## Teaching Notes

### By *Angela Dassow and Sheryl Konrad*

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**Course Information**

Department: **Biology**

Level: **Lower**/Upper Undergraduate (select one)

Course type: Lab/Lecture/**Both** (other, please describe) (select one)

Students: **Majors**/Non-majors (select one)

Number of Students: **~20-30**

**Module Information**

Original Module Name: **The Polar Bear of the Salt Marsh**

Link to Original: <https://qubeshub.org/qubesresources/publications/924/1>

[Adapted Module Name: (if applicable)

Link to Adapted Module]: <https://qubeshub.org/qubesresources/publications/1200/1>

Modified Module Name:

Files associated: (ie. Class Worksheet, Summative Quiz, Lecture Powerpoint, etc)

* **Deutsch 2008 climate warming (Peer-reviewed paper on thermal safety margins and warming tolerances)**
* **Deutsch 2008 data set INSTRUCTOR (raw data from peer-reviewed paper and a tab of summarized data per insect order)**
* **Deutsch 2008 data set STUDENT (raw data from peer-reviewed paper)**
* **Deutsch focus questions (handout for students to complete prior to start of case study)**
* **Deutsh focus questions KEY (Answer key for instructors)**
* **Assessing species extinction risks HANDOUT (Assignment for day 2)**
* **Saltmarsh Sparrow Day 1 (modified PowerPoint)**
* **Saltmarsh Sparrow Day 2 (modified PowerPoint)**

**Modification Learning Goals:**

* Extend concepts of causes of saltmarsh sparrow declines to local endangered species.
* Calculate thermal safety margins and warming tolerances of local species.
* Debate which species are best candidates for conservation funds.

**Teaching Notes**

*(Think about what you would like to read about this activity if you came back to it in 2 years)*

Suggestions for this section (not all required, and extras always welcome):

**Activity Summary:**

Overall, I was pleased with how this case study extension was implemented. I had a greater level of student participation than I had on non-case study related material throughout the semester. The formative assessment results from the exam also indicated that the retention of this material was higher than the non-case study material that we had implemented.

After carrying out this case study in class, it was clear that I should have provided descriptions of what *latitudinal regions* are and where they are found. I had two focus questions related to this concept and the responses to those questions reflected a misunderstanding of the concepts. I have changed these questions and the updated versions can be found in the case study extension material (Deutsch focus questions).

Our college is located in Kenosha, WI so I chose the wood frog (*Lithobates sylvatica*) as my example of a local species. If this case study extension is used at an institution that is outside of the wood frog range, I would recommend changing this example species to something relevant in your area. Utqiagvik, Alaska was chosen as our northern range site; however any other city/area in Alaska or Canada would have also worked for this exercise. In picking localities, what is most important is that it is a region where the species lives and there is an annual temperature difference between the localities.

**Prep Time:**

The prep time for the instructor is less than 1 hour and consists of reading the Deutsch paper, posting reading material and assignments, and setting up a group spreadsheet to collect species information.

The prep time for the students varies between 3-6 hours and will depend on how comfortable each individual is with reading peer-reviewed literature and searching the internet for critical temperatures. One of the assignments requires the students to find a species of their choice. The limitations are that the species must live in North America (in part or in whole), part of that range must extend through Kenosha (to ensure relevant examples in our backyards are used – switch Kenosha with your institution’s locality) and that the species selected has had some prior research done on their thermal limits (critical maximum temperature, optimal thermal temperature). For some students, googling this information was easy. For others, it was a challenge. Moving forward, I would put an earlier deadline in place so I could verify that they found accurate information. I would also require that they include the peer-reviewed source of their information.

By this point of the semester, we had already used Excel for another assignment, but if this will be the first time your students use Excel in the term, I would recommend making an announcement that a specific version of Excel is downloaded.

**Additional Comments:**

This case study was delivered after our chapters on evolution and speciation so it fit very well with the learning goals of our other material. Part of our broader goals for our introductory biology course are to increase the quantitative reasoning and critical thinking skills of our students. By creating a class debate on impacts of warming on local species, each student was able to get a voice on the matter.