Akutan Field Report for the Local and Traditional Knowledge component of the Bering Sea Integrated Ecosystem Research Program (BSIERP-LTK) [Hunn draft of 09-21-2010]

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INTRODUCTION

1. Introduction to the LTK research plan
    a. The human dimension of the Bering Sea ecosystem
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The Local and Traditional Knowledge (LTK) component of the Bering Sea Integrated Ecological Research Project (BSIERP) is designed to provide data and perspective on the dynamics of the Bering Sea ecosystem by inviting residents of five Bering Sea Native Alaskan communities to share their life-long experience of the Bering Sea environment. Five such communities were selected to represent the range of Native Alaskan communities bordering the Bering Sea: Savoonga on St. Lawrence Island, St. Paul on the western edge of the continental shelf, Emmonak and Togiak of the Yukon-Kuskokwim delta shoreline, and Akutan in the eastern Aleutian Islands. Jennifer Sepez and Eugene Hunn are responsible for working with the Akutan Community Advisory Board (CAB), to produce this Akutan LTK report and to work with the other PIs and Community Coordinators to synthesize the LTK information from the five Bering Sea Native communities for inclusion in final BSIERP reports. Akutan is represented on the BSIERP-LTK Regional Advisory Board (RAB) by Jennie Webster, an Akutan resident who serves as the Akutan Community Coordinator. The BSIERP is funded by the North Pacific Research Board.

1. Introduction to the village of Akutan

Akutan is an Eastern Aleut community of about 88 residents in 40 households (according to the ADF&G subsistence survey conducted there in March, 2009). Most of the residents of Akutan are involved in commercial and subsistence fisheries and subsistence sea mammal hunting. The waters around the island remain ice free all year (with the exception of occasional thin sheets of ice near shore in the winter). The terrain of Akutan is largely steep mountain slopes covered by a mat of grasses, herbs, and prostrate shrubs, with very limited flat ground at sea level. Access to the island is by sea plane (a WWII vintage Grumman Goose operated by Pen Air which is unable to fly with a low ceiling) or boat (those

docked at Trident with plans to travel to Dutch Harbor) only. As of 2010 an airstrip is planned on adjacent Akun Island, to be linked to Akutan village by a marine ferry. At the west end of the village, Trident Seafoods operates the largest seafood processing plant in the US. Labor for the plant is imported from around the world. At peak seasons as many as 2000 workers live in the Trident dormitories. There is limited social interaction between the plant employees and the villagers.

The village has electricity and indoor plumbing as well as a local store, a preschool and K-12 school, two churches, a restaurant that is open in season, and a bar. The Native corporation maintains the Bayview Plaza Hotel and the Salmonberry House to accommodate visitors. A boardwalk network keeps foot traffic and ATV traffic out of the mud. There are plans to extend the boardwalk to a new small boat harbor under construction at the head of Akutan Bay. There are no cars or roads in Akutan.

Akutan has three local governments. Firstly as the The Native Village of Akutan it is a federally-recognized tribal government, with a tribal council and tribal administrator (currently Jacob Stepetin). Secondly, it is the seat of a village corporation and affiliated with the SeaAlaska regional corporation, for profit institutions established by ANCSA in 1971. Finally, Akutan is a city in the Aleutians East Borough, established in 1979 (with a city council and mayor, currently Joe Bereskin). These various overlapping jurisdictions appear to work together well in the best interests of the villagers.

Akutan was first settled in 1878 as a fur trading post and cod processing factory. A Russian Orthodox church was established at that time. Unangan families were attracted to the post from neighboring settlements and camps, primarily from islands to the east such as Akun, though today Native families trace their origins to more distant places, such as Shelikoff west of Unalaska Island and east to Sanak Island near Sand Point. Other residents hail from more distant points, such as St. Paul and Attu. Pre-WWII villagers were forcibly evacuated to camps near Ketchikan in se Alaska. Some returned immediately post-war, others a few years later. Thus the current Native population of Akutan has a complex residential history, though they have strong attachments to and are highly knowledgeable about the Akutan-Akun Island region.

The relationship between the village of Akutan and the adjacent massive Trident Seafoods processing plant is complex. The plant was built on land leased from the village corporation. A few village residents work at Trident and the owner of Trident is well known to long-time Akutan residents from his early days as a local commercial fisherman, which facilitates cooperation between the village and Trident. Trident remains locally owned, unlike most of its competition based in Unalaska/Dutch Harbor, which are foreign owned, mostly Japanese. Trident is widely blamed for polluting Akutan Bay, though some long-time residents judge that the village “would be dead without Trident.”

Akutan has its own small boat harbor. Currently village residents own and operate four class C & D vessels (e.g., from the 42-foot *Daybreak* to the 32-foot *Midnight Sun*) for commercial halibut and cod. Seven residents own halibut IFQs, which may be shared among the several fishing boats. These boats are also used for subsistence fishing and sea mammal hunting. Otherwise, village fishermen and hunters use skiffs with outboards.

The two ADF&G subsistence surveys (for the harvest years 1990, 2008) indicate that subsistence harvests are substantial, though they have declined almost across the board since 1990. The 2008 survey (conducted in March 2009) surveyed 36 of 40 households, est. 88% with Native head; the village population was estimated at 88, of which 67 were Native (81%), with a mean age of 38. The village population in 2008 was older and somewhat smaller than in 1990. The population was disproportionately male (63.5% of the total), a pattern common to Alaskan rural villages. Mean length of residency for household heads was 31 years; for the total pop, 25 years. A deep concern of village leaders this year is the "generation gap," the shortage of school-age children that could lead to the loss of state funding for the local school (the mandated minimum is 10 students in K-12), which would have serious long-term consequences for the viability of the Native community.

The Aleut language is understood by some, but spoken by just a very few of the oldest residents. There is some interest in reviving knowledge of the language. There is some retention of native terms for subsistence resources (e.g., harbor seal, fur seal, sea lion, octopus, chitons, wormwood….). Some believe that the WWII evacuation may have dealt a fatal blow to the language. However, one young woman has studied the language in Anchorage and consults the comprehensive Aleut dictionary (Bergsland 1994) to learn local terms that may be forgotten.

Akutan is undeniably an "indigenous" community, though the Native population has a more complex history than is likely the case for the other Native communities in our sample. This is in part due to the exile imposed during WWII, justified by interests of national security. In addition, the eastern Aleutian Islands have long been a crossroads. Many non-Native men came to fish or work in the fisheries, married Native women and stayed to raise families within the Native village. So, for example, one fluent speaker of Aleut and a member of a founding family proclaims that his family hails from Liverpool, England. Thus, Akutan "indigenous" identity is rooted in multi-generational attachments to the local land and seascapes, affirmed by continuing, if declining, dedication to subsistence harvests.

2. The Akutan LTK project

This research has been designed as a fully collaborative project between the project PIs, their Alaska Department of Fish and Wildlife colleagues, and the residents of Akutan. Sepez contacted the Mayor, Joe Bereskin, early in 2008 to ask that he appoint a five-member Community Advisory Board and name a person to chair that Board and to serve as Community Coordinator (a position with a modest remuneration), who would represent Akutan on the Regional Advisory Board (RAB), including the community coordinators of all five participating villages and chaired by Henry Huntington, lead PI for the BSIERP/LTK projects. Hunn traveled to Akutan June 16-20, 2008, to discuss project design and

implementation with the CAB, the Mayor, the Native Corporation staff, and interested residents. The Tribal Administrator and the Mayor provided letters of support. Hunn, meanwhile, obtained Human Subjects clearance from the University of Washington Human Subject Office (which has been renewed each year since). Hunn reported on progress with respect to the Akutan collaboration at the RAB meeting in Girdwood, Alaska, October 2008 (Sepez was unable to attend due to illness).

A key component of the Akutan project was a follow-up subsistence survey to be conducted by a team from the ADF&G (Lisa Scarbrough, team leader). This would provide comparative data on household level harvest and use of all subsistence resources for 1990 (the prior study) and 2008. This study was completed during March, 2009. Thirty-six of forty households participated and a detailed summary has been prepared by the ADF&G.

Sepez and Hunn visited Akutan September 4-8, 2010, to conduct interviews and observations relevant to the LTK project goals. During this visit, Sepez and Hunn conducted in-depth discussions / interviews with several Akutan residents particularly knowledgeable about the local marine and shore environment. Primary interviews were with Jacob Stepetin (b. 1952), Tribal Administrator and life-time resident of Akutan and an active subsistence hunter and fisherman; Antone Shelikoff (b. 1961) Sentinel Field Technician with the Aleut Marine Mammal Commission and an acute observer of the local marine environment; and Darryl Pelkey (b. 1953), life-long local resident, excepting a 10-year residence in Washington State, commercial and subsistence fisherman, owner/captain of the 42-foot long-liner *Daybreak*. Jennie Webster (b. 1947), life-long Akutan resident and Community Coordinator for the Akutan LTK project, contributed to a wide range of discussions while facilitating our visit. In addition we spoke at length with Boris Bear, a 30-year resident of Akutan and an avid bird hunter and more briefly with Harvey McGlashan, a young commercial and subsistence fisherman from a founding family and owner and captain of the 32-foot fishing boat, the *Midnight Sun*. We visited with Jacob, Jennie, and Zenia Boronin, Tribal Council Chair, in the Tribal offices about a range of community concerns, from meeting the student quota for the local school to the disappointing berry harvest. We reviewed a collection of local plants with Jacob, Jennie, Lydia Vincler, and Josephine Stepetin. Hunn had the opportunity to travel with Darryl, Antone, and Darren Bereskin (eldest son of Akutan's current mayor, Joe Bereskin) from Akutan to Dutch Harbor on the *Daybreak*, a six-hour trip, which afforded Hunn particular insights into the local geography, natural history, and practices related to commercial and subsistence fishing.

These various conversations ranged widely over topics related to local subsistence practices, seasonal harvest patterns, distributional and behavioral patterns of and ecological relations among marine mammals, sea birds, fishes, marine invertebrates, marine algae, and terrestrial flora and fauna, plus observations with respect to climatic and oceanographic trends in the local Bering Sea environment. With the informed consent and permission of those interviewed, we recorded these interviews digitally

to facilitate a more complete and accurate summary of local perspectives. Detailed notes from these interviews will be shared in the next few months with the interviewees for additions, corrections, and clarification. Quantitative data from two comprehensive subsistence harvest surveys conducted by the Alaska Department of Fish and Game for the years 1990 and 2008 (the latter gathered by Lisa Scarbrough's team in Akutan in March 2009) provided the basis for key questions with regard to trends in the distribution and abundance of subsistence resources and other species. We summarize what we have learned from these interviews below (see Results).

This report will be reviewed by the Akutan LTK Community Advisory Board and presented to the BSIERP Regional Advisory Board (RAB) at the RAB meeting in Anchorage, October 19-21, 2010, and then revised.

3. Results

The LTK interviews affirmed that numerous Akutan residents are highly knowledgeable about their local marine environment and continue many of traditional harvest practices of their ancestors. Fish and marine mammals form the bulk of the subsistence diet, but observations about the broader environment indicate an interest in the ecosystem and the interdependencies of the organisms within it. The information summarized below represents the experiential knowledge of persons who have been able to observe the ecosystem up close for their entire lives and who often depend on that knowledge for their survival.

Subsistence harvests remain important, though declining; geographic range is typically limited now to < 10 miles from the village, or one hour by boat. This is due in part to fuel costs, as, for example, larger boats (there are four owned and operated by Akutan residents) burn 6-8 gallons/hour at cruising speeds. Otherwise, hunters and fisherman use skiffs with outboard motors that limit travel to relative calm weather.

Jacob Stepetin declared: "We are sea hunters!" This suggests how the people of Akutan see themselves in relation to their Bering Sea environment and would seem to differentiate themselves culturally from non-Native fishermen who travel local waters.

a. Fish

i. Halibut: commercial (four boats; 7-8 IFQs) and subsistence; long-line

ii. P-cod: as halibut by-catch (and by jigging from skiffs)

iii. Salmon: subsistence only; gill nets off point and elsewhere; Reds preferred, spawn in a few local streams with lakes, e.g., Open Bight; late arrival this year due to cold conditions, still running into September; smoked or dried

iv. Salmon: Pinks (Humpies) abundant, esp., head of Akutan Bay, but considered by some too small or inferior in taste to Reds & Silvers; some being smoked 9-2010

v. Greenling, a.k.a., “pogies”: eggs harvested from bull kelp, eaten raw, crunchy

b. Sea mammals; hunted with rifles from skiffs or boats, often opportunistically

i. Steller’s sea lion: harvest way down, in part to conserve sharply declining populations (e.g., Cape Morgan down from late 1960s 75K to ca. 2,500 now) (DP); sea lion flippers for a traditional delicacy (JS)

ii. Harbor seal more often harvested now; winter harvests preferred; traditional avoidance of spring and summer harvests to spare females and pups (AS)

iii. Northern fur seal harvested late September through November as they migrate south from Pribilofs or Bogoslof; a few young bulls present all summer (DP)

iv. Whales and porpoises not hunted but salvaged on rare occasions; old timers particularly like the blubber and meat

v. Sea otters not hunted; considered competition for sea urchins, crab, clams; just chased off, not killed (DP); sea otters shelter in bull kelp but have hauled out on rocks with harbor seals this year as bull kelp growth retarded due to cold weather

c. Waterfowl (decreased since 1990): hunted with shotguns from skiffs, boats, in winter; freshwater ducks (green-winged teal) hunted up creeks

i. Glaucous-winged Gull eggs: targeted when nesting begins, late May to early June, at colonies, notably on Akun Head; traditional strategy was to harvest from nests with one or two eggs but to destroy full clutches of 3 or 4, then wait a week to return and harvest fresh eggs from relaying; due to rough spring weather and distance, visits by skiff (45 minutes from Akutan) are limited; allowed to finish nesting later on (JS, AS); harvests of several hundred eggs possible; widely shared; for custards and pies as well as omelettes.

ii. Tufted Puffin (“sea parrot”) eggs used to be harvested in their burrows (but beware their beaks!); Black Oystercatchers lay single egg right on the rocks, but not harvested (AS)

iii. BB noted for duck hunting preference; prefers “rock ducks” (Harlequin Ducks), targets males to allow ducks to “repopulate”; also “coots”/”scooters” (esp. White-winged Scoter), which are large and tasty; also takes “sawbills” (Red-breasted and/or Common Mergansers)

iv. Eiders not hunted though can be common in Akutan Bay in winter, though usually in Akun Straits; considered to be "protected" but also must be skinned, which is more work (BB); used to travel to the Baby Islands to harvest eider eggs in spring, but haven't done so for years (JS)

v. Don't harvest geese (they're said to be protected [Aleutian Canadas, Emperors]); also said to be "too dry"

d. Marine invertebrates (increase since 1990)

i. Octopus: surprisingly large subsistence harvests reported (2500 lbs/yr), far more than all other species combined; apparently primarily received from crab boats from their by-catch and mostly used for bait; excellent for long-line fishing as the same octopus can be reused for up to six days (DP); some decades earlier might be harvested at low tide in Akutan Bay by blowing Clorox through a hose into their dens in the rocks (JS); still appreciated as food

ii. Sea urchin gonads / "sea eggs": still favored though sea otters have decimated local populations

iii. Razor clams harvested on sandy beaches

iv. Butter and littleneck clams and mussels no longer harvested in Akutan Bay due to pollution from the fish processing operations (JS); mostly killed off but also suspect taste due to pollution

v. Chitons. a.k.a., "gumboots" still occasionally harvested (JS) from rocks at low tide

e. Land-based resources: feral cattle, ptarmigan, and plants

i. Land mammal resources limited to feral cattle populations established > 30 years ago on Akun Island and Hot Springs Valley; DP reports that Oregon State University has analyzed meat of organic, kelp-fed beef and that it is high in Omega-3 fatty acids; possible commercial project to target niche market; however, may taste "fishy" (BB)

ii. Rock Ptarmigan common in winter, hunted right in town with shotguns; skinned, not plucked; ptarmigan eat mossberries (*Empetrum nigrum*) under snow in winter

iii. Plants:

1. Berries remain by far the most important and favored resource

2. Very bad year 2010 for berries; late and few due to cold spring & summer, lack of sun; most important are: salmonberries (*Rubus spectabilis*) abundant in town, eaten fresh or made into jelly and or wine; in tundra on hills above town: mossberries (*Empetrum nigrum*), for pies, jellies; highbush (*Vaccinium ovalifolium*) and lowbush (*Vaccinium uliginosum*) blueberries; less important are: strawberries (*Fragaria chiloensis*), (*Rubus arcticus* ssp. *stellatus*); crowberries (*Arctostaphylos* spp.) not palatable, too dry

3. Still harvest as greens: "petruski" (*Ligusticum scoticum*) and "putchki" (*Heracleum maximum*):[peel young stems; eat; used large leaves to wrap fish for cooking or serving; both abundant near town

4. Fireweed (*Epilobium angustifolium*): abundant in and around town; petals used to make jelly (JW, V&HP)

5. Some recognition of harvesting "chocolate lily" (*Fritillaria kamschatchensis*) to eat the bulbs / "rice roots"

6. Some medicinal plants recalled, e.g., yarrow (*Achillea millefolium*) for colds, etc.; wormwood (*Artemisia unalaskensis*) likewise

7. A "swamp grass" ("minkin grass"; likely *Carex* sp.) harvested to make a sort of broom for brushing the body in the steam bath (JS)

8. Flowers appreciated as decoration and for scent (esp. "white orchid" [*Platanthera dilatata*])

9. Drift wood: a key resource for smoking fish, heating steam bath, firewood; various species distinguished, e.g., cottonwood for smoking fish; yellow and red cedar, Sitka spruce, maybe birch and alder; JS learned to tell them apart and to appreciate their distinctive values; lots washed up in winter near town

f. Preserving subsistence harvests

   i. Smoking salmon, etc.

      1. Smoke houses and raised, screened caches for drying fish common about town; cottonwood from beach drift preferred fuel for smokehouses; September 2010: red and humpback salmon and… being dried

   ii. Curing in air: halibut ?

   iii. Rendering oil from sea mammals

iv. Pickled octopus

v. Special recipes for, e.g., sea lion flipper

vi. Canning salmon; berries

g. Sharing

i. Within the village

1. `especially sea gull eggs

2. Sea lion meat (“black meat” advertised over the radio, freely shared)

3. Porpoise: old timers keep asking for it

4. Frequent potlatches / potlucks for birthdays, etc., but now often mostly store bought foods

ii. Between villages or between commercial boats and the village

1. Octopus and pink salmon by-catch shared with villagers

2. One year when berries scarce at Sand Point, Akutan sent them some.

h. Bering Sea LTK

i. Weather and tides

1. 1996 was a warm water year; Short-tailed Shearwaters and Northern Fulmars had to dive very deep for food, when normally they feed on the surface; several dead birds analyzed and shown to be starving (DP)

2. 2010 is a cold water year; feed abundant but bull kelp (a.k.a. “bouy kelp”) stunted, red salmon late, and berries very scarce due to lack of sun and warmth; also note persistence of snow fields which serve as barometers of the weather (they wager on when a particular patch opposite the village will melt away)

3. Tides seem out of synch with the tide tables this and in recent years; don’t know why, but tidal currents critical for concentrating resource species

ii. Trophic relations

1. Ptarmigan eat mossberries (*Emptrum nigrum*) that are hidden under the snow in winter.

2. Pacific sand lance, a.k.a., "needlefish" (*Ammodytes hexaptera*) a primary feed fish for salmon, P-cod, seabirds, sea mammals: fishermen follow the feed to find the fish

3. Feed fish abound in cold waters

4. Killer whales harvest Steller's sea lions and their populations have rebounded under protection (DP); killer whales don't affect harbor seal populations to the same extent, likely because harbor seals stay closer inshore and on the rocks

5. Sea otters are voracious, eat sea urchins, crabs (but not king crabs as they're too spiny), and clams; a group of 40-60 comes into Akutan Bay to feed but mostly stay out by Akun Pass; used to be a commercial Dungeness Crab fishery but no longer due to sea otter population explosion

6. Bull kelp is habitat for sea otters but also for the young of many species of fish, crabs, etc.; stunted by cold and cloudy spring and summer; ripped from moorings by winter storms; a hazard to small boats as floating mats of kelp tangle their props

7. Atka mackerel and halibut at odds: halibut won't take mackerel bait and seem to avoid spawning concentrations of mackerel, which in September may be so abundant as to create whirlpools just outside the kelp line, that sucks in kelp; halibut then move off (DP)

8. DP noticed that immediately following an earthquake of Richter 5.3 with epicenter 5 miles n of Akutan village all the fish disappeared and those subsequently captured had empty stomachs; they moved off just a few miles, apparently, but did not soon return [year?]

9. Pollution from fish processing in Akutan Bay widely considered to have "killed the bay," though DP [a diver] disagrees that the bay is "dead," as he sees abundant needlefish, etc., in his dives; shellfish and octopus certainly appear to be rare now in the bay but king crab may be returning (DP); pink salmon are not affected as their runs into streams

at the head of Akutan Bay remain abundant [but they don't feed in the bay nor do they eat clams, so pollution doesn't affect them]

10. A diesel spill on the southeast shore of Akun Island destroyed local shellfish populations which many years thereafter had not returned (JS); however, locals did not express deep misgivings about increased vessel traffic, though that could increase the danger from large spills, such as that of the Malaysian flag …. [name]

11. Happy fish /sad fish model: yes (DP)

iii. Conservation practices and attitudes

1. Management of sea gull egg harvests; but in contrast to what Hunn et al. found at Huna, the local practice may involve destroying full clutches found on the initial visits (JS); this may be rationalized by the distance and uncertainty of access to the colonies near Akutan, but likely does not seriously affect long-term sustainability of the gull colonies

2. Harbor seals hunted by traditional preference in winter; this justified by AS as conserving pregnant females and pups which if hunted in spring and summer might constitute a "double killing" (i.e., of parent and offspring). AS avers that some people don't care, hunt seals in summer anyway, considering traditional constraints to be signs of "weakness"

3. Male Harlequin Ducks are the preferred target of bird hunters in winter, avoiding females in order that the species "repopulate" (BB)

4. Hunters have laid off hunting Steller's sea lions in recent years because their populations are seriously reduced, in order to spare them (DP)

5. When a particular resource is scarce and hard to find, fishermen and hunters will share information, even with boats from Bristol Bay or further away, on the expectation that the favor will be returned (DP) [reciprocal altruism]

FOOD WEB AND FORAGING OBSERVATIONS

The fish here eat a feed fish that is called a "needlefish" (which is apparently the Pacific sandlance, *Ammodytes hexapterus*). The fish go where the feed fish go and then the birds and the whales go there

too. The needlefish movements are controlled in part by the tides and also by the temperatures. The salmon movements are also controlled by the temperatures. They wait off shore until the temperature is right, then they all move towards the shore. This spring was exceptionally cold with cold water persisting into summer, which may help explain the very late Red Salmon runs (into late August and early September; normally they are expected in June).

It was obvious to fishermen around here in the 1990s that the killer whales were eating the Steller's sealions. The general consensus was that killer whale predation was a major if not the major cause of Steller's sea lion declines, e.g., the Cape Morgan haul out had some 75,000 in the 1960s and 1970s but is down to ca. 2500 now. Killer whale number thought to have increased due to protection. They don't hunt harbor seals as intensively because the seals stay closer to shore and shallow waters.

Steller's sea lion haul-outs are at spots where Atka Mackerel and herring concentrate.

Hunt sea lions and seals by herding them toward shore.

Never try to shoot a harbor seal if it is looking at you. They are too fast; you'll miss every time. Shoot fur seals from behind as they swim away.

Sea otters eat the juvenile Dungeness crabs in large quantities. There used to be enough here for a commercial dungie fishery. Now there are a lot more otters and there is no longer a Dungeness crab fishery. The otters don't eat juvenile king crab because they are too spiny.

The fishermen cut open halibut stomachs to see what is inside because they are curious. They find octopus (most commonly) and also salmon, mackerel, greenlings, and some kind of small red sculpin. By noting halibut food preferences at different times and places they are better able to locate them for harvest.

The Short-tailed Shearwaters and other birds used to feed on the surface but in 1996 (a very warm year) they started diving deep and staying under a long time, e.g., 2-3 minutes. In 1996 sea surface temperatures were notably warmer which likely explained why the shearwaters were forced to dive deeper lower to get their feed (e.g., needlefish).

Local sea mammal hunters appreciate the intelligence of their prey. They note that when the Trident Processing Plant season begins in March a group of some six or more sea lions appear just as the first fishing boats arrive.

As a fisherman, you know there is nothing on your long lines if the killer whales don't hang around waiting for you to pull your gear. They have learned to come in close when they hear the hydraulics and steal fish from the surface. If there's nothing on the hooks they don't bother.

POPULATIONS

Orca populations have increased

Eider Populations are rising according to several interviewees. You can now see big flocks of them in winter in Akutan Bay following the feed fish.

You can't find butter clams around anymore. Several local consultants attributed this to pollution in the waste water from the fish processing plant, which is disposed in the bay by an offshore offal pipe. Villagers no longer harvest shellfish or octopus from the bay as they don't trust their quality or they believe pollution has killed off the resource.

Bald Eagle populations have increased a lot. They follow you when they are hunting and may steal your kill before you get there.

CONSERVATION PRACTICES

They don't hunt eiders because they are protected. [Actually, only the Spectacled Eider is protected <check this>, and that species rarely if ever visits the eastern Aleutians.]. Plus they are considered too hard to clean, as they must be skinned rather than plucked.

Seal hunters are taught not to shoot seals during the breeding season, because 1 kill can take 2 animals (mom and pup).

Seagull egg harvesters are taught to harvest eggs only from clutches of 1 or 2 eggs. This is a variant of the Hoonah sea gull-egg traditional conservation practice identified by Hunn et al. [*Current Anthropology* 44 (S5):79-104, 2003]. However, unlike the standard Huna practice, gull egg hunters will initially destroy complete clutches (of 3-4 eggs), then return within a week to harvest the fresh eggs of replacement clutches. Eventually, the gulls are left to complete laying and rearing their young, however, so egg harvests are believed to be sustainable, as no declines in the local colonies (e.g., at Akun head) have been noted.

Bird hunters are taught not to take females (in particular, of the favorite duck for eating, the "rock duck" of Harlequin Duck) birds in any season so that they can repopulate the species.

ECOSYSTEM OBSERVATIONS

The berry bloom was essentially a total failure this year, 2010. Several people attribute this to the observation that there were few or no bees here this spring, due to prolonged cold and cloudy weather.

Red salmon came very late this year, August instead of June, but the silvers came in early, early August instead of late September/October. Some fishermen attributed this to the prolonged cold spring weather and persistent cold sea surface temperatures.

1996 was a warm year and a lot of birds were dying. They sent a few of the carcasses to ADF&G who said the birds were starving. This was the year that feeding birds started diving much deeper to find their food. [Is there a connection to ENSO phenomena?]

In years when there is more sunlight there are more salmon berries and the kelp grows more (and more bees and blue flies).

Regarding the "happy fish swim in circles/sad fish swim in a line" model: "Sure! That makes sense!

CLIMATE OBSERVATIONS

This year 2010 is a cold year. There is a snow patch that serves as barometer and this year is still isn't gone, even at the end of summer.

1996 was a warm year

PHYSICAL OCEANOGRAPHY

Whirlpools ar created by schools of Atka mackerel just off shore outside of the kelp zone. The whirlpools can suck the kelp up and pull it away. These spawning concentrations interfere with halibut harvests.

A 5.3 tremor occurred five miles north of Akutan in a good fishing area. Suddenly, they got no more fish there and the few they got had nothing in their stomachs. The good fishing never came back in that spot.

SUMMARY OF STATEMENTS ABOUT ECOLOGY, ECOLOGICAL RELATIONSHIPS, and CHANGES OVER TIME

Cold water (as 2010) retards growth of bull kelp. Bull kelp provides shelter for sea otters, juvenile fishes, Dungeness crab, substrate for greenling eggs.

Cold water retards return of red salmon (August-September versus June-July); they remain off shore until water warms.

Cold weather (as 2010) reduces berry populations of all local species.

Warm water (as 1996) reduces food available for seabirds such as shearwaters, which dive deeper and may starve.

Sea otter predation suppresses populations of sea urchins, crabs (but not king crab, which is too spiny), and clams; they eat large quantities of juvenile Dungeness crab.

Killer whale populations have increased with protection; likewise Bald Eagles.

Steller's sea lion populations greatly reduced due to killer whale predation; harbor seals not affected as they keep close to shore and haul out on rocks.

Sea lions sense the start of commercial fishing by returning to the fish processing factory with the first boats of the season.

Northern fur seals of all age and sex classes migrate south in late fall through Akun Pass.

Glaucous-winged Gulls typically lay three-egg clutches; best to harvest from nests with incomplete sets; alternatively, destroy complete clutches and return to harvest from replacement clutches.

Common Eider populations high due to protection of colonies in the Baby Islands.

Pacific sand lance, “needlefish” (*Ammodytes hexaptera*), are a critical food resource for salmon, Pacific cod, seabirds, and sea mammals; they follow “needlefish” concentrations; they abound in colder waters.

Pollution in Akutan Bay has nearly eliminated octopus, king crab, and butter and little-neck clams; sand lance still abundant and king crabs may be returning as pollution from fish processors is controlled

Pollution in Akutan Bay does not affect pink salmon, as they feed elsewhere; they remain abundant, spawning at the head of the bay.

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