streams, set up a salmon sperm bank to preserve wild genes and consider banning any new net pen within 12 miles of a river mouth, an obvious rule not yet under consideration here.

Nor does the statement dwell on the possibility of migrating wild fish catching indigenous fish diseases from net pens here or of net-pen escapees spreading such diseases into our river systems.

Fish farmers themselves helped call state attention to fecal build-up beneath pens, a build-up that kills clams, oysters and other bottom dwellers and can release poisonous hydrogen sulfide gas, which can kill all fish in a pen in minutes.

In 1986 Commissioner of Public Lands Boyle limited new net pens to sites where the water is at least 40 feet deep at low tide, a mile away from other pens and with enough current to flush away food and fecal deposits. He also limited the surface area of new pens to two acres or less.

These requirements ended up in "Recommended Interim Guidelines" written for the departments of Agriculture, Ecology, Natural Resources and Fisheries, which share regulation of the fish-farm industry, with Agriculture and Pitts calling most of the shots.

With no force of law and offered to help county commissioners site pens under state law, the guidelines deliberately do not talk about navigation problems, use conflicts and, most important, esthetics.

> **"If the two sides could stop feuding and start talking about necessary standards, we could have a safe, considerable industry.**
>
> —Peter Katz, fish farmer

Commissioners have learned that if they turn down a net-pen proposal, the applicant will seek a full rehearing before the state's Shorelines Hearings Board, with Pitts certain to show up to put the stamp of Gardner's administration on having the permit granted.

Dwain Colby, an Island County commissioner, put the matter thus in a 1987 letter:

"While there may be legitimate reasons for denying a permit to locate a salmon net pen, local government has been placed in the position of being able to say 'yes' to such a proposal but not 'no.' "

Under Gardner, the Department of Ecology has refused to require net pen operators to get pollution-limiting discharge permits under the federal Clean Water Act.

The Sierra Club Legal Defense Fund has announced it will sue the U.S. Environmental Protection Agency if necessary to force EPA to force Ecology to force every net pen operator have such a permit.

The state's draft environmental impact statement declares that the major impacts of net pens can be cured by "proper farm siting to assure dispersion of wastes, flushing of the site and protection of sensitive areas."

It's a view that one can come to easily while talking to such eloquent fish farmers as Peter Katz, a marine architect running the Paradise Bay Co. net farm at Port Townsend, and John Forster, a Ph.D. in aquaculture running Sea Farm Washington's similar operations at Port Angeles.

Both pen systems, clean, low in the water, quiet, full of fat, bright Pacific and Atlantic salmon, are barely noticeable in the working harbors that contain them.

But that's quite different than siting a pen in Frenchman's Cove on the west side of Hood Canal, as International Marine Farms Inc. proposes.

Or siting a pen, as Tailfin Inc. proposes, in a main salmon and trout-fishing cove between East Point and Bells Beach on the west side of Whidbey Island, where from her home Margaret Johnston looks out across Saratoga Passage to Camano Island. She heads the Marine Environmental Consortium, made up of 20 citizen organizations that oppose fish and other floating farms.

Katz argues for having the state set standards for siting and operating net pens, to ensure that the pens do not harm the environment and to give the net-pen operators a clear but flexible regulatory framework to live with. But Katz feels the industry is getting a bad rap from people like Johnston, who, he says, simply don't want a net pen in their aqueous front yard.

"If the two sides could stop feuding and start talking about necessary standards, we could have a safe, considerable industry . . .," he says. "But we're years away from that."

Forster, president of the Washington Fish Growers Association, dismisses esthetic revulsion as the main drive behind the opposition to what he characterizes as a clean, beneficial industry with vast prospects.

"It's more than esthetics. It's an intrusion into a life style that they don't like and they're using environmental problems as a smokescreen . . . Because of that, the debate is dishonest at the moment, terribly dishonest."

Johnston, at a gathering in her home with other members of the Marine Environmental Consortium, characterizes such comments as unworthy.

"The net pen issue raises a fundamental issue of public policy that involves more than us, though the environmental questions are real and cannot be brushed aside by the industry or the state. The big question is: Should the public waters of Washington State be turned over to a few corporations for private profit?"

That's a proper question for us all to ask. It must be answered by political action. Gardner's administration has already answered: Yes.

To me it seems stupid to site more pens in pristine salt and fresh waters (yes, an application is pending in Eastern Washington) until we have better, more extensive scientific information about siting than what the draft environmental impact statement supplies.

Until we know if pens can be sited safely anywhere, we would be blind to commit ourselves to putting major sources of pollution in our unpolluted waterways and in waterways we are trying to clean up.

The tragedy of Norway's rivers demonstrates that.

Alaska Mariculture Association

MEMORANDUM

TO: All Legislators

FROM: Rodger Painter
Alaska Mariculture Association

DATE: March 2, 1989

RE: VHS Fact Sheet

The Alaska Mariculture Association (AMA) wishes to add its concern regarding the discovery of a fish virus in Washington State salmon stocks previously undetected in North America. To assist in the understanding of this disease, AMA has gathered the following facts on Viral Hemmorrhagic Septicemia (VHS) from state pathology officials and Washington state officials and fish farmers.

1. VHS was isolated in chinook and coho salmon stocks in two anadromous release hatcheries in Puget Sound: the Glenwood Springs Hatchery, a private facility on Orcas Island, and Makah Hatchery, a joint U.S. Fish and Wildlife Service-Makah Indian Tribe operation near Neah Bay. These hatcheries are located a considerable distance from one another.

2. This discovery resulted in the destruction of roughly 3 million salmon fry and 1 million salmon eggs in the two hatcheries. The destroyed fry and eggs were buried. The facilities have been disinfected and quarantined to prevent the spread of the disease. Washington State and federal officials are working hard to track down potential sources of the infection, and are gathering thousands of wild salmon and trout from areas adjacent to the hatcheries to determine the extent of infection of wild stocks. Tests show that at least two returning adult salmon were infected with the VHS virus.

3. VHS primarily affects trout and can cause heavy mortalities in adult fish in fresh and salt water. There have been no mortalities of fish in either hatchery as a result of the infection, and contrary to press reports there have been no laboratory tests where trout were injected with VHS and mortalities have resulted. VHS is not treatable. The virus can be transmitted by contact with infected fish or contaminated water.

130 Seward St., Suite 201 • Juneau, Alaska 99801 • (907) 463-3600

Denmark trout hatcheries and farms have had major problems with VHS in the past, and apparantly have found found ways to work around the disease. This is similar to the Alaska Department of Fish and Game's success in "farming around" Infectious Hematopoietic Necrosis Virus (IHNV) in its anadromous release sockeye programs. While the appearance of an exotic disease potentially as lethal as VHS is a source of utmost concern, the extent of the threat to Pacific salmon is unclear at this point. Coho salmon in Europe have been observed to be carriers of the disease without suffering ill effects.

4. ADFG and Washington fisheries officials say there is no evidence of how the hatcheries became infected. Some fisheries scientists theorize the virus was introduced through water sources into the two hatcheries, while others suspect adult salmon returning to the hatcheries were infected. Scientists also say it is unclear at this point how the virus was introduced into the Washington environment. One notable Washington disease expert said at a recent public meeting that VHS may have been present in North American fish stocks for some time, but it was not detected until the right environmental conditions existed for the disease to manifest itself in salmon stocks. The virus was detected in routine pathology examinations. Dr. Ted Meyers, Alaska's chief pathologist, said VHS would show up in initial screenings as very similar to IHNV and it's quite possible that VHS might have been mistaken for IHNV in the past. Dr. Meyers also said that a virsus very similar to VHS has been identified in Pacific marine fish, and infection of salmon from contact with a cod could be one path.

5. Oppponents of fish farming in Alaska and Washington have suggested that VHS was transmitted to Washington through Atlantic salmon farms in Puget Sound. Alaska and Washington fisheries officials say there is no substantiation for this allegation. Atlantic salmon eggs imported into Washington State were supplied by hatcheries in Finland, Scotland and Norway which were certified to be free of VHS. Washington's largest fish farming operation said VHS has never been detected in Finland and Scotland, and the only reported case in Norway involved a trout hatchery some 15 years ago. Washington State officials have contacted the European sources of Washington State Atlantic Salmon and have verified that VHS has never been detected in stocks utilized in supplying hatcheries. VHS has never been isolated in Atlantic salmon stocks in the wild, hatcheries or farms. A laboratory experiment showed the virus could be introduced into Atlantic salmon under clinical conditions and Atlantics could potentially be carriers of the virus. However, no ill effects were noted in the infected fish.

6. Washington State import procedures require the hatchery supplying the Atlantic salmon eggs to be certified as free of VHS and "whirling disease", tests are conducted prior to shipment to

ensure VHS and whirling disease are not present, and the eggs are held in strict quarantine until 90 days after hatch-out. The eggs and fry are closely inspected throughout the quarantine process for VHS and other diseases. The Washington fish farming company said its hatchery and others in Washington State handling Atlantic salmon were inspected by Washington fisheries officials last fall and were given a clean bill of health. There have been no reports of VHS present in any farmed Atlantic salmon.

7. ADFG reports that VHS has not been found in any Alaska salmon or trout stocks. ADFG officials say Alaska regulations prohibiting the importation of non-indigenous fish stocks is the best protection against introduction of an exotic disease. Alaska also has a statutory prohibition against the importation of Atlantic salmon.

Don W. Collinsworth, Commissioner

Public Communications
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Alaska Department of Fish & Game

NEWS

FOR IMMEDIATE RELEASE March 1, 1989

ALASKA CONCERNED ABOUT NEW FINFISH VIRUS

Juneau...Fishery pathologists in the Fisheries Rehabilitation, Enhancement, and Development (FRED) Division of the Alaska Department of Fish and Game (ADF&G) are very concerned about the discovery in the State of Washington of Viral Hemorrhagic Septicemia (VHS), a fish virus that has not occurred before in North America.

Recently, a VHS virus was identified in spawning coho and chinook salmon in two hatcheries in the State of Washington: the Glenwood Springs Hatchery on Orcas Island and the Makah Hatchery operated by the U.S. Fish and Wildlife Service near Neah Bay. All fish in these hatcheries were destroyed, and the facilities have been quarantined in order to prevent the spread of this virus.

VHS, first discovered in 1938 in Europe, causes disease primarily in rainbow trout in both fresh and salt water. Other fish shown to be susceptible include Atlantic salmon, brook trout, golden trout, rainbow trout-coho salmon hybrids, and goldfish. Transmission is by contact with other infected fish or contaminated waters. VHS has not been detected in North America despite extensive disease monitoring. VHS is capable of causing severe mortalities in older, larger fish, while Infectious Hematopoietic Necrosis Virus (IHNV), indigenous to wild Alaskan sockeye salmon, typically kills fry and juveniles. As with other viral diseases, there is no treatment for VHS except prevention.

Dr. Ted Meyers, Principal Pathologist for the FRED Division, has found no evidence of VHS disease in Alaskan

- MORE -

salmon stocks. According to Dr. Robert Burkett, Chief of Technology and Development for the FRED Division of ADF&G, Alaska maintains the best possible protection against invasion of exotic fish diseases because it prohibits the importation of any finfish into the state. "The most important thing was done ten years ago when regulations were established prohibiting import of finfish," Burkett says.

Dr. Meyers has been in contact with investigators performing the VHS identification and survey work at the Sand Point U.S. Fish and Wildlife Service Fish Pathology Laboratory in Seattle. Dr. Meyers will be travelling to the Seattle Laboratory to monitor the progress of the investigations and to determine the extent of the VHS problem in Washington and the Pacific Northwest. FRED Division pathologists will continue to monitor Alaskan salmonid stocks for IHNV using procedures that would detect other viruses as well, including VHS.

As a result of the potential risk to Alaskan stocks, the Commissioner of ADF&G, Don Collinsworth, is calling for the immediate formation of a Pacific Coastal Task Force composed of state and provincial representatives from Alaska, Washington, Oregon, Idaho, California, and British Columbia, with appropriate representatives from state, federal, tribal, and private industry, to investigate the risk of spreading VHS from infected hatcheries in Washington State and to develop effective control methods to contain this disease.

* * * * *

FOR YOUR INFORMATION FROM SENATOR JAY KERTTULA 2/28/89

The Seattle Times 2/28/89

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'An emergency disease'

Lethal virus may have infected wild salmon and trout, biologists say

by Jack Broom
Times staff reporter

A potentially lethal fish virus that prompted biologists to destroy 3.8 million fish and eggs in two Washington hatcheries last week may also have infected wild salmon and trout and could spread like a plague, experts say.

"This is classed as an emergency disease. It's not to be taken lightly," said Jerry Grover, an associate manager in the U.S. Fish and Wildlife Service's regional office in Portland.

Thousands of wild salmon, trout and other species will be gathered in the next few weeks from areas around the two hatcheries where the virus was recently detected.

Biologists fear that viral hemorrhagic septicemia (VHS), never before seen in North America, may have the potential to spread rapidly in Northwest hatcheries, net pens and fish populations in open waters.

STEELHEAD RUN SUFFERS

■ An early count of fish at the locks is "terrible." **Northwest, B 5.**

"Right now there's about a 50-50 chance" that the virus has infected fish in the wild, said Ray Brunson, a fish pathologist for the Fish and Wildlife Service.

The virus, known as VHS, is not regarded as dangerous to humans, even if people eat fish that have been infected.

Biologists say VHS may be far more dangerous to steelhead, a form of trout, than to salmon, but the extent of the danger to both species is not yet known.

In Europe, where VHS has been detected previously, coho salmon have been observed to carry the virus and suffer no ill effects, said Larry Peck, head of salmon-culture operations for the state Department of Fisheries. But Peck said that is no

Please see **FISH** on A 6

Virus called 'emergency'

FISH

continued from Page 1

guarantee that Pacific salmon would survive the infection.

In recent laboratory tests on trout here, about 70 percent died after being injected with large doses of the virus.

The presence of VHS was discovered in routine tests at the state's Glenwood Springs Hatchery on Orcas Island and the federally run Makah National Fish Hatchery on the Olympic Peninsula.

Although the virus itself had not killed any fish at those facilities, all fish and eggs at both hatcheries were intentionally killed to prevent its spread. Workers killed the fish by adding chlorine to the water or by turning off the fresh-water supply, causing the fish to die from lack of oxygen.

Yesterday, workers were still killing the last of the fish and putting them into trenches to be buried.

The next step is to determine whether fish outside the hatcheries have the infection.

"We're setting up a very aggressive sampling schedule," Peck said.

He said crews will use nets, lines, traps and electric-shock devices to gather fish from streams and open water near the two hatcheries.

After the fish are caught, it will take two weeks to test them for the virus.

Peck would not speculate on the chance that the virus is now in wild fish, but he said it's possible that salmon returning from the ocean brought the virus into the two hatcheries.

No one knows how the virus got to this country, Peck said. "If anyone had a guess at this point," he said, "it would be just speculation."

Opponents of net-pen salmon raising believe, however, that the importation of Atlantic salmon eggs to the state is the most likely cause.

"It could have come over as infected Atlantic salmon eggs, and Pacific salmon could have picked it up from them. I think that's the most probable cause," said L. Joe Miller, president of the Marine Environmental Consortium.

Miller said his organization will ask at a public hearing tomorrow for a moratorium on new net-pen permits until the cause and extent of the disease are known.

It is impossible to determine how much damage the virus could do to fish populations here because so little is known about its effects, particularly on salmon.

In Europe, where the virus has been detected mainly in trout, it was responsible for killing 80 percent to 90 percent of the trout in a certain confined area, Grover said.

The ability of the disease to spread quickly among fish poses great concern to commercial operators raising salmon in net pens.

"We're cooperating with the state Department of Fisheries in its investigation," said Haavard Rabben, general manager of Global Aqua USA, which raises Atlantic salmon in floating net pens in Puget Sound.

Eggs and fry used by Global Aqua are routinely tested for many diseases and have never tested positive for VHS, Rabben said. But he said if the virus is in wild fish in Puget Sound, it could spread to his fish.

Brunson said the fish kill hurt the morale of hatchery workers. "They've invested a lot of their effort and their heart in trying to rear fish, and then we call them and tell them to kill them," he said.

The number of fish destroyed last week represented only about 1 percent of the fish raised in state, federal and tribal hatcheries in Washington state, but there is deep concern over whether the disease will be found elsewhere.

"It was discovered in routine sampling at Glenwood Springs, and we know we've transferred fish in and out of that facility to and from other hatcheries," said Tony Floor, state fisheries spokesman.

But Peck said no eggs or fish were transferred out of the Glenwood Springs hatchery last year because egg samples from returning adult fish showed that some type of virus was present. "We knew we had some type of problem. We didn't know what it was, but we red-flagged that facility," he said.

Peck said it is too early to gauge the extent of the threat to the state's 30 major salmon hatcheries, but he said additional tests are being done at each site.

More than 327 million fish were released last year from state, tribal and cooperative hatcheries. The smaller federal fisheries program released 60 million fish last year in Washington, Oregon and Idaho.

Grover said the fish destroyed at the Makah hatchery represented "a substantial portion of our total production," in the Northwest. He said fish raised on the Olympic Peninsula are considered particularly valuable because they are close to the ocean and usually have a good survival rate when released.

CANADA'S

The Fisherman (B.C) Dec '88

Norway sees mounting disease, pollution threat from fish farms

The deadly salmon disease furunculosis, previously unknown in Norwegian waters, is breaking out of fish farms and threatening beleaguered wild stocks, says a top government official.

Svein Aage Mehli, head of the division of Norway's Directorate for Nature Management which is charged with protection of wild salmon, told a Washington State regulatory hearing Nov. 14 that 5,000 farmed salmon infected with the disease escaped this summer into Hjorundfjorden near Molde.

Despite an intensive fishery to catch the fish and a system of net barricades at the mouths of salmon rivers, an infected fish was found in fresh water, he testified.

"If the disease spreads to natural stocks, the situation may be out of control in Norway," Mehli said.

"I feel we are on a sharp edge with diseases. If we have (the parasite) *Gyrodactylus salaris* in more rivers we may just accept our wild salmon is extinct."

(Furunculosis is present in B.C. waters and leads to loss of appetite, fluid retention, ulcers and eventually death in up to 60 percent of affected stocks. It had not been found in Norway until smolt transfers from outside the country were undertaken. Gyrodactylus also has been linked to fish farming and is treated by killing all host fish with rotenone.)

Mehli was qualified as an expert witness at a hearing in Lacey, Wash., of the Shoreline Hearings Board, which is hearing an appeal of a Skagit County decision to reject a fish farm in the mouth of the Skagit.

The fish farm proponents, a tribal group, are appealing the refusal of the Skagit County commissioners to issue permits for the farm on the basis that it threatens Skagit salmon and could pollute the sensitive estuary.

Proponents have denied there is any evidence of a disease threat to wild stocks from farmed salmon.

As a result, the appeal hearing has turned into a deep investigation of the environmental impact of salmon farms on wild stocks. Mehli was flown from Norway to testify on behalf of county commissioners, who backed up their decision by referring to the Suzuki Foundation report on Norway called *Journey to the Future*.



• Svein Aage Mehli, of Norway's environmental agency, testified last month to a Washington State regulatory agency.

Mehli responded angrily to suggestions by fish farm proponents that there is "no conclusive evidence" of disease spreading to wild stocks from farms.

"We are very concerned," he said. "It is not right to ask for conclusive evidence at such an early stage."

Furunculosis imported on smolts destined for salmon farms broke out two years ago and authorities felt they had eradicated it, he said.

This year's outbreak was a shock, as was the continued spread of bacterial kidney disease (BKD), which is very difficult to treat even with antibiotics.

"BKD poses a problem for natural stocks because it was diagnosed for the first time in 1980 and previously did not exist in nature," Mehli said. "It is very easy to see a connection between BKD (in salmon farms) and wild stocks in the river."

"It's reasonable to conclude" BKD spread from farms, he said, and Norwegian scientists "see logic in such a connection." BKD is diagnosed or suspected in 100 netpen operations and hatcheries.

Antibiotic use on Norwegian fish farms climbed to 48 tonnes last year, equal to the requirements for human use and animal husbandry combined.

"If you see the first diagnosis of redmouth disease in Norway just two years ago, it's impossible to ask what happened in such a case," Mehli continued. "Veterinarians underline the seriousness of that situation, that net pen operations have an impact."

Mehli said redmouth now present in 300 facilities but was unknown until 1985.

"Net pen operations may function as a multiplying station for disease," Mehli said. "They will give greater disease pressure on natural stocks that we didn't see before netpen operations."

Mehli said further studies on the straying of farmed fish into rivers show a sharp increase in the presence of farmed fish. A year ago, 15 percent of the fish found in the rivers studied were of farm origin. In 1988, the figure rose to 40 percent. The origin was confirmed by scale samples and electrophoresis.

Asked if strong regulations could control disease, Mehli agreed they could "minimize problems if they go far enough. Norway has not gone far enough."

Norway is proposing a ban on the transfer of eggs and smolts between regions of the country, he said, and considering a ban on all imports of sexual products like eggs and milt.

Even though existing regulations list diseases which must not be present in imported eggs, the list is limited and "in Norwegian cage culture we know other diseases are knocking at the door."

In theory, he said, fish farmers "want to get rid of disease, but if they see profit in the short term they may react in a different way."

Mehli also confirmed fears of negative genetic effects of farmed fish on wild stocks if they interbreed. "We are very afraid it could affect their ability to migrate."

Netpen salmon have undergone careful selection for size and growth rate, he said, but researchers may have inadvertently selected other characteristics which could have a negative impact if reintroduced into wild stocks.

"First there is a genetic problem and second an environmental problem. If Atlantic salmon (escaping in Pacific waters) have the same requirements as coho or steelhead trout -- and we know that salmon escape in great numbers — then you will have competition for space in the rivers."

As to their ability to spawn, "we see them in rivers, they are mature, ready to spawn and we are very worried of what will happen."

New zoning regulations now being implemented in Norway will ban farms within 20 kilometres of salmon rivers and close entire fjords to farming where salmon rivers are present.

Don W. Collinsworth, Commissioner

Public Communications
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Alaska Department of Fish & Game

NEWS

FOR IMMEDIATE RELEASE March 1, 1989

ALASKA CONCERNED ABOUT NEW FINFISH VIRUS

Juneau...Fishery pathologists in the Fisheries Rehabilitation, Enhancement, and Development (FRED) Division of the Alaska Department of Fish and Game (ADF&G) are very concerned about the discovery in the State of Washington of Viral Hemorrhagic Septicemia (VHS), a fish virus that has not occurred before in North America.

Recently, a VHS virus was identified in spawning coho and chinook salmon in two hatcheries in the State of Washington: the Glenwood Springs Hatchery on Orcas Island and the Makah Hatchery operated by the U.S. Wildlife Service near Neah Bay. All fish hatcheries were destroyed, and the facilities quarantined in order to prevent the spread of this

VHS, first discovered in 1938 in Europe, causes primarily in rainbow trout in both fresh and salt water. Other fish shown to be susceptible include Atlantic salmon, brook trout, golden trout, rainbow trout-coho salmon hybrids, and goldfish. Transmission is by contact with other infected fish or contaminated waters. VHS has not been detected in North America despite extensive disease monitoring. VHS is capable of causing severe mortalities in older, larger fish, while Infectious Hematopoietic Necrosis Virus (IHNV), indigenous to wild Alaskan sockeye salmon, typically kills fry and juveniles. As with other viral diseases, there is no treatment for VHS except prevention.

Dr. Ted Meyers, Principal Pathologist for the FRED Division, has found no evidence of VHS disease in Alaskan

- MORE -

salmon stocks. According to Dr. Robert Burkett, Chief of Technology and Development for the FRED Division of ADF&G, Alaska maintains the best possible protection against invasion of exotic fish diseases because it prohibits the importation of any finfish into the state. "The most important thing was done ten years ago when regulations were established prohibiting import of finfish," Burkett says.

Dr. Meyers has been in contact with investigators performing the VHS identification and survey work at the Sand Point U.S. Fish and Wildlife Service Fish Pathology Laboratory in Seattle. Dr. Meyers will be travelling to the Seattle Laboratory to monitor the progress of the investigations and to determine the extent of the VHS problem in Washington and the Pacific Northwest. FRED Division pathologists will continue to monitor Alaskan salmonid stocks for IHNV using procedures that would detect other viruses as well, including VHS.

As a result of the potential risk to Alaskan stocks, the Commissioner of ADF&G, Don Collinsworth, is calling for the immediate formation of a Pacific Coastal Task Force composed of state and provincial representatives from Alaska, Washington, Oregon, Idaho, California, and British Columbia, with appropriate representatives from state, federal, tribal, and private industry, to investigate the risk of spreading VHS from infected hatcheries in Washington State and to develop effective control methods to contain this disease.

* * * * *

Peninsula Clarion

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For
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ALASKA: An OPEC production limit is credited for stabilizing North Slope crude oil prices after months of hefty increases. Page 6.

BUSINESS: High energy efficient houses could be the key in reviving the depressed Alaska building market. Page 8.

NATION: John Tower admits to marital infidelity amidst his vow to keep fighting for Senate confirmation as defense secretary. Page 10.

WORLD: Venezuela death toll keeps climbing as new riots against price increases break out in the western slums of Caracas. Page 12.

Borough panel urges fish farming ban

By JON LITTLE
Staff Writer

The borough's Planning Commission surprised some observers Monday when it ignored a state agency's request and called on the borough to forbid salmon farming in peninsula waters.

The state currently bans salmon farming, but may someday lift that restriction if studies indicate the practice poses no health risks to native salmon stocks and other finfish.

An amendment was submitted by state Department of Natural Resources officials and other agencies who wanted the borough policy to leave an option for salmon farming in the future.

But the policy supported by the Planning Commission that is set out in a proposed Coastal Management Plan prohibits all finfish farming within the waters of the Kenai Peninsula Borough.

The DNR wanted the strict policy loosened a little. The agency wanted to continue the ban, but create an option by adding, "until such time as sufficient research, technology and public opinion favor this development."

That is, if the state were to lift its ban, the DNR apparently wanted the borough to be able to follow suit so it wouldn't cut itself off from possible economic development, according to Sylvia Spearow, a borough planner who drafted the Coastal Plan.

Some fears were raised that the amendment would weaken local control on the salmon farming policy, Spearow said.

The sev... Planning Commission

See FISH, back page

Soaring insurance bill slams school district

By MACHELE MARTIN
Staff Writer

The school district's cost for employee health insurance is projected for a 37 percent rise next year and that's one reason district officials are hoping the state Legislature rules out any surprise cuts in funding.

If the state keeps its side of the deal by not tampering with the Foundation Funding formula for local schools, the Kenai Peninsula ... said that is why the Anchorage schools have been able to cut their school taxes.

When more students are added to the classroom, it boosts the number of instructional units the formula applies. The formula multiplies a certain dollar amount by the overall number of instructional units to come up with the amount of state funding for each district. On the peninsula, roughly 13 to 17 students equals one in-



...Fish farming

Continued from page 1

members present Monday rejected the amendment in a 3-4 vote, then voted unanimously to accept the Coastal Plan as submitted to them.

"I was real surprised they changed the amendment, I was happy with it," said Sid Cox, a commercial fisherman from Clam Gulch who showed up to testify against salmon farming. "I was stunned to be perfectly honest."

Cox presented a 30-page document he compiled that contains scientific articles and comments from officials involved in salmon farming. He highlighted concerns about the spread of disease through pen-reared salmon and the use of antibiotics and pesticides on the fish.

The Coastal Plan, which is a list of objectives and policies set by the borough for the development of its coastal region, is still technically in flux. It needs final approval from the Borough Assembly, which follows reviews by separate state and federal agencies.

Salmon farming is also known as "finfish mariculture." Salmon have been raised in floating rectangular pens by Norwegian fishermen for some 18 years. Other countries also allow the practice.

Within the state, some shellfish are raised in underwater farms, and one experimental salmon pen exists near Etolin Island in Southeast Alaska, according to Spearow.

Spearow said she, too, was surprised by the Planning Commission vote but indicated that she was not upset. "If we do feel strongly about finfish farming then we might as well make an absolute statement in our Coastal Plan document," she said.

If the plan makes it through the gauntlet of state and federal review councils with the policy intact, then, "There will be no finfish farming allowed in the borough," she said.

She said the plan stood a good chance of state and federal acceptance, despite the DNR objections. The borough has worked with officials from the state and federal coastal policy councils in producing the draft plan, Spearow said. "I don't see that we're going to have a problem."

Besides the mariculture issue, some controversy remains over the proposed boundary of the borough coastal zone. The draft plan places everything below the 1,000-foot mark within the borough's coastal zone, which would make the zone stretch from Cook Inlet to the foothills of the Kenai Mountains.

Spearow said she hoped to place the plan in the Assembly packet for its March 21 meeting. Assembly action at that time would issue the draft forward to the state level. The plan would then move on for federal review, and finally return to the Assembly for codification into borough ordinances.

In theory, the coastal plan could be back for Assembly action this fall, Spearow said.

...Insurance bill

Continued from page 1

Great-West, the insurance carrier, is projecting, Swarner said after the meeting.

The district could take bids from other insurance carriers and that's something being considered.

"Any time costs go up like that, you've got to make that an alternative," Sandahl said about switching companies.

But Swarner said increases are occurring nationwide and it's unlikely some carrier is going to be any less. The problem, he said, really rests in the costs of medical care.

Tom Wagoner, chamber member and former Kenai mayor, asked if the employees couldn't begin to share some of the premium costs.

Sandahl said the health insurance premiums are set by contract. The teachers' four-year contract expires at the end of FY 90, and any suggestion to have employees share the cost would be up to negotiations on new contracts.

"We'll open it up for discussion next year, but let me tell you, will be hardball," Sandahl said

Swarner said any kind employee payroll deduction benefits would have an immed savings to the district. He employee dollars deducted w be deposited into an account would be used to offset cur costs for insurance premiums.

Swarner said the distr number of insurance claims ar 26 percent for unknown rea He said the district brainstormed all it can to cut c without cutting benefits. One option under way is the form of a "wellness" commit Various members of labor gr hurses and administrators work on devising a prograr make employees a healthier lo

"Without going in and chan the program or employees sha the premiums, we've d everything we can to cor costs," Swarner said.

Sandahl encouraged busi organizations to familia themselves with the concerns ing the schools and lobby Legislature for full funding schools.

...Heart money

Continued from page 1

the funds in the bank until the hospital requests the money. The money will be applied to the cost of the transplant."

The group also stipulated that it would re-evaluate Alexie's progress after six months to see if she were close to her transplant goal. The six-member group will then decide if the money should continue to be reserved for her or donated to someone else.

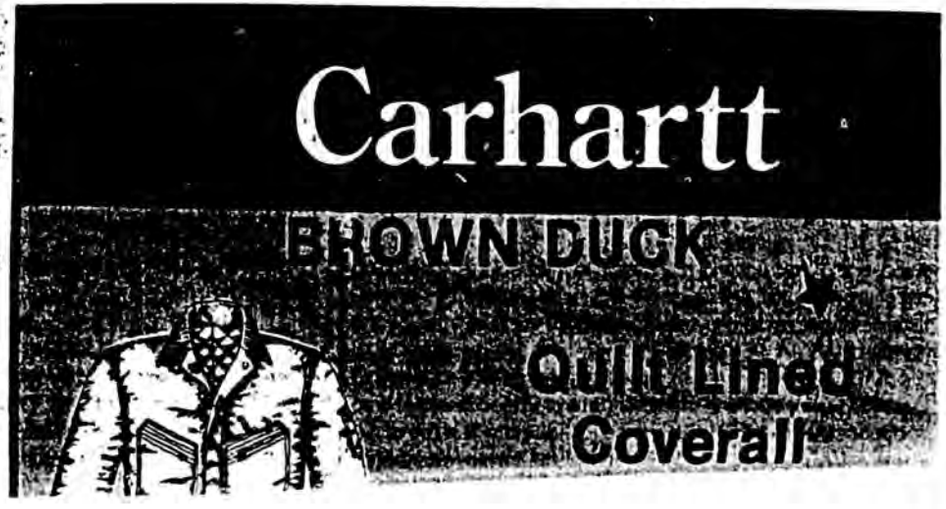
"If she's not had a transplant and the money could go to someone else in a life-threatening situation, then we might do that," Swan said. "We've already had two people call up about the money."

Bodle said she felt good about donating the money to someone else.

"It's a good feeling," Bodle said. "Not only for me, but for the donors. I think they'd get a good feeling knowing the money was going to help someone."

Meanwhile, Bodle said she has her good and her bad days.

"I feel pretty good today," she said. "I know I don't have a lot of time left, but I'm going to try to enjoy my days as much as possible."



Outdoors



GENUINE ARTICLE—About 2,000 Arctic char, like this one, were stocked in Chena Lake on Tuesday. Another 500 are bound for Chena, 500 for two local ponds, and another 8,700 various-sized char are bound for Harding Lake. Ice anglers who catch char are asked to report the catches to the Alaska Department of Fish and Game, Sport Fish Division at 456-8819.

Charles Mason/News-Miner

Char in area waters could be boon to Interior angling

By KELLY BOSTIAN
Staff Writer

The power ice auger sputtered to a stop as Mike Doxey yanked it from the hole he had drilled in the Chena Lake ice. Water ran over his boots and splashed onto his snow pants, but it didn't matter—at 31 below the liquid turned to ice as soon as it touched the fabric.

During this week of 30-50 below temperatures, the most popular deliveries probably have been that of fuel oil. But Doxey, a sport fish biologist with the Alaska Department of Fish and Game, dumped a live cargo of 2,000 Arctic char into Chena Lake that promises to be very popular with area anglers.

The char, which ranged in size from about 8 inches to 12 inches, are classed as "catchables" and are available for ice anglers, Doxey said. "We hope people will be catching them through the ice soon," he said.

Temperatures of 40-50 below between Fairbanks and the Clear Hatchery at Clear Air Force Station, put a stop to the stockings after Tuesday. More stockings are scheduled for Chena Lake, Harding Lake, Bathing Beauty Pond near Moose Creek, and the weigh station ponds near the Richardson Highway weigh station just south of Fairbanks.

Bathing Beauty, and the weigh station ponds will receive 250 each of the large catchables. Chena Lake is slated for 2,500 new residents and Harding will take on 8,700 char of varying sizes, Doxey said.

Dave Parks, hatchery manager, said he can hold on to the big fish for another week or two before crowding and a lack of food become a problem. It was too big a risk to send out a driver with thousands of char at 40 below, he said.

"We sort of picked the mid-minus 20s to be the deciding factor of whether we stock or not," Parks said. "When it gets down to 30 below I won't go to town myself. My main concern is a mechanical failure of the truck and then there we are sitting with a load of fish, the water getting colder and colder and the oxygen running out," he said.

Ice is no problem

Fish normally aren't stocked at this time of winter, and especially not when it's this cold, but Doxey said the department has had good luck stocking lakes through the ice.

Most stockings are done in early spring and throughout the summer, but even warm weather operations aren't without risk. Doxey said it can be a worse shock for a fish to go from cold water to warm water than from warm to cold. Also, small fish are slow for the first few moments in their new environment, which makes them easy prey for summer's sea gulls.

The temperature difference when stocking in winter is minimal, Doxey said. He supposed the water in the hatchery is about 40 degrees and the water in the tank truck is near 33 degrees before the fish are dumped. "In the hole and right underneath the ice it's pretty cold," he said. "As you go down and get away from the bottom of the ice it warms up. Way down in Harding Lake in the middle of the winter it's right around 39 degrees."

Doxey stocked rainbow trout in Birch Lake, about 58 miles south of Fairbanks on the Richardson Highway, through the ice early last spring. Starting with fish that are healthy and have a lot of fat stored from hatchery food, the results of that stocking showed him the method is a good one.

"What happened was they took to it real well," Doxey said. "They had a higher survival. There was no predation from gulls. There was no thermal shock. And they can coast on that body fat if they don't get onto the food items that are available in the lake right away."

Tuesday's cold seemed much harder on Doxey and Assistant Hatchery Manager Tim Burke than it did on the fish. Ice formed on their mustaches and they struggled, alternately heating pipe connections with a torch and then quickly trying to fasten them.

Even a few leftover char that were manually scooped from the bottom of the truck's tank didn't seem to suffer from the cold as they were quickly shuffled down the hole through which their predecessors were piped.



HEALTHY STOCK—Tim Burke, assistant hatchery manager for the Clear Hatchery, examines a net of char after a ride from the hatchery to Fairbanks in 30-below temperatures. A little ice floated inside the insulated tank, but all the fish seemed to be enjoying the balmy 33-degree water. *Kelly Bostian/News-Miner*

Yup, they're real char

There sometimes is confusion over what is a dolly varden and what is an Arctic char. Doxey said that taxonomists have agreed that, generally, the species that travel from salt to fresh water are dolly varden and fresh water lake-dwelling species are Arctic char.

"These are true Arctic char," Doxey said of the Chena Lake fish.

(See CHAR, Page 16)

...the contest will ...accepted during Febuary. All entries must be 35mm color slides and must be postmarked by midnight Feb. 28.

Up to eight slides will be accepted from each entrant. Duplicates will be accepted for judging purposes but originals must be provided for reproductions. Winning entries will be kept on file for use by the Department of Fish and Game until January 1990.

The grand prize is $250 with a first prize of $150, a second prize of $100 and a third prize of $50. Ten honorable mentions will also be awarded. All wining photos will be reproduced in an issue of Alaska Fish and Game magazine.

Entrants should be sure to include their name and address on each entry and include a self-addressed, stamped envelope. Entries should be sent to Alaska Fish and Game magazine Photo Contest, P.O. Box 3-2000, Juneau, Alaska 99802-2000. For information, phone (907) 465-4112.

New road accesses Mount St. Helens

LONGVIEW, Wash. (AP)—Spirit Lake Memorial Highway will be

ATLANTA (AP)—Thousands of Americans are beginning the winter prowl of boat show floors and the industry is expecting another record year.

Jeff Napier, president of the National Marine Manufacturers Association, advises the 750,000 or so people who will buy boats this year to make sure what you're buying is really what you want in a boat.

Today there are boats to fit every purpose and hybrids that will handle several jobs, such as fishing and water skiing.

"The most important thing is to figure out what you really are going to use it for," Napier said by phone from the New York boat show. "Are you going to use it for cruising, or to be a fisherman?

"A lot of people buy a boat because it looks kind of neat, but it doesn't fit their needs. Figure out what your use is going to be."

The average American's average boat continues to be the 16-foot outboard, "the bread and butter of the industry," Napier said.

Americans spent $17.93 billion on boating products and services in 1988, double the 1982 level.

"In 1989, keeping in mind we're already running at record levels, we don't see the growth of the last six years, but after six record

CHAR

(Continued from Page 15)

The fish appear olive in color with some iridescence and yellow spots. They should be easily identified in comparison to the colorful rainbow trout and shiny silver salmon.

Doxey is interested in knowing how soon and how many of the fish are caught. A creel census will be conducted at popular spots, but Doxey said he would appreciate it if anglers called in unrecorded catches. He can be reached at 456-8819.

Doxey is cautiously holding high hopes for char in local lakes. "We hope they will work out well. It looks like they will. They grow real well in the hatchery, but we'll just have to wait and see how they do as far as compared to rainbows and silvers. But, we're pretty optimistic."

Parks has found that char grow three to four times faster than rainbow trout in the hatchery environment. Growth in the lakes remains to be seen, but Parks said he wouldn't be suprised if some eventually grow to 8-10 pounds.

Their fast growth rate makes them less expensive to raise, thus making them popular in private commercial hatcheries. Clear already has had requests for eggs from fish culturists in Alaska and Outside, Parks said.

The other good thing about the char, even if it turns out that they don't grow to great sizes, is that they are voracious eaters. That should make them popular among anglers.

Doxey used the example that rainbow trout and silver salmon complement each other because, when one species is slow or not biting, the other seems to take over. Char, hopefully, will fill their own niche and help keep anglers busy.

"One of the characteristics of char is they're real opportunists," Parks said. "They don't care what they eat: other fish, insects, anything that's available in the water they'll take advantage of—including their own."





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decades by a delegation to solve waste water treatment problems."

He seemed to have in mind, with good reason, not only collaboration in planning the execution of problems, but also broader sharing of the enormous financial outlay required.

In its report to Congress, the agency set this at $83.5 billion. ... The figure, incidentally, points up something we have cause to be glum about: Congress approved the Clean Water Act in 1972, yet 17 years later the problems it addresses still plague the nation. ...

With two-thirds of the nation's waste water treatment plants deficient in some way, it is clear that we need to put more effort – and that means more money – into achieving what Congress intended 17 years ago.

●●●●●

Bangor (Maine) Daily News on the Salman Rushdie affair: The ayatollah (Ruhollah Khomeini of Iran) is meddling directly in the internal affairs of other states (with his execution order for "The Satanic Verses" author Salman Rusdie).

He is using a new form of terrorism – state-funded assassination – to intimidate into silence the resident of a country where freedom of expression is cherished.

He has created a new threat to world commerce. If one nation dislikes a product or process allowed in another, Khomeini has established his own corollary to caveat emptor: Paint a bull's-eye on the head of the foreign manufacturer.

What began as just another strange, almost comical episode in the reign of Khomeini has evolved into a broad confrontation over principles of personal and economic freedom.

The U.S. and its European allies must maintain pressure on the Iranian government to lift the death sentence on Rushdie, a British citizen of Indian heritage who has been made an international symbol of the value of freedom of expression. The Iranians must not be allowed to make him a martyr.

●●●●●

The Morning News Tribune, Tacoma, Wash., on Hirohito's funeral: Few Americans would have blamed George Bush had he chosen to skip Emperor Hirohito's funeral. ... The president had personal reasons not to honor Hirohito's memory.

Like millions of other Americans, he was drawn unwillingly into World War II as a result of Japan's attack on Pearl Harbor. While serving as a naval aviator, he was shot down by the Japanese over the Pacific Ocean in 1944.

Historians today dispute Hirohito's role in the Japanese aggressions of that era. But there's no question the emperor at least reluctantly endorsed Japan's decision to wage war against the United States and other Pacific powers. ...

By attending the funeral, Bush made it clear that what happened in the Pacific nearly a half-century ago no longer has any bearing on America's relationship with Japan. And that relationship – despite all the grumblings about trade balances – is one of friendship. ...

World War II is history. America's future is now inseparable from Japan's. Nothing could demonstrate those realities better than George Bush's presence in Tokyo.

LETTERS

Finfish mariculture

Dear Editor:

On January 28, a Sealaska spokesman, at a Ketchikan symposium on regional economic needs, suggested that one of the most attractive new economic diversification opportunities for Southeast is mariculture and discussed finfish mariculture in particular.

The statement was not meant as an endorsement of immediate or even ultimate public policy authorization of finfish mariculture. Sealaska's purpose was to stimulate the continuing debate on the subject. Sealaska's only position on finfish mariculture is that a responsible public policy debate needs to continue based on objective, scientific, environmental, community needs and economic considerations and not on emotion and self-interest.

Sealaska also believes that other forms of mariculture opportunity not be jeopardized in the controversy over finfish mariculture. The world-

DOONESBURY







FORUM

Pen-farmed salmon industry requires more research

By SONJA CORAZZA

COMPASS
POINTS OF VIEW FROM OUR COMMUNITY

Alaska fishermen's concerns over genetic pollution and disease problems associated with escaped pen-farmed salmon are not unwarranted.

Thirteen to 20 percent of all farmed fish escape, as documented by Norwegian scientists and European countries, and large numbers can escape from pens.

The escapees can spawn in rivers up to a proven distance of 20 kilometers from their net pens.

As a consequence of this research, and with great concern for the genetic integrity and survival of their wild salmon stocks, Norway has just imposed a series of new regulations on their pen-farmed salmon industry. No salmon farms will be located within 20 kilometers of salmon rivers, and entire fjords will be closed to farming where salmon rivers are present.

This past December in Jarvis Inlet, B.C., 300,000 pen-farmed salmon escaped in winter storms that hit Canada. Floating net pens were found for miles up and down the coast.

Norwegians have lost tons of their pen-farmed salmon to a deadly salmon disease *furunculosis*, and last summer 5,000 fish infected with *furunculosis* escaped in Norway. Despite intensive efforts to capture the diseased fish, an infected fish was found in a freshwater stream.

In order to control disease in pens, Norway's use of antibiotics in pen farming has risen 170 percent in the past two years to reach a level of 48 tons, more than the use in animal husbandry and human use combined.

With the present focus on health and nutrition, how does this reliance on antibiotics fit our view of pen-farmed salmon as a healthy addition to our diets?

Norway's most severe threat to wild stocks is from the parasite *gyrodactylus salaris*, which has wiped out 30 wild salmon rivers. This parasite entered Norway via imported salmon eggs from Sweden. Importing eggs had been prohibited, but those regulations were overturned by farmers with economic concerns.

The chemical rotenone which kills the parasite destroys everything in the rivers, hence the loss of wild salmon by the tons in Norway.

In the state of Washington, which two years ago allowed the importation of Atlantic salmon for the economic benefit of their farmers, a report was released on fin fish farming and disease. It stated that the VHS disease carried by Atlantic salmon had never been found outside of Europe and that there was little likelihood of it ever being a problem.

Now, VHS has been found and millions of their eggs and fish are being destroyed. VHS is particularly fatal for rainbow trout and steelhead.

Domesticating Pacific salmon takes three to four generations of fish and the gene pool may be reduced for docile characteristics. It is possible the migration instinct may breed out of wild salmon, and scientists are concerned interbreeding could affect the wild salmon's ability to migrate.

Ownership of the pen farming industry continues to be an issue. In Washington state a local fish farmer is suing foreign corporations, primarily Norwegian, for attempting to monopolize the industry.

Who would own the farms in Alaska? Alaska is presently the world leader in ocean ranching and that program is responsible for at least $80 million in resident income and 2,300 resident jobs.

The Alaska State Legislature should fund the Mariculture Task Force, a forum where legitimate concerns about fin fish farming need to be researched.

☐ Sonja Corazza is a member of the United Fishermen of Alaska, Mariculture Committee.

POINT COUNTERPOINT
Fish Farming: To Be or Not to Be?

Let's Get On With Fish Farming

by Senator Arliss Sturgulewski (R. Anchorage)

This fall I attended the Aquaculture International Conference held in Vancouver, British Columbia, and returned home with mixed feelings of excitement and frustration. Worldwide, the aquaculture industry is experiencing explosive growth, particularly in the salmon farming industry in neighboring B.C. where private investment during the past few years now amounts to hundreds of millions of dollars. The enthusiasm and optimism of Canadian entrepreneurs is contagious. At the same time, I came away with a profound sense of dismay that the opportunity for this type of economic development, occuring, in Alaska.

With our inherently high production costs, we have very few opportunities for renewable resource developments that can be competitive on world markets. Finfish farming is a means of utilizing our comparative advantages of clean marine waters, vast stretches of uninhabited coastline, biological expertise and large public and private salmon hatchery capacity. Recent Alaska Department of Commerce and Economic Development reports have shown that delivered costs for farmed salmon from Alaska could be comparable to those of many competing producers in U.S. and Japanese markets.

Fifteen other countries and numerous states have successfully dealt with the public policy issues surrounding finfish farming. Our own Department of Fish and Game experts tell us that disease and genetic concerns about salmon farming are essentially the same as those in the state's hatchery program and can be addressed via current regulations. Processes for identifying potential sites and resolving user conflicts have been adopted in Washington and B.C. (Note that a large salmon farming operation occupies about two acres —surely there is enough room in state waters to accomodate a moderate-sized industry of perhaps 50 - 100 farms.) Environmentalists worried about water quality and waste sedimentation forget that fish farmers have a powerful economic incentive to protect the marine environment.

In large part, organized fishing groups in Alaska have chosen to perceive the inevitable market effects of worldwide farmed salmon production as a threat to their livelihood rather than an opportunity for

*See **LET'S GO** page 67*

Let's Not Be So Hasty

by Oliver Holm
President, Board of Directors
Kodiak Regional Aquaculture Association

Senator Sturgulewski appears to be infected by the excitement of the wealthy entrepreneurs now beginning to exploit British Columbia for salmon pen rearing. I would like to take issue with her arguments presented in her Dec. 21, 1988 guest opinion in the *Kodiak Mirror*.

I was dismayed, but not surprised to hear her suggest diverting the State's hatchery system into supplying smolts for pen rearing operations. This diversion would cost commercial, sport and subsistence fishermen millions of dollars worth of lost fish in order to benefit a few mariculturists. The very nature of the fish best for mariculture is different than what is desireable for ocean ranching enhancement fish. In Norway, Atlantic salmon have been bred for pen rearing so that they gain weight quicker and are more docile than wild stocks. This is fine for the profits of the pen farmers but should many pen fish escape, it is a disaster for their wild stocks. Straying farm fish are so diluting their wild stocks genetically that the Norwegians are trying to set up a gene bank to preserve the genetic diversity of their wild stocks before it is lost.

Pen rearing experiments with king salmon at Little Port Walter in Southeast Alaska found kings very skittish in pens and prone to sexually maturing early when confined to pens—which halts further growth. Washington State and British Columbia quickly allowed importation of pen adapted Norwegian Atlantic salmon to boost the profitability of their farm operations. This is biologically a very poor policy. This year in Washington commercial fishermen caught escaped Atlantic salmon in many areas. These fish won't migrate out to sea like the native Pacific salmon. Instead they will be a new near-shore predator devouring juvenile wild and hatchery fish. This will cost the commercial and sport fishery in lost production.

Since some hatchery fish stray to other nearby streams and locally adapted stocks usually do better anyway, it is usually state policy and good hatchery management to use only local stocks for hatchery production. Using local stocks and letting the natural ocean environment do the selecting minimizes the genetic impacts of hatchery operations on our wild stocks. With the profits of an Alaskan pen rearing industry at stake I wouldn't want to count on good biological judgement always prevailing. ADF&G's FRED Division moved approximately 10,000,000 pink salmon eggs from Kitoi Hatchery on Afognak Island 450 miles out to Russell creek Hatchery in Cold Bay last year for brood stock. Even though local stocks would clearly be preferred, the transfer was approved by FRED Division because it would save money and was convenient.

There is still a lot of potential for growth in salmon production through increased enhancement efforts and research. It is still much cheaper to let the fish range the ocean to feed themselves. In many areas of the state fishermen are paying much of the enhancement costs through their regional aquaculture associations. This is not the time to divert the state's technical support away from a proven and effective program.

Bringing jobs to Western Alaska villages and fishermen would be admirable but seems unlikely from pen rearing. All of Alaska north of the Alaska Peninsula can be ruled out as unfeasible because of the ice. Southeast Alaska, Prince William Sound, South & East Kenai Peninsula and Kodiak Island are probably the only areas of the state feasible for farm operations.

Pen rearing provides relatively few direct jobs on site. These jobs require a year-round commitment, which doesn't fit in well with commercial fishing or a subsistence lifestyle. It is unlikely that very many rural residents will get jobs in the transportation industry, finance, insurance or consulting services. Unless legislation specifically limits ownerships to co-operatives of rural residents or fishermen, the main benefits of pen rearing will flow to already wealthy entrepreneurs; many would be foreigners.

Most residents of Alaska's coastal areas don't consider the coast uninhabited. Kodiak Island waters are intensively used for numerous fisheries, sport fishing, access to hunting areas, water borne transportation and float plane launching. Senator Sturgulewski's remarks about "burdensome regulations" for shellfish mariculturists makes me think that she feels mariculture should have priority. In Washington State, commercial fishermen and recreational users are having to spend thousands of dollars and hours of time to protect their traditional access to waters that pen rearing applications are trying to usurp. Public policy on mariculture siting needs a very close look, or a much larger segment of the population than the commercial fishing industry will have problems with it.

The course of the timber industry in Alaska is a good example of the kinds of problems we can expect if the legislature jumps on the mariculture bandwagon. Long term sustained yield has been ignored. Small operators were put out of business by regulations and policies designed to help large foreign-owned corporations. There is unnecessary habitat degradation affecting fisheries yields, recreational users, and tourism. Most of the potential jobs are being exported.

Is it any wonder that fishermen are skeptical when promotors claim great economic benefits without any problems? I commend Governor Cowper for not jumping on the salmon farming bandwagon. Much of Alaska is now and always will be dependent on our marine resources. Leasing out our most productive near-shore areas to people who will be concerned primarily with their own profit picture rather than the overall ecological balance is the most serious fisheries management decision the State has ever faced.

LET'S GO

continued from page 66

investment in year-round production capability. Through their cooperatives, fishermen in Alaska could augment their wild catch with farmed fish in the off-season and lock in a position in fast growing fresh salmon markets instead of sitting on the beach and watching their market share steadily decline.

According to experts at the Vancouver conference, the U.S. market for fresh and frozen salmon has plenty of room to grow. In 1987, each U.S. citizen consumed 238 pounds of protein but only 15.4 pounds was seafood, and less than 3.2 pounds was fresh and frozen salmon. As the president of National Seafoods, the largest seafood processing company in North America stated to the conference, "In the near future, any major fish processing company without an aquaculture card in its hand will find it very difficult to compete." Sales of eggs and smolts from public and private hatcheries to salmon farmers could help make the state's subsidized public and private nonprofit hatchery system, which primarily benefits commercial fishermen, self-sustaining.

By 1987, salmon farming had created 570 direct jobs in B.C. It has also resulted in large indirect economic impacts in the seafood processing and support industries—those which supply feed, smolts, equipment, transportation, financing, insurance and various consulting services—have spun off the local salmon farming industry. Direct and indirect employment is expected to grow to 3,500 jobs in B.C. salmon farming by 1990. These opportunities for economic development do not exist in coastal communities in Alaska.

What future does the commercial fishing industry hold for a Western Alaska village family with five kids and one limited entry permit? How many investment opportunities are available for Southeast native corporations that will create jobs for shareholders once the NOLs are gone and their timber resource depleted? What kind of precedent do we set when we allow special interest groups to determine the scope of our economic development possibilities? What business do politicians have in limiting private investment opportunities? How can we afford to forego any means of attracting outside capital investment to diversify our economy away from petroleum revenue dependence?

These policy questions are troubling. It is somewhat embarassing to speak with public officials from other states and countries who have been able to deal with the same issues we are facing and rise above special interest politics to seize the opportunity that aquaculture diversification, particularly finfish farming, presents. Frankly, they are astonished when I tell them about the political situation in Alaska. It is time for the legislature to move ahead on this issue, absent any positive leadership from the governor's office. Our competitiveness in future seafood markets is at stake. We should lift the moratorium on finfish farming and revise the burdensome regulations placed on shellfish farmers. We need to overcome our parochial differences and get on with the responsible development of our marine resources under a reasonable state regulatory regime.

State Senator Arliss Sturgulewski is Chairman of the Senate Community and Regional Affairs Committee and the Senate Special Committee on Local and Regional Economic Opportunity.

SENATE LABOR & COMMERCE COMMITTEE

Senator Richard I. (Dick) Eliason, Chairman

Senator Pat Rodey, Vice-Chairman
Senator Jan Faiks
Senator Jalmar Kerttula
Senator Jack Coghill

When your regs are completed re: aquatic farmings, will they be applicable in state parks? Our regs only apply to land managed by the Div. of Land & Water under Title 38. Parks land are manged under title 41 and as you know the Div. of Parks has regs out for review.
marine parks?

If the state park's regs are adopted to allow aquatic farming, will <u>you</u> be involved in the process? Aquaculture is already allowed, by statute, in marine Parks. Land and Water will not automatically be involved in their decisions.

What does L+WM view as "aqucalture"? We haven't really defined "aquaculture" in our regs, we have used the term aquatic farms and referenced the definition used in title 16 changes in SB 514. I don't know what a departmental definition would be.

Do you think that L+WH view "aquculture" as meaning only enhancement projects or do you <u>think</u> they view it as "aquatic farming"?
I think we would look for a text book or dictionary definition.

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

OFFICE OF THE COMMISSIONER

STEVE COWPER, GOVERNOR

400 WILLOUGHBY AVE.
JUNEAU, ALASKA 99801-1796
PHONE: (907) 465-2400

January 30, 1989

The Honcrable Tim Kelly
President of the Senate
P.O. Box V
Juneau, AK 99811

Dear Mr. President:

Please find attached the Aquatic Farm Report to the Legislature required by Section 19, Chapter 145, SLA 1988.

Sincerely,

Rod Swope for

Lennie Gorsuch
Commissioner

Attachment

cc: All Senators/w attachment

10-J9LH

AQUATIC FARM REPORT

TO THE LEGISLATURE

January 30, 1989



Steve Cowper
Governor
State of Alaska

Lennie Gorsuch
Commissioner
Department of Natural Resources

Gary Gustafson
Director
Division of Land and Water Management

For more information:
Janet Burleson
Project Manager
Division of Land and Water Management
465-3400

This report is submitted in response to Section 19, Chapter 145, SLA 1988 which requires the Commissioner of the Department of Natural Resources (DNR) to provide a report to the legislature detailing the department's implementation of AS 38.05.083 and 38.05.856 which allows individuals to acquire property rights on state-owned tidelands for aquatic farming purposes.

Summary:

Last year the legislature passed new legislation pertaining to aquatic farming in Alaska. The law authorized the farming of aquatic plants and shellfish, prohibited the farming of Atlantic salmon, extended the moratorium on finfish farming until July 1, 1990 and established the Alaska Finfish Farming Task Force. It provided a new system for accepting applications and issuing permits for aquatic farming for DNR. However, no funding was appropriated for implementation. In response to the legislation, the department proceeded to develop regulations and create the aquatic farm districts as required by the law, but has not opened any districts to applications due to lack of resources.

Background:

Aquatic farming is the cultivation of aquatic farm products in captivity. The new law authorizes shellfish and sea vegetable farming in Alaska. There are currently approximately 40 permitted aquatic farms in the state, primarily growing mussels and oysters. A few research operations involve scallops and kelp.

Prior to the enactment of this law DNR issued permits for aquatic farming, but used a general type of permit that did not include a property right and was revocable at will. The permit was issued for one to three years and included no preference for a lease or another permit when the permit expired.

The new law created several additional standards. It requires the department to create aquatic farm districts and hold a 60 day application period in each district annually. An aquatic farmsite permit is now a property right that can only be revoked for breach, giving the permittee the secure tenure needed to obtain financing and to make the significant capital investment necessary to develop a producing farm. A permittee who successfully develops an aquatic farm has an automatic preference right to a lease. Because issuing an aquatic farmsite permit is a "disposal of an interest in state land," as that term is used in Article VIII of the Alaska Constitution, DNR must first comply with all procedural safeguards applicable to land disposals; land planning and classification, best interest findings, public notice and review, reservation of access easements, etc.

Report:

Specifically, Section 19 requires the department to provide a report that includes:

1. **The number of applications received under AS 38.05.083 and 38.05.856, the number of leases and permits issued, according to type of aquatic farm product.**

The department has not yet accepted any applications, due to lack of resources. However, we have taken the steps to otherwise implement the program.

First, the department began the process of determining boundaries for the aquatic farm districts required by AS 38.05.855. To assist in developing district boundaries, the department solicited nominations from the public and state and federal agencies for areas which might be available for aquatic farming and areas that should be excluded from aquatic farming. In the Southcentral Region of Alaska we received a total of 574

nominations; 88 for areas that should be available for aquatic farming, 79 for areas that should be excluded from aquatic farming and 412 pieces of information indicating recreation areas, fishing areas and anchorages. In the Southeast Region, we received a total of 1031 nominations; 162 areas were nominated for development, 369 areas were nominated for exclusion and 500 pieces of information about recreation areas, fishing areas and anchorages. In addition to requesting review by other state and federal agencies, DNR asked for the assistance of an informal citizen's advisory group to help identify districts. The group represented shellfish growers, conservation organizations, and commercial fishermen. The group met several times and reached a consensus on the district boundaries. The group agreed to the establishment of 5 districts in the Southcentral Region and six districts in the Southeast Region. The district boundaries basically conform to DNR's existing or proposed area plan boundaries or coastal district/municipal boundaries. In southeast, the districts include Ketchikan/Misty Fjords, Prince of Wales Island, Stikine/Admiralty Island, Juneau/Haines boroughs, Chichagof/Baranof/Kruzof Island group and Yakutat/Glacier Bay. In the southcentral area the districts include the Alaska Peninsula, Kodiak Island, Kenai Peninsula Borough, Prince William Sound and Cape Suckling/Icy Bay.

Second, the Department of Law advised that the mandatory language in AS 38.05.856 required that regulations be adopted before decisions on permits could be made. Therefore DNR immediately began drafting regulations that set out its policies for carrying out the new program.

The first draft of the regulations was distributed informally in June. A preliminary public hearing draft was then written and distributed for comment to interest groups, individuals and other departments. The department gathered comments on the preliminary hearing draft, then the advisory group met to discuss the comments. The advisory group spent many hours in detailed analysis and discussion. Advisory group members served without compensation, and traveled to Juneau and Anchorage at their own expense.

Ideas suggested by advisory group members and incorporated into the draft regulations included: using a mailing list for effective notice of public comment opportunities; letting permit development plans include both a "floor" and a "ceiling" for development; allowing two renewals of the permit for a total term of nine years (to leave time for the extensive capital investment needed to become profitable); if strictly necessary, authorize onsite housing (removable within 30 days) of personnel at the permit stage, but provide for public review; before deciding to issue a permit, consider the effect on other land uses such as commercial fishing, primary anchorages, recreation and tourism; make sure that overland access to tidewater is not defeated by obstacles in the water itself; and allowing for site testing by means of ordinary revocable-at-will permits, which can be issued quickly because they are not land disposals.

These discussions took place in November. A public hearing draft was then developed which incorporated the comments of the advisory groups as much as possible. The draft was distributed to over 500 individuals, groups and agencies. Eight public hearings were held during mid-January in Anchorage, Homer, Cordova, Kodiak, Juneau, Ketchikan, Wrangell and Petersburg. The public comment period expired on January 20, 1989. The department proposes to incorporate the comments and adopt the regulations by mid-February. They must then proceed to the department of Law to be approved and on to the Lt. Governor to be promulgated.

The draft regulations (11 AAC 63) detail the entire process of applying for and obtaining an aquatic farmsite permit or lease. Sec. 010 of the new chapter explains the subject of the chapter and defines an aquatic farmsite permit as a type of land disposal. Sec. 020 covers the process of calling for area nominations to help set application district boundaries, then opening the district to applications for aquatic farmsite permits, mapping the open area

advertising the opening and setting filing guidelines for applications. Sec. 030 sets filing requirements for permit applications, including the requirement for a proposed development plan and schedule, and explains what will be done if applications overlap or too many applications are filed for a limited area. Sec. 040 covers associated facilities for storing equipment, of housing personnel and puts restrictions on authorizations for such purposes; it also covers the rights of upland owners and offers a preference right to an applicant who will put such facilities on the applicant's land rather than on state land.

Sec. 050 specifies the review process used for complete applications and the criteria for a preliminary finding under AS 39.05.035(e) that granting permits would be in the state's best interest. Sec. 060 sets rules for notice and the opportunity to comment, including notice to upland owners, and specifies that a permit will not be issued if the upland owner will not authorize upland use that the applicant states is necessary. Sec. 070 covers the process of issuing permits after a final best interest finding and sets out permit requirements, including posting a bond and paying a use fee. It also allows for two renewals of a permit under specific circumstances. Sec. 080 explains how the permit or lease bond amount will be determined. Sec. 090 covers the transition from permits issued under AS 38.05.850 (an older law on permits for general natural resource uses) and defines which permits qualify under a "savings clause" that the legislature included in sec. 18 of the law. It limits the circumstances in which the department will issue permits for aquatic farm related purposes using the older permit law rather than the new law. Sec. 100 sets out the requirements for getting and keeping an aquatic farmsite lease. Sec. 110 includes general conditions for both permits and leases and sec 120 defines terms used in the new chapter.

2. The restrictions attached to permits and leases

The department recognizes safeguards in the bond required in the law, the proposed regulations and the statute. Typical conditions to be included in permits and leases (such as prohibiting unlawful activities on the premises, requiring compliance with all applicable laws, and providing for amendments) are set out in the proposed 11 AAC 63.110. Site-specific conditions necessary to resolve or mitigate conflicts may be drawn from guidelines set out in applicable land use or coastal management plans. Where no such guidelines are available, the proposed 11 AAC 63.050 directs that the guidelines included in the department's final Etolin Island Area Mariculture Pilot Project be consulted.

3. A discussion of the system the department implements for issuing leases and tideland and land use permits

Through the summer of 1988 the department met with representatives from the Departments of Fish and Game, Environmental Conservation and the Division of Governmental Coordination, state agencies which are also impacted by the law. The primary purpose of this interagency group was to incorporate the new procedures into existing Alaska Coastal Management Program (ACMP) procedures, streamline the process for the permittee as much as possible and amend the existing aquatic farm application to reflect the changes in the new law. The interagency group developed a consolidated application form used by the applicant to obtain authorizations routinely required by the above departments. Attached to this report are charts which 1) outline DNR's procedures and 2) specify how all the affected agencies processes will work. Also attached is the draft Application for Aquatic Farm Permits developed by the interagency group. The agencies intend to process all applications within a particular aquatic farm district simultaneously. The result should be that all the applicant's state authorizations will be issued at the same time. When the draft regulations are adopted, we will proceed to implement the program, given the availability of sufficient resources.

4. The level of public involvement in the issuance process

The level of public involvement is prescribed in the law. It expanded the notice requirements under AS 38.05.945 which requires notice to municipalities, Native corporations, newspapers, community councils and community organizations to include coastal resource service areas and fish and game advisory boards. A coastal review process is also required. A public hearing is required under AS 38.05.946 when the preliminary decision is completed. Recognizing the interest the public has shown regarding aquatic farming, the department solicited nominations for areas of interest for aquatic farming, mailed over 500 copies of the proposed regulations, established an advisory group to assist in the creation of districts and regulations and held public hearings on the regulations in eight coastal communities. The draft regulations provide that people may get on a mailing list for notice of district openings and best interest findings. In short, we expect the demonstrated public interest in the program to continue and we're prepared to accommodate it.

5. A discussion of how the program is working and the department's plans for modification

The districts are in place and the regulation process is in the final stages. The next step is to open sequentially all districts for 60 day annual application periods, followed by application processing and permit issuance. However, because no money was appropriated to implement the new law, the affected state agencies, including DNR, cannot proceed further at this time.

Attachments (3)

A DNR Processing Time Line
B Aquatic Farm Siting Process Under CSSB 514 and ACMP
C Application for Aquatic Farm Permits

ATTACHMENT A

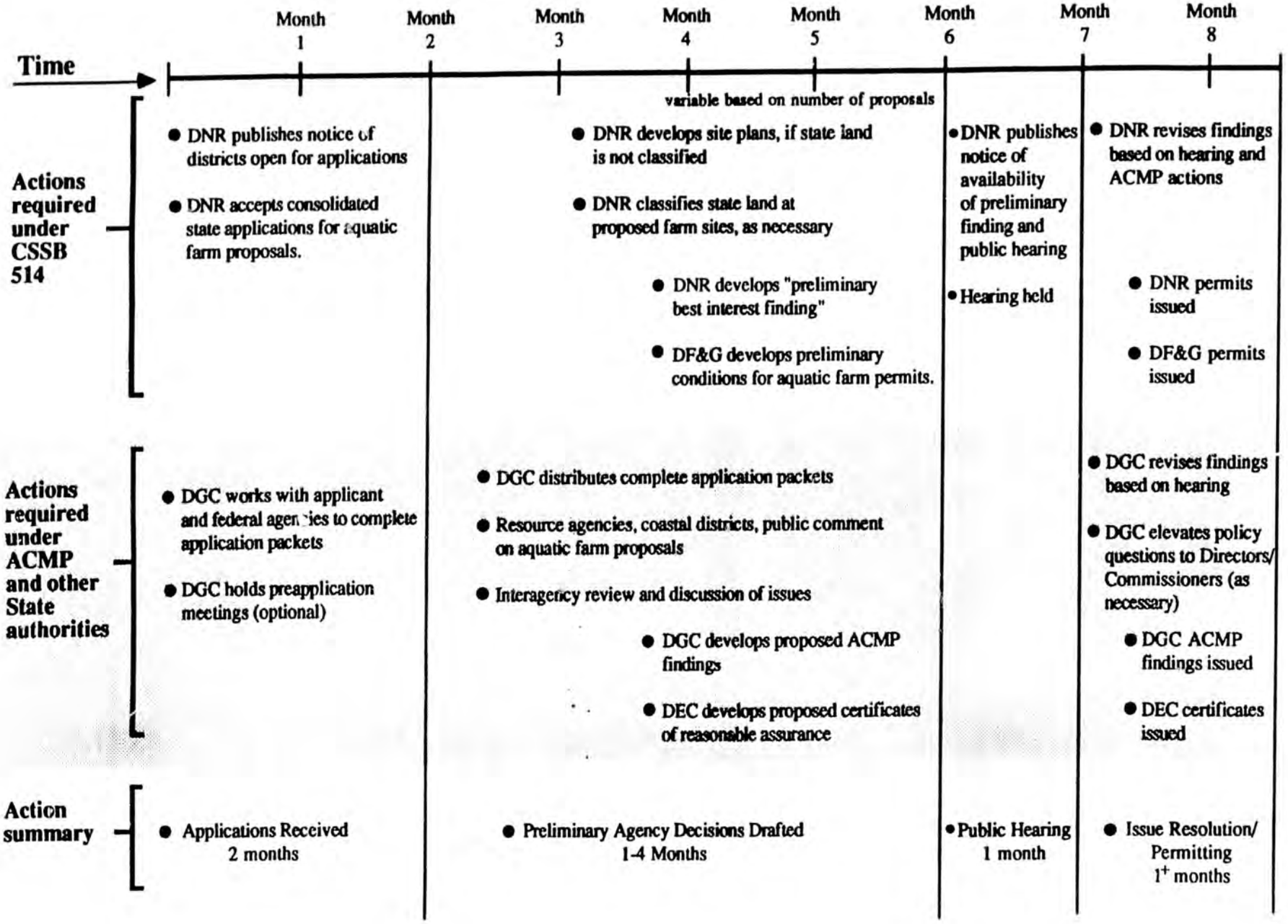
DNR ESTIMATED PERMIT PROCESSING TIME LINE*

Prior to Month 1	DNR Publishes Notice of Districts Open for Application
Month 1-2	Aquatic Farm Proposal Applications Accepted
Month 3-6	Site Plans Developed for Unclassified Lands Lands Classified as Necessary Preliminary Best Interest Finding Developed
Month 7	Notice of Preliminary Best Interest Finding and Public Hearings Published Public Hearings Held
Month 8	Findings Revised as Necessary Permits Issued

* ADF&G, DEC and ACMP Actions and Reviews Are Completed In The Same Time Frame.

ATTACHMENT B

Aquatic Farm Siting Process Under CSSB 514 & ACMP



ATTACHMENT C

STATE OF ALASKA

OFFICE OF THE GOVERNOR

DIVISION OF GOVERNMENTAL COORDINATION

STEVE COWPER, GOVERNOR

CENTRAL OFFICE
P.O. BOX AW
JUNEAU, ALASKA 99811-0165
PHONE: (907) 465-3562

SOUTHEAST REGIONAL OFFICE
431 NORTH FRANKLIN
P.O. BOX AW, SUITE 101
JUNEAU, ALASKA 99811-0165
PHONE: (907) 465-3562

SOUTHCENTRAL REGIONAL OFFICE
2600 DENALI STREET
SUITE 700
ANCHORAGE, ALASKA 99503-2798
PHONE: (907) 274-1581

NORTHERN REGIONAL OFFICE
675 SEVENTH AVENUE
STATION H
FAIRBANKS, ALASKA 99701-4596
PHONE: (907) 456-3084

Dear Aquatic Farm Applicant:

The Aquatic Farm Application is designed to help you obtain the authorizations routinely required by the State of Alaska Departments of Natural Resources (DNR), Fish and Game (DFG), Environmental Conservation (DEC), and Division of Governmental Coordination (DGC) to site and construct your mariculture project. This form can be used to apply for the Aquatic Farm Operations Permit and Fish Habitat Permits from DFG, Water Quality Certification (401), wastewater system plan review, and Waste Discharge Permit from DEC, Aquatic Farm Site Permit from DNR, and the Coastal Zone Consistency Certification from DGC. This application also addresses solid waste disposal for single-family use; facilities larger than single-family are required to apply for a solid waste disposal permit from DEC.

The application must be submitted to the state within the 60-day opening announced by DNR for the district in which you intend to farm. A Coastal Project Questionnaire, which is available from any of these agency offices, must also be submitted with your Aquatic Farm Application to help determine which specific permits must be obtained prior to constructing your project. If you determine that your specific project design requires additional permits for activities such as an increase in water use or solid waste disposal, or use of state owned timber or gravel, you must also file supplementary applications with the standard Aquatic Farm Application.

You will receive a notice and processing schedule for the state coastal zone consistency review from Division of Governmental Coordiantion when your application has been accepted for processing. Your permits will also be processed on this schedule.

Please read this application carefully. A properly completed application is required for the state agencies to process your request. AN INCOMPLETE APPLICATION MAY BE RETURNED TO YOU FOR CORRECTION AND RESUBMISSION. Please note that an acceptable application must be received within the 60-day district filing period. Information which you provide in this application will

be considered as your development plan and schedule. If approved, this development schedule will be used to determine your elegiblity for permit renewals or state land leases.

If you need technical assistance in completing this application, please refer to the list of agency representatives provided at the back of the coastal project questionnaire. If you have questions about this application process, or you are not able to determine which agency can best answer your technical questions, contact the Division of Governmental Coordination in Juneau at 465-3562, in Anchorage at 274-1581, or in Fairbanks at 451-2818.

Stocking your Farm or Selling your Products.
In addition to the permits and approvals to site your aquatic farm, which you are applying for in this Aquatic Farm Application, you will also need to separately apply for and obtain a Shellfish or Aquatic Plant Transport Permit from ADF&G to obtain and hold broodstock, and a Growing-Area Certification and a Harvester's Permit from DEC in order to sell your product. These permits are not covered by this application since they are required for later phases of your project.

A Shellfish or Aquatic Plant Transport Permit is required by ADF&G before you can obtain, hold, transport, and raise shellfish and aquatic plants. We encourage you to contact the Fisheries Rehabilitation, Enhancement and Development (FRED) Division in Juneau at 465-4160 or in Anchorage at 267-2157 as early as possible in order to apply for and obtain a Transport Permit.

Water quality in the growing area must meet the standards of the National Shellfish Sanitation Program incorporated by reference in 18 AAC 34.170 and state water quality standards. You should contact DEC regarding certification requirements so that you can be reasonably sure that your site will qualify. The growing area must be free from sewage discharge and all sewage discharges must be 300 feet or more from the boundary of an approved growing area depending on the type of discharge and local condition. All facilities used to retain, collect, treat or dispose of human wastes must be approved by the DEC.

We recommend that you apply for Growing Area Certification and a Harvester's Permit at least six months before you intend to harvest shellfish. Individuals requesting growing area surveys must bear the cost of transporting the DEC representative to and from the growing area from the nearest commercial airport. Also, the individual must bear the cost of shipping daily water samples during the five-day survey to the DEC laboratory in Palmer, Alaska. To obtain more information on certification requirements, please contact DEC in Anchorage at 563-0318.

jbak88122301DMF

State of Alaska

Application for Aquatic Farm Permits

General Instructions

1. Answer **all** questions using the blanks provided or additional pages.

2. If additional space is needed, mark the additional pages with the corresponding number in the application.

3. Type or print your answers **clearly** in **ink**.

4. The applicant or an authorized representative must **sign the application.**

5. Submit the **original application**, a copy of the coastal project questionnaire, and a **filing fee** of $50.00 to the Department of Natural Resources in the region in which the farm is to be located.

DNR
Southeast Regional Office
400 Willoughby Avenue
Suite 400
Juneau, Alaska 99801

DNR
Southcentral Regional Office
3601 C Street, Anchorage
Mailing Address:
P.O. Box 107005
Anchorage, Alaska 99510-7005

DNR
Northern Regional Office
3700 Airport Way
Fairbanks, Alaska 99709

6. Submit a copy of the application and the original **coastal project questionnaire** to the appropriate regional Office of the Division of Governmental Coordination.

DGC
Southeast Regional Office
431 North Franklin Street
P.O. Box AW, Suite 101
Juneau, Alaska 99811-0165
(907) 465-3562

DGC
Southcentral Regional Office
2600 Denali Street
Suite 700
Anchorage, Ak 99503-2798
(907) 274-1581

DGC
Northern Regional Office
675 Seventh Avenue
Station H
Fairbanks, AK99701-4596
(907) 451-2818

7. ***Please note:*** This application is for a specific aquatic farm project. You will need to submit a new application if you change any of the following:

   A. The species to be grown
   B. The size or design of your operation
   C. The location of your operation

State of Alaska

Application for Aquatic Farm Permits

3/15/88
Revised: 1/89

A. APPLICANT INFORMATION

1. _____
Name

_____
Mailing Address

_____
City State Zip Code

_____
Phone

2. _____
Business Name (if different than above)

_____
Business Address

_____
City State Zip Code

_____
Phone

3. _____
Authorized Agent (if applicable)

_____
Address

_____
City State Zip Code

_____
Phone

B. GENERAL INFORMATION

1. Provide a brief description of the facility and your overall proposal. Include upland, tideland, and submerged land facilities.

_____

_____

_____

2. Housing on state lands can only be approved if site development requires daily attention at the time housing begins, if personnel cannot reasonably commute by road or boat, and no suitable private lands are available for rent or sale (see 11 AAC 63 040(a)).

Does your proposal include caretaker housing on state land or water? Yes___ No___

If yes, please describe why onsite housing is necessary.

_____

_____

_____

3. a) Do you currently own or lease upland property adjacent to, or near the proposed farm site? Yes___ No ___
b) Are you applying for a preference right under 11 AAC 63.040(b)? Yes ___ No ___
c) Do you agree to contain your aquatic farm support facilities (storage, dwellings,etc.) on these privately owned or leased lands? Yes___ No___
If yes, attach a copy of the ownership deed or lease agreement.

4. In order to process your application, we need to know who owns the adjacent lands. Please provide the names and addresses of the landowners of adjacent uplands and tidelands.

Uplands	Tidelands
_____	_____
_____	_____
_____	_____

C. PROJECT LOCATION

1. Is the Project on: (please mark with ✓)

State Land _____ Federal Land _____ Private Land _____ Municipal Land _____

2. Attach a topographic map (U.S.G.S. Scale 1: 63,360) and nautical chart to this application that show the site location boundaries and general area. Clearly indicate the site location and identify the map and chart reference number.

3. Township _____ Range _____ Meridian _____ Section _____ Longitude _____ Latitude _____

4. Number of acres of state land applied for: Uplands _____ Tidelands _____

D. FARM DEVELOPMENT AND OPERATING PLAN

1. Species to be raised:

Species	Annual Production Goal maximum	minimum
a _____	_____	_____
b _____	_____	_____
c _____	_____	_____

2. Please provide a timetable showing approximate dates for installation of spat collection gear, placement of production and support facilities, date of first sale, and a schedule for reaching expected maximum production. If you plan to operate at this site less than year round, please include your operating schedule.
Note: You may submit both a minimum and maximum development goal if you are uncertain about your construction schedule. Reasonable use of the site must be proposed.

_____

_____

_____

3. Donor Stock

a. What is the source of the donor stock for your farm? _____
b. If you plan to capture wild stock, please identify your proposed capture location.*

_____

* Please be advised that other permits and authorizations are required from the Department of Fish and Game, and possibly the Commercial Fisheries Entry Commission for capture of wild stock.

E. SITE PLAN & PHYSICAL DESCRIPTION

1. Provide a site plan drawn to scale (no less than 1" = 50') which shows the layout, location, and dimensions of the following (a sample site plan is provided on page 6 for your reference).
   a. The rafts or other production facilities employed (please include size and number).
   b. Anchoring systems and shoreties.
   c. Docks, upland dwellings, floating structures associated with caretaker facilities
   d. The location of waters, including any drinking water wells or other drinking water system sources, fresh water(s), and salt water, within 200 feet of the proposed wastewater disposal system.
   e. Wastewater disposal systems, including both sewage and greywater discharge points (e.g. greywater means domestic wastewater from laundry, kitchen etc., which does not contain human waste).
   f. Solid waste storage and disposal sites (note: you are encouraged to use existing permitted sites for the disposal of solid wastes).
   g. Roads or air strips.
   h. Other upland or tideland facilities at the site associated with the farming operation.
   i. Fuel and chemical storage.
   j. Properties referenced in #4 and #5 of Section B.
   k. The boundary of the farm area which is located on state lands, including tide and submerged lands.

2. Attach a cross sectional diagram of the proposed facilities, and identify the construction materials. (Diagrams prepared for the Corps of Engineers permits are acceptable.)

3. On the site plan, draw lines and identify the tide level at the following stages:

   - Mean Lower Low Water (MLLW)
   - Mean Higher High Water (MHHW)
   - Mean High Water (MHW)

4. On the site plan, diagram the prevailing direction of the surface water flows at the ebb and flood tides.

5. What is the maximum surface tidal current speed at ebb tide?____ At flood tide?____ Did you estimate or measure the speed? _____

6. What is the water depth at the site of culture gear at MLLW? _____

F. SITE SUITABILITY

1. Physical and Biological Characteristics

   a. Provide any information you may have regarding tidal flushing, water temperature, salinity, and turbidity/sedimentation at the site. Include the dates these data were recorded.

   _____

   _____

   _____

   b. Describe the bottom type composition at the site (if more than one type, indicate percent).

   sand ____ mud ____ rock ____ gravel ____ eelgrass ____

   other: _____

   c. Describe winter conditions at the site (temperatures, icing, storms, etc.).

   _____

   _____

   _____

   d. Do anadromous fish (e.g. salmon) use any streams in the area for spawning? yes ____ no ____
   If yes, indicate which streams are used and label them as such on the site plan.

   _____

   _____

   e. Is the target species naturally present in the area? yes ____ no ____
   If yes, describe abundance and condition.

   _____

   _____

   f. Describe measures you would propose to control predation by marine mammals, seabirds, or other potential predators.

   _____

   _____

   _____

   g. Indicate which of the above responses in Section F are based upon on-site investigations by circling the corresponding letter: a, b, c, d, e.

G. WATER QUALITY

Note to Applicant: Sewage or industrial discharge(s) may accumulate in or harm the growth or consumptive use of your shellfish product. Oysters, mussels and scallops are filter feeders and may accumulate fecal coliform bacteria and associated pathogens from sewage discharges. If a caretaker facility is needed for the site, and its discharge is located near the culturing operation, there may be a risk of contamination. To ensure that your growing area can be certified by DEC, the department has developed the following requirements for those aquatic farms where a sewage discharge is necessary. 1) Discharges must meet water quality standards (18 AAC 70), wastewater disposal regulations (18 AAC 72), and requirements of the National Shellfish Sanitation Program (incorporated by reference in 18 AAC 34.170). 2) No sewage discharge will be allowed within 300 feet from the boundary of an approved growing area (the boundary encompasses the entire growing area). 3) Outhouse and septic systems must maintain a minimum 100 foot horizontal separation distance from surface waters and a minimum 4 foot vertical separation distance from the high ground water table. The department will require a waste discharge permit and system plan review for all sewage discharges. Additional information may be required by the DEC depending on the type and complexity of wastewater system proposed. After review of application materials, the DEC may decide it is not necessary to issue a waste discharge permit for facilities generating very small daily volumes of sewage and greywater.

1. Wastewater Discharge and System Plan Review

a) Is there is a floathome, dwelling or upland caretaker's facility proposed for the site? Yes____ No____
b) Will wastewater be discharged from any of these facilities? Yes____ No____
If yes, please provide the following information.

- What are the daily maximum and average discharge volumes? Maximum _____ Average _____

PLEASE SUBMIT THE FOLLOWING INFORMATION ON SEPARATE PAGES
(Contact the Department of Environmental Conservation to determine submittal requirements for your specific proposal.)

- Wastewater system design plans consisting of reports and/or drawings that clearly and legibly depict the design, type, and volume of discharge. (Design plans may require preparation by a registered engineer.)
- A description of proposed and existing wastewater treatment works, disposal systems, or sewers.
- Sufficient soils and topographic information to allow evaluation of the soil type, absorption area, depth to water table and impervious surfaces, and topography, if treatment or disposal (other than a conventional on-lot soil absorption system) is into or onto land or subsurface land.

2. Were there any sources of past pollution at the site, such as a shorebased seafood processor, industrial facility, or a town or village? yes____ no____

If you answered yes to the above, identify:

- The type of previous use (e.g. mine, village, seafood processor) _____
- The last known date of use _____
- The distance from site of previous use to your project site _____

3. Are there any current potential sources of human or industrial pollution in the area? (For example, sewage outfalls, industrial transfer facilities or upland operations, boat harbors, etc.) yes____ no____

If yes, please describe:

- The type of discharge(s) _____
- The location and distance from your site _____
- The name of the discharger(s), if known _____

4. Are you aware of any other planned development in the general area of your proposed farm? yes____ no____ . If yes, please describe them.

H. CURRENT LAND USE

Are there any other human uses of the project site and the surrounding area such as commercial development, mining, timber harvest or transfer, sheltered anchorage, subsistence, recreation, commercial fishing, sport fishing, or residential use, etc? Yes____ No____

If yes, please describe.

_____

_____

_____

Certification Statement

The information contained herein is true and complete to the best of my knowledge. I understand that I must separately apply for and hold a Transport Permit from the Department of Fish and Game in order to hold, transport, and raise shellfish or aquatic plants, and a Growing Area Certification and a Harvesters Permit from the Department of Environmental Conservation in order to sell my product.

_____ _____

Signature of Applicant or Agent Date

Jim Hemmings. Halibut Cove

Tim Torrell - oyster - Kodiak

John Nielson - Wrangell

Shellfish Growers at
Reg mtg

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

SOUTHEAST REGIONAL OFFICE
DIVISION OF LAND AND WATER MANAGEMENT

STEVE COWPER, GOVERNOR

400 WILLOUGHBY AVENUE
SUITE 400
JUNEAU, ALASKA 99801-1000
PHONE: (907) 465-3400

PROPOSED AQUATIC FARMSITE REGULATIONS

December 15, 1988

Dear Alaskan:

Enclosed are proposed new regulations of the Alaska Department of Natural Resources. The Division of Land and Water Management (DLWM) is soliciting comments on the proposed regulations at public hearings to be conducted in Cordova, Juneau, Kodiak, Anchorage, Petersburg, Wrangell, Homer, and Ketchikan from January 9 to January 12, 1989, or by mail by January 20, 1989. Please see the enclosed "Notice of Proposed Changes in the Regulations of the Department of Natural Resources" for more information on how, when, and where to comment on the regulations.

The proposed regulations are intended to implement 1988 legislation on aquatic farming or mariculture. The new law was enacted as SB 514 and is now officially known as Chapter 145, SLA 1988. It allows people to raise shellfish or aquatic vegetables such as kelp on state land, but prohibits any "change of use" and extends an existing moratorium against finfish mariculture until July, 1990.

Chapter 145, SLA 1988 also created new responsibilities for the Department of Fish and Game and the Department of Environmental Conservation. However, these draft regulations deal only with duties of the Department of Natural Resources. The new legislation set up a system of three-year permits and preference-right leases for state land managed by the Department of Natural Resources under AS 38. It does not apply to state parks designated by the legislature in AS 41.

DLWM had issued permits for mariculture in the past, but formerly used a general type of permit that did not include any property rights and was revocable at will. The new system is different. An aquatic farmsite permit is a property right and a permittee who successfully develops an aquatic farm has a preference right to a lease. Because issuing an aquatic farmsite permit is a "disposal of an interest in state land," DLWM must first comply with the usual procedural safeguards applicable to land disposals: land planning and classification, preparing a "best interest" finding, public notice and review, reservation of access easements, etc. The draft regulations set out this process in more detail.

DLWM would like to take this opportunity to thank a very dedicated group of Alaskans for their work in developing the proposed regulations. In addition to requesting review by other agencies, DLWM asked for the assistance of an informal citizens' advisory group representing shellfish growers, conservation organizations, and commercial fishermen in southeast and southcentral Alaska. The group spent many hours in a detailed analysis and discussion of the draft regulations. As might be expected from such a diverse group, opinions differed on many points. But the entire group showed a willingness to compromise and to work toward a common goal of proposing public land policies that would be fair to everyone. Not only did advisory group members serve without compensation, those who traveled from their homes to Juneau and Anchorage did so at their own expense because agency budgets did not include any funding to implement the new legislation. The effort these public-spirited citizens devoted to the project is a fine example of volunteerism in action.

Ideas suggested by advisory group members and incorporated into the draft regulations include: using a mailing list for more effective notice of public comment opportunities; letting permit development plans include both a "floor" and a "ceiling" for development; allowing two renewals of the permit for a total term of nine years, to leave time for the extensive capital investment needed to become profitable; if strictly necessary, authorize onsite housing (removable within 30 days) of personnel at the permit stage, but provide for public review; before deciding to issue a permit, consider the effect on other land uses such as commercial fishing, primary anchorages, recreation, and tourism; make sure that overland access to tidewater is not defeated by obstacles in the water itself; and allow for site testing by means of ordinary revocable-at-will permits, which can be issued quickly because they are not land disposals.

Another key policy developed during the review of the draft regulations implements a savings clause in the legislation. That clause allows continued operations by those who were "lawfully operating an aquatic farm or related hatchery" on June 9, 1988, the act's effective date. DLWM interpreted the clause as granting a preference right to one of the new aquatic farmsite permits. However, some permittees who were not yet "operating an aquatic farm" had already made significant good-faith investments. Therefore the regulations expand the preference right to those who had obtained necessary permits and had undertaken the initial steps that would lead to full-scale operations.

For a summary of other main points in each of the draft regulations, see the "Notice of Proposed Changes in the Regulations of the Department of Natural Resources."

In your review of the draft regulations, you will notice some wording that is underlined. This underlined wording indicates new material that the department is proposing to add to an existing regulation (11 AAC 05.010) or to the existing list of chapters within Title 11 of the Alaska Administrative Code. The rest of the draft regulations have no underlining or bracketing because they would form a completely new chapter, 11 AAC 63.

Your comments on the draft regulations will be most useful to DLWM if you refer to particular regulations by section number, rather than by page, and if you suggest specific wording changes that you feel would improve the clarity of the regulations or would constitute better public policy. If you have questions on any provision contained in this proposal, the division's contacts on this project are Mary Kaye Hession in our Anchorage office, phone 762-2680, and Janet Burleson in our Juneau office, 465-3400. The Department of Natural Resources thanks you for your time and interest in this matter.

Cordially,

Gary Gustafson

Gary Gustafson
Director

Attachment

NOTICE OF PROPOSED CHANGES IN THE
REGULATIONS OF THE DEPARTMENT OF NATURAL RESOURCES

Notice is given that the Department of Natural Resources, under authority vested by AS 38.05.020 and AS 38.05.856, proposes to adopt regulations in Title 11 of the Alaska Administrative Code, dealing with issuance of property rights to undertake aquatic farming (mariculture for shellfish and aquatic vegetables) on state-owned land, to implement AS 38.05.083, AS 38.05.855, AS 38.05.856, and sec. 18 of Chapter 145, SLA 1988 (1988 legislation formerly known as "SB 514"), as follows. The purpose of the regulations is to carry out the new responsibilities these new aquatic farming laws place on the Department of Natural Resources.

11 AAC 05.010, an existing regulation that sets application fees for most authorizations by the Department of Natural Resources, is proposed to be amended to add a fee for aquatic farmsite permit and lease applications, including renewals and extensions.

A new 11 AAC 63 is proposed to be adopted. This new chapter covers the entire process of applying for and obtaining an aquatic farmsite permit or lease. Sec. 010 of this new chapter explains the subject of the chapter and defines an aquatic farmsite permit as a type of land disposal. Sec. 020 covers the process of calling for area nominations to help set application district boundaries, then opening the district to applications for aquatic farmsite permits, mapping the open area, advertising the opening, and setting filing guidelines for applications. Sec. 030 sets filing requirements for permit applications, including the requirement for a proposed development plan and schedule, and explains what will be done if applications overlap or too many applications are filed for a limited area. Sec. 040 covers associated facilities for storing equipment or housing personnel and puts restrictions on authorizations for such purposes; it also covers the rights of upland owners and offers a preference right to an applicant who will put such facilities on the applicant's land rather than on state land. Sec. 050 specifies the review process used for complete applications and the criteria for a preliminary finding under AS 38.05.035(e) that granting permits would be in the state's best interest. Sec. 060 sets rules for notice and the opportunity to comment, including notice to upland owners, and specifies that a permit will not be issued if the upland owner will not authorize upland use that the applicant states is necessary. Sec. 070 covers the process of issuing permits after a final best interest finding and sets out permit requirements, including posting a bond and paying a use fee. It also allows for two renewals of a permit under specific circumstances. Sec. 080 explains how the permit or lease bond amount will be determined. Sec. 090 covers the transition from permits issued under AS 38.05.850 (an older law on permits for general natural resource uses) and defines which ones qualify

under a "savings clause" that the legislature included in sec. 18 of the 1988 aquatic farming legislation. It limits the circumstances in which the department will issue permits for aquatic farm-related purposes using the older permit law rather than the new legislation. Sec. 100 sets out the requirements for getting and keeping an aquatic farmsite lease. Sec. 110 includes general conditions for both permits and leases and sec. 120 defines terms used in the new chapter.

Notice is also given that any person interested may present oral or written statements or arguments relevant to the proposed action at hearings to be held in Cordova at the Cordova City Library conference room, 622 First St., at 12 noon on Jan. 9, 1989 (via teleconference); in Juneau at the 4th floor conference room in the Willoughby Building, 400 Willoughby, at 7 p.m. on Jan. 9, 1989; in Kodiak at the Fort Abercrombie State Park Headquarters Building (on East Rezanof Drive four miles from city center) at 12 noon on Jan. 10, 1989 (via teleconference); in Anchorage at Room 336 in the Frontier Building, 3601 C Street, at 7 p.m. on Jan. 10, 1989; in Petersburg at the Petersburg City Hall Council Chambers, 12 South Nordic, at 12 noon on Jan. 11, 1989; in Wrangell at the Wrangell City Hall, 205 Bruger, at 6 p.m. on Jan. 11, 1989; in Homer at the Homer Senior Citizen Center, 3935 Svedlund, at 6:30 p.m. on Jan. 11, 1989; and in Ketchikan at the Ketchikan City Hall, 334 Front Street, at 5 p.m. on Jan. 12, 1989. In addition, written statements or arguments may be sent to Director Gary Gustafson, Division of Land and Water Management, Department of Natural Resources, P.O. Box 107005, Anchorage, Alaska 99510, to be received no later than Jan. 20, 1989.

It is estimated that this action will require increased appropriations as follows: FY89, $85,300; FY90, $154,100; FY91, $154,000.

Copies of the proposed regulations may be obtained by writing to the Division of Land and Water Management at the above address or from the division's Southcentral Regional Office (3601 C Street, Suite 1080, Anchorage) or Southeast Regional Office (400 Willoughby Avenue, Fourth Floor, Juneau).

The Department of Natural Resources, upon its own motion or at the instance of any interested person, may after the comment period adopt proposals within the scope of this notice without further notice or may decide to take no action on them.

Date: December 15, 1988

for Gary Gustafson, Director

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PUBLIC HEARING DRAFT 12/15/88

TITLE 11. NATURAL RESOURCES

Part 1. Office of the Commissioner (11 AAC 03--11 AAC 06)

Part 6. Lands (11 AAC 52--11 AAC 98)

PART 1. OFFICE OF THE COMMISSIONER.

Chapter
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05. Fees for Departmental Services (11 AAC 05.010--11 AAC 05.900)

CHAPTER 05. FEES FOR DEPARTMENTAL SERVICES

Section
010. Fees
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11 AAC 05.010. FEES. (a) Non-refundable fees to apply for authorizations or fees to obtain publications or services from the department are as follows:

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(6) surface leasing

(K) application for aquatic farmsite permit or lease; for amendment or renewal of aquatic farmsite permit; or for amendment, extension, or assignment of aquatic farmsite lease, $50;

(Eff. 1/1/86, Register 96; am 8/10/86, Register 99; am 8/23/87, Register 103; am / /89, Register)

Authority: AS 03.10.020
AS 27.21.030
AS 38.05.020
AS 38.05.035
AS 38.05.295
AS 38.05.856
AS 38.09.110
AS 38.35.020
AS 38.35.050
AS 38.50.160
AS 38.95.240
AS 41.06.020
AS 41.21.020

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AS 41.21.026
AS 44.37.020
AS 44.37.025
AS 45.50.315
AS 46.15.020

PART 6. LANDS.

Chapter

63. Aquatic Farmsite Permits and Leases (11 AAC 63.010--11 AAC 63.120)

11 AAC is amended by adding a new chapter to read:

CHAPTER 63. AQUATIC FARMSITE PERMITS AND LEASES.

Section

p.2 010. Applicability
p.3 020. Nominations; application periods
" 030. Aquatic farmsite permit applications
p.5 040. Associated facilities; upland owner preference right; upland owner access right
p.7 050. Best interest finding
p.7 060. Notice and opportunity to comment
" 070. Aquatic farmsite permit
p.11 080. Bond
" 090. Transition; permits under AS 38.05.850
p.12 100. Aquatic farmsite lease
p.14 110. General permit and lease provisions
p.15 120. Definitions

11 AAC 63.010. APPLICABILITY. (a) This chapter covers aquatic farmsite permits issued under AS 38.05.856 and leases issued under AS 38.05.083 for the development and operation of an aquatic farm or related hatchery, as those terms are defined in AS 16.40.199. An aquatic farmsite permit or lease may be issued for tideland, submerged land, and shoreland managed by the department under AS 38. The aquatic farmsite authorization may include authorization for associated storage and housing facilities, including facilities on adjacent upland managed by the department under AS 38, in accordance with 11 AAC 63.040.

(b) Issuance of an aquatic farmsite permit is a disposal of an interest in state land. An aquatic farmsite permit is revocable only for breach of its provisions. It conveys the exclusive, non-transferable right during a three-year term to improve and develop the site as an aquatic farm or related hatchery in accordance with the permit's provisions, and includes a preference right to an aquatic farmsite lease if the permittee develops the site for aquatic farming or related hatchery

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operations in accordance with the permit's provisions. (Eff. / /89, Register)

Authority: AS 38.05.020
AS 38.05.083
AS 38.05.855
AS 38.05.856

11 AAC 63.020. NOMINATIONS; APPLICATION PERIODS. (a) The commissioner will, in his or her discretion, periodically call for public nominations of areas to be opened to or withheld from aquatic farmsite permit applications. The commissioner will, in his or her discretion, use area nominations in setting or revising boundaries of districts to be opened to aquatic farmsite permit applications. An area nomination is not an application for an aquatic farmsite permit.

(b) The commissioner will give notice that a district is open to aquatic farmsite permit applications by publication, beginning before the application period opens, in at least one newspaper of statewide circulation and one newspaper of general circulation in the district.

(c) The commissioner will, in his or her discretion, set application filing guidelines for a district such as minimum or maximum size limits for aquatic farmsites, minimum distances from anchorages or the mouths of anadromous fish streams, or a limit on the total number of applications that a person may file or permits that a person may hold in that district. Filing guidelines will be available at the places listed in the public notice of the application period.

(d) Maps of a district that is open to aquatic farmsite permit applications will be available at the places listed in the public notice of the application period. To the extent practical, the map will indicate areas known to be unavailable or unsuitable for aquatic farmsite permits. For example, an area may be unavailable because it is already subject to aquatic farmsite authorizations or because aquatic farming is prohibited by a local zoning ordinance, approved district coastal plan, state land use plan, or classification; an area may be unsuitable because of known water pollution inconsistent with raising shellfish and aquatic vegetables for human consumption. (Eff. / /89, Register)

Authority: AS 38.05.020
AS 38.05.855
AS 38.05.856

11 AAC 63.030. AQUATIC FARMSITE PERMIT APPLICATIONS. (a) An aquatic farmsite permit application is subject to 11 AAC 67.007, except that it may be filed only at the regional office

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that is responsible for the district involved. The application must:

(1) be submitted on a form approved by the commissioner;

(2) include the non-refundable application fee required by 11 AAC 05.010;

(3) include a clear drawing of the site applied for on a state township plat or, if no state plat is available for that township, on a Bureau of Land Management master title plat;

(4) be accompanied by a completed coastal project questionnaire as required by 6 AAC 50, unless the application is solely for shoreland outside the coastal zone; and

(5) comply with all application filing guidelines set under 11 AAC 63.020(c), except that the applicant may request a waiver of a filing guideline that sets a maximum size limit. The commissioner will, in his or her discretion, waive the size limit if the applicant shows that a waiver is justified by its experience, capitalization, and need for a larger site in order to form an economic unit and the commissioner, after considering the reason for which the size limit was imposed, determines as part of the finding under 11 AAC 63.050 that the waiver is in the state's best interest.

(b) Each application must include sufficient detail on the applicant's proposed site improvements to allow the commissioner to determine the amount of the bond required under 11 AAC 63.080. It must also include a proposed development plan and schedule. The development plan and schedule must result in reasonable use of the site and ensure that the site is developed for aquatic farming or related hatchery operations before the permit expires. In this chapter and in AS 38.05.083, "developed for aquatic farming or related hatchery operations" means that all planned capital improvements are in place and functioning at their planned capacity to produce aquatic plants or shellfish; however, the aquatic plants or shellfish need not be marketed or be of marketable size in order to fulfill the development requirement. The commissioner will, in his or her discretion, approve the development plan and schedule or amend it as the commissioner considers necessary to make reasonable use of the site. The application may include both a minimum and maximum development plan and schedule; if both are approved, fulfilling the minimum development plan and schedule will fulfill the development requirement, and the permittee may operate at any higher level up to the maximum development plan and schedule without the need for an amendment.

(c) An applicant may file as many applications during the application period as desired, unless the commissioner has limited

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the number by setting a filing guideline under 11 AAC 63.020(c). In no case may a person file more than one application per site.

(d) Except as provided in 11 AAC 63.040(b) and 11 AAC 63.090(b), all complete applications received during a district application period are considered to have been simultaneously filed. If the number of applications filed for a particular area exceeds the number of sites that the commissioner decides to grant, the commissioner will hold a lottery to eliminate the excess applications.

(e) If two applications overlap in an area where the commissioner does not propose to limit the number of authorized sites, the applicants will be granted 30 days to agree on amendments that eliminate the overlap. If an application overlaps an existing aquatic farmsite permit or lease, or a mariculture testing or development site subject to a preference right under 11 AAC 63.090(a), the applicant will be granted 30 days to amend the application so as to eliminate the overlap. The commissioner will, in his or her discretion, amend an application

(1) to eliminate an overlap if the applicant has failed to do so, or

(2) to eliminate or reduce other site or resource use conflicts. (Eff. / /89, Register)

Authority: AS 38.05.020
AS 38.05.855
AS 38.05.856

11 AAC 63.040. ASSOCIATED FACILITIES; UPLAND OWNER PREFERENCE RIGHT; UPLAND OWNER ACCESS RIGHT. (a) The commissioner will, in his or her discretion, authorize associated facilities for storing equipment or housing personnel at the aquatic farmsite, including upland managed by the department under AS 38, if the commissioner is satisfied that the associated facilities are necessary for aquatic farming. An applicant who wants authorization for associated facilities at either the permit or lease stage must request it as part of the permit application so that it can be considered during agency and public review.

(1) The following conditions apply to authorizations for housing personnel at the aquatic farmsite during the permit stage. The commissioner will authorize such housing only if the applicant shows that the level of site development at the time the housing is expected to begin will require that personnel be present on a daily basis, the personnel cannot reasonably commute to the site by road or by boat on a daily basis, and no nearby land suitable for housing is available for rent or sale. The housing facility may not be used as the personnel's primary residence. It must be designed and constructed so that it can be removed and the site completely restored within 30 days if the

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permit terminates or if housing personnel at the aquatic farmsite ceases to be necessary. The facility may not be placed on a permanent foundation, except that a foundation of wooden pilings may be used if the applicant agrees either to remove the pilings or to cut them off at ground level if site restoration is required.

(2) The following additional conditions apply to authorizations for floating housing at the aquatic farmsite during either the permit or lease stage. The commissioner will authorize floating housing only if such use is consistent with the floathouse provisions of an applicable land use plan and if the Department of Environmental Conservation determines that such housing would not result in wastewater discharges that would be incompatible with raising shellfish or aquatic vegetables for human consumption.

(3) The nature and extent of associated facilities are a factor in setting the bond amount under 11 AAC 63.080, setting the fee for an aquatic farmsite permit under 11 AAC 63.070, and appraising the fair market value of a lease under 11 AAC 63.100.

(4) After a permit or lease terminates, the former permittee or lessee has no entitlement or preference right to continue using or occupying any portion of the aquatic farmsite, including anchoring a floathouse at the site.

(b) The owner or lessee of adjacent or nearby upland may apply for a preference right to an aquatic farmsite permit by agreeing to place the applicant's associated facilities for storing equipment or housing personnel on the applicant's land or leasehold rather than on state-owned land. For a lessee to be eligible for a preference right, the term of the upland lease must equal or exceed the combined terms of an aquatic farmsite permit and lease. The commissioner grants this preference right to eligible upland owners and lessees in order to increase the compatibility of aquatic farming with upland management policies. An upland owner preference right is secondary to a preference right that the commissioner grants under 11 AAC 63.090(a). If the number of applications eligible for an upland owner preference right exceeds the number of permits that the commissioner decides to grant, the commissioner will hold a lottery as set out in 11 AAC 63.030(c) among the eligible applications only. An upland owner or lessee who wants a preference right must apply under this subsection and has no entitlement under AS 38.05.075(c) to an aquatic farmsite lease.

(c) No aquatic farmsite permit or lease will be issued that would deny an upland owner's right of reasonable access to tidewater. (Eff. / /89, Register)

Authority: AS 38.05.020
AS 38.05.083

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AS 38.05.855
AS 38.05.856

11 AAC 63.050. BEST INTEREST FINDING. (a) After the aquatic farmsite permit application period closes, complete applications will undergo review by agencies and affected coastal districts in accordance with 6 AAC 50.070 for consistency with the Alaska Coastal Management Program. Compliance with this requirement fulfills the agency consultation requirement of AS 38.05.855(c). Comments received will be considered both for the division of governmental coordination's proposed consistency determination and for the commissioner's preliminary best interest finding. If applications are filed for sites within a state game refuge or critical habitat area, the commissioner will request the approval of the commissioner of the Department of Fish and Game as required by AS 16.20.060 or 16.20.530.

(b) The commissioner will prepare a preliminary best interest finding that proposes sites for which permits may be issued. If the sites are unclassified, a proposed land use plan and classification order must be prepared and may accompany or be included as part of the preliminary best interest finding. If the commissioner decides to deny an application, to require its amendment, or to limit the number of sites to be authorized, the finding will explain the reason. Criteria that must be considered in the finding include:

(1) Whether the Department of Fish and Game considers that the proposed aquatic farm or hatchery meets the criteria of AS 16.40.105 (that is, that the physical and biological characteristics of the site are suitable for farming the shellfish or aquatic plant proposed; that the proposed farm or hatchery does not require significant alterations in traditional fisheries or other existing uses of fish and wildlife resources; that it does not significantly affect fisheries, wildlife, or their habitats in an adverse manner; and that its plans and staffing plans demonstrate technical and operational feasibility);

(2) Whether the Department of Environmental Conservation determines that the proposed aquatic farmsite is protected from pollution from adjacent and upland activities to ensure product wholesomeness, and that effective pollution control measures can be implemented to protect land and water at the site from pollution caused by the proposed aquatic farm or hatchery;

(3) Whether the division of governmental coordination proposes to find the proposed aquatic farm or hatchery consistent with the Alaska Coastal Management Program;

(4) Whether aquatic farming is compatible with official land management policies applicable to the proposed aquatic farmsite and nearby upland, including legislative or congressional designations such as parks or wilderness areas and adopted

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federal, state, and local land use plans, land classifications, and zoning;

(5) Whether aquatic farming conflicts with existing or pending uses of the site and of nearby land (whether or not in state ownership), including

(A) Impacts on nearby communities or residential land, including the cost to communities or residential users if increased wastewater treatment will be needed after the area is certified for growing shellfish;

(B) Traditional and existing uses of the site, including commercial fishing, sport or subsistence fishing, use as a primary anchorage (one for which there is no available alternative), navigation, recreation, sightseeing, and tourism; consideration of this criterion may be combined with a traditional use finding if such a finding is required by AS 38.05.830;

(C) Historic and cultural resources;

(D) Commercial or industrial facilities, such as log transfer facilities, seafood processing plants, or harbor development, that would be incompatible with aquatic farming;

(6) How public access to and along public waters, and the upland owner's right of reasonable access to tidewater, will be ensured by reserving easements under 11 AAC 53 or by other means; if upland access to the water is limited to a specific point by topography, existing improvements, or other factors, the commissioner will ensure that aquatic farming facilities do not obstruct water access to that point;

(7) How the interests served by the public trust doctrine, specifically the public's right to use navigable waters and the land beneath them for navigation, commerce, fishing, and other purposes, will be protected;

(8) Whether special permit provisions or other measures are needed to mitigate identified conflicts; for this purpose the commissioner will consult guidelines set out in an appropriate land use or coastal management plan or, where no such plan or guidelines exist, will consult the guidelines set out on pp. 80-85 of the final Etolin Island Area Mariculture Pilot Project;

(9) Other significant social, economic, and environmental effects of the proposed aquatic farming.

(b) In general, the commissioner will not grant aquatic farmsite permits that would encumber more than a third of the surface area estimated to exist at mean lower low water of a bay, bight, or cove, unless the commissioner finds it is in the state's

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best interest to concentrate permits in one such bay, bight, or cove so as to keep other water bodies completely unencumbered. (Eff. / /89, Register)

Authority: AS 38.05.020
AS 38.05.035
AS 38.05.127
AS 38.05.128
AS 38.05.855
AS 38.05.856

11 AAC 63.060. NOTICE AND OPPORTUNITY TO COMMENT. (a) Notice under AS 38.05.945 that the preliminary best interest finding is available for written comment may be combined with notice of the time, place, and location of a hearing to be conducted under AS 38.05.946(b); notice of a proposed determination of consistency with the Alaska Coastal Management Program; notice of a proposed land use plan and classification, if the land is not yet classified; and notice of the approximate date when the final best interest finding is expected to be available.

(b) The commissioner will conduct the public hearing that AS 38.05.946 requires in each district either in person or by teleconference.

(c) The department will maintain a mailing list of persons who request in writing to receive notice of district openings and notice of comment opportunities. Any interested person may request in writing to be put on an aquatic farming mailing list. The department will use the mailing list to notify recipients of opportunities for public comment and involvement such as a call for area nominations, the opening of a district application period, or the availability of a preliminary best interest finding.

(d) If the upland adjacent to an aquatic farmsite permit application is not managed by the department, the commissioner will attempt to give notice to the upland owner of the opportunity to comment under (a) of this section. If the aquatic farmsite permit applicant states that using upland for associated facilities is necessary for aquatic farming, and the upland owner notifies the commissioner in writing that the owner cannot or will not authorize the upland use, the commissioner will not grant the aquatic farmsite permit. (Eff. / /89, Register)

Authority: AS 38.05.020
AS 38.05.855
AS 38.05.856
AS 38.05.945
AS 38.05.946

11 AAC 63.070. AQUATIC FARMSITE PERMIT. (a) The commissioner will grant an aquatic farmsite permit to a successful applicant after the commissioner issues the final finding required

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by AS 38.05.035(e) and AS 38.05.855(d) and the division of governmental coordination issues a conclusive determination of consistency with the Alaska Coastal Management Program.

(b) Within 30 days after receiving the permit, the applicant shall sign it and return it to the commissioner along with

(1) the bond required by 11 AAC 63.080 and

(2) a use fee[1] set in a fee schedule approved by the commissioner to provide the state a reasonable return for the permittee's use of the site, but less than the fair market value rent.

(c) An aquatic farmsite permit is subject to the provisions set out in this section in addition to the general provisions required by 11 AAC 63.110.

(d) A permit may be also subject to special provisions that the commissioner imposes to make it consistent with the Alaska Coastal Management Program or that the commissioner otherwise considers necessary to serve the state's best interests.

(e) The aquatic farm development plan and schedule proposed in the application, as approved or amended by the commissioner, is incorporated as a provision of the permit.

(f) A permit may be cancelled, in whole or in part, if the permittee obtained it improperly through misrepresentation or error with respect to material facts.

(g) A permittee may apply for no more than two renewals of a permit. A new written finding is not required before the commissioner renews a permit. The commissioner will renew a permit if the commissioner is satisfied, based on information submitted by the permittee and testimony provided by interested persons under AS 38.05.856, that:

(1) the permittee is in substantial compliance with the permit's provisions and is in operation, or

(2) the permittee is in substantial compliance with the permit's provisions except that the permittee is not in operation, but that the failure to comply with the aquatic farm development plan and schedule and to begin operating is due to circumstances beyond the permittee's control. (Eff. / /89, Register)

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[1]Currently proposed as an annual fee of $250 plus $50 per acre during the first permit term, with an annual fee of $500 plus $50 per acre for the first or second renewal of the permit, and with an additional charge for floating or upland housing.

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Authority: AS 38.05.020
AS 38.05.035
AS 38.05.850
AS 38.05.855
AS 38.05.856

11 AAC 63.080. BOND. For any aquatic farmsite permit or lease, a bond, cash deposit, certificate of deposit, or other form of security acceptable to the commissioner must be posted and maintained in an amount determined by the commissioner to be sufficient to cover the cost of site cleanup and restoration and any associated cleanup costs. Factors the commissioner will use in determining the amount of the bond include the planned size and extent of improvements; travel costs to reach the site for cleanup or inspection; whether construction materials are combustible and could be burned at an available upland site; whether an authorized landfill site is available for disposal of noncombustible materials; whether heavy equipment would be necessary for site restoration and, if so, the cost of renting it; and whether associated facilities are afloat, placed on a temporary foundation onshore, or placed on a permanent foundation onshore. The commissioner will, in his or her discretion, subsequently change the amount of the required bond, based on changes in the level of site development, new information, or other appropriate factors. (Eff. / /89, Register)

Authority: AS 38.05.020
AS 38.05.035
AS 38.05.083
AS 38.05.856

11 AAC 63.090. TRANSITION; PERMITS UNDER AS 38.05.850. (a) If the commissioner finds that it is in the state's best interest to issue an aquatic farmsite permit, a person who has a permit in good standing that was issued under AS 38.05.850 for mariculture testing or development purposes has a preference right to the aquatic farmsite permit if:

(1) as of June 9, 1988, the person was either lawfully operating an aquatic farm at that site, or had obtained and was complying with all permits necessary to operate an aquatic farm at that site and, in reliance on those permits, had undertaken the initial steps that would lead to full-scale operations; photographs, purchase orders, receipts, or other evidence acceptable to the commissioner must be provided to establish eligibility; and

(2) the person files a complete application for the site during the appropriate district application period.

(b) An application filed by a person who has a preference right to the site under (a) of this section is exempt from the amendment or lottery procedures of 11 AAC 63.030(c).

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(c) A person who has a permit issued under AS 38.05.850 but who does not otherwise meet the requirements of (a) of this section does not have a preference right to an aquatic farmsite permit that may be issued for the site. However, the person may apply for an aquatic farmsite permit on a non-preference-right basis. If another person is chosen as the successful applicant, or if the commissioner decides that it is not in the state's best interest to grant an aquatic farmsite permit for the site, the commissioner will revoke the permit issued under AS 38.05.850 after reasonable notice to the permittee.

(d) A permit in good standing that was issued under AS 38.05.850 to a person who may have a preference right under (a) of this section will be renewed until the site is included in a district application period. In the interim, the permittee may continue operating so long as all required permits remain in good standing and no change of use occurs.

(e) Except as provided in this subsection, no new permit will be issued under AS 38.05.850 for aquatic farming purposes unless the applicant filed a complete application before June 9, 1988.

(1) A person may obtain a permit under AS 38.05.850 solely to test a site's suitability for aquatic farming or, to the extent allowed by 11 AAC 96, may undertake such testing without a permit from the Department of Natural Resources. Testing is limited to a period of no more than one year and to an area of no more than 16 square feet. Testing includes placing data collecting equipment and up to 2000 organisms in the water. The organisms may not be used for commercial purposes. A permit for testing site suitability may not be renewed.

(2) In an emergency, such as a dinoflagellate plankton bloom that could result in an unacceptable concentration of toxins in shellfish, the director will use his or her discretion under AS 38.05.850 to authorize relocating rafts or other rearing structures to another location until the emergency ends. (Eff. / /89, Register)

Authority: AS 38.05.020
AS 38.05.083
AS 38.05.850
AS 38.05.855
AS 38.05.856
sec. 18, ch. 145, SLA 1988

11 AAC 63.100. AQUATIC FARMSITE LEASE. (a) If the commissioner finds that it is in the state's best interest to issue an aquatic farmsite lease, an aquatic farmsite permittee who has developed the site for aquatic farming or related hatchery

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operations in accordance with the permit's provisions has a preference right to lease the site at its appraised fair market value without competitive bid. Only an existing aquatic farmsite permittee may apply for an aquatic farmsite lease.

(b) An aquatic farmsite permittee who has not succeeded in developing the site for aquatic farming or related hatchery operations does not have a preference right to any lease that may be offered for that site. However, if the commissioner offers the lease at public auction, the unsuccessful permittee may bid for the lease. The commissioner will offer a former permit site for lease at public auction only if the former aquatic farmsite permittee does not qualify for a preference right or chooses not to exercise the preference right.

(c) The term of an aquatic farmsite lease is ten years[2]. If the lessee applies for an extension before the lease's tenth anniversary, the commissioner will, in his or her discretion, extend the term for an additional ten years. The commissioner will, in his or her discretion, require a lease diagram before issuing the lease. Before the commissioner extends a lease, the commissioner will determine whether AS 38.04.045 or a successor statute requires a cadastral survey. If AS 38.05.102 or a successor statute is still in effect when the lease expires, the lessee may apply to renew the lease.

(d) Before a lease is issued, a performance bond or other security must be posted as required by 11 AAC 63.080.

(e) Unless the commissioner grants a variance for good cause, the lessee shall continue to operate the aquatic farm at or above the operating level reached when the permittee applied for the lease. For a lease offered at auction, the commissioner will, in his or her discretion, impose a minimum lease operating level or require the bidder or lessee to propose a lease operating plan for the commissioner's approval.

(f) A lease that is in good standing may, with the approval of the director, be assigned. The assignee shall promptly and diligently seek to obtain all permits necessary for lawful operations.

(g) Lease rental must be paid annually on or before the anniversary date of the lease. (Eff. / /89, Register)

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[2]Owing to a possible error in recently enacted legislation, a ten-year lease is both a short-term lease (for which no cadastral survey is required) and a long-term lease (which requires a cadastral survey). If this overlap is not corrected, the proposed regulation will set the initial term of the lease at nine years and 364 days rather than ten years.

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Authority: AS 38.04.045
AS 38.05.020
AS 38.05.083
AS 38.05.856
AS 38.05.920

11 AAC 63.110. GENERAL PERMIT AND LEASE PROVISIONS. An aquatic farmsite permit or lease is subject to provisions that include, but are not limited to, the following:

(1) A permittee or lessee shall operate so as to cause no significant damage to tideland, submerged land, and other state land.

(2) A permit or lease is subject to all applicable federal, state, and local law, including statutes and regulations in effect on its effective date; statutes and regulations placed in effect after its effective date, to the extent constitutionally permissible; and the public trust doctrine regarding the public's right to use navigable waters and the land beneath them for navigation, commerce, fishing, and other purposes.

(3) A permittee or lessee shall obtain and remain in compliance with all other federal, state, and local authorizations necessary for lawful operations.

(4) A permit or lease may, with the approval of the commissioner and after payment of the application fee required by 11 AAC 05.010, be amended to change the species of shellfish or aquatic plant being raised or to change the boundary or acreage of the aquatic farmsite, or the number of rafts or other rearing structures authorized, if the change is minor and does not increase obstructions to navigation or to other public use. However, no change of use, as that term is defined in 11 AAC 63.120, will be authorized.

(5) A permittee or lessee and its invitees may not use an aquatic farmsite for any unlawful purpose.

(6) A permittee or lessee may use an aquatic farmsite only for the purposes authorized by the permit or lease, and the state reserves all other interests in the site. The rights granted by the permit or lease must be exercised in a manner that does not unreasonably interfere with the rights of the state or of its permittees, lessees, or grantees, consistent with the principle of reasonable concurrent uses as set out in article VIII, section 8 of the Alaska Constitution. A permittee or lessee shall pay for any damages that may become payable by reason of the permittee's or lessee's failure to comply with the requirements of this paragraph.

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(7) A permittee or lessee shall comply with the approved development plan and schedule or the approved lease operating level.

(8) A permittee's or lessee's failure to timely perform its obligations under the permit, or otherwise to comply with all express or implied provisions of the permit, constitutes a default. If a permittee or lessee fails to cure the default or to begin and diligently continue to remedy the default within 30 days after written notice of the default and an opportunity to be heard, the commissioner will, in his or her discretion, order suspension of site development or operations until compliance is achieved or may take other action the commissioner finds appropriate, including revocation of the permit or lease.

(9) With the commissioner's written consent, a permit or lease that is in good standing may be relinquished. (Eff. / /89, Register)

Authority: AS 38.05.020
AS 38.05.035
AS 38.05.083
AS 38.05.085
AS 38.05.855
AS 38.05.856

11 AAC 63.120. DEFINITIONS. In this chapter,

(1) "aquatic farm" has the meaning set by AS 16.40.199, that is, a facility that grows, farms, or cultivates aquatic farm products in captivity or under positive control; "aquatic farm product" means an aquatic plant or shellfish, or part of an aquatic plant or shellfish, that is propagated, farmed, or cultivated in an aquatic farm and sold or offered for sale;

(2) "aquatic farmsite permit" means a three-year, non-transferable property right, revocable only for breach, to improve and develop state-owned public domain land as an aquatic farm or related hatchery in accordance with the permit's provisions; it includes a preference right to an aquatic farmsite lease if the permittee develops the site for aquatic farming or related hatchery operations in accordance with the permit's provisions;

(3) "aquatic farmsite lease" means a lease to operate an aquatic farm on state-owned public domain land for a term of ten years, extendable for an additional ten years; an aquatic farmsite lease is issued at not less than fair market value and reappraised every five years, and may be assigned with the director's approval;

(4) "change of use" means a change from one species of shellfish to any species other than shellfish or from one species of aquatic plant to any species other than aquatic plants, a

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change in the location of the aquatic farmsite, a significant increase in its acreage, or a significant increase in the surface area of the farmsite that is encumbered by rafts or other rearing structures;

(5) "commissioner" means the commissioner of the Department of Natural Resources or the commissioner's delegate;

(6) "department" means the Department of Natural Resources;

(7) "director" means the director of the division of lands or the director's delegate;

(8) "good standing" means being in compliance with all provisions of all required authorizations. (Eff. / /89, Register)

Authority: AS 38.05.020
AS 38.05.083
AS 38.05.085
AS 38.05.855
AS 38.05.856
AS 38.05.920
AS 38.05.945
AS 38.05.946
sec. 18, ch. 145, SLA 1988

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March 7, 1989

Senator Richard Eliason
Alaska State Senate
Juneau, Alaska 99811

Dear Dick:

I am sending along a clipping from today's New York Times that you will find of interest.

--Hope the session is going well for you.

Best personal regards.

Sincerely,

Joe

Fish and Eggs Destroyed in West After Disease Strikes Hatcheries

By TIMOTHY EGAN

Special to The New York Times

SEATTLE, March 6 — An untreatable fish disease, never before found in North America, has been detected at two salmon hatcheries in the Pacific Northwest, prompting biologists to kill nearly four million eggs and young fish in an effort to halt the spread of the virus.

Government officials, who worry that the disease may have expanded beyond the hatcheries to wild trout and salmon, say they might have to destroy marine life in entire river systems if the virus, viral hemorrhagic septicemia, is found in those waterways.

The virus, which is not harmful to humans even if they eat infected fish, has killed nearly 90 percent of the trout in some areas of Europe, where it has existed for years. Although biologists are not sure how the virus got into two salmon hatcheries in the Puget Sound area, experts say its appearance raises fresh concerns about transplanting foreign fish species into American waters.

Some biologists are pointing fingers at the growing Atlantic salmon fish farm industry here. Atlantic salmon, which are not native to Northwest waters, are imported from Scotland, Norway and Finland and raised in net pens in Puget Sound. Although their eggs are screened for the virus, and no trace of it has yet been found in Atlantic salmon here, the fish are capable of carrying the disease, Federal biologists said.

"If you want to have a fish farm, you should stay with the stock from the local area," said Jerry C. Grover, a manager with the Federal Fish and Wildlife Service in Portland, Ore.

Officials in the state of Washington, who have promoted Atlantic salmon aquaculture in Puget Sound, said the European fish pose little harm to America's Pacific salmon industry.

But they said the virus, no matter where it came from, could devastate some of the most prized American sport fish, mainly freshwater trout and steelhead, a seagoing rainbow trout that grows to the size of many Pacific salmon.

Mr. Grover said the appearance of the virus at the Makah National Fish Hatchery on the Olympic Peninsula of Washington and the Glenwood Springs Hatchery on Orcas Island in the San Juan Island chain near the Canadian border is classified as an extreme emergency.

Under such a designation, officials are empowered to destroy all fish life in the areas where the virus appeared. Nearly one million young coho and steelhead were killed along the two hatcheries last month, or slightly more than 1 percent of the total annual salmon hatchery production in Washington state.

> If the virus spreads, marine life in entire river systems would have to be killed.

It is unknown how many of the young fish were infected with the virus. Biologists say trout and salmon can pick up the virus through bacteria in fish urine and feces. The degenerative disease kills trout by weakening the kidney.

Officials are now checking wild fish in rivers near the two hatcheries. If these fish are found to be infected, all marine life in the rivers will be destroyed by sending an electric current through the water, said Tony Floor, a spokesman for the Washington State Department of Fisheries.

"Since this is an emergency status disease, we have no choice but to kill the whole river," Mr. Floor said. It will take up to a month to determine if these rivers carry contaminated fish.

Electroshock and other radical eradication efforts now under consideration "are an effort to nip this thing in the bud," Mr. Grover said. An alert has been sent to salmon and trout hatcheries along the West Coast, advising them to check for the virus.

"We're very alarmed," said Mr. Grover. The virus first showed up in adult chinook and coho salmon, two types of Pacific salmon, when they returned to the two hatcheries. The disease is apparently not fatal to salmon, Mr. Grover said, but they can infect trout and steelhead, which often share the same freshwater streams for spawning.

Mr. Grover believes the virus had to come from fish or eggs brought in from Europe. "The thing leapfrogged from Europe to Puget Sound," he said. Europeans have been fighting the disease since the early 1960's, he said, and they have not found a cure. Some European trout stocks have been nearly wiped out by the disease.

The disease has been cited by some commercial fishermen who see fish farming as a threat, both biological and economical, to their industry.

The outbreak "has lent credence to some of the questions we've been raising," said L. Joe Miller, who heads a group called Save Our Shores, which is opposed to efforts to expand fish farming in Puget Sound.

He said disease will continue to plague fish farms, as it has in Europe. "It's a flawed technology," he said.

Haavard Rabben, general manager of Global Aqua USA, which has an Atlantic salmon fish farm in Puget Sound, said the disease has not shown up in Atlantic salmon in Europe for 20 years. He said the farms can be managed without widespread outbreaks of disease, and noted that in Norway the net pens increased their production 50 percent last year.

Regardless of whether the virus is ever traced to Atlantic salmon, officials say the appearance of the virus in Puget Sound could harm the salmon and trout industry if other countries decide to block imports of certain American fish.

"Our main long-term worry is that if this is widespread it could be devasting to trout, but we could also face an economic problem if other countries won't accept fish that have been near this disease," said Dr. Marsha Landolt, a professor of fisheries at the University of Washington.



Seattle Times

Alan Kehril, a fish culturist for the Samish Indian Tribe, removing salmon killed at the Glenwood Springs Hatchery on Orcas Island, north of Seattle. The salmon were killed when a virus lethal to fish appeared.

Do you have The Times delivered?

U.S. Seeks to List African Chimpanzees as Endangered

Special to The New York Times

WASHINGTON, March 6 — The Interior Department has proposed listing African chimpanzees as an endangered species in an attempt to protect them from extinction.

The action, which was first proposed in 1987 by conservation groups and African nations, would make importation of the chimps illegal but would not affect medical research on chimps in the United States. Species are put on the endangered list primarily to prevent commercial trade in animals whose populations are diminishing in their habitat.

"What the ruling does is make sure that in the future no more chimpanzees will come out of the wild," said Curtis Bohlen, senior vice president of the World Wildlife Fund. "As consumer countries we bear a great deal of the blame" for the destruction of chimps.

An estimated 175,000 chimps live in the wild in Africa, and nearly 100 States in the last year. Since the 1940's, 3,000 to 4,000 chimps have been exported from Africa, most to the United States.

The action would bring United States law into line with 99 nations that adhere to the Convention on International Trade in Endangered Species, which prohibits all commercial trade in chimpanzees.

The proposal would apply to all chimpanzees in Africa, including those in the wild, those in captivity and their progeny. It would not apply to the 600 chimps in the United States, which would continue to be classified as threatened, permitting their use in medical research.

In a notice published Feb. 24 in the Federal Register, the Interior Department concluded that the chimp has become extinct in 4 of the 25 African countries it had inhabited, including Benin, Gambia, Togo and Burkina Faso. The public has 60 days to comment on the proposal, after whether to put it into effect.

> 'In the future no more will come out of the wild.'

The dwindling number of chimpanzees is caused by poaching, the destruction of habitats through slash and burn cultivation, and local hunting. At least 5 to 10 chimpanzees die in the process of capturing 1 alive, usually a young chimp for an overseas buyer, according to the Federal Register.

To gain access to a young chimp, its mother is shot and its family poisoned, said Geza Teleki, chairman of the Committee for Conservation and Care of Chimpanzees, an organization of scientists. A chimp will bring in $25,000, up from just $2,000 five years ago, he said.

was quoted in the Federal Register as saying, "The continued removal of infants from wild populations (even if this does not involve the killing of breeding females) will, within a short period of time, bring wild chimpanzees to the verge of extinction in Africa."

The resolution allows chimp blood and tissue samples for research purposes to be shipped to the United States. National Institutes of Health research grants for medical research in African nations will not be affected by the resolution, said Robert Whitney, director of the office of animal care and use of the National Institutes of Health.

"We'll support it," Mr. Whitney said. "We have no problem with the resolution." The institutes said the number of chimps in the United States was sufficient for research, and that it will no longer obtain chimps from the wild or conduct or support research on chimps caught in



Animals, Animals/Stewart D. Halperin

Young female chimpanzee at

State concerned about a new salmon virus

Fishery pathologists in the state Fisheries Rehabilitation, Enhancement and Development (FRED) Division of the Department of Fish & Game are very concerned about the discovery in the state of Washington of Viral Hemorrhagic Septicemia (VHS), a fish virus that has not occurred before in North America.

Recently, the virus was identified in spawning coho and chinook salmon in two hatcheries in Washington state. All fish in the hatcheries were destroyed and the facilities have been quarantined to prevent the spread of the virus.

VHS, first discovered in 1938 in Europe, causes disease primarily in rainbow trout in both fresh and sale water. Transmission is by contact with infected fish or contaminated waters.

Dr. Ted Meyers, principal pathologist for the FRED Division, has found no evidence of VHS disease in Alaskan salmon stocks. According to Dr. Robert Burkett, Chief of Technology and Development for the FRED Division of ADF&G, Alaska maintains the best possible protection against invasion of exotic fish diseases because it prohibits the importation of any finfish into the state. "The most important thing was done 10 years ago when regulations were established prohibiting import of finfish," Burkett says.

Dr. Meyers has been in contact with investigators performing the VHS identification and survey work at the Sand Point U.S. Fish and Wildlife Service Fish Pathology Laboratory in Seattle. Dr. Meyers will be travelling to the Seattle Laboratory to monitor the progress of the investigations and to determine the extent of the VHS problem in Washington and the Pacific Northwest. FRED Division pathologists will continue to monitor Alaskan salmonid stocks for IHNV using procedures that would detect other viruses as well, including VHS.

As a result of the potential risk to Alaskan stocks, the Commissioner of ADF&G, Don Collinsworth, is calling for the immediate formation of a Pacific Coastal Task Force composed of state and provincial representatives from Alaska, Washington, Oregon, Idaho, California and British Columbia, with appropriate representatives from state, federal, tribal and private industry to investigate the risk of spreading VHS from infected hatcheries in Washington State and to develop effective control methods to contain this disease.

—Alaska Department of Fish & Game, March 1, 1989

A Different Kind of Tanking

Fish Farming in Fairbanks

by Rodger Painter

Editor's note: The Alaska Legislature wrote an exception into the recent moratorium on commercial finfish farming which allows "commercial finfish farming in a privately owned freshwater body that has no outlet to state water." The following article was reprinted from the Nov.-Dec. 1988 issue of the Alaska Mariculture Report.

Andy Wescott couldn't have picked a tougher entry into fish farming. A placer gold miner with no fisheries or farming experience, Wescott decided to start a salmon farm in Alaska's bitterly cold interior.

The only climate more hostile to a beginning fish farmer might be the political maelstrom into which the Fairbanks man finds himself being reluctantly dragged. Andy Wescott is no politician, but he is a fighter, and he just won't take no for an answer.

Rather than go down fighting government agencies and lawsuits by environmentalists, Wescott figured out how to scale back his placer mining production and change operating methods to meet water quality standards and still make a profit. He then went about transforming his placer claim into a tourist attraction.

Wescott built his own train, and hauls tourists through his operation at $20 a head. The tourists are treated to "mining experiences from the early 1900 through today" and are guaranteed gold during their panning excursion.

There were a number of local miners who toyed with the idea of a gold panning tourist attraction, but they always gave up after their first rebuff, Wescott said. "I've never been one to take no for an answer. When a door closes, I go knock on another until I find a way to do whatever I'm trying to do."

An Alaskan for the past 23 years, Wescott initially learned about salmon farming from a television special filmed on British Columbia's Sunshine Coast, the heart of salmon farming country. He then set about gathering information from a variety of sources and started planning to farm salmon in a spring-fed gravel pit at his Fairbanks home.

His lack of experience in handling fish or in farming fails to daunt Wescott. "Everything you need for information is out there and easy to obtain," he said. "I started on a trial and error basis and have been very fortunate to succeed."

Wescott credits the Division of Fisheries Rehabilitation, Enhancement and Development (FRED) in the Department of Fish and Game with helping him get a promising start. He helped FRED personnel gather wild coho eggs, spending weeks as a volunteer in the field at remote streams.

In June, Wescott obtained 1,200 coho fry hatched from surplus eggs he helped gather. The eggs were incubated at the Clear Hatchery near Fairbanks. By mid-December, Wescott said the only mortalities were ten smolts who "committed suicide" by jumping out of a rearing tank.

The fish are being grown in 1,100 gallon tanks in Wescott's large shop. The gravel pit plan fell by the wayside when Wescott realized he needed to have heated water. Wescott maintains his water temperatures at a steady 55° F by heating the workshop and recycling 100 percent of his water. He uses a water filter designed especially for his operation by the California company Aquatech.

The water comes out of his well at 38° F. Westcott said he helps control the water temperatures by adding ½ gallon of new water per 1,000 gallons recirculated.

Wescott's ingenuity in his machine shop has been a key to his shoestring operation. Brian Allee, FRED director and an experienced aquaculturist, and other state officials who visited Wescott's operation have come away impressed.

Allee was particularly fascinated with Wescott's homemade automatic fish feeder. Wescott took his son's toy red wagon, moved the wheels to the ends of the body and used it as a frame for a conveyor belt which is driven with an electric drill motor. A timer activates the motor for .6 seconds every 45 minutes, dropping out 2.5 inches of feed from the rotating conveyor belt.

Five conveyor loads per day provides the fish with about 1,500 grams of feed. Wescott said he is maintaining lower feed amounts as a measure of extra caution and to provide additional time to secure financing to expand his operation to keep pace with fish growth.

What Wescott lacks in knowledge about fish, he makes up by asking questions and observing his fish very closely. He's continually pumping Clear Hatchery biologists for more information, and the FRED workers make a point of regularly stopping by Wescott's operation to see how he's doing.

His unorthodox approach appears to be working. The experimental batch of coho fry hatched in February, and were about "1¼ inches long" when delivered. By mid-December the largest fish was about "11 inches."

Wescott has made a point of not

handling his fish unnecessarily and has avoided measurements and weighings. He estimated that roughly one-third of his stocks were between 9-11 inches, one-third from 6-9 inches, and the remainder 3-6 inches.

He plans to grade the fish soon so the smaller animals won't have to compete with the larger fish for food. Wescott says his feeding system doesn't spread the feed around the tanks well enough to allow the smaller fish to get to the pellets in time. An improved feed delivery system is high on his agenda.

Wescott has yet to be faced with a disease problem, and he watches his stocks closely to catch any subtle changes in the fish.

"I spend four hours a day with them now," Wescott said. "It's a lot of fun and they get a lot of attention. All I can say is thank God my wife works."

Starting with disease-free eggs was a big plus, but Wescott said the most important factor in his experience to date probably has been his ability to maintain water quality in his recirculating system. "As far as I'm concerned, the whole key is water quality."

Wescott said one fish has had a damaged gill from the start, but even it has been progressing well so far.

While he is confident of his ability to raise the fish with the amount of close attention they've been getting to date, Wescott plans to hire a biologist when he gets into a fuller production stage.

With his makeshift farming system and folksy approach (his farming business is Mrs. Andy's Coho Ranch), Wescott might seem to be the quintessential "mom and pop" farmer. But, beating beneath the surface is the heart of an entrepreneur who sees some obvious business opportunities involved in finfish farming.

Wescott envisions his farm growing to a capacity to handle up to one million eggs. His investment requirement is about $5.4 million. He hopes to secure financing for a $1.2 million first phase of operations capable of handling 200,00 coho fry.

"The market's there," Wescott said. "Investment dollars are the name of the game."

As evidence, Wescott says he has been approached by one Japanese company interested in securing up to 10,000 pounds of fish per week. He claims local grocers will snap up all of his initial production. He said Carr's supermarket chain is very interested since it is paying $5.40 per pound plus freight for Norwegian farmed Atlantic salmon.

He does not worry about competing against net pen farmers. "I can beat any net pen situation just because of my ability to control my water temperatures" and other controls on environmental conditions in a tank farm.

Wescott says his fish probably will be targeted for export to Japan and Korea. He expressed confidence that regularly scheduled direct Fairbanks/Tokyo air freight service would be in place by the time his major production is on line.

The Fairbanks farmer is undaunted by the dizzying projections for increasing salmon supplies and suggestions that he will be at a cost disadvantage compared to open net operations in B.C. and other growing areas.

Wescott is certainly facing a major challenge in making an indoor salmon farm economical in Fairbanks, but his biggest hurdles may be political in nature. Wescott's ability to enter commercial finfish farming was made possible by a provision in the finfish farming moratorium allowing "commercial finfish farming in a privately owned freshwater body that has no outlet to state water." The section was added by Fairbanks Senator Bettye Fahrenkamp specifically to allow Wescott to proceed.

The exemption does not allow Wescott to obtain a water appropriation permit or obtain broodstock from any sources other than state-owned hatcheries. The attorney general's office has issued an opinion saying such farming operations cannot include private hatcheries and must meet with approval by the Board of Fisheries.

Wescott's request for another 200,000 fry was referred to the Board of Fisheries, and almost immediately ran into problems. ADFG originally issued a recommendation that freshwater farms not be allowed to raise salmon, but later amended that recommendation to include cohos.

The proposal was scheduled for Board of Fisheries action in December, but got bumped to early February when the Board got bogged down in the Cook Inlet salmon wars between sport and commercial fishermen. Meanwhile, the Clear hatchery has gathered the 200,000 eggs from returning fish, and is holding them pending Board action.

The delay and continued uncertainty has interfered with Wescott's efforts to raise capital for his farm. He is prepared to rent a 6,000 square feet building to house the 200,000 fish, while he constructs a larger growout facility.

Wescot admits to being puzzled by fact that the furor over pen rearing salmon is causing him such problems. After all, his operation poses no threat to any public resource and his product is designed to replace farmed Norwegian salmon, not Alaska-caught fish.

He recently agreed to speak before the United Fishermen of Alaska's board of directors, and hopes to discuss his operation with other commercial fishermen.

"They should want me to succeed," he said. "I pose no threat to them, and I'm willing to do things right."

Robert D. Stevenson
P. O. Box 28024
Juneau, AK 99802

3-9-89

SENATOR RICHARD ELIASON
ALASKA STATE SENATE
POUCH V
JUNEAU, AK 99811

DEAR DICK:

ENCLOSED IS AN ARTICLE FROM THE ISLAND'S SOUNDER, A WEEKLY PUBLICATION FROM EASTSOUND, WASHINGTON THAT MAY BE OF INTEREST.

EASTSOUND IS IN THE SAN JUAN ISLANDS, WHERE I WORKED IN THE LATE 30'S,

OLD TIMER LEGIONNAIRE

Robert D. Stevenson

Viking girls go to state tournament: page 7



Help stars tape radio show at Orcas Center: page 8



The Islands' Sounder

Volume 25, Number 9 | Eastsound, Washington 98245 | Wednesday, March 1, 1989

Mr R D Stevenson
P O Box 20824
Juneau, AK 99802

25¢



DRAINED POND -- At Glenwood Springs Hatchery, on the east side of Eastsound Bay, a half million fingerling salmon were destroyed this week. The pond is being disinfected due to a fish virus.

Photo by Lisa Willis

At Glenwood Springs

Salmon killed

by Jan Koltun

"Even the state fisheries trucks can't come on the place; we're in quarantine," Kathy Youngren said Monday.

The trucks brought chlorine to disinfect six rearing ponds at the Youngrens' Glenwood Springs Hatchery, southeast of Eastsound on the old Keyes place. Care was taken to ensure that no chlorine got into nearby Eastsound Bay.

A half-million fingerling salmon were destroyed at Glenwood Springs, most last Thursday and the remainder on Monday, after state officials identified a "mysterious" European fish disease.

"We used a backhoe, dug a trench, and buried the fingerlings," Jim Youngren said.

The sadness in his voice was echoed by hatchery employees and volunteers, some of whom, in previous years, have marked small fish by implanting small electrodes in their foreheads, so that when they are caught the locations and other information can be passed on to fisheries scientists.

Department of Fisheries pathologists discovered the pathogen during routine checks of "bucks," adult male salmon coming back to the hatchery last fall. It took several weeks to grow the virus so that it could be analyzed, and several more weeks before the pathogen could be identified.

"They weren't able to identify them because they have never been found before in this country," said Jim Youngren. He said the state fisheries pathologists have taken samples from some of the destroyed fish and will continue to monitor the ponds "indefinitely."

Eating fish infected with the pathogen, a rhabdovirus that causes a degeneration of the blood-forming tissue in the kidney, does not present health risk to humans.

However, there is no known treatment for infected fish. It is not known whether the virus has spread into Pacific salmon and steelhead stocks.

Altogether, some three million fingerlings and fry (a "fry" is a small adult fish) and one million eggs and fish were destroyed in the two areas in Washington state where the fish disease surfaced.

Because it is such a large watershed, most of the stock was at the Makah National Fish Hatchery near Neah Bay, where returning adult coho were found to contain the virus.

Although speculation was that the virus could have come from private owners of exotic trout, from other fish, from ships, people's shoes or clothes, or from net-pen farming, there was no conclusive evidence to support any of these notions. Aquaculturists who import eggs must submit them to strict state quarantine and inspection.

"Nobody has any idea where the virus could have come from," said Youngren. "It was found in one or two returning Chinook, so we don't know whether they picked it up in the open ocean or in the hatchery.

The disinfected rearing ponds will be tested periodically for the virus. In the fall, returning male fish will be scrutinized.

In the meantime, the ponds rest, empty, at the hatchery. There is an outside chance that within two months fingerlings could be placed in them again.

The hatchery will open "at the very latest in the fall, when fish return," Youngren said.

The returnees next fall will largely be three and four-year old bucks; a small percentage will be "jacks," or precocious one-year-olds, with a few two-year-olds and potentially some five-year-olds.

The virus was found last fall in three or four year-old fish; it is not known precisely which year.

It has caused significant fish losses among commercial trout stocks in continental Europe, but was previously unreported in North America.

In a joint press release issued last week by the State Department of Fisheries, the Northwest Indian Fisheries Commission, and the U.S. Fish and Wildlife Service, officials said the disease is being aggressively monitored.

Fin fish farming . . . the price may be too high

'Bering Sea Fisherman/February 1988

The recent articles commenting on the success of Norway's fin fish farming industry have ignored the high price that Norway has paid in fish diseases that have ravaged their industry and destroyed thirty of their wild salmon rivers, and the very real fears their scientists have concerning genetic pollution of their wild stocks of salmon.

Norwegian salmon farmers, in the business for twenty years, find themselves continually fighting new diseases that have required the slaughter of tons of pen-farmed salmon. A group of farmers, who lost their harvest either to furunculosis (a disease that kills 60% of affected stocks) or to government control of diseased fish, is suing the Norwegian government for $25 million dollars. Farmers themselves are demanding that 100 more fish veterinarians specializing in disease control be hired before anymore fish farm permits are issued . . . those in addition to 60 fish disease specialists and nearly 150 fish veterinarians already working around the country.

Norway's use of antibiotics for controlling these diseases rose over 170% last year to reach 48 tons. This is more than the amount used for animal husbandry and humans combined. With our focus on health and nutrition how does this use of such large quantities of antibiotics affect our view of pen farmed salmon? Scientists have expressed concerns of effects on the food chain and the increase of human resistance to antibiotics.

Last summer in Norway 5,000 farmed salmon infected with the deadly furunculosis escaped into their waters. Despite their best efforts to blockade and capture the sick fish, an infected fish was found in one of their rivers. "If the disease spreads to natural stock, the situation may be out of control in Norway," their scientists warned. Studies by three Norwegian fish biologists conclude that disease in farms can lead to higher infection rates of wild stocks in the vicinity of the net pens even if the disease itself may already exist in the natural stocks.

The fish farm disease that kills wild salmon in rivers and has destroyed 30 wild salmon rivers in Norway is *Gryodactylus salaris*, a parasite that entered Norway via infected smolts from Sweden. The only way to clean up the rivers is by the use of a chemical called rotenone. Unfortunately along with killing the parasite, it also kills every other living thing in the river, including wild salmon. A top Norwegian scientist says, "I feel we are on a sharp edge with diseases. If we have the *Gryodactylus salaris* in more rivers we may just accept our wild salmon is extinct."

It has recently been suggested that one of the reasons that Alaskans might be interested in a pilot project in salt water would be to assess the probability of fish escaping. We don't have to experiment . . . it is documented. **At least** 13% of farmed salmon escape and there are occasionally very large numbers that escape. For instance, this last December in Jarvis Inlet, B.C. an estimated 300,000 fish escaped from their pens in winter storms and residents reported many net pens floating up and down the coast. Also, in Washington State, commerical fishermen have reported substantial numbers of escaped farmed salmon in their catches. Should these escapees concern Alaskans?

Svein Mehli, head of Norway's Directorate for Nature Management, which is responsible for protection of wild salmon, appeared in Washington State on December 14 as an expert witness on fish disease and genetic pollution. He testified that up to 40% of the fish in many of their rivers is now of farmed stock origin and says they are very concerned about the genetic effects of farmed salmon on wild stocks. "We are very afraid it could affect their ability to migrate," he said. Three major fisheries institutes in Norway have reported that escaped farmed salmon **do** spawn in rivers. In order to combat this threat, Norway has implemented new zoning regulations this year. . . . **no salmon farms will be located within 20 kilometers of salmon rivers, and entire fjords will be closed to farming where salmon rivers are present.**

In Alaska, using indigenous species that would take at least three generations to tame (until they had lost their basic will to survive in the wild) and the resulting genetic pollution from escaped fish could pose the same threat. Although the magnitude of that threat would be related to the population size and density in individual streams, spawning escaped salmon would still be a danger, especially in streams with small populations.

Alaskans who imagine that we could control diseases better than other countries because we have a large hatchery system and would not be forced to import eggs or smolts need to examine the situation in Washington State and British Columbia. Both these areas have overturned strict fish regulations banning the importation of foreign stocks at the economic pressure of fish farmers who find that native wild stocks are slow to domesticate and growth rates are not rapid. The already domesticated Atlantic salmon is the economic savior of fish farmers. Fish biologists were mystified at the reversal of their regulations and a Canadian biologist wrote that his government was playing "Russian Roulette with our wild fish stocks." That same economic pressure forced Norway to lift their ban on importation and the result was the *Gryodactylus salaris* parasite that has caused such a tragedy in their country. Acquisition of eggs or smolts from hatcheries or river systems is also a major public policy issue for Alaskans to consider. The only experimental on-land tank farm in Alaska acquired its eggs from a northern sport fish hatchery. . . .that may be fine as long as the public, through the Board of Fish process, has an opportunity to comment. The demand for eggs in British Columbia has created conflicts between sport and commerical fishermen and fish farmers.

In Washington, a local fish farmer is now suing in U.S. District Court alleging that foreign national interests, primarily Norwegian, have made an attempt to monopolize the commercial farming industry in his state. 80% to 95% of the fin fish farming industry in both Washington and British Columbia is owned by Norwegian Corporations. Could Alaska escape such a fate ? It's doubtful.

There seems to be a plentiful supply of pen-raised salmon these days . . . it's starting to go into freezers in Europe as well as being sold fresh. Alaska is presently the world leader in ocean ranching. The State's hatchery programs are responsible for at least 80 million dollars in resident income and 2300 resident jobs.

Last year's mariculture legislation, which addressed shellfish and aquatic plant farming, also called for an Alaska Mariculture Task Force to study the issues relating to fin fish farming (especially, salmon pen rearing). We believe that this Task Force should be funded now to give all concerned parties and the Legislature an approved forum in which to study and assess the impacts of fin fish farming on Alaska. Alaska contains 48% of the wild salmon in the world . . . we should not let the winds of economic development sway our way of thinking. It is imperative that we fully understand the consequences of our actions and protect the future of our unique and valuable resource.

Editor's Note: This article was provided by the United Fishermen of Alaska, Mariculture Committee. For more information, contact UFA's office in Juneau at 586-2820 or 1-800-478-FISH. ★

11 Seattle Post Intelligencer 2/25/89

Virus threatens state's salmon and steelhead hatcheries

By Jane Hadley and George Foster
P-I Reporters

State and federal biologists have destroyed almost 4 million fish and eggs at two Washington state hatcheries because some of the fish were infected with a fatal viral disease that has never before occurred in North America.

The hatcheries have been quarantined, but the virus may already have spread into valuable Pacific salmon and steelhead stocks, alarmed fisheries experts say. The disease has previously infected European commercial trout operations.

"The worse-case scenario is that every hatchery would become infected," Joseph Blum, director of the Washington state Department of Fisheries, said yesterday.

"The hatchery world throughout the U.S. has been put on alert. The word is out and traveling quickly," said David Klinger, a spokesman for the U.S. Fish and Wildlife Service's regional headquarters in Portland.

The virus, which cannot be treated and is always fatal to infected fish, poses no risk to human health, even if a contaminated fish is eaten, according to the state fisheries department.

Two hatcheries, the Makah Hatchery near Neah Bay and the Glenwood Springs Hatchery on Orcas Island, are being disinfected. No fish or eggs can enter or leave the facility, said Klinger.

Coho, chum, fall chinook, and steelhead were destroyed.

The virus first showed up in December at Glenwood Springs, a joint private-state salmon rearing operation.

A short time later the virus appeared at the U.S. Fish and Wildlife Service's Makah Hatch-

See **VIRUS**, Page A7

Virus: Threat to hatcheries

From Page 1

ery on the Olympic Peninsula. But the virus was not positively diagnosed until last week.

The disease, called viral hemorrhagic septicemia or "VHS," has previously been reported only in continental Europe, where it has caused "significant fisheries losses" at commercial trout operations, according to the fisheries department.

Blum said a little over 300 million young fish and 60 million eggs are produced annually in the state. The fish and eggs destroyed this week would amount to about 1 percent of that.

"Obviously, it's a significant number of fish," said Klinger. And the Makah hatchery fish also are considered especially valuable because the hatchery is so close to the open ocean that the fish have a very high survival rate, he said. But the possibility that the disease might spread to other hatcheries is now the main worry.

Glenn Yokoyama, manager of the University of Washington's fish hatchery on Portage Bay, said if fish and eggs were transferred into or out of the infected hatcheries after the virus discovered but before the quarantine was put into effect, it would heighten the chances the disease would spread.

Bob Byrne, a spokesman for the state Department of Wildlife, said department biologists are concerned that the virus will spread.

"The likelihood of this virus showing up someplace else at some point is pretty high," he said..

Top fish disease experts throughout the Northwest met in Medford, Ore., this week to discuss the virus and other matters, according to the state fisheries department.

The disease causes the blood-forming tissues of the kidneys to degenerate.

The disease could have been introduced by certain fish species, or by ships or travelers carrying contaminated water.

"The possibilities are bilge water from vessels or that people who travel worldwide pick it up on their boots, or that other fish could have it," Blum said. "My understanding from our technical folks is that black sea bass are a carrier. Atlantic salmon have been known to have it."

The new disease may well fan the flames of the controversy over salmon net pens and other aquaculture operations in the state. Opponents have insisted that net pens pose the risk of introducing new fish diseases, while supporters have downplayed the risk. The favored fish at net pen operations is the Atlantic salmon.

The state has 13 net pen operations, most of which raise Atlantic salmon, and a number of new ones are proposed.

Hatcheries in this state have been plagued by a virus for many years known as IHN. Since 1982 the UW's hatchery has had to test each egg and young salmon individually for the presence of IHN.

The Inlet News

Kenai Peninsula Fishermen's Association

FEBRUARY, 1989

Penney Pushes Peninsula Pen-Rearing

Just when you thought it was safe to go back in the water. He's back.

Anchorage developer Bob Penney's latest fishing scheme is the building of a $1.6 million experimental sockeye salmon farm in Resurrection Bay near Seward.

Penney and Dave Daisy, the duo who brought you Project US, want the state to lift a two year moratorium on finfish mariculture so they can build the farm. Penney claims technology is available to rear fish profitably and that he can arrange financing to fund the project.

Penney has contacted key legislators to promote his plan. In a recent letter to Senate Resources committee chairwoman Betty Fahrenkamp Penney said, "We are willing to take the financial risk. All we ask is that the legislature give us the right to try."

Fahrenkamp has expressed public approval to proceed with some form of mariculture. "We've got to figure what type of program we want or if we just want to sit here and just let the world pass us," she said. She said she would bring Penney's proposal before her committee and that it could end up in legislation.

Commercial fishermen across the state lobbied the legislature last year to impose a 2 year moratorium on salmon farming. As part of the law which imposed the ban, a task force was to be created to study the issue and the concerns raised by fishermen. **(see related article on page 3)**



Bob Penney

Cook Inlet sport fishing groups have also opposed the development of finfish mariculture. At a February 1988 meeting of the Cook Inlet Fisheries Coalition, members unanimously passed a resolution opposing finfish mariculture in Alaska. Coalition members expressed fears that mariculture development would drain already limited financial resources for fishery management.

KPFA spokesperson Cheryl Sutton said at the time, "Our commercial and sport fisheries each provide millions of dollars to Alaskans annually. To jeopardize either industry by reducing management funds which, instead would be directed to start up a new industry is neither wise nor appropriate."

Other concerns raised by Coalition members included the potential for disease spreading to wild stocks, environmental degradation and potential conflicts with the harvest of wild salmon stocks.

The Kenai River Sportfishing Association, of which Penney is chairman, voted in support of the resolution opposing mariculture development.

Penney says he isn't seeking exclusive rights for fish farming. He says he would be satisfied if the state approved a general bill allowing the creation of several test farms for which he could bid. Penney contends that fish farming, if the moratorium is lifted, could rapidly develop as a major new industry in Southcentral Alaska.

(See "**Penney**" on Page 6)

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State Budget Asks for More Fishery $'s ***Page 3***

KPFA Member Survey Results ***Page 4***

Lease Sale Planned ***Page 5***

Fish Board Appointments Named

Governor Cowper has reappointed sportfishing guide **Bud Hodson** to the Board of Fisheries and named two new members.

Bristol Bay commercial fisherman **Harold "Robin" Samuelson** of Dillingham and **John Hanson** of Alakanuk were appointed to three year terms on the Board. They replace Val Angason and Jesse Foster.

Hodson was first appointed in 1987 by Cowper to fill a vacancy. His reappointment was supported by the KPFA. Hodson is an owner-operator of the Tikchik Narrows Lodge near Dillingham. He is also a founding member of the Alaska Professional Sportfishing Association.

Samuelson has been a commercial salmon and herring fisherman for more than 30 years. Hanson works as a fisheries manager for Yupik Star Fisheries in Alakanuk and is also a member of Alaska's negotiating team at the United States and Canadian salmon treaty talks.

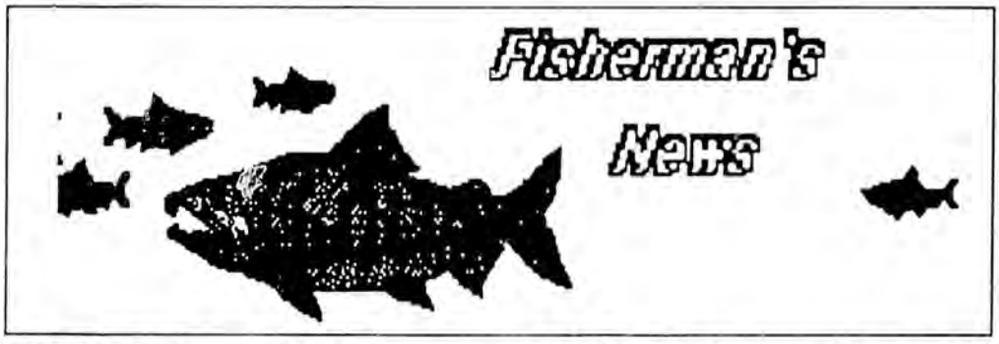
Blossom Running for CIAA Board of Directors

KPFA Board member **Dave Blossom** is running for election to the Cook Inlet Aquaculture Board of Directors. He is being opposed by Sid Fox of UCIDA.

We need a strong show of support and votes for Dave. The CIAA notes that setnetters are notorious for not getting out the vote.

Ballots have been mailed to all permit holders. **If returning by mail, ballots must be postmarked by March 3. You can hand deliver your ballot to the Aquaculture Building until 5 p.m. March 10.**

Please take a moment to vote today and vote for a strong voice for setnetters, Dave Blossom. Your vote will count.



Board of Fisheries to Meet

The Alaska Board of Fisheries will continue to meet throughout the winter. The following is the latest tentative schedule.

February 22-March 6 **Juneau**
Southeast/Yakutat Finfish
Statewide finfish

March 10-17 **Anchorage**
Westward Shellfish

March 18 **Anchorage**
Statewide Shellfish

The Juneau meeting is planned to take place at the Travel Lodge. The Anchorage meetings will be at the Egan Convention Center.

Copies of proposals to be considered can be obtained at local Fish and Game offices.

Advisory Committee Elections: Get Out & Vote February 24

The Kenai/Soldotna Fish and Game Advisory Committee will be electing new members at a meeting February 24th. Five seats are up for grabs.

Nominations and elections will both take place at the meeting. KPFA Board member **Brent Johnson** will be running for re-election and needs our support.

We also strongly encourage our members to offer themselves for nomination. We need a big turnout at the meeting to show support for our nominees. It's expected that more than 75 guides will show up to stack the votes in their favor.

If you're interested in being nominated please contact the KPFA office at 262-2492.

The election will be held February 24th at the Borough Building at a 7 p.m. meeting.

Cowper Proposes Fisheries Budget Increases

Governor Cowper has proposed increased funding for several fishery related projects as part of his FY 1990 budget now being reviewed by the state legislature.

When Cowper released his budget in December, he noted that the budget included expanded services in three areas "essential to the state's economy." Cowper called one of those areas his "fisheries development initiative."

"The initiave is aimed at strengthening Alaska's fishing industry and implementing a mariculture bill passed but not funded by the 1988 legislature," Cowper said.

Cowper's budget request includes the following items:

Increased fish and wildlife enforcement by the Department of Public Safety **$596,800**
Increased resources for Dept. of Fish and Game management of Upper Cook Inlet **$250,000**
Improved inspection efforts by the Department of Environmental Conservation **$554,200**
Increased instructor support of fisheries technology classes at AVTEC in Seward **$ 56,000**

Marciculture-**$714,000** is requested for various mariculture related programs in the Office of the Governor and the Departments of Fish and Game, Environmental Conservation, and Natural Resources regarding permitting, resource management and inspections.

The budget request specifically directs that, if funded, the Department of Fish and Game will undertake projects to:

(1) Assess the production capacity and establishment of escapement and harvest objectives for Susitna River salmon stocks;

(2) Protect wild stocks from overharvest and seek realization of the full potential benefit from the hatchery program; and

(3) Participate in the national and international fisheries management arenas to represent Alaska's interests.

The Commercial Fisheries Division would also conduct subsistence surveys in coordination with the Subsistence Division.

The fisheries initiative also envisions a project conducted by the FRED Division to allow fishery managers to harvest hatchery fish without impacting wild stocks by enhancing the coded wire tagging program. FRED Division would also implement mariculture permitting and technical review functions required as part of the mariculture moratorium enacted in 1988.

Funding of $300,000 is also proposed to allow the Board of Fisheries to hire additional staff and to promote "the timely review and codification of regulatory information."

ComFish '89 Set for Kodiak

Kodiak will host ComFish '89, a large commercial fishing industry show March 17-19. More than 80 companies were represented at ComFish in 1987 and 4,000 people attended.

Various commercial fishing groups will conduct meetings in conjunction with ComFish '89 activities. The Alaska Fisheries Development Foundation will hold a Board meeting. A shipboard medical care/sea survival course will also be offered. The Women's Fisheries Network will meet and the annual Fishermen's Wives Ball will take place.

For more information call the Kodiak Chamber of Commerce at 486-5557.

HHB Working for Setnetters

Holden Hackney and Breeze continues to work with the KPFA as we plan our future course.

HHB has been asked to assist with fundraising activities and will submit a plan this month. HHB also produced this newsletter and continues to meet with Board members as needed.

HHB made a presentation requested of several Board members recently about how to establish a "Fishermen's Credit Union" on the Peninsula. The information presented is being reviewed.

HHB Public Relations Director **Virginia Breeze** and Account Executive **Jeff Day** recently received their national accreditation from the Public Relations Society of America. Few PR practitioners have achieved this designation in Alaska. Accreditation comes only after passing a thorough oral and written examination on subjects including public relations history, communication theory, law and techniques.



KPFA President
Tim Keener

Your Support is Needed Now More than Ever

Due to the many demands placed upon the Association to protect the fishery, our financial resources have dwindled.

We will no longer be able to maintain the level of service provided on behalf of our members unless significant financial donations are made within the next few weeks.

Each year we ask members to dedicate 2% of their payments from processors to the KPFA. Some members made that commitment. Many did not. Some have sent in contributions independent of the 2% assessment.

The activities these contributions support include the staffing of our office, research, public speaking and advocacy on fishing issues important to all of us, lobbying in Juneau, and publication of this monthly newsletter to name a few. The Board of Directors which has done a fantastic job this past year has devoted hundreds of hours of volunteer time *without* compensation.

Without immediate financial support, those activities will be reduced or eliminated. With critical issues facing us in the future ranging from Bob Penney's mariculture scheme to the Cook Inlet Oil and Gas Lease Sale, the Mat-Su Timber sale and, perhaps, Project US in a revised form, it would be unwise to reduce our efforts.

Please take a moment and write a check to the KPFA for whatever amount you feel is appropriate to protect our fishery. A small investment today may save our fishery, our way of life for generations.

Commercial Fishing Survey Results Show Economic Impact

Last Fall, the KPFA sent a survey to the 102 permit holders who are also members asking about their fishing practices and history. Questions were also asked about expenses, salaries paid, and sport fishing activity.

A substantial number of the forms were returned allowing the KPFA to make an impressive presentation to the Board of Fisheries.

The average number of nets fished per site in 1988 was 8.6. The most common number was 6 followed by 12. The average number of permits fished per site was 2. 28% answered they fished 4 nets per site, 25% fished 3 and 22% fished 2 nets.

When asked how many nets were fished certain distances off shore respondents said an average of 6 nets were fished from 0-1/2 mile, 3 nets from 1/2-1 mile and 3 nets for 1 to 1 1/2 miles.

70% of those answering said they fished gear to a depth of 45 mesh.

65% of those answering said they would be willing to participate in a 1989 King Salmon Release Program. 16% said maybe.

Based on the economic questions answered, the average setnet site employed 8 people with a payroll of $56,600. The average expenditure for fishing supplies was $20,550 with average living expenses for food, laundry etc. at $4,500. Based on responses, it appeared that KPFA members-permit holders spent $3,445,514 on crew member wages alone.

The survey showed the average fisherman has engaged in fishing for 20 years. 12% said 4 generations of their family had commercially fished. 44% said three generations, 24% said two generations and 20% were first generation fishermen.

86% reported being Alaskan residents with an average length of residency at 19 years.

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Cook Inlet Oil and Gas Lease Sale Planned

The Department of Natural Resources has announced its intention to issue a final decision by April 1989 regarding the sale of oil and gas leases as part of a proposed sale in Cook Inlet.

Proposed sale 67A includes 173 tracts totalling about 679,804 acres. The proposed sale area consists of state-owned uplands in Anchorage, Wasilla and Houston, in the lower Susitna Valley, near Redoubt and Trading Bays and on the upper Kenai Peninsula, and the tide and submerged lands in Cook Inlet.

The Department of Natural Resources planned to hold a public hearing on the sale on February 14. ***Written comments can be sent to the Division of Oil and Gas through February 22. That address is P.O. Box 107034, Anchorage 99510-7034. Send comments to the attention of Pam Rogers.***

A preliminary finding describing the potential effects of the lease sale can be obtained from the Division at 3601 C Street in Anchorage, Room 1398. Copies of the document are also available at Anchorage, Kenai, Soldotna, Wasilla and Palmer libraries. Excerpts from that document are quoted below.

If a decision is made to hold the lease sale, it is tentatively set to occur at the Egan Convention Center in Anchorage on June 27.

Oil and Gas Lease Sale Background

Before a state oil and gas lease sale can be conducted, it must be determined that it's in the state's best interest. That decision must include an analysis of the potential effects of the sale both positive and negative.

The state contends that experience with oil and gas exploration, development and production in other areas of the Cook Inlet Region has provided the state with sufficient knowledge to anticipate and plan for many potential effects.

The following information is quoted directly from the state's preliminary findings of potential effects of this sale.

"Some adverse effects, however, likely are unavoidable, and these must be anticipated and balanced against the beneficial effects. The magnitude of effects from the proposed sale will depend on the location and size of economic discoveries of oil and gas, the type and extent of facilities necessary for development of those discoveries and the effectiveness of mitigation measures in negating any adverse impacts."

"Impacts on fish and wildlife will be directly dependent on the amount of habitat degradation caused by petroleum-related activity. Generally, impacts can be grouped into three broad categories: (1) pollution from discharge oil, drilling muds and cuttings, formation and cooling waters, or other wastes directly to the environment; (2) direct habitat loss or alteration from facilities construction; and (3) disturbance from noise and the presence of humans."

"Oil spills can cause significant damage to biological and environmental resources. Several proposed mitigation measures have been designed to help prevent accidental discharges of oil or to deal with an accidental discharge should one occur."

"Oil blowouts are, perhaps, the most serious and dramatic form of pollution associated with oil and gas development. Fortunately the probability of a blowout is extremely low. The state will require that lessees take appropriate steps to prevent a blowout from occurring."

"The state will also require that lessees be prepared to respond to an oil discharge in the event that one were to happen. Lessees holding onshore leases must prepare a plan to provide for the detection and cleanup of oil. In addition, the plan must specify the location of spill cleanup equipment and define the time required to obtain equipment. The state will require that offshore lessees develop an oil discharge contingency plan."

"The state will (a) require that the siting, design, construction, and maintenance of facilities in key wetlands must prevent oil contamination of those wetlands, (b) require impermeable lining and diking of oil storage facilities with a capacity greater than 660 gallons, (c) require that facilities be sited and consolidated to avoid sensitive habitat, and (d) prohibit fuel storage facilities in active floodplains."

"Discharge of pollutants into marine waters is a major concern in the proposed Sale 67A area. The direct discharge of produced waters to surface marine waters of Cook Inlet, except for shallow water habitats, is generally considered acceptable. To protect environmentally fragile areas, the state will prohibit the offshore discharge of produced waters, drilling muds and cuttings within 1000 meters of coastal marshes, river

(See "Lease Sale" on Page 6)

Lease Sale Planned for Cook Inlet

(Continued from Page 5)

deltas, river mouths, designated areas meriting special attention or game refuges."

"Oil and gas development within the sale area could affect fish populations by interfering with migrations, altering spawning and rearing habitats, or reducing overwintering areas. Pollution from spilled hydrocarbons, produced waters, or drilling muds and cuttings could reduce fish populations or habitat if the substances enter fresh or marine waters."

"Effects of an oil spill on fish would be dependent on the size and location of the spill and the time of year. Eggs and larvae are more sensitive to oil than are fish at later stages of development."

"Adult fish may be able to avoid contaminated areas; however, oil spilled in nearshore waters could impede the movement of anadromous fish to feeding, spawning or overwintering areas. Local behavioral and physiological changes may occur in adults, and juveniles may experience limited growth and an increase in predation."

The documents available for review list many other concerns and restrictions that would be imposed upon lessees.

Penney Plans Pen Rearing Project

(continued from Page 1)

He proposes to produce two harvests of pen-reared sockeye salmon totalling at least 200 tons. He claims he would then dismantle the farm and shutdown the project turning over all scientific and financial data to the state.

He also says he would help finance state observation of the plant by pre-paying a fish tax which would be levied against a 200 ton harvest.

Penney's colleague, Dave Daisy, says Alaska's state hatchery system has developed state of the art techniques for handling disease prone fish. "In the event of any disease, we would allow the state to kill all the fish," Daisy said.

Kenai Peninsula Fishermen's Association
P.O. Box 546
Soldotna, Alaska 99669-0546

FIRST CLASS

Senator Dick Eliason
P.O. Box V
Juneau, AK 99811

HIGH EUROPEAN STOCKS REFLECT PRICE RESISTANCE

ABETH LAMBERT

...son's fiasco in the West Coast frozen salmon business has had ...ad repercussions throughout Europe. Most smokers are now ...ng embarrassingly high stocks of Pacific product which are proving ...ficult to clear in view of the flood of cheap farmed salmon.

FROZEN SALMON

For several seasons now, frozen salmon packers in North America have tended to dismiss the threat of growing competition from farmed Atlantic product in Europe, pricing their exports for the Japanese market and expecting European buyers to follow suit. This year, however, the strategy has come unstuck. There is, it seems, an upper price limit beyond which Europe can quite happily do without Pacific salmon.

Following the record prices paid for Pacific product during the 1987/88 season, European buyers were already advocating caution back in May last year. As reported in FOODNEWS (May 6, 1988), French importers were warning of the dangers of yet another price bonanza in the current season.

But then the Pacific runs came in late, Japan was a strong early buyer and the whole market took off. For their part too, the importers were carried along with the overall trend and early price resistance soon gave way to good demand, despite the highest dollar prices ever recorded.

MARKET TURNED SOUR

In the event, the whole market has turned sour. While the additional late runs in Canada and the USA were a factor in starting a weaker trend during October, it has been the flood of cheap farmed product that is really behind the present situation.

In Norway, where salmon production virtually doubled last year — to an estimated 85 000 tonnes and is forecast to reach 120 000 tonnes this year — producers were anxious to liquidate stocks during December.

In France, the largest world market outside Japan, prices for fresh Norwegian salmon fell by 30% in the two weeks leading up to Christmas to average around FF30 per kg compared with FF55 at the same stage in 1987.

But, even at these prices, offtake could not keep pace with the flood of supply and large unsold quantities had to be frozen. French traders report that as much as 250 tonnes was frozen in the week between Christmas and New Year — salmon which is now being sold off very cheaply.

Even before this, French retail outlets were reported to be cancelling orders on Pacific smoked salmon in favour of the Atlantic product and, as a result, at least three leading French smokers are reported to be holding excessively large high-priced stocks of coho.

A similar situation applies in the UK where Norwegian salmon has also had a major impact this season. As one importer commented this week: "Even at the reduced prices of recent weeks, Norwegian salmon can undercut North American coho. Our last quote on troll coho 6-9 lbs was US$4.00 per lb cif which is equivalent to around UK£2.40 per lb as against wholesale prices on fresh Norwegian below UK£1.50. This undercuts even net cohos!"

UK smokers also have large stocks and some claim they would be prepared to drop Pacific coho altogether on cost grounds, although they will review the market again once supplies run out.

Of all the European markets, Denmark is proving to be the most buoyant due to the fact that the smokers there tend to demand the cheaper, lower grade species. Following a good Christmas trade, Danish smokers are still in the market for frozen pinks and silverbrights, but these are in tight supply.

A few Puget Sound brights are offered in the region of C$2.65 per lb cif, but for the most part the heavy inventories on the West Coast are low grade product. And, even at the substantially lower prices now prevailing, the trade cannot shift any volume. Japan is out of the market and likely to remain so, and Europe is just not interested in semibright chums which even at US$1.90-2.00 per lb cif — almost a dollar below opening levels — are still considered too expensive.

It is difficult to predict how the market will proceed from here on. For their part, the reputable West Coast packers, some of whom were prepared to make special concessionary prices to Europe this season, may offer remaining product at a bargain price to established customers to help them offset their losses on the high-priced stocks in hand. But, in the longer term there is no doubt Europe is downgrading on Pacific fish and that demand will continue to slump unless prices come back dramatically next season.

NORWEGIAN IMPACT

Whatever the outcome, Norwegian farmers have been the beneficiaries. As one contact commented: "It is now recognised by West Coast traders that they did the best ever advertising job on Norwegian salmon this season."

GLOBAL PRODUCTION OF FARMED SALMON

(In '000 metric tons)

	1985	1986	1987	1988*
Atlantic				
Norway	28.7	45.5	47.4	80.0
UK	6.9	10.4	13.0	15.0
Ireland	0.7	1.2	2.2	4.5
Faroe Is.	1.3	1.9	2.5	4.0
Iceland	0.1	0.7	1.7	1.8
Canada	0.5	0.8	1.0	1.1
Spain	0.0	0.1	0.1	0.3
France	0.1	0.1	0.2	0.2
Total	38.3	60.7	68.1	106.9
Pacific				
Japan	5.0	7.0	12.0	5.0
Chile	1.2	1.5	2.0	5.0
Canada	1.0	1.0	2.5	2.6
N. Zealand	0.3	0.6	1.0	1.5
USA	1.0	1.5	1.5	3.8
Total	8.5	11.6	18.0	27.9
Total salmon	46.8	72.3	86.1	135.0

*Preliminary.
Source: Globefish/FOODNEWS.

Sealaska official touts mariculture

THE ASSOCIATED PRESS

KETCHIKAN – One of the most promising areas for diversification of Southeast Alaska's economy is mariculture, a Native corporation official says.

Robert Loescher, senior vice president of natural resources for Sealaska Corp., made the comments in a discussion of the future role of Native corporations in the Southeast timber industry.

"Southeast Alaska has one of the world's best environments for salmon farming and would be the production center for Alaska industry," Loescher predicted. However, state and federal policies have restricted the growth of private mariculture, he said.

Loescher said the explosive growth of mariculture around the world cannot be ignored. He said mariculture production in British Columbia is expected to bypass the region's fishing industry in revenue by the mid-1990s.

Loescher said British Columbia will have the best of both worlds: a thriving aquaculture industry and its traditional fishing industry.

"There is no reason Alaska cannot have the same," he said.

"With proper safeguards for wild stocks and environment, a finfish industry in Southeast will not threaten or diminish our fishing industry," Loescher said.

Juneau Empire 2/2/89

B.C.-farmed salmon win first in taste test

THE ASSOCIATED PRESS

VANCOUVER, British Columbia – British Columbia-farmed salmon won first prize at a taste test last week at the Sea Fare International Exposition in Long Beach, Calif.

The contest organized by Seafood Leader Magazine of Seattle included troll-caught Alaska chinook salmon and farmed salmon from six leading salmon-producing areas around the world.

The British Columbia farmed chinook salmon won the grilled category and the over-all title by earning 537 out of a possible 600 points. Farmed salmon from Washington state and Chile took second and third places, respectively.



Sheila - Please put with mariculture articles of similar nature

Alaska State Legislature

REPRESENTATIVE BILL HUDSON

P.O. BOX V
Juneau, Alaska
99811
(907)465-3744 or 4991

COMMITTEES:
Transportation
Resources
Foreign Trade

FINANCE SUBCOMMITTEES
DOT/PF
C & RA

February 21, 1989

Senator Dick Eliason
Alaska State Legislature
Juneau, Alaska

Dear Senator Eliason:

Enclosed is a copy of a recent article from Foodnews, dated February 3, 1989.

For years I have been terribly concerned about the possible impacts of high volumes of farm raised salmon on Alaska's salmon market.

I'm alarmed that "large unsold quantities had to be frozen," because all along the argument for farm raised salmon was the year-round availability of fresh, unfrozen salmon.

Also enclosed is a copy of an article from The Fisherman, "Norway Sees Mounting Disease, Pollution Threat from Fish Farms."

I think it's very responsible for Alaska to take a good inside view of what's occurring in the world salmon markets before we invest our diminishing public and national resources in pen reared fin fish.

Respectfully,

Bill Hudson

BH:lkh

Enclosures

HIGH EUROPEAN STOCKS REFLECT PRICE RESISTANCE

BY ELIZABETH LAMBERT

This season's fiasco in the West Coast frozen salmon business has had widespread repercussions throughout Europe. Most smokers are now carrying embarrassingly high stocks of Pacific product which are proving difficult to clear in view of the flood of cheap farmed salmon.

FROZEN SALMON

For several seasons now, frozen salmon packers in North America have tended to dismiss the threat of growing competition from farmed Atlantic product [illegible] increasing their exports for [illegible] market and expecting [illegible] follow suit. This [illegible] strategy has come [illegible] seems, an upper [illegible] which Europe can [illegible] without Pacific salmon.

Following the record prices paid for Pacific product during the 1987/88 season, European buyers were already advocating caution back in May last year. As reported in FOODNEWS (May 6, 1988), French importers were warning of the dangers of yet another price bonanza in the current season.

But then the Pacific runs came in late, Japan was a strong early buyer and the whole market took off. For their part too, the importers were carried along with the overall trend and early price resistance soon gave way to good demand, despite the highest dollar prices ever recorded.

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Spain	0.0	0.1	0.1	0.3
France	0.1	0.1	0.2	0.2
Total	**38.3**	**60.7**	**68.1**	**106.9**
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Chile	1.2	1.5	2.0	5.0
Canada	1.0	1.0	2.5	2.6
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Total	**8.5**	**11.6**	**18.0**	**27.9**
Total salmon	**46.8**	**72.3**	**86.1**	**135.0**

*Preliminary.
Source: Globefish/FOODNEWS.

Provided by UFA

UFA is recommending Sen. Resources ask this Norwegian specialist to testify IF there is a bill on mariculture. — OR possibly a teleconference

The Fisherman Dec. 8, 1988

Norway sees mounting disease, pollution threat from fish farms

The deadly salmon disease furunculosis, previously unknown in Norwegian waters, is breaking out of fish farms and threatening beleaguered wild stocks, says a top government official.

Svein Aage Mehli, head of the division of Norway's Directorate for Nature Management which is charged with protection of wild salmon, told a Washington State regulatory hearing Nov. 14 that 5,000 farmed salmon infected with the disease escaped this summer into Hjorundfjorden near Molde.

Despite an intensive fishery to catch the fish and a system of net barricades at the mouths of salmon rivers, an infected fish was found in fresh water, he testified.

"If the disease spreads to natural stocks, the situation may be out of control in Norway," Mehli said.

"I feel we are on a sharp edge with diseases. If we have (the parasite) *Gyrodactylus salaris* in more rivers we may just accept our wild salmon is extinct."

(Furunculosis is present in B.C. waters and leads to loss of appetite, fluid retention, ulcers and eventually death in up to 60 percent of affected stocks. It had not been found in Norway until smolt transfers from outside the country were undertaken. Gyrodactylus also has been linked to fish farming and is treated by killing all host fish with rotenone.)

Mehli was qualified as an expert witness at a hearing in Lacey, Wash., of the Shoreline Hearings Board, which is hearing an appeal of a Skagit County decision to reject a fish farm in the mouth of the Skagit.

The fish farm proponents, a tribal group, are appealing the refusal of the Skagit County commissioners to issue permits for the farm on the basis that it threatens Skagit salmon and could pollute the sensitive estuary.

Proponents have denied there is any evidence of a disease threat to wild stocks from farmed salmon.

As a result, the appeal hearing has turned into a deep investigation of the environmental impact of salmon farms on wild stocks. Mehli was flown from Norway to testify on behalf of county commissioners, who backed up their decision by referring to the Suzuki Foundation report on Norway called *Journey to the Future*.



• Svein Aage Mehli, of Norway's environmental agency, testified last month to a Washington State regulatory agency.

Mehli responded angrily to suggestions by fish farm proponents that there is "no conclusive evidence" of disease spreading to wild stocks from farms.

"We are very concerned," he said. "It is not right to ask for conclusive evidence at such an early stage."

Furunculosis imported on smolts destined for salmon farms broke out two years ago and authorities felt they had eradicated it, he said.

This year's outbreak was a shock, as was the continued spread of bacterial kidney disease (BKD), which is very difficult to treat even with antibiotics.

"BKD poses a problem for natural stocks because it was diagnosed for the first time in 1980 and previously did not exist in nature," Mehli said. "It is very easy to see a connection between BKD (in salmon farms) and wild stocks in the river."

"It's reasonable to conclude" BKD spread from farms, he said and Norwegian scientists "see logic in such a connection." BKD is diagnosed or suspected in 100 netpen operations and hatcheries.

Antibiotic use on Norwegian fish farms climbed to 48 tonnes last year, equal to the requirements for human use and animal husbandry combined.

"If you see the first diagnosis of redmouth disease in Norway just two years ago, it's impossible to ask what happened in such a case," Mehli continued. "Veterinarians underline the seriousness of that situation, that net pen operations have an impact."

Mehli said redmouth now is present in 300 facilities but was unknown until 1985.

"Net pen operations may function as a multiplying station for disease," Mehli said. "They will give greater disease pressure on natural stocks that we didn't see before netpen operations."

Mehli said further studies on the straying of farmed fish into rivers show a sharp increase in the presence of farmed fish. A year ago, 18 percent of the fish found in the rivers studied were of farm origin. In 1988, the figure rose to 40 percent. The origin was confirmed by scale samples and electrophoresis.

Asked if strong regulations could control disease, Mehli agreed they could "minimize problems if they go far enough. Norway has not gone far enough."

Norway is proposing a ban on the transfer of eggs and smolts between regions of the country, he said, and considering a ban on all imports of sexual products like eggs and milt.

Even though existing regulations list diseases which must not be present in imported eggs, the list is limited and "in Norwegian cage culture we know other diseases are knocking at the door."

In theory, he said, fish farmers "want to get rid of disease, but if they see profit in the short term they may react in a different way."

Mehli also confirmed fears of negative genetic effects of farmed fish on wild stocks if they interbreed. "We are very afraid it could affect their ability to migrate."

Netpen salmon have undergone careful selection for size and growth rate, he said, but researchers may have inadvertently selected other characteristics which could have a negative impact if reintroduced into wild stocks.

"First there is a genetic problem and second an environmental problem. If Atlantic salmon (escaping in Pacific waters) have the same requirements as coho or steelhead trout — and we know that salmon escape in great numbers — then you will have competition for space in the rivers."

As to their ability to spawn, "we see them in rivers, they are mature, ready to spawn and we are very worried of what will happen."

New zoning regulations now being implemented in Norway will ban farms within 20 kilometres of salmon rivers and close entire fjords to farming where salmon rivers are present.

COAL HARBO

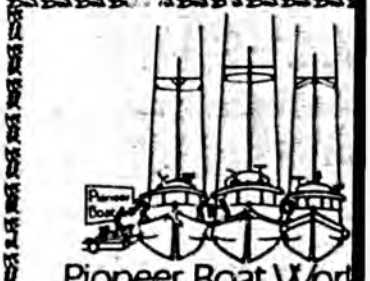
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FISHING VESSEL OWNERS
ASSOCIATION OF B.C.
wish you
Good Luck and
Good Health in the
Coming Year!

Merry Christmas &
Prosperous Ne
from the
Staff & Employ

Fish farmer sues foreigners

A Washington state fish farmer and his corporation have sued in U.S. District Court alleging that foreign national interests have attempted to monopolize the commercial fish farming industry in his state. Lee A. Holley III of Lopez Island in northern Puget Sound alleges in his suit that foreign business interests, primarily Norwegian, operated through American national fronts to destroy competition in the industry, remove local control and violate antitrust laws.

Holley, owner of Northern Nights Fish Farms Inc., is suing several Norwegian corporations that have either sole or partial ownership of farms in Puget Sound. Also named in the suit are state officials and other individuals who allegedly contributed to illegal activity. Holley charges that large financial contributions were made to state political campaigns by the foreign interests, which, he says, also assisted in defeating a moratorium proposed against new businesses in San Juan County, where Holley lives

Comments from the Norwegian companies and state officials were being withheld pending litigation, according to several reached by telephone.

— Brad Matsen

The Fisherman January 25, 1989

Fish farm drug hits wild stock

Fishermen harvesting shellfish off Scotland say a chemical used by salmon farmers is killing marine life.

Scientists at Aberdeen University have linked the chemical with increasing numbers of wild salmon going blind.

The controversy has erupted over Nuvan 500, which farmers use to control pests. Its byproduct, dichlovros, is listed by the 1987 North Sea Conference as one of 26 most dangerous chemical in waterways.

The debate highlights the severe problems salmon farming disease treatment can pose for the marine environment and other marine life.

According to the *London Observer*, in a report on its wire service Jan. 11, scientists at Norway's Institute of Marine Research in Bergen have found the chemical could be damaging sensitive lobster and crab larvae around the farms. Mussel and oysters also absorb the chemical.

Nuvan is strictly controlled on land, but salmon farmers have easy access because they are not subject to the same regulations.

Fishermen and environmentalists are demanding a ban on Nuvan, but farmers say they will be decimated by sea lice if Nuvan is taken from their arsenal. They favour voluntary controls.

Nuvan is not registered for use in Canada, meaning it is unavailable. Valery Brooks, of the B.C. Salmon Farmers Association, said sea lice are not a problem in this province, but a special session on lice is scheduled for an aquaculture conference in Dartmouth next month.

Scientists there have concluded that sea lice threaten the viability of salmon farming in Atlantic waters and 96 percent of farms must user treatments to control the parasite.



THE REPORT OF THE
SUZUKI FOUNDATION
FACT-FINDING TOUR
ON FISH FARMING
IN NORWAY
APRIL, 1988

JOURNEY to the FUTURE

By Geoff Meggs



Veteran halibut fisherman Wayne Patterson peers into the holding tank for the world's first farm-raised halibut in Austevoll, Norway. Norway is moving aggressively to farm new species in a research effort aimed at transforming fish production.

THE FUTURE of the fish farming industry, with its promise of great profit for farmers and grave peril for wild fish resources, is being foretold in three Norwegian laboratories.

In Oslo, veterinarians perform autopsies on farmed salmon, seeking signs of the ever-more prevalent diseases that have battered the industry during the past three years, precipitating multi-million dollar lawsuits and the slaughter of thousands of tonnes of fish.

In another laboratory, in Trondheim, a scientist watches over the frozen sperm of Norway's dwindling wild salmon stocks, gathered here as insurance against farm-borne parasites and genetic pollution which he fears could exterminate the wild stocks forever.

And in a third laboratory, at the Austevoll research station near Bergen, Canadian scientist Karin Pittman peers daily into the gloom of a saltwater-filled silo, watching newly-hatched halibut larvae move like specks of dust through a dim column of light to seek food.



DFO PHOTO

Salmon fry, seen here about twice life-size, emerge from their eggs in a hatchery tray.

No licence is granted in Norway where 'it will cause risk of the spread of disease among fish or shellfish'

DISEASE, the struggle to conserve wild stocks and the unflinching drive to smash the biological barriers to fish farming are the recurring themes in Norwegian aquaculture.

They are played out against the backdrop of the country's salmon farming miracle, which parlayed surplus eggs from a few hundred depleted Atlantic salmon runs into an industry which employs 5,000 and will produce 70,000 tonnes of fish in 1988.

But as eight British Columbians found on a recent two-week fact-finding tour, the aquaculture breakthrough has not been without cost. We had come to find the answer to a single question: is salmon farming threatening Norway's wild salmon resources?

The answer is yes. We found a country which is fighting farm-borne parasites, disease and genetic pollution to save its wild stocks from extinction. A sign of the desperation: the tiny commercial salmon fishery will be closed forever next year unless Norway's powerful fishermen's organizations can win yet another delay.

We found a country with many similarities to our own, including deep ocean fjords, strong coastal communities and a burning need for economic development.

But we found vast differences as well. Unlike B.C.'s salmon farmers, who have opposed any move to strict regulation, Norway's industry is demanding a freeze on further expansion until stronger measures are in place to assure fish health.

Unlike B.C.'s government, which has insisted that the industry should be regulated only by market forces, Norway's government intervenes directly to control the growth of aquaculture and to direct its development.

Most important of all, we found a country which by our standards has already lost the fight to save the wild salmon. Norway harvests only 1,600 tonnes of wild salmon a year from its 400 streams, a tiny fraction of the 100,000 tonnes taken annually from B.C.'s waters. Nonetheless, Norway's salmon legislation starts from the assumption that protection of the environment and wild stocks must be the top priority.

British Columbia, like Norway, has a salmon farming industry. Unlike Norway, it has a vast wild salmon resource capable of increasing its production several times over. Yet it is in Norway, not B.C., where government and industry are joining hands to safeguard and husband the source of all the salmon industry's wealth: the wild salmon.

Patterson holds a preserved sample of the first halibut to be raised from egg to fish at the Austevoll research station. Cod at the station have been trained to answer a dinner bell, eliminating the need for fishermen.



GEOFF MEGGS PHOTO

THE B.C. delegation to Norway was organized by the T. Buck Suzuki Foundation, the environmental organization founded by the UFAWU in 1981. Among the participants was Jim Cameron, a Sunshine Coast gillnetter who had witnessed the explosion of fish farming firsthand.

It was Cameron who had joined several other fishermen in 1986 to protest the issuance of fish farm leases in commercial fishing areas, contrary to government pledges. This protest led to the 1986 moratorium on fish farm licences and a brief commission of inquiry.

But the Gillespie Report, which was produced without testimony from Norwegian experts, ducked the fundamental issues of the environmental impacts of salmon farming.

As rumours and reports of environmental and disease problems trickled in from Norway, Cameron's fellow-fishermen proposed a trip to Norway to settle these questions once and for all.

The UFAWU endorsed the idea and asked the Suzuki Foundation to organize the trip. Union locals raised almost $10,000 toward the cost of sending five delegates. They included Cameron, troller Dan Clark, of Nanaimo, shoreworker Arnold Nagy, of Prince Rupert, longliner and purse seiner Wayne Patterson, of Vancouver, and union organizer Dennis Brown.

Joining the union group were Will Soltau, a vice-president of the Pacific Trollers Association, and Edith Iglauer Daly, a journalist from Pender Harbour who was on assignment for *The New Yorker.* Soltau is the commercial fishermen's representative on the province's Aquaculture Advisory Committee. As editor of *The Fisherman* and secretary of the foundation, it was my job to organize the tour.

The group left April 11. The questions seemed simple: could disease spread from farmed fish to wild? Is there a danger of genetic pollution of wild stocks by farmed fish? Is pollution from fish farms a threat to the marine environment?

The answers proved fairly easy to find. Issues that are the subject of bitter debate in B.C. are largely settled in Norway, where authorities are drafting ever-more restrictive regulations to safeguard against fish disease.

If B.C.'s salmon farming industry is in its infancy, then Norway's is a teenager, confronting problems of massive growth. Markets may soon be a problem for Norway's fish farmers, but today the main effort centres on disease control. Again and again in the days that followed our arrival in Oslo, we had the uneasy feeling of seeing glimpses of the future.

THE STATISTICAL

story of Norway's explosive fish farm growth, the story brought home by a dozen government and industry groups, is an impressive one. From a modest office building in downtown Oslo, only a few hundred yards from the port and the ancient fortress of Akershus, the Norwegian Royal Ministry of Fisheries manages both traditional fisheries and the aquaculture industry.

Kari Bjorbaek is head of the ministry's aquaculture section. Only 10 years ago, Norwegian farmers were producing only 4,000 tonnes of salmon annually. Today the figure is 12 times that, with harvests expected to reach almost 90,000 tonnes this year and 120,000 by the early 1990s.

Under Bjorbaek's supervision are 611 smolt production plants with a capacity of 183 million smolt per year serving 728 farms with a capacity of five million cubic metres.

The export value of Norway's farmed salmon is more than $400 million a year. That figure alone convinces Canadian politicians that we need as much farming as possible as soon as we can get it.

But Norway is in no hurry to expand its production, Bjorbaek told us in a morning-long briefing April 14. Although the Norwegian Fish Farmers Association favors a 50 percent increase in farm capacity, to 12,000 cubic metres from 8,000 cubic metres, much of this increase would be used to reduce stocking densities to curb disease.

"Any increase in capacity has not been decided upon yet," Bjorbaek said, "and we have issued no new licences since 1985.

"We are working to improve the quality of farmed fish and to control disease."

In fact, disease control is considered a prerequisite for success in a special report on aquaculture to the Storting, Norway's Parliament.

The existing licensing legislation already requires that no licence be granted where it "will cause risk of the spread of disease among fish or shellfish, will cause risk of pollution (or) has a distinctly unfortunate location in relation to the surrounding environment, lawful traffic or other exploitation of the area."

Now the ministry is proposing even tougher rules on licensing with provisions to tighten disease protection, increase protection for other marine users and to increase participation by women.

Can disease spread from farms to wild stock? "The possi-

JOURNEY to the FUTURE



SEAFOOD FROM NORWAY PHOTO

bility will always be there," she replies, "but in the wild stock you can't always notice disease because the fish go to the bottom. We have taken steps to ensure the existence of the wild stock."

Bjorbaek and her staff are optimists. Despite the 1985 outbreak of Hitra disease, a cold water vibriosis or infection which forced the destruction of large numbers of fish, they believe disease can be controlled.

In a recent status report on Norwegian aquaculture, Bjorbaek reported that Norway's "main strategy has been and still is to prevent the spread of communicable diseases through a close monitoring and through strict rules, particularly in relation to hatcheries.

"In spite of this we have had serious outbreaks of various diseases . . . All our efforts so far have been directed at disease control and only recently have we instituted programs for disease prevention. With the development of new vaccines, we feel confident that we are on our way to tackle these problems."

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Despite disease problems, Norwegian salmon farmers are heading for 120,000 tonnes of annual production. Strict government regulations control use of antibiotics, but farmers are demanding 100 more fish veterinarians before any more farm licences are issued.



GEOFF MEGGS PHOTO

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Trygve Poppe, of the national veterinary institute, confirms fish disease moves from wild stock to farmed and vice versa. He wants farmers to breed for disease resistance, not just quick growth.

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The tour organized by the T. Buck Suzuki Foundation lasted two weeks and included (left to right) Wayne Patterson, Jim Cameron, of Pender Harbour, journalist Edith Iglauer Daly, of Pender Harbour, union organizer Dennis Brown, shore worker Arnold Nagy, of Prince Rupert, troller Dan Clark, of Nanaimo and troller Will Soltau, of Sointula, also a director of the Pacific Trollers Association.

ACROSS OSLO

, in the laboratory of the National Veterinary Institute, director Trygve Poppe is not as confident that disease problems can be resolved.

"Diseases have a very heavy impact on the industry," he says. Norwegian specialists are encountering signs that some diseases are becoming resistant to antibiotics. Each year produces new strains of disease that must be countered.

"As early as 1966 we already had disease imported from Denmark," he told the delegation. "Legislation was passed in 1968 and regulations came in on June 1, 1969. Now we are planning even more comprehensive legislation."

The Veterinary Institute, under the Ministry of Agriculture, is the front line in the war against disease, but also is considered by its critics to be the main chink in Norway's armour.

Although exceedingly conservative, the institute succumbed to industry pressure in 1985 to permit the importation of salmon smolts from Scotland that carried in furunculosis with disastrous effects. About 20 farms had their stocks destroyed without compensation.

Critics contend the institute was lax in allowing the import of eggs from Sweden which some believe carried in the parasite *Gyrodactylus salaris*, a devastating freshwater disease that is crippling wild salmon streams.

Farmers who lost their stock to furunculosis or the control measures are suing the government for 125 million krone, about $25 million, in a case that will have tremendous repercussions for the industry.

Today, however, Poppe and his colleagues are more concerned with drafting even tougher regulations on the movement of eggs and fish. On his laboratory slab he has farm samples with distinctive bruised flesh and diseased organs typical of Hitra disease. "The bacteria are humming so loud in there you can almost hear them barking," he remarks.

Control of fish disease is a costly and prolonged process. Furunculosis imported on rainbow trout and transferred to Atlantic salmon in a Norwegian river in the 1960s persisted until 1977. There are worrying signs of other problems.

"BKD is increasing in two Atlantic salmon rivers," Poppe says, "and in one case we have escaped farmed fish."

By B.C. standards, Norway already deploys an army of veterinarians against the disease threat. Sixty veterinarians deal only with fish disease and between 100 and 150 work on fish around the country.

But the salmon farmers association has demanded a freeze on the issuance of further licences until at least 100 more full-time fish health specialists are in the field.

Last year, use of antibiotics rose 170 percent in Norway to 40 tonnes. The increase is disturbing when you consider that use of antibiotics is illegal unless approved by a government veterinarian. Fish may not be moved to market until nine weeks after treatment ends and must again be inspected to confirm the antibiotic is no longer present in the flesh.

"More emphasis should be put into breeding a healthy salmon," Poppe says, "rather than a fast-growing, late-maturing salmon.

"To some extent the salmon farmers have tried to breed for disease resistance but we see every day they have more and more diseases. Obviously, the Atlantic salmon is very vulnerable to disease. We see new diseases coming up all the time."

Are there other solutions? Poppe favours increased capacity on each farm to reduce the density of the stocks, which produces a "fish soup in which it is very easy for disease to spread."

But more drastic are proposals to monitor and regulate the movement of all eggs, smolt and fish. To protect wild salmon streams from genetic and disease threats, large areas of the coast would be declared "security zones" free of farming activity. Finally, Norway would be divided into a number of regions and transfer of live fish from one to the other would be strictly controlled or banned.

It's strong medicine, too strong even for Norway's regulation-minded fish farmers.

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TRONDHEIM

, situated on a fjord just above the western bulge of Norway's coastline, is the business heart of the Norwegian fishing industry. Here, in a few square blocks, are the offices of Norges Fiskarlag, the country's fishermen's organization, the Norwegian Fish Farmers Association (NFFA), the Norwegian Fish Farmers Sales Organization (NFSO) and a host of other sales organizations for other fish products.

A measure of the difference between Canada and Norway is the fact that Norges Fiskarlag and the Fish Farmers Association requested that the Canadians meet them together.

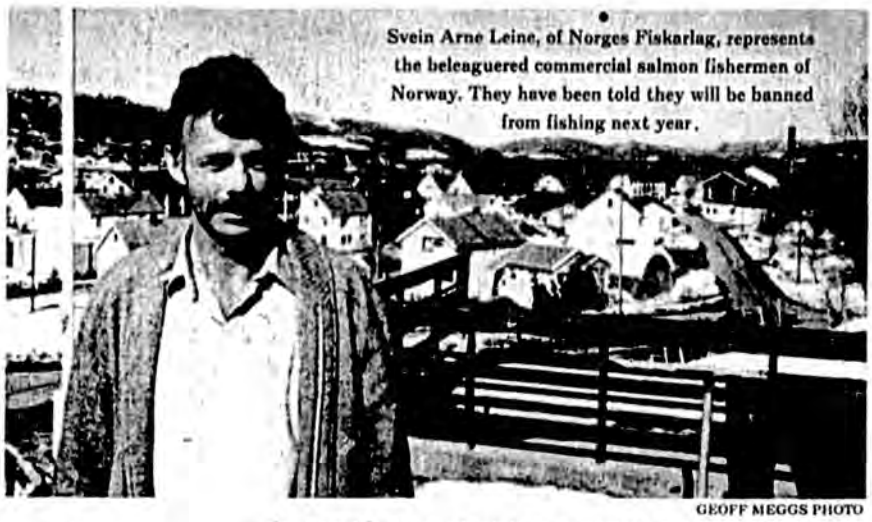
"We consider them like our little brother," says Torleif Paasche, organizational director of Norges Fiskarlag. At his side is Anne Beriby, secretary of the Norwegian Fish Farmers Association. "Because we have had such a controlled development, we have had a positive relationship," he explains.

Not quite a union, but more than an association, Norges Fiskarlag is backed in its work by national legislation. With more than 19,000 members, it acts on behalf of fishermen coastwide in 500 local fishermen's associations. Its elected



GEOFF MEGGS PHOTO





Svein Arne Leine, of Norges Fiskarlag, represents the beleaguered commercial salmon fishermen of Norway. They have been told they will be banned from fishing next year.

GEOFF MEGGS PHOTO

Fish farmers support new policies to avoid local conflicts over water use because 'the world wasn't empty when fish farming came.'

board has the sole right to negotiate on behalf of fishermen on economic issues, including fish prices.

Norwegian fishermen are more concerned with allocation issues, pollution from British nuclear power stations and the strength of stocks than with the impact of salmon farming, Paasche says.

The massive cod fishery, for example, produces almost 25 percent of the country's billion-dollar fish landings annually. "A major problem is the balancing between the capability of the fleet and the resources to keep ahead of natural conditions of the fisheries," Paasche says, "how to mix capacity so you don't overfish."

In the case of the salmon fishery, this balance has been fatally disrupted. Proposals to curb commercial fishing and increase regulation of fish farming to protect the depleted wild stocks have united farmers and fishermen in opposition, as well as their common base in coastal communities. This distribution of farms throughout the coast is the result of government licence controls.

Depletion of the salmon must be traced in part to environmental problems like acid rain, Beriby and Paasche agree, as well as the poor husbandry and hatchery practices of river owners, who control salmon streams in Norway.

"The environment department seems to blame fishermen and fish farmers for the problems," says Beriby, "but so many other things could be responsible. They have no evidence except their environmental arguments. We seem to represent something dirty because we are trying to earn money."

Seine fishermen near Trondheim on the island of Hitra — which later gave its name to a salmon disease — pioneered fish farming, Beriby explained, but did not make great strides until they created a sales organization in 1978 to manage their marketing.

The success of the industry "is based on small-scale farms and people willing to share their experience," Beriby explains. "Farming has meant a lot to the coast — at least 5,000 jobs."

At the same time, Beriby says, Norway's "strong laws have been important to success. There are a lot of things we can do and cannot do."

The Fish Farmers Association is opposed to more licences being issued before an even stronger national infrastructure — vets, roads, higher education, research — have been in place. "If they want more licences, they must put in more resources," Beriby says.

The FFA supports local ownership and new policies to avoid conflict with other industries. "The world wasn't empty when fish farming came. We had conflicts with seine pounds and some local conflicts, but we are ensuring now that every community makes its own coastal plan."

Disease is always a concern, she agrees, "but disease is a problem both for wild stock and farmed fish. Diseases exist in wildlife but you don't see it because the fish simply die. Fish farmers are the first who want to get rid of disease."

For this reason they support the minimum 10-kilometre spacing between farms, the requirement for two locations to allow rotation, the regular inspections and the stringent controls on disposal of dead fish.

Vaccination is helping to curb disease, but the real problem, Beriby says, is "education. We need to get results out to fish farmers." Disease outbreaks like furunculosis, she points out, can be traced to imports done under government permit.

Has the relationship always been so friendly? "The need for access to coastal areas has been the most important area of conflict," Paasche says. Where fishermen pond herring or saithe is often where farmers wish to locate.

"The disease question is more troubling in the long run," he adds, "because we are developing a kind of monoculture of the ocean."

Ultimately "the production of wild salmon is so small that it's not a question of competition between the two," says Paasche. "There will always be some market niches for wild salmon."

Will this attitude change when large-scale production of cod and halibut begins in a few years? It is too early to say.

Beriby has little trouble explaining the merits of salmon farming. She falls silent, however, when it comes to the Norges Fiskarlag demand for a continued gillnet fishery for wild salmon.

This strange friendship between salmon farmers and the commercial fishermen is even more starkly outlined two days later in the tiny coastal community of Kyrksaeterora, where the last of the salmon fishermen live next door to the largest salmon hatchery in the world.

SOUTH OF Trondheim lies the community of Kyrksaeterora, tucked in the valley at the head of a large fjord. At the town's back is a large freshwater lake which feeds the Harga River, a salmon stream whose water helps run the massive hatchery of the Norwegian Fish Farmers Sales Organization before emptying into the sea.

Further to sea and to the south are the remote fishing villages where most of Norway's remaining salmon fishermen make a precarious living on salmon and other species.

The depletion of Norway's rivers is hard to understand when set next to the huge hatchery, capable of producing 5,000 litres of eggs annually, about twenty percent of the nation's requirements.

As hatchery director Knut Gunnes takes the Canadians through his facility, he emphasizes the role the hatchery plays in genetic improvement of farmed stock.

Launched with donated eggs and then developed into the largest plant of its type in the world, the hatchery allows the farmers to centralize breeding and ensure replacement stock in case of disease losses.



Technicians at the Kyrksaeterora hatchery sort trout from salmon. This enormous hatchery produces broodstock eggs for the fish farming industry. It certifies them disease-free and undertakes selective breeding programs for improved market characteristics as well as disease-resistance.

GEOFF MEGGS PHOTO

"Our objectives are better growth, feed utilization, later maturing and good disease resistance," Gunnes says. "Disease resistance is the most important goal we see."

Cleanliness is strictly observed in the hatchery. Before eggs are allowed into production, parent fish are examined for any sign of disease. If any is found, the entire stock is slaughtered.

For competitive reasons, the farmers wish to lead the world in selective breeding, seeking fish with better shape and fat content as well as disease resistance. Owned by a company controlled by the sales organization, the hatchery is financed by money taxed from the sale of farmed fish.

So far, growth rates in the farmed fish have been improved by three percent a year, thanks to genetic selection. In outdoor tanks the parent fish of future generations wait their turn. In a nearby seapen operation, other stocks are being grown to maturity.

Domestication of salmon still is several generations away, Gunnes believes, but the latest product is already very tame. Three generations ago, for example, fish could not stand densities greater than eight kilograms per cubic metre for young fish. Now experimental densities of 200 kilograms have been achieved and 20 kilograms is common.

(Lower densities are being used for adult fish to avert disease problems.)

At Gunnes' side is Odd Ustad, public affairs director for the Fish Farmers Sales Organization. At our request, he has invited the local representative of Norges Fiskarlag, Svein-Arne Leine, to come to lunch to explain his members' fight to save their remaining wild salmon fishery.

And so Leine, a fisherman himself, sits down in a restau-

JOURNEY to the FUTURE



GEOFF MEGGS PHOTO

Salmon fry wriggle in a tank at Kyrksaeterora. Fish from about 60 streams have contributed to the gene pool at this hatchery facility. Duplicate government facilities insure the industry against loss of this broodstock to disease or any other calamity.

rant overlooking the fjord and the farmers' hatchery to tell how 1,600 Norwegian fishermen are fighting to save their way of life and their communities.

Although always a small fishery, the Norwegian industry gained importance in the 1960s with the development of a gillnet harvest between the baseline and the 12-mile limit. Despite competition from the high seas driftnet fishery and the wealthy sport fishermen working the rivers, the fishermen built their industry in the face of strict regulations and licensing requirements.

But a full 10 years ago, Leine explained, the river owners began campaigning for a halt to the ocean fishery. For centuries, farmers and land owners along river banks have leased fishing rights, often to wealthy foreigners.

As pollution, dams and overfishing drove down catches, they engaged in amateur hatchery work and soon became convinced that they owned all the fish produced by the rivers. They found unlikely allies in the national environment ministry, which saw closure of the commercial fishery as the only sure way to assist the declining stocks.

Although most fishermen harvest salmon only part-time, this income is so crucial "that they may have to stop fishing and find other work if the closure is approved," Leine says. Especially hard-hit are the people on a nearby island whose community could be wiped out if many are forced to leave.

"Fishermen say pollution is the reason for the decline of the wild salmon," Leine said, "but we are opposed by 200,000 to 300,000 sport fishermen. We are a little group against the rest."

The sport fishermen, often foreigners, are prepared to pay staggering sums to the river owners. Ustad, himself a sport fisherman, had good catches last year on 200 metres he leased for about 600 dollars. For that amount he was allowed to fish both sides of the river on alternate days for June, July and August.

Because the run was good, this year's fee has risen to almost $18,000. "Common people can't do it," Ustad says. "It's for rich people and people from abroad, who come in by charter planes."

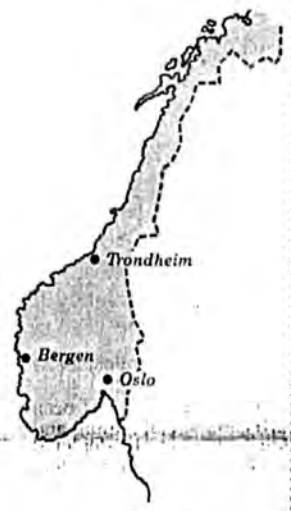
"The closure is simply to provide more fish to rich fishermen on the rivers," says Leine. "Very little is done to stop the driftnet fishery at the Faeroe Islands."

Under the circumstances, Leine has little complaint about salmon farming, although he says his members "are a bit afraid of disease moving from farmed fish to wild fish." Some have lost fishing grounds to farm leases.

"If we manage the pollution and parasite problems properly there is a very positive future for the wild salmon in Norway," Leine says. "But a stop to the commercial fishery now means a stop forever."

The government may offer a compromise, he believes: a freeze on licences and a 10-year phase out of the fishery coupled with complete closures immediately in some areas.

Who are these bureaucrats who have driven farmers and fishermen into a united front? The ministry is called the Directorate for Nature Management, Norway's national agency charged with the protection of wild salmon.



Norway's long coast, warmed by the Gulf stream, make for ideal farming conditions. Government regulations have forced even distribution of farms around the coast. New regulations will close many inside waters to salmon farms to safeguard wild stocks.

BY CANADIAN standards, the 130-member directorate, with an annual budget of only $40 million, is a small institution to handle and entire coastline's environmental problems. Only a fraction of the directorate's research staff handles the management and conservation of wild salmon, which Norway treats almost as an endangered species.

Yet it is this small agency which leads the world in researching the impact of salmon farming on natural stocks. Their findings make grim reading.

Svein Aage Mehli, the youthful head of division for salmon, stands guard over about 400 streams, the largest of which produces only about 100 tonnes of salmon a year in the river itself. In many streams the catch is measured in kilograms.

"The catch and spawning population of wild salmon has been relatively stable," Mehli says, "but overall there is a decline in wild stocks."

Part of the reason for the apparent stability is the growing number of farmed fish escaping to nearby streams, which may contribute up to 10 percent of the catch. Undermining the totals is a harvest of up to 600 tonnes annually off the Faeroe Islands, where Denmark operates a drift gillnet fishery that takes between 30 and 40 percent of the total catch of Norwegian stocks.

Mehli's first target in his battle for the salmon is the commercial fishery, which he firmly states will end in 1988. The offshore driftnet fishery, which takes up to 90 percent of some runs, is beyond reach. Sport fishermen will see curbs to the use of gillnets in their sport fishery for mackerel, but otherwise will be left to enjoy themselves.

Also out of reach for the time being is the threat of acid rain. Concentrated in the spring freshet, the acid waters of Norway's mountains "kill very efficiently," Mehli says, when they strike overwintering eggs. Despite a costly program of liming certain rivers, losses of 100 to 200 tonnes annually are blamed on acid rain.

But the greatest threat of all, according to Mehli and his colleagues, is the threat of genetic extermination due to the mixing of stray farmed fish with wild stocks. Genetic straying and farm-borne parasites are ravaging wild salmon streams.

Per Ivar Bergan, executive officer in the directorate, lists four main environmental conflicts between fish farms and wild stocks:

- farms compete for stream water to run their smolt production facilities, reducing areas for spawning in the river, drawing down reservoirs and preventing the migration of anadromous fish;
- diseases and parasites, a big problem for the farmers, can be carried on escaped fish and "spread the diseases to the wild stocks;"
- fish farmers, fearing their stocks will contract diseases from wild fish "have tried to get rid of the wild fish" migrating into their water supply; and
- a lot of fish escape.

"We are very concerned about the genetic effects on the wild stocks of Atlantic salmon and the risk for spreading of new species," Bergan concludes.

Is there evidence of escaped fish actually spawning? "We have no direct evidence production is going down in these streams (due to mixing of farmed and wild fish)," Bergan



GEOFF MEGGS PHOTO

Svein Aage Mehli, head of Norway's Directorate for Nature Management, is responsible for protection of wild salmon stocks from farm-borne parasites and genetic threats. His department is urging the creation of "farm-free" zones and stringent controls on the movement of salmon eggs and smolt.



Norway has undertaken the task of 'saving' salmon rivers from farm-borne parasites by stripping them of fish life with pesticide and then restocking with hatchery fish



Gyrodactylus salaris is the scientific name for this one-millimetre long parasite. Only one is required to reproduce and these parasites breed by the thousands, attack juvenile salmon, and kill them. Introduced by river stocking from an infected fish farm, the parasites can only be removed by poisoning the host stock with rotenone.

replies. "But we have no time to wait for evidence. Then it will be too late."

From the viewpoint of the directorate, there is an undeclared war between farmers and the wild stocks. "The farmers are very afraid of wild fish in their intake," Bergan continues. "Some have tried to use so much water that the natural fish can't come up. Some others have used rotenone to get rid of wild fish.

"Some even oppose restocking programs for fear of disease on the wild fish."

Rotenone has been a weapon on the side of the environment department as well. Mehli has undertaken the demoralizing task of "saving" salmon rivers from farm-borne parasites by stripping them of fish life with the pesticide rotenone and then re-introducing hatchery stock.

Less than a millimetre long and common in some Swedish rivers, the parasite *Gyrodactylus salaris* is believed to have entered Norway in a truck carrying salmon smolts. Once established in a Norwegian hatchery, they were distributed throughout the country, in many cases for stocking of rivers.

A recent scientific review of the *Gyrodactylus* story concluded that the most likely explanation for the parasite infestation is that it is "a new parasite to our fauna, which has been introduced through stocking with salmon parr from infected hatcheries/fish farms."

"Evil tongues have said if you are going to design a strategy for spreading disease in Norway, the current system is very effective," Mehli says drily. "If a disease is introduced, we see a rapid spread over the country."

This parasite is particularly mobile. Researchers believe hatchery stocking and movement of escaped farmed fish may be the most likely cause of dispersal, but it could be transported on wet sport fishing equipment or even by birds.

Gyrodactylus was discovered in Norway in 1975, when researchers noticed a sharp decline in the number of smolts in the Lakselva River. A 10-year program of research confirmed the correlation between the presence of the parasite and a single infected hatchery.

"I don't say the parasite causes the infection, but it is reasonable to see a connection," Mehli concludes.

Capable of producing several generations from a single individual, the parasite pierces the skin of the smolt and sucks its blood. Thousands may attack a single fish, killing by infection or dehydration if not from loss of blood. From its first location, the parasite has spread to 30 rivers.

In a single cycle, salmon production may drop from more than 100 tonnes annually to almost nothing. The parasite is blamed for a 300-tonne per year drop in Norway's salmon catches.

Because *Gyrodactylus* survives only on salmon in fresh water, the counterattack must focus on the river. Rotenone has now been used on three of the streams.

"It's a tough treatment," Mehli says, "but this is the only method we have to use to get rid of the parasite." Would it be effective in a river like the Fraser or the Skeena? Mehli shakes his head. "If such a parasite comes to such a river and behaves in the same way, I really can't see any solution for that."



Genetic improvements have allowed greatly increased densities of fish in Norwegian farms, but new regulations will allow larger farms in the hope of encouraging lower densities and fewer outbreaks of disease.

So far the battle against the parasite is budgeted to cost $2.5 million a year. Pamphlets have been distributed nationally to enlist fishermen's aid in the fight to save the wild stocks. Fish ladders have been closed in an effort to remove the parasite from some streams.

Mehli has developed a 10-year program to control the parasite, but concedes that some streams are too big or too fast to treat with rotenone or any other technique. In these cases, he says, "it's a real tragedy for the wild stocks."

Combatting disease on fish farms has been a full-time occupation for regional veterinary officer Arne Kyrkjebo, who is based on Trondheim and works closely with Mehli's team.

It was Kyrkjebo who headed up the two-year struggle against furunculosis on a score of farms in the Trondheim region, using the strong powers of the veterinary laws to force the destruction of entire farm stocks on the suspicion of infection.

The source of the infections was a lag in the production of smolts, Kyrkjebo believes, which produced pressure on the government to allow importation of foreign eggs and smolts. His pointer jumping from one point on the map to another, he rhymes off the diseases present in his region: bacterial kidney disease, furunculosis, whirling disease and more.

Desperate to curb the spread of diseases, the veterinarians are proposing that Norway be divided into zones and movement between these zones banned except under special permit.

Kyrkjebo is particularly concerned "about the sale of fry from hatchery to hatchery. It should be forbidden.

"I am afraid for the wild fish stocks. It is very hard to detect disease in fry and problems are most likely to develop in the smolt."

For Mehli, Kyrkjebo and Bergan, Dagfinn Gausen is developing an insurance policy. A burly biologist, he believes the wild salmon may be destroyed not by disease but by their submersion in a sea of escaped farmed fish. He has undertaken a national salmon sperm bank program to save the wild salmon.

Escaped farmed fish, released by animals, storms or negligence, are spreading throughout Norway's coast. Gausen says flatly that "escapes by salmon from fish farming pens in the seas represent a new and potentially greater threat to natural genetic resources" than *Gyrodactylus* or acid rain.

"The loss of locally-adapted traits or characteristics can eventually exterminate the wild salmon as we know it today."

Although 25 of Norway's stocks already are extinct and 15 are very weak, there remain about 400 distinct races of Norwegian Atlantic salmon.

False reports

A 1987 B.C. Government brochure on salmon farming made three key statements about salmon farming which the Suzuki Foundation tour proved to be false.

The B.C. government brochure states that "recent studies . . . showed environmental damage from fish farms was not a concern." In fact, Norwegian experience indicates that feces and other debris from farms completely destroy seabed life directly under pens. This impact may be localized, but can spread under certain conditions. Major research now is beginning in Norway to determine whether the bacteria in these deposits is developing resistance to antibiotics.

The B.C. government brochure states "there is no evidence to indicate that disease is ever transferred from farmed fish to wild stock." This is simply a lie. Since the 1960s, Norwegian scientists have been combatting an outbreak of furunculosis in wild salmon which was introduced to the system from hatchery trout. Infected smolts imported to Norwegian farms near Bergen in 1985 caused a major disease outbreak which was controlled only after the destruction of thousands of tonnes of farmed salmon. Veterinarians fear the disease may spread in the wild, although there is no evidence of losses as yet. Most seriously, the parasite *Gyrodactylus salaris*, introduced to Norwegian rivers through the stocking of hatcheries and farms, is wiping out wild stocks in a dozen streams.


FISH FARMING
B.C.'s New Venture on the Coast

The B.C. government stated that "escaped farm salmon would rarely interbreed with wild stock, if at all." In fact, escaped farmed fish have been identified in the spawning populations of 28 Norwegian rivers. Spawned out farm fish have been observed. Up to 40 percent of the fish in some rivers is of farm origin. A national salmon sperm bank program has been established to protect remaining wild stocks.

JOURNEY to the FUTURE



GEOFF MEGGS PHOTO

Karin Pittman, a Canadian-born scientist at Austevoll, helped in the breakthrough that saw halibut successfully raised from egg to fish for the first time. The slide records a critical moment: proof that the juvenile halibut has eaten food in its farm environment.

They are under siege. A survey of 54-salmon rivers found farmed salmon in 23 of them, or about 40 percent. The percentage of farmed fish ranged from a low of five percent to a high of 50 percent and averaged 13 percent.

"Nearly every farmed salmon we have encountered is sexually mature," Gausen says. "I believe a great proportion of these salmon are capable of spawning."

Identification of the farmed fish is fairly simple. After a few years in the pens, their dorsal fins and tails are deformed and worn down. By checking the location of fish farms in the regions around the affected rivers, Gausen has concluded the salmon can stray at least 20 kilometres.

Convinced that the survival of the wild salmon is at stake, the directorate has undertaken a third 10-year program, this time to develop a salmon sperm bank.

Failure to act, says Gausen, would mean "destruction of the natural genetic resources which have the greatest value, even for the fish farmers themselves.

"If you destroy that original resource, what can you do if you have problems with the strains you are working with? You can't back up."

In 1986, Gausen began collecting the sperm of endangered salmon runs, freezing it in liquid nitrogen and storing it near Trondheim. Each sample costs about 800 krone, or almost $150, "but it's worth it," he says, "because these resources can't be measured in money."

Working from a small truck and changing overalls at every location to avoid spreading disease, he has acquired genetic material from 857 fish representing 69 stocks. Fish farmers hoping for help from Gausen will be disappointed. "This sperm will only be used in saving stocks from extinction," he declares.

This is one side of Norway's multi-million dollar commitment to the wild salmon. The other is the Lenka program, a coastal zone management system now under development which seeks to bring peace to the war over salmon by making protection of wild stocks the cornerstone of fish farm regulation.



BRITISH HIGH COMMISSION PHOTO

Frozen salmon sperm collected by the British farming industry is for sale worldwide. Similar technology is used by the Norwegians to save wild salmon sperm as insurance against genetic pollution.

LENKA IS the Norwegian abbreviation for Nation-wide Analysis of the Suitability of the Norwegian Coast for Aquaculture.

Essentially a $6.5 million coastal zone management program, it unites the ministries of fisheries, labour and environment in a comprehensive planning effort which will give local authorities the power to determine where aquaculture may be located.

The entire coast is being classified according to its suitability for aquaculture. Where shallow water or poor currents could produce pollution problems, farms will be banned.

More important, however, is agreement that fish farms will not be placed into or close to salmon rivers of great value.

To Bergan and his colleagues at the directorate, that means rivers "which give an annual catch of more than 500 kilograms of anadromous salmonids" or any watercourses with "genetically valuable stocks of salmonids."

The result of this decision is the creation of hundreds of "security zones" designed to eliminate farms from inside waters adjacent to salmon streams. Existing farms would be allowed to remain for the time being.

More controversial, but under serious consideration, are proposals to curtail drastically the movement of salmon eggs, smolt or adults from one area to another.

Everyone involved in the Lenka program, including the farmers themselves, have welcomed this new procedure, which will provide even more security for coastal communities and, equally important, the wild salmon.

Along with Lenka, the government is undertaking other initiatives. Research is being stepped up into fish health, particularly "diseases (which) are spread from facility to facility and to wild fish."

"Medicines and chemicals are spread in the environment and may have long-term effects about which we, as yet, know too little," warns the fisheries ministry report to the Storting. "It is therefore very important that research is used to develop new knowledge about what causes diseases and how these can be treated and prevented."

The ministry is proposing an overall plan for development of an even more elaborate infrastructure to "focus especially on strengthening the public administration and improving health and environmental conditions at the facilities."

In short, Norway has made a commitment to a national effort to develop aquaculture in a planned manner, with minimum negative effects on the environment or wild fish. One result of that commitment is the Institute of Marine Research of the Department of Aquaculture located at Austevoll south of Bergen.

AUSTEVOLL, with its brand new labs located on a beautiful fjord south of Bergen, was the last stop on the Suzuki tour, a glimpse of a research facility where Norway hopes to smash the technological barriers to intensive production of all valuable marine fish.

We were guided through the research station by Karin Pittman, a Canadian who looked around the world to see where she could work on the most advanced aquaculture research possible. She decided that Austevoll, where researchers averaging 30 years of age are domesticating salmon, halibut, turbot and cod, was the place.

As a result, she was a member of the team which succeeded in 1986 in raising halibut from egg to adult for the first time.

Last month, she turned on a VCR in her office to show the Suzuki delegation just how far this new technology may go. We watched in silence as the tape showed a Norwegian scientist adjusting the computer which operates the cod-rearing facility at Austevoll.

As the soundtrack played the theme from 2001: A Space Odyssey, the farmed cod raised in a nearby netpen answered a hooter hung from their automated feeder and rushed over for a meal. A trap around the feeder snapped shut and pumped the fish into the lab for vaccination and then back into the pond.

With genetic tagging, the fish could even be released back to the wild, Pittman explained. "This opens the possibility of sea-ranching of cod." With cod trained to answer a dinner bell as faithfully as the family dog, the cod fishery of tomorrow may see computer-fed stocks reporting to the processor's pump when ready for harvest.

Pender Harbour gillnetter Jim Cameron finally broke the silence as Pittman rewound the tape: "Maybe I'll start banging my head on the side of the boat to attract fish."

Although cod have already gone into limited commercial production, the price remains too low to warrant major expansion in competition with the wild stock fishery.

Wary of competition in salmon markets and anxious to diversify, the Norwegians are moving into other species, Pittman explains. "It's a national effort and we're hoping for a breakthrough here."

Although halibut eggs have been hatched in the lab for decades, no one had succeed in raising them to adults until 1986. Even then, Pittman says, it took hundreds of thousands of eggs to produce a broodstock that remains under 100 individuals.

The first year only a handful of fish survived. The 1987 crop produced more than 200 adults, but almost more than half fell to an outbreak of vibriosis. This year, however, with on-land facilities and ample egg supply, Pittman hopes to raise 1,000 adults. By 1995, says the ministry of fisheries, production could hit 5,000 tonnes annually.



Setbacks will not be allowed to slow the breakneck pace of commercial production. Cod ranching is on the horizon and, if the legal rights of river owners could be resolved, ocean ranching of salmon would be undertaken tomorrow.

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Additional copies of this supplement may be ordered from the T. Buck Suzuki Foundation, 160-111 Victoria Drive, Vancouver
Price $1

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Graphic design by Kris Klassen

Slides taken through a microscope trace the life cycle of these first farmed halibut, hatched from wild fish recovered from trawlers' nets.

From tiny, transparent eggs the halibut larvae emerge with huge yolk sacs which sustain them until their first meal of microscopic sea life. By keeping the larvae in a darkened silo of sea water which imitates their natural deepsea environment, the scientists were able to coax the fish to take their first meal.

From there the immature halibut, already exhibiting the basic features of an adult but still completely transparent, quickly develop their distinctive size and color. About four months after hatching, they are two inches long.

Four major Norwegian aquaculture firms, including two with investments in Canada, have already begun commercial attempts to raise cod and halibut. In a new building at Austevoll, Pittman and her colleagues have scaled up the original pilot project into a full-size production facility.

The land-based silos loom 20 feet high in the darkness of the barn. Through small portholes, the tiny larvae can be seen floating like dust in the light of a single dim bulb, waiting for food to come their way.

These larvae are the offspring of wild halibut kept in land-based tanks no larger than a backyard swimming pool. Docile as pet sheep, they readily give eggs as required and rush to the edge to beg for food with gaping mouths when anyone happens by. Will farming them be as simple as it seems?

"This might be the breakthrough year or we might be scratching our heads," Pittman says, "wondering what we did wrong this time."

But if salmon farming is any guide, these setbacks will not be allowed to slow the breakneck pace of commercial production. Cod ranching is on the horizon and, if the legal rights of the river owners could be resolved, ocean ranching of salmon would be undertaken in Norway tomorrow.

In the brave new world of high technology intensive fish production there are no insoluble problems, no absolute technological barriers. There may be no fishermen in this new world and no wild salmon. The choice is ours. •

Sounding a warning

WE GOT a very good insight into fish farming and the dangers to our stock in terms of diseases — damage to the environment, the ocean floor, flora and fauna.

The first priority must be to get to the different agencies in B.C. and attempt to convince them that there is a desperate need for an infrastructure which would possibly provide some protection, if they would listen to the experience in Norway.

Another area that's a priority is to get what we have experienced across to the public as much as we can. If we can be successful at that, we may be able to turn this around.

The real top priority is the safety of our wild stocks. That has to be Number One.

Wayne Patterson,
Halibut fisherman and seiner,
VANCOUVER

IF our wild salmon and our way of life is to continue we must pressure the provincial and federal governments into placing strict regulations on the aquaculture industry. With the disease and parasite problems we witnessed in Norway, it would be suicide to allow an unregulated industry such as this to operate in B.C. waters.

In order to stop this stupidity I fell that we must launch a massive campaign and let the people of B.C. know that once again the Socreds and the Tories have deceived us and are willing to sacrifice our industry.

In this effort we must call upon the sport fishermen, city councils, MPs, MLAs and most of all, I feel, the native community must be brought on board. If a parasite such as *Ggyrodactylus salaris* were to invade a watershed, it would do serious damage to the stock, if not wipe it out altogether.

Arnold Nagy,
Shoreworker,
PRINCE RUPERT

DRAWING from my experience on the Norwegian tour, I believe that the people of B.C. must be made aware that our wild salmon are endangered to the point of possible extinction.

Unless strict regulations for salmon farming are put in place immediately, disease, parasites and genetic pollution could weaken our wild stocks and ultimately destroy them entirely.

This may sound extreme, but in Norway wild salmon in many rivers have been wiped out completely.

If such a diaster were to occur on the Skeena or Fraser systems, the results would be devastating environmentally, commercially, recreationally and culturally for the people of B.C.

Dan Clark,
Troller,
NANAIMO



Fish farm technician adjusts the nets at a broodstock holding farm near Kyrkseterora

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Fish farm workers slaughter farmed salmon caught in an algae bloom on the Sunshine Coast in 1986. Despite studies indicating many Sunshine Coast farms are located in areas poor for aquaculture, the farms remain.



The UFAWU program

FOLLOWING are the fish farming policy recommendations of the union members on the Suzuki tour as adopted by the General Executive Board in its meeting May 5, 1988:

"The basic principle of fisheries development on our coast must be the conservation, enhancement and rehabilitation of wild salmon stocks. Where farms are permitted, they must be strictly regulated. This regulation must be carried out by public agencies with the legislative power and infrastructure to enforce stringent controls for the protection of wild stocks, the environment and the public interest in general.

To this end, we recommend that the union restate its demand for a complete moratorium on the issuance of fish farm licences pending the development of a proper regulatory regime. Licences or permits issued at this time but not used should be withdrawm.

The moratorium must remain in place until:

1) both levels of government have completed comprehensive environmental baseline studies coastwide to identify sensitive areas and areas which may be suitable for aquaculture.

2) government regulations and infrastructure are in place to protect wild stocks and to regulate aquaculture to at least the Norwegian level.

3) completion of a coastal zone management plan to ensure local community involvement in integrated resource management of forest and fishery resources.

The coastal zone management plan will ensure that aquaculture does not proceed unless there is broad public support and areas identified where it could develop with minimum impact on wild stocks and the environment. Such areas would have minimal wild stocks or wild stock potential. Farm broodstock would have to be drawn from local runs to avoid genetic pollution.

These coastal plans would permit locally-based economic development based on improvement of wild stocks or other environmentally-sound initiatives. Where farms are already located in areas where aquaculture should not be permitted, they would be phased out and required to move to aquaculture zones. At the same time, the two levels of government would have to develop an extensive infrastructure of veterinary and inspection services to enforce its regulations. As one delegate said, "the bottom line is the protection of wild stock in its full genetic diversity."

Anchorage Times – Feb 7

Let's move on mariculture

HATS OFF to the Sealaska Corp., which has now put its substantial weight behind the move to authorize commercial mariculture operations in the 49th State.

The endorsement by the Juneau-based native corporation is particularly significant because many of its members already are commercial fishermen in Southeastern Alaska. And it is among some segments of the commercial fishing industry in the Panhandle that the opposition to the pen-rearing of salmon has been the most vociferous.

But to Sealaska, the handwriting is on the wall — as it is to many Alaskans everywhere.

Robert Loescher, senior vice president of natural resources for the native corporation, says the explosive growth of mariculture around the world simply cannot be ignored. Clearly Alaska will be shut out of world markets unless it hurries to catch up with developments going on elsewhere.

Sealaska is interested because of the obvious. Said Mr. Loescher: "Southeast Alaska has one of the world's best environments for salmon farming and would be the production center for Alaska industry."

But not unless the legislature quits fiddling around and quickly enacts the legislation necessary to make possible private commercial operations.

THE LAWMAKERS need to listen to Mr. Loescher when he says: "With proper safeguards for wild stocks and environment, a finfish industry in Southeast will not threaten or diminish our fishing industry."

That's the same message being delivered over and over again by experts throughout the fishing regions of the state.

Now is the time for the legislature to act.

And fast.

Business

People B5
Calendar B6
Key rates B6

Set long-term goal for improvement and stay on path



Carol Smith Monkman

Perhaps more than any other, the decade of the 1980s has been the decade of management by slogans. It's also been the decade of the E-word in business — excellence, empowerment, entrepreneurship, ethics. Come up with a slogan with an E-word in it, and — PRESTO — you're an instant management guru. But with so many people pumping out "excellent" advice, why are we not a nation of "excellent" companies? Businesses are gobbling up consulting advice in the form of books, videotapes, seminars at ever increasing rates, yet very little of it seems to be sticking. People bandy around the buzzwords, but ask any employee how "excellent" he or she feels these days, and you're likely to get a laugh.

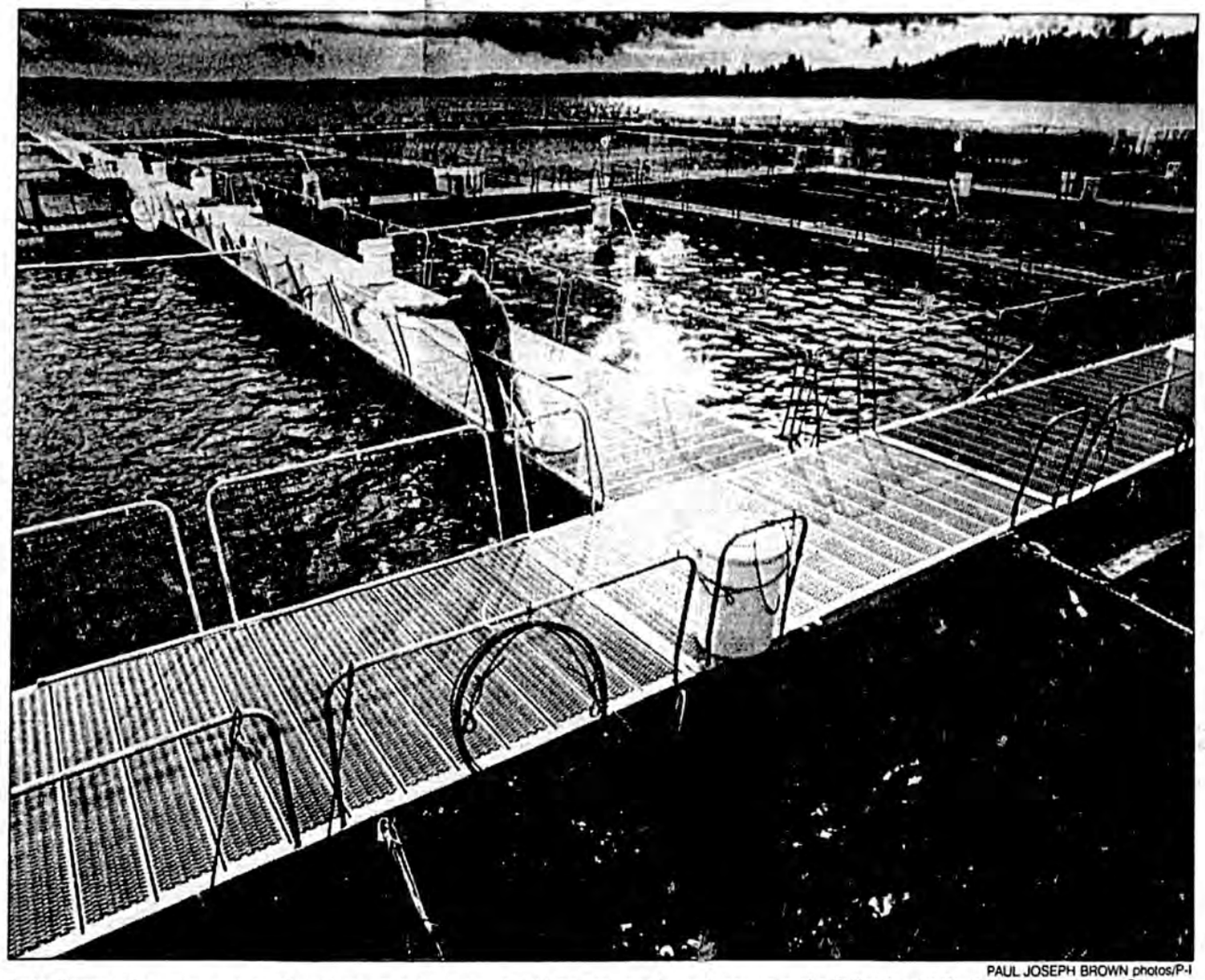
Despite a real desire to change and despite the avalanche of advice available, most companies still have no idea of how to go about making themselves into "peak performers."

So what's wrong? It's not the messages. The messages, in fact, are good, if not necessarily original. The problem lies in how companies use the messages.

"It seems to me that the people who run companies want quick and easy answers," says Susan Webb, president of Pacific Resource Development Group, a Seattle-based management consulting firm whose specialty is leadership development. And that's just what many of the books and seminars are selling.

WEBB RECALLS TELLING a client that the pill that would fix everything in a company does not exist. Two months later, the "pill" appeared in the form of "The One-Minute Manager."

One person comes out with something called "Management by Objective," and people get excited about it for a little while, she says. They may try it, but when the crunch of getting the next order out the door gets too great, they drop it. Then along comes someone who says, "Voila — Quality Circles." Management gets excited again and the cycle continues. The irony of it is that



PAUL JOSEPH BROWN photos/P-I

Under heavy skies, plant manager Gary Marquartt throws a handful of feed into one of the salmon pens of a Global Aqua A/S salmon farm in Kitsap County.

Keeping the old farm afloat

Putting food on the table means salmon in B.C.

By Bruce Ramsey
P-I Reporter

SOOKE, B.C. — On an inlet of the Strait of Juan de Fuca, immigrant farmer Harry Hammer lives on a wooded slope overlooking his farm: rectangular steel net pens of salmon, floating in the cold sea.

In the distance, one of Hammer's eight employees is scooping pellets of commercial fish feed into the pens. Below the surface flash the silvery bodies of chinook salmon, fattened on herring meal.

Some of the big companies in British Columbia's new fish farming industry use computer-controlled feeders, but Hammer doesn't believe in that. Sometimes the fish are in a mood to feed and sometimes not, he says, and a machine doesn't know.

"If you're going to succeed in fish farming, you need to give it personal attention," he says.

Hammer's company, Seafarms Northwest Ltd., is one of the small private companies in a growing B.C. salmon farming industry that now includes six companies with stock on the Vancouver or Toronto exchanges: Aquarius Seafarms Ltd., Royal Pacific Sea Farms Ltd., Hagensborg Resources Ltd., General Sea Harvest Corp., Western Harvest Seafarms Ltd. and Pacific Aqua Foods Ltd.

Seventy percent of the B.C. industry's sales are to customers in the United States, virtually all of it fresh fish sold to the restaurant trade at premium prices.

Hammer's farm is one of 135 saltwater salmon farms in British Columbia, compared with only eight in Washington.

Fish farmers have faced obstacles in both places: biological, financial and political. In British Columbia, fewer of those obstacles have been political.

B.C. regulations keep the net pens away from wild salmon spawning streams and other sensitive areas, but have allowed the industry plenty of room to expand along British Columbia's long, rugged coast. Washington's protected waters are smaller and more developed. Its regulatory system has allowed opponents to block the issuance of most new permits.

Opponents have raised environmental issues about the net pens — such as the fish feces and uneaten feed that cover clam beds under the pens and fish diseases that could spread to wild fish. Industry people say that in the Pacific Northwest, these have not been intractable problems, and that the complaints have little to do with marine ecology.

"The basic issue is esthetics," says aquaculture consultant Jon Lindbergh, who founded Washington's first and largest salmon farm, Domsea Farms at Manchester, Kitsap County. "Shoreline landowners don't like to look at commercial activity in front of their homes."

The political process reflects that, particularly in Washington. "It costs $100,000 to $150,000 to do the work to get a shorelines permit," says Eric Hurlburt, aquaculture coordinator for the Washington Department of Fisheries. "The only people who can afford to go through all the hoops are people who can find corporate backing."

Even corporations find it not worth their while. "The only way to get started here has been to purchase ongoing farms," says Haavard Rabben, general manager in Kitsap County for Norwegian-owned Global Aqua A/S, which bought the assets of Domsea Farms last year.

Bud Kirchner, president and chief executive of Pacific Aqua Foods, Vancouver, B.C., says, "We sold our interests in Washington because of all the roadblocks. We went through all the hearings and permits, and continued to be hassled by the system. We spent easily 10 times as much on any given process of leasing or establishing a farm there as we would here."

> **"Biologically, we have incredible potential.**
> — John Pitts, aquaculture expert

The buyer, Scan Am Fish Farms of Anacortes, takes a different view. "We do have a lot of hoops to jump through, but it's not impossible," says co-owner Amanda Linderoth. The acquisition of Pacific Aqua's site at Skagit Bay has made Scan Am one of the largest salmon farms in Washington.

Industry people say Washington could make a much bigger splash in salmon farming. It would take only 80 acres of pens in Puget Sound, Lindbergh says, to offset the entire imports of farmed salmon from Norway, Chile and Canada.

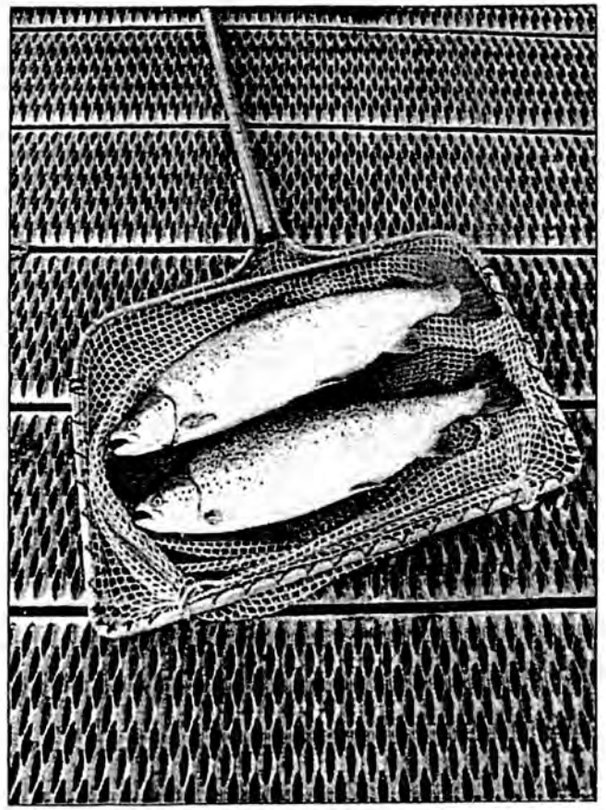
"Biologically we have incredible potential," says John Pitts, who is in charge of aquaculture promotion and market development for the Washington Department of Agriculture. "But the demographic and social structure is not going to lend itself to an industry anywhere near the size of British Columbia's."

British Columbia's salmon farming industry was mostly started by foreigners.

One man often cited as the father of the industry there, Tom May, came from Seattle. In 1979, he sold his boat yard in Seattle and moved with his wife, Linda, to Nelson Island, B.C., and started raising salmon.

"It was the only occupation that we could see that would earn us more than wages," he says. With an investment from Sergio Kumar, an Italian executive with the German aspirin company Bayer AG, the two men created Royal Pacific Sea Farms Ltd., which went public two years ago. May is president; Kumar is chairman. The

See **SALMON**, Page B4



The focus of all the ruckus? These silvery 12 to 15-pound Atlantic salmon.

Salmon: B.C. rules 'surprisingly easy' for fish farmer

From Page B3

industry has relied heavily on foreign financing, particularly from Norway, home of the largest salmon farming industry.

Harry Hammer came to Canada from Norway in 1986, he says, because Norway had 2,500 applications for fish farms and was granting only 150 a year.

"It was hard to get on in Norway," he says. "In B.C., it was surprisingly easy."

Hammer is one of many Norwegians farming fish in British Columbia. "There is no way there would be a fish farming industry today without the Norwegians," he says. That especially includes the Norwegian banks.

Canadian and U.S. banks haven't wanted to finance fish farming, industry people say.

"No Canadian banks . . . are providing loans to the industry unless they are fully guaranteed by other than inventory or accounts receivable," said a report last year by The DPA Group Ltd., Vancouver consultants.

"There is no way there would be a fish farming industry today without the Norwegians."
— Harry Hammer, salmon farmer

"They won't take the fish as collateral," says Valerie Brooks of the B.C. Salmon Farmers Association. Bankers remember well the scandal in 1987 when an audit of Pacific Aqua Foods, the first B.C. salmon farming company to go public, revealed that 90 percent of the fish on the books didn't exist.

Starting and running a salmon farm for the first three years, until the first harvest is in, takes about $2 million, Hammer estimates. He says he raised his grubstake from private sources in Norway and from a Norwegian bank, the Christiania Bank.

The reliance on foreign money is not much different in Washington. "Most of the farms in Washington are using foreign banks," says Rabben of Global Aqua.

The Norwegian banks have 10 years' experience with fish farming, and can sometimes get loans guaranteed by the Norwegian government.

Scan Am Fish Farms at Anacortes also uses a Norwegian bank, says Linderoth, because Washington banks weren't willing to lend. "Now they're getting close to being willing," she says. "In fact, we've been approached."

In British Columbia, the larger companies have raised money on the Vancouver Stock Exchange and in private placements, both largely from foreigners. Of $340 million invested in the industry, most has come from Europe, says consultant David Egan of DPA Group. Japanese investors have been conspicuously absent.

The fish farming shares are speculative "penny" stocks, and were hit hard in the crash of Oct. 19, 1987. The flow of new capital into the industry slowed in 1988. Some companies received infusions from Canada's big fish packers, most of whom have now made investments in salmon farming. National Sea Products Ltd. of Halifax, for example, bought a controlling interest in Pacific Aqua Foods.

New money is short. Kirchner of Pacific Aqua Foods says the average private company is highly leveraged, with $10 of debt for every dollar of equity, while the average public company has about 50 cents of debt for every dollar of equity. Already, some small fish farmers have been forced to sell.

"Financing has been the trouble of the industry from the start," Kirchner says. "Early in the industry, it was too easy to obtain financing, including in the stock market. Subsequently it's been too difficult."

As farmers, the pioneers of salmon aquaculture have made considerable progress. They have learned to deal with hungry birds, poisonous plankton and bacterial kidney disease. They have identified "phyloplankton belts" where it's best not to have a farm, and have learned to fight disease with medicated fish feed.

Two years ago, less than half their fish survived; now more than 70 percent do, says Bob Nelles, executive director of the B.C. Salmon Farmers Association.

Most of the B.C. pioneers did not raise Atlantic salmon, the fish farmed in Norway. The B.C. industry has been built on Pacific salmon: chinook and coho. The B.C. government has allowed only three companies to import salmon eggs into the province, so that for most farmers, Pacifics were the only eggs available.

Chinook and coho are harder to raise than Atlantic salmon. The fish are not used to being raised in pens, and unless given more room, they will get sick.

Coho have been a particular problem. They won't grow as big as the others. Unless neutered, coho males become sexually mature, which makes them worthless.

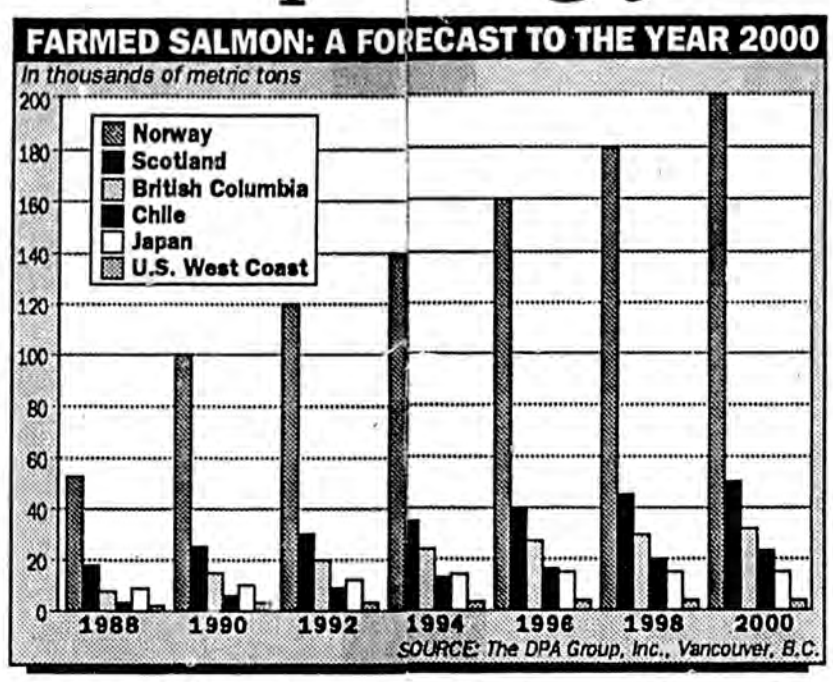
The industry on both sides of the border is moving away from coho. This year, 75 percent of British Columbia's farmed-salmon production will be chinook. In Washington, farms are turning toward fast-growing Atlantic salmon.

Pacific Aqua Foods raises chinook and Atlantic salmon in its B.C. pens. Kirchner, the company's president, says Atlantics generally do better.

"The Atlantic salmon has been domesticated for many generations," he says. "The Pacific salmon is one, maybe two generations out of the wild."

Consultant Lindbergh, based in North Bend, says: "Atlantics will dominate here, and eventually in British Columbia. It's a good farming fish. Chinook brings an equally good price, but it's a more difficult fish to raise."

Kirchner says he is not giving up on chinook. "The secret of the broiler industry was the development of a broiler chicken that could go to market in 12 weeks," he says. It could happen with the chinook, too.



By the year 2000, says DPA Group, 31 percent of the world's salmon production will be farmed, including 2 percent of the U.S. consumption, 6 percent of Japan's, 30 percent of Canada's, and 100 percent of Norway's.

British Columbia will be the world's No. 3 producer of farmed salmon, with more than eight times the production of the U.S. West Coast.

As fish farming expands, it is bound to compete directly with fishermen. Spokesmen for the fish-farming industry argue that they don't compete directly now, because farmed fish are sold when wild fish aren't available fresh. But they do compete; fresh farmed fish, say seafood brokers, already has replaced frozen wild fish in the premium markets on the West Coast.

"Financing has been the trouble of the industry from the start. . . ."
— Bud Kirchner, Pacific Aqua Foods

"Why buy frozen salmon when you can get year-round fresh?" the broker says.

Many in the industry say salmon prices have not been affected by the new supply. At least, they have not *obviously* been affected. During most of the period of fast growth for salmon farming, the price of salmon has gone up.

As supply has increased, so has demand. North Americans are eating more fish.

In the long run, the increased supply of farmed salmon will tend to stabilize the price, promoters say. It may not shrink it drastically, even if the fish farmers develop their docile chinook "broiler": salmon feed costs three times as much as chicken feed.

But in the long run, the industry's promoters say, fish farming will keep salmon on many more tables than otherwise.

"Sooner or later, the production is going to equal the demand. The price is going to go down, and consumption is going to go up," Lindbergh says. "The more efficient farms will do OK."

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ATTENTION HOMEBUYERS
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February 6, 1989

Mr. Brooks Dareff
Editor
Ketchikan Daily News
P.O. Box 7900
Ketchikan, AK 99901

Dear Mr. Dareff:

On January 28, a Sealaska spokesman, at a Ketchikan symposium on regional economic needs, suggested that one of the most attractive new economic diversification opportunities for Southeast is mariculture and discussed finfish mariculture in particular.

The statement was not meant as an endorsement of immediate or even ultimate public policy authorization of finfish mariculture. Sealaska's purpose was to stimulate the continuing debate on the subject. Sealaska's only position on finfish mariculture is that a responsible public policy debate needs to continue based on objective, scientific, environmental, community need and economic considerations and not on emotion and self-interest.

Sealaska also believes that other forms of mariculture opportunity not be jeopardized in the controversy over finfish mariculture. The worldwide mariculture industry is large and growing and will impact the seafood industry in Alaska no matter what we do. The question is, are we going to stick our heads in the sand or are we going to establish a responsible public policy that allows us to take the best advantage possible of mariculture opportunities while maintaining a strong and viable wildstock fishing industry in our state?

Sincerely,

Byron I. Mallott
Chief Executive Officer

bcc: Governor Steve Cowper
Southeast Legislators
Senator Arliss Sturgelewski
SC Board of Directors
Southeast ANCSA Corporations
Sealaska Corporate Officers
Sealaska Subsidiary Presidents

Finfish Farming is a Dangerous Gamble With Alaska's Salmon Fisheries

by Earl E. Krygier

Alaska's commercial fishers oppose finfish farming in Alaska, because they depend upon wild salmon stocks. Others, including sportsfishers, conservationists, and even community groups have also stepped forward in opposition. This opposition arises not from one single issue, but rather from the cumulative effects of this proposed industry on the health and stability of the existing seafood industry in our state, and on the other users of marine resources.

Resolution of the mariculture debate will not be an easy accomplishment since it involves formulation of social policy questions such as the privatization of public resources, disposal of public lands and estuaries, and the effects which will be imposed on the current seafood industry. Even Cowper has indicated that he could not support any legislation which would include saltwater rearing of salmon.

What are the issues which have galvanized the statewide fishing industry into action against allowing this new industry? The fishing industry feels the value of shellfish and sea vegetables culture to the state and local communities outweighs the associated costs. These forms of mariculture will fit into the Alaskan style of life and economy, with few negative impacts on our existing socioeconomic structure. On the other hand, we strongly oppose the implementation of finfish farming in Alaska. Our opposition rests not on the concern over a single issue, but rather the cumulative effects.

Most fishers--who are good business people--believe that pen-rearing of salmon just doesn't make business sense in Alaska. Alaska produces 90 percent of all salmon landings in the United States which equates to 43 percent of the world's landings from wild, natural runs of salmon. We have a recovered and now healthy fishing and seafood industry, the value of which is too great to gamble with. When the possible benefits of salmon farming are weighed against the probable repercussions, the benefits to the people of the state just aren't there. Each side in this debate has called forth its experts to prove their points, and one thing is certain, there are a lot of gray areas.

The following is a brief list of our concerns and why we believe resolution is not at hand.

- Competition for Funding

We are concerned over the cumulative negative impacts of salmon farming. Where will the resources come from to manage this prospective industry? Proponents suggest that their industry will take little from the existing system but, as most of us know, there are no free lunches out there. You just can't get something for nothing as the fish farm promoters suggest. There will have to be government programs created or expanded to regulate fish farming practices and these regulatory programs will cost state dollars and state resources. The money and resources won't come from an increasing state budget and we know the new operations won't be paying taxes until they start showing a profit, which may well be many years down the road. Budgetary constraints will force legislators to view a fish as a fish.

It is a safe bet that the funds needed to manage this proposed industry will come out of current fish management programs. These are the same programs which are producing such a high rate of return to our state's economy, the same programs that are already being cut to the bone because of revenue shortfalls.

What happens when the budget of an agency such as the Department of Fish and Game is reduced? It affects its ability to make accurate resource management decisions. A lack of information on which to base sound management decisions encourages a tendency to manage the resource conservatively. This may appear good for the state, and is how any prudent manager would respond, but when one considers that a portion of the resource has been wasted when it could have been harvested, it becomes a loss to Alaska's fishers and economy.

For example, a recent analysis done for the Bristol Bay fishery indicated that for each additional $86,000 put into the management program, management error decreased by one percent. In this fishery a one percent reduction in the catch represents a direct loss to fishers of $2.76 million. If the funds had been available to reduce management error by one percent, Alaska would have seen at least a 3,000 percent return on investment. This does not include losses to the secondary and tertiary sectors of our economy in which these dollars would have circulated if the resource had been optimally managed.

Another striking example is what takes place in the annual Alaska Seafood Marketing Institute (ASMI) budget debate. ASMI has been one of our major tools to fight the worldwide market onslaught of farmed salmon. In a recent report prepared for the state titled, "World Markets for Salmon: Pen-Reared Salmon Impact," the Sea Fare Group concluded that "there is little doubt that farmed salmon does indeed compete with some species of wild Alaska salmon. And given current world salmon market and production trends, the competition can be expected to become increasingly stiff."

ASMI has begun to combat the impacts of pen-reared salmon on our traditional markets with a federal grant requiring state and matching funds. The Alaskan seafood industry has provided over $1 million of this match, which along with $495,000 of state funding qualifies ASMI to receive a federal grant of $3.45 million. Without these matching dollars there would be no federal grant to offset the impacts on our foreign markets caused by farmed salmon, yet the Legislature had so many demands for funding that some contemplated not fully funding ASMI in 1989.

If, by chance, mariculture management funds did not come out of fishery management funds, they might come out of hatchery funding. This would be the ultimate irony--because if salmon farms get hatchery money, then fishermen will have to make up any deficits with more assessment taxes on themselves in order to keep these hatcheries open. In this case, fishermen would be financing the fish farm industry, an industry they don't want in the first place and in which fact would be in direct competition with them.

Disease

We are concerned that allowing salmon farming in Alaska may lead to increased disease risks. Proponents of salmon farming suggest that the present disease and genetics policies of the state afford adequate protection. We agree that there are some reasonable protections under existing policies. We firmly believe, however, that there are many inherent dangers for our wild and enhanced stocks, once the profit motive is set free.

"We submit that if salmon farming were to come to Alaska, we would see the industry dominated by a few wealthy individuals and multinational corporations predominantly from Norway."

We contend that once private for-profit salmon farming is initiated, finfish farmers will be howling at the doors of the Legislature for reduced restrictions so they can meet their financial obligations. The expense of developing a salmon farm is particularly high, on average around $1 million for a small net pen operation, while upland tank farms cost considerably more. Why do we say this? British Columbia had some stringent genetics and disease policies. Since they have allowed salmon farming, the farmers first complained that they couldn't get enough eggs. So eggs were brought in from outside B.C., moving them across boundaries which surpass prudent safeguards. Then they complained that Pacific salmon were not docile enough for animal husbandry and Atlantic salmon were needed to stay profitable. Because of the huge financial investment, an exception on the importation of exotics was allowed. Such foolishness has also occurred in the state of Washington. And people wonder why we're concerned!

"Disease outbreaks have plagued the life of fish farmers through the years. The Hitra disease of Norway is clearly the most frequent cause of loss there...last year losses due to the disease and early slaughtering could be as high as 8,000 tons or $65,000,000." (Ian Angus at the Sitka aquaculture conference 1987).

The proponents claim we have nothing to fear; they claim that there has never been an example of cultured fish infecting wild stocks. On the contrary, there are at least three examples. First, in the late 1960s Japan asked the state of Alaska for some sockeye eggs for culture purposes. We sent them, and in doing so introduced IHN to Japan's few natural sockeye stocks. Second, a Norwegian fish farmer (T. Bruusgaard) told me that the Hitra disease which is devastating farmed stocks is from Scottish smolts. This disease is now in the environment, so natural stocks must be infected. Third, mass infestation of Atlantic salmon by Gryodactylus salaris has occurred in Norwegian hatcheries, fish farms, and most importantly, wild stocks. This freshwater parasite was brought into Norway from Scotland via fish farm hatcheries, some of whose smolts were released into natural systems where they infected wild stocks.

The current stringent regulatory safeguards on wild stocks are inadequate. It is our concern that regulations such as strictly forbidding the importation of non-indigenous or exotic species of fish, a primary safeguard in our they present system, will fall by the wayside (as it has in other places) because the proposed industry is perceived as more important than some possible effects which may occur in the future.

Genetics

We are concerned with the maintenance of genetic integrity in our salmon stocks. Proponents of salmon farming claim that this is a non-problem. First they say that few if any fish will escape; second they say we already release a lot of hatchery fish--so what's the big deal? As we see it, it's a very big deal, especially when the numbers of farms increase.

Proponents claim they will produce thousands of jobs (advertisement in the

Anchorage Daily News), on the other they claim they will have little impact. Well, it can't be both ways. To produce thousands of jobs there will have to be hundreds of farms since the average farm only employs three to six persons. Hundreds of farms equates to millions of fish. Some might balk at such growth, yet this starry-eyed gold rush is exactly what occurred in British Columbia. Our concern is over the natural escape rate from salmon farms. As one B.C. farmer put it "I put a hell of a lot of smolts in and I only got two-thirds of them back. Where did they all go?"

The Norwegians can tell you where they end up; they have found a shockingly high percent (57% in one river) of "renegade" escaped salmon from their fish farms. It may only be a small percentage of fish which escape from each pen, but when the numbers of farmed fish are large enough, as they are in Norway, a small percentage is a lot of fish. Norway is concerned enough about the problem that a sperm bank has been initiated to assure maintenance of wild stock genes. Should we be less concerned?

Is there really a difference between these pen fish and those swimming in the wild? Yes there is. Wild stocks have developed over thousands of years, becoming adapted to their specific environment through natural selection. Salmon, because of their "homing" sense, will return to the natal streams to which their genes have adapted. Alaska ocean ranched hatchery fish also return "home" to their hatchery where they have been imprinted. The genetic characteristics which wild and ocean-ranched hatchery fish have are those of "survival in the wild", while those reared in salmon farms have genetic traits which are selected for animal husbandry (ones which adapt to confinement and docility). The possibility of wild stock dilution with farmed fish characteristics exists.

Water and Land Use Conflicts

Mariculture is not just another project like a log dump, but is a long term extraction of public lands and estuaries. Two of the major areas of conflict with salmon farming in the state of Washington and along the Sunshine Coast of B.C. have been water and land use. There are no coastal areas of Alaska which are not utilized, and the issuance of mariculture use permits will entail the exclusion of some other users. Commercial fishers, sportsmen and sportswomen subsistence, and other non-consumptive users are all greatly concerned with the possible problems of a mariculture industry restricting their tidelands use. Most who testified at the legislative hearings touched on the need for clear land/water use regulations, in statute, as part of a mariculture bill.

Foreign or Corporate Ownership

We are concerned that promoters have greatly oversold the promise of salmon farming--the amount of employment it will provide and to what extent Alaskans will be involved. First, it should be pointed out that our current fishing industry already employs approximately 50,000 people directly; this does not include employment in associated support industries in all segments of our economy. The economic impact this proposed industry will have is the transfer of jobs and wealth from an established segment of the economy to a new, smaller group that may not even include Alaska residents.

Though proponents are selling the concept that the farms will be owned and run by local residents and be typical of small businesses like your local fishers or grocers, the real world depicts a different reality. Small, locally owned operations won't have a chance. Because of the start-up and operating costs involved, mom and pop-type Alaskan operations may, at most, be able to get their boots in the door. It is doubtful that they could stay afloat if hit with a disease outbreak or a downturn in the industry which all experts project in the next three to five years. We submit that if salmon farming were to come to Alaska we would see the industry dominated by a few wealthy individuals and multinational corporations predominantly from Norway.

As with most industries, fish farming is continually adapting to new technologies which reduce employment to remain profitable. This type of capital intensive industry is certainly not what most of our local community members

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can afford or are being promised.

At a seminar in Seattle this last year, John Spence from Hardy Seafoods, a thriving mariculture company in British Columbia, told the audience that "mom and pop operations were just a dream." He said these small operations are being bought up by larger organizations and that by 1990 the industry in B.C. would be controlled by 20 or so large companies.

In the October issue of *B.C. Business,* an article titled "The Norwegian Connection" states that since Canadian banks aren't willing to advance funds for mariculture development, Norwegian financial offers are eagerly accepted, and the Norwegians are now estimated to control 60 percent of the industry in British Columbia.

These financing packages also contain clauses which require the farmer to buy building facilities and supplies from Norwegian companies. The article goes on to state that should reality fail to live up to projected goals, the Norwegians could call in their mortgages and end up owning the industry in B.C. outright.

Market Impacts

Proponents profess first, that their product will not compete with our wild-caught product for a share of the world market; second, that even if Alaskan pen-reared salmon did compete with our wild product this competition would be such a small increment that it wouldn't make that much difference; and finally, that world seafood consumption is increasing. Our response to their first claim is we must realize that there is only one market for fish products in the world; fish of all kinds compete on this market. Since the volume of pen-reared salmon is projected to triple by 1990, salmon farm producers will look to new markets and product forms to keep pace with production. In order to remain profitable, they will have to try to take traditional markets away from our wild-caught product. For instance, farmers in Alaska would attempt to target markets like Japan which currently consumes 84 percent of our frozen salmon each year.

Second, as the supply of all fish products increases, the price paid by the consumer will decline. As with all products, price is directly related to available supply. Since Alaskan pen-raised salmon will compete in the world market, increases in production will have a direct effect on the current price of the product.

Finally, with regard to the fact that worldwide seafood consumption is on the increase, it must be borne in mind that we are primarily concerned with the consumption of salmon and not of seafood in general. The market for salmon is a much more limited demographic market and even though it will share in the general increase in consumption, it is likely that its consumption won't keep pace with production to the extent that mariculture proponents would lead us to believe.

Pen-reared salmon production will cost the fishing industry through lost management, lost fisheries enhancement, and possible harmful effects on our wild stocks. It is ironic that not only would we pay for production through losses to our existing industry, but that the farmed product which we inadvertently help produce will further cut into the existing economy by competing with our wild product in the world markets.

Mariculture proponents are fond of saying that we have the right to fail; we, the fishermen say yes but not at our expense. We have in Alaska the last great wild salmon runs in the world. These runs are an important economic sector in this state and are proving to be Alaska's true permanent fund.

Pen-reared salmon compete with this resource and dilute the value of our already massive investments. No one can say for certain that no harm will come from pen-reared fish. It doesn't make good economic sense to gamble with Alaska's salmon fisheries without knowing what the stakes are. *–APAJ*

About the author: Earl Krygier is the Executive Director of the Alaska Trollers Association.

Correction

On page 37 of the spring edition, Mr. Gorsuch's article should have read that there are 43 states, not 44, which elect attorney generals; and 7, not six, that appoint their attorney generals. We regret the error.

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AK. Public Affairs Journal - 1988

Finfish Farming Offers Opportunities For Alaska

by Rodger Painter

About three years ago, then-Governor Bill Sheffield appointed a diverse group of Alaskans to an aquaculture policy task force. The task force was composed of representatives of major interest groups--commercial fishers, private non-profit salmon ranchers, processors, municipalities, and three persons involved in mariculture. Its composition ensured that nothing too controversial might emerge.

The governor asked the group to arrive at a consensus on a policy for the development of a mariculture industry in Alaska. Not too surprisingly, this group of individuals with diametrically opposed positions couldn't agree on many things. One exception was that the most controversial issue--salmon farming--needed further study and discussion. This recommendation came after the task force was warned by a prominent aquaculture policy expert, Dr. Gerald Bowden, that the best way to kill an embryonic mariculture industry is to commission a study.

Dr. Bowden also told the task force that Alaska has the opportunity to become either the hammer or a nail in the sweeping changes aquaculture is bringing to world seafood markets. Alaska can protect its dwindling share of global markets by becoming a driving force in aquaculture production, or it can be hammered by other regions taking advantage of increasing consumer demand for fresh seafood.

Two and one-half years after the task force issued its recommendations, we're still talking, and studying, and talking about conducting even more studies, even though our bookshelves are already overflowing with reports. Meanwhile, Alaska's share of world seafood markets continues to erode while overall seafood consumption increases.

Policy Gridlock

Dr. Bowden and other aquaculture experts stress that the most important impediments to aquaculture development are regulatory and administrative in nature, not financing, market development, technology or research. Every successful aquaculture industry around the world has occurred in a region with supportive public policies.

Alaska has yet to come to grips with the most important aquaculture opportunity available on the horizon--finfish farming. Unable to come to a consensus during the 1987 session, the legislature approved a one-year moratorium on finfish farming, with the understanding that much work would be done over the interim.

Other than a junket to Norway to study salmon farming, nothing was accomplished by the legislature over the interim. In fact, the two committees designated to tackle the issue never even met.

The result was that the information sitting on the table for consideration by policymakers continued to come primarily from supporters and opponents of finfish farming. Caught between the wildly conflicting claims and mounting pressure from both sides, the policymakers did what every good politician does during an election year on a controversial issue--punt.

The Mariculture Bill

A mariculture bill was passed in the 1988 legislature and has been signed into law (Senate Bill 514). It primarily imposed more restrictions on what already is allowed--shellfish and aquatic plant farming--and created a task force to study finfish farming during a two-year extension of the moratorium. SB 514 did give shellfish farmers some important gains:

Lease Preference. Shellfish farmers previously had no legal standing protecting work put into developing a site when they applied for a tideland lease; a speculator could offer a better lease fee to the state and be awarded a site into which the farmer had put years and thousands of dollars. SB 514 gives the farmer a preference.

Policy Statement. A policy statement favoring mariculture development

should help give agencies more direction in setting various policies affecting aquatic farms. SB 514 states: "It is the policy of the state to encourage the establishment and responsible growth of an aquatic farming industry, and that allocation of aquatic farming sites be made with full consideration of established and ongoing activities in an area."

Grandparent Clause. All shellfish farmers with a valid tideland permit will automatically qualify for a lease preference or permit on that parcel. SB 514 stipulates that the farmer "must agree that during the term of the lease or permit the person will not change the use of the site." This clause apparently is designed to protect against speculators who may wish to later modify a shellfish lease to farm salmon or other finfish.

Shellfish Hatcheries. SB 514 allows private for-profit shellfish and aquatic plant hatcheries. The state says current law does not provide for private for-profit hatcheries, although some attorneys counter that since private hatcheries are not prohibited by statute they are permissible.

Legal status. The legal status of aquatic plant and shellfish farming was firmly clarified in law.

Despite these attractive features, SB 514 was opposed by the Alaska Mariculture Association (AMA), Kodiak Mariculture Association, Alaskan Shellfish Growers Association, Resource Development Council, Kodiak Area Native Association, Alaska State Chamber of Commerce and individual shellfish farmers because of restrictive siting provisions and wide-ranging powers granted various state agencies.

The most objectionable provision to shellfish growers is a section which prompted weeks of debate before the Senate Resources Committee and had been stripped from a related bill. Under SB 514, the Department of Natural Resources (DNR) is required to:

"Divide the state into aquatic farming districts.

"Schedule at least one 60-day period per year in each district when tideland permit applications would be processed.

"Consult with the Alaska Department of Fish and Game (ADFG) and the Department of Environmental Conservation (DEC), then issue a preliminary finding proposing sites within the district for which permits may be issued. This preliminary finding and other aquatic farming tidelands actions are subject to a broader statutory notice than requirements for any other state land action.

"Provide notice and hold a public hearing for all proposed permits, then identify eligible sites with specific conditions and limitations on farming activities."

"Caught between the wildly conflicting claims and mounting pressure from both sides, the policymakers did what every good politician does during an election year on a controversial issue--punt."

These siting provisions created considerable controversy because mariculture proponents said they are far more restrictive than what is applied to any other users of public water. The area-wide siting process was devised by DNR, but the agency testified against putting it into statute. AMA and other farmers preferred elimination of the process entirely.

SB 514 was also riddled with open-ended sections giving the agencies broad discretion in regulatory action. For example, ADFG "may attach conditions to a permit issued under this section that are necessary to protect natural fish and wildlife resources." While this sounds pretty reasonable, it also provides the agency with broad discretionary authority.

There are numerous examples of overkill in the legislation. For instance, detailed provisions on disease control and inspection provide a framework to be applied to all forms of mariculture, but most are mandatory procedures written primarily to protect wild stocks from salmon farming. Many of the precautions are unnecessary for shellfish and aquatic plant farming.

The possibility of anything positive coming out of this effort was greatly diminished by the failure to fund the legislation. In a letter to legislative leaders, Governor Cowper said he was not planning to appoint members to the finfish farming task force until funding is made available. What does this mean for Alaska? Two more years of talking and no action while Alaska's opportunities in fish farming are stolen by such unlikely regions as Chile, Australia, Minnesota, South Dakota and California.

Seafood Markets

As Alaska attempts to diversify and expand its private industries, an obvious area of emphasis should be the seafood industry. The seafood industry has been a mainstay of Alaska's private economy since the late nineteenth century, and growing world demand for high value seafood promises great opportunity for expansion.

Commercial fishing has been plagued with cyclical fluctuations of natural stocks and the industry is having difficulty competing with rapidly increasing production from aquatic farms. Indeed, Alaska's share of U.S. and global seafood markets is slipping even as consumption of fisheries products rises.

A recent study prepared for the British Columbia Salmon Farmers Association by a noted U.S. seafood analyst, says farmed salmon is expected to account for 45 percent of U.S. consumption of fresh and frozen salmon by 1990.

The popularity of farmed salmon is apparent even in Alaska--the home of the world's largest salmon fishery--where it is featured in many restaurants and supermarkets. Some Alaskan seafood processors find they now have to purchase farmed salmon to satisfy the needs of their customers.

These facts underscore the importance of developing a strong diversified mariculture industry in Alaska; it is vital to the long-range viability of our seafood industry, as well as to our ability to create more private sector jobs tied to renewable resources.

The addition of a full line of mariculture products would allow Alaska to compete more effectively on world markets. By jointly marketing its wild

and farmed seafoods, Alaska would regain its competitive advantage through its ability to supply large volumes of seafood on a year-round basis.

Tremendous amounts of seafood currently are harvested during very short, intinsive fisheries which create very small windows of opportunity fot marketing fresh seafood.

While Alaska has the advantage of offering volume and competitively priced products, it currently cannot compete effectively for fresh markets with countries able to guarantee year-round deliveries of high quality fresh products.

One of the state's successful seafood processors recently explained to the Alaska State Chamber of Commerce how his company is marketing its products in Midwest supermarkets by utilizing a modular retail counter it calls the Alaska Seafood Express. The only non-Alaska seafood sold from the Alaska Seafood Express is farmed salmon because there simply is no reliable source of fresh product available during winter months.

A diverse mariculture industry also would expand the variety of seafood available in Alaska by adding oysters, mussels, trout, Arctic char and other species. Aquatic farming could also expand the state's year-round supplies of scallops, shrimp, black cod, halibut and abalone. This flow of new product would allow Alaska's seafood processors to offer customers a broader array--and year-round supply--of high quality seafood.

Salmon Enhancement Programs

Alaska already has one of the world's most successful mariculture programs in the form of its network of state and private nonprofit salmon hatcheries. State and private hatchery operations this year handled some 1.5 billion salmon eggs and the return from these eggs in several years will add millions of fish to the catches of commercial and recreational fisheries.

These state and private hatcheries present one of Alaska's biggest public investments in any industry: voters approved $56 million in general obligation bonds to build the public hatcheries. Private operations have been loaned $31.8 million (the present value of the loan portfolio is estimated at $59.7 million), and another $5.8 in operating funds and grants has been spent in support of private hatcheries in the past five years.

These hatchery programs have been called one of the best investments ever by the State of Alaska in terms of direct returns to the economy, but cutbacks in state spending threaten to close down many of the public facilities.

Repayment of the private loans will require the private hatchery systems to divert substantial amounts of fish from harvests by commercial fishermen for cost recovery programs by hatchery managers. One of the biggest potential sources of new funding for these public and private enhancement programs could be the sale of juvenile fish to Alaska salmon farmers.

The Alaska Department of Fish and Game estimated there were 88.6 million eggs surplus to the needs of state and private hatcheries in 1986. A 44 million pound salmon farming industry in Alaska would require roughly 10 million

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of these surplus eggs per year. Should the state or private hatcheries decide to utilize these surplus eggs to produce the juvenile fish (smolts) needed by salmon farmers, these sales could generate $7 to 10 million annually. The additional investments required for operating hatcheries with surplus eggs would be minimal and would not divert from common property enhancement efforts.

Fish Feed Manufacturing

One of the significant spinoffs of a salmon farming industry is the manufacturing of fish feed. About half the operating expenses of fish farms are tied up in feed. A 44 million pound salmon farming industry in Alaska would require roughly 88 million pounds of fish feed a year (worth $30-40 million) provided by regionally based meal plants. That much fish feed would require 264 million pounds of raw product (fish waste or whole fish). At six cents a pound (Washington state rates), fish processors could be paid $15.8 million for waste they now have to spend money to dump in the ocean.

Production of fish feed can enhance the viability of shore-based surimi plants. Alaska's two largest surimi plants (located in Unalaska) already utilize their by-products to produce about 17.6 million pounds of fish meal per month, which now is sold to Taiwanese eel farmers. Export markets for Alaska-produced fish feed could be substantial. One of the major impediments to the growth of the British Columbia salmon farming industry is an adequate source of raw materials for production of fish feed.

A recent study completed for the B.C. Salmon Farmers Association said the province's salmon farms demand for fish feed is "projected to increase from about 11,000 tonnes in 1987 to about 86,000 tonnes in the year 2000." B.C. farming companies and fish feed manufacturers are actively scouting fish meal sources around the world. One company recently completed a deal to truck fish wastes from the east coast of Canada to B.C. for processing into meal.

With more than 3.5 billion pounds of fish waste generated by processing operations in our inshore and offshore waters, the opportunity for Alaska in fish feed production is truly staggering. This opportunity is open whether or not Alaskans are allowed to farm finfish, but the value to the state would be multiplied many times over if we could convert the feed to fresh farmed salmon.

Tourism

One of the more unique applications for mariculture is a proposal by an Anchorage group, Indicator Inc., to construct a shrimp or salmon farm at the old Ship Creek hatchery near downtown Anchorage. The facility would utilize waste heat from a nearby power plant. The commercial farming operation would be a tourist attraction by incorporating glass sides in some of the rearing tanks and conducting a tour. A restaurant specializing in Alaskan farmed seafood would complete the package.

A Fairbanks couple, Andrew and Pam Wescott, have managed to secure licenses and permits for a commercial salmon farm operated in a spring-fed gravel pit on private land under a very narrow exception to the finfish moratorium. The Wescotts already operate a gold panning camp for tourists, and want to build a large freshwater salmon farm to attract visitors. The Wescotts are unlikely to get past the experimental stage under the terms of the moratorium.

"Alaska can protect its dwindling share of global markets by becoming a driving force in aquaculture production, or it can be hammered by other regions taking advantage of increasing consumer demand for fresh seafood."

Derivative Economic Benefits

Fish farming has a higher secondary economic impact than most of Alaska's primary industries because of the fairly large support structure required by these year-round activities. This has particular significance for Alaska's regional hubs, particularly Anchorage, which is likely to be the state's biggest service center for aquatic farms.

One of the most important impacts would be in the transportation industry which would be bolstered by exports of fresh seafood during their slowest months.

Air cargo backhauls from coastal communities should improve air service to rural areas during the winter months, and allow fishers or small local processors better access to scheduled air service for sales of commercially caught seafood.

While there are no estimates for the amount of product a fully developed Alaskan mariculture industry could produce, a 44 million pound salmon farming industry alone could account for $13.2 million in additional airline revenue at a 30 cents per pound rate.

Aquatic farming could also create a wide variety of other opportunities for support businesses. One example is the special shipping boxes used by salmon farmers to ensure delivery of the highest possible quality product. These boxes must be manufactured regionally because the styrofoam inserts are considered too bulky to ship empty. The technology and costs of producing these styrofoam inserts could allow smaller scale production on a regional basis.

Conclusion

A fully-developed mariculture industry would provide a year-round boost to Alaska's troubled private economy and could bring new investment dollars and jobs to rural villages and urban service centers. Other states and countries throughout the world have realized the economic importance of mariculture and are moving aggressively forward to support this development.

Alaska cannot afford to sit idly by and watch our seafood markets be displaced by foreign producers. Alaska must break its mariculture policy gridlock while it still has the opportunity to attain some of these benefits. It's about time we start to decide to become the hammer rather than a nail. –*APAJ*

About the author: Rodger Painter is the founder and Executive Director of the Alaska Mariculture Association.

Alaska Mariculture Association

Jan. 19, 1989

Senator Bettye Fahrenkamp, Chairwoman
Senate Resources Committee
P.O. Box V
Juneau, AK 99811

Dear Senator Fahrenkamp:

As the session gets underway, the Alaska Mariculture Association (AMA) would like to rekindle the debate over mariculture development in Alaska. This undoubtedly comes as no surprise, as noone expected last year's legislation (Senate Bill 514) to be the final chapter in the shaping of state mariculture policies.

Unfortunately, we have made precious little progress in resolving this thorny issue over the past three years. The 1987 legislature passed a onr-year moratorium on finfish farming, and decided to work on the issue over the interim. There were no interim meetings, staff work, or other meaningful actions.

Unsurprisingly, the debate just picked up where it had left off, with opponents and proponents no closer together and the legislature still trying to sort fact from fiction in widely varying claims. This resulted in a deadlock broken only by a last-minute blitzkreig behind a bill strongly opposed by all mariculture supporters.

Senate Bill 514 set out a burdensome permitting process for aquatic farmers, extended the finfish farming moratorium for two years, and established a citizens finfish task force. As you are aware, the bill's fiscal note was not funded, so the task force remains a concept and the agencies are straining meager existing resources to implement a major change in law.

So, just how has this affected mariculture? The Department of Natural Resources (DNR) stopped accepting applications for shellfish farming permits and begin working on a new comprehensive permitting program. While DNR has done an admirable job in mustering enough manpower to develop the sweeping new program, the proposed regulations it recently published are even more objectionable to shellfish farmers than the legislation they are designed to implement.

Faced with an overwhelming volume of red tape threatening to strangle any Alaskan with visions of developing a small, renewable business, shellfish farming advocates are banding together to propose new legislation designed to ease some of the restrictions imposed by SB 514. The Alaskan Shellfish Growers Association, Kodiak Mariculture Association, Kodiak Area Native Association and AMA are working on a measure to address only shellfish and aquatic plant concerns.

This represents a change in course for AMA which has advocated for a comprehensive approach to mariculture policies by the state. While we still conceptually support this approach, it has become quite evident that the controversy over finfish is resulting in undue restrictions on shellfish farmers and a complete separation of the issues is a political necessity.

As you deal with these proposed changes, please keep in mind that our existing shellfish farmers are very small businesses struggling to establish a new industry. We believe Alaska is an ideal environment for aquatic farming, and these biological advantages will offset the added costs of doing business in remote areas with extraordinary transportation costs and no infrastructure.

The thrust of our suggested changes is to provide mariculture an equal footing with other potential uses of state tidelands. In other words, we want multiple use resource management. This does not seem to be an unreasonable request.

We do not want to discard the basic process established under SB 514, only to make it more palatable to aquatic farmers.

The finfish side of the mariculture issue is likely to be more difficult. After going through yet another interim with no work on the issue, AMA believes it is time for the legislative committee ystem to revive the discussion on finfish farming policies.

The policy vacuum on finfish farming over the past eight months can be attributed pprimarily to the lack of funding for the Alaska Finfish Farming Task Force, and some are suggesting that funding of the task force is the appropriate legislative action on finfish farming this session.

AMA is not opposed to the funding of the task force, but we think it is important for all lawmakers to fully understand the role of the task force in the legislative process. The task force was designed to simply gather facts and report back to the legislature, so policymakers have an unbaised source of information on the pros and cons of salmon farming.

The task force is not charged with developing recommended policies or solutions, and it will not resolve our current gridlock. The answer is not to fund the task force and wait for its report. Face it, there is little hope of funding being approved and the task force appointed until after this session adjourns.

Controversial issues requiring major policy decisions almost always require two years to wind through the legislative process. The two-year extension of the finfish farming moratorium expires in about 16 months. If you wait for the task force report, lawmakers will have a four-month session to make a decision.

Legislative committees can gather good, unbiased information just as effectively as any task force. Let's make the committee process work by systematically examining the major issues involved. There is a wealth of information available, and we'd be pleased to assist in this process. I'm certain the critics of salmon farming won't pass up the opportunity to participate.

As you are well aware, finfish farming is a complex issue and there are many different components of this promising industry. For instance, the farming of arctic char in freshwater tanks or private

ponds raises vastly different concerns than the fullscale farming of chinook salmon in marine net pens. Some of the issues involved in finfish farming may be relatively simple to resolve.

We believe the legislature is committed to fully exploring all significant opportunities to diversify our economy, and finfish farming represents one of the best opportunities available. Our economy is too troubled for the legislature to ignore the potential of creating hundreds of new jobs and millions of dollars of income.

We look forward to working with you during the coming months to seek some logical approaches on dealing with mariculture policies and pledge to do our part to make the committee process function. Thank you for considering our comments.

Sincerely,

Rodger Painter
Executive Director

c.c. All Senators

SENATE LABOR & COMMERCE COMMITTEE

Senator Richard I. (Dick) Eliason, Chairman

Senator Pat Rodey, Vice-Chairman
Senator Jan Faiks
Senator Jalmar Kerttula
Senator Jack Coghill

Rudy McPherren
349-4491

Safeway

13-18 lbs
~~Ketchikan~~
Sitka

~~AK~~ Gourmet - broker
563-3752
(Steve)

Farm Raised
Coho

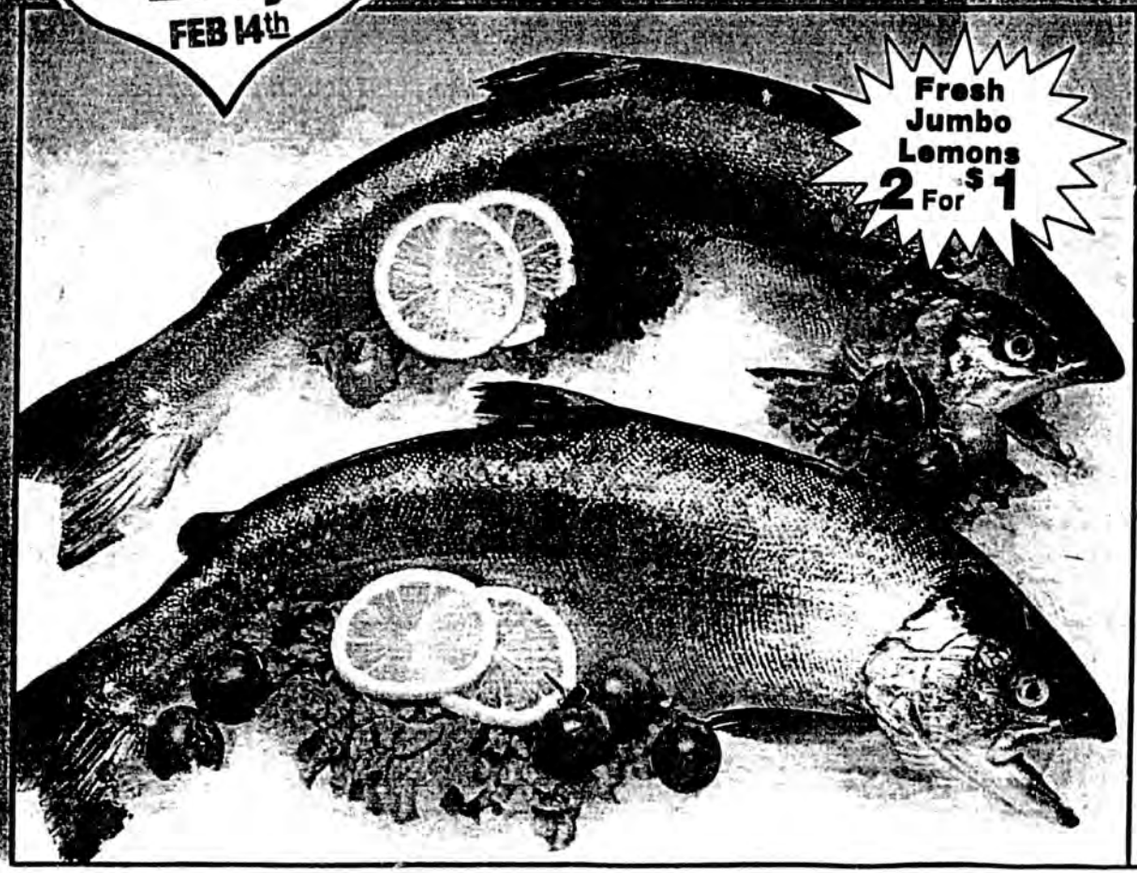
3.84 (In Seattle)

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Troll Caught, Head On, 6 to 9-lb. Average

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Whole or Half

Sheila Den File - Mariculture

AQUATIC FARM REPORT

TO THE LEGISLATURE

January 30, 1989



Steve Cowper
Governor
State of Alaska

Lennie Gorsuch
Commissioner
Department of Natural Resources

Gary Gustafson
Director
Division of Land and Water Management

For more information:
Janet Burleson
Project Manager
Division of Land and Water Management
465-3400

This report is submitted in response to Section 19, Chapter 145, SLA 1988 which requires the Commissioner of the Department of Natural Resources (DNR) to provide a report to the legislature detailing the department's implementation of AS 38.05.083 and 38.05.856 which allows individuals to acquire property rights on state-owned tidelands for aquatic farming purposes.

Summary:

Last year the legislature passed new legislation pertaining to aquatic farming in Alaska. The law authorized the farming of aquatic plants and shellfish, prohibited the farming of Atlantic salmon, extended the moratorium on finfish farming until July 1, 1990 and established the Alaska Finfish Farming Task Force. It provided a new system for accepting applications and issuing permits for aquatic farming for DNR. However, no funding was appropriated for implementation. In response to the legislation, the department proceeded to develop regulations and create the aquatic farm districts as required by the law, but has not opened any districts to applications due to lack of resources.

Background:

Aquatic farming is the cultivation of aquatic farm products in captivity. The new law authorizes shellfish and sea vegetable farming in Alaska. There are currently approximately 40 permitted aquatic farms in the state, primarily growing mussels and oysters. A few research operations involve scallops and kelp.

Prior to the enactment of this law DNR issued permits for aquatic farming, but used a general type of permit that did not include a property right and was revocable at will. The permit was issued for one to three years and included no preference for a lease or another permit when the permit expired.

The new law created several additional standards. It requires the department to create aquatic farm districts and hold a 60 day application period in each district annually. An aquatic farmsite permit is now a property right that can only be revoked for breach, giving the permittee the secure tenure needed to obtain financing and to make the significant capital investment necessary to develop a producing farm. A permittee who successfully develops an aquatic farm has an automatic preference right to a lease. Because issuing an aquatic farmsite permit is a "disposal of an interest in state land," as that term is used in Article VIII of the Alaska Constitution, DNR must first comply with all procedural safeguards applicable to land disposals; land planning and classification, best interest findings, public notice and review, reservation of access easements, etc.

Report:

Specifically, Section 19 requires the department to provide a report that includes:

1. **The number of applications received under AS 38.05.083 and 38.05.856, the number of leases and permits issued, according to type of aquatic farm product.**

The department has not yet accepted any applications, due to lack of resources. However, we have taken the steps to otherwise implement the program.

First, the department began the process of determining boundaries for the aquatic farm districts required by AS 38.05.855. To assist in developing district boundaries, the department solicited nominations from the public and state and federal agencies for areas which might be available for aquatic farming and areas that should be excluded from aquatic farming. In the Southcentral Region of Alaska we received a total of 574

nominations; 88 for areas that should be available for aquatic farming, 79 for areas that should be excluded from aquatic farming and 412 pieces of information indicating recreation areas, fishing areas and anchorages. In the Southeast Region, we received a total of 1031 nominations; 162 areas were nominated for development, 369 areas were nominated for exclusion and 500 pieces of information about recreation areas, fishing areas and anchorages. In addition to requesting review by other state and federal agencies, DNR asked for the assistance of an informal citizen's advisory group to help identify districts. The group represented shellfish growers, conservation organizations, and commercial fishermen. The group met several times and reached a consensus on the district boundaries. The group agreed to the establishment of 5 districts in the Southcentral Region and six districts in the Southeast Region. The district boundaries basically conform to DNR's existing or proposed area plan boundaries or coastal district/municipal boundaries. In southeast, the districts include Ketchikan/Misty Fjords, Prince of Wales Island, Stikine/Admiralty Island, Juneau/Haines boroughs, Chichagof/Baranof/Kruzof Island group and Yakutat/Glacier Bay. In the southcentral area the districts include the Alaska Peninsula, Kodiak Island, Kenai Peninsula Borough, Prince William Sound and Cape Suckling/Icy Bay.

Second, the Department of Law advised that the mandatory language in AS 38.05.856 required that regulations be adopted before decisions on permits could be made. Therefore DNR immediately began drafting regulations that set out its policies for carrying out the new program.

The first draft of the regulations was distributed informally in June. A preliminary public hearing draft was then written and distributed for comment to interest groups, individuals and other departments. The department gathered comments on the preliminary hearing draft, then the advisory group met to discuss the comments. The advisory group spent many hours in detailed analysis and discussion. Advisory group members served without compensation, and traveled to Juneau and Anchorage at their own expense.

Ideas suggested by advisory group members and incorporated into the draft regulations included: using a mailing list for effective notice of public comment opportunities; letting permit development plans include both a "floor" and a "ceiling" for development; allowing two renewals of the permit for a total term of nine years (to leave time for the extensive capital investment needed to become profitable); if strictly necessary, authorize onsite housing (removable within 30 days) of personnel at the permit stage, but provide for public review; before deciding to issue a permit, consider the effect on other land uses such as commercial fishing, primary anchorages, recreation and tourism; make sure that overland access to tidewater is not defeated by obstacles in the water itself; and allowing for site testing by means of ordinary revocable-at-will permits, which can be issued quickly because they are not land disposals.

These discussions took place in November. A public hearing draft was then developed which incorporated the comments of the advisory groups as much as possible. The draft was distributed to over 500 individuals, groups and agencies. Eight public hearings were held during mid-January in Anchorage, Homer, Cordova, Kodiak, Juneau, Ketchikan, Wrangell and Petersburg. The public comment period expired on January 20, 1989. The department proposes to incorporate the comments and adopt the regulations by mid-February. They must then proceed to the department of Law to be approved and on to the Lt. Governor to be promulgated.

The draft regulations (11 AAC 63) detail the entire process of applying for and obtaining an aquatic farmsite permit or lease. Sec. 010 of the new chapter explains the subject of the chapter and defines an aquatic farmsite permit as a type of land disposal. Sec. 020 covers the process of calling for area nominations to help set application district boundaries, then opening the district to applications for aquatic farmsite permits, mapping the open area

advertising the opening and setting filing guidelines for applications. Sec. 030 sets filing requirements for permit applications, including the requirement for a proposed development plan and schedule, and explains what will be done if applications overlap or too many applications are filed for a limited area. Sec. 040 covers associated facilities for storing equipment, of housing personnel and puts restrictions on authorizations for such purposes; it also covers the rights of upland owners and offers a preference right to an applicant who will put such facilities on the applicant's land rather than on state land.

Sec. 050 specifies the review process used for complete applications and the criteria for a preliminary finding under AS 39.05.035(e) that granting permits would be in the state's best interest. Sec. 060 sets rules for notice and the opportunity to comment, including notice to upland owners, and specifies that a permit will not be issued if the upland owner will not authorize upland use that the applicant states is necessary. Sec. 070 covers the process of issuing permits after a final best interest finding and sets out permit requirements, including posting a bond and paying a use fee. It also allows for two renewals of a permit under specific circumstances. Sec. 080 explains how the permit or lease bond amount will be determined. Sec. 090 covers the transition from permits issued under AS 38.05.850 (an older law on permits for general natural resource uses) and defines which permits qualify under a "savings clause" that the legislature included in sec. 18 of the law. It limits the circumstances in which the department will issue permits for aquatic farm related purposes using the older permit law rather than the new law. Sec. 100 sets out the requirements for getting and keeping an aquatic farmsite lease. Sec. 110 includes general conditions for both permits and leases and sec 120 defines terms used in the new chapter.

2. The restrictions attached to permits and leases

The department recognizes safeguards in the bond required in the law, the proposed regulations and the statute. Typical conditions to be included in permits and leases (such as prohibiting unlawful activities on the premises, requiring compliance with all applicable laws, and providing for amendments) are set out in the proposed 11 AAC 63.110. Site-specific conditions necessary to resolve or mitigate conflicts may be drawn from guidelines set out in applicable land use or coastal management plans. Where no such guidelines are available, the proposed 11 AAC 63.050 directs that the guidelines included in the department's final Etolin Island Area Mariculture Pilot Project be consulted.

3. A discussion of the system the department implements for issuing leases and tideland and land use permits

Through the summer of 1988 the department met with representatives from the Departments of Fish and Game, Environmental Conservation and the Division of Governmental Coordination, state agencies which are also impacted by the law. The primary purpose of this interagency group was to incorporate the new procedures into existing Alaska Coastal Management Program (ACMP) procedures, streamline the process for the permittee as much as possible and amend the existing aquatic farm application to reflect the changes in the new law. The interagency group developed a consolidated application form used by the applicant to obtain authorizations routinely required by the above departments. Attached to this report are charts which 1) outline DNR's procedures and 2) specify how all the affected agencies processes will work. Also attached is the draft Application for Aquatic Farm Permits developed by the interagency group. The agencies intend to process all applications within a particular aquatic farm district simultaneously. The result should be that all the applicant's state authorizations will be issued at the same time. When the draft regulations are adopted, we will proceed to implement the program, given the availability of sufficient resources.

4. The level of public involvement in the issuance process

The level of public involvement is prescribed in the law. It expanded the notice requirements under AS 38.05.945 which requires notice to municipalities, Native corporations, newspapers, community councils and community organizations to include coastal resource service areas and fish and game advisory boards. A coastal review process is also required. A public hearing is required under AS 38.05.946 when the preliminary decision is completed. Recognizing the interest the public has shown regarding aquatic farming, the department solicited nominations for areas of interest for aquatic farming, mailed over 500 copies of the proposed regulations, established an advisory group to assist in the creation of districts and regulations and held public hearings on the regulations in eight coastal communities. The draft regulations provide that people may get on a mailing list for notice of district openings and best interest findings. In short, we expect the demonstrated public interest in the program to continue and we're prepared to accommodate it.

5. A discussion of how the program is working and the department's plans for modification

The districts are in place and the regulation process is in the final stages. The next step is to open sequentially all districts for 60 day annual application periods, followed by application processing and permit issuance. However, because no money was appropriated to implement the new law, the affected state agencies, including DNR, cannot proceed further at this time.

Attachments (3)

A DNR Processing Time Line
B Aquatic Farm Siting Process Under CSSB 514 and ACMP
C Application for Aquatic Farm Permits

ATTACHMENT A

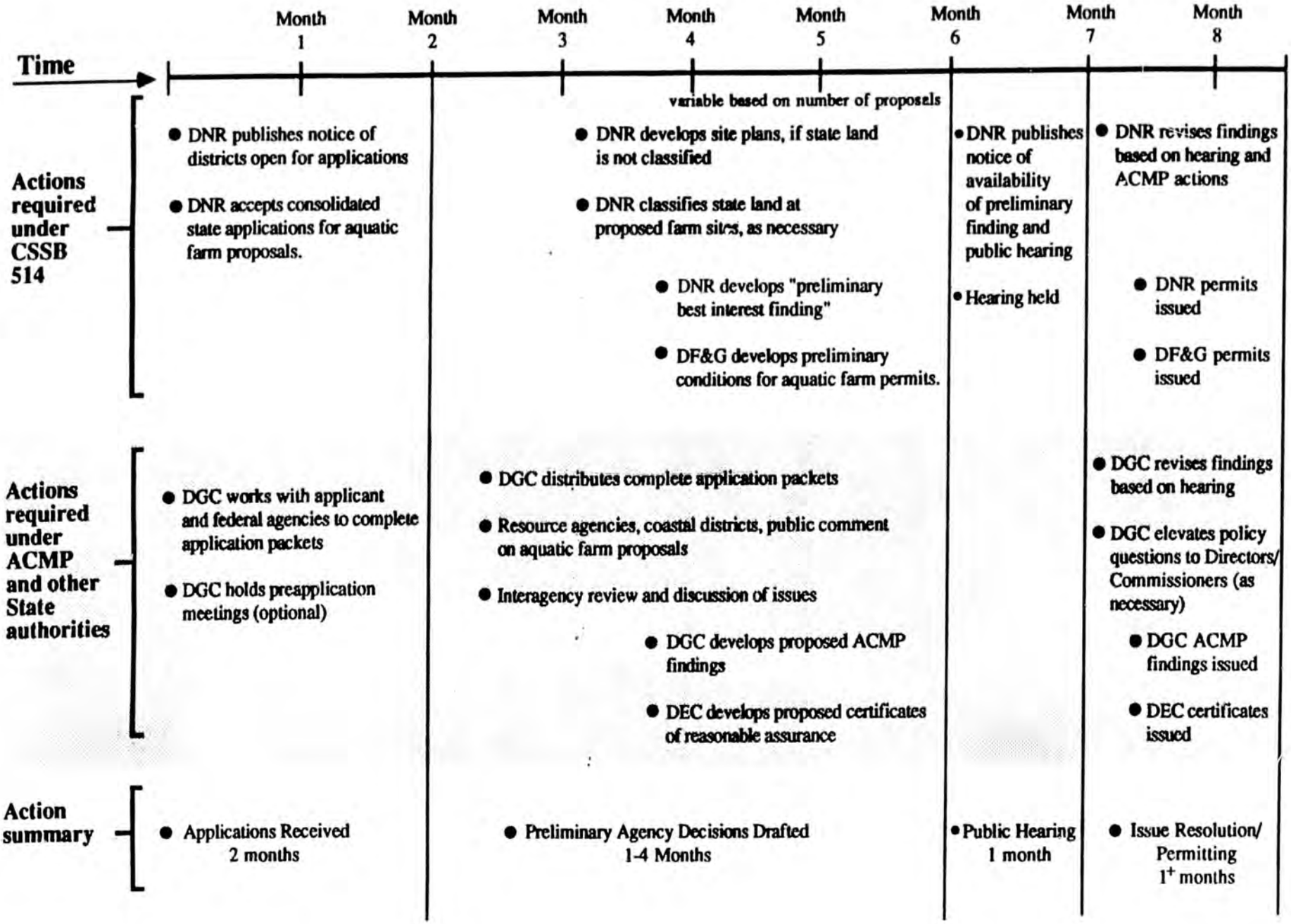
DNR ESTIMATED PERMIT PROCESSING TIME LINE*

Prior to Month 1	DNR Publishes Notice of Districts Open for Application
Month 1-2	Aquatic Farm Proposal Applications Accepted
Month 3-6	Site Plans Developed for Unclassified Lands Lands Classified as Necessary Preliminary Best Interest Finding Developed
Month 7	Notice of Preliminary Best Interest Finding and Public Hearings Published Public Hearings Held
Month 8	Findings Revised as Necessary Permits Issued

* ADF&G, DEC and ACMP Actions and Reviews Are Completed In The Same Time Frame.

ATTACHMENT B

Aquatic Farm Siting Process Under CSSB 514 & ACMP



ATTACHMENT C

STATE OF ALASKA

OFFICE OF THE GOVERNOR

DIVISION OF GOVERNMENTAL COORDINATION

STEVE COWPER, GOVERNOR

CENTRAL OFFICE
P.O. BOX AW
JUNEAU, ALASKA 99811-0165
PHONE: (907) 465-3562

SOUTHEAST REGIONAL OFFICE
431 NORTH FRANKLIN
P.O. BOX AW, SUITE 101
JUNEAU, ALASKA 99811-0165
PHONE: (907) 465-3562

SOUTHCENTRAL REGIONAL OFFICE
2600 DENALI STREET
SUITE 700
ANCHORAGE, ALASKA 99503-2798
PHONE: (907) 274-1581

NORTHERN REGIONAL OFFICE
675 SEVENTH AVENUE
STATION H
FAIRBANKS, ALASKA 99701-4596
PHONE: (907) 456-3084

Dear Aquatic Farm Applicant:

The Aquatic Farm Application is designed to help you obtain the authorizations routinely required by the State of Alaska Departments of Natural Resources (DNR), Fish and Game (DFG), Environmental Conservation (DEC), and Division of Governmental Coordination (DGC) to site and construct your mariculture project. This form can be used to apply for the Aquatic Farm Operations Permit and Fish Habitat Permits from DFG, Water Quality Certification (401), wastewater system plan review, and Waste Discharge Permit from DEC, Aquatic Farm Site Permit from DNR, and the Coastal Zone Consistency Certification from DGC. This application also addresses solid waste disposal for single-family use; facilities larger than single-family are required to apply for a solid waste disposal permit from DEC.

The application must be submitted to the state within the 60-day opening announced by DNR for the district in which you intend to farm. A Coastal Project Questionnaire, which is available from any of these agency offices, must also be submitted with your Aquatic Farm Application to help determine which specific permits must be obtained prior to constructing your project. If you determine that your specific project design requires additional permits for activities such as an increase in water use or solid waste disposal, or use of state owned timber or gravel, you must also file supplementary applications with the standard Aquatic Farm Application.

You will receive a notice and processing schedule for the state coastal zone consistency review from Division of Governmental Coordiantion when your application has been accepted for processing. Your permits will also be processed on this schedule.

Please read this application carefully. A properly completed application is required for the state agencies to process your request. AN INCOMPLETE APPLICATION MAY BE RETURNED TO YOU FOR CORRECTION AND RESUBMISSION. Please note that an acceptable application must be received within the 60-day district filing period. Information which you provide in this application will

be considered as your development plan and schedule. If approved, this development schedule will be used to determine your elegiblity for permit renewals or state land leases.

If you need technical assistance in completing this application, please refer to the list of agency representatives provided at the back of the coastal project questionnaire. If you have questions about this application process, or you are not able to determine which agency can best answer your technical questions, contact the Division of Governmental Coordination in Juneau at 465-3562, in Anchorage at 274-1581, or in Fairbanks at 451-2818.

Stocking your Farm or Selling your Products.
In addition to the permits and approvals to site your aquatic farm, which you are applying for in this Aquatic Farm Application, you will also need to separately apply for and obtain a Shellfish or Aquatic Plant Transport Permit from ADF&G to obtain and hold broodstock, and a Growing-Area Certification and a Harvester's Permit from DEC in order to sell your product. These permits are not covered by this application since they are required for later phases of your project.

A Shellfish or Aquatic Plant Transport Permit is required by ADF&G before you can obtain, hold, transport, and raise shellfish and aquatic plants. We encourage you to contact the Fisheries Rehabilitation, Enhancement and Development (FRED) Division in Juneau at 465-4160 or in Anchorage at 267-2157 as early as possible in order to apply for and obtain a Transport Permit.

Water quality in the growing area must meet the standards of the National Shellfish Sanitation Program incorporated by reference in 18 AAC 34.170 and state water quality standards. You should contact DEC regarding certification requirements so that you can be reasonably sure that your site will qualify. The growing area must be free from sewage discharge and all sewage discharges must be 300 feet or more from the boundary of an approved growing area depending on the type of discharge and local condition. All facilities used to retain, collect, treat or dispose of human wastes must be approved by the DEC.

We recommend that you apply for Growing Area Certification and a Harvester's Permit at least six months before you intend to harvest shellfish. Individuals requesting growing area surveys must bear the cost of transporting the DEC representative to and from the growing area from the nearest commercial airport. Also, the individual must bear the cost of shipping daily water samples during the five-day survey to the DEC laboratory in Palmer, Alaska. To obtain more information on certification requirements, please contact DEC in Anchorage at 563-0318.

jbak88122301DMF

State of Alaska

Application for Aquatic Farm Permits

General Instructions

1. Answer **all** questions using the blanks provided or additional pages.

2. If additional space is needed, mark the additional pages with the corresponding number in the application.

3. Type or print your answers **clearly** in **ink.**

4. The applicant or an authorized representative must **sign the application.**

5. Submit the **original application**, a copy of the coastal project questionnaire, and a **filing fee** of $50.00 to the Department of Natural Resources in the region in which the farm is to be located.

DNR
Southeast Regional Office
400 Willoughby Avenue
Suite 400
Juneau, Alaska 99801

DNR
Southcentral Regional Office
3601 C Street, Anchorage
Mailing Address:
P.O. Box 107005
Anchorage, Alaska 99510-7005

DNR
Northern Regional Office
3700 Airport Way
Fairbanks, Alaska 99709

6. Submit a copy of the application and the original **coastal project questionnaire** to the appropriate regional Office of the Division of Governmental Coordination.

DGC
Southeast Regional Office
431 North Franklin Street
P.O. Box AW, Suite 101
Juneau, Alaska 99811-0165
(907) 465-3562

DGC
Southcentral Regional Office
2600 Denali Street
Suite 700
Anchorage, Ak 99503-2798
(907) 274-1581

DGC
Northern Regional Office
675 Seventh Avenue
Station H
Fairbanks, AK99701-4596
(907) 451-2818

7. ***Please note:*** This application is for a specific aquatic farm project. You will need to submit a new application if you change any of the following:

   A. The species to be grown
   B. The size or design of your operation
   C. The location of your operation

State of Alaska

Application for Aquatic Farm Permits

3/15/88
Revised: 1/89

A. APPLICANT INFORMATION

1. _____
Name

_____
Mailing Address

_____
City State Zip Code

_____
Phone

2. _____
Business Name (if different than above)

_____
Business Address

_____
City State Zip Code

_____
Phone

3. _____
Authorized Agent (if applicable)

_____
Address

_____
City State Zip Code

_____
Phone

B. GENERAL INFORMATION

1. Provide a brief description of the facility and your overall proposal. Include upland, tideland, and submerged land facilities.

_____

_____

_____

2. Housing on state lands can only be approved if site development requires daily attention at the time housing begins, if personnel cannot reasonably commute by road or boat, and no suitable private lands are available for rent or sale (see 11 AAC 63 040(a)).

Does your proposal include caretaker housing on state land or water? Yes___ No___

If yes, please describe why onsite housing is necessary.

_____

_____

_____

3. a) Do you currently own or lease upland property adjacent to, or near the proposed farm site? Yes___ No ___
b) Are you applying for a preference right under 11 AAC 63.040(b)? Yes ___ No ___
c) Do you agree to contain your aquatic farm support facilities (storage, dwellings,etc.) on these privately owned or leased lands? Yes___ No___
If yes, attach a copy of the ownership deed or lease agreement.

4. In order to process your application, we need to know who owns the adjacent lands. Please provide the names and addresses of the landowners of adjacent uplands and tidelands.

Uplands	Tidelands
_____	_____
_____	_____
_____	_____

C. PROJECT LOCATION

1. Is the Project on: (please mark with ✓)

State Land _____ Federal Land _____ Private Land _____ Municipal Land _____

2. Attach a topographic map (U.S.G.S. Scale 1: 63,360) and nautical chart to this application that show the site location boundaries and general area. Clearly indicate the site location and identify the map and chart reference number.

3. Township _____ Range _____ Meridian _____ Section _____ Longitude _____ Latitude _____

4. Number of acres of state land applied for: Uplands _____ Tidelands _____

D. FARM DEVELOPMENT AND OPERATING PLAN

1. Species to be raised:

Species	Annual Production Goal maximum	minimum
a _____	_____	_____
b _____	_____	_____
c _____	_____	_____

2. Please provide a timetable showing approximate dates for installation of spat collection gear, placement of production and support facilities, date of first sale, and a schedule for reaching expected maximum production. If you plan to operate at this site less than year round, please include your operating schedule.
Note: You may submit both a minimum and maximum development goal if you are uncertain about your construction schedule. Reasonable use of the site must be proposed.

_____

_____

_____

3. Donor Stock

a. What is the source of the donor stock for your farm? _____
b. If you plan to capture wild stock, please identify your proposed capture location.*

_____

* Please be advised that other permits and authorizations are required from the Department of Fish and Game, and possibly the Commercial Fisheries Entry Commission for capture of wild stock.

E. SITE PLAN & PHYSICAL DESCRIPTION

1. Provide a site plan drawn to scale (no less than 1" = 50') which shows the layout, location, and dimensions of the following (a sample site plan is provided on page 6 for your reference).
   a. The rafts or other production facilities employed (please include size and number).
   b. Anchoring systems and shoreties.
   c. Docks, upland dwellings, floating structures associated with caretaker facilities
   d. The location of waters, including any drinking water wells or other drinking water system sources, fresh water(s), and salt water, within 200 feet of the proposed wastewater disposal system.
   e. Wastewater disposal systems, including both sewage and greywater discharge points (e.g. greywater means domestic wastewater from laundry, kitchen etc., which does not contain human waste).
   f. Solid waste storage and disposal sites (note: you are encouraged to use existing permitted sites for the disposal of solid wastes).
   g. Roads or air strips.
   h. Other upland or tideland facilities at the site associated with the farming operation.
   i. Fuel and chemical storage.
   j. Properties referenced in #4 and #5 of Section B.
   k. The boundary of the farm area which is located on state lands, including tide and submerged lands.

2. Attach a cross sectional diagram of the proposed facilities, and identify the construction materials. (Diagrams prepared for the Corps of Engineers permits are acceptable.)

3. On the site plan, draw lines and identify the tide level at the following stages:

   - Mean Lower Low Water (MLLW)
   - Mean Higher High Water (MHHW)
   - Mean High Water (MHW)

4. On the site plan, diagram the prevailing direction of the surface water flows at the ebb and flood tides.

5. What is the maximum surface tidal current speed at ebb tide?____ At flood tide?____ Did you estimate or measure the speed? _____

6. What is the water depth at the site of culture gear at MLLW? _____

F. SITE SUITABILITY

1. Physical and Biological Characteristics

   a. Provide any information you may have regarding tidal flushing, water temperature, salinity, and turbidity/sedimentation at the site. Include the dates these data were recorded.

   _____

   _____

   _____

   b. Describe the bottom type composition at the site (if more than one type, indicate percent).

   sand ____ mud ____ rock ____ gravel ____ eelgrass ____

   other: _____

   c. Describe winter conditions at the site (temperatures, icing, storms, etc.).

   _____

   _____

   _____

   d. Do anadromous fish (e.g. salmon) use any streams in the area for spawning? yes ____ no ____
   If yes, indicate which streams are used and label them as such on the site plan.

   _____

   _____

   e. Is the target species naturally present in the area? yes ____ no ____
   If yes, describe abundance and condition.

   _____

   _____

   f. Describe measures you would propose to control predation by marine mammals, seabirds, or other potential predators.

   _____

   _____

   _____

   g. Indicate which of the above responses in Section F are based upon on-site investigations by circling the corresponding letter: a, b, c, d, e.

G. WATER QUALITY

Note to Applicant: Sewage or industrial discharge(s) may accumulate in or harm the growth or consumptive use of your shellfish product. Oysters, mussels and scallops are filter feeders and may accumulate fecal coliform bacteria and associated pathogens from sewage discharges. If a caretaker facility is needed for the site, and its discharge is located near the culturing operation, there may be a risk of contamination. To ensure that your growing area can be certified by DEC, the department has developed the following requirements for those aquatic farms where a sewage discharge is necessary. 1) Discharges must meet water quality standards (18 AAC 70), wastewater disposal regulations (18 AAC 72), and requirements of the National Shellfish Sanitation Program (incorporated by reference in 18 AAC 34.170). 2) No sewage discharge will be allowed within 300 feet from the boundary of an approved growing area (the boundary encompasses the entire growing area). 3) Outhouse and septic systems must maintain a minimum 100 foot horizontal separation distance from surface waters and a minimum 4 foot vertical separation distance from the high ground water table. The department will require a waste discharge permit and system plan review for all sewage discharges. Additional information may be required by the DEC depending on the type and complexity of wastewater system proposed. After review of application materials, the DEC may decide it is not necessary to issue a waste discharge permit for facilities generating very small daily volumes of sewage and greywater.

1. Wastewater Discharge and System Plan Review

   a) Is there is a floathome, dwelling or upland caretaker's facility proposed for the site? Yes____ No____
   b) Will wastewater be discharged from any of these facilities? Yes____ No____
   If yes, please provide the following information.

   - What are the daily maximum and average discharge volumes? Maximum _____ Average _____

PLEASE SUBMIT THE FOLLOWING INFORMATION ON SEPARATE PAGES
(Contact the Department of Environmental Conservation to determine submittal requirements for your specific proposal.)

- Wastewater system design plans consisting of reports and/or drawings that clearly and legibly depict the design, type, and volume of discharge. (Design plans may require preparation by a registered engineer.)
- A description of proposed and existing wastewater treatment works, disposal systems, or sewers.
- Sufficient soils and topographic information to allow evaluation of the soil type, absorption area, depth to water table and impervious surfaces, and topography, if treatment or disposal (other than a conventional on-lot soil absorption system) is into or onto land or subsurface land.

2. Were there any sources of past pollution at the site, such as a shorebased seafood processor, industrial facility, or a town or village? yes____ no____

   If you answered yes to the above, identify:

   - The type of previous use (e.g. mine, village, seafood processor) _____
   - The last known date of use _____
   - The distance from site of previous use to your project site _____

3. Are there any current potential sources of human or industrial pollution in the area? (For example, sewage outfalls, industrial transfer facilities or upland operations, boat harbors, etc.) yes____ no____

   If yes, please describe:

   - The type of discharge(s) _____
   - The location and distance from your site _____
   - The name of the discharger(s), if known _____

4. Are you aware of any other planned development in the general area of your proposed farm? yes____ no____ . If yes, please describe them.

H. CURRENT LAND USE

Are there any other human uses of the project site and the surrounding area such as commercial development, mining, timber harvest or transfer, sheltered anchorage, subsistence, recreation, commercial fishing, sport fishing, or residential use, etc? Yes____ No____

If yes, please describe.

_____

_____

_____

Certification Statement

The information contained herein is true and complete to the best of my knowledge. I understand that I must separately apply for and hold a Transport Permit from the Department of Fish and Game in order to hold, transport, and raise shellfish or aquatic plants, and a Growing Area Certification and a Harvesters Permit from the Department of Environmental Conservation in order to sell my product.

_____ _____

Signature of Applicant or Agent Date