GENERATING DATA FOR FOOD HABITS MODELS

RESOURCE ECOLOGY AND ECOSYSTEM MODELING TROPHIC INTERACTIONS LABORATORY

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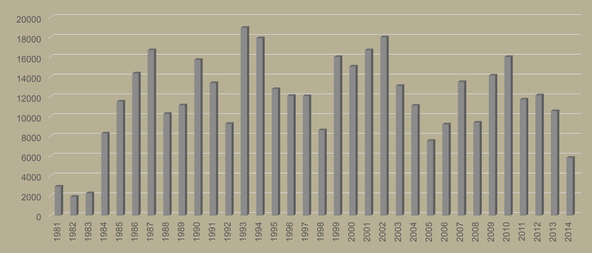
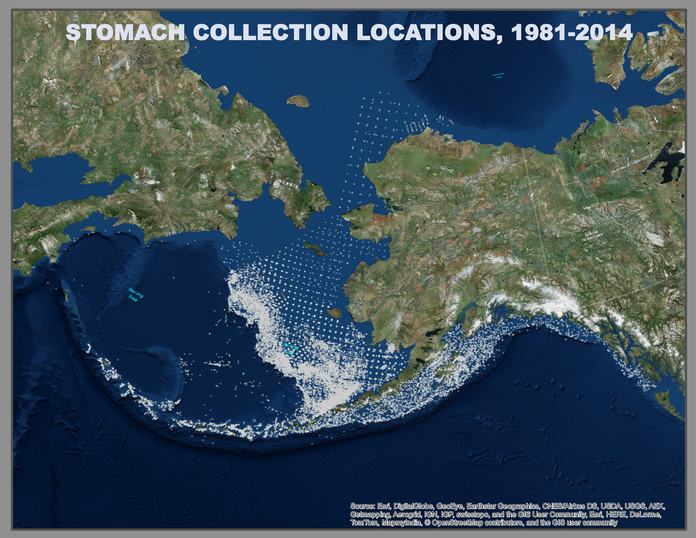
INTRODUCTION

The Resource Ecology and Ecosystem Modeling Task at the Alaska Fisheries Science Center focuses on the collection and analysis of data relating to trophic interactions in the North Pacific and incorporation of these data into environmental assessments and single-species and multispecies models. Quantifying food web linkages is essential to increase our understanding of how external forces such as fishing may cause unanticipated shifts in ecosystem composition. Groundfish predation interactions are also an important part of understanding resource availability to mammals and birds.

Number of stomachs analyzed by year



400,098 total stomachs analyzed



FIELD WORK

Groundfish stomachs are collected annually from the eastern Bering Sea and biennially from the Gulf of Alaska and the Aleutian Islands during summer bottom trawl surveys. In recent years, stomach samples have been collected from the Beaufort Sea and Chukchi Sea. Stomach samples are collected opportunistically in other seasons from fisheries operations and other surveys. Approximately 15,000 stomachs are collected and analyzed annually.

Stomach removal from Arrowtooth Flounder, *Atherstes stomias*

Stomach removal of Walleye Pollock, *Gadus chalcogrammus*

STOMACH COLLECTION

Stomach samples are collected at virtually no cost to the program by utilizing existing assessment cruises and fishery observers for collection. There are two methods of stomach collection and analysis that have contrasting costs and benefits. Experienced stomach analysts conduct Stomach Content ANalysis at-Sea (SCANS) on some stomach samples, primarily in the Aleutian Islands and Gulf of Alaska. However, the majority of the samples are collected and preserved at sea and returned to the laboratory for analysis. The resulting data is recorded in the AFSC groundfish food habits database which now contains over 1,000,000 records from about 400,000 stomachs collected since 1981, including historical collections off of the west coast.

Benefits of preservation and laboratory analysis

- Larger sample sizes per species
- More species can be sampled
- Minimal training required to collect samples
- Greater ability to detect small prey types and prey parts
- Greater precision in prey mass measurement
- Easier access to taxonomic references and expertise

Benefits of Stomach Content ANalysis at Sea (SCANS)

- Faster delivery of data to management
- Higher detection of coelenterate (jellyfish etc.) prey
- Tissue color/texture and prey color aid in identification
- Allows for possible genetic identification of prey
- Reduced purchase, transport, storage, and use of hazardous chemicals

Stomach contents of Pacific Cod, *Gadus macrocephalus*

STOMACH ANALYSIS

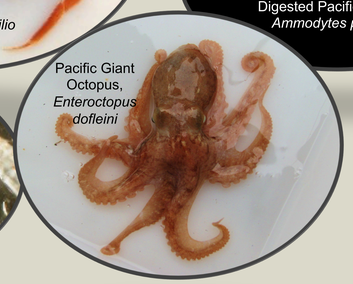
The prey found in stomachs are identified to the lowest practical taxonomic level. Due to digestion, prey are not always whole or easily identified. Experienced stomach analysts in the Trophic Interactions Laboratory use a variety of literary references, reference photographs, and reference specimens collected from stomachs, to aid in prey identification. Characteristics such as skeletal elements and gill raker counts and morphology are used to identify well digested fish prey. Region specific guides and keys have been developed by our lab to aid in the identification of various planktonic and benthic invertebrate prey types.

First gill arch of Redbanded Rockfish, *Sebastes babcocki*

Snow Crab, *Chionoecetes opilio*

Digested Pacific Sandlance, *Ammodytes personatus*

Calanoid Copepods



Pacific Giant Octopus, *Enteroctopus dofleini*

PREY TYPES IDENTIFIED FROM FISH STOMACHS

FISHES- ~ 250 Species

CRABS- ~45 Species

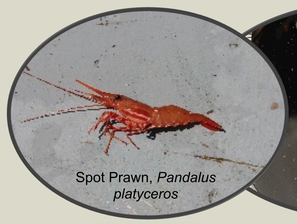
SHRIMPS- ~80 Species

CEPHALOPODS- ~25 Species

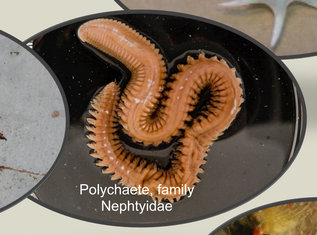
POLYCHAETE WORMS- ~40 Families

AMPHIPODS- ~40 Families

Vertebrae and preopercular spine of Darkfin Sculpin, *Malacocottus zonurus*



Spot Prawn, *Pandalus platyceros*



Polychaete, family Nephtyidae

Krill, *Thysanoessa* spp.

SUPPLEMENTARY FOOD HABITS WORK

In addition to the collection and identification of prey from fish stomachs, the Trophic Interactions Laboratory conducts other tasks that supplement food habits data.

STABLE ISOTOPES
Predator fish muscle and liver tissue samples are collected, prepared and shipped to an outside lab for stable isotope analysis.

PLANKTON AND BENTHIC GRAB SAMPLES
Species composition can be compared to prey composition of fish stomachs.

SEABIRD DIET DATA

Black-legged Kittiwake, *Rissa tridactyla*

Bill load and regurgitation samples collected by other groups are analyzed.