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UNDERSTANDING ALYESKA:

THE OIL INDUSTRY AND ALASKANS

by Riki Ott

In the designated deep water anchorage just off Knowles Head in Prince William Sound, two oil tankers swing on the hook as they await a pilot boat to escort them up Valdez Arm through the Narrows and into Port Valdez to the Alyeska oil terminal. The Alyeska terminal is the southern-most point of the trans-Alaska pipeline system. The terminal clings to the steep sides of snow-covered mountains on the south shore of the deep water fjord across from the town of Valdez.

Both tankers ride high in the water exposing much of their red hulls, enormous rudders and bulbous bows, normally all below the waterline. The tankers come north nearly empty and hungry for the Prudhoe Bay crude oil at Alyeska. They look tippy, riding so high out of the water but they have both tanked down with just enough seawater–approximately 30% of their total volume–to make them stable for the trip north. When they reach the terminal, they pump off this ballast water and take on the black gold which is then transported south to refineries Outside.

Twenty four percent of the United States' domestic oil comes from the North Slope and the Alyeska terminal is a busy place with a constant stream of tankers arriving, light and high, and leaving, low and squatty. Besides being an oil terminal, Alyeska is a ballast water treatment facility, the largest in the United States, because the seawater which tankers bring north becomes contaminated with residual oil as it sloshes around in tanker holds and this oil must be removed before the ballast water can be discharged into the receiving waters of Port Valdez.

This ballast water treatment facility has been operating for eleven years. During this time, Alyeska has routinely discharged **petroleum hydrocarbons** (the compounds found in crude oil) into the water under a discharge permit authorized by the U.S. Environmental Protection Agency and monitored by the Alaska Department of Environmental Conservation (ADEC).

While Alyeska scientists steadfastly maintain there are no pollution problems in Port Valdez resulting from these routine discharges, independent National Marine Fisheries Service and NOAA scientists report that the total hydrocarbon concentration in Port Valdez sediments and blue mussels, an indicator organism, is near the low end for chronically polluted marine environments in North America. Who is the public to believe?

To understand the extent of these environmental problems, one must first understand how the Alyeska facility was designed to operate (Figure 1). Oil comes down the pipeline under pressure and, before it is loaded onto tankers, the oil is sent **crude oil storage tanks** where the oil is allowed to "off-gas." (When the pressure on the oil is released, the oil "fizzes" like opening a can of Coke.) The poisonous crude oil gases or vapors collect in the tops of the cone-shaped crude oil storage tanks. These vapors (similar to what you smell when you fill your car up with gasoline) are drawn by a centralized compressor system to incinerators where the hydrocarbons in the vapors are destroyed by burning them at high temperatures (1400 degrees F). This process is called the **vapor recovery system** (Fig. 1).

The oil is now ready to be loaded onto tankers but before the tankers can onload oil, they must offload **ballast water**. Tankers pump their contaminated seawater ballast into **ballast water holding tanks** (Fig. 1) which store ballast water until it can be properly treated. This system allows tankers to offload their ballast water quickly so they can onload oil.

Ballast water then flows into **impound basins** (Fig. 1) where, in theory, bacteria physically eat or degrade the hydrocarbons, removing these compounds from the water. The treated ballast water is discharged as **effluent** directly into the receiving waters of Port Valdez. Again in theory, the effluent now meets the state's water quality standards.

The Alyeska ballast water treatment facility was designed as a model plant but problems arose when actual plant construction and operation veered away from the original design approved by Congress. Originally the plant was designed in three phases; each phase increased the physical size of the plant as the volume of oil coming down the pipeline increased (Table 1).

Table 1.

Phase	Oil Flow Rate	# Ballast Water Storage Tanks	# Crude Oil Storage Tanks	# Incinerators
1	about 0.6 mbd	3	14	3
2	1.2-1.5 mbd	3	22	3
3	over 2.0 mbd	5	32	5

Today, however, the plant is the exact same size as when it was built in 1977 despite over a three fold increase in pipeline throughput. Alyeska is currently operating in Phase III oil production (over 2.0 million barrels per day) with only a little over Phase I plant capacity: 3 ballast water storage tanks; 18 crude oil holding tanks; and 3 incinerators.

Because the Alyeska facility is overloaded, neither the ballast water treatment system nor the vapor recovery system can keep up with the oil flow. The result is that large quantities of hydrocarbons are entering the water and air in Port Valdez daily during standard plant operations.

The vapor recovery system is both overloaded and badly in need of major repairs. To cut expenses, miles of pipeline for the vapor recovery system were built with mild steel instead of stainless and this pipeline is corroding badly throughout its length. The incinerators have trouble maintaining the high temperatures necessary to properly combust the crude oil vapors: between 1980 and 1987, inclusive, the incinerators were operating properly 6% of the time.

To compound the problems with the vapor recovery system, since early 1987 large volumes of natural gas liquids (NGLs) have been routinely injected into the pipeline when it was discovered that addition of NGLs substantially increase oil flow by reducing friction. NGLs contain a high proportion of "light ends" (highly volatile hydrocarbons) and therefore cause a much greater degree of off-gasing than crude oil alone. Additional incinerators are necessary to handle the additional vapors from the NGLs; yet Alyeska officials have made no plans to increase the size of the vapor recovery system to compensate for the additional vapors from NGLs.

To avoid stressing the rapidly weakening vapor recovery system, crude oil is loaded directly onto the tankers from the pipeline. The oil off-gases in the tanker holds releasing tons of noxious hydrocarbon vapors untreated into the air daily.

The ballast water treatment system simply does not work. Bacteria need both time and warm temperatures to properly degrade hydrocarbons: with the present system, they have neither. Because of the shortage of ballast water holding tanks, the ballast water must be rushed through the impound basins to prevent slow-downs in tanker traffic and oil flow. The bacteria are not very active in cold water. Because of the cold temperatures and rapid flow, the bacteria do not have time to eat the hydrocarbons. The resulting effluent contains high levels of hydrocarbons.

The DEC has granted Alyeska a **mixing zone** which is a volume of water in which toxic compounds in effluent mix with surrounding seawater and are diluted so that the state's water quality standards will be met at the mixing zone boundaries. However, the DEC criteria specifically state that there shall be NO MIXING ZONE ALLOWED for compounds which accumulate in the sediment or are carcinogenic. The effluent from Alyeska contains compounds which are both known **carcinogens** and powerful **mutagens** (compounds which change DNA in ways which can be passed on to offspring). The heavier weight hydrocarbons found in sludge are also known to accumulate readily in sediment.

As a result of both the standard operating procedures at Alyeska and the presence of a mixing zone, high levels of hydrocarbons in the sediment have been reported by independent scientists. But hydrocarbons are extremely mobile compounds; that is they are readily taken up by organisms and passed throughout the foodweb (see accompanying insert). Scientists have documented the following pathway for flatfish: 1) hydrocarbons settle out of the water column and collect in the sediment; 2) "bugs" (small invertebrates) pick up the hydrocarbons from the sediment while feeding; 3) flatfish pick up the hydrocarbons from the bugs while feeding; 4) the hydrocarbons are broken down in the liver (which is where poisons are sent for detoxification); 5) the resulting break-down products or **metabolites** are themselves toxic; and 6) these metabolites cause cancer in the flatfish. A similar pathway of uptake and accumulation of hydrocarbons has been demonstrated for chinook salmon.

The types of compounds that Alyeska is discharging can cause long-term environmental damage by reducing the reproductive potential of fish and other aquatic organisms. The waters of Port Valdez lie within Area E and are part of a rich fishery which in 1987 yielded over $70 million worth of salmon and herring product. Halibut, tanner crab and shrimp are also harvested commercially and for subsistence within Port Valdez. Clams are taken for personal use as well as salmon by sports fishermen. The local communities of Cordova, Valdez and Whittier are directly affected by their fishing interests in Area E.

But the implications of the environmental problems in Port Valdez affect all Alaskans, not just the communities in Prince William Sound because the seven oil companies that, as a consortium, own and operate Alyeska are the same seven oil companies that work the North Slope oil fields and that want to open the Arctic National Wilderness Refuge (ANWR) for oil development. If Alyeska is an example of how these oil companies operate "in an environmentally sound manner," what are they doing in more remote wilderness areas with even less supervision than they have at Alyeska?

In its eleven years of operation, the trans-Alaska pipeline system has paid for itself over three times: Alyeska has reported a net profit of $12.4 BILLION. The money exists and the technology exists to operate a ballast water treatment facility with minimal environmental impact. (Other oil industries both in the Lower 48 and other countries operate oil terminals with carbon filter systems with off-gas capture.)

The oil companies responsible for Alyeska need to upgrade the plant and include a state-of-the-art ballast water treatment system. Construction and maintenance work need not cost jobs on the North Slope; rather such work could employ local Alaskans. Surely it costs less, both financially and in terms of worker safety, to continually maintain and upgrade a system rather than to operate or rebuild a completely run-down system.

Other countries also use independent technical review boards composed of representatives from regulatory agencies, the oil industry, scientists, other affected commercial or recreational industries, environmentalists, and the general public to oversee and monitor operations. Perhaps we should establish such a group for monitoring Alyeska and the North Slope operations: can we really believe that one DEC employee working part-time in Valdez is enough to supervise an oil industry which supplies 24% of the United State's domestic oil?

In light of the oil industry's practices at Alyeska, Alaskans should carefully consider the decision to open ANWR for further oil development. At a time when a single sockeye salmon is worth more than a barrel of oil, we must weigh the long-term benefits from our renewable resources against the costs of our nonrenewable resources. Perhaps it is time to insist that we want oil AND A CLEAN ENVIRONMENT.

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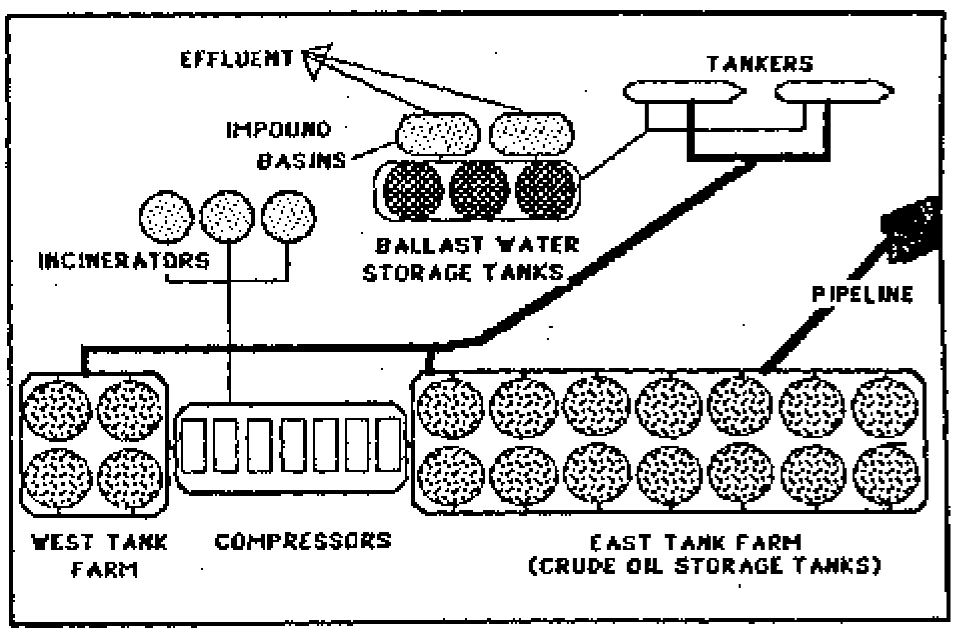

FIGURE 1. ALYESKA BALLAST WATER TREATMENT FACILITY

Spilled Oil and the Alaska Fishing Industry: Looking Beyond Fouled Nets and Lost Fishing Time

by Riki Ott, Ph.D.

Opening Remarks

On July 2, 1987, the tanker *Glacier Bay* struck a rock five miles off the mouth of the Kenai River and released 125,000 gallons of Prudhoe Bay crude oil into Cook Inlet. It was two weeks before the peak of the Cook Inlet sockeye run, which had, in 1987, an ex-vessel value of $95 million. The roughly 1,000 setnetters and gillnetters in the area were closed down or restricted to fishing clean waters south of the spill for the next 15 days. To date, only a few setnetters have recovered compensation for fouled gear, but no one has been compensated for lost fishing time: lawsuits are pending.

The price tag for damaged gear and lost fishing time is, however, a gross understatement of the total economic impact resulting from an oil spill which hampers the fishing industry. This paper will address three questions:

1) What area in Alaska currently has a high probability of an oil spill from a tanker accident?

2) What are the major fisheries in this area and how do these fisheries impact the local economies?

3) Given a worst case scenario of an oil spill during peak harvest, what would be the total costs of the spill to the fisheries and the local communities?

Oil and Alaska

In 1988, over 730 million barrels of oil, representing 24% of the total United States domestic supply, were produced in Alaska; most of it from the North Slope fields (**Figure 1**; personal communication Tom Brennan, Alyeska public relations, Anchorage, AK). Oil production also takes place in Cook Inlet from 14 platforms in marine waters. The North Slope oil is transported from the North Slope via the 800 mile trans-Alaska pipeline system to the tanker terminal, Alyeska, in Port Valdez in northern Prince William Sound.

From Port Valdez, the majority of the oil is shipped Outside at the rate of 2.0 million barrels per day (mbd). Between 65-90 tankers per month are loaded at the terminal. About three percent of the annual North Slope production is transported to the Tesoro refinery near Kenai in Cook Inlet (personal communication 'Raymond', Tesoro refinery, Kenai, AK). A small fleet of tankers and barges shuttle refined products (heavy fuel oil, diesel and gasoline) from the Kenai refineries to the Far East and small Alaska coastal communities (Figure 1). Oil tankers make roughly 250 trips per year through Cook Inlet (D.E.C. 1988).

The answer to the first question, then, is that the highest concentration of tanker traffic and, therefore, the greatest likelihood of a tanker-related crude oil spill occurs in Prince William Sound and Cook Inlet. These areas are part of the Gulf Coast or southcentral region of Alaska.

It is important to note, however, that this tanker traffic has no monopoly on spilling oil. Between November 1988 and January 1989, 41 oil spills from boating accidents occurred in western and southcentral Alaska, not counting Port Valdez! These spills varied in size from minor spills (under 10,000 gal) to major spills of over 2 million gal. Most of the spills involved fuel oil which was quickly dissipated by rough seas in open water. Let's focus on the tankers carrying unrefined crude.

There have been four crude oil spills in the Gulf Coast region associated with this tanker traffic since the first tanker left Alyeska in August 1977. Three of these spills occurred within the last <u>two</u> years (Figure 2):

<u>Cook Inlet</u>
7-2-87 *Glacier Bay* -- 125,000 gal. (3000 bbl)

<u>Port Valdez</u>
8-26-84 *Arco Alaska* -- 2,520 gal. (60 bbl)

1-3-89 *Thompson Pass* -- 71,400 gal. (1700 bbl) with 35-40 bbl. lost

1-16-89 *Cove Leader* -- 2,310 gal. (55 bbl) with 20 bbl. lost

A 1988 marine structural casualty study (Purtell et al.) reported that, of the total U.S. tanker flagships, 13% transport North Slope crude, but this 13% accounts for 52% of the structural failures of this fleet; a fact which does not bode well for the future. What, then, are the major fisheries in the Gulf Coast region and how do these fisheries impact the local communities?

Gulf Coast Fisheries: Harvesting Sector

In 1988 the combined value of the Prince William Sound and Cook Inlet commercial fish harvest was $333 million. This is 19% of the total 1988 ex-vessel value of $1.749 billion for all Alaskan fisheries; "ex-vessel" being the value of the fish paid to the fishermen (Figure 4; personal communication with James Brady, Area Management Biologist ADF&G, Cordova, AK; Halibut Commission, Seattle, WA; Herman Savikko, ADF&G, Juneau, AK).

To develop our worst case scenario, we will focus on the Prince William Sound (PWS) fisheries because this area has the greatest amount of tanker traffic and because I am most familiar these fisheries. The 1988 ex-vessel value for all PWS fisheries combined was $131 million. The salmon harvest represented $70.6 million or 54% of the total ex-vessel value; halibut about $46 million (35%); herring $12.2 million (9%); and shellfish $2.5 million (2%) (**Figure 5**).

In Alaska, the commercial fishing industry is the largest employer of local residents in the private sector. In 1988, there were an estimated 786____ limited entry permit holders participating in the PWS fisheries (personal communication with the Commercial Fisheries Entry Commission, Juneau, AK) (Figure 6). Taking into consideration the fact that many captains employ the same crew members in more than one fishery (Coughenower 1987) and based on projections from license data compiled by the Alaska Department of Revenue, an estimated 1390 workers were employed as crew members with commercial fishing operations in 1988.

Thus, the PWS commercial fishing industry employed a total of 2176 fishermen (Appendix A).

Fishermen typically deliver to tenders that transport the fish product to processing plants.

<u>Prince William Sound Fisheries: Processing Sector</u>

About one-half of the statewide employment in the processing sector is located in the entire Gulf Coast region, including Anchorage and Kodiak (Berman and Hull, 1987). Precise figures for number of people employed by processing plants is not available yet for 1988. However, average annual employment in seafood processing in the Gulf Coast region for 1979 through 1985 was fairly constant, varying between 2,859 to 3,844 (mean = 3310 ± 336) (Berman and Hull, 1987).

In 1988, 28 processing plants registered with the Alaska Department of Fish and Game, Cordova, AK, to process PWS fish. Of these, 10 plants were located within PWS and nine processors were floating plants which processed herring within PWS, then moved north.

I am narrowing the scope here from the Gulf Coast processing sector to the PWS processing sector, but it is important to realize that all plants which process PWS fish would be economically impacted by decreases in fish harvest. Plants within PWS, however, would be most affected as they process almost entirely local catch.

Employment in the processing plants in the PWS area ranged from small family operations to over 200 workers. Using an average plant employment of 90 workers (Appendix B), PWS area plants employed an estimated 900 people in 1988 (Figure 7).

According to Alaska Department of Labor statistics, people were paid an average of $8.50 per hour with 48.5 hour work weeks lasting for 3 months (Meacham and Bigler, 1988). Thus, the total annual wages for workers in the PWS area amounted to an estimated $4,452,300 (Appendix B). This figure does not include wages for salaried employees--which, as top management personnel will attest, can account for a substantial percentage of total salaries and wages paid.

Prince William Sound Fisheries: Transport and Support Sectors

There are many other elements within PWS communities that would be impacted by an oil spill in this region: for example, the transport sector. Cordova is the third largest port in Alaska (based on *ex-vessel value of seafood landed*) and the seventh largest in the United States. Raw fish and fish products are transported by air, land, and sea carriers through Anchorage, and also directly, to the lower 48 states and to countries throughout the world--where the product may be further processed, again providing more wages and economic benefits.

A model to assess economic impacts of the fishing industry in Pacific coastal communities was generated by California Sea Grant (Radtke et al. 1987). By applying this model, it is possible to estimate the economic activity generated by the 1988 salmon harvests in PWS (Figure 8). An important concept in this model is that of output multipliers which essentially show for each dollar spent, how much leaks out of the community.

An output multiplier ranging from 1.5 to 2.5 was found to apply to the fish harvesting and processing industries (Radtke et al. 1987). For the communities within PWS, the output multiplier would be below average because of the small community size, the limited number of businesses in the communities, and the greater distances to large economic centers. (This indicates that these communities would not be very self-sufficient and there would be a correspondingly greater outflow of dollars.)

Although the output multipliers for fish harvesting and fish processing are actually two different numbers, the lowest multiplier (1.5) was used in both cases to determine economic activity. Thus, the model probably understates the economic activity generated by the fishing industry.

As indicated in the model (**Figure 8**), the 1988 PWS salmon fish harvest of $70.6 million generated $264.8 million of corresponding economic activity in communities which processed PWS salmon. Note that the processor's margin is a net margin of sales revenue: the margin is 1.5 times the original price paid to fishermen for raw product (Radtke et al. 1987).

With this model in mind, let's develop a worst case scenario for spilled oil in PWS and determine economic impact to communities.

Spilled Oil in Prince William Sound: A Worst Case Scenario

A concept of the timing of the various different fisheries is central to determining economic impacts from an oil spill (**Figure 9**). The entire sac roe herring fisheries occurs in a 1-12 hr window during a two week period in March/April; the bait herring fisheries occurs within a week period during October/November. ADF&G biologists in Cordova, AK, felt that in the event of an oil spill in the same location as herring were schooling, the fisheries would simply not take place.

Halibut quotas are typically taken during two or three 24 hr openers: one in May, June, and September or October, if necessary. These openers are scheduled by the International Halibut Commission and would not be changed in the event of an oil spill. For fishermen with small boats unable to move out of affected waters, the window of opportunity for this harvest would be lost.

The peak of the crab harvest occurs between September through January; shrimp are fished year round with the highest landings from April through September. Again according to the ADF&G biologists in Cordova, AK, in the event of an oil spill, the fisheries in the impacted area would be temporarily closed down.

A worst case scenario for an oil spill would involve the salmon fisheries because this fisheries generates the greatest ex-vessel value and also employs the greatest number of people both directly and indirectly. Within PWS, the salmon are harvested commercially from mid-May through September with the peak occurring in July/August.

Let's look at the effects of a hypothetical oil spill in Port Valdez during the peak week of the pink salmon harvest (**Figure 10**). Because of the narrow entrance to Port Valdez, the circulation is restricted and it would be fairly realistic to assume that an uncontained medium oil spill could close down the seine fisheries for a week.

The 1987 data for the Solomon Gulch hatchery in Port Valdez shows that the peak week occurred during July 4-11 when a total of 4,906,000 pounds of salmon were harvested in the Eastern District (ADF&G statistical areas 221-60 and 221-62 from ADF&G 1987) (**Figure 11**). This represented 15% of the total volume of salmon landed during the 1987 season. Based on 1988 prices, the ex-vessel value of these fish was $3,915,000 (Appendix C).

Let's look at three different ways to measure economic impacts from this loss of fish dollars through: direct relationships; the economic impact model; and hidden or abstract relationships. One example of direct losses to the support sector could be calculated in taxes (**Figure 12**). The PWS salmon fisheries are assessed 5.3% of the gross for taxes which in this case amounts to $207,000 ($3,915,000 x 5.3%). The loss would be shared by the PWS Aquaculture Corporation (PWSAC) which assesses a 2% tax for its salmon ranching program; the local communities' and state's budgets which (in PWS) split the 3% raw fish tax equally; and, the Alaska Seafood Marketing Institute (ASMI) which assesses a 0.3% tax to defray marketing costs.

The model of Radtke et al. (1987) can be used to estimate the loss in economic activity from a fish harvest decreased by $3,915,000 (**Figure 13**). Using the same output multipliers as earlier, the loss in economic activity amounts to $14,682,000. This loss would be shared by all the communities processing PWS salmon at the time of the spill.

The total loss to fishermen and communities is shown in **Figure 14**. The $182,000 gear loss figure was determined assuming $13,000 per seine (personal communication Phil Lian, Area E, Cordova, AK), peak effort of 140 boats during the week of July 4-11 (ADF&G 1987), and a 10% gear loss.

The ratio of the total economic loss of $18.7 million if 4.5 times the decreased fish harvest of $3.9 million. The 4.5 ratio is most likely an underestimate of the total economic impacts. An economic study by the University of Rhode Island found that the loss to the community was 9 times the loss from the fisheries (University of Rhode Island, 1988).

PWS Fisheries: Hidden Costs of an Oil Spill

There are additional costs of an oil spill which are more extensive than can be readily measured by taxes and models. For example, it is difficult to pin a value on market image, or public perception of product, but unfavorable perception has definite economic impacts (Figure 15). In 1982 one man in Belgium died from botulism poisoning: the cause of his demise was improperly canned pink salmon--from Alaska. The resulting botulism scare drove the statewide (ex-vessel) price of pink salmon down 34% from 44 to 15¢/lb. It was five years before the ex-vessel price of pink salmon again reached 44¢/lb (personal communication Ralph Lohse, fisherman, Cordova, AK).

In 1988 the Alaska Seafood Marketing Institute (ASMI) spent $3.2 million to develop and market an image of "pure and pristine" seafood from Alaska. Yet this image is very tenuous. Public perception of Alaska salmon is just that: Alaska salmon. The image is not divided by area. Fish contaminated by an oil spill in one area could drive down the price statewide.

The multi-million dollar tourism and sport fishing industries also depend on a "pure and pristine" image. A major study on the economic impact of the sport fishing industry in southcentral Alaska (Jones & Stokes 1987) found that 2.5% of the total sport fishermen make a trip to Port Valdez. Both sport fishermen and tourists are very mobile so that, should there be a major oil spill in Port Valdez, trips (and dollars) to Port Valdez would most likely be routed elsewhere in the state.

And finally, there could be environmental damage which could affect the size of the recruitment class and future runs. This is an important concept because young of the year for one fisheries or another are present in the water column throughout the year (**Figure 16**). Spilled oil could also affect recruitment indirectly by impacting lower trophic levels; i.e., fish food.

Summary

In summary, there are three main points. First, some form of oil or its refined products is spilled frequently in Alaska. There are a lot of small boats associated with the fishing industry that should not be out in the kind of weather they quite often find themselves in. But the fishermen, especially those of us in the Gulf Coast region and Bristol Bay (lease sale 92), are concerned about "The Big One." Given the high frequency of tankers into Port Valdez, the increasing age and size of that tanker fleet, and the inability to quickly contain and clean-up an oil spill in open water of Alaska, fishermen feel that we are playing a game of Russian roulette.

Second when, not if, "The Big One" does occur and much or all of the income from a fishing season is lost, compensation for processors, support industries and local communities will be difficult if not impossible to obtain. Fishermen, the Coast Guard, and State agencies do in general have greater legal protection and recourse. However, the process is extremely slow. While the Coast Guard and State agencies may have the resources to weather the inevitable legal delays, Alaskan fishermen--engaged in seasonal efforts that occur only once a year--will be faced with an immediate economic crisis.

Last, there are several major studies underway regarding the economic
impact of the fishing industry throughout Alaska. When these studies are released, it will be possible to more accurately estimate economic impact resulting from a decreased fish harvest.

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References

Alaska Department of Fish and Game. 1987. Commercial Salmon Catch Statistics for the Prince William Sound Management Area for 1987. Division of Commercial Fisheries, Cordova, AK. Report 87-12.

Alaska Department of Fish and Game. 1988. Commercial Salmon Catch Statistics for the Prince William Sound Management Area for 1988. Division of Commercial Fisheries, Cordova, AK. Report 2C88-12.

Alaska Fisherman's Journal. 1989. 1988 Wrap Ups: Halibut, Crab, Salmon, Herring. Seattle, WA. Vol. 12 (1): 54-73.

Berman, M.D. and T. Hull. 1987. The Commercial Fishing Industry in Alaska's Economy. Institute of Social and Economic Research, Univ. of Alaska, Anchorage. 55 pp. plus appendices.

Coughenower, D.D. 1987. Commercial Fishing Industry Study. Homer, Alaska. Alaska Sea Grant College Program, Univ. of Alaska Fairbanks. Marine Advisory Bulletin No. 33: 27 pp.

Jones & Stokes Associates, Inc. 1987. Southcentral Alaska Sport Fishing Economic Study. Prepared for Alaska Depart. Fish and Game, Division of Sport Fisheries, Anchorage, AK

Larson, D. 1980. 1979 Fisherman's Income Survey Herring and Salmon Fisheries. Alaska Sea Grant Program, Univ. of Alaska Fairbanks. Report 80-5: 20 pp.

Meacham, C.P. and B.S. Bigler. 1988. Importance of Commercial Fisheries to Anchorage. Presented at the Alaska Chapter of the American Fishery Society Meeting Nov. 16, 1988.

Purtell, T.W., T.C. Mielke and J.P. Brusseau. 1988. Report to the Marine inspection program casualty review council: Marine Structural Casualty Study. 33 pp.

Radtke, H., C.M. Dewees and F.J. Smith. 1987. The Fishing Industry and Pacific Coastal Communities: Understanding the Assessment of Economic Impacts. Pacific Sea Grant College Program, Univ. of Cal. Marine Advisory Publication UCSGMAP-87-1, 10 pp.
University of Rhode Island/Sea Grant reference available by phone (907)424-3915

Appendix -A

Calculation of number of PWS fishermen in 1988

Seine permits (270) x ave. no. crew (4) =	1080 crew
Gillnet permits (540) x ave. no. crew (.25) =	136 crew
Setnet permits (30) x ave. no. crew (1.5) =	45 crew
Crabbers (38) x ave. no. crew (4) =	152 crew
Adjustment dual permit holders (92) =	<92>
Adjustment dual crew (92 x .25) =	<23>
Permit holders: seine	270
gillnet	540
setnet	30
crabbers	38
Total	2176

Assumptions:

1) "Crabbers" refers to the highest number of boats participating in the shellfish fisheries in August (indicates number of boats not participating in the salmon fisheries).

2) Average crew numbers from Coughenower 1987 with adjustments for the PWS salmon fisheries (less crew on gillnetters).

Appendix B

Estimates of 1988 Average Annual Employment in PWS Processing Sector

No. of plants processing PWS finfish in Cook Inlet & PWS

Total	28	(Supplied by ADF&G, Cordova, AK)
Adjustments		
Floaters	<9>	
Anchorage	<5>	
Small plants	<2>	
Kodiak plants	17	
Subtotal	29	

Average Annual Employment in Gulf Coast Region
(Supplied by Berman & Hull, 1987)

Mean	3310	
Adjustments		
Anchorage	<717>	(Supplied by Meacham & Bigler)
Subtotal	2593	

Estimate of Workers in PWS Processing Sector

No. of Workers (2593) / No. processing plants (29) = 90 workers/plant

Ave. no. workers per plant (90) x No. plants in PWS (10) = 900 workers

Estimate of Total Annual Wages from Processing Sector in PWS

Method #1

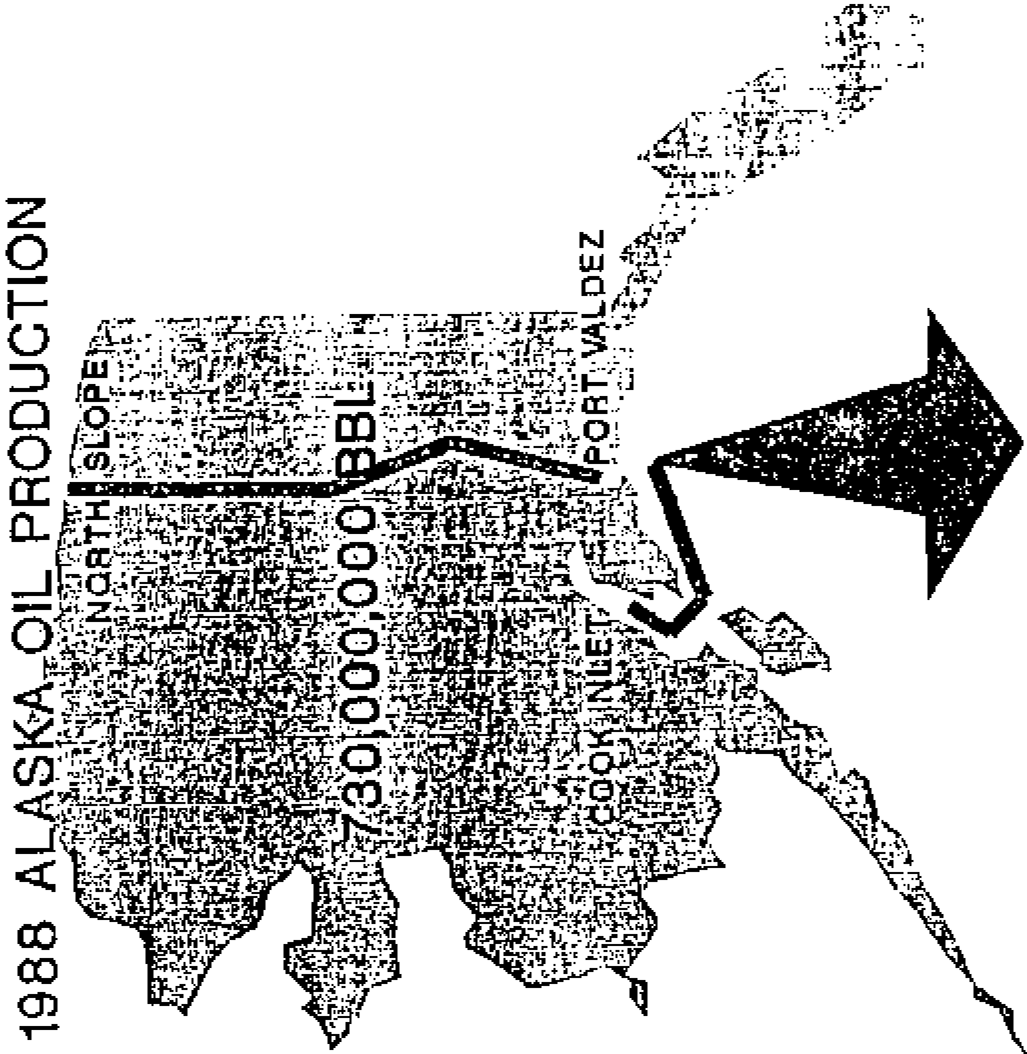
$8.5/hr x 48.5 hr/wk x 12 wk = $4947 (Meacham & Bigler 1987)

$4947/worker x 900 workers = $4,452,300

Appendix C

Ex-Vessel Value of Seine Fisheries in Port Valdez
July 4-11, 1987

Species	Pounds (1,000)	Ex-Vessel $/LB	Ex-Vessel Value ($1,000)
Pink	4,743	0.80	3,795
Chum	158	0.70	111
Sockeye	3	2.75	8
Coho	2	1.00	2
Chinook	--	2.75	0.5
TOTALS	4,906		$3,915


1988 ALASKA OIL PRODUCTION
NORTH SLOPE
730,000,000 BBL
PORT VALDEZ
COOK INLET

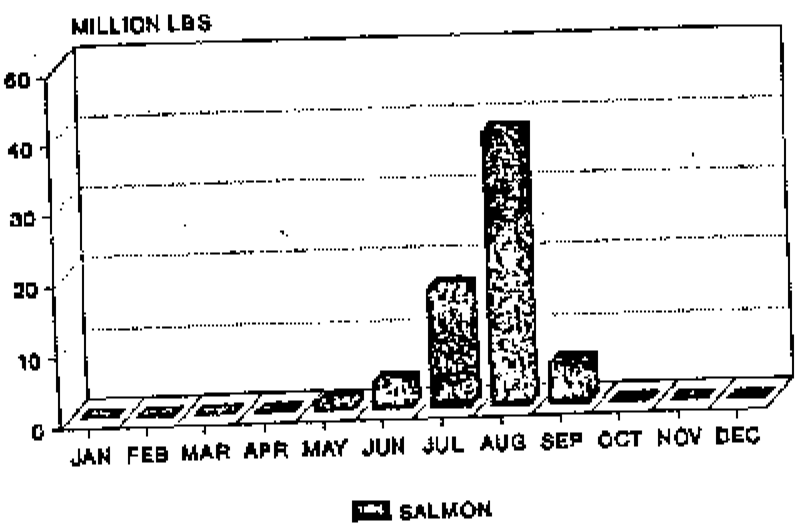
ECONOMIC ACTIVITY GENERATED BY PWS FISHERIES ($ millions)

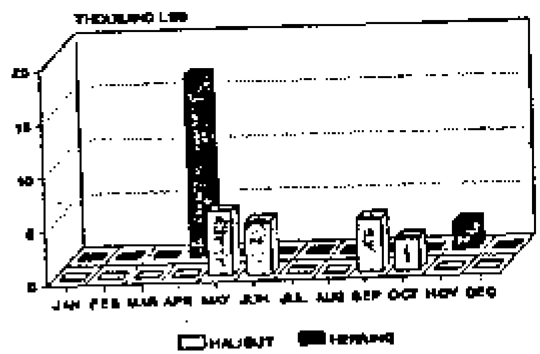
FISH HARVEST	x	OUTPUT MULTIPLIER	x	PROCESSOR'S MARGIN	=	ECONOMIC ACTIVITY
$70.6	x	1.5*			=	$105.9
$70.6	x	1.5*	x	1.5	=	$158.9

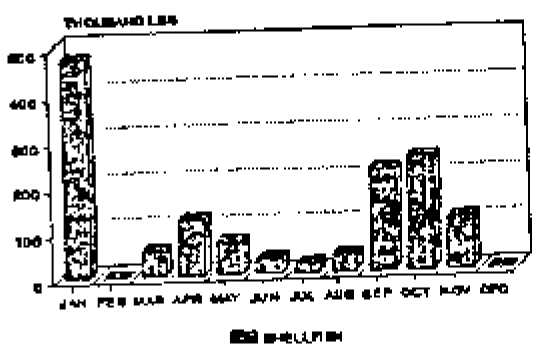
TOTAL

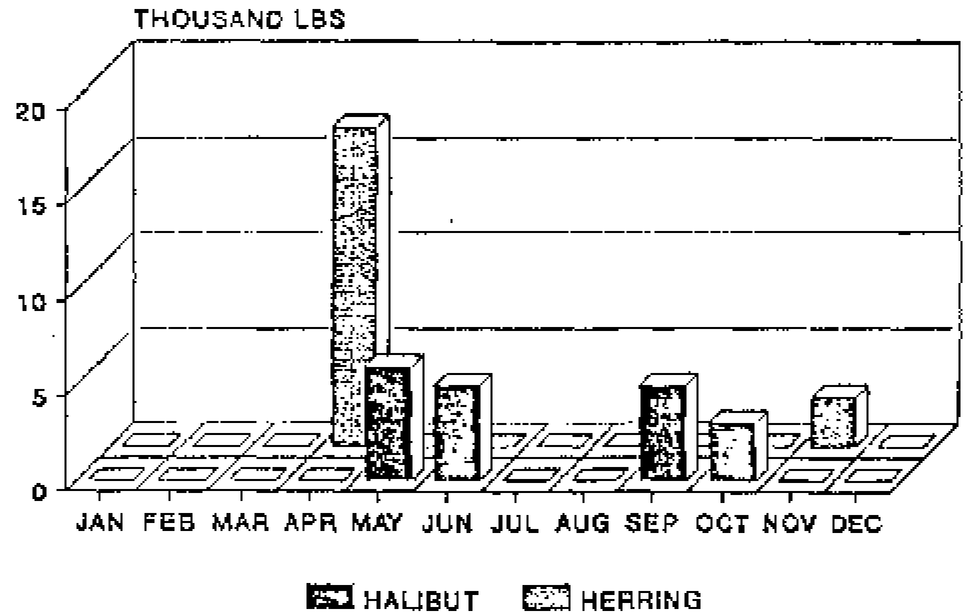
$264.8

1988 PWS HARVEST TIMING







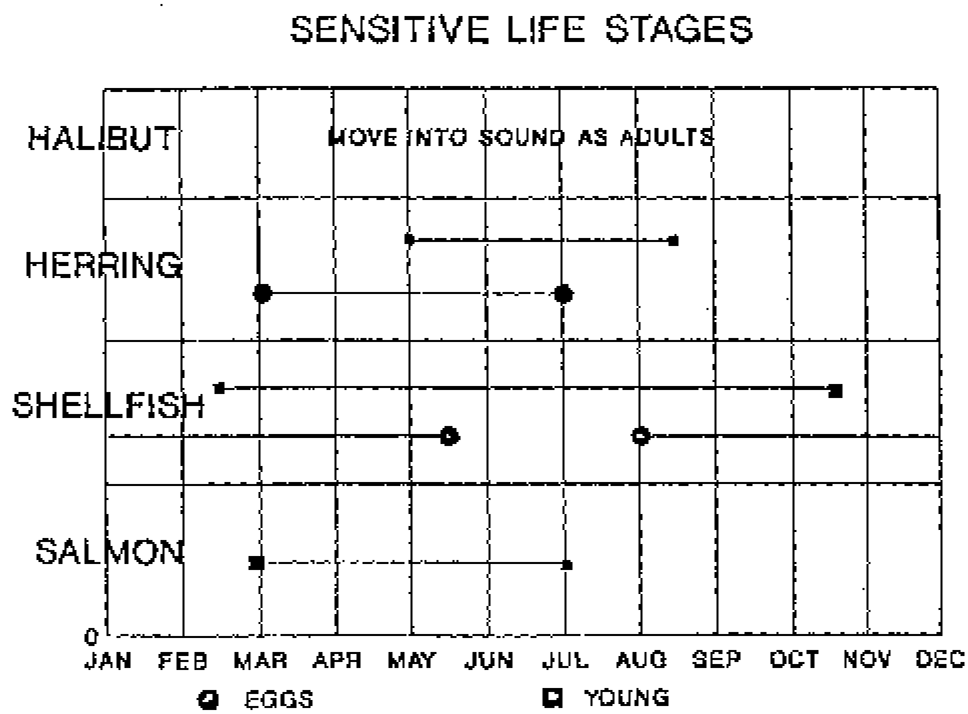

THOUSAND LBS
20
15
10
5
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
HALIBUT
HERRING

ECONOMIC IMPACT OF OIL SPILL
($ millions)

DECREASED FISH HARVEST	x	OUTPUT MULTIPLIER	x	PROCESSOR'S MARGIN	=	ECONOMIC ACTIVITY
$3.915	x	1.5*			=	$5.873
$3.915	x	1.5*	x	1.5	=	$8.809

TOTAL

$14.682


SENSITIVE LIFE STAGES
HALIBUT
MOVE INTO SOUND AS ADULTS
HERRING
SHELLFISH
SALMON
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
EGGS
YOUNG