Winter Ecology
BIOC60H

Course Syllabus

Course description

The goal of this course is to understand what means organisms have evolved to survive our Canadian winters. In particular, you will learn about the three main ways to face the cold season: 1. winter evasion in the form of migration to warmer areas; 2. cold avoidance, thus shorter or longer periods of hibernation or torpor, and finally 3. cold resistance, a state of activity even during the coldest winter days and nights. This course takes a very integrative approach to the topic, putting focus on both plants and animals, and approaching winter survival from an ecological, evolutionary, as well as physiological perspective.

We will learn how selected species prepare for their, in part, very long migrations to their overwintering grounds and see what winter evasion costs. You will learn about the physical property of frozen water, because this is integral for understanding coping mechanisms of species, which spend the winter in Ontario. All of Ontario's plants hibernate in one way or another and we will put special emphasis on understanding the adaptations in plants, which have organs exposed above the snow. The main emphasis of the course will be to investigate the survival of animals overwintering in Ontario. Many organisms go into a prolonged state of hibernation, such as invertebrates, amphibians or reptiles (poikilotherms). Homeotherms face the especially hard task of needing a lot of energy to remain warm. You will learn how heat is produced and in what various ways animals use to stockpile reserves for their winter energy budgets. Among homeotherms, some animals are able to decrease their energetic needs by entering hibernation or torpor, whereas others have to remain active all the time. Life under the seal of our frozen winter lakes is hard to observe or imagine, but organism face very particular sets of limitations and have evolved ingenious adaptations to meet them. Many winter survival adaptations are present in people, which have been living in cold areas since a long time. We will look at how Inuit, African Koisan and Australian Aborigines survive annually occurring or nightly cold periods. The last topic of the course is to look at what is already happening, but what will become even more pronounced in the future: global warming. Things will not just become cushier due to warmer and shorter winters. Instead, a lot of plants and animals adapted to winter are expected to suffer large fitness decreases and possibly extinction.

Students will learn about winter adaptations during lectures, while taking the practice quizzes and while working on the assignments. Each of the 24 lectures is associated with one practice quiz each (two weekly quizzes). Parallel to what will be discussed in class, students will produce a podcast, in groups of two, as well as prepare two multiple choice questions about the podcast.

Learning outcomes

1. Understand the limiting effects of cold winter conditions across different ecosystems.
2. Understand the benefits and costs of migration.
3. Understand how plants, poikilothermic and homeothermic animals including humans survive the winter.
4. Appreciate that all organisms are products of natural selection and that interpretation of morphology can only make sense in light of evolution.
5. Relate the structure of particular types of cells, tissues, and organs to their functions in particular environments.

Instructor

Ivana Stehlik

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Feel free to contact me any question you might have

TA
Bill Weihan Liu
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Bill is your go-to person for questions related to the podcast assignment

Marks breakdown

Podcast	17%
Points involved in the step-by-step creation of the podcast assignment*	3%
Taking of student-generated MC Q about podcasts (4*0.5%)	2%
24 quizzes about 24 lectures (0.5% each)	12%
Midterm (lectures 1-12)	33%
Cumulative final exam	33%

*Submission of draft on intro/research 0.5% (P/F), 1% work on partner's draft, submission of optimized draft on intro/research 0.5%, 1% for writing 2 Q&A on podcast

Teaching mode and course time
BIOC60 uses what is called a modified version of a flipped classroom approach with three integral components to the course delivery: (1) prerecorded lectures, (2) two weekly quizzes, and (3) interactive and live Q and A sessions about hard quiz questions.

(1) Lectures will be prerecorded (PPT plus audio) and students are encouraged to listen to them at their own pace. Should any explanations in these lectures be unclear, I encourage you to write me an email or drop by during virtual office hours.
(2) Each lecture is associated with its own quiz, with at least one question targeting each slide. All quizzes, if solved correctly, are worth a maximum of 12%. To get credit for taking quizzes, students need to do the quizzes within 7 days of the associated lectures (incentive to keep up with the lecture material!), and there is just one attempt per question per quiz. Afterwards, the quizzes will open up again to practice for exams with unlimited attempts and students will be able to see the correct answers.
(3) For each quiz, I will compile a file of the hardest questions (those solved by 75% or fewer students correctly) and in a BB Collaborate approach, I will host a Q and A for quizzes, in which I will explain why which answer is right or wrong. I encourage you to actively participate to make sure you understand any issues.

Course lecture time and place (asynchronous): Mon, 3 – 5 pm
Interactive Q and A on weekly quizzes (synchronous; BB Collaborate): Wed, 2-3 pm

Course schedule/Important dates (excluding podcast dates)

Week, day, date	Lectures	Activity
1, Mon, 1/11	1/2	Migration
2, Mon 1/18	3/4	Physical properties of snow
2, Wed 1/20	Synchronous, 3 pm: Q and A on quizzes 1, 2	
3, Mon, 1/25	5/6	Winter survival of plants
3, Mon, 1/25	Synchronous, 3 pm: Information on podcast assignment	
3, Wed, 1/27	Synchronous, 3 pm: Q and A on quizzes 3, 4	
4, Mon, 2/1	7/8	7: winter survival of plants; 8: Winter survival of poikilotherms
4, Wed, 2/3	Synchronous, 3 pm: Q and A on quizzes 5, 6	
5, Mon, 2/8	9/10	Winter survival of poikilotherms
5, Wed, 2/10	Synchronous, 3 pm: Q and A on quizzes 7, 8	
Reading week		
6, Mon, 2/22	11/12	11: Heat 101; 12: Animal energy budget
6, Wed, 2/24	Synchronous, 3 pm: Q and A on quizzes 9, 10	
7, Mon, 3/1	13/14	13: Animal energy budget ; 14: hibernating homeotherms
7, Wed, 3/3	Synchronous, 3 pm: Q and A on quizzes 11, 12	
8, Mon, 3/8	15/16	Resisting homeotherms
8, Mon, 3/8, 3-5 pm	**Midterm exam, lectures 1-12**	
8, Wed, 3/10	Synchronous, 3 pm: Q and A on quizzes 13, 14	
9, Mon, 3/15	17/18	17: resisting homeotherms; 18: Life under the ice
9, Wed, 3/17	Synchronous, 3 pm: Q and A on quizzes 15, 16	
10, Mon, 3/22	19/20	19: Life under the ice; 20: Plant animal interactions
10, Wed, 3/24	Synchronous, 3 pm: Q and A on quizzes 17, 18	
11, Mon, 3/29	21/22	Humans and winter
11, Wed 3/31	Synchronous, 3 pm: Q and A on quizzes 19, 20	
12, Mon, 4/5	23/24	Winter ecology and global warming
12, Wed, 4/7	Synchronous, 3 pm: Q and A on quizzes 21, 22	
Mon, 4/12	Synchronous, 3 pm: Q and A on quizzes 23, 24	
Apr TBA (exam period)	**Final exam (cumulative; lectures 1-24)**	

Penalty for late submission

There will be a penalty of 5% per day for assignments received late. Weekend days count as individual days. Unless there are extenuating circumstances (e.g. medical reasons with an official University of Toronto medical certificate), a mark of zero will be applied to assignments submitted one week late or more. Heavy workloads or malfunctioning computer equipment are not legitimate reasons for late submission. If you know ahead of time that you have a legitimate reason why you cannot hand in an assignment, let the course instructor know two weeks before the due date.

Missed exams

Students who miss an exam or a deadline of an assignment for reasons entirely beyond their control must notify the instructor within 3 days that you missed the exam or deadline of the assignment. In case you do not do this, you will receive a 0 on the exam or assignment. Then submit your doctor's note or other documentation to Jennifer Campbell in SW421D. You may submit the doctor's note or other documentation for the reason AFTER you notify the instructor, ie you need to first and foremost notify the instructor for missing the exam or assignment. A make-up will be scheduled within 10 days of the original date, unless you provide a second form indicating that your problem has persisted. The appropriate documentation is the official University of Toronto medical certificate (www.utoronto.ca/health/form/ medcert.pdf).

Academic integrity policy

According to Section B of the University of Toronto's *Code of Behaviour on Academic Matters*, it is an offence for students to:

• use someone else's ideas or words in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.

• include false, misleading or concocted citations in their work.

• obtain unauthorized assistance on any assignment.

• provide unauthorized assistance to another student. This includes showing another student completed work.

• submit their own work for credit in more than one course without the permission of the instructor

• falsify or alter any documentation required by the University. This includes, but is not limited to, doctor's notes.

• use or possess an unauthorized aid in any test or exam.

Violation of the Code of Behaviour on Academic Matters will force the instructor to provide a written report of the matter to the Chair/DeanProvost's and a penalty according to the U of T's guidelines on sanctions will be put into place.

Communication policy

Students are required to regularly and often check their university email to receive announcements relating to the course. To inquire about course-related issues, students are

strongly encouraged to solely use their university email, as hotmail or other email providers are spam-filtered on a regular basis. It is the responsibility of the student to make sure his or her email reaches the instructor.

The instructor will not answer any questions related to material discussed in class or during the labs by email (unless it is a clear yes-no answer), but the student is encouraged to ask these questions during official office hours or to schedule a meeting outside office hours by email.

Accessibility

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach the course instructor and/or the AccessAbility Services Office as soon as possible. Enquiries are confidential. The UTSC AccessAbility Services staff (located in S302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or ability@utsc.utoronto.ca.

Readings

There is no required reading and no course book, because no single book covers adequately all course topics. The course heavily relies on sources from the primary literature. In case of conceptual problems, students are encouraged to do their own online research, consult the primary sources referred to on the slides or get help from the instructor before or after class or during office hours.

Winter survival podcasts

1. Why a podcast assignment in BIOC60?

The Covid-19-edition of BIOC60 will produce a podcast series called 'winter survival'. While many podcasts fit the category 'infotainment', podcasts are a great way to disseminate (scientific) knowledge. Good science podcasts need to hit the sweet spot of being informative, understandable, succinct and well scripted. This is the reason why your prof decided to use the format of podcasts to replace the normally scheduled PPT presentations (under non-Covid conditions).

I believe the topic of 'winter survival' is (or should be ☺) of interest especially for Canadians, but also for any smart population of humans worldwide, thus there should definitely be a market for this topic (if this podcast series was for real…). In addition, the topic is wide enough to so that the podcast series could be sustained for hundred-plus episodes (an important feature of successful and long-running podcasts).

2. General features of podcasts

The term podcast was invented in 2004 in an article in the Guardian (British newspaper). The name is connected to 'iPod', a gadget onto which consumers of podcasts were able to upload audio files using a program called iPodder (quickly replaced by Apple's iTunes), and 'audio-casts' (https://en.wikipedia.org/wiki/Podcast#History). In the year 2005, 'podcast' was declared 'word of the year' by the New Oxford American Dictionary. Very quickly, podcasts became hugely popular. The ubiquitous use of smartphones has fueled the ravenous consumption of podcasts, where over 55% of Americans have listened to at least one podcast, over 155 million of Americans listen to a podcast every week, and podcast listeners consume an average of seven shows per week in 2020 (https://brandastic.com/blog/why-are-podcasts-so-popular/).

Podcasts can range from totally improvised to carefully scripted. They can be done solo (one person talking) or with a co-host. Podcasts can feature interviews or consist of a one-person narrative. The length of podcasts varies a lot, from 30 min (average drive to work in many areas), to just under an hour (longest typical commitment span by listeners), to very short with under 10 min. Podcasts using hosts and interviews tend to follow a general format: (1) teaser, (2) intro music, (3) welcome, (4) ad spot ("this podcast is supported by x"), (5) interview, (6) call to action ("like us on your social media"), and (7) Outro Music. Using this format of different segments makes it easier to share small clips on social media. It is important that every episode produced should cater towards repeat listeners as well as new listeners.

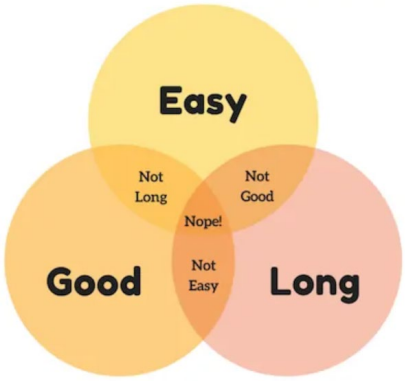

Fig. 1. How to plan the length of your podcast: easy, good or long. From https://popuppodcasting.ca/blog/how-long-should-my-podcast-be.

3. Specifics of the podcast assignment

3.1. General overview

Students will pair up and produce a podcast based on a scientific paper covering one specific topic of winter survival. The podcast will have a general introduction (solo by the podcast host) and an interview part, where the host interviews the scientist. The production will take nine weeks from start to finish and there will be tasks involving the creation of the podcast in most of these nine weeks of the winter term (Fig. 2). The audio of the podcast will be scripted because we are aiming for podcasts of high quality, not easy podcasts (Fig. 1). The BIOC60 podcasts will be on the shorter side (a maximum of 15 min each), because it is easier to produce a high quality short podcast as opposed to a high quality long podcast (Fig. 1). At the end of the production of the podcast, all students will choose to listen to four podcasts (at least; feel free to listen to as many as you want…) produced by their fellow students and answer online Quercus MC questions about them for credit. For a detailed overview on the steps involved in the production of the podcasts see figure 2.

3.2. Specific features of the podcast

Podcasts in BIOC60 will use seven segments, simulating a professional format of a podcast:

(1) teaser (under 1 min)

(2) intro music (under 30 sec)

(3) welcome (description of the background science; introduction)

(4) ad spot (“this podcast is supported by x”; make up something fun or thank your relative who pays for your tuition etc; under 30 sec)

(5) interview (conversational description of the research)

(6) call to action (“like us on your social media”; under 30 sec)

(7) Outro Music (under 30 sec)

4. Steps involved

4.1. Formation of student groups, paper selection, paper reading (weeks 3, 4)

At the end of week 3, students will pair up in groups of two (on their own, if you know who you would like to work with; or with the help of the TA, for unpaired singletons). Individual student pairs will select a paper forming the basis of the podcast. The paper selection process will happen online using 'Signup Genius'. Each paper can only be chosen by one student group and the selection is based on a first-come-first-serve basis. By the end of week 4, all individual students are required to read their paper (Fig. 2). All papers have been selected to fit five major topics, paralleling the structure of the 24 lectures of BIOC60.

Major topics

- (1) winter survival of poikilotherms (insects, amphibians, reptiles)
- (2) winter survival of homeotherms – hibernating animals
- (3) winter survival of homeotherms – birds
- (4) winter survival of homeotherms – resisting mammals
- (5) winter survival in a changing world

Steps involved	Work	Grades	Deadlines	Info
Pair up into groups of 2 students Select a paper from the list (topics 1-6)	pair		Week 3	4.1
Read your selected paper	alone		Week 4	
Student A writes a 500 word-limit draft on paper's intro Student B write a 500 word-limit draft on paper's research **A and B submit their drafts to Quercus**	alone	Pass/Fail: 0.5%	Week 5	4.2
Student A reads and works on B's draft Student B reads and works on A's draft **A and B submit their comments on drafts to Quercus**	alone	Max: 1%	Week 6	4.3
Students A and B co-create optimized drafts on intro and research Students A and B write two MC questions (+answers) on intro and research **Student A submits optimized drafts to Quercus** **Student B submits MC Q and A to Quercus**	pair	Pass/Fail: 0.5% Max: 1%	Week 7	4.4
Students A and B record & splice together audio on intro & research into 1 podcast **Submission of podcast to Quercus**	pair	Max: 17%	Week 9	4.5
All students individually select 4 podcasts on 4 different topics other than their own All students individually listen to these 4 podcasts All students individually answer the associated Quercus MC questions	alone	Max: 2%	Week 12	4.6
		Max: 22%		

Fig. 2. All steps, modes of work (alone or with paired up), grades, deadlines and where to find more detailed info involved in the creation of the podcast in BIOC60. Please note that all weekly deadlines refer to Sunday, 11.59 PM.

4.2. Writing of podcast draft (week 5)

In your group, first decide which student will be the host (interviewer) and which the scientist (interviewee). The host's draft should focus on the big-picture introduction, while the scientist's draft should cover the actual research done in the paper. Both host and scientist should write some questions the host could ask in the interview to bring out the science done in the paper. See detailed instructions for both drafts below.

By the end of week 5, individually submit your podcast draft with your interview questions (inserted at the end of your draft text) to Quercus. Quercus will use Turnitin to check for plagiarism: you need to paraphrase your text from the paper. Your TA will skim-read the drafts and check for adherence to the word limit and presence of questions, and reward good-looking drafts with 0.5% (pass-fail; Fig. 2).

4.2.1. Host's draft (interviewer)

As the host of a recurrent series of podcasts on Winter Survival, you need to set the stage for the featured interview, so that your listeners (idea: both new and recurrent listeners) can understand the context of the interview and the larger relevance of it. This introduction is important to "wet your audience's appetite", so that they can't wait to hear the interview ☺.

Because the published paper most likely targets biologists while your target audience is comprised of a smart and interested general audience, you need to translate the paper's somewhat technical and dry lingo into more colorful, captivating, and simpler language, but without dumbing it down or misrepresenting concepts.

Most likely much of the scientific concepts for you to cover will be in the introduction of your chosen article, but you might have to read up more general contents in the internet (Wikipedia or other articles). Having read the full article (by week 4), review the subchapters after the introduction and write down a number of questions to ask your scientist partner for a successful interview.

4.2.2. Scientist's draft (interviewee)

As the scientist, it is your role to explain the nature of the paper, why the research was done, why the particular species was chosen to do the research, what the results were and what the greater relevance is of the research, all in an accessible language to accommodate a smart and interested general audience. As a budding UTSC biologist, you were chosen by your host not because you are the author of the paper, but because you have the smarts to explain the science represented in the paper.

Your 500 word-limit draft should contain some contents of all subchapters of the paper. From the introduction, you will need the questions or hypotheses; from the introduction and materials & methods you will need information on the species; the materials & methods chapter will also provide you with the info on the actual methodology; but most importantly you need to talk about what the authors present in the discussion. You can talk about your results directly followed by their interpretation (no separation of Results and Discussion, as in scientific papers).

The way scientific original articles present materials & methods most likely will be too detailed for you to talk about in your interview. Hence, you will need to distill the most important information from this particular section of the paper, so that your audience will understand how the research was done. If the methodology (for example the analytical tools used) is complicated, simplify it and omit what is not necessary to understand the big picture of the paper. Likewise,

you do not need to talk about the statistical analysis at all. Ask yourself what your smart non-scientist family members would need to understand the research. When referring to the actual results, statistical details (P-values etc.) are not relevant. Your host will assume that you will only discuss relevant outcomes, thus results supported by significant statistics.

Once you have written your draft, identify its major units and write down fitting questions your host could ask to bring out your answers.

4.3. Work on your partner's podcast draft (week 6)

In week 6, you will work on your partner's draft. To do that, first exchange your texts and revisit the paper. Read the podcast draft of your partner with an open heart and kindly scrutinize it from the perspective how well it will help to make your podcast flow well and be simple, yet informed. Use the 'Track changes' option in Word to make text edits and, if necessary, add 'Comments' to indicate why you have changed your partner's original text (both these functions can be found under 'Review' in Word's top bar).

Submit your edited partner's word file to Quercus. Your TA will grade your effort and award you 1% towards your course's final grade if there is evidence for a good effort, 0.5% for a 'meh' effort and 0% if there are no edits.

4.4. Co-write the optimized podcast draft and MC questions (week 7)

Week 7 marks the first time where you will have to work together with your partner in real time, albeit virtually. Hopefully (or sadly) all of us by now are pros in using media like Zoom, where you can talk in real time and also share screens to work on a text together.

In this week, it is your group task to distill the best joint versions of your host and scientist drafts. Make sure you do this merging of your texts and edits in the best possible Canadian way: politely and focusing to help each other with the goal of the best possible product. These optimized podcast drafts will form the basis of the recorded podcast audio. Student A (host) submits this merged text file to Quercus, where your TA will award you and your partner 0.5% points for doing this correctly and on time (pass/fail). This text (essentially a transcript of your future recorded podcast) together with the final audio product will help the TA to grade your podcast.

Together as a group, you are also requested to write two multiple-choice questions and their answers about the two text units (one question for the host's intro and one for the interview research texts). These questions will be answered by students choosing to listen to your podcast in week 12. Phrase the questions in a way that only students who listened to your podcast can answer them, but try to aim for biologically relevant, big-picture questions, testing understanding, as opposed to 'tedious' small detail questions. Student B (scientist) submits the MC question and their answer to Quercus, where your TA will grade them. If your MC question and their answer are good, you and your partner will be awarded 1% towards your final grade, if they are 'meh', you will get 0.5% and if you fail to provide them, you will get 0%.

4.5. Recording of the audio of the podcast (week 9)

Week 9 will mark the recording of the podcast. On the following UTSC website, you will find all the necessary information on how to produce your podcast, including:

- How and where to download the program to create the podcast (Audacity: free)
- How to create an audacity project file
- How to extract a clip from interview recording
- How to record a clip of your voice
- How to export the Audacity Project to a single audio file

Here is the link to the website:
https://q.utoronto.ca/courses/128786/pages/audio-podcast-how-to?module_item_id=1231942

Once your podcast is done, submit it to Quercus and the TA will make all the podcasts accessible for everybody to peruse and listen to.

4.6. Listen to four podcasts and answer associated MC questions (week 12)

Of the five major topics, choose four podcasts (one per topic other than your own; your choice!), listen to them and answer the associated multiple-choice questions incorporated into Quercus. This part of the assignment is to be done on an individual student basis, it is due by the end of week 12 and worth a maximum of 2%.

5. Grading rubric

	Fail	Satisfactory	Good	Outstanding
Introduction, background science (2. welcome)	**2** Fails at introducing the listener to the research, bad flow or structure	**4** Most pieces needed to understand the background are present, but structure and/flow could be better; science is either too superficial or not easily understandable to a lay audience	**6** Good pitch of the background; good science, and mostly comprehensible to a lay audience; good structure and flow	**8** Excellent pitch of the background; excellent science, comprehensible to a lay audience; excellent structure and flow
Research (5. interview)	**2** Fails at explaining the research to the listener, bad flow or structure	**4** Most pieces needed to understand the background are present, but structure and/flow could be better; research is either too superficial or not easily understandable to a lay audience	**6** Good pitch of the research to a lay audience, good level of explaining the methodology, the results and general the relevance thereof; good structure and flow	**8** Excellent pitch of the research to a lay audience, excellent level of explaining the methodology, the results and general the relevance thereof; excellent structure and flow
Format	**0.5** Not all units are present or the balance is too off	**1** The podcast contains all seven units, but the correct balance is lacking, podcast sounds amateurish	**1.5** Good adherence to the seven subunits, the time allocation to each subunit is mostly balanced and correct, the podcast sounds relatively professional	**2** Excellent adherence to the seven subunits, the time allocation to each subunit is balanced and correct, the podcast sounds very professional
Language	**0.5** Major issues with language, grammar, pace, monotony, or understanding	**1** Some issues with language, grammar, pace, monotony, or understanding	**1.5** Good language; grammatically mostly correct, mostly captivating, mostly intelligible, mostly good pace	**2** Excellent language; grammatically correct, captivating, clearly intelligible, good pace

Papers for podcasts

(1) Winter survival poikilotherms

1. Woolly bear (*Pyrrharctia Isabella*)

Layne J.R., Edgar C.L. and Medwith R.E. 1999. Cold hardiness of the woolly bear caterpillar (*Pyrrharctia Isabella*, Lepidoptera: Arctiidae). American Midland Naturalist 141: 293-304.

2. Emerald ash borer (*Agrilus planipennis*)

Crosthwaite J.C., Sobek S., Lyons D.B., Bernards M.A. and Sinclair B.J. 2011. The overwintering physiology of the emerald ash borer*, Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae). Journal of Insect Physiology 57: 166-173.

3. Multicolored Asian lady beetle (*Harmonia axyridis*)

Labri G., Coderre D. and Lucas E. 2008. Overwintering strategy of multicolored Asian lady beetle (Coleoptera: Coccinellidae): Cold-free space as a factor of invasive success. Annals of the Entomological Society of America 101: 860-866.

4. Woolly adelgid (*Adelges tsugae*)

Tobin P.C., Turcotte R.M., Blackburn L.M., Juracko J.A., Simpson B.T. 2017. The big chill: quantifying the effect of the 2014 North American cold wave on hemlock woolly adelgid populations in the central Appalachian Mountains. Population Ecology 59: 251-258.

5. Spring peeper (*Pseudacris crucifer*)

Layne J.R. and Kefauver J. 1997. Freeze tolerance and postfreeze recovery in the frog *Pseudacris crucifer*. COPEIA 2: 260-264.

6. Garter snake (*Thamnophis sirtalis*)

Churchill T.A. and Storey K.B. 1992. Freezing survival of the garter snake *Thamnophis sirtalis parietalis*. Canadian Journal of Zoology 70: 99-105.

(2) Winter survival of homeotherms – hibernation

1. Little brown bat (*Myotis lucifugus)*

Ben-Hamo M., Munoz-Garcia A., Williams J.B., Korine C. and Pinshow B. 2013. Waking to drink: rates of evaporative water loss determine arousal frequency in hibernating bats. Journal of Experimental Biology 216: 573-577.

2. Hoary bat (*Lasiurus cinereus cinereus*)

Cryan P.M., Stricker C.A. and Wunder M.B.2014. Continental-scale, seasonal movements of a heterothermic migratory tree bat. Ecological Applications 24: 602-616.

3. Chipmunk (*Tamias striatus*)

Humphries M.M., Kramer D.L. and Thomas D.W. 2003. The role of energy availability in mammalian hibernation: An experimental test in free-ranging eastern chipmunks. Physiological and Biochemical Zoology 76: 180-186.

4. European hedgehog (*Erinaceus roumanicus*)

Rutovskaya M.V., Diatroptov M.E., Kuznetzova E.V., Anufriev, A.I., Feoktistova N.Y. and Surov A.V. 2019. The Dynamics of Body Temperature of the Eastern European Hedgehog (*Erinaceus roumanicus*) during Winter Hibernation. Biology Bulletin 46: 1136-1145

5. Grizzly bear (*Ursus arctos*)

Pigeon K.E., Stenhouse G., and Cote S.D. 2016. Drivers of hibernation: linking food and weather to denning behavior of grizzly bears. Behavioural and Ecological Sociobiology 70: 1745-1754.

6. Woodchuck (*Marmota monax*)

Zervanos S.M., Maher C., and Florant G.L. 2014. Effect on body mass on hibernation strategies of woodchucks (*Marmota monax*). Integrative and Comparative Biology 54: 443-451.

(3) Winter survival of homeotherms – birds

1. Common Loon (*Gavia immer*)

Gray C.E., Paruk J. D., DeSorbo, C.R., Savoy L.J., Yates D.E., Chickering M.D., Gray R.B., Taylor K.M., Long D., Schoch N., Hanson W, Cooley J. and Evers D.C. 2014. Body mass in Common Loons (*Gavia immer*) strongly associated with migration distance. Waterbirds 37: 64-75.

2. Dark-eyed junco (*Junco hyemalis*)

Spellmeyer A.J., Rogers C.M. and Schneegurt M.A. 2020. Radiotracking refines the role of food supplementation on overwinter survival of the Dark-eyed Junco (*Junco hyemalis*). Avian Biology Research 13: 92-99.

3. Ruffed grouse (*Bonasa umbellus*)

Shipley A.A., Cruz J. and Zuckerberg B. 2020. Personality differences in the selection of dynamic refugia have demographic consequences for a winter-adapted bird. Proceedings of the Royal Society B - Biological Sciences 287:

4. Snowy owl (*Bubo scandiacus*)

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(4) Winter survival of homeotherms – resisting mammals

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(5) Global change

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