

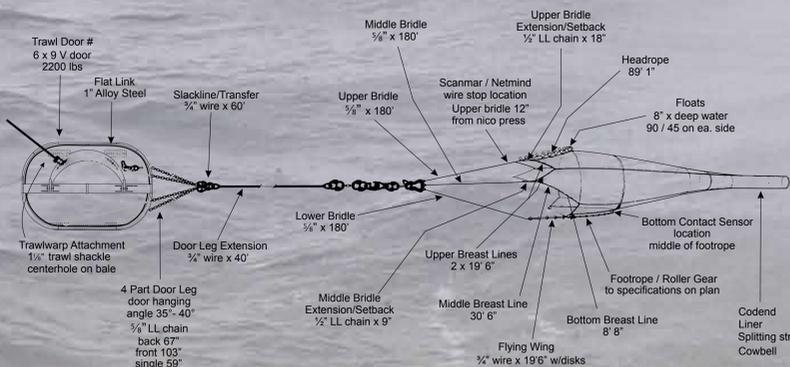
# A New Time Series: Eastern Bering Sea Upper Continental Slope Bottom Trawl Groundfish Survey

## INTRODUCTION

The eastern Bering Sea (EBS) slope environment produces some of the largest fish biomass world-wide. Groundfish assessments depend on bottom trawl surveys for fisheries independent biomass estimates and stock structure of many commercial and ecologically important fish and invertebrate species. The Alaska Fisheries Science Center has begun a new time series of bottom trawl surveys from the upper continental slope of the eastern Bering Sea. To date the time series consists of five successful biennial surveys conducted between 2000 and 2010, with the next survey scheduled to be conducted in 2012. The new time series utilizes modern net mensuration, navigational and oceanographic equipment, as well as current taxonomic keys and guides, providing the most accurate and detailed information available.

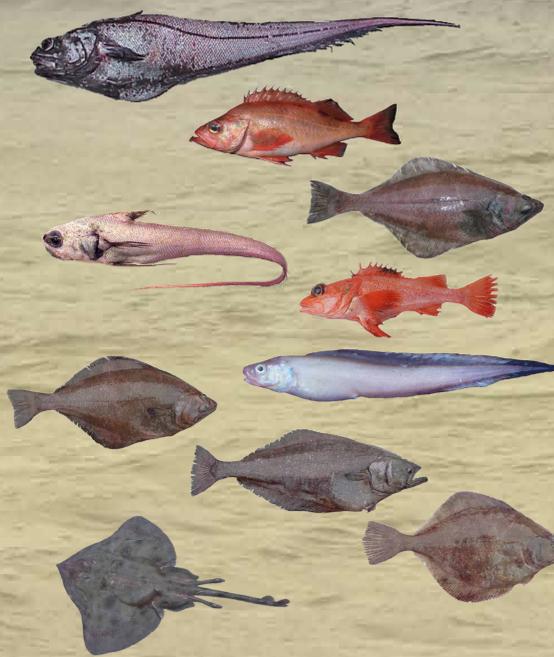
## NET DESIGN & OPERATION

The eastern Bering Sea upper continental slope survey is conducted with a Poly Nor'Eastern trawl net rigged with groundgear consisting of 8 inch rubber disks over a 1/2 inch chain. The doors have a four-point bridle connection which increases door stability at the relatively slow (2.5 knot) towing speed. During towing the net dimensions are approximately 16 m wide x 7 m high.



## SPECIES COMPOSITION

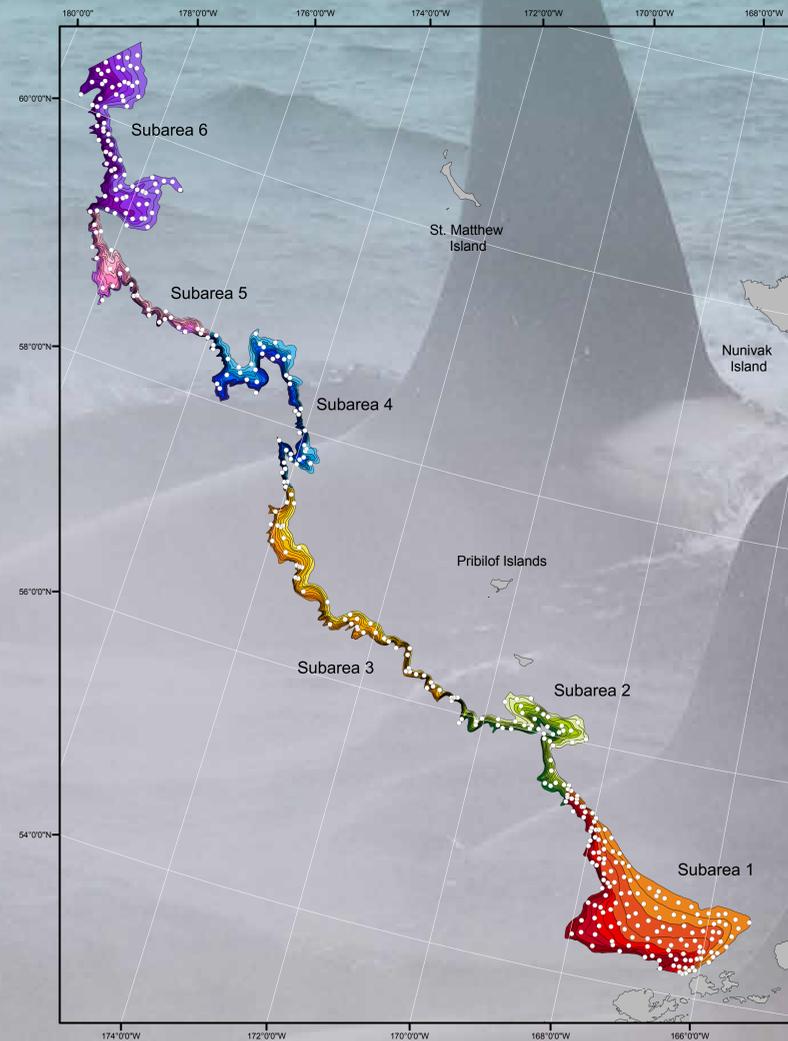
Catch composition consists of 10 dominant fish species that comprise nearly 88% of the estimated biomass. The dominant species (by biomass) is the Giant Grenadier (*Albatrossia pectoralis*) and the most abundant fish species is the Popeye Grenadier (*Coryphaenoides cinereus*).



Common Name	Biomass
Giant Grenadier	48.50%
Pacific Ocean Perch	16.28%
Arrowtooth Flounder	5.63%
Popeye Grenadier	4.13%
Shortspine Thornyhead	2.98%
Western Eelpout	2.80%
Kamchatka Flounder	2.56%
Greenland Turbot	1.78%
Flathead Sole	1.69%
Aleutian Skate	1.60%

## SURVEY DESIGN

The survey is of stratified random design with sampling effort reflecting the estimated area. The survey area is divided into six subareas which distinguish the four major canyons from the steeper inter-canyon areas. Each subarea is further divided into five 200 m depth strata between 200 and 1200 m. The survey is conducted during daylight hours from approximately June 1 to August 1 on a biennial even-year schedule. The total successful hauls completed during each survey year has varied between 111 and 231, however a recent level has been set at a goal of 200 each survey year.



Subarea	Depth (m)	Area (km <sup>2</sup> )	Hauls (n)	Density (km <sup>2</sup> /haul)
1	200-400	4012.41	21	191.07
	400-600	4062.77	36	112.85
	600-800	1741.66	13	133.97
	800-1000	1354.74	5	270.95
	1000-1200	1106.89	3	368.96
2	200-400	1157.64	7	165.38
	400-600	705.08	8	88.13
	600-800	591.27	5	118.25
	800-1000	552.73	2	276.37
	1000-1200	535.67	2	267.84
3	200-400	903.78	10	90.38
	400-600	886.11	4	221.53
	600-800	910.26	6	151.71
	800-1000	732.35	2	366.18
	1000-1200	675.52	2	337.76
4	200-400	1236.27	11	112.39
	400-600	730.35	4	182.59
	600-800	693.95	4	173.49
	800-1000	707.59	4	176.90
	1000-1200	662.42	2	331.21
5	200-400	423.71	3	141.24
	400-600	425.73	3	141.91
	600-800	431.83	2	215.91
	800-1000	551.99	2	276.00
	1000-1200	570.14	2	285.07
6	200-400	2595.79	12	216.32
	400-600	1705.76	12	142.15
	600-800	917.49	8	114.69
	800-1000	645.17	3	215.06
	1000-1200	496.42	2	248.21
Totals	200-1200	32723.49	200	mean 204.48

## SURVEY PRODUCTS

The survey encounters approximately 150 fish and 325 invertebrate species. Scientists collect biological data on approximately 80 species of fish and invertebrates, including lengths, age structures, stomachs, genetic samples, and reproductive status. The new time series survey has completed an additional 60 scientific projects requested from universities, federal and state government agencies, NGOs and private researchers.

## TAXONOMIC INSIGHTS

Fish taxonomists have identified at least 9 new species, 30 species that are new to the eastern Bering Sea, and 24 species that were previously of dubious standing as part of the EBS slope fauna.

Newly Described (9 species)	Range Extension into EBS (30 species)		Confirmed to EBS (24 species)	
<i>Bothrocara nyx</i>	<i>Acantholiparis opercularis</i>	<i>Halargyreus johnsonii</i>	<i>Anotopterus nikparini</i>	<i>Polyacanthonus challengeri</i>
<i>Careproctus</i> n. sp. 1	<i>Alepisaurus ferax</i>	<i>Lycodapus dermatinus</i>	<i>Benthalbella dentata</i>	<i>Poromitra curilensis</i>
Liparidae n. sp. 1	<i>Allocareproctus jordani</i>	<i>Lycodapus endemoscotus</i>	<i>Careproctus bowersianus</i>	<i>Psychrolutes phrictus</i>
Liparidae n. sp. 2	<i>Amblyraja badia</i>	<i>Lycodapus pachysoma</i>	<i>Careproctus ectenes</i>	<i>Raja rhina</i>
Liparidae n. sp. 3	<i>Avocettina infans</i>	<i>Lycodes parviceps</i>	<i>Careproctus melanurus</i>	<i>Rhinoliparis attenuatus</i>
Liparidae n. sp. 4	<i>Bajacalifornia megalops</i>	<i>Magnisudis atlantica</i>	<i>Coryphaenoides filifer</i>	<i>Scopelosaurus adleri</i>
Liparidae n. sp. 5	<i>Bathyraja abyssicola</i>	<i>Nannobranchium ritteri</i>	<i>Coryphaenoides longifiliis</i>	<i>Sebastes variegatus</i>
<i>Paraliparis penicillus</i>	<i>Bothrocara hollandi</i>	<i>Nansenia candida</i>	<i>Diaphus theta</i>	<i>Sebastolobus macrochir</i>
Rajidae n. sp. 1	<i>Bothrocara zestum</i>	<i>Natacanthus chemnitzii</i>	<i>Lampnactys jordani</i>	<i>Sigmops gracilis</i>
	<i>Bryozochthys marjorius</i>	<i>Paraliparis grandis</i>	<i>Merluccius productus</i>	<i>Squalus acanthias</i>
	<i>Careproctus comus</i>	<i>Paraliparis paucidens</i>	<i>Paraliparis dactylosus</i>	<i>Tactostoma macropus</i>
	<i>Careproctus gilberti</i>	<i>Rastrinus scutigera</i>	<i>Paraliparis ulochir</i>	<i>Zesticelus profundorum</i>
	<i>Careproctus zachirus</i>	<i>Rouleina attrita</i>		
	<i>Caristius macropus</i>	<i>Sebastes melanostictus</i>		
	<i>Gigantactis vanhoffeni</i>	<i>Sebastolobus altivelis</i>		

## STOCK ASSESSMENTS

The EBS slope survey provides data for stock assessments of more than a dozen species. As the time series grows additional species will be included as data users expand stock assessments for deepwater taxa.

### Stock Assessments

- Greenland Turbot
- Arrowtooth Flounder
- Kamchatka Flounder
- Pacific Ocean Perch
- Shortraker Rockfish
- Rougheye Rockfish
- Black-spotted Rockfish
- Giant Grenadier
- Popeye Grenadier
- Pacific Grenadier
- Giant Octopus
- Other Octopus Species

For more information on the eastern Bering Sea Upper Continental Slope Survey visit the Websites:  
**2010 Survey** <http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-224.pdf>  
**2008 Survey** <http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-197.pdf>  
**2004 Survey** <http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-156.pdf>  
**2002 Survey** <http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-141.pdf>

For more information on trawling protocols and net and survey design visit the website:  
**NOAA Trawl Protocols** <http://spo.nmfs.noaa.gov/tm65.pdf>