The purpose of this ongoing study is to investigate the trophic ecology of snow crab on the Beaufort and Chukchi shelves via stomach content and stable isotope analyses. Here we present preliminary results of these analyses for crabs occupying the Chukchi and Beaufort Sea shelves. Stomach varied in fullness, with West Beaufort crabs having near empty or empty stomachs. NE and SE Chukchi crab stomachs commonly contained significant amounts of detritus. Polychaetes, crustaceans, bivalves and other taxa were all present in stomachs. Regional differences were found in the δ13C and δ15N isotope values, between West and Central Beaufort crabs. Additional samples will further elucidate these preliminary trends.

Introduction

Trophic dynamics are critical to our understanding of ecosystem functioning and stability. Snow crab are a key species within epibenthic assemblages because they are locally dominant in both the Chukchi1 and Beaufort Seas2 and occur at large body sizes (>78 mm CW) in the Beaufort Sea. Snow crab prey in regions where this species is commercially harvested (i.e., the eastern Bering Sea and Canadian Atlantic) generally includes bivalves, brittle stars, crustaceans (including smaller conspecifics), and polychaete worms. The recent increased interest in Pacific Arctic snow crab as a potential future fisheries target3 warrants an in-depth assessment of snow crab trophic ecology on Alaskan shelves. Knowledge on snow crab diet and trophic position adds to our understanding of how crabs might be influenced by changes in energy flow with climatic perturbations and how that will differ regionally in the Alaskan Arctic (Fig. 1).

Objective

Use stomach content and stable isotope analyses of C. opilio from across the Alaskan Arctic to gain a better understanding of the diet and trophic positioning of snow crab. 

Methods

- Crabs with size range of 50-80 mm CW collected from bottom trawls - RUSALCA 2012(NOAA-funded) and Arctic Eis 2012 (BOEM-funded) cruises to the Chukchi Sea; BeauFish 2011 (CMI-funded) and US-Canadian Transboundary 2012 (BOEM-funded) cruises to the Beaufort Sea

Stomach Content Analysis

- Stomachs removed, weighed, and preserved in 10% buffered formalin (BeauFish, Transboundary) or frozen (RUSALCA, Arctic Eis)
- Stomach contents removed and rinsed with 50% isopropyl
- Empty stomach weighed to calculate content weight
- Contents inspected, photographed and images of taxa cataloged for identification
- Taxa per stomach determined for frequency of occurrence

Stable Isotope Analysis

- Crab muscle tissue removed from a leg, lipid extracted and dried
- Samples analyzed for δ13C, δ15N and C:N ratios at Alaska Stable Isotope Facility at UAF

Fig 1. Station locations on the Chukchi and Beaufort Sea shelves. Colors denote each of four regions: Central (green) and West (blue) Beaufort Sea and NE (orange) and SE (yellow) Chukchi Sea. Red circles denote the stations that stable isotope and stomach content data are presented for.

Fig 2 a-g. Stomach contents from snow crab in the Chukchi and Beaufort Seas.

Fig 3. Relative index of percent stomach fullness. Colors indicate fullness and pie size indicates frequency of occurrence of each fullness level.

Preliminary Results

- Wide variety of prey items in stomachs including hard and soft parts of bivalves, crustaceans, polychaetes, and other taxa (Fig. 2 a-g)
- Crab stomach fullness ranges from 0-90%, with more empty or near empty stomachs in the W Beaufort (Fig. 3).
- The frequency of occurrence for identified prey items differed across regions with detritus more common in Chukchi Sea regions (Fig. 4)
- Bivalve Yoldia hyperborea occurred more frequently in the W Beaufort
- Polychaetes had similar frequency of occurrence in the NE Chukchi and W Beaufort
- A majority of polychaete parts are suspected to be Cistidenidae hyperborea (Fig. 5)
- West and Central Beaufort crabs occupy slightly different isotopic space, which may reflect differences in trophic level or regional differences in end-member isotope ratios (Fig. 6).

Fig 4. Percent frequency of occurrence for selected stomach content items. Stomachs have not been analyzed for the C Beaufort at present.

Fig 5. a) Bivalve Ennucula tenius and polychaete Cistidenidae hyperborea with detritus and b) polychaete setae.

Fig 6. δ13C and δ15N isotope values for snow crab occupying the Alaskan Arctic.

You can stomach it!

Unidentified images from snow crab stomachs will be displayed in a photo gallery on the website listed below. If you want to assist with identification, please email Lauren Divine. Email is listed under the “Contacts” tab of the website.

http://www.sfos.uaf.edu/research/seaccebaita/CMI_crab/index.html

Literature Cited

2. Logerwell et al. (2011) Oceanographic characteristics of the habitat of benthic fish and invertebrates in the Beaufort Sea. Polar Biol 34:1783-1796