From: Eric Danner - NOAA Federal <eric.danner@noaa.gov>
Sent: Thursday, April 27, 2017 12:41 PM
To: Garwin Yip; Brycen Swart - NOAA Federal
Subject: Fwd: Upper Sacramento River temperature & biological models meeting, April 25

FYI
---------- Forwarded message ----------
From: **Benjamin Martin - NOAA Federal** <benjamin.martin@noaa.gov>
Date: Thu, Apr 27, 2017 at 11:45 AM
Subject: Re: Upper Sacramento River temperature & biological models meeting, April 25
To: Sheila Greene <sgreene@westlandswater.org>
Cc: Eric Danner - NOAA Federal <eric.danner@noaa.gov>, Miles Daniels <miles.daniels@noaa.gov>, Hanson Chuck <chanson@hansonenv.com>, Azhderian Ara <ara.azhderian@sldmwa.org>

Hi Sheila,

We fit our model to egg-to-fry survival data from 1996-2015. That model includes a background survival parameter and 2 thermal tolerance parameters. We fit our model with the assumption that temp-dependent mortality only occurs in the embryonic stage. So for our independent variable we used the time series of RAFT predicted temperatures experienced by all known redd within a year. We then fit this model to the egg-to-fry survival data, which means we used on nonlinear optimization routine (specifically a Nelder-Mead simplex) that finds the parameters that minimize error between the model predictions and data. So if we fit a model with no temperature-dependent mortality, our estimate of background survival would be equal to the average egg-to-fry survival observed in our data set fro 1996-2015. However, we do include temperature mortality in our model, which explained a lot of the interannual variation in egg-to-fry survival, so our model ends up predicting that background survival (survival in the absence of temp-dependent mortality) is higher than the average observed egg-to-fry survival.

To illustrate, consider an example where epidemiologist monitors a million 50 year-olds for 10 years and finds that the average 10 year survival probability is 85%. But then the epidemiologist looks at his data more carefully and notices that 20% of the 50 year olds were smokers, and that the smokers survival probability was only 60%. So the background survival probability in the absence of smoking (~90%) is higher than the population average, because we have accounted for a factor which explain the low survival of a certain portion of the population. In this case it was smoking. In our model that factor was temperature. It is the parameter that includes all sources of unknown factors that affect survival.

Best regards,
Ben

Benjamin Martin
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Research Website
Google scholar profile

On Thu, Apr 27, 2017 at 10:55 AM, Sheila Greene <sgreene@westlandswater.org> wrote:

Hi all,

I thought I should send you the graph and data that I showed to you on Tuesday afternoon. It is the "residual" survival to Red Bluff after removing temperature and DO related mortality. I simply divided the egg to fry survival to Red Bluff estimates by the NMFS mortality model survival estimates. The NMFS egg survival in on the X axis the residual survival is on the y axis. The trend doesn't make sense to me. I would expect the 2014 residual survival to be lower as the temperature in the field were quite high in October, up to 65 at Clear Creek.

I have another request. I have read the 2016 report and 2017 paper and don't understand how you developed the background survival. Could you please send me a more detailed description please?

Thank you. The meeting was very informative and look forward to them in the future.

Sheila Greene

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