

A Tale of Two Rivers

Culture, Ecology, and Competition in an Alaskan Fishery

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ABSTRACT Most ethnographic accounts of commercial fishing have been concerned with ocean fisheries; river-based fisheries have received comparatively little attention. This paper concerns a Pacific salmon (*Oncorhynchus* spp.) set gillnet fishery in Southeast Alaska. It first examines the techniques and strategies used by setnet fishermen and how these have been shaped by the very different ecological conditions of two rivers. The paper then examines the different rules observed by the fishermen to determine access to and allocation of fishing sites, a potentially thorny problem in a river-based fishery where the best fishing sites are known by all fishermen and are finite in number. Of particular concern is how the fishermen have responded to increased competition for fishing sites and the mechanism adopted to avoid conflict. [Maritime, commercial fishing, ecological anthropology.]

While the literature on the anthropology of fishing has grown considerably in recent years (cf. Acheson 1981), the bulk of the writings concern marine fisheries. Alaska is a notable exception to this; anthropologists and other social scientists working for the Subsistence Division of the Alaska Department of Fish and Game (ADF&G) have conducted many studies of river-based fisheries (e.g. Braund 1980; Stanek 1981; Magdanz 1981; Stokes 1982; Thomas 1982; Caulfield 1983; Wolfe and Ellanna 1983; Magdanz and Ollana 1985). Most of these studies, however, have been of subsistence rather than commercial fishing, and because they have been conducted for a fish and game regulatory agency they have focused primarily on the distribution of fishermen, the mapping of resources, harvest levels, and other matters related to the management of resources. Moreover, the methodology on which these studies have been based has been primarily social surveys, and consequently the ethnographic content of the writings has been minimal.

The aims of this paper are threefold. The first is to provide an ethnographic account of the commercial Pacific salmon (*Oncorhynchus* spp.) set gillnet (setnet) fishery in the Yakutat region of Alaska. Second, is to examine how fishermen in the setnet fishery allocate rights to fishing sites, and how the different ecological conditions of two adjacent rivers have resulted in very different rules. And third, is how the fishermen have responded to increased competition caused by the arrival of a new group of *mobile* fishermen.

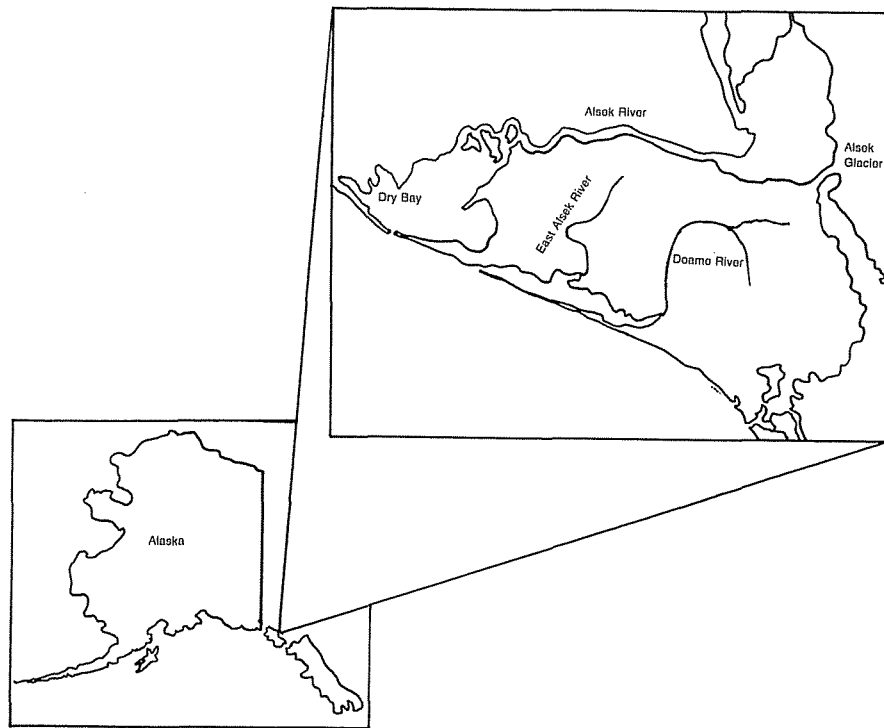
This salmon setnet fishery in Yakutat involves stretching gillnets from a river bank out into the river; salmon migrating upstream to spawn hit the nets and become entangled. The trapped fish are then *picked* from the nets by fishermen working from small boats while the nets are still in place. As in other fisheries, such as seining and trolling, there are proscribed rules of behavior to regulate the competition for access to the best fishing sites. Because setnetters are cognizant of the best places to fish, rules are needed to regulate the competition for access to the best sites. Setnetting in this region does differ from these other techniques for harvesting salmon in several ways though. First, setnetters spend comparatively little time in their boats away from land, and when they are on the water they are seldom more than 30 m from the shore. In contrast, trolling and seining are done on the open water; the fishermen work, eat, and sleep on their boats, and may be away from land for days at a time. Second, there is less danger in setnetting than in open sea fishing. This is not to say that setnetting is without hazard, especially in the glacial streams of Alaska which are frigid and swift; but it is clearly safer than fishing in the open seas of the Gulf of Alaska, where severe storms can develop quickly. Third, in riverine setnetting there is less uncertainty in knowing the location of the salmon since fishermen can read the contours of the river bank and the corresponding flow of the water to determine where the fish are mostly likely to gather. Trollers and seiners, in contrast, operate in a marine environment where it is more difficult to determine the location of salmon (Gatewood 1984; Langdon 1977, 1982; Orth 1986, 1987). Finally, setnetters typically work alone, whereas most trollers and seiners work in crews.

The fieldwork on which this study is based was conducted by the senior author (G. Gmelch) during the summers of 1982 and 1986.¹ The data were collected through a multi-method approach involving participant-observation, informal interviews, questionnaires, mapping, inventories of fish camps, and review of ADF&G harvest data. While the bulk of the data is qualitative, with much of the field time spent observing fishermen at work, a questionnaire survey was used to gather basic data on demography and patterns of resource use. The survey schedule was administered to 31 fish camps, 22 (92%) of the study area's stationary fishermen and 9 (35%) of its mobile fishermen.

The Setting: The Alsek and East Rivers

Dry Bay, the setting of this study, is located on the Gulf of Alaska about 80 km south of the village of Yakutat (see Map). The commercial fishery there takes place on two rivers – the Alsek and the East – which flow across a short coastal plane, known as the Yakutat forelands. Forming a backdrop to this coastal plane is one of the largest mountain ranges in North America, the St. Elias Mountains, with several peaks in excess of 5,000 m. Immense glaciers scour the mountain valleys, with melt water feeding the streams that flow out to the ocean.

The Alsek and East Rivers are radically different from one another. The Alsek River, which rises in the Yukon Territory, is almost 325 km long; while the East



Map of the Dry Bay area

River runs just 23 km from its artesian source to the ocean. The Alsek is extremely cold (3-5°C); most of its volume being glacial melt. The East River is shallow and because it is non-glacial, is comparatively warm (13-18°C). The water of the Alsek is turbid. From the air, its milky grey color gives it the appearance of watery cement. The East River, in contrast, is crystal clear. The current of the Alsek is swift, averaging six knots, while the East River's current is a gentle two knots.

Setnetters in both rivers focus their efforts primarily on red salmon (*O. nerka*), although pink (*O. gorbuscha*), chum (*O. keta*), coho (*O. kisutch*) and king salmon (*O. tshawytscha*) are important additions to the monetary value of the catch. Since 1976, the annual harvest of salmon in the Dry Bay region has ranged from a low of 62,172 salmon in 1976, to 217,363 salmon in 1985. Generally, the harvest from the East River has contributed the bulk of the catch (cf. Table 1 & 2). Despite its small size, the East river is nearly twice as productive as the Alsek River. The reason for its high salmon densities are ideal spawning conditions, so ideal that the local ADF&G biologist has referred to the river as "one giant hatchery" (Alex Brogle, pers. comm.).²

Table 1. Historical salmon setnet harvest in the East River: 1976-1989

Year	# of Fishermen	Days Fished	Kings (#)	Reds (#)	Coho (#)	Pink (#)	Chum (#)	Total Catch (#)
1976	8	54.5	119	29,816	1,129	3	6,712	37,779
1977	8	na	104	21,309	3,392	454	7,000	32,259
1978	18	57.0	80	31,003	4,727	185	5,428	41,423
1979	22	47.0	261	51,262	2,933	853	5,979	61,288
1980	52	41.0	76	48,530	2,401	193	18,782	69,982
1981	58	34.0	116	47,365	6,520	2,141	8,734	64,876
1982	40	42.0	81	97,785	2,026	428	4,668	104,988
1983	52	29.5	30	82,204	4,891	273	9,566	96,964
1984	48	27.5	22	39,023	10,875	851	22,419	73,190
1985	66	35.0	67	185,851	8,148	801	10,576	205,443
1986	78	28.0	109	76,355	2,769	332	14,285	93,850
1987	89	50.2	98	133,723	5,134	113	10,525	149,593
1988	81	39.0	40	61,483	20,148	2,628	24,453	108,752
1989	92	43.0	42	145,516	7,287	678	13,724	167,247
N:	14	13	14	14	14	14	14	14
Min:	8	27.5	22	21,309	1,129	3	4,668	32,259
Max:	92	57.0	261	185,851	20,148	2,628	24,453	205,443
Aver:	51	40.6	89	75,088	5,884	710	11,632	93,402
SD:	29	9.7	59	49,339	4,907	767	6,342	51,053

Note: From Anonymous (n.d.).

A Brief History of the Fishery

The fishermen in the Dry Bay area are all seasonal and comprise both Alaska Native (Tlingit) and non-native Anglo-Americans. There have not been any year-round residents in the Dry Bay area since 1908 when the last Tlingit village in the area was abandoned (Goldschmidt 1946:840).³ At that time many of the Dry Bay natives moved to the large village of Yakutat, returning to Dry Bay only during the summer months to fish; others moved permanently from the region, settling in other towns in southeast Alaska. The transition from year-round village life in Dry Bay to seasonal stays in summer fish camps was hastened by the construction of a cannery in Dry Bay in 1910. The cannery provided fishermen with transportation from Yakutat to Dry Bay, making it possible for the natives to fish at Dry Bay, yet live in town.

At the same time, many Norwegians and Finns who had come to the area to work in the cannery, switched to fishing where they could earn more money and be independent as well. When the fishing season ended each September they moved to Alaskan coastal towns and cities, such as Sitka and Juneau, for the winter (Brogle 1981).

Table 2. Historical salmon setnet harvest in the Alsek River: 1976-1989

Year	# of Fishermen	Days Fished	Kings (#)	Reds (#)	Coho (#)	Pink (#)	Chum (#)	Total Catch (#)
1976	20	53.0	545	18,712	4,954	0	182	24,393
1977	22	57.0	1,385	39,409	11,351	58	169	52,372
1978	29	49.0	2,285	49,646	13,402	39	164	65,536
1979	38	45.0	2,561	40,223	6,044	25	120	48,973
1980	40	42.0	1,401	25,385	7,602	9	929	3,326
1981	21	40.0	761	24,680	10,614	25	472	36,552
1982	25	34.0	523	28,917	6,304	6	72	35,822
1983	18	40.0	77	19,131	5,661	7	299	25,175
1984	22	33.0	60	14,409	7,854	23	1,354	23,700
1985	21	33.0	212	5,603	5,674	8	423	11,920
1986	23	34.0	476	24,164	1,331	13	537	26,521
1987	27	38.0	345	11,299	2,537	0	1,922	16,103
1988	30	34.0	223	6,286	4,986	7	907	12,409
1989	28	38.0	240	13,513	5,972	2	1,031	20,758
N:	14	14	14	14	14	14	14	14
Min:	18	33.0	60	5,603	1,331	0	72	11,920
Max:	40	57.0	2,561	49,646	13,402	58	1,922	65,536
Aver:	26	40.7	792	22,956	6,735	16	613	31,111
SD:	7	7.7	810	13,117	3,274	17	548	15,769

Note: From Anonymous (n.d.).

The cannery closed in 1913 when the company's vessel, loaded with the entire season's catch of salmon (14,000 cases), sank in the mouth of the Alsek River, bankrupting the firm. But commercial fishing continued in the area after the 1913 accident, with the catch being shipped out for processing (History 1949).

Many of the native fishermen from Yakutat left the Dry Bay area abruptly after an earthquake measuring 8.2 on the Richter scale occurred in 1958. The earthquake had swept men off their feet, opened large fissures in the earth around them, changed the course of one area river and caused the largest vertical uplift (approximately 14 m) of land ever recorded. These fishermen did not immediately return after the earthquake as other rivers nearer to their homes in Yakutat were producing good catches. But by 1978, with the productivity on some of the other rivers declining and reports of tremendous profits at Dry Bay filtering into Yakutat, they began to return. Many of these older Yakutat fishermen had actually fished on the Alsek and East Rivers prior to the 1958 earthquake.

In 1982 the number of fishermen in the Dry Bay area varied from 30 to 75, depending upon the time of the season. Nearly all of the fishermen were men; the only exceptions were two women both of whom entered fishing through male



Fish camps of mobile native fishermen on the beach, near the East River



Fish camp of a non-native fisherman on the upper Alsek

relatives (i.e., one took over her husband's permit upon his death, and the other first fished with her father).

The fishermen comprise two recognizable and self-identified groups: 1) the stationary fishermen who have permanent fish camps (58 individuals in 24 fish camps), and 2) the mobile fishermen who spend only part of the season in Dry Bay, living in tents and temporary shelters on the beach (their numbers fluctuate widely; at the peak of the sockeye run in early August there are approximately 40 individuals living in 20 fish camps). The stationary fishermen are all non-native and most leave the region at the conclusion of the fishing season, although their permanent camps remain behind. The mobile fishermen are primarily Tlingit and all are residents of Yakutat. In addition, the mobile fishermen fish a number of different rivers along a 325 km stretch on the Gulf of Alaska during the summer fishing season.

Management of the Fishery

Setnetting is an extremely efficient method for catching salmon. So effective that well over half of all the fish in a river may be harvested during an *opening* (the weekly period during which fishing is allowed). On the narrow East River, where the nets often stretch two-thirds of the way across, and where there are 10 nets in the first five kilometers of the river, over 90 per cent of the salmon in the river are taken during an opening (Alex Brogle, pers. comm.).

The setnet fishery is managed by ADF&G by controlling the length of open-

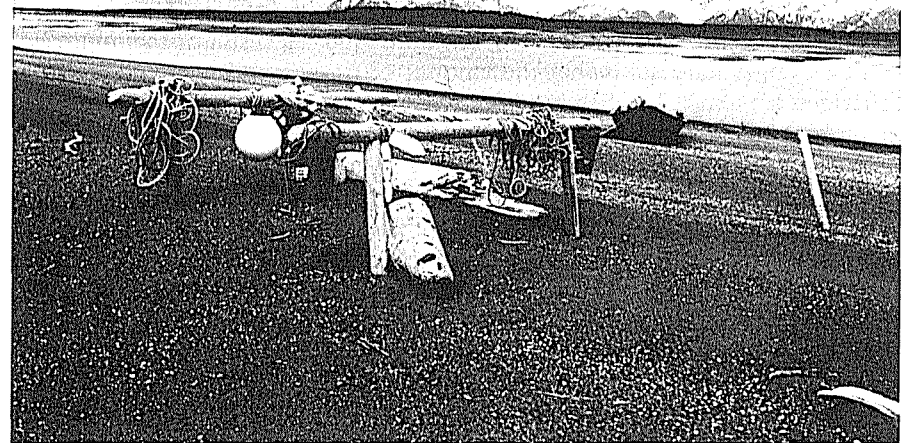


Mobile native fishermen checking their gillnets on the East River

ings and amount of gear used, limiting access to permit holders, and regulating the areas where fishing is permitted. The ADF&G stipulates that nets be a minimum of 100 yards (91.4 m) apart. ADF&G permits fishing for periods of one to four days (openings). In the past, openings were customarily five days each week, but as the effectiveness of fishing gear and the number of fishermen increased, openings have become shorter. Dry Bay area fishermen now get one day openings at the start of the season. Once there has been an adequate escapement of salmon the opening is increased to two days and late in the season (August-September) to three days.

State regulations also limit the amount of gillnet each fisherman may use. On the Alsek river, each fisherman is limited to not more than 91.4 m of gillnet prior to the third Monday in July; after which they are limited to 137 m. While on the East River, fishermen are limited to not more than 36.6 m of gillnet prior to the first Monday in September, and 73.2 m after (Anonymous 1984). In addition to restricting time, gear and effort, the area on each river where fishing is permitted is also regulated. On the Alsek the distance is 22.5 km while on the East River it is 4.8 (Anonymous 1984).

Since 1974, participation in this fishery has been controlled by the Alaska Commercial Fisheries Entry Commission. Entry permits may be owned only by individuals, though they are freely transferable with a current market value of \$40,000. Prior to 1974 anyone who bought a commercial fishing license could fish in the Dry Bay area. But with the introduction of limited entry in 1974, commercial fishing was restricted to those who qualified for a permit. To qualify,



Rack for drying nets on the lower Alsek River

a fisherman had to have fished commercially in the area for a period of time prior to 1973. The purchase of an entry permit usually includes a fish camp and gear.⁴

The Techniques and Strategies of Setnetting

First let us examine the technology. The single most important piece of equipment is the gillnet. The gillnet is comprised of the webbing or mesh in which the salmon are caught, the *corkline* which is a rope that runs along the top of the net and to which are attached corks or floats, and a *leadline* which is a weighted rope that is attached along the bottom of the net to make it hang vertically in the water. Both the corkline and leadline are attached to anchors at the end of the net by means of a rope yoke. The yoke is important in that makes an integral whole of the various parts of the net, and it prevents the cork and leadlines from going their separate ways in the current. Finally a buoy to mark the location of the net in the water and to carry the required identification (i.e., the limited entry permit number) of the fisherman.

Since the different species of salmon harvested in the Dry Bay area vary in size (from 11 kilogram king salmon down to 1 kilogram pink salmon) the fishermen use different size net mesh: 22.2 cm for king salmon, 15.2 cm for coho salmon, and 13.3 cm for red salmon. As the season progresses, and new species arrive in the river, fishermen remove the old webbing and stitch on the new, proper size.

In recent years new net technology has had a significant impact on the fishery. Nylon nets were introduced to the area in the mid 1970s and swiftly replaced bulky cotton webbing. Nylon webbing is more difficult for salmon to see enabling fishermen on the East River, where the water is clear, to fish during the day. Formerly, they fished primarily at night when the salmon were unable to see well. With the older cotton webbing only the less *intelligent* chum salmon could be caught in quantity during daylight. Due to the turbidity of the Alsek River, which makes it difficult for salmon to see any type of net, fishermen have always been able to catch fish during daylight. Another result of the improved nets and larger harvests is that the amount of time (length of opening) that fishermen are allowed to fish has been reduced in order to protect the salmon from being over harvested.

Setnetting also requires a boat. Until the early 1970s all Dry Bay area fishermen used the same type of boat – a 5-6 m skiff made of cedar plywood with high sides and a flattened bottom. Today, however, fiberglass skiffs of the same basic design, a few Boston Whalers, and one aluminum boat are also used. Under certain conditions each type of boat, according to the fishermen, has advantages. For example, the wood skiff has more stability owing to its greater weight, and for this reason it is used by native fishermen living in Yakutat who travel 80 km to Dry Bay on the open ocean, and who also fish in the surf. The fiberglass Boston Whaler, in contrast, is fast, economical on fuel, maintenance free, unsinkable and can carry a greater load than the others. However, its low sides do not give fishermen a place to lean while reaching over the side to tend their nets.

It is also unsuited to the surf, and is the most expensive of all the boats to buy.

Fishermen power their boats with 40-70 horsepower outboard engines. Because of the swift current and dangerous conditions on the Alsek River, fishermen have two engines; while on the gentler East River, fishermen use a single engine.

Having described the equipment, let us turn now to the actual techniques of setnetting. The site on the river where a fisherman places his net(s) in the water is known as a *set*. In choosing a set the fisherman looks for a pool or eddy where salmon gather to rest for their journey up river. The fisherman also looks for evidence of fish, either being able to see them below the surface or fining on the surface. In silty glacial streams like the Alsek, much experience is required to recognize good sets. The fisherman places his net in the water either where the fish are schooled or between them and the direction they are travelling.

Because fishermen believe that salmon follow the bank as they travel, they set their nets toward the center of the stream perpendicular to the bank. Where the current is swift the nets are often swept back toward the bank at an oblique angle. Once the nets are placed in proper position, the fisherman waits in his boat or on the bank for fish to hit – indicated by the corks or floats bobbing up and down as the salmon, caught in the mesh, struggle to get free.

Many fishermen attempt to increase their catch by chasing salmon into their nets. This is done by driving their boats at high speed back and forth, particularly driving through the holes where fish may be sitting. Since fish tend to spook downstream, the net is usually placed at the bottom of a hole and fish are chased down stream into the net. The fisherman starts upstream near the next net on the river and runs his skiff downstream in increasingly faster and tighter circles until, with his last circle, he almost touches his own net. As the chasing takes place, numbers of salmon may be seen hitting the net at once, their fins and silver bodies flashing on the surface. Chasing salmon is only done where the water is clear enough to know the location of fish, and hence it is done primarily on the East River.

According to the fishermen, fishing is best on the flood tide since salmon prefer to move into the river and upstream with the tide. However, some are caught on the ebb as the fish circulate back downstream. Hence, in the lower reaches of the river, salmon may be caught going in both directions; while in the upper reaches, above the area influenced by tidal action, fish are only caught going upstream. Dry Bay fishermen also claim that in clear water of the East River, fishing is better at night when the salmon cannot see the nets as clearly. Time of day is not a factor on the Alsek River where the turbidity makes nets difficult to see at all times. According to the local ADF&G fishery biologist, salmon are most active and do most of their travelling in early morning and late in the day and tend to sit in holes during midday (Alex Brogle, pers. comm.). Nonetheless, the tides seem to be the most important factor.

After a number of salmon have been trapped in the net, the fisherman removes or *picks* them. To do this the fisherman leans over the bow of his boat, grasps the corkline and pulls himself and the boat along the length of the net, lifting

the net to check for fish as he goes. Each time he finds a fish, that portion of the net, plus the cork and leadline, is brought over the bow of the boat and the fish is removed. When there is a good *run* (i.e., a large number of salmon moving up the river) and salmon are hitting the net frequently, the fishermen work continuously back and forth across their nets. Dry Bay fishermen say it is important to keep the nets free of salmon because once several fish are caught those following behind will see them and go around. The same principle applies to keeping the nets clear of debris.

In this regard, the two rivers pose different sets of problems for the fishermen. The East River produces enormous quantities of underwater vegetation which is swept downstream by the current, clogging the fishermen's nets. Fishermen must regularly shake their nets, a small section at a time, to get rid of it. This is exhausting work and means that the East River fishermen must spend more time at their nets than fishermen on the Alsek or other area rivers. Moreover, on the ebb tide, which increases the current, there can be so much vegetation in the water that fishermen must remove their nets from the water, or risk having it sink to the bottom with the weight. (Actually, the nets are not physically removed, because to do so would immediately make the site available to another fisherman; rather the fishermen tie the webbing and the leadline to the corkline so that very little of the net is left below the surface of the water where it could collect vegetation).

On the Alsek River the major problem is not vegetation, but drifting logs and ice from a large calving glacier upstream. Small logs and chunks of ice foil the nets and keep the salmon away; large logs and chunk ice can destroy the nets. One man lost two nets to an iceberg the size of a car. When the river floods there is so much ice and timber that it becomes impossible to fish. On the positive side, ice may be taken from the river and used to chill the fishermen's catch until it is taken to the processors; it is also used in household ice chests.

Seals, preying on the salmon, trapped in the fishermen's nets are also a problem.⁵ Fishermen estimate that five per cent of all the salmon netted are lost to seals. The salmon are mauled, most often being bitten in the area of the heart and gills and are either unsalable or fetch a lower price. Seals are said to be clever and to understand how gillnets work.⁶

Bears may also bother the nets. On the shallow East River bears wade in the stream and pull the salmon from the net. Some have actually hauled a net onto the bank to get at the fish. In both cases not only are the fish lost but the webbing is often damaged. To keep bears away, one fisherman keeps a fire going on the bank and spreads his dirty laundry on bushes to give the area a strong scent of humans. Another uses an automatic, noise-making cannon, like those used to keep birds away from cornfields. Still others shoot bears. Occasionally, wolves, both singly and in packs, are observed taking fish from nets that were left partially dry as the tide went out (Gordon Woods, pers. comm.).

The fishermen's nets also catch unwanted species of fish, notably starry flounder (*Platichthys stellatus*), Dolly Varden (*Salvelinus malma*), and Dogfish (*Squalus acanthias*). The number of these incidentals caught is particularly high

around the mouths of the rivers and declines as you travel upstream. On the East River, one fisherman was observed picking three flounder for every salmon from his net. Another fisherman reported that during one 24 hour period of heavy fishing he took over 150 flounder and 30 Dolly Varden from his net. Most Dry Bay fishermen throw incidentals back into the water (many do not survive); others simply toss them in their boats or on the bank so that they will not get caught in their nets again. A common euphemism for discarding fish in this way is to feed them to the eagles. Given the abundance of salmon, very few fishermen take the incidentals back to their camps to eat.

About twice each day, under normal fishing conditions, fishermen haul their catch to a small processing plant on the Alsek River. Most fishermen transport their catch themselves; those more distant from the plant have the fish buyer come pick up their fish in return for a slightly reduced price for the fish.

At the processing plant company workers unload the fisherman's boat at the river bank. Using a fish pew (a single tine pitch fork) they transfer the fish, counting the number, from the boat into a net lined sled. The sled is then pulled up the bank by a truck. The load of fish resting in the net is raised overhead by a small crane to which is attached a scale. The catch is weighted with the different grades or quality kept separate. The number of each category of fish and weight is then recorded with the fisherman's name and permit number, and a receipt given to the fisherman. Payment is made by check the following week.

The number of salmon caught during an opening may fluctuate widely from week to week depending upon the timing and strength of the *run*. For example, one East River fisherman, in 1982, caught only 17 fish one week, and at the same location he caught 1,200 fish a month later at the peak of the red salmon run; the difference in weekly earnings was over \$7,000. Due to the size of the Alsek, there may be enormous differences in the catches of fishermen fishing at the same time, the differences being due to an uneven distribution of salmon in the river as well as migration paths that bypass some sets. For example, during one opening in July 1982, there were over 20 fishermen in the Dry Bay area, yet 15 per cent of the total catch was taken by a single fisherman at the mouth of the Alsek.

In the Dry Bay area there is none of the secrecy concerning catch success that is often characteristic of other fisheries (see Andersen 1972; Stuster 1978, 1980; Acheson 1981). Dry Bay area fishermen talk freely with other fishermen about how they are doing, disclosing without deception the number of salmon caught. Reports of individual catches are passed from person to person, usually beginning at the processor where the fish are weighed in. Using this information, fishermen are quick to generalize about how well one river is producing compared to the other, and more specifically how one section of a river is doing compared to others. Much of this is done out of sheer interest or curiosity, but the information may also be useful in deciding where to fish during the next opening.

Access to the Resource

Success in the Dry Bay setnet fishery is heavily dependent upon the fishermen securing good locations on the river to place their nets. The fishermen with the best sets usually catch the most fish. Other factors are also important to fishing success, particularly hard work, or in the words of the fishermen the willingness to "sit on your nets," picking them clean of both fish and debris regularly, day and night when the salmon are moving. But the quality of the set is most important.

On the upper reaches of the Alsek River, fishing sites are strongly identified with particular families.⁷ In effect the river is divided into a number of distinct fishing territories, and by gentlemen's agreement integrity of these territories is observed by all local fishermen. Generally, when a fisherman purchases a limited entry permit, it is accompanied by the previous owners fish camp (usually a shack or cabin) and first rights to the best sets along the bank near his camp. Over the past decades no one has successfully usurped one of these sets, though one was temporarily taken while a fisherman was absent for a season.

The situation is quite different on the East River and on lower Alsek River where the rivers fan out into a delta. Here constant erosion and the repositioning of sand bars results in good sets frequently disappearing. While a number of permanent fish camps have been established along these waters, none of the camps are today near a prime producing set. The result is an understanding among fishermen that sets are claimed on a first come first serve basis. And once the fishermen claim their sites, they are able to keep them as long as they continue to regularly work them. The fishermen let one another know where their sets are by placing a buoy on the river bank with their name or fishing permit number on it. When large discrepancies in the sizes of the fishermen's catches occur over several openings, custom is strained. Fishermen with sparsely producing sets naturally want to move their nets to areas of greater productivity in order to increase their catch. Fishermen say that this is even more important today than in the past due to the shorter openings.

Short openings and the impermanence of good sites on the lower Alsek and East Rivers has resulted in some fishermen encroaching upon the territory of others, called *corking off*. The term commonly refers to placing one's nets immediately downstream of another fisherman's and thus intercepting salmon bound for his nets. Corking off is usually illegal since the encroaching fisherman usually places his net inside the required minimum distance between nets. Consequently, it is usually done at night; the fishery biologist explained:

Everything is legal during the day. But on a dark, stormy night another fisherman throws in a net ten yards or so downstream from you. Since he doesn't want to lose his legal set, he is probably using an extra or "bingo" net. He may do it because you have a good site, but chances are he has a vendetta against you personally. I know one fisherman who corks off another fisherman every chance he gets.

In the past, the fishermen expected others to be far enough away so as to be out of sight, except around the prime spots at the river mouth. But all this changed with an influx of mobile fishermen from Yakutat beginning in 1978.

The stationary fishermen, particularly those who had arrived after 1958 with little knowledge of the Yakutat native fishing tradition, viewed the arrival of these fishermen as an "invasion." They had never experienced significant outside competition before; during their reign there had never been more than twenty fish camps and about forty people in Dry Bay. After 1978 that figure doubled, especially during the peak of the salmon migration.

How did the stationary fishermen respond to the competition? Initially some resorted to intimidation. Shots were fired over the heads of some of the mobile fishermen and several of their fish camps were vandalized. However, the majority of stationary fishermen rejected the use of force and in 1978 a method for dealing with the increased competition for fishing sites was introduced by the mobile fishermen. While sites on the East River and lower Alsek remained on a first come first serve basis, it now became possible for somebody to contest a site through a *challenge*, also known as a *race off*. That is, a race in which the first man to get his nets in the water wins the set. The challenger may either tell the fisherman whose set he wishes to claim that he wishes to "race" for it, or he may say nothing and simply place his net and buoy on the river bank near the other man's gear before the opening. Either way the challenger usually informs the stream guard or fishery biologist that he wishes to race and asks that he referee. The race is begun by the stream guard or biologist firing a gun or dropping his hand. The two fishermen race their skiffs toward the center of the stream, feeding their nets over the stern. The first man to get all of his net and anchor in the water is declared the winner. The loser must pick up his gear and move to another site, but rarely does the loser leave peaceably. More often the loser grumbles about the outcome and may even physically threaten the opposing fisherman and the enforcement officer who officiated the race off. Race offs have been known to be the cause of longstanding grudges between fishermen. On several occasions the fishery biologist has called in the Alaska State Police because of conflict and the threat of violence over race offs.

The races are not always fair in that the fisherman with the lightest skiff and the highest horsepower engine has an advantage. Differences in boats and engines, however, are considered part of the game and a fisherman cannot refuse to race simply because his boat is slower. In fact, on the Tsiu River, north of Yakutat, one challenger used a helicopter in competition against a boat, dropping his net and anchor from the air at the instant the starting gun was fired. Others countered by using five men who waded into the stream to hold their net above the water until the sound of the gun. There have also been several instances in which a fisherman tried to gain an advantage by using a shorter net: a man with a 15 fathom net is more likely to get it all in the water before one with a 20 fathom net. One fisherman won a race off using a five fathom net. Instead of leaving, the loser waited out the winner: when his opponent went to change his five fathom net to a length of net that would catch fish, the loser

dashed his net in and reclaimed the set (Gordon Woods, pers. comm.).

The Challenge: A Case Study

The following case reveals the kind of situation in which challenges usually occur and its course of action. In this instance no one was able to umpire, thereby leaving the outcome in doubt. The challenge occurred on 26 July 1982 at the mouth of the East River. Two individuals were involved, and while both were mobile fishermen from Yakutat, one (Fisherman A) is non-native and the other (Fisherman B) is native.

Fisherman A, the first Yakutat fisherman to arrive on the East River, had held the number one position inside the river mouth since the opening of the season. Fisherman B had the fourth set inside the river mouth. During the preceding weeks A had caught considerably more fish than B (but A is an exceptionally hard worker, spending more hours on his nets than most fishermen, so it is difficult to know what portion of his success was due to having a better set). Prior to the two day opening on 26 July, a sandbar developed in the hole where B had been setting his net, thereby eliminating his set. B had to find a new set and knowing that A had already made a lot of money decided to challenge.

10:00 Two hours before the opening, B has placed his net next to the marker on the bank opposite A's net. Everyone is aware of the challenge and curious to see how it will turn out.

11:00 Two stream guards and the fishery biologist arrive on their regular rounds. B tells the head stream guard that he wishes to challenge and wants him to referee. The stream guard declines, having recently been told by his superior not to get involved. A heated argument ensues in which B accuses the stream guard of discrimination and favoritism toward the "Washington" fisherman. [Fisherman A, in fact, is a non-native Yakutat resident.] Finally, the stream guard agrees to start the race but he will not declare a winner.

11:55 Five minutes before the opening. Both fishermen enter the river carrying their nets and anchor above the water. Because the tide is out the water is not deep enough to use boats.

12:01 As the stream guard lowers his hand both A and B drop their nets into the water; A who has the help of an assistant gets his net in first and walks to the bank while B is still feeding out his net into the current. Without a referee no one is declared the winner. The fishery biologist, realizing that neither party will accept defeat, then expresses the opinion that the race is a tie. Some of the bystanders know differently, but no one says so. The head stream guard tells A and B that they have 15 minutes to sort things out or he will have to confiscate their nets and write them tickets. Neither A nor B budges; they sit motionless on opposite banks, each waiting for the other to make the first move. Both A and B have an extra net nearby in case their nets are confiscated. Interest among the bystanders heightens as they wonder how the stalemate will be resolved.

12:45 At the stream guard's request, A crosses the river and talks to B. No agreement is reached.

13:00 With no sign of the stalemate being broken, and wishing to avoid further conflict, the biologist moves the boundary marker, stating that it was out of place. He moves the marker far enough down river to allow both A and B to squeeze in, to have the required distance between their nets.

The end result of this challenge was that both fishermen were able to stay at the river mouth; however, the challenger succeeded in capturing the number one and better position. For the challenge to work as a mechanism for managing competition it is essential that both sides accept the verdict of the referee. In 1982 what little order there was broke down when the fishery biologist and stream guard (Fish and Wildlife Protection Officer) were ordered by their superiors to stay out of the potentially "messy business" of refereeing challenges. For awhile competing fishermen asked an independent third party to referee their races, but over the years since 1982 challenges have gradually died out, such that in 1989 the fishery biologist was unaware of any having occurred. A major cause for the decline in challenges, believes the fishery biologist, has been three consecutive "good" years of fishing in which all the fishermen have done well. This has been coupled with efforts by the stream guard and biologist to avoid, whenever possible, ticketing fishermen who are in violation of the regulation concerning the minimum distance between nets. This has the effect of minimizing the possibility of conflict between individual fishermen. Instead of confiscating gear and giving out tickets, the authorities have tried to "squeeze" everyone in by shifting the adjoining fishermen's nets wherever possible to create the necessary distances between everyone's nets (Gordon Woods, pers. comm.).

When fishermen were questioned about the ethics of attempting to take a set away from someone who was there before them, most mobile fishermen asserted that challenges are legitimate and that they have a long tradition on other area rivers. They added one qualification, that elders who have fished the same sets for many years should be immune to challenges. In fact, there was a case involving a young native who raced and won a set on the Situk River from an elder. The loser took the case to court; the Yakutat judge ruled in his favor on the grounds that having fished there over a period of years and having maintained the set by clearing away logs, the elder had proprietary rights. In contrast, most stationary fishermen asserted that the first fisherman to claim a site should have exclusive rights as long as he regularly fishes there.

Finally, it should be noted that challenges in setnetting are unique to the Yakutat region. In the other major setnet fisheries in Alaska (Cook Inlet, Kodiak, False Pass and Bristol Bay), setnet sites are registered with the State of Alaska and ownership generally unquestioned. Due to the constantly changing formations of the East River and the lower Alsek, and therefore the absence of permanent sets, such a system would be unworkable in the Dry Bay area.

Conclusions

Given the importance of having a good set, coupled with the facts that in a river-

based fishery the best sites for fishing are fixed, known, and finite in number, how do fishermen regulate competition for fishing sites? And to what degree do conditions on the Alsek and the East Rivers dictate different strategies?

The "understandings" among the fishermen that have emerged in the Dry Bay area have indeed been shaped by geography and history. On the upper Alsek, where the river flows through rock and therefore where the contours of the river and the location of the sets are fairly constant from year to year, the fishing sites are tied to ownership of fish camps. While on the East River and the lower reaches of the Alsek, with their ever changing profile, fishing sites are much less fixed and access rights are of short duration. Because of this temporal nature, a mechanism for allocating access (the *challenge*) was introduced.

Given that the challenge is a Yakutat native custom, why did the stationary fishermen accept it? An important factor was its support by the ADF&G fishery biologist, a widely respected and charismatic figure with many years experience. The biologist made it workable by agreeing to umpire, doing so primarily out of concern for maintaining order between competing fishermen when there was intense pressure for a limited number of good sets.

Another important factor in the acceptance of the challenge was that it did not apply to the traditional sets on the upper Alsek or to any sets that had been worked continuously for more than one season by the same fisherman. Hence most challenges were to take place between the mobile fishermen, with the stationary fishermen being less frequently involved.

We believe the difference in attitude between mobile (generally native) and stationary (generally non-native) fishermen reflects cultural differences in how they view the environment: the non-native Western culture valuing private ownership of land versus a communalistic native culture with a tradition of clan ownership, coupled with a belief that the land and waters are there for all to use (cf. Berger 1985; Nelson 1985).

Finally, why is there such openness about catches in the Dry Bay area when in so many other places fishermen resort to all sorts of deceptive strategies to keep the same information from their competitors? Part of the answer lies simply in the impossibility of concealing information in a very small population where each fisherman's catch is weighed openly in full view of anyone who cares to observe. But also, in a fishery in which each fisherman is fairly fixed in one place and is not as mobile as in ocean fishing, at least for the duration of each opening, there is no serious disadvantage in others knowing how well one is doing.

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Notes

1. The field research was conducted by George Gmelch; a full description of the fieldwork and the problems of doing research among competing groups of fishermen can be found in Gmelch (1990). Geoffrey Orth, a maritime anthropologist, assisted with the analysis and writing.

2. There are at least three contributing factors, according to the local fishery biologist: 1) the artesian flow of water prevents the river from freezing, and thereby results in a high survival rate for the salmon eggs; 2) a profusion of underwater vegetation shelters the fry from predators and puts a great deal of oxygen into the water; and 3) the combination of minerals from the mixing of the Doame and East River waters creates a fertile environment. The fry mature so rapidly in the East River that they move out to sea their first fall, a full year before fry in most other waters (Alex Brogle, pers. comm.).

3. According to De Laguna (1972), the native population along this entire stretch of the Gulf of Alaska (from Controller Bay to Cape Spencer) was never very large. A Russian explorer in the 1880s counted only 820 people along the entire 240 km of coastline, little more than the present day population of Yakutat.

4. Because all of the Dry Bay area is either United States Forest Service or National Park land, the construction of cabins or tent frames is restricted to those who have fishing permits and those who guide hunters. Hence, fish camps (i.e., cabin or tent and gear) has traditionally changed hands along with the sale of a permit.

5. Seals are more of a problem on the Alsek River than on the East River. This is partially due to there being more food (flounder and shrimp) for seals in glacial streams than in warm water. But also, according to fishermen, seals have had a more difficult time surviving the assaults of fishermen in clear water streams. There, unlike in silty streams, they can be seen and shot or chased with boats until they drown. Further, he suggests that the inability to control the seal population has led native fishermen in the past to under fish the Alsek and other glacial rivers. Indeed seals persistently come around a net, most Dry Bay fishermen shoot at or near them to scare them off.

6. This was aptly illustrated by the local fishery biologist. In 1981 a severe storm resulted in fishermen abandoning some nets in the surf at the mouth of the East River. When the biologist went to remove them, after the storm abated, he found behind each of the three nets still in place, a seal working them - driving salmon into the net and then retrieving them.

7. In a study of Eskimo fishermen on the Nome River, Magdanz and Ollana similarly note that "virtually every good set net site on the river is identified with individual fishing families" (1985:15).

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