Obegi, Doug

From: Polansky, Leo <leo_polansky@fws.gov>
Sent: Friday, September 29, 2017 10:39 AM
To: Obegi, Doug
Subject: Re: some recent life cycle model results to poke at and support for a fall X2 action

Hi Doug,
See responses below inline in **blue bold** text.
Leo

On Fri, Sep 29, 2017 at 9:44 AM, Obegi, Doug <dobegi@nrdc.org> wrote:

> Hi Leo,
>
> Thanks for sharing this information and these graphics. Am I understanding correctly that:
>
> - The recruitment modeling evaluates survival from the SKT to the 20 mm survey;

Yes. The ratio is 20mm from June survey compared with a Jan-Mar composite measure based on Spring Midwater Trawl survey for years 90-01, and SKT for years 02-15. So recruit ratio is post-larval abundance in June: adult abundance in the prior winter.

> -
> - It evaluates the effect of a single covariate on that survival ratio;

The model evaluates the effect of a single covaraite on recruitment (defined above) or one of 3 survival rates Post-larval survival (20mm:TNS), juvenile survival (FMWT:TNS), and subadult survival (SpMWT/SKT : FWMT of prior calendar year).

> -
> - It finds that the following covariates have a statistically significant effects on survival: spring (March-May) outflow, spring X2, spring inflow, spring E/I ratio, spring temperature, prior Fall X2. Higher spring outflow, lower spring X2, lower spring E/I ratio, and lower prior Fall X2 all result in higher recruitment. Other covariates, like striped bass spring abundance, did not have a statistically significant effect on survival.

Yes.

> -
>
> I also wasn't sure how to interpret the "Recruitment parameter posterior plots and evidences" – is this showing the likelihood of an effect from the covariate, the magnitude of the effect, or something else?

The model is fit using Bayesian methods. Once a model is fit, for each parameter in the model one has a sample of values that describe the distribution of values that this parameter might take (the marginal posterior distribution given the data). The "bell shaped" looking lines show this distribution, but I could have used a histogram. To assess

how a covariate is expected to influence a vital rate, one can take the mean value of this distribution and look at how the vital rate responds to changes in the covariate when the parameter is at that mean value (these are the solid lines in the vital rate vs. covaraite plots). This would be akin to using the point estimate of a parameter fit using least squares or maximum likelihood techniques. Similarly, fixing the parameter at the 2.5 and 97.5 percentiles from this distribution and looking at how the vital rate changes with changes in the covaraite gives a measure of uncertainty (dashed lines in the vital rate vs. covaraite plots).

> And as for the juvenile and subadult survival rates, are you seeing a basically linear relationship between those abundance indices?

Yes. Put another way, no effect. I suspect this is because the data underpinning the either one or both of the observations in the ratios are very noisy and biased, so it makes it hard to identify effects in dynamic time series models such as what we're using. (Not that STN and FMWT do not provide valuable information in an average sense, but that is a pretty different topic.)

> Thanks,
>
> Doug

From: Polansky, Leo [mailto:leo_polansky@fws.gov]
Sent: Friday, September 29, 2017 9:18 AM
To: Obegi, Doug <dobegi@nrdc.org>
Subject: Fwd: some recent life cycle model results to poke at and support for a fall X2 action

Hi Doug,

As you expressed interest in the delta smelt life cycle model I'm working on, I thought I'd forward you this incremental result that I shared with upper management last month. One finding, or lack of, that remains consistent over model iterations since last winter is that there is no evidence for or against the hypothesis that average X2 in the fall influences fall survival. However, it seems there is some support that lower average (using daily values from Sep and Oct) X2 leads to higher recruitment in the subsequent generation.

Leo

---------- Forwarded message ----------
From: **Polansky, Leo** <leo_polansky@fws.gov>
Date: Fri, Aug 18, 2017 at 10:21 AM
Subject: some recent life cycle model results to poke at and support for a fall X2 action

To: Ken Newman <ken_newman@fws.gov>, Lara Mitchell <lara_mitchell@fws.gov>, William Smith <william_e_smith@fws.gov>, Matt Nobriga <matt_nobriga@fws.gov>

Here are the beginnings of results from applying the suggestion Ken got to look at "one covariate at a time", per vital rate, rather than having each vital rate depend on one or more covariates, while also allowing for a good/bad year effect. As in other iterations, most/all of the 'significant' results are related to recruitment; I think the other vital rate observations are often too noisy to detect signals (perhaps another case for EDSM?)

Notable covariates according to evidence (a sort of P-value shown in parentheses). To do includes model selection, including more complicated covariate dependencies in each vital rate, etc.

Recruitment

Observations: Abundance in June from 20mm compared with FebMar SKT/SpMWT abundance

mean X2 in current March-May, negative (0.04)

Inflow in current March-May, positive (0.05)

E/I ratio in current March-May, negative (0.05)

Mean Temp in current March-May, negative (0.02)

mean X2 in ***previous*** fall months of Sep-Oct (the fall X2 action), negative (0.08)

Post-larval survival

Observations: JulyAug TNS abundance compared with 20mm June abundance

mean Secchi in June-Aug, *negative* (0.02), counterintuitive

Juvenile survival

Observations: FMWT Oct-Nov abundance compared to TNS July-Aug abundance

Nothing 'significant' found.

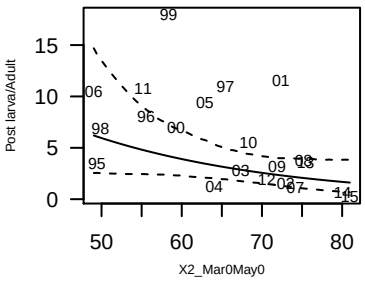
Subadult survival

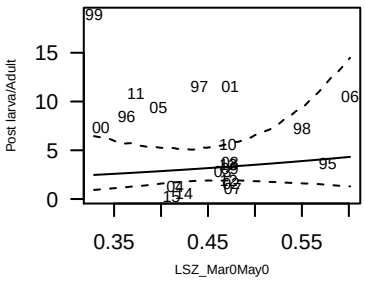
Observations: FebMar SpMWT/SKT age 1 compared with FMWT OctNov age 0

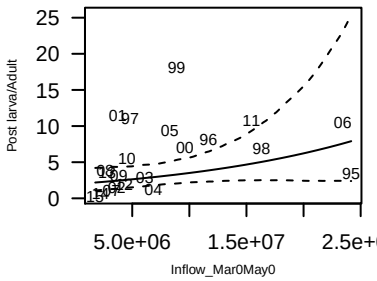
Nothing 'significant' found.

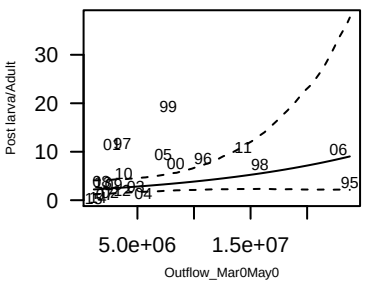
Post−larval recruitment
observed/predicted vs. covariate

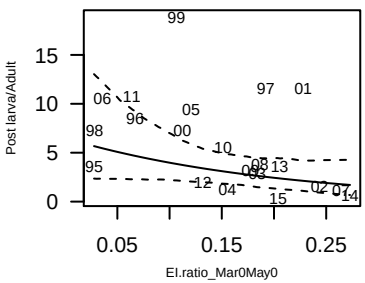
NRDC-37

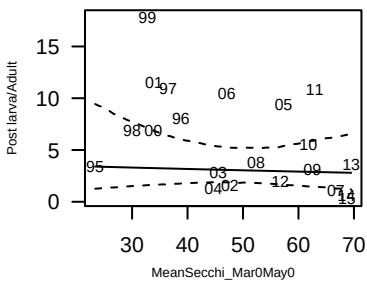


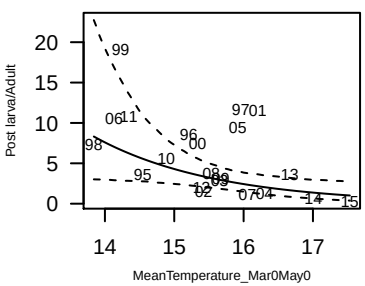


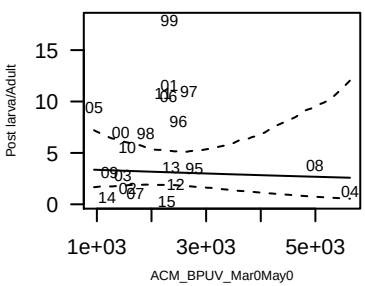


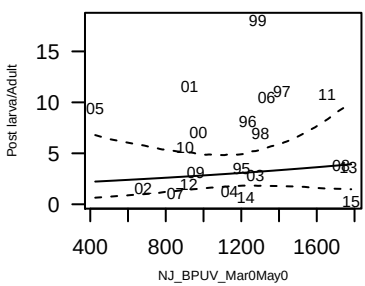


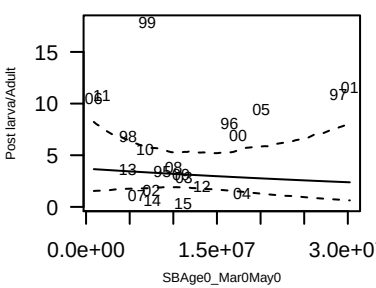


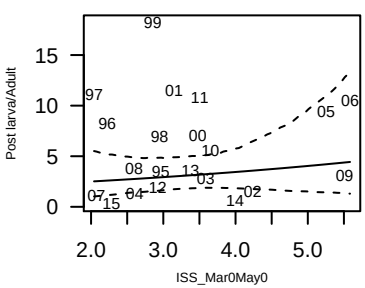


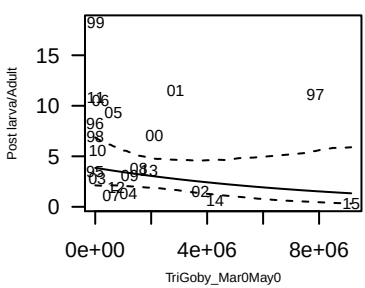


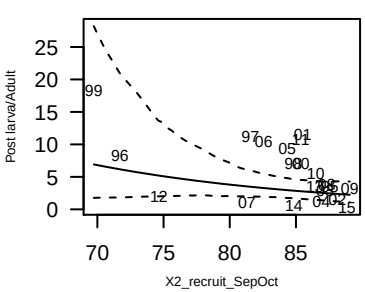


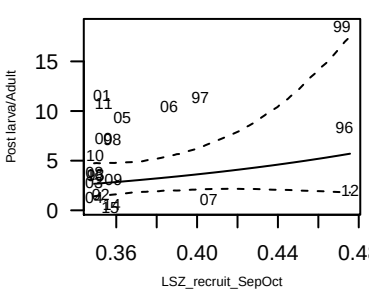


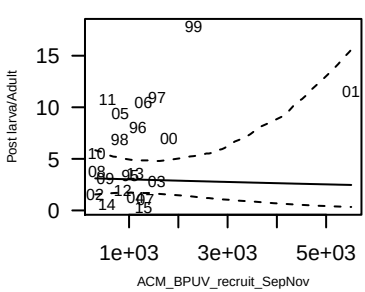












Recruitment paramter posterior plots and evidences