

Operational Plan: Southeast Coastal Monitoring, 2021

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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, χ^2 , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
Weights and measures (English)		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft ³ /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	≥
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia	e.g.	less than or equal to	≤
pound	lb	(for example)		logarithm (natural)	ln
quart	qt	Federal Information Code	FIC	logarithm (base 10)	log
yard	yd	id est (that is)	i.e.	logarithm (specify base)	log ₂ , etc.
		latitude or longitude	lat. or long.	minute (angular)	'
Time and temperature		monetary symbols (U.S.)	\$, ¢	not significant	NS
day	d	months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	H_0
degrees Celsius	°C	registered trademark	®	percent	%
degrees Fahrenheit	°F	trademark	™	probability	P
degrees kelvin	K	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	α
hour	h	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	β
minute	min	U.S.C.	United States Code	second (angular)	"
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
Physics and chemistry				standard error	SE
all atomic symbols				variance	
alternating current	AC			population	Var
ampere	A			sample	var
calorie	cal				
direct current	DC				
hertz	Hz				
horsepower	hp				
hydrogen ion activity (negative log of)	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

REGIONAL OPERATIONAL PLAN NO. CF.1J.2021.02

OPERATIONAL PLAN: SOUTHEAST COASTAL MONITORING, 2021

by

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March 2021

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SIGNATURE PAGE

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PURPOSE

The primary objective of the Southeast Coastal Monitoring project (SECM) is to evaluate the status of the pelagic ecosystem, including juvenile salmon (*Oncorhynchus* spp.) and other pelagic fish species, in the northern region of Southeast Alaska. SECM surveys support research on the marine ecology of salmon, provide harvest forecast models for Southeast Alaska pink salmon (*O. gorbuscha*), and support ecosystem research in the Gulf of Alaska. SECM surveys will occur during monthly intervals from May to July 2021 at twelve principal stations, and will include surface trawl (Nordic 264) sampling for salmon and other pelagic fish species, bongo net sampling for zooplankton, and CTD data collection of temperature and salinity data. In July, sampling will also occur at eight new stations in lower Chatham and Sumner Straits to provide data from new habitats and geographic locations in central Southeast Alaska.

Key words: Chatham Strait, Chinook salmon, chum salmon, coded wire tag, coho salmon, Icy Strait, *Oncorhynchus gorbuscha*, *Oncorhynchus keta*, *Oncorhynchus kisutch*, *Oncorhynchus nerka*, *Oncorhynchus tshawytscha*, pink salmon, sockeye salmon, Southeast Alaska, Sumner Strait, otolith, thermal mark, pelagic trawl.

OBJECTIVES

1. Conduct pelagic trawl (Nordic 264) operations at stations in Icy Strait, Upper Chatham Strait, and Stephens Passage in June and July to maintain long-term standardized catch and size indices of juvenile salmon and other epipelagic fish species in the northern region of Southeast Alaska.
2. Conduct pelagic trawl (Nordic 264) operations at new experimental stations in Lower Chatham Strait, and Sumner Strait in July to develop standardized catch and size indices of juvenile salmon and other epipelagic fish species in the central region of Southeast Alaska.
3. Collect coded wire tags, otoliths, and genetic tissue samples in June and July to study the origin and age of juvenile salmon in the northern and central regions of Southeast Alaska.
4. Collect salmon specimens for the analysis of diet and energetic condition in June and July to monitor and evaluate the feeding ecology and energetic status of juvenile salmon in the northern and central regions of Southeast Alaska.
5. Collect data on temperature, salinity, chlorophyll, and zooplankton with CTD (SBE 49) and bongo net sampling in May, June, and July to monitor the ecosystem status of northern and central Southeast Alaska.

BACKGROUND

SECM surveys have provided information on the status of juvenile salmon and marine ecosystems in northern region of Southeast Alaska annually since 1997. The surveys support research on the marine ecology and production dynamics of Southeast Alaska salmon stocks and are used in forecast models of Southeast Alaska pink salmon harvests (Orsi et al. 2016; Wertheimer et al. 2018). Critical periods in the natural mortality of salmon are integral to the development of forecast models of abundance and harvest. The initial marine period of juvenile pink salmon (*O. gorbuscha*) is believed to be the primary determinant of year-class strength (Parker 1968; Mortensen et al. 2000; Willette et al. 2001; Wertheimer and Thrower 2007) due to the high and variable mortality that occurs during this life-history stage. SECM surveys provide unique insight into the relative importance of the initial and later marine stages of salmon to their overall survival

by sampling juveniles after the initial marine entry stage (Murphy et al. 1999; Fergusson et al. 2018).

Juvenile abundance is uniquely informative to pink salmon. Due to their short, two-year life cycle, the adult population consists of a single age class that returns in the same year, and therefore adult sibling data cannot be used to provide insight into cohort strength. Uncertainty in spawner abundance and highly variable marine survival (Heard 1991; Haeseker et al. 2005) limit the utility of spawner-recruit models to project future abundance of pink salmon. As a result, simple or “naïve” models often outperform more complex spawner-recruit models (Haeseker et al. 2005). Wertheimer et al. (2006) documented a highly significant relationship between annual peak juvenile pink salmon catch-per-unit-effort (CPUE) from SECM surveys conducted in June or July and the Southeast Alaska harvest of adults in the following year. CPUE data have been supplemented with ecosystem indicators (Orsi et al. 2016; Wertheimer et al. 2018) and used as auxiliary data to improve exponential smoothing models used by the Alaska Department of Fish and Game (ADF&G) to generate pink salmon harvest forecasts (Piston and Heintz 2017). The use of ecosystem indicators to model natural mortality processes is becoming more common in stock assessment (Hollowed et al. 2011) and salmon production models (Miller et al. 2013; Orsi et al. 2016).

Prior to 2018, NOAA Fisheries, Alaska Fisheries Science Center, Auke Bay Laboratories (NOAA) initiated and conducted all operations related to the SECM survey. ADF&G began to incorporate SECM pink salmon data into their pink salmon forecasts for the 2007 return (Eggers 2007), and the two agencies produced separate pink salmon harvest forecasts for Southeast Alaska from 2007 to 2018. In 2018, the two agencies increased their collaboration in support of the project and began producing a joint forecast for the 2019 pink salmon return. The ADF&G research vessel *Medeia* was used to conduct the 2018 to 2020 SECM surveys and will continue to be the primary project survey vessel for the foreseeable future. The SECM survey is now conducted in coordination between the NOAA and ADF&G, with an effort to focus and expand the project to provide a wide variety of information of value to the fishing industry.

STUDY SITE

Primary sampling stations extend from inshore waters of Southeast Alaska in Stephens Passage to Icy Strait (Figure 1). Four sampling stations are located in Stephens Passage along the southern shore of Douglas Island, four stations are located near the junction of upper Chatham Strait and Icy Strait, and four stations are located in Icy Strait just north of the city of Hoonah (Figure 1; Table 1). Icy Strait is one of the primary migration corridors for juvenile salmon heading to sea from the inside passages of Southeast Alaska. Additional experimental stations have been added in southern Chatham Strait and Sumner Strait to provide data from new habitats and geographic locations in central Southeast Alaska (Figure 2). Four sampling stations are located at the southern opening of Chatham Strait and stretch from Cape Ommaney across to Coronation Island, and four stations are located in Sumner Strait from near Point St. Albans across to Point Hardscrabble (Figure 2; Table 2). Four backup stations were also identified in lower Chatham Strait in case stormy weather prevents conducting work in the more open water between Cape Ommaney and Coronation Island (Figure 2; Table 2).

Table 1.–Coordinates of transects and stations sampled during the Southeast Coastal Monitoring project in marine waters of the northern region of Southeast Alaska during May (oceanography only), June, and July of 2021.

Transect	Station	Latitude	Longitude
Upper Chatham Strait	UCA	58.076167	-135.001333
Upper Chatham Strait	UCB	58.103667	-135.015167
Upper Chatham Strait	UCC	58.132500	-135.066667
Upper Chatham Strait	UCD	58.160667	-135.042000
Icy Strait	ISA	58.220833	-135.529333
Icy Strait	ISB	58.237000	-135.487667
Icy Strait	ISC	58.254667	-135.444167
Icy Strait	ISD	58.273000	-135.399667
Stephens Passage	SPA	58.179333	-134.278333
Stephens Passage	SPB	58.206167	-134.442000
Stephens Passage	SPC	58.231833	-134.630833
Stephens Passage	SPD	58.306333	-134.716167

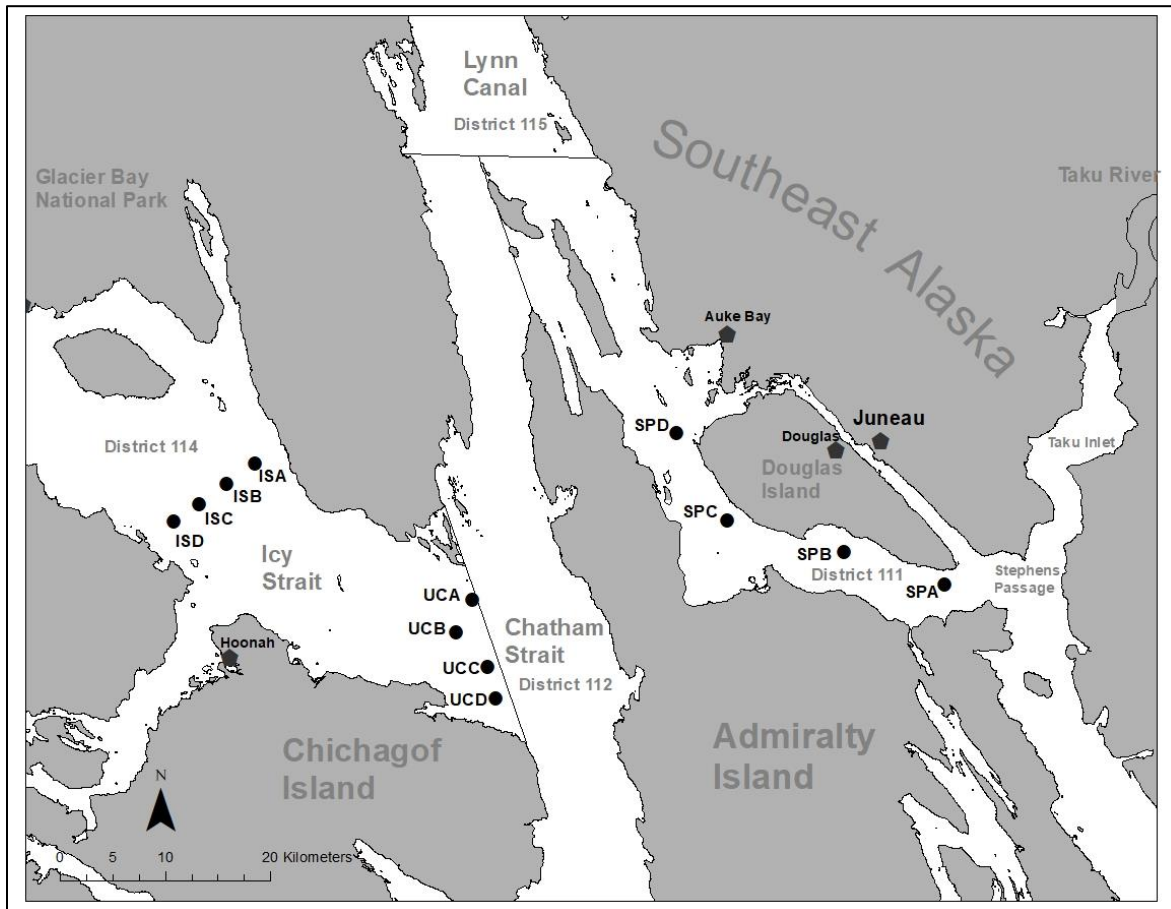


Figure 1.–Location of the primary Southeast Coastal Monitoring project survey stations in northern Southeast Alaska.

Table 2.—Coordinates of new experimental southern Chatham Strait and Sumner Strait transects and stations sampled during the Southeast Coastal Monitoring project in marine waters of the central region of Southeast Alaska during July of 2021. Exact coordinates may change slightly based on conditions encountered during the first survey of these new stations.

Transect	Station	Latitude	Longitude
Lower Chatham Strait	LCA	56.143617	-134.670250
Lower Chatham Strait	LCB	56.075903	-134.595267
Lower Chatham Strait	LCC	56.006197	-134.504208
Lower Chatham Strait	LCD	55.944922	-134.414189
Lower Chatham Strait Backup	LCBUA	56.262117	-134.596708
Lower Chatham Strait Backup	LCBUB	56.253114	-134.502342
Lower Chatham Strait Backup	LCBUC	56.245825	-134.408386
Lower Chatham Strait Backup	LCBUD	56.239500	-134.315083
Sumner Strait	SSA	56.070769	-133.957258
Sumner Strait	SSB	56.040683	-133.901833
Sumner Strait	SSC	56.019056	-133.856947
Sumner Strait	SSD	55.994200	-133.807614

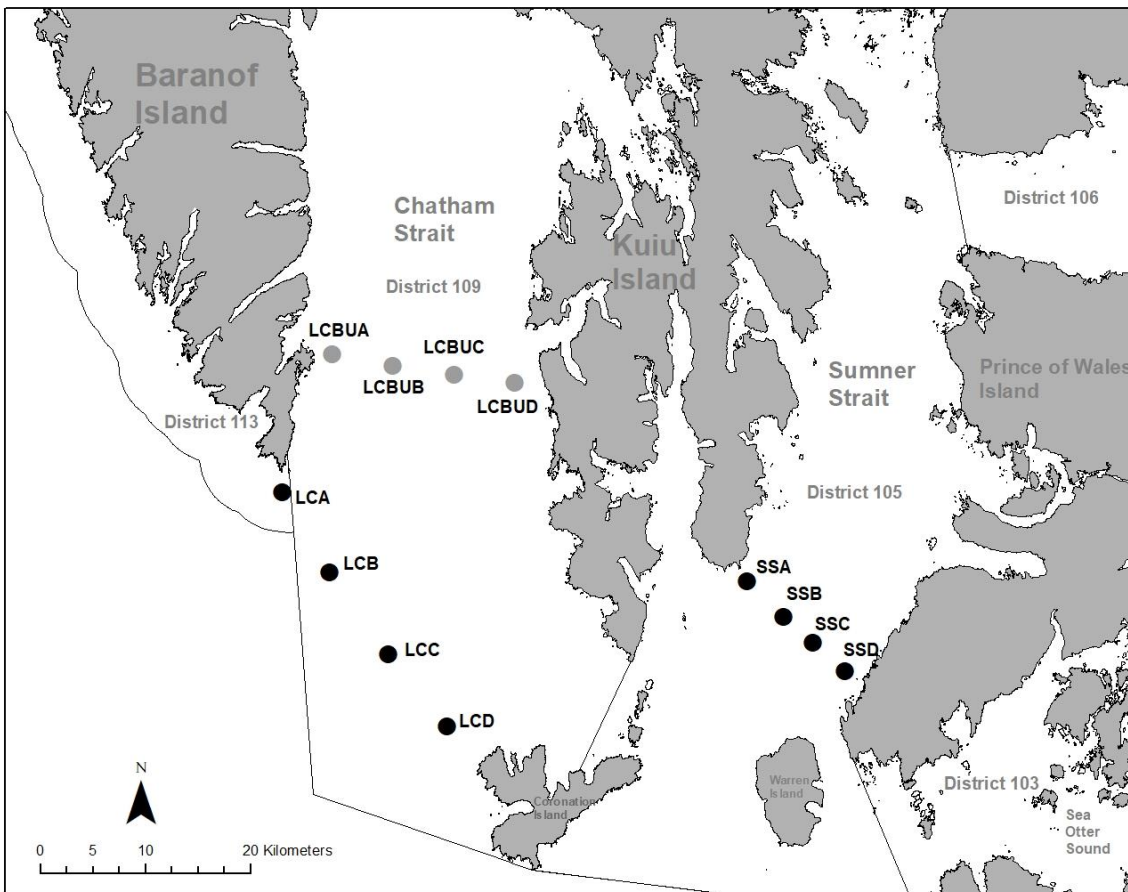


Figure 2.—Location of new experimental Southeast Coastal Monitoring project survey stations in central Southeast Alaska.

MARINE MAMMAL INTERACTIONS

Consistent with the terms and conditions of the Biological Opinion for Southeast Alaska, if during the course of the marine vessel survey injured or entangled marine mammals are observed, the following protocols will be implemented:

- Document with photos/video (remain at least 100 yards from the animal) and record the date, time, and location (latitude/longitude, description of bay, point, island, etc.).
- As soon as possible, report to Alaska Marine Mammal Stranding Network 24-hour Hotline: 877-925-7773 (877-9-AKR-PRD).
- If a large whale is alive and entangled, immediately call the U.S. Coast Guard at VHF Channel 16.
- If possible, record the species, age class, sex (for sea lions), type of gear, a description of the gear and how the animal is entangled, its relative degree of impairment, and direction of travel. Include this information in the report to the Hotline/USCG above.

For dead animals, if communications allow, contact the Stranding Hotline while you are near the carcass to determine if samples or additional information can be collected.

METHODS

PELAGIC TRAWLS

A Nordic 264 (Appendix A) rope trawl with 5/8" synthetic TS2 bridals will be used to conduct surface trawls. Surface trawl hauls will have a duration of 60 minutes in Stephens Passage and 20 minutes in upper Chatham and Icy Straits, and the new stations in lower Chatham and Sumner Straits. A pair of 3-m foam-filled Lite trawl doors, each weighing 544 kg (91 kg submerged), will be used to spread the trawl open. To keep the headrope fishing at the surface, two clusters of three A-4 Polyform buoys (inflated to 0.75 m diameter and encased in knotted mesh bags) will be clipped on the opposing corner wingtips of the head rope and one A-3 Polyform float (inflated to 0.5 m diameter) will be clipped into a mesh kite pocket in the center of the head rope. Two 50-kg tom-weights may be integrated into the foot rope to maximize fishing depth. Two acoustic pingers (10 kHz, 132 dB) will be attached to the corners of the head rope to deter porpoise interactions.

The boat crew of the ADF&G research vessel *Medeia* will lead the deployment and retrieval of the trawl net, but the scientific crew will assist during this process. All members of the scientific crew are required to wear personal floatation devices and hard hats while assisting on deck.

TRAWL CATCH PROCESSING

Fish Collection Protocol

Once the catch is sorted by species, a total of 30 fish per species and life-history stage (e.g., juvenile, immature) per tow will be measured (snout to tail fork length) and weighed. One replicate tow is conducted at each station, which will provide up to 60 lengths and weights per species and life-history stage. Jellyfish spp. will be weighed in as catch (i.e., total weight only).

Salmon Collection Protocol

Each species will be weighed in as catch following protocols outlined in the Data Recording section below. A total of 30 salmon per species and life-history stage will be weighed and measured for snout to tail fork length per tow. Each salmon weighed and measured will be wrapped in plastic wrap with a unique barcode. Multiple fish can be enclosed in the same sheet of plastic wrap as long as individual fish are enclosed in multiple wraps to keep them clearly separated. Generally, 6–10 juvenile salmon can be enclosed in one plastic wrap sheet and still freeze evenly and quickly. The heads and stomachs of immature Chinook salmon (*O. tshawytscha*) will be removed and individually bagged in a zip top bag, along with a barcode, for processing in the laboratory. All samples of a species and life-history stage will be stored in a ziplock freezer bag labeled with the species, survey identification, station, and trawl number and placed in a freezer as soon as sampling of the tow is complete.

All Chinook and coho (*O. kisutch*) salmon will be examined for adipose fin clips and scanned for the presence of a coded wire tag (CWT) using a handheld detector. The ad-clipped/CWT fish will be individually bagged with a barcode and a CWT card, and CWTs will be read onboard the vessel to identify origin. For adult salmon, length, weight, and sex will be recorded, and up to 10 stomachs per species at each station will be collected. Each stomach sample will be frozen individually with an associated barcode.

Juvenile Salmon Identification

Identification of salmon during their first few months at sea can be extremely challenging (Figure 3). The field marks used to identify juveniles in fresh water are often faded, modified, or are no longer present, and fish of the same species in a single trawl may have different appearances due to variation in development and time at sea. In addition, many of the field marks that can be used to identify adult salmon are not present in juvenile salmon during their first few months at sea. Due to the difficulty in some identifications, more than one feature should be used when distinguishing between species.

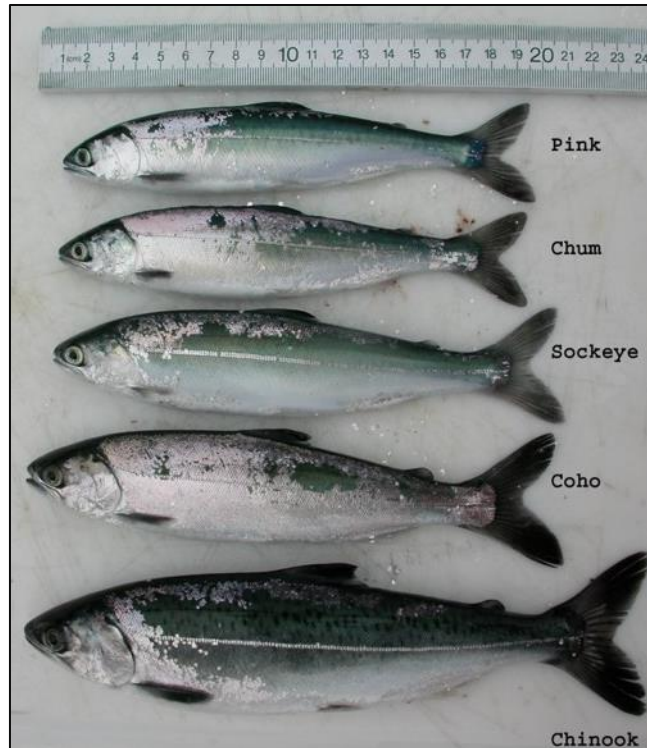


Figure 3.—Juvenile salmon captured during the Southeast Coastal Monitoring project (© NOAA).

Chinook and Coho Salmon

Juvenile Chinook salmon can look very similar to coho salmon in their first months at sea, and many of the features that are used to separate the two species in freshwater or as adults are not readily apparent. Typically, Chinook and coho salmon can be quickly separated from other salmon species based on the presence of spotting on the dorsal surface, which is typically lacking in the other salmon species at this stage. Although the spotting pattern and individual spot shape and size on adult Chinook is distinctive, it is of limited value for separating Chinook and coho salmon in the juvenile stage as the spotting can appear similar in both species, especially early in the summer.

One feature that can help to quickly separate Chinook from coho salmon early in the summer is the nearly completely dark pectoral fin on Chinook salmon (Figure 4). Coho salmon will often have dark pigmentation on the upper part of the pectoral fin, but not over the entire fin as in Chinook salmon. This feature may be most obvious during the June survey, as coho salmon pectoral fins appear to darken after a few months at sea (Figure 5). When visible, faded parr marks tend to be football shaped on Chinook salmon and are usually wider than the spaces in between. In contrast, coho salmon have thinner parr marks with the spaces between being wider than the parr marks. In both species, the parr marks are roughly centered on the lateral line, unlike sockeye salmon (*O. nerka*) which have parr marks that are located mostly above the lateral line (Figure 6). The head shape of coho and Chinook salmon can be a useful field mark as coho tend to have a blunter snout than Chinook salmon, but this feature can be difficult to discern without experience. In cases where identification is not clear, the pyloric caeca can be examined; Chinook salmon have more numerous pyloric caeca (135–185) that appear longer and thinner than the less numerous and blunter pyloric caeca of coho salmon (45–80). Chinook salmon also have a distinct odor that some people describe as smelling like cucumbers. Coho seem to have no distinct odor, so it is helpful to

smell some positively identified Chinook salmon during the survey so that you can use their unique odor as an additional field mark for difficult to identify specimens.



Figure 4.—Juvenile Chinook (top) and coho (bottom) salmon captured in late June during the Southeast Coastal Monitoring project. Note the difference in coloration of the pectoral fin between the two species. (© ADF&G/photo by Andrew Piston).



Figure 5.—One juvenile Chinook (bottom) and four juvenile coho (top) salmon captured in late July during the Southeast Coastal Monitoring project (© ADF&G/photo by Andrew Piston).

Sockeye Salmon

When separating sockeye salmon out of a mixed-species trawl catch, the most obvious feature is their proportionally larger eye, which is distinctive during the first few months at sea (Figure 6). When sorting a mixed-species catch, this feature is often the first thing you will notice. If parr marks are still visible, they are located primarily above the fish's lateral line, which makes that feature distinctive from Chinook and coho salmon (Figure 6). Sockeye salmon have 28 to 40 long, slender gill rakers on their first gill arch. Chinook, coho, and chum (*O. keta*) salmon have shorter, more widely spaced gill rakers; the differences are best detected by comparing known specimens early in the survey to calibrate your eye. Pink salmon will have moderately long, closely spaced gill rakers, but can be easily differentiated from sockeye salmon by other features.



Figure 6.—Juvenile sockeye salmon captured in late June during the Southeast Coastal Monitoring project. Note the large eyed look and the parr marks that are primarily above the lateral line, and the visible scale pockets (hash marks) above the lateral line (© ADF&G/photo by Andrew Piston).

Chum Salmon

Chum salmon juveniles most closely resemble pink salmon, and the best feature to separate the two is by the scale pockets left behind after removal of almost all scales by the trawl net (Figures 7 and 8). Chum salmon will have distinct scale pockets that can be seen relatively easily, while pink salmon will appear to be almost completely smooth. Chum salmon may also show faint parr marks that are centered more above the lateral line than Chinook and coho salmon and are generally smaller than in other species. Chum salmon have fairly short, stout, widely spaced gill rakers that should appear very different than the relatively long, closely spaced gill rakers of a pink

salmon. Both chum and pink salmon juveniles have a thinner, more elongated body profile than Chinook, coho, and sockeye salmon.



Figure 7.—Juvenile sockeye salmon (top), chum salmon (middle), and pink salmon (bottom) captured in late June during the Southeast Coastal Monitoring project (© ADF&G/photo by Andrew Piston).



Figure 8.—Juvenile chum salmon (top) and pink salmon (bottom) captured in late June during the Southeast Coastal Monitoring project. Note the very visible scale pockets above the lateral line in the chum salmon and the lack of noticeable pockets on the pink salmon (© ADF&G/photo by Andrew Piston).

Pink Salmon

Pink salmon can be best identified by the very smooth appearance of the body surface due to their very small scales and tiny scale pockets left after a fish is denuded of scales in the trawl net (Figures 7, 8, and 9). Juvenile pink salmon tend to have a sharply demarcated dark back and a slightly bluish cast in good light, which can be useful for initial identification (followed by examination of scale pockets; Figure 9). Chum salmon can appear similar, but generally the contrast between the back and the upper flanks is not as distinct (Figures 7 and 8). As noted earlier, the gill rakers of pink salmon should be clearly distinguishable from those of chum salmon.



Figure 9.—Juvenile pink salmon captured in late June during the Southeast Coastal Monitoring project (© ADF&G/photo by Andrew Piston).

Other Species

A variety of other species will be captured during SECM survey trawls. Some of the most common species include Pacific Herring (*Clupea pallasii*), Walleye Pollock (*Theragra chalcogramma*), Starry Flounder (*Platichthys stellatus*), Pacific Spiny Lumpsucker (*Eumicrotremus orbis*; Figure 10), Smooth Lumpsucker (*Aptocyclus ventricosus*; Figure 10), and Crested Sculpin (*Blepsias bilobus*; Figure 11), but a wide variety of species may be encountered.



Figure 10.—Smooth Lumpsucker (left) and Pacific Spiny Lumpsucker (right) captured during the Southeast Coastal Monitoring project (© ADF&G/photo by Andrew Piston).



Figure 11.—Crested Sculpin captured during the Southeast Coastal Monitoring project (© ADF&G/photo by Steven C. Heintl).

Jellyfish

Jellyfish captured during the survey will be weighed and entered as catch. The primary species encountered during the survey are Lion's Mane (*Cyanea capillata*), *Aequorea* spp., *Chrysaora melanaster*, *Aurelia* spp., and *Staurophora mertensii*, but other species may be present. The lion's mane (Figure 12) can be clear, white, orange, or red in color and is best identified by the large lobes on the outside circumference of the bell. *Aequorea* spp. and *Aurelia aurita* are both clear jellyfish; *Aequorea* spp. has numerous radial canals on the outside edge of the bell, whereas *Aurelia aurita* has four circular gonads resembling a movie reel (Figure 13). The *Chrysaora melanaster* is clear with prominent yellow radial canals, it has very long tentacles, and has numerous small lobes around the outside edge of the bell (Figure 14). *Staurophora mertensii* is a clear jellyfish with 4 dark radial canals that form an X across the bell (Figure 15).



Figure 12.–Lions Mane (*Cyanea capillata*) jellyfish (© NOAA/photo by Emily Fergusson).



Figure 13.—*Aurelia aurita* (left) and *Aequorea* spp. (right) jellyfish (© NOAA/photo by Joe Orsi).

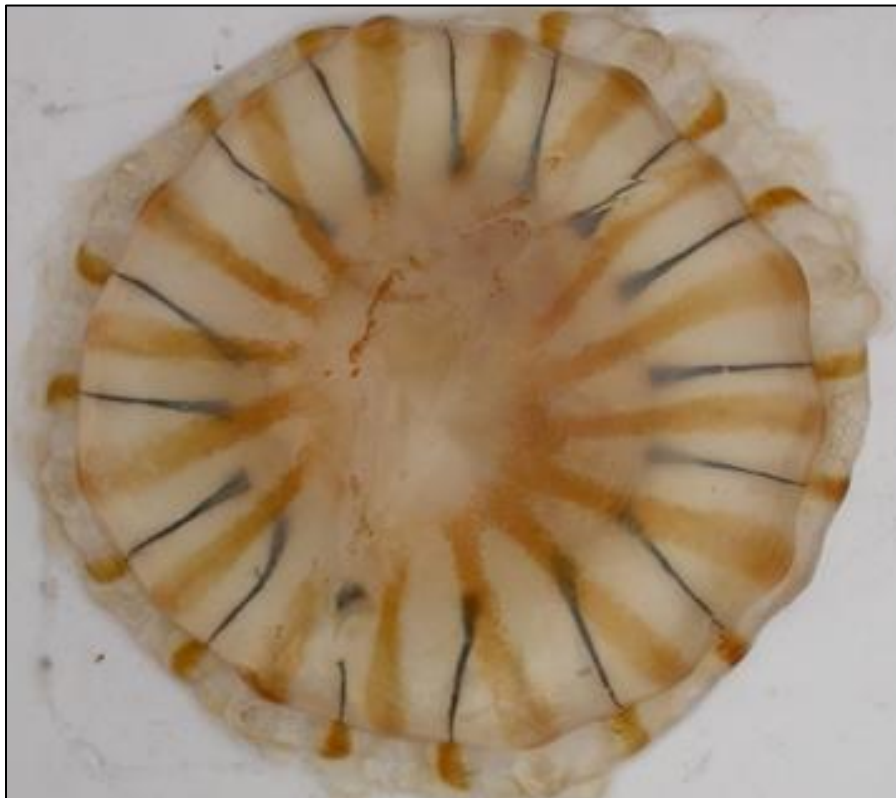


Figure 14.—*Chrysaora melanaster* jellyfish (© NOAA/photo by Emily Fergusson).



Figure 15.—*Staurophora mertensii* jellyfish (© NOAA/photo by Joe Orsi).

Data Recording

On most surveys, data will be recorded with a Catch Logger for Acoustic Midwater Surveys system (CLAMS) developed by the Alaska Fisheries Science Center (AFSC), but in some cases the system may not be available, and data will be recorded on paper forms (Appendix B).

CLAMS

The names of all scientists who are participating on the survey need to be entered into CLAMS, which can be done in the CLAMS administration tab or directly edited in the database with the Oracle SQL Developer (this is the preferred method). Each survey is given a name based on the vessel, year, and cruise number, and details on Chief Scientist, region, and dates are recorded in CLAMS. For example, use ME2101, for the June 2021 *Medeia* survey as it is the first survey on the *Medeia* in 2021. Setting up the survey is most easily done in the administration tab of the main CLAMS menu.

Station and biological data collected from trawl catches will be recorded with CLAMS, and the system will provide species catch composition by weight and number. Specimen collections will be tracked electronically with barcode readers and barcoded specimen tags. CLAMS is set up to record all aspects of each trawl. The initial trawl information is entered by the Chief Scientist on a computer located near the wheelhouse as the trawl net is being deployed and hauled back on the “Log Event” tab. Once the trawl net is brought onboard and the catch is sorted, the scientific crew will begin logging the catch of each species on the “Enter Catch” tab. Once the total catch of a

particular species is entered into CLAMS, the individual specimens can be measured and/or weighed using the “Specimen Form” tab.

Log Event

To start the process of data entry for each trawl, open the CLAMS software and select the “Log Event” tab. The next window will ask you to select an event to log; select “Trawl Event.” This will bring you to a screen called “Events in Database” where you will select “Start New Event.” This will bring up a screen asking if there are marine mammals present in the vicinity of the boat and if there are any endangered seabirds in the vicinity of the boat; you are then given the choice to abort the trawl or proceed. If it is safe to proceed, the next screen will ask you to identify yourself from a dropdown menu; click your name and “ok.” Once this is completed you will arrive at the main trawl information screen.

On the main trawl information screen, you will enter the following information: bottom depth in meters; trawl gear (select “NETS264 Nordic”), station number (which will be the same as event number unless determined otherwise by the Chief Scientist onboard), gear performance (select “good” performance as long as things are proceeding normally), and haul type (select “Surface trawl at pre-determined station”). For the “Transect” tab enter 1 for Stephens Passage, 2 for Icy Strait, and 3 for upper Chatham Strait. For the “Strata” tab enter 1 for inshore habitat and 2 for strait habitat (Transects 2 and 3). You are now ready to start the trawl recording which will happen as soon as the vessel Captain and Chief Scientist determine the net is set and fishing. At that point you will click on “EQ” and a timer will start counting down the trawl time and a GPS will record the coordinates of the trawl. Trawls will be one hour in length in Stephens Passage and 20 minutes in length in Icy, Chatham, and Sumner Straits. Enter the rpms and the station name under comments; for the research vessel *Medeia*, the rpms will typically be around 950. At the end of the trawl, you will enter the ending depth and then click “Haulback” as soon as the winches start pulling back the net. Click “Done”; the trawl event will be created, and the catch data can be subsequently entered. Click “Done” again to get back to the main CLAMS screen.

Enter Catch

Two CLAMS stations are set up in the sampling shelter on deck to enter catch and specimen data. CLAMS1 is set up on the right side of the shelter and CLAMS2 is on the left and is connected to the large basket scale for measuring catches. Check in the haul with CLAMS2 by clicking on “Enter Catch.” The first screen will ask you to identify yourself from a pre-determined list of names; click your name and “ok.” Next you will make sure you are on the correct haul, which should be the current or active haul entered from the wheelhouse “Log Event”. You first need to enter the “Haul Form” and specify that the catch is not subsampled and that the total weight will be calculated from the individual species weights. A codend status window will pop up and you will select “Codend Status OK” assuming everything went well. There are alternative options for cases where the net malfunctions or other issues arise. Next select “Catch Form” and then select “Add Species” to begin entering species present in the trawl catch. When you select “Add Species” you will have the option to search for species or click on species that have occurred in the last 10 hauls from a dropdown menu. Several species have been mapped to life-history stage or species subcategory (juvenile, immature/mature {IM}, age-0, etc.). After selecting a species/subcategory click on “Add to List” to make that species available to enter catch.

If you run into a situation where the entire catch cannot be sorted to species in a reasonable time frame, select “Add to Mix” to create a mixed species catch weight category. Add species to the

haul (Add to List) or the mix (Add to Mix). Enter toss and measure the weight of the mix, like entering species-specific catch weights. Be sure you have a uniform mix when selecting the subsample. It is good to take random samples from each sorted basket. The measure weight of the mix is sorted to species and measure and toss weights are recorded for each species. Once you have added all the species in the current trawl catch you can begin to weigh them in; you can also add a single species to begin measuring and weighing individual specimens on the “Specimen Form” tab and come back to add in more species on the “Catch Form” if that makes more sense in the situation.

Select the species or species group (mix) that you want to record catch weights for, and a message will pop up saying you are changing the active species to whatever you chose; click ok if it was not a mistake. Now you will weigh in the catch using either the large scale to the left of the sampling station on the *Medeia* for large baskets of a species, or on one of the specimen scales in the sampling shelter for smaller catches. Be sure to regularly calibrate the scales, especially if there is a change in ship’s motion or wind. Use the 2 kg calibration weight for the specimen scales and 10 kg calibration weights for the basket scale. Be sure to tare the scale with an empty basket or a tub before weighing a container of fish. Catch weight protocols are set up for both the basket scale and the specimen scale. However, it is not possible to have both the basket scale and a specimen scale be assigned for catch weights. Therefore, it is not possible to add catch weights with the specimen scale that is connected to the basket scale. Weight from the basket scale can be automatically entered in CLAMS by pressing “Print.” Weights from the smaller scales need to be manually entered by clicking “Manual Weight”; enter the weight manually and then click “Enter.” You will then be asked for a “Basket Sample Type”; for species you are going to measure and weigh individually click “Measure,” for baskets of jellyfish or large baskets of salmon that are beyond the amount weighed in to sample individually you can select “Toss.” In cases where you weigh in the catch for a species you are not going to measure individually, you can enter the weight and select “Count” if it is only a few organisms. Enter jellyfish catch as count=0 as they will not be measured or counted. If all catches are recorded as toss it will not register in the catch records correctly. Once you have finished weighing in a species that you are going to further sample and bring back to the lab, you can move on to the “Specimen Form.” For species that are going to be measured but not brought back to the lab, enter measurements under the length form.

Specimen and Length Forms

You will have the option of recording specimen data with the specimen collection form and the length form. The specimen form and the length-weight form, which is found within the specimen form tab, are mapped to specific species codes; therefore, it is only possible to use these forms with pre-specified species. Use the length form for species that will not have specimen samples saved (i.e., no barcode numbers assigned) and are too small to adequately weigh; possibly species like squid and age-0 pollock. Use the length-weight form for species that will not have barcode numbers collected and are large enough to have individual weights taken (e.g., herring and starry flounder). Select auto-next when just entering in length-weight data, which will automatically cycle to a new record once length and weight has been entered. You will only be able to select the length-weight form for a particular species if it has been mapped to that species code. If the length-weight form is an option for a given species, you can also use a combination of the specimen and length-weight forms (e.g., collect four herring with the specimen form and the remainder with the length-weight form).

When opening the specimen form there will be a list of species available. These will be species that are assigned to the specimen form and have catches entered into CLAMS. Select the species and specimen form you want to use. Currently all specimens are collected using the Arctic EIS protocol. This is the framework that was originally defined for surface trawl surveys as part of the Arctic Integrated Ecosystem survey in the northern Bering Sea and Chukchi Sea. Both lengths and weights are required fields in the Arctic EIS protocol and buttons are red. Required fields are also assigned an order, and you must sample length before weight. Other fields are optional and therefore can be collected at any time after length and weight data have been entered.

Place the fish on the electronic measuring board and place the magnetic stylus so the correct end is at the fork of the tail (when measuring fork length). The Velcro strap can be used to secure the stylus to your finger if you wish. There are directional cuts on the top and bottom of the stylus, creating a point on the left side of the stylus, which is the point where you measure fish lengths. Lights will flash on the electronic measuring board when you have recorded a length, the length will appear on the board and on the screen, and the length button will turn green. You can click on the length button and manually enter length (cm) if you are not able to take a length with the electronic board (e.g., salmon shark). One of the boards has a dead spot (marked on the board); you will need to manually enter lengths in this situation.

Scales need to be calibrated regularly and wind can often cause problems with the stability of the specimen scales. You may need to close the door to the bait shed if wind is causing issues. To collect fish weight, put the fish on a tarred tray and press the “Enter” button on the scale. You need to ensure the steady light is on or the scale will not send a weight to the CLAMS computer. If it is not stable, then you will need to calibrate the scale. The weight button will turn green and the weight will be visible on the specimen form once it accepts a weight. Scan the barcode and follow collection protocols by assigning sex and maturity for immature salmon and specifying specimen types if required in the sample tab. Add comments, including CWT data for Chinook and Coho salmon. Select “Next” once all data have been entered for that specimen. A common mistake is to forget to select “Next” when you are done entering data for a given specimen record; be sure you are on the correct screen before starting to take measurements of the next fish. When “Next” is not selected an error message will come up asking if you want to overwrite the length data for the specimen. When this happens, select no, and then “Next” to correctly move to the next specimen record. There are two specimen protocols for immature/mature salmon. One protocol uses the large basket scale for specimen weight, the Arctic EIS protocol uses the specimen scale. Select the most appropriate protocol. It is always possible to hand enter weights so this is simply a matter of what is the most appropriate.

For adult salmon, select “immature salmon large scale” under the specimen form; this will allow you to weigh the adult salmon on the large scale and will give you options to enter length, weight, sex, maturity, bar code, and sample type (stomach). When you finish weighing all of the specimens for a species click “Done” and move on to the next species. Once all fish have been processed you can click on “Finish processing haul” to end the sampling of that trawl.

Saving and Exporting Clams Database Files

At the end of each survey day, all data files need to be backed up to the computer and to an external thumb drive. To start, navigate to the Oracle SQL Developer, click on “CLAMS Local Server”, and then “Views.” Find the data tables of interest, which will be labeled “Specimen_V2_FIN”, “Catch_V2_FIN”, and “Event & Catch Summary_V2_FIN”. In each of these three tables, go to

the DATA tab to view all the data, and then filter the survey column for only the current survey ID (e.g., filter for survey ME202101 for June survey in 2021). Once the three data tables are filtered for the current survey, right click and export a CSV file for each table to a directory with the CTD and SBE39 data on the desktop. Copy this directory to a thumb drive. Next, backup the CLAMS database by first navigating to the CLAMS desktop folder. Once in the Database folder, double click the “exportdatabase.bat” file; this file should then back up the entire database.

SBE39 Trawl Sensor

As part of each trawl, a Seabird SBE29 temperature and depth recorder is attached to the center of the foot rope chain of the trawl. The SBE29 is generally setup for each trawl by the Chief Scientist before or just as the trawl is deployed. Once the net begins to be deployed you will have approximately 2–3 minutes to setup the SBE29 and bring it out to the deck where it can be attached to the foot chain. To set up the SBE29 for deployment, connect the SBE29 to the computer via its cable and USB port (in most cases it will already be attached from downloading the prior trawl’s data). Open the SeaTerm software and click “Connect.” Once the SeaTerm software is connected to the SBE29, type the command “ds” to view details of the instrument. Samplenum should be set to 0; if not, type the command “samplenum=0” to reset it. Then type the command “startnow” to begin the data collection. Unplug the sensor from the computer, put on the portable plug and cap, and the sensor is ready to deploy.

As the trawl net is being hauled in, go out and obtain the SBE29 sensor and take to the wheelhouse. Be sure to take off the cap outside to empty any water in the cap. Then remove the plug and connect the sensor to the laptop. Click “connect” and then type “stop” in the terminal of the SeaTerm software. Then click “ds” to view details of the instrument and to make sure data were collected; on a typical trawl you might have in the range of 700–1,000 samples if the SBE29 is collecting data every three seconds. Then click the “Upload” button and a popup box will ask you to enter the range of data, which will be 1 to whatever the last data point collected was for that trawl. Enter a file name and the data will be downloaded to the file. Plot the SeaTerm results by double-clicking the Plot39.exe file shortcut on the desktop of the laptop. Once Plot39 is opened, enter a graph title and select “O.K.” Then enter the appropriate file name containing the data and a plot will appear. Save the plot as a JPEG. Then close the window and select “yes” for “save plot setting to disk.” Once it is verified that you have data, reset the sample number to 0 by typing the command “samplenum=0.”

Coded Wire Tag Reading

All Chinook and coho salmon captured during the SECM survey will be checked for coded wire tags with a magnetic detector. Coded wire tags will be removed, and tag codes will be read using a microscope on the vessel following each trawl as time allows. All coded wire tagged Chinook and coho salmon will be bagged individually with a unique barcode and CWT card.

To read coded wire tags, first scan the whole fish with the magnetic detector to verify the presence of a tag. Make sure to remove all watches, rings, or other items from your hand that could potentially cause a false-positive reading. Then, use a scalpel to remove the snout of the fish and run the snout through the magnetic detector to ensure the tag is contained in the portion you removed. Once you confirm the tag is present, use the scalpel to slice the snout in half and test each half in the magnetic detector. Continue halving the portion of meat in this fashion until you can locate the tag. Sometimes the magnetized tag will stick to the metal scalpel blade, so be sure to check the blade carefully if you find neither half of meat registers a tag. The tag may also

inadvertently be on your hand. The tags are very small and can be easily lost, so be very careful while dissecting.

Once you have located the tag you can place it in the palm of your hand and gently rub it if it has any flesh clinging to it that could obstruct your view of the tag code. Next, take the CWT pencil and align the tag so that it is sticking straight off the pointed end. Place the CWT pencil in the handheld reader to read the tag code. The tag will have a six-digit number that is etched lengthwise across the tag on both sides. The beginning of the code is indicated by a carrot. Sometimes one side of the tag will be more legible than the other so be sure to spin the tag and look at it from all angles to determine the final tag code. Dipping the tag in water may improve the readability of the tag code. Once you can clearly read the code, record it on the data form and have a second reader confirm the code. Once the tag code is read, tape the tag onto the data sheet and circle its location with a pencil. Then replace the fish in its individual bag, along with the dissected parts. When you are finished reading all the tags from a trawl, return the samples to the freezer as soon as possible. Obtain a list of tag codes for Chinook and Coho salmon prior to the survey. Cross check CWTs with this list and enter stock origin on the CWT form.

OCEANOGRAPHY

Bongo Tows

Oceanographic data will be collected once at each station each survey. Zooplankton will be sampled with oblique bongo tows. The bongo net frame has two 60 cm diameter net rings with 333- and 505- μ m mesh nets. CTD data will be collected real time with a Seabird SBE-49 FastCat (or backup SBE-19) attached to the bongo net. A Markey variable frequency drive direct current oceanographic winch will be used to deploy the bongo and CTD.

Prior to deploying the bongo net, record the flow meter numbers (all 6 digits) on the Bongo Tow Deck Sheet. Bongo tows will be deployed to 200m or within 20m of the bottom at a rate of 60m/min during down cast and 30m/min during up cast. Monitor wire rates on the block counter read out. The rates will change with depth, so try to keep the rates near average by having the winch operator slow down or speed up accordingly. The bongo net should be towed for 30 seconds at the max depth prior to starting retrieval. During all stages of the bongo tow, the cable should be at a target angle of 45°, with an acceptable range of 35° to 55°. The crew member checking the cable angle should wear a head set for communicating the angle to the boat captain, who will slow down or speed up to keep the angle within the desired range. Once the bongo is on deck, write down the final flowmeter readings (record all 6 numbers) on the Bongo Tow Deck Sheet. Do a quick check of the numbers to see if they both changed by a similar number. If one of them is very different from the other, make a note on the deck sheet.

Once the bongo net is brought onboard and the weight and CTD has been detached, the net will be attached to the crane and lifted into position for rinsing. Use a deck hose to spray down the bongo nets, starting at the top and gradually working towards the codends as the crane lifts the net, as needed, to get all the plankton into the codends. Be sure to use the hose on the outside of the net mesh and do not spray additional water inside the nets. In most cases you will have to rinse down the sample in the cod end to remove most of the water. This requires directly spraying the mesh screen to move the zooplankton that will clog the screen from the inside and impede drainage. It is best to use the cod end as the sieve but a sieve with mesh smaller than 300- μ m can be used if necessary. Remove any jellyfish or salps larger than a half-dollar in diameter, rinse off in the sieve, and volumetrically measure before discarding. Make a note of jellyfish or Salps and their volume

on the Bongo Tow Deck Sheet. Transfer the 333- μm and 505- μm samples into their respective 1000ml labeled plastic bottles.

Zooplankton samples will be preserved in 5% formalin-seawater solution buffered with a 2.5% sodium borate solution. If formalin and sodium borate are not pre-measured in jars, there will be container with pre-measured amount of both formalin and borax. Once the zooplankton have been transferred into the correct bottles, add the preservatives to the zooplankton jar and then add enough filtered seawater to bring the water level to just below the collar of the jar and then screw on all lids tightly so there are no leaks. Invert the bottle 2–3 times to ensure the formalin is distributed throughout the bottle. If the bottle is more than 2/3 full of plankton, you must split the sample between two bottles (extra bottles will be provided). If you need to use two jars, make sure to label the 2nd jar with station, mesh, and date. Then label both jars with “1 of 2” or “2 of 2”. If the sample is split between two jars, make a note of this on the Bongo Tow Deck Sheet. The lid of the jar shall be labeled (with a sharpie) noting mesh, station, and date. Samples must be stored in a dry, warm environment. Samples should not get below 40° F, or the formalin will precipitate out and negate the preservation process.

Zooplankton Lipid Analysis

One additional bongo tow will be conducted at the final transect of the survey to provide live zooplankton samples for lipid analysis to maintain our time series of prey quality measures in Southeast Alaska. The bongo net will be towed obliquely to and from 50m depth. When the net comes back up on deck, do not wash down the net as you would normally do. Just transfer the zooplankton from the 333- μm cod end into two 1000ml bottles. Add seawater to bring the water level to just above the collar of the bottle (do not add formalin or borax, which will kill the zooplankton). Remove any large (>2-3cm diameter) jellyfish, as they will eat the zooplankton during the time it takes to get samples to the lab. Store the bottles in the ship refrigerator to keep cool and do not freeze. You want to maintain a good ratio of water to zooplankton to help keep them alive in transit to town. Contact appropriate staff as soon as the boat reaches port so the samples can be brought to the lab to processes as soon as possible.

CTD

Note the starting bottom depth at the survey site; the target depth is ~20–40m off the bottom. Then, turn on the deck unit which powers the CTD. Go to the other laptop that has the SeaSave software: Real-time data > Start, then name the new output file. Note that the pump on the CTD instrument takes approximately 60 seconds to turn on, so be sure to click “Start” when the instrument is ready to be deployed. The instrument can also be held at the surface until the pump kicks on if weather/sea conditions allow. Be sure to communicate depth, including target stop depth, to the crew. The typical deployment speed for the CTD instrument is 60 meters per minute on the way down; the retrieval speed is 30 meters per minute. When the instrument is back at the surface, stop the data collection (SeaSave software: Real-time data > Stop) and turn off the deck unit.

Chlorophyll *a* Sampling

When the vessel gets on station to start oceanography collections, use the blue bucket with attached rope to collect a bucket of surface water. Next, rinse a 250 ml, brown HDPE Nalgene bottle three times with a small volume of sample water from the bucket. After the bottle is rinsed with sample water, fill the bottle to overflowing and bring it to the sampling station for processing (Figure 16). Record volume (250 ml) for every sample on the log sheet.

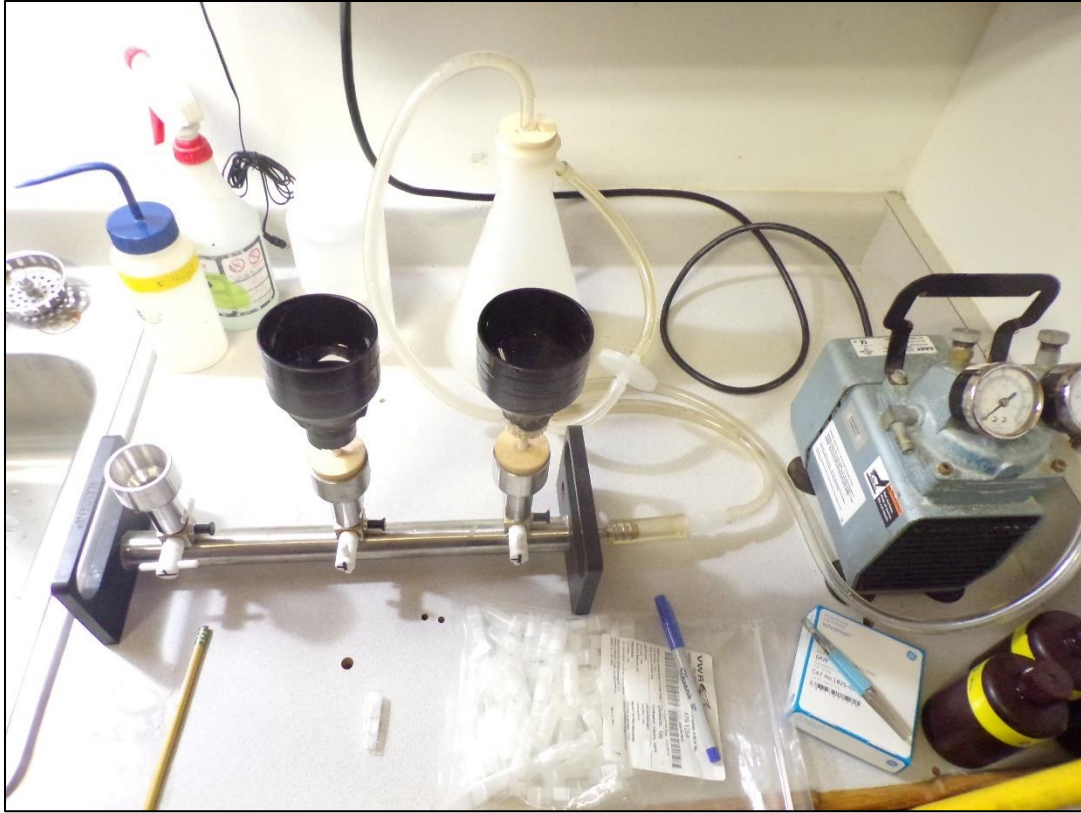


Figure 16.—Chlorophyll *a* sampling station onboard the research vessel *Medeia* (© ADF&G/photo by Andrew Piston).

Filtration

Use forceps to place a chlorophyll *a* filter (textured side up for GF/F filters), on the fret of the filter funnel, and then seal the cup (Luer Lok screws shut). Pour sample water directly from the sample bottle into the filter funnel. To remove cells stuck to the sides of the sample bottle, rinse with filtered seawater (5–10 ml) and pour rinse water into filter funnel. Next, turn on the vacuum pump (5–10 psi; 7–10 psi is about right) and open the valves to each funnel. Just before the filter is sucked dry, rinse the cup with a small amount (~5 ml) of filtered seawater to remove cells stuck to the sides of the cup. As soon as the last of the water goes through filter, turn off the valve, as cells can be damaged when vacuum is applied to a dry filter. Now remove the filter cup, and if the filter is hard to remove after the vacuum is shut off, open and then close the valve to release the air seal on the filter. Use forceps to grab the filter at the edge where there is no pigment. Fold the filter in half and place it lengthwise in a labeled cryovial. Place cryovials in a cryobox and *immediately* put in the freezer: do not thaw until analysis.

The easiest way to make filter seawater (for rinsing filter cups and cylinders) is to hook up the 1L filter flask to the vacuum pump tubing. Make sure a protective filter is inserted in line between flask and pump. Put one of the filter funnels into a stopper that fits on the filter flask. Filter spare sample water (deep water is best since it typically has less particles) through a GF/F filter and save the filtrate. You may need to go through a couple filters as they start to get clogged. Store filtered seawater in a squirt bottle.

At one station in each transect, filter a second water sample to serve as a replicate. Further, filter a blank after filtering a set of samples (post-blank). This is just like filtering a sample, but with no sample water. Put a GF/F filter on the filter funnel and filter ~10–15 ml of filtered seawater through the cup. Fold the filter in half and store in the same way as the sample filters.

DATA ANALYSIS

LABORATORY PROCESSING OF SALMON

After each survey, frozen individual juvenile salmon will be weighed (0.1 g) in the laboratory. Mean lengths, weights, Fulton condition factor (Cone 1989), and residuals from a length-weight linear regression (condition residuals, CR) will be computed for each species by habitat and sampling month. To determine stock of origin, sagittal otoliths will be extracted from the crania and preserved in 95% ethyl alcohol, then later mounted on slides, ground down to the primordia, and examined for potential thermal marks (Secor et al. 1992). Stock composition and growth trajectories of thermally marked fish will then be determined for each month and habitat. An index of seasonal condition will be obtained via calorimetry, using a 1425 Parr micro-bomb calorimeter. Whole body energy content (cal/g WW) will be determined from ten fish of each species captured in July.

Genetic samples will be collected from juvenile Chinook salmon (caudal fin clip) and immature Chinook salmon (pectoral fin clip) and placed on Whatman sample cards. Samples from Stephens Passage will be analyzed at the ADF&G Gene Conservation Laboratory in Anchorage with a micro-satellite genetic baseline to assign origin of Chinook Salmon. Genetic stock mixtures will be used to generate stock-specific abundance indices and genetic estimates of CWT mark fractions for juvenile Chinook Salmon in Stephens Passage. Tissue samples will be collected in other regions, but direction for these samples will be defined once we have a better understanding of expected sample sizes and expected stock mixtures from CWTs.

TRAWL CPUE BY SPECIES

Due to various research vessels being used over the life of the SECM project, the salmon catches from the survey need to be converted to comparable estimates of CPUE. From 1997 to 2007, the NOAA research vessel *John N. Cobb* was used to conduct the SECM survey. In 2007, in anticipation of the decommissioning of the *John N. Cobb*, the ADF&G research vessel *Medeia* and the *John N. Cobb* were fished synoptically for 28 pairs of trawl hauls to develop calibration factors for the vessels (Wertheimer et al. 2008; Table 3). In 2008 and 2009, similar vessel calibration studies were conducted to compare the *Medeia* to the research vessel *Steller* (2008) and the commercial trawler *Chellissa* (2009) in order to convert the catches from those vessels into units comparable to the *John N. Cobb* (Wertheimer et al. 2009 and 2010). From 2010 to 2017, the 52 m stern trawler *Northwest Explorer* was chartered to conduct the SECM project, and it was assumed to have a calibration comparable to the similarly sized *Chellissa*. Starting in 2018, the ADF&G research vessel *Medeia* was used to conduct the surveys. For pink salmon forecasting, a pooled-species fishing power coefficient of 1.19 (Tables 3 and 4) will be used to calibrate catches of juvenile salmon to the *John N. Cobb*, which is slightly different than the calibration that has been used in the past (Murphy et al. *In prep*).

Table 3. –Estimated fishing power coefficients to calibrate catches of juvenile salmon by the *Medeia* to those of the *John N. Cobb*.

Species	Fishing Power Coefficient– <i>Medeia:Cobb</i>
Pink	1.13
Chum	1.21
Sockeye	1.19
Coho	1.26
Total juvenile salmon	1.19

Table 4.–The data set for the variable CPUE (index of juvenile pink salmon abundance based on log-transformed catches that are standardized to an effort of a 20-minute trawl set) using pooled-species calibration coefficients.

Year	Vessel	Juvenile Pink Salmon CPUE
1997	<i>John N. Cobb</i>	2.48
1998	<i>John N. Cobb</i>	5.62
1999	<i>John N. Cobb</i>	1.60
2000	<i>John N. Cobb</i>	3.73
2001	<i>John N. Cobb</i>	2.87
2002	<i>John N. Cobb</i>	2.78
2003	<i>John N. Cobb</i>	3.08
2004	<i>John N. Cobb</i>	3.90
2005	<i>John N. Cobb</i>	2.04
2006	<i>John N. Cobb</i>	2.57
2007	<i>John N. Cobb</i>	1.17
2008	<i>Steller</i>	2.32
2009	<i>Chellissa</i>	2.33
2010	<i>NW Explorer</i>	4.11
2011	<i>NW Explorer</i>	1.45
2012	<i>NW Explorer</i>	3.52
2013	<i>NW Explorer</i>	2.14
2014	<i>NW Explorer</i>	3.82
2015	<i>NW Explorer</i>	2.45
2016	<i>NW Explorer</i>	4.35
2017	<i>NW Explorer</i>	0.35
2018	<i>Medeia</i>	1.17
2019	<i>Medeia</i>	1.14
2020	<i>Medeia</i>	2.15
Average		2.63

LABORATORY PROCESSING OF PHYTOPLANKTON AND ZOOPLANKTON

In the laboratory, displacement volumes (DV, ml), standing stock (DV/m³), and density (number/m³) will be determined for various samples. Standing stock will be calculated using DV and filtered water volumes. Detailed zooplankton species composition from the 333- μ m samples will be determined microscopically from subsamples obtained using a Folsom splitter. Densities will then be estimated using the subsample counts, split fractions, and water volumes filtered. Percent total composition will be summarized across species by major taxa, including small calanoid copepods (< 2.5 mm total length, TL), large calanoid copepods (> 2.5 mm TL), euphausiids (principally larval and juvenile stages), oikopleurans (Larvacea), decapod larvae, amphipods, chaetognaths, pteropods, and combined minor taxa.

SCHEDULE AND DELIVERABLES

The 2021 SECM trawl surveys will take place in late June and July. A final report for each year will be completed by the project leaders after the field season and published as an ADF&G Fisheries Data Series report or a North Pacific Anadromous Fish Commission report. Additional reporting will include semi-annual and final progress reports to the Pacific States Marine Fisheries Commission.

RESPONSIBILITIES

Jim Murphy, Principal investigator, Research biologist within the Salmon Ocean Ecology and Bycatch Analysis group at NOAA Fisheries, Auke Bay Laboratories. Provides project oversight, project planning, budgeting, scheduling, acts as Chief Scientist or participates in surveys, assists with data analysis, and reporting.

Andrew Piston, Fishery Biologist IV. Co-investigator, ADF&G, Fishery Biologist IV, Pink and Chum salmon project leader. Provides project oversight, project planning, budgeting, scheduling, acts as Chief Scientist or participates in surveys, assists with data analysis and reporting.

Jamal Moss, Research biologist within the Salmon Ocean Ecology and Bycatch Analysis group at NOAA Fisheries, Auke Bay Laboratories, assists with project planning, data analysis, and participates in surveys.

Wess Strasburger, Research biologist within the Salmon Ocean Ecology and Bycatch Analysis group at NOAA Fisheries, Auke Bay Laboratories, assists with project planning, data analysis, and participates in surveys.

Emily Fergusson, Fisheries Research Biologist, NOAA Fisheries, Auke Bay Laboratories, assists with project planning, acts as Chief Scientist or participates in surveys, assists with data analysis and reporting.

Steve Heinl, Regional Salmon Research Supervisor, ADF&G, assists with project planning and budgeting, participates in surveys, assists with data analysis and reporting.

Andrew Gray: Lead biologist for the Salmon Ocean Ecology and Bycatch Analysis group at NOAA Fisheries, Auke Bay Laboratories, assists with project planning and participates in surveys.

Rich Brenner: Salmon Stock Assessment Biologist, ADF&G Headquarters. Provides biometric support and assists in data analyses, forecasting, and contributes to report writing and review. May also participate in surveys.

Sara Miller: Salmon Stock Assessment Biologist, ADF&G Headquarters. Provides biometric support and assists in data analyses and forecasting, and contributes to report writing and review. May also participate in surveys.

Kyle Hebert: Fishery Biologist IV, ADF&G, acts as budget manager for the ADF&G portion of project funding.

New Hire Pending: ADF&G, Boat Officer IV. Commanding officer of R/V *Medeia*; will work closely with project leaders to ensure efficiency and safety of survey operations; responsible for ensuring vessel supplies, equipment, and crew are fully operational.

Cedar Stark: ADF&G, Boat Officer III. Second-in-Command of R/V *Medeia*; assists with safe operations, navigation, and assignment of vessel crew duties; responsible for operation, maintenance, and repair of all ship systems.

Craig Conger: ADF&G, Boat Officer II. Able-bodied seaman and relief cook; performs routine maintenance, repair, and deck work such as line handling, operating deck machinery, handling and repairing fishing and scientific gear, stowing and securing cargo and deck loads, launching and retrieving skiffs, anchoring, and fueling operations.

Luke Erickson: ADF&G, Boat Officer I. Vessel cook and deck hand; performs routine deck work such as line handling, operating deck machinery, handling and repairing fishing and scientific gear, stowing and securing cargo and deck loads, launching and retrieving skiffs, anchoring; assists with routine maintenance, repairs, and fueling operations.

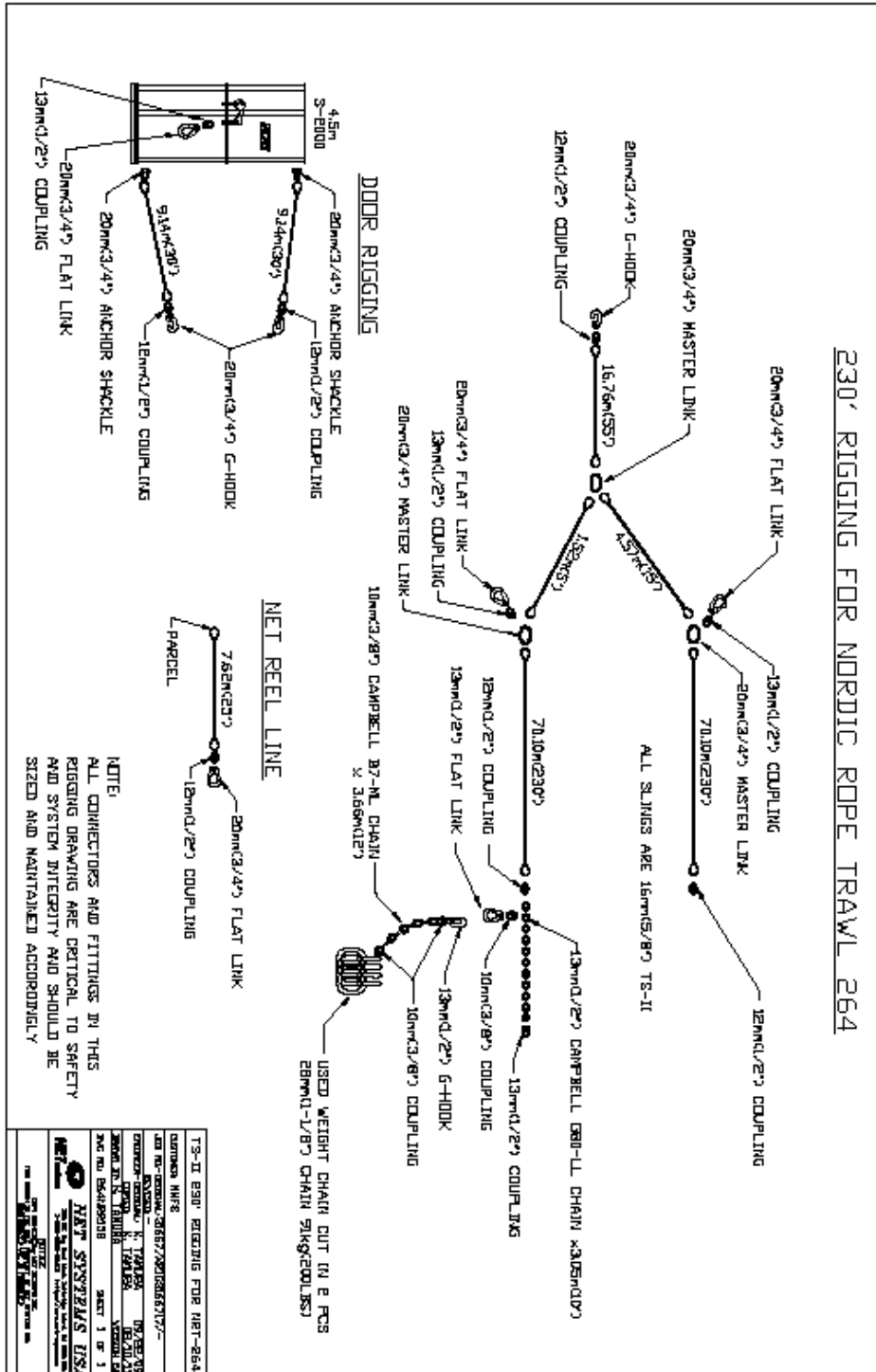
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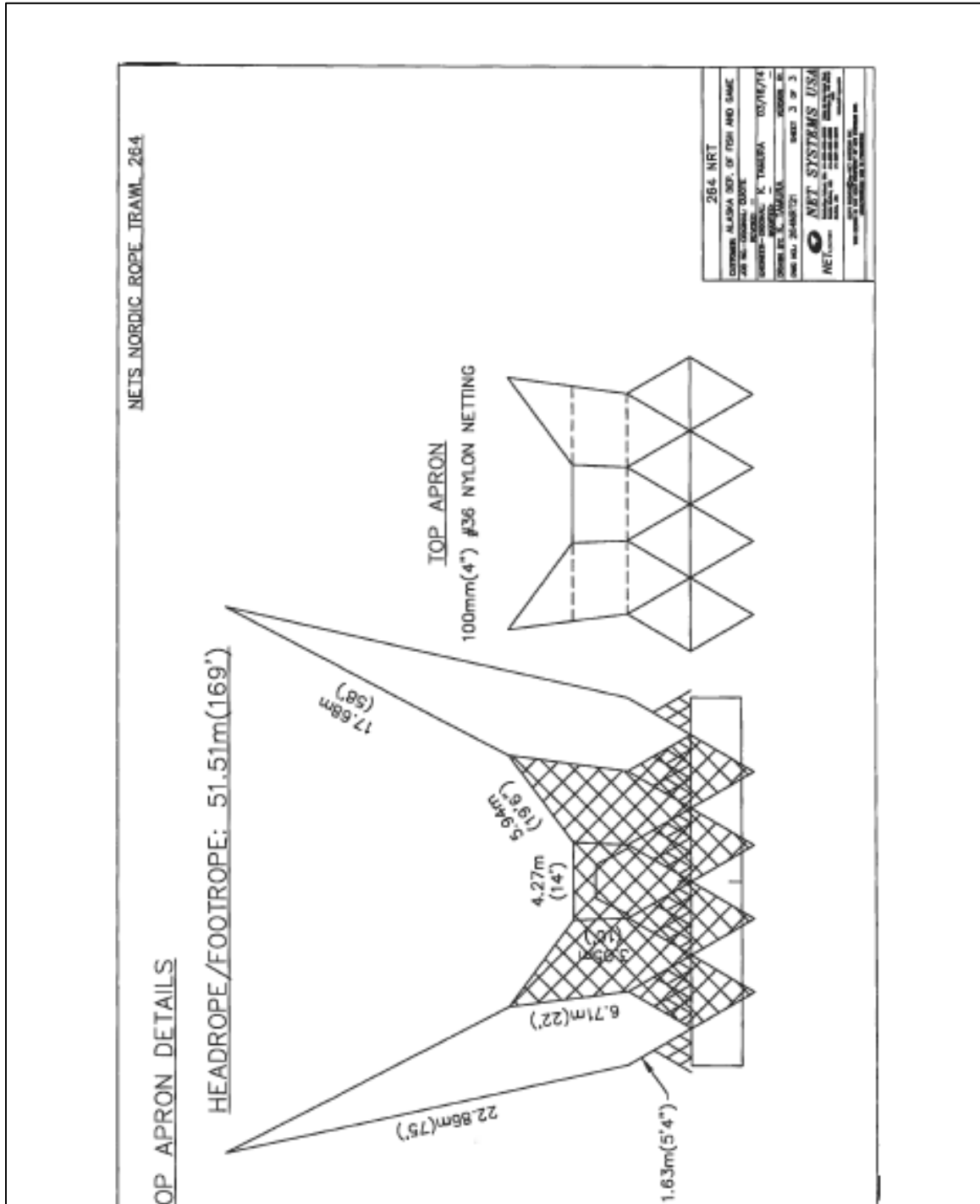
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APPENDIX



-continued-



Appendix B.–Paper forms for recording SECM data when CLAMS system is not available.

Date ____/____/19 Time ____ Haul ____ Station ____ Station # ____ Station Depth (m) ____					
Cruise #: _____		Water sample <input type="checkbox"/>	Replicate station <input type="checkbox"/>	Bongo <input type="checkbox"/>	Vessel: _____

BONGO (60cm)	333 Bottle #: _____	505 Bottle #: _____	CTD
	Depth (m): actual _____		cast #: _____
	Bongo deployed at 1m/sec, retrieved at 0.5m/sec, Wire angle target = 45 degrees		

NOTES:

Incidental Catch

	# caught	# measured	sample #s
6 P. herring			
7 capelin			
8 crested sculpin			
11 prowfish			
12 PS lump sucker			
14 soft sculpin			
17 sablefish			
18 P. sandfish			
22 walleye pollock			
222 pollock larvae			
23 P. cod			
24 <i>Sebastes</i> sp.			
33 wolf-eel			
34 squid			
42 Sm lump sucker			
48 salmon shark			
49 spiny dogfish			
53 unknown larvae			

Adult Salmon

	# caught	# measured	# stomachs	Barcode #s
101 Pink				
102 Chum				
202 Chum				
103 Sockeye				
203 Sockeye				
104 Coho				
105 Chinook				
205 Chinook				

HAUL # _____

	Total Caught	Total Measured	Frozen Individ.	Frozen whole fish Barcode #s	Notes
Juvenile salmon					
1 Pink					
2 Chum					
3 Sock.					
4 Coho					
5 Chin.					

Date	Station	Species	Barcode	Length (mm)	Weight (kg)	Comments
			1			
			2			
			3			
			4			
			5			
			6			
			7			
			8			
			9			
			10			
			11			
			12			
			13			
			14			
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			24			
			25			
			26			
			27			
			28			
			29			
			30			
			31			
			32			

SECM Coded-wire tags				SECM Coded-wire tags			
Barcode	<input type="text"/>	<input type="text"/>	<input type="text"/>	Barcode	<input type="text"/>	<input type="text"/>	<input type="text"/>
Is adipose missing?	YES	NO		Is adipose missing?	YES	NO	
Is there a tag?	YES	NO		Is there a tag?	YES	NO	
SECM Coded-wire tags				SECM Coded-wire tags			
Barcode	<input type="text"/>	<input type="text"/>	<input type="text"/>	Barcode	<input type="text"/>	<input type="text"/>	<input type="text"/>
Is adipose missing?	YES	NO		Is adipose missing?	YES	NO	
Is there a tag?	YES	NO		Is there a tag?	YES	NO	
SECM Coded-wire tags				SECM Coded-wire tags			
Barcode	<input type="text"/>	<input type="text"/>	<input type="text"/>	Barcode	<input type="text"/>	<input type="text"/>	<input type="text"/>
Is adipose missing?	YES	NO		Is adipose missing?	YES	NO	
Is there a tag?	YES	NO		Is there a tag?	YES	NO	
SECM Coded-wire tags				SECM Coded-wire tags			
Barcode	<input type="text"/>	<input type="text"/>	<input type="text"/>	Barcode	<input type="text"/>	<input type="text"/>	<input type="text"/>
Is adipose missing?	YES	NO		Is adipose missing?	YES	NO	
Is there a tag?	YES	NO		Is there a tag?	YES	NO	
SECM Coded-wire tags				SECM Coded-wire tags			
Barcode	<input type="text"/>	<input type="text"/>	<input type="text"/>	Barcode	<input type="text"/>	<input type="text"/>	<input type="text"/>
Is adipose missing?	YES	NO		Is adipose missing?	YES	NO	
Is there a tag?	YES	NO		Is there a tag?	YES	NO	

SECM Survey Water Samples

Month: _____ Year: _____

Station	Station #	Date	Sample type	Notes
SPA			surface	
SPA			duplicate	
SPB			surface	
SPC			surface	
SPD			surface	
SPD			blank	
ISD			surface	
ISD			duplicate	
ISC			surface	
ISB			surface	
ISA			surface	
ISA			blank	
UCA			surface	
UCA			duplicate	
UCB			surface	
UCC			surface	
UCD			surface	
UCD			blank	