EVOSTC ANNUAL PROJECT REPORT

Project Number: 10100132-G

Project Title: PWS Herring Survey: Top-down regulation by predatory fish on juvenile herring in Prince William Sound

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Time period covered: FY10

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Project website: http://www.pwssc.org/research/biological/PacificHerring/pacificherring.shtml

Work Performed

In FY2010, surveys for fish preying on juvenile herring were performed during 12-19 November 2009 and 17-23 March 2010 cruises. Both cruises focused on five bays in Prince William Sound known historically to hold large overwintering aggregations of juvenile herring: the four bays sampled as part of the EVOS Sound Ecosystem Assessment (SEA) program (Eaglek, Simpson, Whale, and Zaikof Bays), as well as Lower Herring Bay. Our field research was conducted in conjunction with multi-project cruises including surveys of juvenile herring biomass, fish and seabird predators, plankton, oceanographic conditions in nursery bays, as well as sampling of juvenile herring schools for species composition, energetics and disease.

The focus of this project is to assess the potential for fish predators to regulate juvenile herring recruitment. We used a combination of traditional field surveys and gut content analyses to examine the suite of fish preying on juvenile herring. Our study is designed to complement and expand on other concurrent herring studies that are part of the integrated Prince William Sound herring survey program.

Our November 2009 cruise served as a trial run for our methodology and included longlining and mid-water trawling. Based on survey results, we continued longlining in March 2010 and replaced trawling with mid-water gillnet sampling. Collection efforts for each cruise were aided by a second vessel performing hydroacoustic transects that established locations and abundance of juvenile herring schools inside each bay. For trawls, we performed nocturnal (late evening and early morning) trawls for durations of 25 to 45 min. We used a 7.6 m Marinovich otter trawl that measures 7.6-m wide (when fully opened) and 8.1 m length. It has two, 23 kg otter doors on each side. Mesh size is 9 cm on the wings and body of the net and 3 cm on the cod end. Trawls were towed at 3 to 4 km h^{-1} and at depths where fish schools were detected on the research vessel sounder.

At sunset we set one longline followed by a soak time of three hours. Following its retrieval, we set a second, replicate longline approximately 3 hours prior to sunrise and spaced to avoid areas previously fished. Each longline consisted of a 530 m (1 skate) mainline with 200 gangions. Each gangion was ~60 cm long with a #13/0 offset-shank circular hook and was baited with a non-local species of squid.

In March 2010, longline sets were followed by the deployment of two, 25 m gillnets deployed in tandem, each 10 m deep and containing three 8.3 m panels of different mesh sizes (76, 114, and 152 mm stretched). The gillnets were deployed at a depth of 10 to 20 m for a total of three hours prior to retrieval. For each of the bays sampled, we collected up to 30 specimens of each species. All fish captured were measured for total length and weight prior to removal of stomachs for dietary analyses. Stomachs were individually preserved in whirl packs containing 10% formalin then transferred to 50% isopropanol until analyses could be performed.

Preliminary Results

During the November cruise, longline efforts collected a total of 93 fish representing 11 species with Pacific cod as the most abundant predator (Table 1). In March, our longline efforts collected 14 species

and a total of 200 fish with Pacific cod as the most abundant predator followed by great sculpin (Table 1). Effort expended longlining was similar for both cruises; however, CPUE for each bay was typically higher during the March cruise (Figure 1). Overall, our mid-water fish capture techniques were not successful in catching fish (Table 2). We expended a total of 7 hours of effort over 13 tows using our mid-water trawl and only one tow caught fish (27 walleye pollock). Similar results were attained when additional effort was expended by deploying a smaller mesh, mid-water otter trawl belonging to Dr. Rob Campbell. In March, we soaked our experimental, mid-water gillnet for a total of 29 hours and caught only seven fish total.

All fish collections were processed and gut contents were shipped to the Fisheries Ecology Lab at the Dauphin Island Sea Lab, University of South Alabama. Stomach contents are currently being analyzed and otoliths found in stomachs or collected from unidentifiable fish will be sent to another lab for identification.

Table 1. Number and total lengths (mm; $\bar{x} \pm$ se) of fish caught by longline during November 2009 and March 2010 cruises.

	Nov 2009 Longline			Mar 2010 Longline		
		Total length (mm)			Total length (mm)	
Species	*n*	± se	range	*n*	± se	range
Arrowtooth Flounder	1	595				
English Sole	2	394 ± 5	389 – 398			
Flathead Sole				4	436 ± 6	422 – 450
Pacific Halibut	5	622 ± 45	524 – 740	7	1223 ± 133	580 – 1580
Starry Flounder				3	460 ± 17	426 – 480
Yellowfin Sole	4	362 ± 22	322 – 420	10	345 ± 9	299 – 390
Pacific Cod	56	594 ± 15	393 – 810	77	717 ± 11	460 – 910
Walleye Pollock				21	596 ± 17	330 – 675
Kelp Greenling				1	418	
Copper Rockfish	1	328		1	482	
Quillback Rockfish				1	402	
Rougheye Rockfish	2	333 ± 42	291 – 374	1	392	
Sablefish	10	438 ± 6	401 – 462			
Great Sculpin	4	493 ± 33	435 – 560	44	442 ± 11	240 – 570
Big Skate				13	747 ± 36	562 – 1010
Longnose Skate	1	740		16	920 ± 52	620 – 130
Spiny Dogfish	7	832 ± 15	780 – 890			
Giant Wrymouth				1	800	

Table 2. Summary of effort for mid-water fish capture techniques by bay and method. Trawls performed in November 2009 only and gillnet performed in March 2010.

	Marinovich trawl			Small otter trawl			Mid-water gillnet		
		Total time			Total time			Total time	
Site	Reps	(h:mm)	# Fish	Reps	(h:mm)	# Fish	Reps	(h:mm)	# Fish
Eaglek Bay	5	2:11	27[a]	2	0:40	0	2	5:47	2
Lower Herring Bay	2	1:12	0	3	1:40	3	2	6:23	3
Simpson Bay	2	0:55	0				2	7:08	2
Whale Bay	1	0:47	0	1	0:30	0	2	6:04	0
Zaikof Bay	3	1:50	0				1	3:16	0

[a]all juvenile walleye pollock from one replicate trawl

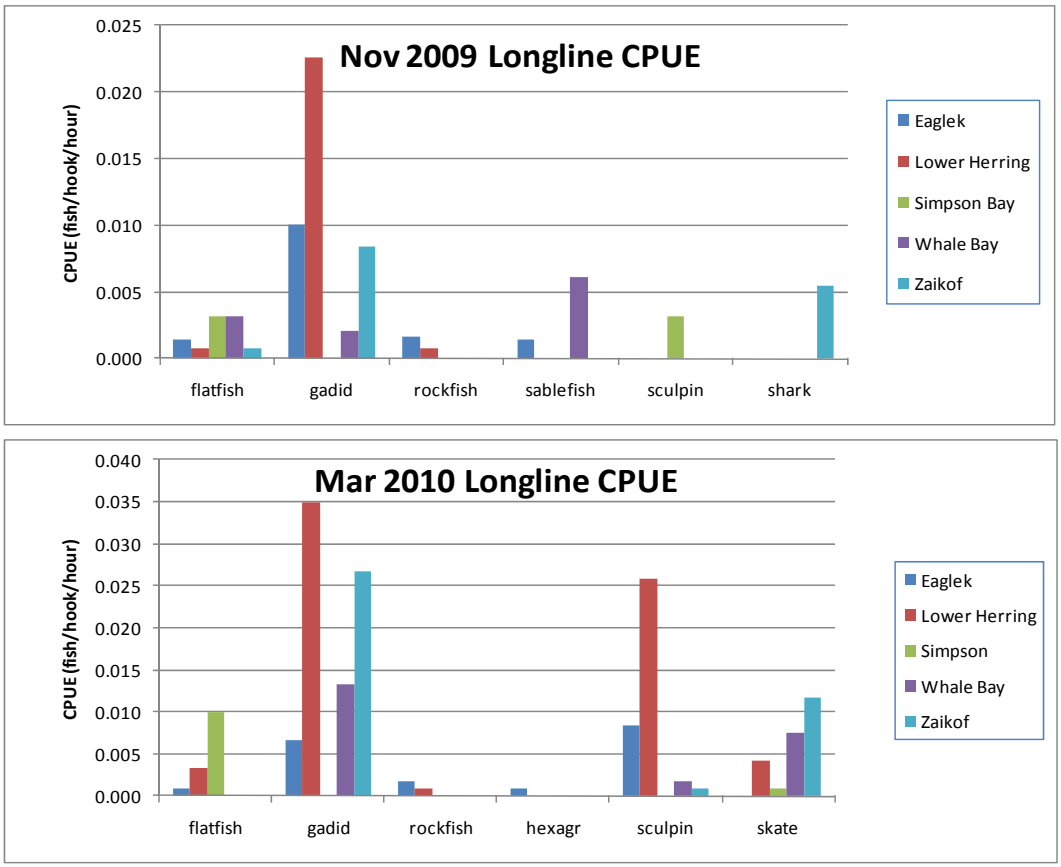

Figure 1. Total numbers and catch per unit effort (CPUE) for fish collected by longline in November 2009 and March 2010 by species and location. CPUE calculated as fish caught per hook per hour.

Future Work

For future sampling efforts we will continue to deploy longlines; however, this method selects for fish typically >300 mm TL. In March 2010, we employed commercial gillnetters to conduct a "herring blitz" during which several bays were sampled for juvenile herring using demersal gillnets (<20 mm mesh stretched). Results from this effort indicated that small mesh, demersal gillnets were very successful in catching fish in the size range that is largely absent from our data set (100-300 mm TL). Based on these results we will deploy demersal gillnets constructed with multiple, small mesh panels (19, 32, and 44 mm mesh stretched) to capture smaller fish (e.g., juvenile saffron cod and walleye pollock). Additionally, we will modify our mid-water gillnets for both mid-water and demersal deployments so that they may be deployed in tandem with the small mesh gillnets.

Coordination/Collaboration

Our project is part of the Prince William Sound Herring Survey Group. Field work is conducted concurrent with energetics, disease, and hydroacoustic herring surveys, and avian predator observations. Principal investigator Bishop attended the November 2009 EVOS herring meeting in Anchorage as well as presented at the May 2010 Herring Survey Group meeting in Cordova.

Community Involvement/TEK & Resource Management Applications

During the May 2010 Herring Survey Group meeting, held in Cordova, all of the PWS Herring Group principal investigators, including Bishop fielded questions from the local community. One hour at the end of the meeting was dedicated solely to answering questions from the public.

Information Transfer

An article entitled, "Herring survey program examines the effect of predation on PWS juvenile herring" was written by Brad Reynolds for the 2010 Delta Sound Connections, an annual, free newspaper on science activities in Prince William Sound and the Copper River Delta prepared for general distribution to tourists visiting the area.

Public Outreach

Our project was featured along with the rest of the Prince William Sound Herring Survey Group in Field Notes, a radio program developed by Allen Marquette, of Prince William Sound Science Center.

These programs are available on Youtube.

Part 1 - http://www.youtube.com/watch?v=I37nv5Sq5fo
Part 2 - http://www.youtube.com/watch?v=mYW-2tNuV2U

In addition, our project is now featured on the on the Prince William Sound Science Center's web site, under the PWS Herring Group web page:
http://www.pwssc.org/research/biological/PacificHerring/pacificherring.shtml

This web page is still under construction but should be up and running by the end of September 2010

Budget Changes:

No major changes.