

1. PROJECT INFORMATION

GOA IERP Project Number:	4181-00
Title:	UTL – Surviving the Gauntlet
Overall project duration	1 October 2010 – 30 Sept 2014
Overall project funding	\$3,765,811
Report period	1 April 2012 to 1 December 2012
Report submission date	1 December 2012
Lead Author of Report*	Jamal Moss

**Although there may be only one lead author of the report, all PIs and co-PIs of the project, as identified in the approved statement of work and listed below, are responsible for the content of the Semiannual Progress report in terms of completeness and accuracy.*

Principal Investigator(s), Co-Principal Investigators and Recipient Organization(s):

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2. PROJECT OVERVIEW

a. Briefly (4-5 sentences) describe the core purpose of your project, and the underlying need for this research.

The overall goal of our research is identifying and quantifying the major ecosystem processes that regulate recruitment strength of key groundfish species in the Gulf of Alaska (GOA). We concentrate on a functional group of five predatory fish species that are commercially important and account for most of the predatory fish biomass in the GOA. We focus on recruitment success because large swings in the abundance of these species have occurred despite precautionary fishing levels. Their early life begins with an offshore pelagic phase followed by a nearshore settlement phase. Spatial distribution, food preference, and habitat suitability of these two life history phases are poorly known. Fieldwork will define a critical environmental window for these five focal species by examining the gauntlet they endure while crossing from offshore spawning to nearshore settlement areas. We will contrast two regions: the central GOA with a broad shelf dominated by high oceanographic variability and large demersal fish biomass and the

eastern GOA (SEAK) with a narrower shelf, lower demersal biomass, and higher species diversity. Retrospective analysis of biological and environmental variability combined with multispecies stock assessment models will determine the relative influence of environmental parameters and identify processes influencing recruitment. Regional differences will be linked to dietary preference of top level predators to infer causal mechanisms for population trends and influence of climate change on ecosystem structure and diversity.

b. State the specific GOAIERP hypothesis or hypotheses that your project is addressing.

The Gauntlet: The primary determinant of year-class strength for marine groundfishes in the GOA is early life survival. This is regulated in space and time by climate-driven variability in a biophysical gauntlet comprising offshore and nearshore habitat quality, larval and juvenile transport, and settlement into suitable demersal habitat.

GOAIERP hypotheses are posted in SharePoint at: <https://agora.afsc.noaa.gov/sites/gisr>

c. List the specific objective(s) of your research project.

- 1.) Quantify, by region, the temporal variability in potential climatic, oceanographic, or biological drivers influencing the early life survival of key groundfish species. Differences between the eastern and central GOA will be examined through retrospective analyses of available spatial datasets. Please refer to the retrospective component progress report for more details.
- 2.) Determine by region the abundance, distribution, and condition of key groundfish species during their offshore to nearshore pelagic phase through at-sea sampling with concurrent observations of the biophysical environment (i.e. oceanography, prey, competitor, and predator fields). Please refer to the lower trophic level (LTL) and the middle trophic level (MTL) component progress reports for more details on nearshore sampling and the concurrent offshore observations of oceanography, competitor, and prey fields.
- 3.) Create benthic habitat suitability maps by region through analysis of available bathymetry and substrate data (e.g. slope, grain-size) to characterize the nearshore demersal habitat.
- 4.) Develop growth curves and consumption rates through laboratory work, which will parameterize simple bioenergetics models that will estimate potential fish growth for rockfish.
- 5.) Analyze dietary preference and foraging behavior of seabirds and relate diet to prey availability. Please refer to the MTL component progress report for more details on the estimation of total biomass removals by seabirds.

3. PROGRESS SUMMARY

a. Provide a table showing the timeline and milestones for the current reporting period only.

<i>What</i>	<i>Who</i>	<i>Start and end dates</i>	<i>Status</i>
2012 fisheries oceanographic survey	Moss, Fournier	July 1 2011 – September 11 2012	Complete

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Post 2012 fisheries oceanographic survey cruise report to <i>Workspace</i>	Moss, Fournier	September 2011 – November 2012	Complete
2011 predator diets	Fournier	March 2012 – June 2012	Complete
Georegistering and digitizing of GOA bathymetry and sediment data in the central, eastern, and gap regions	Zimmermann, Reid	April 2012 – December 2012	In progress
Submit advisor application and research opportunity to NRC for habitat post doc position	Shotwell	April 2012 – December 2012	Complete
2013 UTL survey planning	Moss	November 2012	In progress
2013 UTL survey coordination	Fournier	November 2012	In progress
Proximate analysis for age-0 target species collected in 2011	Heintz	December 2011 – August 2012	In progress
Age-0 rockfish/focal species physiology lab study	Heintz, Sreenivasan	December 2011 – March 2012	In progress
Age-0 rockfish/focal species RNA/DNA lab study	Heintz, Sreenivasan	September 2012 – December 2012	In progress
2011 Age-0 rockfish diet analysis	Fournier	November 2012	Complete
Analyze 2011 seabird diet data	Slater	December 2011– June 2012	Complete
Provide 2011 seabird reproductive success data	Slater	December 2011– June 2012	Complete

b. Describe report period progress.

Retrospective Analysis (1):

Please refer to retrospective component progress report.

Fisheries Oceanographic Surveys (2):

The UTL component completed its second fisheries oceanographic survey. Fish samples were collected using a midwater rope trawl (Cantrawl model 400 made by Cantrawl Nets LTD of Richmond, BC, Canada). The Cantrawl model 400 model is a 198-m midwater rope trawl that has a mouth opening 55 m wide x 15 m deep, is comprised of hexagonal mesh wings in the body, and has a 1.2-cm mesh codend liner at the foot. During the survey the trawl was rigged to fish at the water surface by stringing buoys along the headrope, tows were made at predetermined grid stations, and were 30 minutes in duration. Immediately after the trawl was retrieved, catches were sorted by species and standard biological measurements (length, weight, and maturity) were recorded.

Whole age-0 marine fish, juvenile salmon, and forage fish were collected and frozen for transportation to the laboratory for food habits, energetic, and genetic analyses. A livebox was attached to the codend of the survey trawl at predetermined grid stations to collect live age-0 rockfish in the southeastern GOA region. Once the livebox was retrieved, live specimens were immediately transferred to an aerated livewell on deck and transported to the laboratory for feeding and growth rate studies. All other species caught in the livebox were returned to the sea.

An observer was aboard each cruise to record sightings of seabirds and marine mammals along transects run between sampling stations. Observers followed protocols standardized by the U.S. Fish and Wildlife Service, Migratory Bird Management office. Seabirds and marine mammals within the transect extending from the center-line of the research vessel to 300 m to the port were recorded by species, number, and activity type. Observations were entered in the program dLog3[®] (R.G. Ford Consulting Company), which was linked to a GPS unit to continuously record wildlife locations. During trawl surveys, observers maintained a lookout for marine mammals and short-tailed albatrosses (in particular) to minimize encounters or entanglement with the net. Datasets were proofed on a daily basis and a log of events kept.

Physical oceanographic data was collected at gridded survey stations by deploying conductivity, temperature, and depth meter (CTD) with ancillary sensors (SBE-911, Sea-Bird Electronics, Inc, Bellevue, WA). This provided vertical profiles of salinity, temperature, fluorescence, photosynthetic available radiation (PAR), and dissolved oxygen. Water samples for nutrients (N, P, Si), chlorophyll *a*, phytoplankton, and microzooplankton were collected (surface 10m, 20m, 30m, 40m, and 50m depth) using 5-L Niskin bottles. Water samples filtered for chlorophyll *a* with GFF filters which were stored in the dark at -40°C. Nutrient samples were taken from Niskin bottles and stored at -40°C. Water collected for in situ oxygen samples were sealed in a glass vessel and stored in a cool place.

Zooplankton and ichthyoplankton samples were collected at gridded station locations using double oblique bongo tows with 505 μ mesh nets mounted to 60-cm diameter frame simultaneously with 150 μ mesh nets mounted to a 20-cm diameter frame. Oblique tows were made from the surface to near bottom (5 meters) to a maximum of 200 m with a 45° wire angle.

Habitat Suitability (3):

We completed a region-wide draft bathymetric surface of the Gulf of Alaska (GOA) which extends from the southern tip of Prince of Wales Island to the western edge of the Alaska Peninsula. This compilation was requested by the modeling component and is an extension of the previous draft areas which just included the western and eastern GOA separately as detailed in the original UTL proposal. Therefore, this work focused primarily on filling the “gap” area between the previous drafts of the western and eastern GOA and on finding and digitizing datasets to provide a more complete coverage for the whole region. The “gap” area extends from the area outside of Prince William Sound to the area outside of Yakutat Bay. Originally this “gap” area was excluded from the GOA-IERP bathymetric compilation, but due to requests from other GOA-IERP components, we edited the available bathymetry data and digitized several available data sources, in order to bridge the gap between the two areas. While attempting to combine the western, gap, and eastern GOA areas it was obvious that additional bathymetry data sources would be required in order to provide a comprehensive compilation. Therefore we found, digitized or edited bathymetry data from other sources and began merging the bathymetry into a larger compilation. With each compilation new errors were discovered and corrected until a first draft of a region-wide bathymetry compilation was produced for the GOA.

Georegistering and digitizing continues for the sediment data in a similar fashion as the bathymetric data with the goal of a region-wide GOA surface that includes the “gap” area between the western and eastern GOA areas. Generally, sediment data on a particular smooth sheet are digitized by one person and then proofed by another. All the smooth sheet data in the western GOA (defined by the boundaries from the western edge of Kodiak to the western edge of Prince William Sound) are digitized, proofed, and in the process of being merged and proofed again as a whole. Conversion into numerical data will follow. The eastern GOA data (defined by Yakutat Bay to Baranof Island) are in the process of digitization and proofing. Identification of data and digitization is in progress for the gap region (area between western and eastern GOA).

We are currently exploring the options for processing the additional habitat data (e.g. rocky reefs, kelps, islets, rocks, clay) available on the smooth sheets. There are four complicating issues. First, during the data processing to numerical values (e.g., into usSEABED), rocks or rocky reefs are converted into incompatible information when compared to sediment, and cannot, therefore, easily be included in a sediment-size surface. Second, “clay” and “silt” descriptors are merged into a single granulometric value (“mud”), although separate values are determined for mean/median grain-size. Third, many seafloor points do not address the sediment size, instead noting only the hardness or softness of the sediment surface. Finally, there may also be a possible scarcity of large-scale NOS smooth sheets in the “gap” area. These issues will likely severely limit our ability to create single gridded surfaces that cover the entire area of interest.

Some potential solutions for addressing these issues in the habitat suitability model and maps may be to either create separate feature dataset layers rather than a single, continuous gridded surface or to define the seafloor into only hard and soft categories rather than grain-size. Digitizing this data will be dependent on the usefulness of this information following completion of the literature synthesis of the habitat preferences for the five focal species.

We are writing up some of our bathymetry and sediment data explorations as a manuscript which describes several potentially useful measures for describing and comparing five of the MTL sites. Below are draft figures for (A) bathymetry for Kiliuda Bay, (B) sediments for Port Dick, (C) exposure of shoreline to the Gulf of Alaska for Izhut Bay, (D) watershed, streams and integration of bathymetry with USGS topographic map for Aialik Bay, and (E) predicted (Norcross et al., 2007) essential fish habitat for juvenile Pacific halibut (*Hippooglossus stenolepis*) and juvenile flathead sole (none) (*Hippoglossoides elassodon*) at the Barren Islands (Figure 1).

The habitat data post-doc position has been submitted to the Research Associateship Program (RAP) conducted by the National Research Council (NRC) in cooperation with the AFSC. Through this program an approved NRC Research Advisor submits a research opportunity to the NRC RAP and prospective applicants develop a proposal to complete the research. The advisor is typically a representative from the sponsoring funding agency (in this case Kalei Shotwell from the UTL). Following the application process, the advisor provides input to the NRC panel on the value of the submitted proposals to their laboratory. The NRC panel then reviews the applicants and provides a score and rank of the applicants to the sponsoring agency. The sponsors then authorize the NRC to notify the selected applicant and initiate the award process.

Seabirds and Marine Mammals (4):

An observer recorded sightings of seabirds and marine mammals in both the eastern and western study regions on 2012 cruises aboard the F/V *Northwest Explorer*. Observations along transects occurred farther offshore in 2012 than in 2011. Wildlife sightings were reflective of this as densities were generally lower than those observed in shallower waters. These observations are being used to generate estimates of seabird and marine mammal densities along transects.

Seabird Colony (5):

Colony-based work occurred on St. Lazaria (eastern study region) in 2012, but not on East Amatuli Island (western study region) due to lack of funding, as 2012 is not a fully funded field year for the GOA Project. Data collected at St. Lazaria covered the full complement of monitoring parameters for storm-petrels (planktivores) and auklets (piscivores). In addition, data on rhinoceros auklet foraging range was obtained by deploying 22 temperature-depth recording (TDR) dataloggers between 30 June and 12 August. Ten of these loggers were retrieved with data and six global positioning system (GPS) tags were deployed. Citizen observers recorded size and location of rhinoceros auklet flocks in the Sitka Sound area during late July and August.

Physiology (6):

An initial growth and consumption rate/assimilation efficiency study was carried out on age 3+ yellowtail rockfish. Rockfish were cultured at two temperatures (4.5°C and 9.5°C), with each temperature treatment consisting of 6 individual tanks (12 tanks/trial). Fish in each temperature treatment were cultured in tanks for 4 week periods, with a 2nd trial carried out after termination of the 1st trial. To quantify pristane concentrations and RNA/DNA ratios in fish at the onset of each trial, 4 fish were immediately sampled (n=8 across both trials). Fish in each temperature treatment were cultured at different food rations (low ration 0.5% body weight, medium ration 1.0% body weight, high ration 2.0% body weight), with 4 fish in a single tank and copepods used as prey. Fish were measured (length/weight) at the start of the trial, midway through the trial (end of week 2), and once again at the end of the trial (week 4) in order to calculate growth rates. Fish within each tank were individually identified by unique fin-clips.

Tanks for each trial were set up on 4 shelves (4 tanks/shelf), with half of tanks held at 4.5°C, and half of the tanks held at 9.5°C. The tanks on the uppermost shelf housed 3 fish each on a copepod diet (to be used in 2nd trial). Feces were siphoned from each tank and placed in individually labeled bags prior to each feeding session and stored at -20°C until an analysis of pristane concentration is initiated. Fish were fed the designated rations after siphoning.

The 2nd trial began after the termination of the 1st trial (after 4 weeks). The tank design remained similar to the 1st trial, but the food treatment varied for tanks in the central shelf. Instead of being fed a medium copepod ration, fish (3 per temperature treatment) were held without food at both 4.5°C and 9.5°C in order to measure pristane depuration rates (to factor into assimilation efficiency calculations). The fish slated for studying pristane depuration rates were held in 2 of the 4 acclimation tanks at the start of the 1st trial and fed copepods (for 4 weeks) so they had pristane in their system at the start of the 2nd trial. As with the 1st trial, fish were sampled at the start of the 2nd trial (n=4) to quantify pristane concentration.

All samples from the yellowtail rockfish study have been homogenized (whole body) in preparation for analysis of pristane concentrations, and muscle plugs excised for RNA/DNA ratio analyses. Muscle plug samples are currently being analyzed for RNA/DNA ratios (estimated time for analyses is 2 weeks) in order to compare growth rates on a cellular level between fish held at different ration levels. The pristane assay on whole body homogenate will be carried out after RNA/DNA analysis is completed. After completion of the pristane assay on all samples, the data will be used to compare growth rates, assimilation efficiencies, and consumption rates for fish at different ration levels.

Similar growth and consumption rate studies are planned on a broader temperature scale (4 temperature treatments) for juvenile rockfish, Pacific cod, and walleye pollock. We have obtained juvenile Pacific cod from NOAA's Little Port Walter station and transported them to the wet lab at Ted Stevens Marine Research Institute's (TSMRI) wet lab. Juvenile rockfish have been collected by the Sitka Sound Science Center and are currently being held in Sitka until they can be transported to TSMRI. Walleye pollock are currently being quarantined in TSMRI's wet lab to ensure that any fish used in the growth studies are healthy and disease-free.

A heat-exchanger (required for maintaining fish at 4 temperatures) has been ordered and is in the process of being plumbed into the wet lab and connected to the treatment tanks. Temperature-dependent feeding and growth studies will be initiated as soon as treatment tanks can be stabilized at specific temperatures required for the experiments.

c. Describe preliminary results.

Fisheries Oceanographic Surveys (2):

The 2012 UTL fisheries oceanographic survey was conducted over the course of three survey legs aboard the 162 ft. stern ramp trawler F/V *Northwest Explorer* from June 30th – July 23rd, August 1st – August 23rd, and September 4th – September 12th. The vessel operated in the southeast and central GOA regions as well as along two transects extending from nearshore to offshore within the vicinity of Yakutat Bay and Kayak Island. A total of 160 surface trawl hauls were completed in 2012, with 78 of those trawls occurring in the eastern study region (July 3rd – July 21st), 61 in the western (August 3rd – August 21st), and 21 livebox trawls in the eastern study region (September 6th – September 10th). Numerous age-0 pollock (*Theragra chalcogramma*), Pacific cod (*Gadus macrocephalus*), arrowtooth flounder (*Atheresthes stomias*) (ATF), and rockfish (*Sebastes* spp.) were encountered and collected in the eastern and western study regions; but few of these species were captured along the Yakutat and Kayak Island transects (Figures 2 - 5). Very few sablefish (*Anoplopoma fimbria*) were encountered in the GOA. Juvenile salmon (*Oncorhynchus* spp.) were highly abundant (Figure 6).

Age-0 pollock were widely distributed across the GOA in 2012 with catches occurring at most survey stations (Figure 2). Age-0 Pacific cod were highly abundant and widely distributed in the western study region but rarely encountered in the east (Figure 3). Age-0 ATF were located on the shelf in the western study region and offshore in the eastern region (Figure 4). Age-0 ATF were most commonly encountered in the northern half of the eastern grid, which was similar to the distribution pattern observed in 2011. Age-0 rockfish were primarily distributed 30-80 nm offshore in the southeast region and seaward of the shelf break along the Yakutat line. The highest catches of age-0 rockfish occurred from the outer edge of the shelf and over the shelf break to offshore waters in the southern half of the western grid (Figure 5).

Juvenile Chinook (*O. tshawytscha*) were the least encountered juvenile salmon species, with most Chinook occurring in southeastern Alaska waters. Juvenile pink (*O. gorbuscha*) and chum (*O. keta*) salmon were most abundant from the vicinity of Cross Sound to the Kenai Peninsula. Sockeye (*O. nerka*) and coho (*O. kisutch*) salmon were broadly distributed but less abundant relative to juvenile pink and chum (Figure 6).

A livebox was attached to the codend of the trawl and deployed in the southeast region during leg 3 in order to collect live age-0 rockfish, Pacific cod, and walleye pollock for physiological and feeding studies. Sampling effort for live fish occurred at GOA Project common stations using standard trawling protocols, and thus catch data and samples collected in the fall of 2012 are comparable to those collected in the eastern study region during fall 2011. Nineteen live box hauls were conducted at common GOA Project survey grid stations, and two in inside waters of SEAK. Few Age-0 rockfish were encountered, but nearly 300 age-0 pollock were captured and successfully transported to the TSMRI's wet lab for physiological studies.

Habitat Suitability (3):

The majority of the bathymetry data for the region-wide surface is from high quality National Ocean Service (NOS) charting surveys, a deep water United Nation Convention Law of the Sea (UNCLOS) survey in the eastern GOA, and lower resolution ROMS model data from the GOA IERP modeling component. There is generally much less sediment data over the region than for bathymetry, but similar to the bathymetry, more broadly distributed data are available from NOS smooth sheets than for data originating from other agencies and universities (USGS, MMS/BOEM, EPA, UAF, NOAA, etc.). An example draft of the lower resolution sediment map was provided in the original UTL proposal. For this reason, we will likely develop two separate draft sediment surfaces for a final product, one surface that uses well-located NOS data and one surface that includes data derived from the other listed sources.

We received approval for the NRC Advisor (Kalei Shotwell) and the accompanying research opportunity in October. The application process closed in early November and applicant proposals were subsequently

forwarded to the NRC Advisor for initial recommendation. The proposals will now go into NRC panel review for approximately 6-8 weeks and the review notification and award will occur on January 14. We anticipate a start date for the recommended post-doc in late March, likely beginning with the PI meeting in Seattle. The post-doc will be stationed in Juneau, Alaska and will work directly with the NRC Advisor at the Auke Bay Laboratories.

Seabirds and Marine Mammals (4):

One observer was present on legs 1 and 2 of the 2012 F/V *Northwest Explorer* cruises to record sightings of seabirds and marine mammals. Cruise tracks along transects occurred farther offshore in 2012 than in 2011, and as a result wildlife sightings were generally lower than those observed in shallower waters. These observations will be used to generate estimates of seabird and marine mammal densities along transects, however, no preliminary data on marine mammal and seabird distribution is presently available. Sightings of assumed tsunami debris generated from the March 2011 earthquake in Japan were noted.

Seabird Colony (5):

Monitoring data were collected to evaluate population trend, annual productivity, and timing of breeding events, chick growth, and chick diet composition. Preliminary analyses of rhinoceros auklet activities are as follows:

- Burrow occupancy rates on long-term study plots (i.e., number of burrows active out of total number on plots) was 62.7%
- Annual reproductive success (number of active burrows in early August/number of active burrows in early July) was approximately 85%
- Breeding occurred 1-2 weeks later than usual and was more asynchronous than typical
- Chicks fledged slightly heavier (< 5 grams) than in 2011

More pronounced breeding asynchrony than typical resulted in challenges in capturing adults for telemetry work as well as collecting data on stomach contents of adults. Nevertheless, 19 adults were non-lethally sampled for stomach contents and 34 adults were sampled for blood stable isotope analysis. Data on rhinoceros auklet foraging range was obtained by deploying 22 temperature-depth recording (TDR) dataloggers between 30 June and 12 August (Figure 7) which will be used to describe foraging behavior.

No diet samples were collected from seabirds in western Gulf as part of GOAIERP due to lack of Alaska Maritime National Wildlife Refuge funding. However, tufted puffin diet data were summarized from the time period 1995-2011 and submitted to the team. Ninety-three diet samples (defined as individual bill-loads of prey) were collected from adult rhinoceros auklets in 2012, with relative biomass of the predominant prey identified from 1994-2012 reported (Figure 8). Fork-tailed storm-petrel diet samples were collected at the St. Lazaria colony in 2012 and remain to be analyzed.

Physiology (6):

No preliminary data on fish feeding rate, pristane concentrations, or RNA/DNA ratio analyses is available at this time.

d. Describe integration activity.

Fisheries Oceanographic Surveys (2):

UTL fisheries surveys are integrated over the LTL, MTL, and UTL components by design and representatives from each of these trophic level components staff surveys during fully funded field

seasons (2011 and 2013). However, 2012 as it was not a fully funded field year and only representatives from the LTL and UTL participated in UTL fisheries oceanographic surveys.

Habitat Suitability (3):

Mark Zimmermann has had several meetings with Sarah Hinckley on the development of the habitat suitability layers, model resolution, and what to do in the nearshore area. He will be attending their modeler's group meeting in late December as a representative of the benthic habitat group. We are currently discussing various questions from the modeling group and providing as much information as possible to assist with the IBM development.

We have discussed the potential for collecting groundtruthing habitat data (e.g. sediment grabs) from the MTL sites in locations where the five focal species are actually sampled. This would provide supportive evidence for the habitat suitability maps. Currently, no sediment grabs have been taken from the MTL sites; however, this topic has been added to the priority list for the November 30, 2012 survey meeting.

We will continue to coordinate with all the components to inform surveys, sampling, and modeling as the habitat products develop.

Seabirds and Marine Mammals (4):

Density estimates of marine wildlife observed on transects (i.e., between sampling stations) during UTL fisheries oceanographic surveys in 2012 are being derived (using an R-based script) for incorporation within the GOA Project *Workspace*. Also, through this integrative process, distribution and abundance of all species can be temporo-spatially linked with chemical and physical properties of the marine environment recorded during UTL cruises and provided to the Modeling group for model simulation validation.

Seabird Colony (5):

A subsample of rhinoceros auklet diets collected in 2011 was sent to the Auke Bay Laboratories for lipid content analysis and dietary preference determination. These samples were analyzed during summer 2012.

Physiology (6):

The physiology team has routinely corresponded with the modeling group to identify priorities for wet lab studies in order to provide information that will fill information gaps as they are revealed through the model development process. We will continue as planned, developing functional responses for growth under different temperatures and rations for rockfish and sablefish. In addition, we will try to develop similar data for Pacific cod as time and resources allow. For all the target species we will identify critical condition values for fish that have starved to death. These will include length, weight, energy, RNA/DNA and lipid.

e. Describe any concerns you may have about your project's progress.

The collection of live age-0 rockfish has proven much more difficult than originally anticipated and remains a concern regarding our project's progress to date. Despite significant efforts directed toward field collections over the past two field seasons we have only collected approximately 60 rockfish which are presently available for physiological, feeding, and growth rate experiments. A sample size of 300 would have been ideal, and we intend to continue in our effort in collect live specimens whenever possible.

f. Poster and oral presentations at scientific conferences or seminars

1. Oral presentation: (5th Annual Juneau Naturalist Symposium, April 2012) The Gulf of Alaska Project: an Integrated Ecosystem Research Program by Jamal Moss
2. Oral presentation: (Alaska Chapter of the American Fisheries Society) Benefits of living life on the edge: Enhanced growth and foraging opportunities for juvenile salmon inhabiting the margins of the Sitka Eddy by Jamal Moss

g. Education and outreach

Jamal Moss participated in the Alaska Coastal Rainforest Symposium Workshop on Developing a Collaborative Framework for Research Workshop hosted by the Juneau Economic Development Council, Juneau, AK (April 2012).

Jamal Moss staffed a pop-up diagram on the GOA Project at the Sitka Whalefest market, Sitka AK (November 2012).

UTL field survey blog: <http://gulfofalaska.nprb.org/program/field.html> (UTL cruises are not able to accommodate teachers at sea).

4. PROGRESS STATUS

We have made satisfactory progress in completing all tasks scheduled for the current reporting period with the exception of conducting live age-0 rockfish feeding and growth rate experiments in the laboratory. Age-0 marine fish physiological studies are scheduled to begin December 2012. Survey data from 2012 is almost ready to be shared with the group (expected December 2012) and processing of 2011 samples is nearly complete. The processing of 2012 fish samples is scheduled to begin January 2013. Planning for the 2013 UTL summer and fall surveys is underway and we expect to have a post doc working with the Habitat Suitability group by April 1st.

5. FUTURE WORKPLAN and DATA DELIVERY

Workplan

<i>What</i>	<i>Who</i>	<i>Start and end dates</i>	<i>Other key dates</i>
NOAA/UTL 2012 summer field survey sample processing	Moss, Fournier	January 1 – June 20	
2012 fisheries oceanographic survey data posted to <i>Workspace</i>	Fournier, Moss	December 1 – January 1	
Adult salmon diet processing	Fournier	March 1 – June 30	
Finalize surface of region-wide bathymetry product for GOA	Zimmermann	December 1 – completion of product	
Complete digitizing and proofing of western and eastern GOA sediment data and begin	Reid	December 1 – completion of product	

process for gap region			
Select NRC post-doc, begin transfer to ABL laboratories and PI meeting	Shotwell	December 1 – April 1	
Begin age-0 rockfish lab experiments	Heintz	January 1	
Rockfish (2012) genetics processing	Heifetz	January 1 – March 30	
Continue RNA/DNA analysis	Sreenivasan	December 1 – April 1	

Data delivery

GOAIERP Data Delivery Table		
Data type for delivery	Delivery Month & Year	Person sending data, with email address
2012 field survey data	December 2012	Wyatt Fournier wyatt.fournier@noaa.gov
Adult salmon diet data	June 2013	Wyatt Fournier wyatt.fournier@noaa.gov
Age-0 focal species diet data	June 2013	Wyatt Fournier wyatt.fournier@noaa.gov
Tufted puffin diet data	April 2013	Arthur Kettle arthur_kettle@fws.gov
Fork-tailed storm-petrel diet data	September 2013	Leslie Slater leslie_slater@fws.gov
Seabird/marine mammal observational data	May 2013	Leslie Slater leslie_slater@fws.gov
Species Specific Habitat Suitability (SSHA) maps	January 2014	Kalei.Shotwell@noaa.gov

1) 2012 field survey data will be posted to the *Workspace* site December 2012. Specific survey data to be delivered are:

- Haul location, timing, weather, and net mensuration
- Fish species abundance by haul (counts and total weight)
- Individual lengths and weights for all fish sampled
- Event log with time and location (GPS) of all sample activities

2) Wyatt Fournier will disseminate fish diet data.

- Prey composition by prey group weight for adult salmon
- Prey composition by prey group weight for age-0 marine fish

3) Leslie Slater will disseminate shipboard seabird and marine mammal observational data and seabird colony diet and tag data.

- Transect line counts (with locations) of seabirds and marine mammals
- Diet and tag data from colonies

References:

Norcross, B., F. J. Muter, and B. A. Holladay. 1997. Habitat models for juvenile pleuronectids around Kodiak Island, Alaska. *Fish. Bull.* 95:504-520.

Figures:

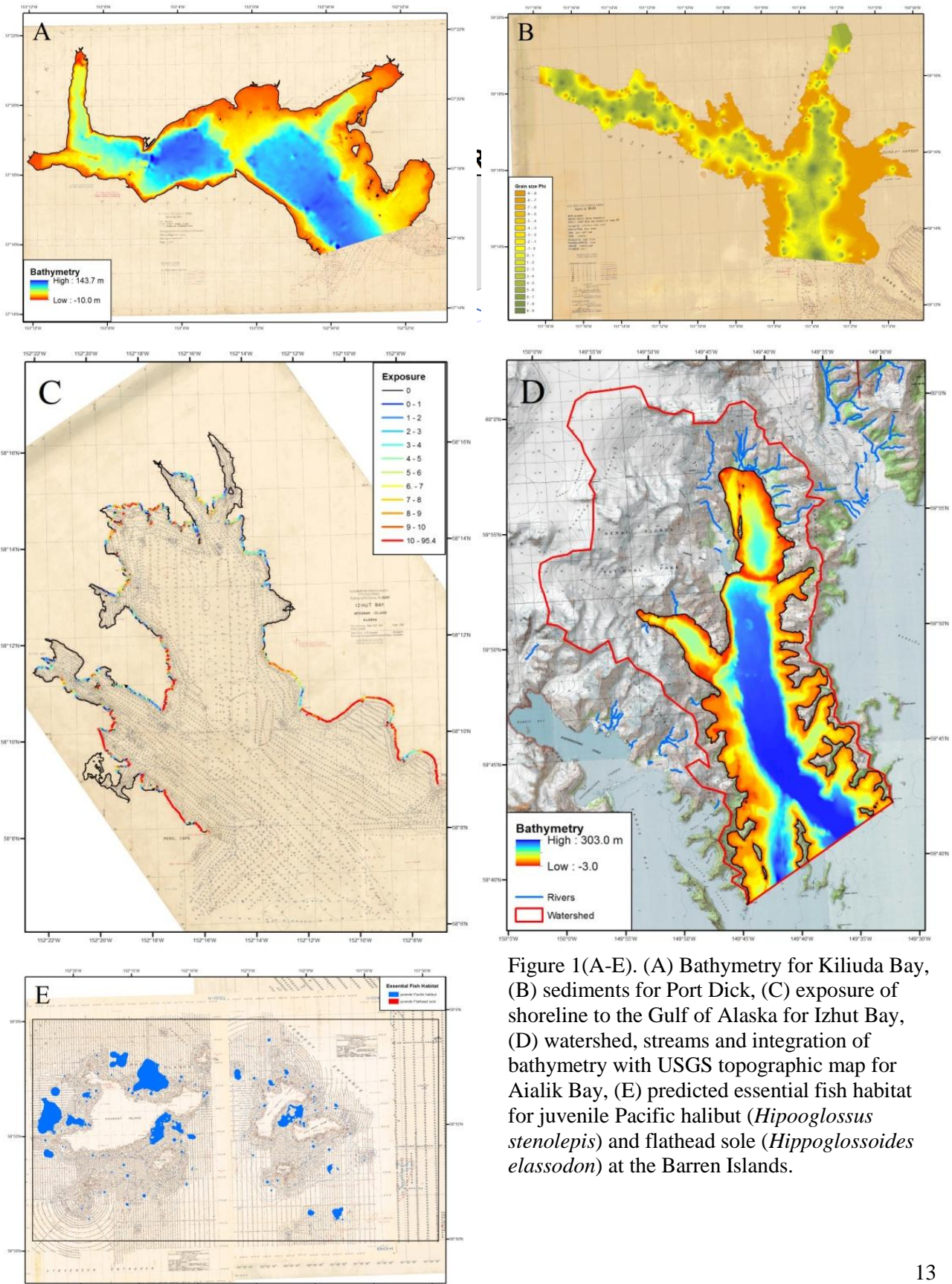


Figure 1(A-E). (A) Bathymetry for Kiliuda Bay, (B) sediments for Port Dick, (C) exposure of shoreline to the Gulf of Alaska for Izhut Bay, (D) watershed, streams and integration of bathymetry with USGS topographic map for Aialik Bay, (E) predicted essential fish habitat for juvenile Pacific halibut (*Hippoglossus stenolepis*) and flathead sole (*Hippoglossoides elassodon*) at the Barren Islands.

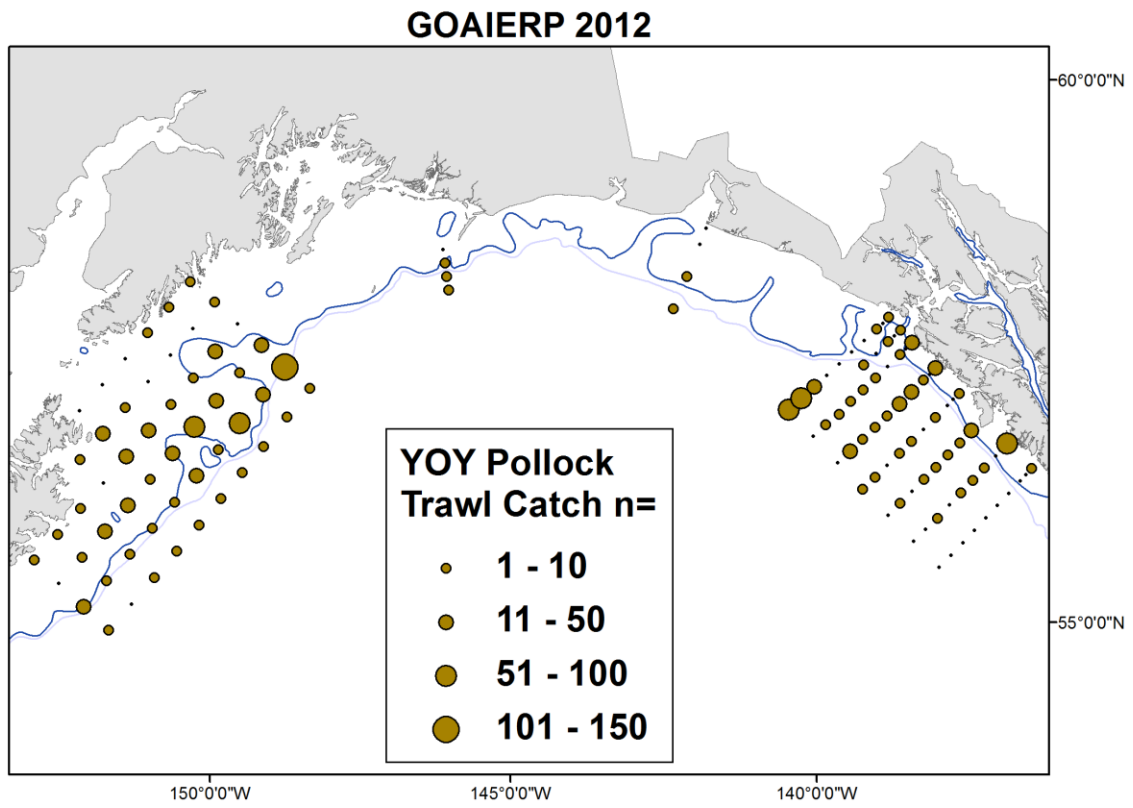


Figure 2. Age-0 walleye pollock (*Theragra chalcogramma*) catch during GOA Project UTL summer survey 2012. The size of each bubble is proportionate to the total catch at a particular station over the course of a 30-minute trawl. A black dot represents a grid station location that was sampled but yielded no catch

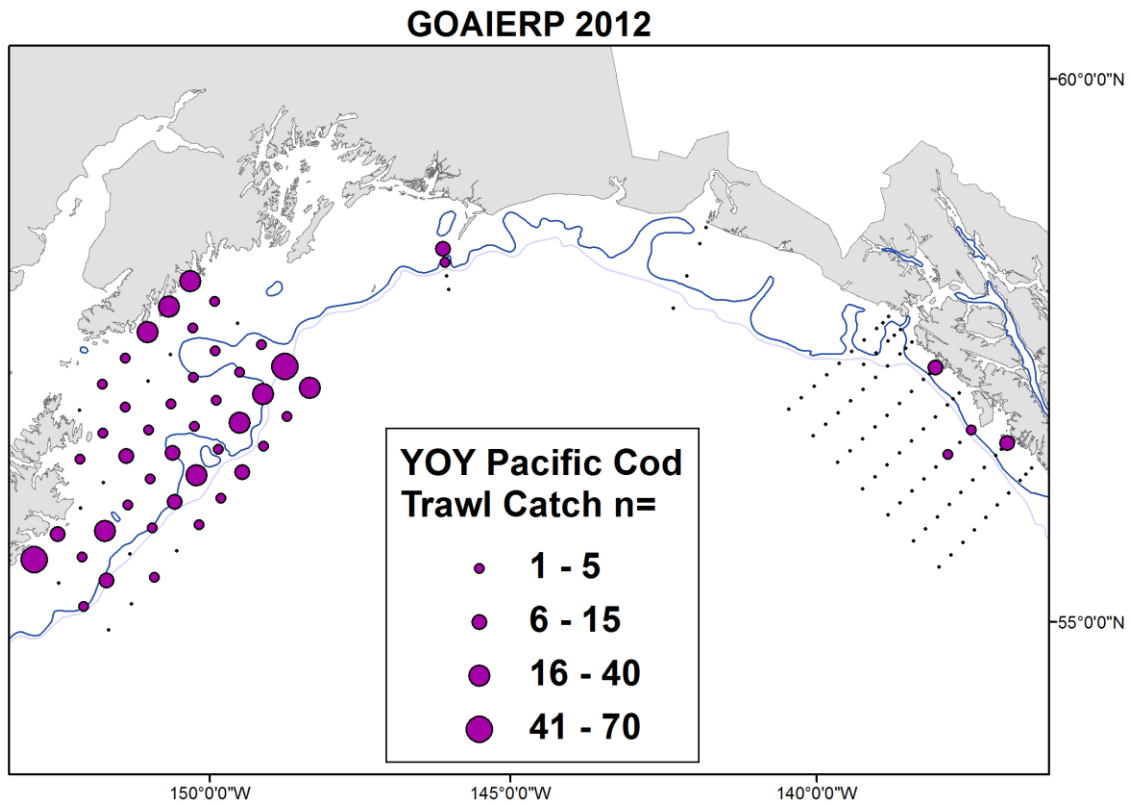


Figure 3. Age-0 Pacific cod (*Gadus macrocephalus*) catch during GOA Project UTL summer survey 2012. The size of each bubble is proportionate to the total catch at a particular station over the course of a 30-minute trawl. A black dot represents a grid station location that was sampled but yielded no catch.

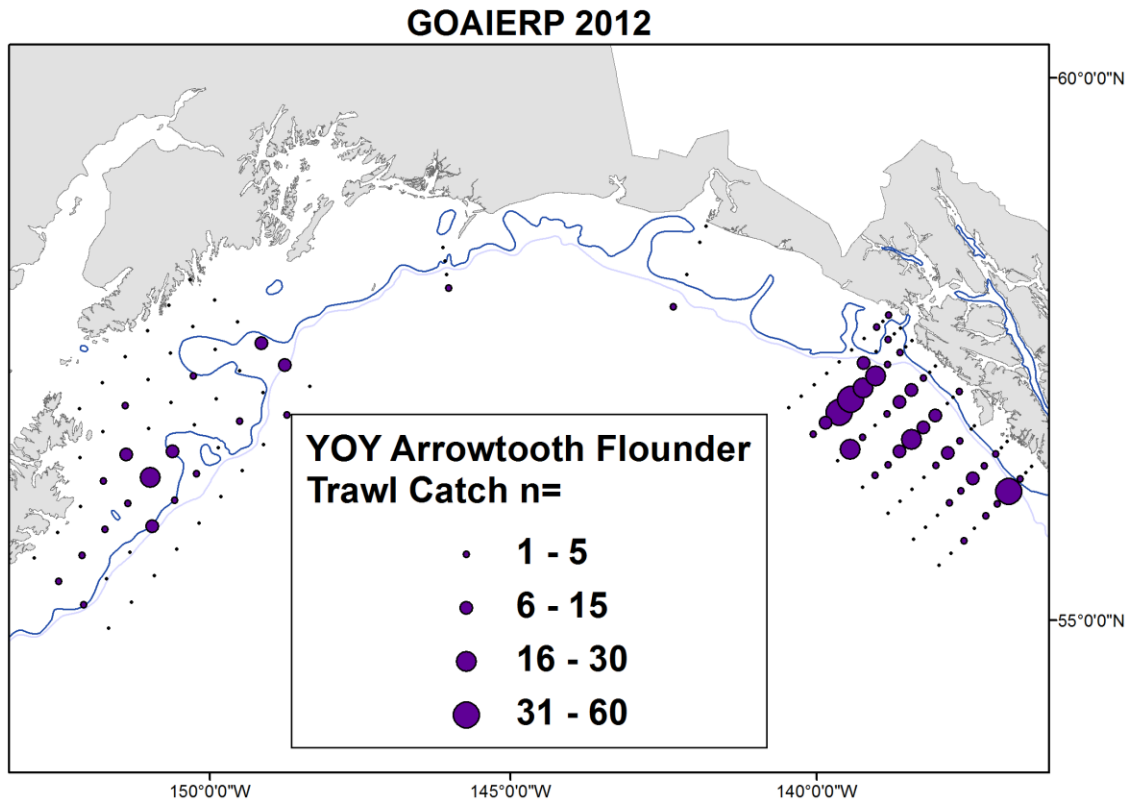


Figure 4. Age-0 arrowtooth flounder (*Atheresthes stomias*) (ATF) catch during GOA Project UTL summer survey 2012. The size of each bubble is proportionate to the total catch at a particular station over the course of a 30-minute trawl. A black dot represents a grid station location that was sampled but yielded no catch.

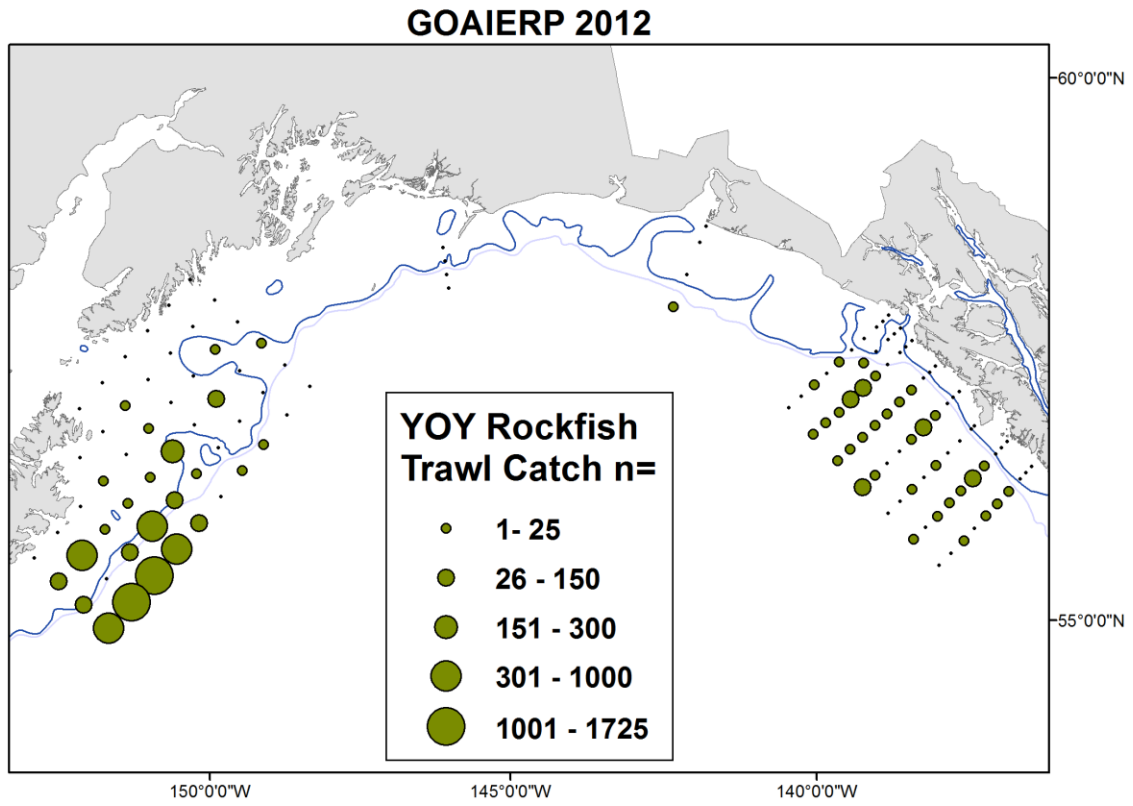


Figure 5. Age-0 rockfish (*Sebastes* spp.) catch during GOA Project UTL summer survey 2012. The size of each bubble is proportionate to the total catch at a particular station over the course of a 30-minute trawl. A black dot represents a grid station location that was sampled but yielded no catch.

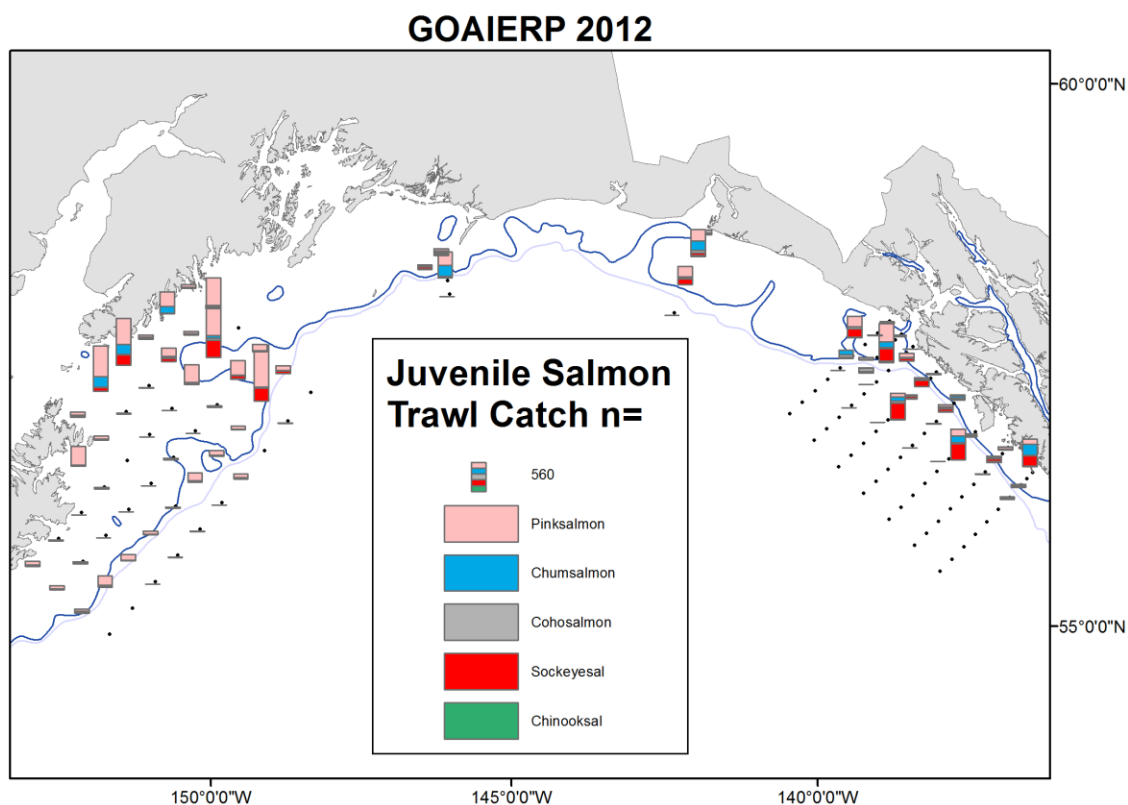


Figure 6. Juvenile salmon (*Oncorhynchus* spp.) catch during GOA Project UTL summer survey 2012. Each bar represents the total catch of five species of juvenile salmon over the course of a 30-minute trawl. A black dot represents a grid station location that was sampled but yielded no catch. Salmon species are represented by the color of each bar: pink (*O. gorbuscha*) = pink, chum (*O. keta*) = blue, coho (*O. kisutch*) = grey, sockeye (*O. nerka*) = red, Chinook (*O. tshawytscha*) = green.

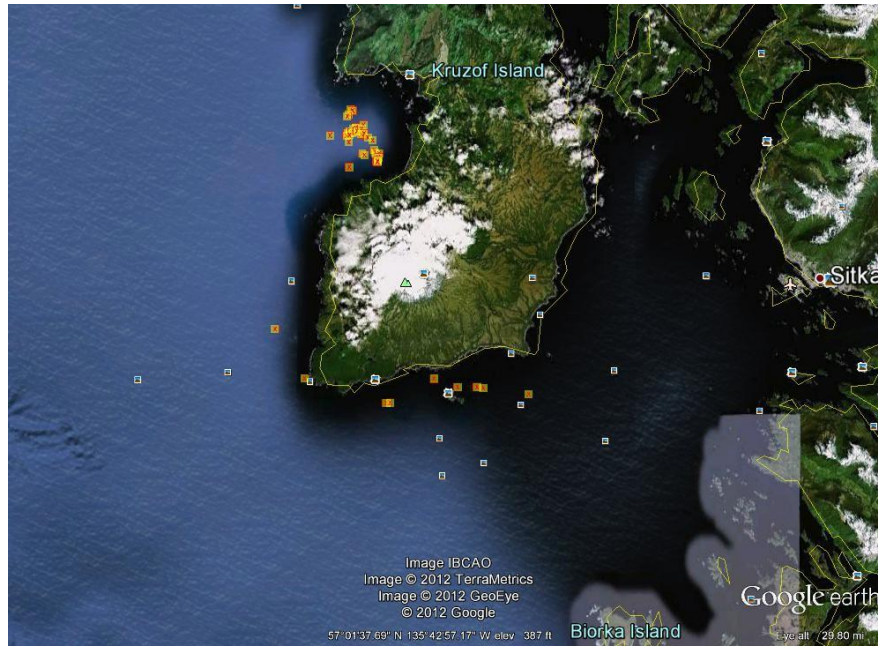


Figure 7. Foraging locations of one adult rhinoceros auklet (27-28 July 2012), a breeding bird captured at St. Lazaria Island.

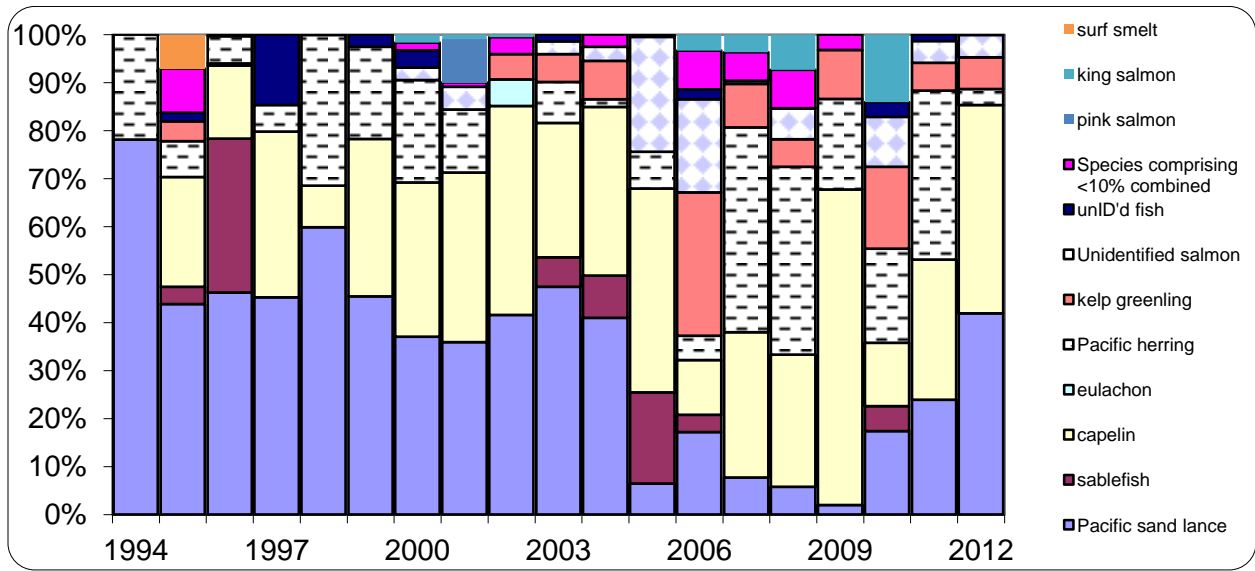


Figure 8. Relative biomass of prey species identified in rhinoceros auklet bill-loads being delivered to chicks, St. Lazaria Island, Alaska, 1994-2012.