Teresa’s defense

Ch 1

Use AIC to keep or remove variables without strict threshold of p-value. If I had done this, there maybe would have been a significant effect of Temp x CO2 on RMR because the significant effect of CO2 on Q10 suggests an interaction, i.e. changing CO2 makes MO2 more or less temperature-sensitive.

Ch 2

Mike: How does CO2/hypoxia might select certain traits out and affect the response of the species over time? What would you need to measure to know if there is some selection pressure? Think about the conditions necessary for natural selection.

i.e. test whether the traits are heritable

Amy: Was survivorship used to fit the DEB model? You state that at higher temperatures they grow faster but are smaller

Figure 2.3-example of one individual fish. Breakpoint analysis ok?

Make it clearer in the caption that each of these panels is for one individual fish.

Bayesian breakpoint analysis?

Have another developmental quality on the x-axis (instead of oxygen or time? Which figure??)

Silversides can see a difference in 2C daily. Is there enough of a difference in T between those two experiments. Need to emphasize the difference in carbonate chemistry in those 2 experiments.

Is the temperature of 28C really stressful? Yes, when spawning because they are done spawning by June.

Once you scale for weight, the effect is much less severe.

Is the variation in metabolism per individual so much greater than the variation between treatments? In terms of future work is it possible to reduce individual variability if you could scale things by weight?

* Weight increases much more quickly than length.
* Teresa used mass-specific for larvae but not embryos? If you used weight that would not be feasible for embryos because if you weighted them the yolk would mess up those weight measurements
  + Because yolk does not respire, so we would have to remove the yolk to get the true respiring mass

Developmental rates and discus in importance of results.

* If you have two fish of the same size, but different developmental stage what is the result? At hatch at low temperatures they have yolk still so are not as fully developed. Can you put this somehow in your model? Can you make categorical variables into continuous variables?

No effect of CO2, temperature is the main effect, but then you calculate Q10 (Figure 1.2). You could redo the model (Fig 1.1) and use AIC. Maybe you can apply general Q10 to Ch 2 to correct, but Fig 1.2 led Amy to believe that you couldn’t because there is a temperature effect. Can you temperature correct in Ch 2? Pretend Exp 2 was done at 24C by multiplying by Q10 esp because you are near the optimal temperature, not at 17 or 28c temperature extremes?

Ch. 3

Did we have preferred survivorship of fish with higher ionocyte density

Double check the 95% confidence interval in Fig 3.5. Should you try to statistically account for that? You have 10 degrees of T. 28 is physiologically different from all the other temperatures. And this comes back to your other conclusions. Enzymes may have a different Q10 than metabolism, but we assume that it is similar to metabolic rate/Q10. Capacity of enzymes may change completely at 28C. See this in Fig 3.4, is it even appropriate to put confidence intervals. Can you bin metabolic rate by ionocyte density by 100-200 bins? Or correct by Q10? Or look at them separately by Temperature? Then this is seen in Fig 3.4

Should have dif SE bars for dif temps (did I mean to write linear regressions?)

Bin the ionocyte densities by, e.g., 100/mm2 and calculate average RMR for each temp.

Look at separately by temperature similar to figures from Ch. 1.

Temp correction or binning might increase the R2 in 3.5B.

Could some of the results from Fig 3 and gene expression could feed into ~~Fig~~ Ch 4. The main thing you achieved in Ch 4 was fairly basic model selection to look at different energy flows to know what ones are broadly more important for the results you saw.

* Teresa has been thinking about ionocytes and maintenance and the previous work Roger has done with killifish, but may not be the same kind of methods. Broadly, info from gene expression could constrain the methods on the DEB modeling. What are the wider implications for Ch3 and gene expression?
  + Can you get at what Amy was saying about the significance of 28C and gene expression?
  + How to take the suborganismal process and convert it into a part of the energy budget?

Is there something in the work you did on pCO2 that can resolve the ambiguity in its effect on embryos and larvae? You didn’t model Co2 in DEBkiss, but could you now or in the future?

Could do a cluster analysis for RMR x Ionocyte Density. The 28C treatment stands out for both RMR and Ionocytes, rather than a general temperature effect.

Enzymes increase with temperature up to a critical temperature above which then decrease, maybe 28C is around or above that critical temperature.

Either they are not producing ionocytes or the capacity of ionocytes to function changes.

Ch 4

Explain better the correction factors. Z changed the other 3 parameters, is that appropriate for AIC?

Talk about correction factor and Pcrit value reasoning. Say we tried estimating D (x-intercept) for correction factor and it was near Pcrit so we used Pcrit.

What about breaking points (reversals)

Model realism vs. complexity/simplicity? Mortality is not well-connected to process, but were changed to better match the data. Mortality could be caused by difficulty in removing toxic metabolic materials from anaerobic processes. Since maintenance didn’t effect length and egg buffer … didn’t catch the rest of your answer. Survivorship was the response that didn’t really fit that well.

How does scope for growth affect their latitudinal range? How does hypoxia affect distribution around Long Island?

Do they have site fidelity or natal homing? Would their range be affected?

You have experiments from 17-28 C and you would have different sex ratios at different temperatures so how would different sex ratios affect the outcome of metabolic rate? Make sure that in paper you day that sex ratio isn’t determined by 8-21mm. Make sure to state in the DEB model. In some cases the population adapted to temperature at which they were kept after several generations, so the sex ratio evened out.

Table 4.3 – when you synthesized these datasets what did you do to adjust for temperature? Teresa used experiments from same temperature, maybe only a difference in 2-4 degrees between temperature.

What is the biggest thing you need for DEB – differences between experiments? Do you have CO2 and hypoxia from the Cross experiments? If you have concerns with temperature and evelopmental stage, then maybe you can use the Cross paper that has CO2 and Do treatments concurrently in same experiment. What would be the implication be if there is an interaction – CO2 didn’t effect except in the low DO and low pH in the Cross experiment. So maybe the ionocytes aren’t being formed as quickly. You have equal amount of reserve but can’t use it effectively in hypoxia (and maybe high CO2) –inability to meet

Amy says - Not assimilation – but defended well - it’s an egg

For dissertation: Redo Ch3 analysis for publication, Ch 4 needs a second round before publication.