EVOSTC ANNUAL PROJECT REPORT

Project Number: 10100624

Project Title: Measuring Interannual Variability in the Herring's Forage Base from the Gulf of Alaska

PI Name: Alexander Bychkov and Sonia Batten

Time period covered: 1st Sept 2010 to Aug 31st 2011

Date of Report: Aug 24th

Report prepared by: Sonia Batten

Project website: http://www.pices.int/projects/tcprsotnp/default.aspx

Work Performed:

Sampling and sample analysis

Processing of all samples collected in 2010 has been completed and the data added to the database. New technicians were contracted in Anchorage to be responsible for servicing and unloading the CPR at the end of each north-south transect from 2011, following the retirement of our *Valdez* technicians. They attended a 2-week training course at SAHFOS in March 2011 and were ready for the arrival of the first transect in April. There have been no problems with the hand-over, and the servicing has progressed very well. The sampling schedule for 2011 is given below, and has been quite successful to date:

April transect	16–18 April: Initial samples analysed and data available
May transect	19–21 May: Initial samples analysed and data available
June transect	18–21 June: Final portion suffered mechanical failure; remaining samples undergoing processing.
July transect	21–23 July: Samples undergoing processing
August transect	19–22 August: Sampling underway at time of writing
September transect	Likely to be mid-late September

As Figure 1 shows, the transect remains remarkably consistent from month to month

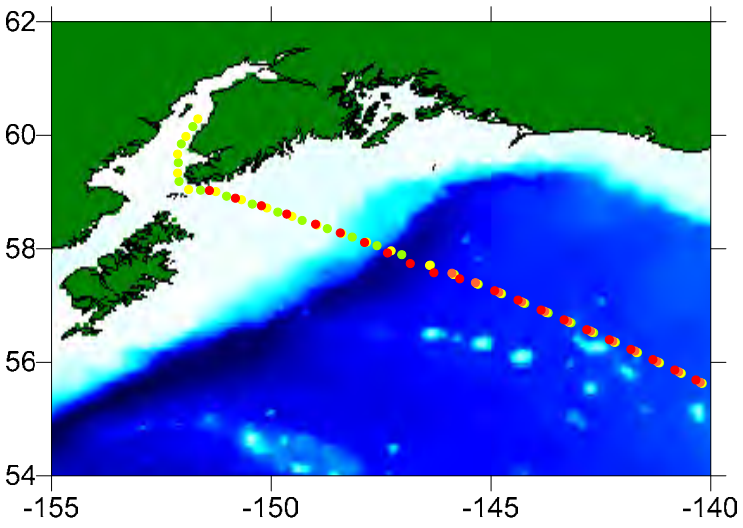

Figure 1 Location of the samples collected to date in 2011 (only 50% are shown, even so many samples overlap). Green = April, Yellow = May, Orange = June, Red = July.

Results

The most straightforward index to calculate from the plankton abundance data is estimated total mesozooplankton biomass. Figure 2 shows the time series of data from the shelf, excluding samples from Cook Inlet and Prince William Sound (PWS), in the upper panel. The lower panel demonstrates the mean seasonal cycle, together with the provisional 2011 spring data (a larger proportion of samples remain to be processed, plus quality control methods applied). At this stage in the analysis the values for spring 2011 seem low. 2010 had reasonably high biomass, but 2009 was also very low. There continue to be large interannual fluctuations in mesozooplankton biomass.

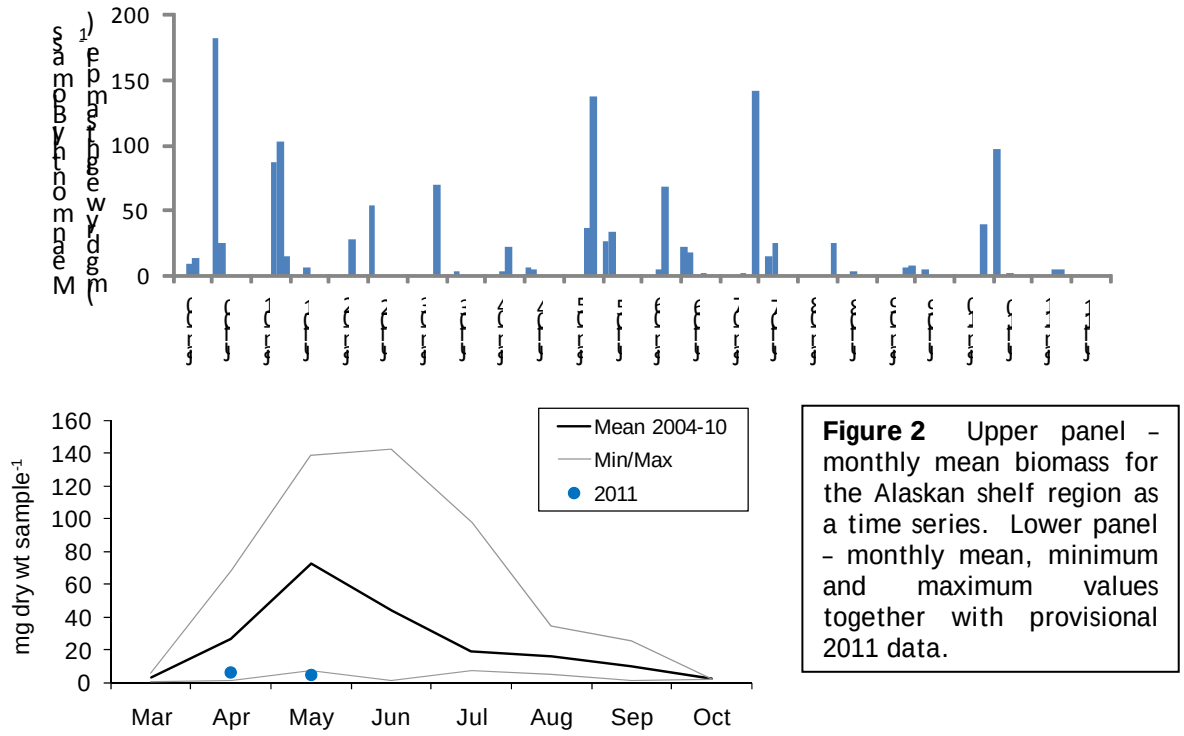

Figure 2 Upper panel – monthly mean biomass for the Alaskan shelf region as a time series. Lower panel – monthly mean, minimum and maximum values together with provisional 2011 data.

Although sampling is normally carried out every month, it is difficult to resolve the annual spring peak in zooplankton for a particular year, especially since the timing of the ship transects are outside of our control and when one or more spring samplings has experienced mechanical problems. However, by examining the relative proportions of the juvenile stages of a dominant spring copepod species, *Neocalanus plumchrus*, we can estimate the day of the year when 50% of the population reached the sub-adult stage, which is considered to be peak biomass (Mackas *et al*., 1998; Batten and Mackas, 2009). This index can be a proxy for the timing of the spring peak. Figure 3 shows these data for the Alaskan shelf.

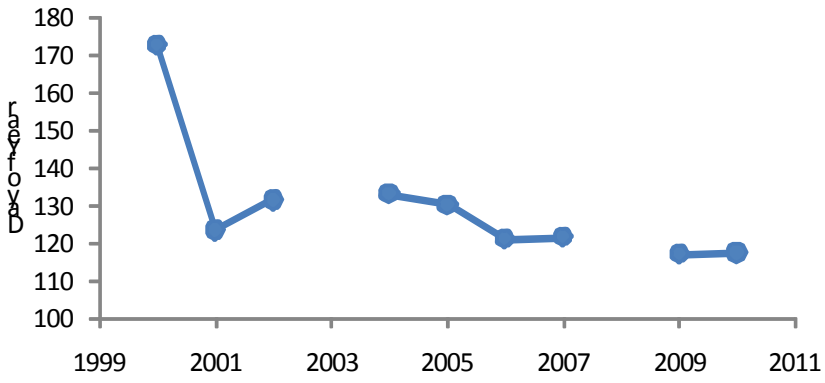

Figure 3 Day of year when peak biomass of *Neocalanus plumchrus* is estimated to have occurred.

In two years this date was not captured; sampling began too late in 2008 due to a lack of funding, and was insufficient in spring 2003. Recent years have seen an advance in this date, although only by a few days. An earlier peak has also been noted in other regions of the NE Pacific (Batten *et al*., 2009). If the trend towards an earlier peak continues, there are implications for upper trophic levels which feed on the zooplankton spring peak.

Future Work:
The final sampling for 2011 will take place in September, and sample processing will be ongoing for the rest of this year. The equipment will be returned to SAHFOS after the final tow for an annual overhaul and shipped out again in early 2012.

Coordination/Collaboration:
One objective of the original proposal was to investigate the linkages between zooplankton on the shelf, as measured by the CPR and zooplankton within PWS, as measured by other researchers. A comparison with the data collected by R. Campbell between 2010 and 2012 under EVOS project 10100132A will wait until later in both projects, however, preliminary comparisons of historical data have been undertaken this year. PWS has been sampled by ring nets in 2000 to 2008, although the stations occupied and months sampled varied each year. The mesh size used was larger than the mesh of the CPR (335 µm compared to 270µm for the CPR), and the nets were deployed from 50m to the surface, as compared to the ~7m depth sampled by the CPR. Furthermore, identification of the ring net data was to broad taxonomic groups only, while the CPR data contain many species level counts. Given these differences in sampling strategy, there are limits to the comparisons that can be made, however, data were generously made available by R. Campbell and R. Thorne for an initial examination. We began by looking at community composition. Both datasets were divided into offshore, shelf and then either PWS (ring nets) or Cook Inlet (CPR), and comparisons (see Figure 4) were made for spring (from 2000 to 2008) and fall (2007 and 2008 only for PWS).

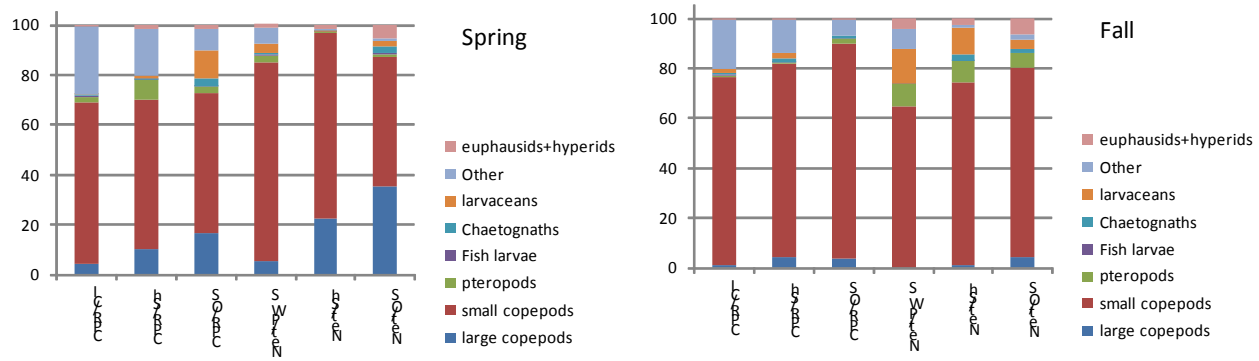

Figure 4 Mean contribution (% of abundance) of each taxonomic group to the zooplankton community in spring and fall, as sampled by ring nets and the CPR. Note that net samples in the offshore and shelf regions were only sampled in one month. CI=Cook Inlet, Sh=shelf, OS = offshore.

Despite different sampling methodologies, the communities described by each method are broadly similar. Copepods dominate, with small copepods numerically dominant (but less so in terms of biomass). Large copepods were more important in all regions in spring compared to fall, and both sampling systems showed them to be most important offshore and least important inshore in Cook Inlet and PWS, with the shelf intermediate. The nets captured relatively more euphausiids, likely because of their deeper depth of sampling. Pteropods were more common in CPR sampling in spring, while more common in nets in the fall, but this could be a bias caused by only one year of sampling contributing to the net fall data for shelf and offshore – the decade of CPR sampling shows them to have large interannual variability.

Given the similarities in community composition, the next stage of this analysis will be to compare interannual variability. Initial examination suggests that fluctuations in the abundance of copepods in

PWS lag behind the shelf communities. However, the years of overlap are small and the sampling frequency not always adequate to capture the seasonal cycle.

Community Involvement/TEK & Resource Management Applications:
The samples have been unloaded and the gear serviced each month by personnel in Anchorage. Samples were collected by the officers and crew of the M/V *Horizon Kodiak*.

Information Transfer:

A. Publications

Sonia D. Batten and Anthony W. Walne (2011). Variability in northwards extension of warm water copepods in the NE Pacific. *Journal of Plankton Research*; doi: 10.1093/plankt/fbr06

B. Conference/workshops

The annual Marine Science in Alaska Symposium was attended by S. Batten in January 2011. She presented a poster entitled "*A comparison of zooplankton time series from Prince William Sound and the Gulf of Alaska*" by Sonia Batten, Richard Thorne and Rob Campbell.

C. Data/Information products

CPR data were contributed to

(i) The Canadian Department of Fisheries and Oceans "State of the Ocean" meeting (February 2011) and report:
Batten, S. (2011). Mesozooplankton in the Gulf of Alaska in 2010. *In* State of physical, biological, and selected fishery resources of Pacific Canadian marine ecosystems in 2010, edited by W. R. Crawford and J.R. Irvine. *DFO Can. Sci. Advis. Sec. Res. Doc*. 2011/054.

(ii) NOAA's Ecosystem Considerations report (in August 2011) to be published this fall:
Batten, S.D. Continuous Plankton Recorder data from the Northeast Pacific (in press) http://access.afsc.noaa.gov/reem/ecoweb/Index.cfm

Budget:
No changes to actual or budgeted expenditures anticipated.

The Canadian Department of Fisheries and Oceans renewed its contribution to the North Pacific CPR Consortium in March 2011 for a further 3 years, so that the required matching funds to complete this project in 2012 are available.

Literature cited
Batten, S.D., and Mackas, D.L. (2009). Shortened duration of the annual Neocalanus plumchrus biomass peak in the Northeast Pacific. *Marine Ecology Progress Series*, 393: 189-198.

Mackas DL, Goldblatt R, Lewis AG (1998). Interdecadal variation in development timing of Neocalanus plumchrus populations at Ocean Station P in the subarctic North Pacific. *Can J Fish Aquat Sci.*, 55: 1878-1893.

Please submit reports electronically in ProjectView or by email to catherine.boerner@alaska.gov. Also, please be sure to post your annual report on your own website, if you have one.

We appreciate your prompt submission of your annual report and thank you for your participation.