Report of the NOAA Bottom Trawl Survey of the Aleutian Islands

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ABSTRACT

One of the components of the biological task was to collect some fish for radionuclide analysis in a manner similar to commercial fisheries. This report describes the collection efforts aboard the *Gladiator* during the NMFS Bottom Trawl Survey of the Aleutian Islands. The CRESP function was to collect several target species of fish that were of interest to commercial fisheries, but were also species caught by subsistence peoples living in the Aleutians. The CRESP researcher (J. Weston) was on the expedition during only one leg, which was involved in sampling from Amchitka to Kiska islands, from 18 July to 8 August. During this time, several key target species were collected in sufficient numbers to be analyzed for radionuclides, including Pacific Ocean Perch, Northern Rockfish, Dusky Rockfish, Pacific Cod, Walleye Pollock, and Atka Mackerel. Pacific Cod was particularly important because it is one of the ten most preferred Aleut subsistence foods, and of high commercial interest. Where possible, muscle, liver and bone were prepared on the ship.

INTRODUCTION

The main objective of the biological component of the Amchitka Science Plan was to collect sufficient biota from the vicinity of Amchitka Island and a reference site for radionuclide analysis to assess the current and future safety of the food supply and the marine ecosystem. From the initiation of the Amchitka Science Plan, it was clear that there were three main types of biota for assessment: subsistence foods, commercial fish, and different trophic levels of the marine food chain. Subsistence foods and biota for examination of the food chain could be collected from a vessel dedicated to terrestrial, intertidal, and diving operations. However, these activities were incompatible with the bottom trawling activities of commercial fisheries. Thus it became clear that two different ships were necessary to accomplish all three types of biological collections.

After discussions with a wide range of scientists, including those involved with the National Marine Fisheries Service (of NOAA), we decided to pursue the possibility of working with the NMFS Survey. This survey, run out of the NMFS Seattle Office (under Mark Wilkins), is conducted in the Aleutians every two years. Availing ourselves of this opportunity provided CRESP with the potential for collection fish as part of their regular survey, in a manner consistent with commercial trawling operations. The trawl survey has a limited number of spaces for scientists conducting projects of interest to NOAA, and that fit with their overall goals. CRESP applied for a position on the trawl survey leg that would go from Amchitka to Kiska Island, the sites of interest for the overall project,

and was accepted to work on the *Gladiator*.

The main objective of the work on the *Gladiator* was to collect a target list of species that reflected commercial interests, and would provide parallel specimens to those collected by the scientists and subsistence fishermen on the *Ocean Explorer*, the main CRESP expedition ship. Where possible, some mass reduction and specimen preparation occurred on the ship, which also used Adak as its port.

METHODS

The methods employed by the CRESP fisheries biologist on the *Gladiator* were the same as those employed on the *Ocean Explorer.* That is, the same Biological Implementation Plan was followed to allow consistency among collections (see Appendix 7.C). Basically, target species were collected on transects that were near Amchitka and Kiska Islands. All samples were handled in the same manner during both expeditions, with the same Chain of Custody and shipping methods. Fish were collected on the transects adjacent to Amchitka, smaller Rat Islands, at off Kiska (Fig. 1).

There were three obvious differences in methodology between the collections on the *Gladiator* and the *Ocean Explorer*:

1). *Gladiator* samples were taken from bottom trawls at far greater depths than those taken on the *Ocean Explorer.*

2) Fish collected on the *Gladiator* were taken only on trawls on the Pacific Ocean side of Amchitka, while those on the *Ocean Explorer* were taken on both the Bering Sea and Pacific Ocean sides of Amchitka.

3) The fish collected on the *Gladiator* were taken farther from the Amchitka shoreline than were those taken from the *Ocean Explorer.*

RESULTS

There were a total of 15 trawls at three sites from which organisms were collected: 6 from Amchitka, 5 from smaller Rat Islands, and 4 from near Kiska. A total of 86 fish were collected from the Amchitka trawls, 61 from the Rat Island trawls, and 53 from Kiska (Table 1). Scientific names are listed in Table 2.

Because of the need to collect five fish of the same size and approximate weight for compositing, we collected fish in the average size range for each species. That is, we collected flatfish, rockfish, and round fish in the average size range of those collected in the NOAA trawls (Fig. 2-4). Thus, when we compared the average length of the fish brought up from the NOAA trawl with those NOAA collected for their overall bottom trawl samples, there is a significant difference. However, when you compare the fish collected by CRESP and NOAA from the same trawls, there is a significant difference in average length only for Walleye Pollock and for Atka mackerel (Table 3). The size differences, however, were not very great.

DISCUSSION

It was possible to place a fisheries biologist on a NOAA trawl boat during the performance of NMFS Bottom Trawl Survey of the Aleutian Islands, which is conducted every other year. This arrangement had both advantages and disadvantages.

The advantages were that we did not have to mount a separate fishing trawl operation, arrange for a boat and supplies, and pay board on the boat. The transects have been established for some time, and the locations of the transects, and the species expected to be collected, were thus known beforehand. Using the NOAA trawl also has the advantage of perhaps providing a mechanism for future collections for radionuclide analysis near Amchitka and Kiska, without having to mount a separate expedition.

The limitations related to 1) timing, 2) location, 3) species targeted, and 4) dedicated researcher. The collaboration of CRESP with NOAA meant that the CRESP biologist was a part of the NOAA collecting team, and helped with their collections, as well as our own. Thus, Weston could not devote all his time to the collection of CRESP samples. Since the transects have been established by NOAA for some time, we were limited to their transects, and the transects do not come inshore as close as the *Ocean Explorer* sampling. Further, the NOAA trawl ship samples on the Pacific Ocean side of Amchitka only, and was not near either Long Shot of Cannikin. Additionally, the NOAA sampling is intended to represent bottom fish of commercial importance, and is not representative of all fish or invertebrates.

Finally, the fish captured by the scientists and Aleut fishermen aboard the *Ocean Explorer* were mostly taken by fishing pole in the traditional manner of subsistence fishermen. The bottom trawl, in contrast, collects a wider range of fish sizes that did the fishermen on the *Ocean Explorer*. Thus, some selection was required by CRESP fisheries biologist on board. Some of the decisions were made by time constraints (when he had time to collect), and consistency (he had to collect fish of the same size), but in other cases, he was deciding what size fish to collect. Thus in the future, if this mechanism were employed, direction as to the size of fish to collect would be essential.

Table 1. Number of individual organisms collected from three sample sites in the central Aleutian islands.

	Amchitka Island			Small Rat Islands			Kiska Island		
Fish Collected	**L**	**M:B**	**WF**	**L**	**M:B**	**WF**	**L**	**M:B**	**WF**
Rockfish:									
Pacific Ocean Perch	10	10	--	5	5	--	--	--	10
Pacific Ocean Perch	10	5	--	--	--	--	--	--	--
Northern	10	5	--	--	--	--	--	--	10
Harlequin	10	5	--	--	--	--	--	--	--
Shortraker	5	5	--	--	--	--	--	--	--
Rougheye	5	5	--	--	--	5	--	--	--
Dusky	5	5	--	--	--	--	--	--	--
Round Fish:									
Pacific Cod	5	5	--	--	--	--	--	--	5
Walleye Pollock	10	5	--	--	--	--	--	--	6
Atka Mackerel	10	5	--	--	--	10	--	--	10
Great Grenadier	--	--	--	5	5	--	--	--	--
Armorhead Sculpin	--	--	--	--	--	10	--	--	--
Yellow Irish Lord	--	--	--	--	--	--	--	--	7
Flat Fish:									
Northern Rock Sole	5	5	--	--	--	10	--	--	--
Pacific Halibut	1	1	--	1	1	--	--	--	--
Pacific Halibut	--	--	--	--	--	5	--	--	--
Rex Sole	--	--	--	--	--	10	--	--	--
Arrow Tooth Flounder	--	--	--	--	--	--	--	--	5

Invertebrates Collected	**WB**	**WB**	**WB**
Golden King Crab	--	5	--
Red King Crab	--	5	--
Urchins	10	10	10
Shrimp	20	20	--

There were a total of 15 trawls at three sites from which organisms were collected: 6 from Amchitka, 5 from small Rat Islands and 4 from Kiska. Pacific ocean perch and Pacific halibut were collected from different trawls from the same site so are listed twice. Due to logistical constraints only some fish had their livers removed and were sectioned into smaller muscle and bone samples the rest were left whole.
L = liver tissue, M:B = muscle and bone tissue, WF = whole fish and WB = whole body.

Table 2. List of organisms collected and codes used for study.

Fish Collected	**Species Name**	**Code**
Rockfish:		
Pacific Ocean Perch	*Sebastes alutus*	PERC
Northern	*Sebastes polyspinus*	NROC
Harlequin	*Sabastes variegatus*	HARL
Shortraker	*Sebastes borealis*	SRAK
Rougheye	*Sebastes aleutianus*	REYE
Dusky	*Sebastes ciliatus*	DUSK
Round Fish:		
Pacific Cod	*Gandus macrocephalus*	PCOD
Walleye Pollock	*Theragra chalcogramma*	WALL
Atka Mackerel	*Pleurogrammus monopterygius*	ATKA
Great Grenadier	*Albatrossia pectoralis*	GREN
Armorhead Sculpin	*Gymnocanthus galeatus*	ASCU
Yellow Irish Lord	*Hemilepidotus jordani*	LORD
Flat Fish:		
Northern Rock Sole	*Lepidopsetta polyxystra*	NSOL
Pacific Halibut	*Hippoglossus stenolepis*	HALI
Pacific Halibut	*Hippoglossus stenolepis*	HALI
Rex Sole	*Glyptocephalus zachirus*	RSOL
Arrow Tooth Flounder	*Atherestes stomias*	ATFL
Invertebrates Collected		
Golden King Crab	*Lithodes aequispina*	GOCR
Red King Crab	*Paralithodes camtschaticus*	RECR
Urchins	*Strongylocentrotus polyacanthus*	URCH
Shrimp	*Pandalus borealis*	SHRIMP

Table 3. Reduced number of NOAA samples

Species	Code	Length (mm)† NOAA	Length (mm)† CRESP	Sample Size NOAA	Sample Size CRESP	P value	Statistics
Flatfish							
Arrow Tooth Flounder	ATFL	443	452	29	5	0.6994	t-test
Northern Rock Sole	NSOL	371	368	47	15	0.7917	t-test
Roundfish							
Walleye Pollock	WALL	561	516	119	16	**0.0105**	Mann Whitney
Pacific Cod	PCOD	648	639	119	10	0.8578	t-test, Welch's
Atka Mackerel	ATKA	381	402	89	30	**0.0021**	t-test
Rockfish							
Northern	NROC	319	325	63	20	0.2159	t-test
Pacific Ocean Perch	PERC	348	368	178	35	0.0731	Mann Whitney
Dusky	DUSK	408	402	44	5	0.3195	t-test

† = mean value for total length.

Table 4. Collection site trawl data.

	Trawl Number				
Date	CRESP	NOAA	Depth (m)	Latitude (N)	Longitude (E)
07/19/04	TA1	168	140	51.2083	179.3626
07/19/04	TA2	169	140	51.2946	179.3899
07/20/04	TA3	170	157	51.2552	179.2768
07/20/04	TA5	172	151	51.2527	179.2008
07/21/04	TA6	174	388	51.4514	178.6024
07/21/04	TA7	175	217	51.4869	178.6351
07/21/04	RI1	176	265	51.9092	178.2550
07/21/04	RI2	177	250	51.9224	178.2526
07/22/04	RI3	178	93	51.9591	178.2681
07/22/04	RI4	179	434	51.9568	178.0642
07/22/04	RI5	180	327	52.0149	177.9897
07/23/04	KI2	182	137	51.8215	177.6290
07/23/04	KI3	183	118	51.8494	177.6891
07/23/04	KI4	184	117	51.8312	177.4958
07/23/04	KI5	185	274	51.7458	177.3591

TA = Trawls near Amchitka Island
RI = Trawls near small Rat Islands (reference sites)
KI = Trawls near Kiska Island (reference sites)

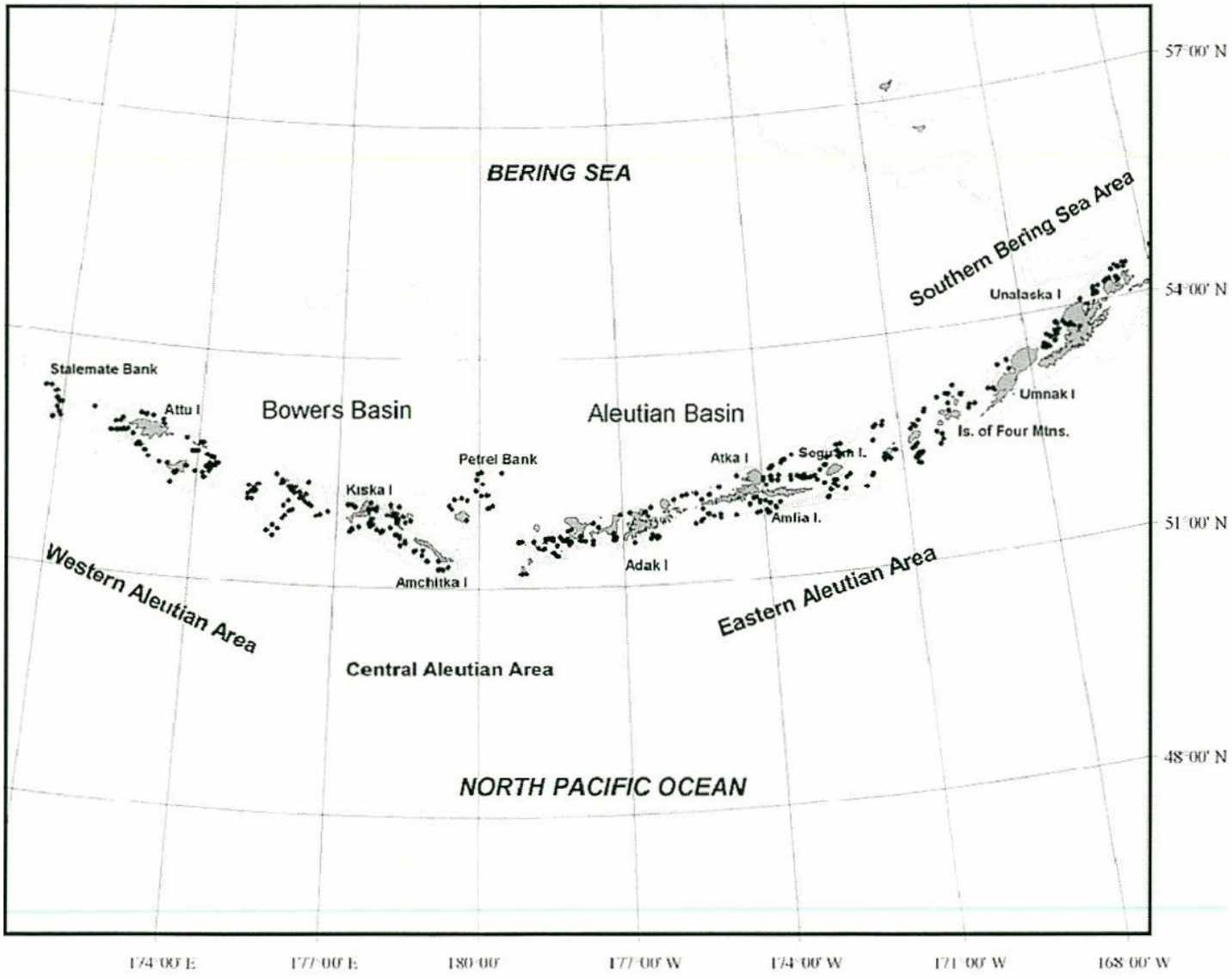

Figure 1. 2004 NOAA Benthic Survey sampling locations around Aleutian Islands, AK. CRESP samples collected near Rat Islands (between Kiska and Amchitka) from 07/19/04 to 07/24/04, during R/V Gladiator's 3rd leg. Table 4 provides exact latitude and longitude coordinates and depths for collection trawls. There were 6 trawls near Amchitka Island, 5 around small Rat Islands (between Amchitka and Kiska) and 4 near Kiska Island.

Flat Fish

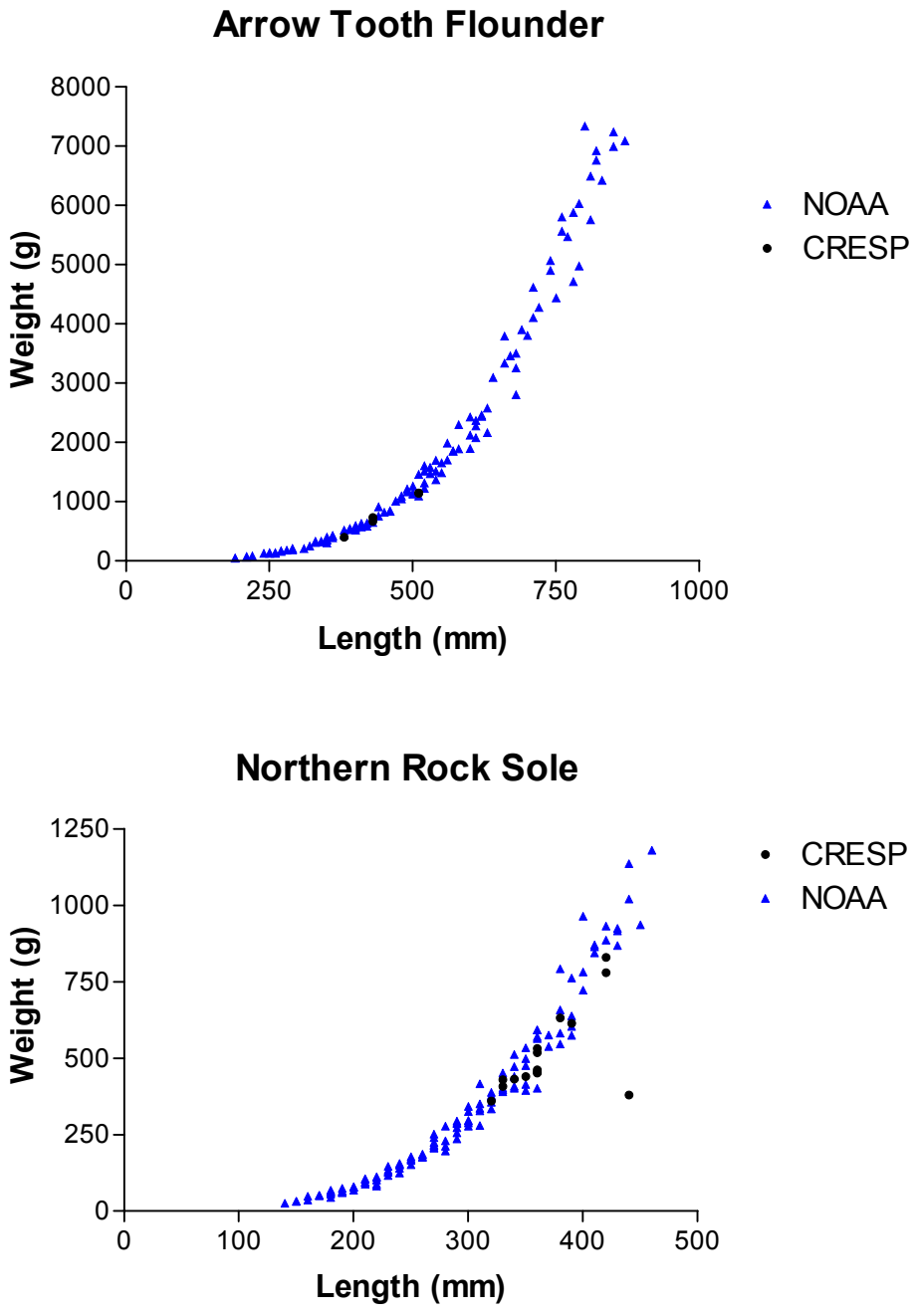

Figure 2.

Rockfish

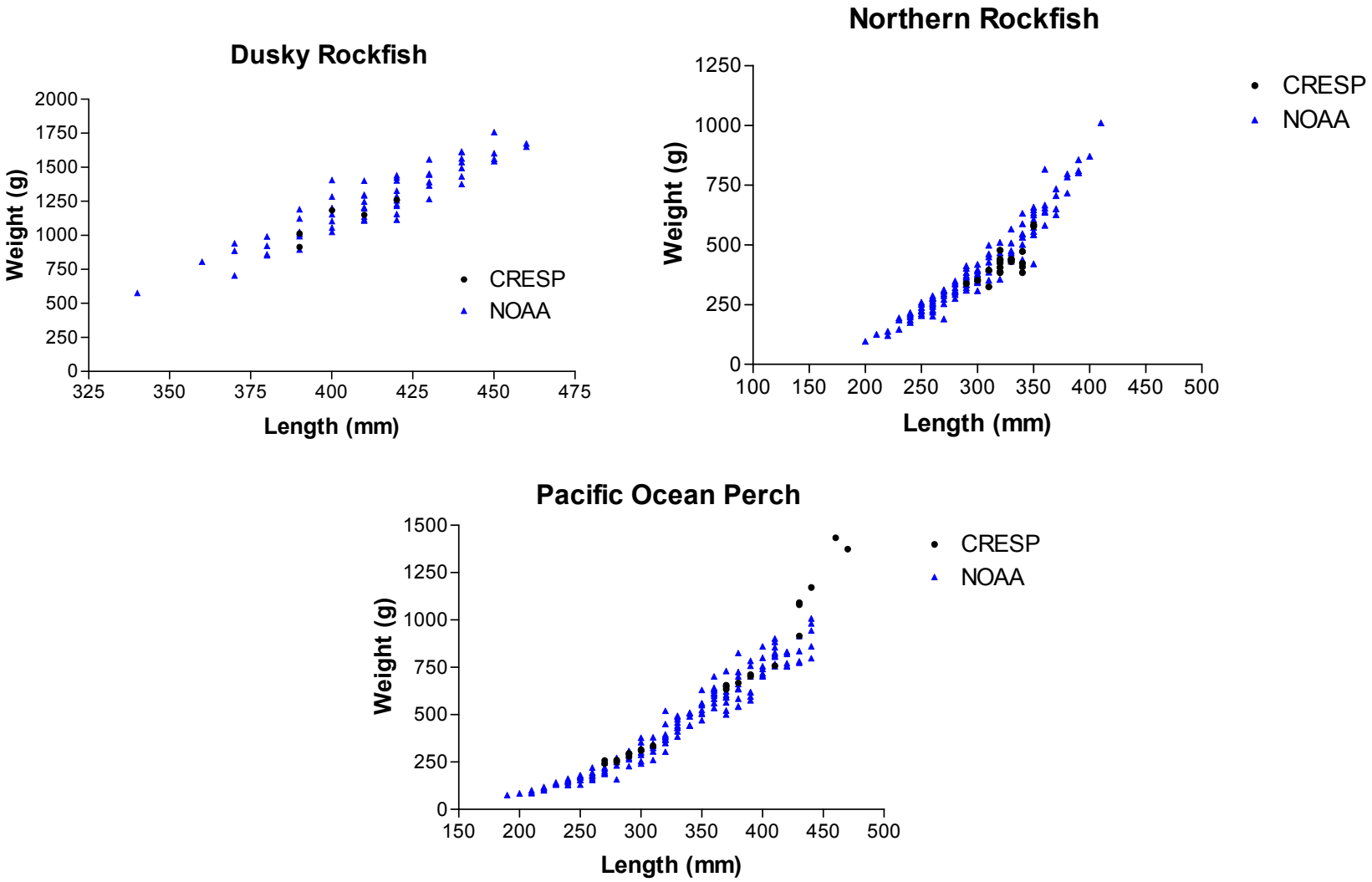

Figure 3.

Round Fish

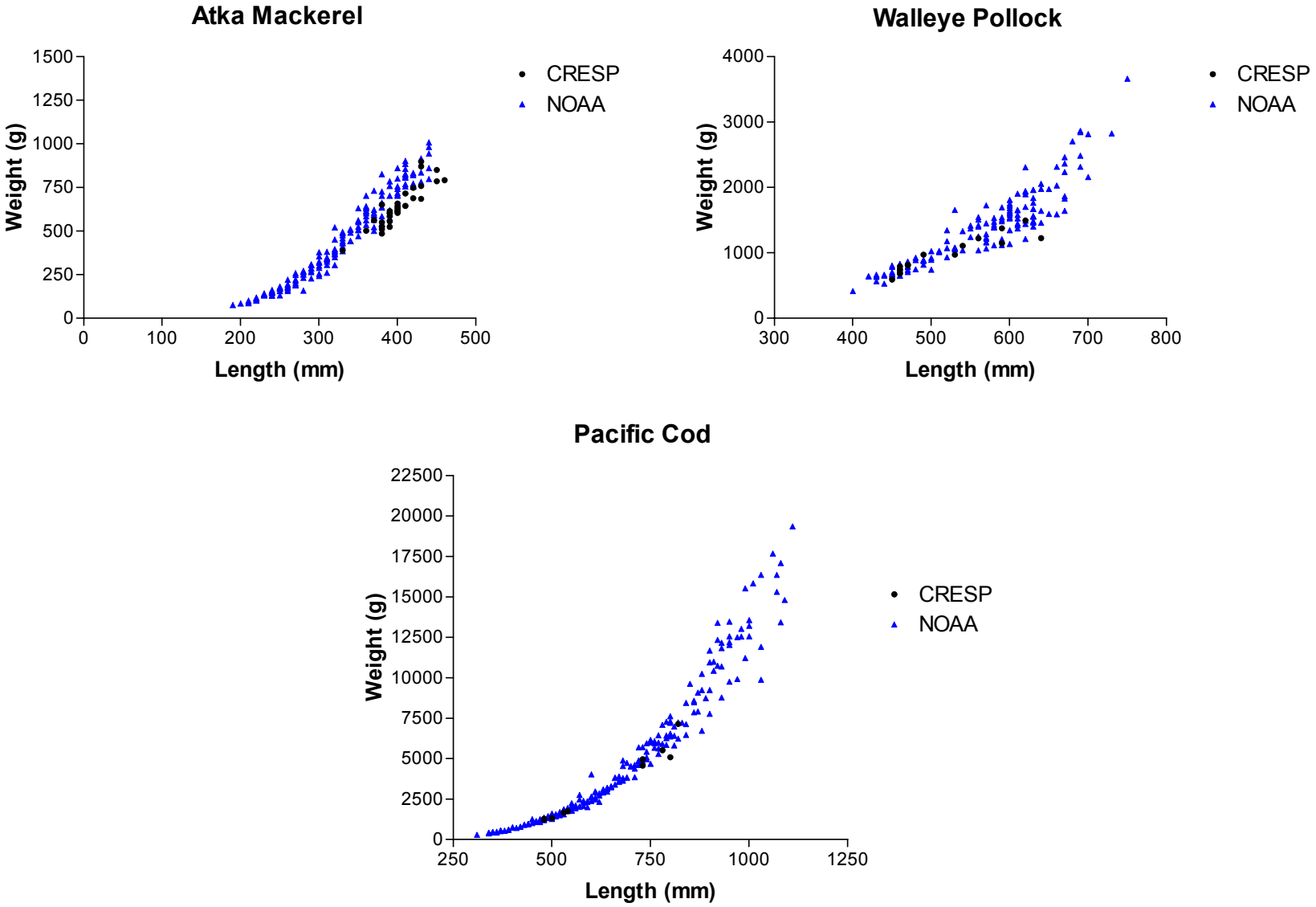

Figure 4.

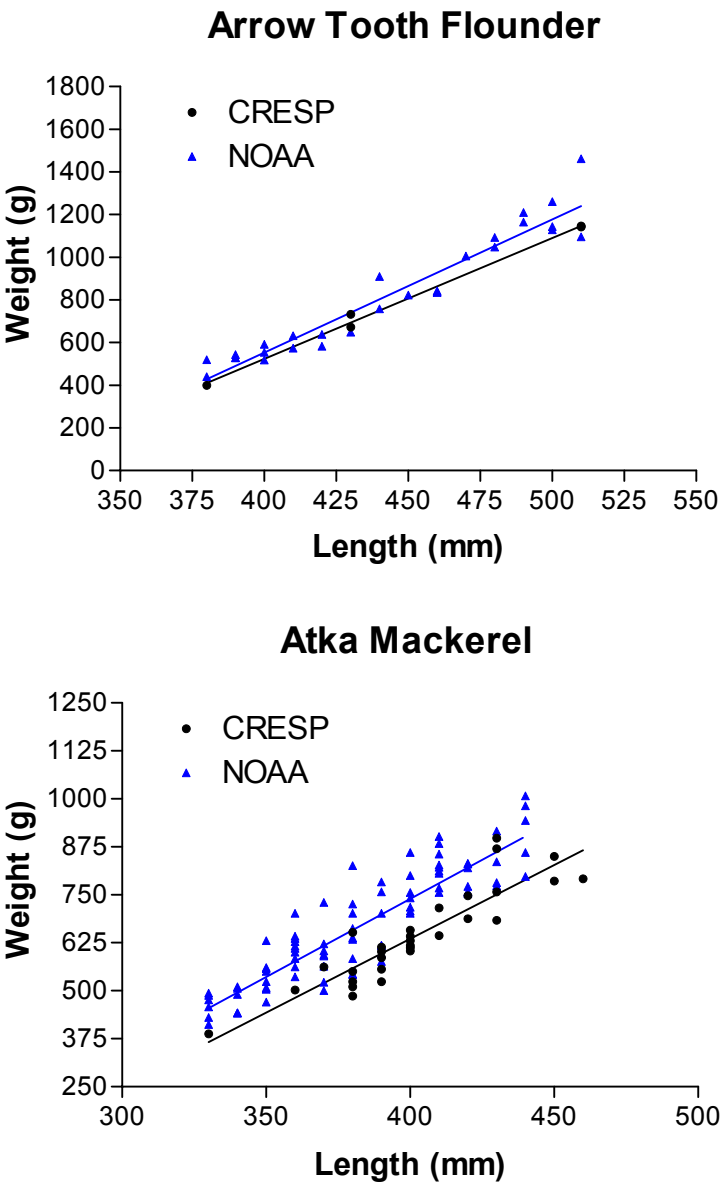
Arrow Tooth Flounder
CRESP
NOAA
Weight (g)
Length (mm)
1800
1600
1400
1200
1000
800
600
400
200
0
350
375
400
425
450
475
500
525
550
Atka Mackerel
CRESP
NOAA
Weight (g)
Length (mm)
1250
1125
1000
875
750
625
500
375
250
300
350
400
450
500

Figure 5.