

**EVERYTHING YOU WANTED TO KNOW
ABOUT BEACH SEINING IN LOWER COOK
INLET BUT WERE AFRAID TO ASK**

By

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&

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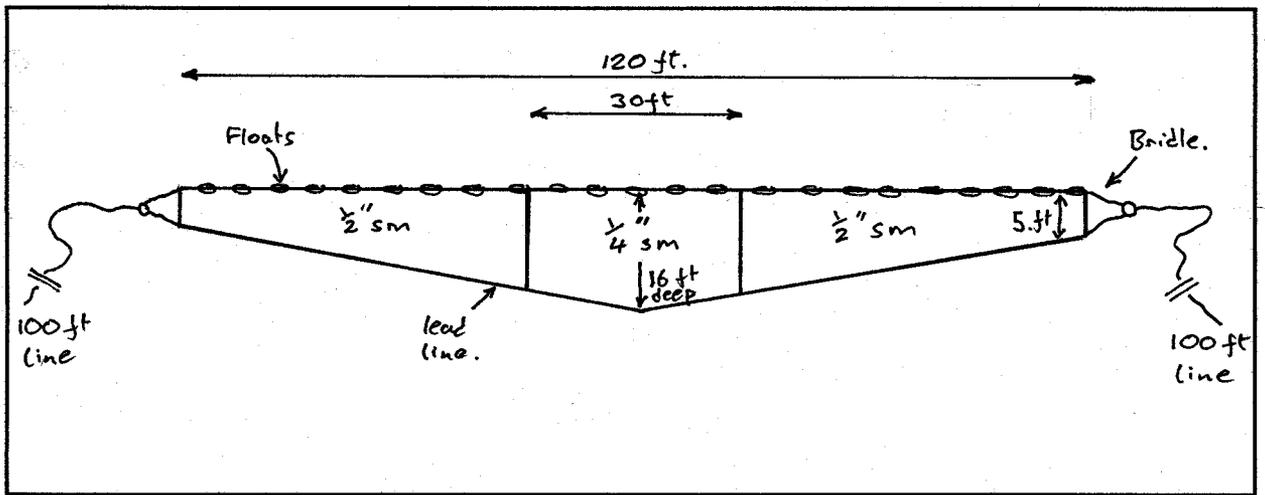
U.S. National Biological Service

Equipment and Personnel:

Beach seining is easily conducted from an inflatable or small whaler, although an aluminum skiff could also be used. Ideally, at least three people take part in the operation although it can be done with just two people.

The net is usually 120' to 150' long with a line of rope on the top and bottom. The APEX project is seining using nets of the design shown in Figure 1. These nets have removable floats to allow them to be sunk if desired to fish on the bottom (our standard protocol will not call for the floats to be removed as we will be fishing using a floating net).

Figure 1. Standard APEX beach seine design.

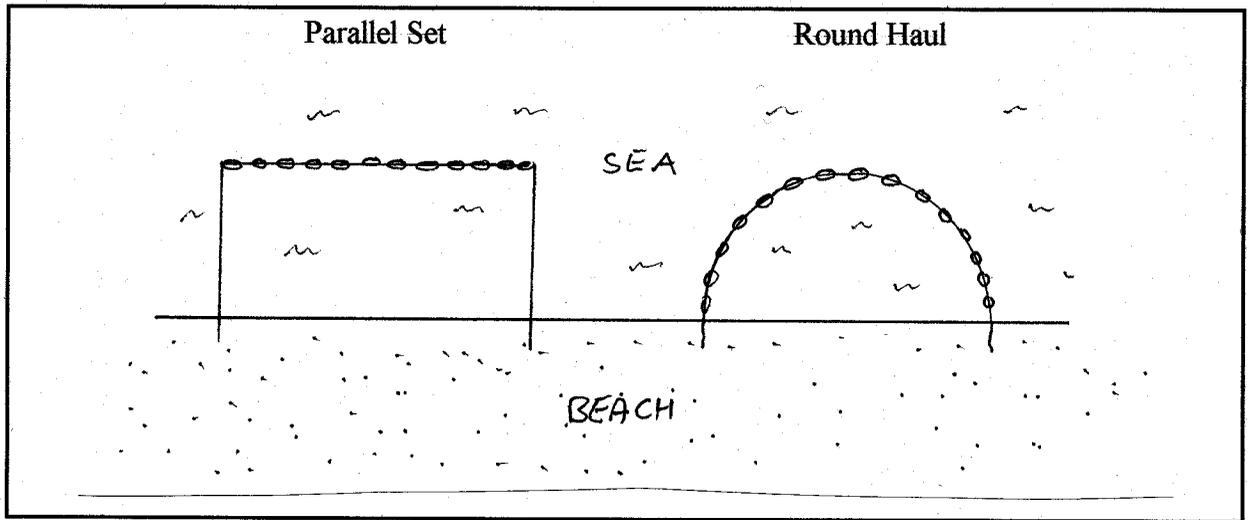


One rope has floats along the entire length of the net (the float line) and the other is weighted (with visible lead weights or with a weighted rope; the lead line). If it has not already been done, a 100' length of rope needs to be attached to the bridle at each end of the net (where the float and lead lines come together at the end of the net). This rope should be at least 5/8" polypropylene rope (smaller diameter rope tends to be hard on the hands when pulling). This line needs to be marked at a point 80' from the bridle.

When the net is put into the boat, ensure that there are not things such as oars, the spare engine, or other equipment underneath which will get caught up during deployment. Feed the net into the boat starting with an end of one of the polypropylene lines. With two people, have one person feed the float line as the other feeds the lead line, keeping both separate. This will facilitate a quick and easy deployment of the net with no tangles.

The net is generally deployed in one of two manners: The round haul in which the net is set in a semi-circle starting and ending at the beach or the parallel set here the net is set parallel to shore and then pulled into the beach (Figure 2). Note that the parallel set will look like a round haul at a point during retrieval (the net does not come into the beach parallel, it is just set that way).

Figure 2. The two common deployment strategies for setting beach seines.



Picking a Time and a Place:

Beach seining can easily be conducted on beaches that range from mud through sand to cobble. Areas that have larger rocks, mussel beds, submerged obstructions etc. will cause problems such as snagging and fish will be lost. Particularly when choosing sites that will be sampled on a regular basis, look at low tide for a sand beach with no large rocks present. Try to choose a relatively low angled beach which isn't exposed to excessive wave and current action. The beach needs to be at least 150' wide, and with water deep enough to allow the inflatable to run its engine to within about 15' of shore.

A last point to consider is beaches that collect large amounts of debris, particularly kelp tend to be problematic to seine. The net usually fills with kelp, and due to the weight can require several boat-loads of Argonauts to get it onto the beach. Sorting the fish from a net filled with kelp is also excessively time consuming and tedious.

After selecting a beach for seining, the aspect, substrate, and general characteristics need to be categorized:

- | | |
|------------------|--|
| Aspect: | Describe as shallow, moderate, or steep in angle (this is only really possible at low tide). |
| Substrate: | Describe the overall beach as silt, sand, gravel, or cobble. |
| Characteristics: | Draw a simple sketch of the beach noting extent and amount of debris, exposed rocks, shape, freshwater input etc. On this sketch also note the beach location (preferably by GPS coordinate or by distance and bearing from a charted location). |

Standardization of Seining Protocol:

During in 1996, we are trying to standardize as much as possible of the beach seining effort. Beach seining is plagued by a multitude of variables which makes comparison between sites difficult. To avoid this, it is important to follow the deployment methodology exactly and keep to the following guidelines as much as possible.

- We will beach seine (using the parallel set method) twice each month, on or around periods of maximum tidal oscillation.
- Make the beach seines within one hour of slack water (this gives a two-hour window for conducting seining). This not only helps with comparability between areas but also facilitates deployment. Ideally, if time allows, beach seine at high and low tide each time. If time does not allow on a particular day, be consistent throughout the summer with which tide-state you choose. If you have to make a choice from the start then fish right at low tide.
- Beach seine during daylight hours to prevent diurnal variation compromising comparability between sets and areas.
- It is very difficult to beach seine in stormy conditions or if there is a swell over 18". Therefore this type of variable is not really an issue. So don't worry if on a particular day, you had decided to seine and there's a two foot swell coming straight into the beach; it's just best not to seine that day as the results won't be representative and the fishing will be totally unenjoyable.

Optional Extras:

If you have time, it will be interesting and useful to also collect fish in the following ways:

- At low or high tide (depending on which tide states are being done during daylight hours) during the night to assess diurnal variation.
- At different sites to assess geographical differences in fish distribution.
- Altering the net by removing the removable floats (on APEX project nets) to fish on the bottom rather than at the surface.
- Seining using the round-haul method to compare to the parallel set method.

Deployment Methodology:

Every time a beach is seined we will be making a duplicate set to help reduce the variance from only making one haul. The second set can be lined up with the line of tracks made when pulling in the first set. By seining exactly next to the previous set, geographic variability should be avoided.

The exact location of the first set is not used for the second due to the disturbance of that specific area.

The following methodology is conducted twice at each site

1. The inflatable is brought into the beach and at least one person gets out with an end of the polypropylene rope. The rope is held with the 80' mark at the waterline.

Two people must remain in the boat at this point. If only two people are conducting the beach seining, and there is no current flowing, the line can be thrown onto the beach with an anchor attached to the 80' mark.
2. The inflatable is driven out from the beach, with a person feeding out the polypropylene line until the bridle is reached.
3. The inflatable is turned parallel to shore and reversed slowly as the net is payed into the water (note: the net cannot be deployed with the boat going forwards or the propeller will tangle in the net). Care must be taken to prevent crossing the head and foot ropes. As the net is deployed an uninterrupted line of floats should be seen on the surface. If net lies over floats at any point, it is important to rectify this before retrieval of the net. Usually pulling hard on the net will remove any twists. However, if the overlap remains, return to that point and untwist the net directly.
4. When all the net is deployed, continue reversing for about 10' and then turn the inflatable and drive forwards, straight into the beach as the second polypropylene rope is payed out. Anchor the boat once the beach is reached. If at this point the net is not parallel to the shore, the set should be abandoned. If the net becomes caught in a current, and it is impossible to pull the net in, release one end of the net into the water and pull the net in from one end only.
5. The polypropylene ropes are pulled in evenly until the net reaches the beach. If the net snags on the bottom, have one person go out in the boat and carefully unsnag it. Usually by pulling the net a little away from shore by the float line will resolve this situation.
6. Once the net starts to come onto the beach it is very important to ensure the lead line stays against the beach. At this point the people pulling the net in on each rope can start to move closer together.
7. The net is pulled completely onto the beach with care that the lead line stays at least in line with the float line (a puffin's eye view would see the lead line directly under the float line). It is easier to pull the net in if once half the net is on the beach, the people pulling the net in quickly move down to the water's edge and pull on the net from this point. If there is any swell, pull quicker and don't stop at all during the last 10' of retrieval as the cod-end of the net comes ashore. It is easy to loose fish at this point as the swell lifts and drops the net.

Once onto the beach, fish can be immediately sorted by species and subsampled if necessary.

Note that although we are concentrating on forage fish, the total number and weight of all species collected are required.

Subsampling Procedure:

If large numbers of a particular species are caught in a catch, it is only necessary to keep a proportion of these.

For the small forage fish such as herring, smelts, or sand lance the easiest way to subsample is by volume. Using a gallon zip-lock or a small bucket, scoop up two full loads and keep each of these (separately) for later analysis. Continue scooping up the fish and discard them directly back into the ocean, counting the number of loads. If the last scoop is not full, keep these. Count and weigh the fish in the first two bags, and take the mean value for total number and weight. By multiplying this by the number of bags discarded and adding the number and weight of the last partially filled bag, the total catch can be calculated.

For larger fish such as salmon, if caught in large numbers the easiest way to subsample is individually by hand. Keep approximately 10% of the catch (chosen at random) for later analysis, using a rock or priest to kill the fish by a blow behind the eye. Measure the remaining fish to the nearest cm and release them back into the ocean. By producing a length/weight curve for the species later on, an estimate of total biomass can be made for that species.

Fish can then be placed into labeled plastic bags for later identification and morphometric analysis.

Analysis:

Good fish keys for identification include Pacific fishes of Canada (Hart 1973), Alaska's saltwater fishes and other sea life (Kessler 1985), the draft annotated key to Alaska's marine fish (Mecklenburg and Mecklenburg 1994), and the Peterson field guide to Pacific coast fishes (Eschmeyer 1983). If a particular fish cannot be identified, keep and preserve up to 10 of them as a reference collection for later identification. Classify these fish as unidentified with careful notes as to the date and which set they were caught in. If the unidentified species continues to be caught, refer to the reference collection each time (it is not necessary to keep collecting more of this species each time).

The key measurements needed are fork length and weight for each forage fish caught. Fork length is the length (measured to the nearest mm) from the tip of the snout to the fork in the caudal (tail) fin. If the fin is not forked then the measurement is still to the mid-point of the tail. Weight is measured to the nearest 0.01g.

Length and weight for the first 250 fish of each species is ideally required for a particular sampling period. For example, if 3 beaches in the survey area are being surveyed (with the duplicate set at each site, this amounts to 6 sets) at both high and low tide for a total of 12 sets then once 250 of a species are weighed and measured (which may be accomplished in the first set) no more data is necessary for that species for that time period other than total numbers caught and total biomass. If more than 2 weeks separate sampling periods another set of 250 is required. Obviously, if less than 250 of a species are caught then all fish will need to be measured.

Each month individuals of each forage fish should be individually whirl packed and frozen or preserved for later genetic, stable isotope, or meristic analysis. Please see additional information regarding numbers of each species required.

If time allows, it would be desirable to look at the stomachs of a sample of the larger predatory fish caught (please record their fork length and weight). This is not a detailed analysis, but a quick visual estimation of contents to give a semi-quantitative indication of diet (particularly in relation to which forage fish are present). An index of fullness can be made on the following scale:

- 0 - empty
- 1 - stomach less than full
- 2 - stomach full but not distended
- 3 - stomach full and distended

Identify the percent composition of the contents (by volume assessed visually). The key classes will be fish (identified if possible, and if intact measured to the nearest mm), invertebrates (identified if possible to crab, shrimp, euphausid, etc.), seaweed. In many areas there will be a commonly caught predatory fish such as Dolly Varden. If this is the case and time is limited, just look at the diet of this one species.

Species List for Lower Cook Inlet

(This may not be comprehensive)

Based on Blackburn's 1976 collections and our 1995 Beach Seines.

Arctic Lamprey	<i>Lampetra japonica</i>	Arrowtooth Flounder	<i>Atheresthes stomias</i>
Spiny Dogfish	<i>Squalus acanthias</i>	Rex Sole	<i>Glyptocephalus zachirus</i>
Big Skate	<i>Raja binoculata</i>	Petrale Sole	<i>Eopsetta jordani</i>
Black Skate	<i>Raja kincaidii</i>	Flathead Sole	<i>Hippoglossoides elassodon</i>
Longnose Skate	<i>Raja rhina</i>	Pacific Halibut	<i>Hippoglossus stenolepis</i>
Pacific Herring	<i>Clupea harengus pallasii</i>	Butter Sole	<i>Isopsetta isolepis</i>
Bering Cisco	<i>Coregonus laurettae</i>	Rock Sole	<i>Lepidopsetta bilineata</i>
Pink Salmon (Humpy)	<i>Oncorhynchus gorbuscha</i>	Yellowfin Sole	<i>Limanda aspera</i>
Chum Salmon (Dog)	<i>Oncorhynchus keta</i>	Dover Sole	<i>Microstomus pacificus</i>
Coho Salmon (Silver)	<i>Oncorhynchus kisutch</i>	Lemon (English) Sole	<i>Parophrys vetulus</i>
Red Salmon (Sockeye)	<i>Oncorhynchus nerka</i>	Starry Flounder	<i>Platichthys stellatus</i>
King Salmon (Chinook)	<i>Oncorhynchus tshawytscha</i>	Alaska Plaice	<i>Pleuronectes quadrituberculatus</i>
Dolly Varden	<i>Salvelinus malma</i>	Sand Sole	<i>Psettichthys melanostictus</i>
Surf Smelt	<i>Hypomesus pretiosus pretiosus</i>		
Capelin	<i>Mallotus villosus</i>		
Longfin Smelt	<i>Spirinchus thaleichthys</i>		
Eulachon	<i>Thaleichthys pacificus</i>		
Pacific Cod	<i>Gadus macrocephalus</i>		
Pacific Tomcod	<i>Microgadus proximus</i>		
Saffron Cod	<i>Eleginus gracilis</i>		
Walleye Pollack	<i>Theragra chalcogramma</i>		
Shortfin Eelpout	<i>Lycodes brevipes</i>		
Wattled Eelpout	<i>Lycodes palearis</i>		
Threespine Stickleback	<i>Gasterosteus aculeatus</i>		
Pacific Sandfish	<i>Trichodon trichodon</i>		
Searcher	<i>Bathymaster signatus</i>		
Daubed Shanny	<i>Lumpenus maculatus</i>		
Pacific Snake Prickleback	<i>Lumpenus sagitta</i>		
Longnose Prickleback	<i>Lumpenella longirostris</i>		
Crescent Gunnel	<i>Pholis laeta</i>		
Bering Wolffish	<i>Anarhichas orientalis</i>		
Quillfish	<i>Ptilichthys goodei</i>		
Prowfish	<i>Zaprora silenus</i>		
Pacific Sand Lance	<i>Ammodytes hexapterus</i>		
Rockfish spp.	<i>Sebastes spp.</i>		
Sablefish (Black Cod)	<i>Anoplopoma fimbria</i>		
Rock Greenling	<i>Hexagrammos lagocephalus</i>		
Masked Greenling	<i>Hexagrammos octogrammus</i>		
Whitespotted Greenling	<i>Hexagrammos stelleri</i>		
Lingcod	<i>Ophiodon elongatus</i>		
Silverspotted Sculpin	<i>Blepiasis cirrhosus</i>		
Spinyhead Sculpin	<i>Dasycottus settiger</i>		
Buffalo Sculpin	<i>Enophrys bison</i>		
Soft Sculpin	<i>Gilbertidia sigalutes</i>		
Thread Sculpin	<i>Gymnocanthus pistilliger</i>		
Red Irish Lord	<i>Hemilepidotus hemilepidotus</i>		
Yellow Irish Lord	<i>Hemilepidotus jordani</i>		
Bigmouth Sculpin	<i>Hemilepidotus bolini</i>		
Northern Sculpin	<i>Icelinus borealis</i>		
Thorny Sculpin	<i>Icelus spiniger</i>		
Pacific Staghorn Sculpin	<i>Leptocottus armatus</i>		
Blackfin Sculpin	<i>Malacocottus kincaidii</i>		
Great Sculpin	<i>Myoxocephalus polyacanthocephalus</i>		
Eyeshade Sculpin	<i>Nautichthys pribelovius</i>		
Tadpole Sculpin	<i>Phychrolutes paradoxus</i>		
Scissortail Sculpin	<i>Triglops forficata</i>		
Ribbed Sculpin	<i>Triglops pingeli</i>		
Northern Spearnose Poacher	<i>Agonopsis emmelane</i>		
Sturgeon Poacher	<i>Agonus acipenserinus</i>		
Smooth Alligatorfish	<i>Anoplagonus inermis</i>		
Aleutian Alligatorfish	<i>Aspidophoroides bartoni</i>		
Gray Snarsnout	<i>Asterotheca alascana</i>		
Fourhorn Poacher	<i>Hypsagonus quadricornis</i>		
Tubenose Poacher	<i>Pallasina barbata aix</i>		
Sawback Poacher	<i>Sarritor frenatus</i>		
Leatherfin Lump sucker	<i>Eumicrotremus derjugini</i>		
Pacific Spiny Lump sucker	<i>Eumicrotremus orbis</i>		
Spotted Snailfish	<i>Liparis callyodon</i>		
Ribbon Snailfish	<i>Liparis cyclopus</i>		
Marbled Snailfish	<i>Liparis dennyi</i>		
Lobefin Snailfish	<i>Polypera greeni</i>		

Fish collections (number of individuals) required from Kachemak Bay, Chisik Island, Barren Islands, Aleutians, Alaska Peninsula, Prince William Sound, and Southeast Alaska.

	GENETICS One-time collection (fish 50-200mm)	MERISTICS One-time collection (fish 50-200mm)	ENERGETICS/STABLE ISOTOPE One-time collection (fish 50-200mm)	ENERGETICS/STABLE ISOTOPE Monthly collections
Pacific Herring			35	30 individuals 50-200mm
Salmon (specify spp.)			35	5-10g of muscle tissue from 10 individuals over 200mm
Dolly Varden			35	5-10g of muscle tissue from 10 individuals over 200mm
Capelin			35	30 individuals 50-200mm
Eulachon			35	
Surf Smelt			35	
Pacific Cod			35	30 individuals 50-200mm and 5-10g of muscle tissue from 10 individuals over 200mm
Pacific Tomcod			35	
Saffron Cod			35	
Walleye Pollack			35	30 individuals 50-200mm and 5-10g of muscle tissue from 10 individuals over 200mm
Threespine Stickleback			35	
Pacific Sandfish			35	
Myxodipid spp. (specify spp.)			35	
Prickleback spp. (specify spp.)			35	
Eelblenny spp. (specify spp.)			35	
Crescent Gunnel			35	
Prowfish			35	
Pacific Sand Lance	30-100	30-100	35	200g of larval; 30/45 individuals 80-140mm; 60/30 individuals over 140mm
Sablefish (Black Cod)			35	
Greenling spp. (specify spp.)			35	
Sculpin spp. (specify spp.)			35	5-10g of muscle tissue from 10 individuals over 200mm
Squid			100g/100g	
Euphausiids			100g/100g	
Other Common Species			35	5-10g of muscle tissue from 10 individuals over 200mm

All the fish for each energetics and stable isotope collection should be collected at the same time if possible.

Fish should be frozen individually in whirl-paks or zip-locks and labelled with date, time, location, species, and method of collection.