Introduction

The year 2010 was devoted to fiscal and personnel issues. Early in the year, we filed an appeal to NSERC on the loss of the Major Resources Support grant. This was unsuccessful. However, we did receive funding to further develop outreach programming from the Principal’s Innovation Fund. This enabled QUBS to deal with the loss of personnel occasioned by the loss of MRS, while developing new avenues of programming and income.

In 2010, total user-days again flirted with the 10,000 mark, coming in at 9,608 user-days (user-day data are displayed in tabular form on pp. 68 - 69). Overall, use was down 4.2% over 2009.

On average, 44 researchers (professors, graduate students, honours students and assistants) were in residence through the summer (May through August). Abstracts of 2010 research projects and documentation of the personnel involved are to be found on pages 27 through 62.

User-Days at QUBS

In teaching activities, QUBS hosted 6 modules (11 weeks worth of modules) in the Ontario Universities Program in Field Biology (OUPFB). 3 of these modules were presented by Queen's instructors and 2 by instructors from other institutions (one course was a collaborative effort between Queen's and Ottawa U.). Overall, the OUPFB field course list totaled some 38 modules in 2010. A list of field courses offered at QUBS in 2010 is found on p. 25.
Jim Ludden (a QUBS alumnus) brought a midsummer field course to QUBS from College of DuPage (Glen Ellyn, Illinois). A two-week course on river habitats and hydraulics was offered in late summer by Drs. Rick Cunjak and Michelle Gray Canadian Rivers Institute, University of New Brunswick. In addition, in fall, Ted Thomas and his associates from North Park Collegiate-Vocational School in Brantford brought an elite group of high school students to QUBS for several days of field modules.

A summary of conference, meeting and field trip use of QUBS in 2010 appears later in this report (pp. 62-63).

**Thousand Islands - Frontenac Arch Biosphere Reserve**

QUBS continues involvement with the local Biosphere Reserve. QUBS properties contribute to education, research and conservation programs within the Biosphere Reserve. The Biosphere Reserve recognizes the attributes of the Frontenac Arch and promotes wise land use and sustainability within its borders.

One of the board meetings of FABR was held at QUBS in January and QUBS figured prominently in a tour of the Reserve itself in Fall.

**MAJOR GIFTS**

**Baillie Family Chair in Conservation Biology**

Dr. Paul Martin continues as Baillie Chair. He and his students focus on a variety of bird species and avenues of investigation which involve behaviour, phylogeny, population status and conservation. A summary of current topics of research is found later in this report.

**William C. Brown Research Endowment Fund**

The Brown Fund is used to augment research opportunities at QUBS.

**The Queen's Land Trust**

At year's end, the Queen's Land Trust has a capital balance of $138,336. While still far short of the ultimate goal of an endowed fund of $1,000,000, the current fund does offer assurance that if a parcel of land that is integral to QUBS should be opened for potential development, QUBS would hopefully be in a position to act. In addition, the income from the land trust helps to cover costs of maintaining the extensive land base at QUBS.

**Dr. James H. Fullard – Dec. 29, 1952 – March 6, 2010**

Dr. James Fullard passed away March 6, 2010 after a determined battle against pancreatic cancer. On June 19, 2010, friends and colleagues of James and Michelle (Veniance) gathered to celebrate the life of a one-of-a-kind person and a staunch supporter and user of QUBS. The following notes are from organizer Dr. Gary Bell:
Welcome:

My name is Gary Bell. I knew James for about 35 years. They say if you have five really close friends in your life, friends you can trust, you can count on, who share your thoughts, your philosophy, who speak the truth to you, who never forget you, through thick and thin, who are true friends, then you are very, very lucky. For me, James was one of those friends. I know there are many people here today who also included James in their own select group of true friends.

We all know why we are gathered here today but I'd like to take a moment to remind us all anyway. James Howard Fullard, friend, colleague, teacher, mentor, husband, brother, son, touched the lives of everyone here and many others who could not be here today. And as Michelle said to me recently, James was so appreciative of all things, he taught us to be appreciative as well. So today is an opportunity to share, just by our gathering, our love for James and our appreciation for his time among us.

So, about today: just what is a memorial service? My step-daughter, Mathilde, sang in a women’s chorus this spring and one of the works the group sang was Henry Purcell’s “Dido and Aeneas”. Near the end Dido, preparing for death, sings “Remember me but, ah, forget my fate”. And in that moment I realized the meaning of today. Yes, we are sad. But this should be a joyous occasion. Look around you at all the people who were part of his life and you realize that James’ spirit, his joy of life, lives on in all of us. Today we are remembering James.

But there’s more to it than that. Like most of us, James lived in two worlds – professional and private. Many of the people here today know each other through academic association. James’ wife and soulmate, Michelle Venancio, knows both of those worlds well but there are some here today who are veritable strangers to biology, and the biology station. James’ mother Jean, his sister Millie Engle, and his niece Lea are here with us. So this is an opportunity for them to see the incredible community of James’ life and a chance for all of us to express to them how important he was to us well.

So, now, let’s remember James. Brilliant, handsome, kind, joyous, and funny. Very, very, very funny. There are a thousand James stories to tell and each one opens a little window into him.

But before we go to stories we’re going to hear some music. James spent about three years solid abroad but mainly in the South Pacific including research trips, vacation, and sabbatical. It was a life thing for him. He idolized Paul Gaugin and his travels in the South Pacific. And he loved the music of the South Pacific.

1st song: Martin Pahinui:

James visited the Hawaiian islands eight times, and every time he would go to see his favourite Hawaiian musician, Martin Pahinui. This is a Hawaiian hymn called Hilo Hanakahi. James loved this song.

Sengwa Cooking:

I’d like to tell one little James story before I invite some other people to come up and speak. In 1979 James, Don Thomas, Brock Fenton, and I went on a five-week research trip to Rhodesia (that was Zimbabwe for those of you under 35). We went on a hereculan shopping spree in Salisbury (that was Harare for those of you under 35) for supplies and then moved into a four-bedroom cottage at the Sengwa Wildlife Research Institute far out in the boonies of the African savanna. Everything we ate we brought with us and our pantry was well stocked and the freezer stuffed full.

Now Don, Brock and I all considered ourselves to be distinguished chefs, and we all spent time cooking and putting meals on the table. But cooking was not something that came naturally to James back then and he took more than a little flack for it.

But one day Brock, Don and I went off in the Landrover for an all-afternoon field trip. James had, strangely, decided not to go but had stayed behind to “work on his lab set-up”. On our return in the evening, wet, cold and tired, we walked into the house to the heavenly smell of pot roast!

James was beaming as he declared that this was his mother’s famous pot roast recipe and it was the only thing he knew how to cook but he knew it well. So we sat down at the table and prepared to dig in. James brought the pot to the table, took off the lid and there, delectable in the brown gravy, was the ten pound Fillet Mignon roast that Brock had bought for a special occasion. Special occasion it was, indeed. And Jean, not only was it the best tasting pot roast of my life, it was certainly the most tender.

First Set of Speakers:

Glenn Morris

James showed me the tropics. He instigated a trip to Papua New Guinea in 1981 that pointed the way: and I worked on bug chirps and buzzes in the tropics for the rest of my career. James was a delightful and resourceful field companion on that trip and many others.
Scientists interested in similar things recognize each other as members of a specialized club, defined by that interest. In their papers these people talk to each other across generations. The people in the club are famous — to each other. James belonged to two such groups: bat people and moth people. And his research will be remembered and consulted and be a part of the conversation of the “bat and moth worker club” forever.

He was an undergrad in my courses, bleary eyed at an 8 am lecture. Later he became my PostDoc and then a U of T faculty colleague: my first memory is always how much fun he was. On a trip to British Columbia in the early days we rented a van in Vancouver; all the seats were removed except the two in front, so that the three of us, Ron Aiken, myself and James, could sleep in the back. As we pulled out of the airport and headed east toward the mountains there was nowhere for James to sit. He was at the bottom of the pecking order as a mere undergrad in the company of the professor and his graduate student (Aiken), so he was told to just sit on the floor back there.

Somewhere up the Fraser Valley Jimmy (Aiken always called him Jimmy) insisted we stop at a mall. Herein he purchased a folding chair. And then sat in glory behind the driver and his accomplice with his crossed legs, feet hooked onto the motor cowling. We swerved around curves on the mountain road and the chair like some mad metronome swerved to and fro in synchrony under James’ weight. It was not a strong chair and eventually it swerved into total collapse, affording much merriment to Ron and I.

But James wasn’t beaten. We had strong nylon ropes whose purpose I cannot remember. He strung these ropes from the internal supports in the roof of the van, looped them through the broken chair to both sides until he could hang it, dangling from the van roof. Back into this swinging ‘jolly jumper’ he hooked his feet on the cowling. This worked well for the rest of the trip and was a seriously frightening sight for oncoming traffic.

Resilience with humour: with my friend James I was privileged to share animal adventures in the field. He was a very good scientist, properly curious throughout.

Robert Barclay [and a letter from David Jacobs]

Before I read a letter from another colleague I would like to pass along a couple of little anecdotes about working with James. We were grad students together in Brock Fenton’s lab and, like many students, James was always looking for ways to save money. He lived in an apartment in a terrible part of town [now The Glebe!] and he drove a beat up little Austin Mini about which there are many tales. The car was always on the brink of falling apart. One time I recall James accidently broke of the key in the ignition. Rather than have a locksmith repair it he simply found a little screwdriver that he kept in the glove box. He would stick the screwdriver in the broken ignition to start the car. Someone once asked him if he wasn’t worried about it being stolen, his neighbourhood being so rough. Well, he lamented that, try as he might, he had been completely unsuccessful at having the car stolen as much as he would like it to be so that he could collect the insurance money!

Now, despite the fact that James really studied insects, he usually went to the North American Bat Meetings. He would submit abstracts on the inner workings of moth ears, and this one time he put in an abstract (on exactly the inner workings of moth ears...), so some of us decided to write up a [fake] letter from the host of the meeting and the letter said something like this:

“Dear Dr. Fullard,

Thank you very much for submitting your abstract. It is absolutely no reflection on the science that you do, but we really don’t think that studies on moths belong in a conference about BAT ecology and behaviour. And so I’m sorry, but we are not going to let you give your lecture at our conference.

Sincerely,

Etc, etc.”

We put it in the mail and waited for him to open it up. When he opened the envelope, there were a few expletives screamed out, and he said, “These guys...their minds are SO narrow ...they OVERLAP!”

So...David Jacobs is a professor of Zoology at the University of Cape Town in South Africa. And he was here working with James recently – I don’t know exactly when – as I say, I haven’t been here myself since 1981...some of you I notice haven’t changed very much at all, but the place itself has changed considerably. But David worked here much more recently when he was over from South Africa, and he sent this, which I will read...

David Jacobs

"James was my mentor, friend, and colleague. I first met James in Hawaii..."
here's a little interjection (Robert Barclay talking): David and James and I went to Hawaii one year and the most memorable event on that trip was a golf game that we had - James liked to play golf - he was not very good at playing golf, but he liked to play, and he especially liked the golf course with the G&T's; David 'smoked' us at golf that day...

...and so the image I have of him is that of James with some exotic concoction in his hand meeting me at the airport - it is something I will have always etched in my memory.

James introduced me to the exciting inwards of moths. And to the wonderful world and people of QUBS (pronounced “CUBS” as Dave said it) - experiences that I'll always treasure. He taught me that if you have to work, then it might as well be with beautiful people in exotic locations and on something that excites you”.

That lesson has enabled me to live a life beyond my wildest dreams. His enthusiasm for life was contagious and no matter where he was - whether it was some remote island, some desert in Africa, or in front of his rig here at QUBS, James was always in the Zone, living his life to the fullest. James knew how to live a good life, and he was generous in sharing that knowledge.

James was a brilliant scientist, nurturing mentor, and an considerate friend.

2nd song:

This next piece of music is a Cook Island Song from Atui, sung by the Atui Catholic Youth. The song was sent to Michelle this week from people he loved, Roger and Kura Malcolm who James stayed with many times in the Atui Hotel. They sent this song for the memorial and it's called "Father Edwin" named for the Dutch priest on the island, who recently passed away, who James and Michelle met many times and who passed away just after they saw the last time. Michelle and James went to service and Edwin had James and Michelle stand up and he acknowledged them as visitors. He was there for 30 years.

Second Set of Speakers

Brock Fenton

The last time I saw James was in October of last year. We met in a restaurant in Toronto for lunch. And it was a typical session with James. We talked about research, of course, but we also talked about teaching. James was always interested in, and always searching for ways to connect to students in teaching. How do you make the material matter to them? How do you incite their curiosity? It says a lot about James that both sides were important to James – not just the research but the sharing of knowledge to the next generation as well. He loved the whole process.

Now one of the things that Robert (Barclay) delicately didn’t mention was that for a while there were several graduate students in the lab. And two of them, Don Thomas and James, discovered that parking passes for the campus lots were relatively easy to make, and they had made their own parking stickers... and James would always put some snow over it whenever he drove through the gates!

But one of the other students working in the lab was also working in the parking office and she stole some parking office letterhead paper. So we decided to write James an official letter from the parking office, and this was in the old days when typewriters weren't replaced by keyboards and printers and typewriters were identifiable. So we couldn’t use my typewriter because he knew my typewriter so I had to go and use the typewriter in the Biology Department office. And we constructed a very, very serious letter saying,

"Dear Mr. Fullard, It has come to our attention that you have been using a parking sticker that has NOT been issued by this office." And then a whole bunch of blah about all the costs incurred by the parking office, and about how all the other students had to pay their own way... and "that we look forward to processing your application for one of our parking stickers."

So, he opens the letter and looks at it and says, "I'm not going to say anything! Somebody wrote me a letter and I bet it was..." And then he said, "Oh, no, no... it's not his effing typewriter!" So he storms around the lab holding this thing up in the air and then says, "What does "cc:" mean?

"cc: Dean of Graduate Studies", and "cc: Chair, Department of Biology".

So we explained that it meant "Copy to: "; and he said, "you’re kidding me!"

Anyway, he gave us a full 15 minute display — we could've sold TICKETS!

The other side of this was then when Jim said, "How come Don doesn’t get a letter!?" Wait, so the next day, Don’s letter arrives, and Don says, "Oh God". And now James says, "Hey, "cc:" - you know what THAT means?!

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James was taken from us too soon. It occurs to me that there should be a rule that students are not allowed to predecease their thesis advisors. I should have gone before him. But there is no such rule. And in my mind James was irreplaceable.

Paul Faure & Ron Hoy

James had me out here a few times - even though I was never a student of James' I was fortunate to be able to work with him and learn from him. And it was through James that I got to know a few people here at QUINS. And it's been such a wonderful experience to see everyone connected to both worlds of bats and insects. I'm very grateful to have known James and to be able to get up here and say a few words about him.

But also I'm here to read a note from my PhD adviser, Ron Hoy...

"I sincerely regret that I'm unable to speak these words in person to all of you but next best is to have them read by Paul Faure, whom I'm proud to have had as Ph.D. student, and who was before that, James' friend and junior colleague.

I came to know about James Fullard early on in my career, back in the late 1970s, when I was sent manuscripts of his papers, written in collaboration with his friend and Ph.D. mentor, Brock Fenton, to review for various journals. There is a common thread here--I myself was inspired, as a graduate student, to become a neuroethologist by Ken Roeder's book, "Nerve Cells and Insect Behavior," about bats, and by Don Griffin's book "Listening in the Dark," about bats. Roeder recounted the fascinating war between the moths and the bats, all mediated in the realm of sound, bioacoustics.

So I was delighted to read the Fullard-Fenton (F & F's) papers. They followed so logically from the program set out by Roeder and Griffin--F & F's collaboration was the perfect intellectual marriage of minds between a moth auditory neurobiologist student and a bat bioacoustics mentor. I said as much in my enthusiastic review, which turned out to be the first of many reviews of manuscripts and NSERC grants written by James, and several to the National Geographic, which I enthusiastically endorsed, while being envious of the travel opportunities conjoined with good science.

More than any neuroethologist I know, James traveled the world with gusto, doing his science and enjoying his life. I never ceased to be amazed at James's singularly original approach to his science, which was a brilliant investigation of the evolutionary neurobiology behind the evo-long struggle between bats and moths as it unfolded in all corners of our planet. So from the beginning, I watched his career grow and thrive "up North," and I was delighted to finally meet him in person, on a seminar trip to Mississauga, in the early 1980s. We hit it off from the start and he earned my enduring and grateful respect through our mutual fondness for "real" Chinese food. James told me to go to Lee Garden, on Dundas St., I believe, where the menu is written on a chalk-board, all in Chinese, which in spite of my ancestry, I can neither read nor speak. He advised me to leave it to the waiter and I was delighted with the outcome. On my subsequent trips to Toronto, we met up at Lee Garden or other restaurants in Toronto, always my delight. I recall having to follow him through the streets of Toronto as he led the way on his beloved motorcycle.

James had a knack for attracting and recruiting very talented and interesting students into his research program. I am keenly aware of this because I served as an outside reviewer of their Ph.D. theses--he expected rigor in experimental application and in writing. I'm sure he was not always the easiest of mentors but he respected the integrity of the process. I count myself very lucky that several of James' students made the trek south, down to Ithaca, to labor in the Hoy lab. This was no accident. James and I were in close contact about many things, including his students. I am grateful to have had Paul Faure, Andrew Mason, Jayne Yack, and John Batcliffe as students and postdocs after they had passed through the Fullard/Fenton/Morris and Barclay labs. So while I regret never having worked side-by-side with James, I got the best thing--his students.

I hold a decades old picture in my mind: James arriving in Ithaca and striding into my lab in his leather jacket and asking if it was OK to park his "bike" outside. I often thought of James' "Brando-esque" presentation to the world which seemed at odds with his sensitivity in other domains. But these are the traits that made James Howard Fullard a very special scholar, teacher, and friend. And why undoubtedly, so many of you are gathered here today. I will miss him and I thank you for giving me the opportunity to say so, through Paul."

16 June 2010

Dr. Ronald Raymond Hoy, Professor

Department of Neurobiology & Behavior

Cornell University

Mike Hamilton who will introduce the 3rd piece of music.

3rd Song:

O'Horton. This is the theme from the movie O Horton.

Third Set of Speakers
Janice Bogart

I think it would be fair to say that James was bejeweled with a little bit of magic. No, he didn't pull rabbits out of hats or involve himself in the paranormal — that would go against all standard scientific principles where he was so firmly rooted. Regardless of his scientific background, one could argue that he did have a majestic presence or attitude that could be repeatedly observed in the way that he interpreted and experienced the world around him. I have loads of empirical and measureable evidence, as I'm sure you do, that lends credence to my hypotheses.

What I'm trying to say is that I've never met anyone else who enjoyed life, lived in the moment, and appreciated the small things and social activities as much as James did. His genuine and deep appreciation for these things — a sunny day ... a pleasant evening counting bats ... a special dinner or even a not so special one ... a margarita ... the sight of your face (one of his many friends) ... his girl and wife Michelle by his side ... a Friday patio night ... making someone else happy ... a warm summer evening ... the Folk Fest ... Forfar cheese ... sharing one of his many beautiful travelogues with you that he so carefully and lovingly put together ... but, most importantly, did I mention his wife and girl, Michelle, by his side? All of these things and people made him beam with happiness. His reactions were contagious. If you were too blind to be pleased with the little things and the sublime, his very presence reminded you that this is as good as it gets.

Speaking of my dear friend Michelle, and James' loving wife, whom I've known for close to thirty years, she asked me if I could maybe tell you a little bit about a side of James that you might not know about. She was referring to his Frank Sinatra side. You see, it all goes back to my theory of how I believe he was indeed touched by a bit of magic! He liked to don himself in the apparel of the moment and take you along with him for the ride while he entertained and doted on you as his guest.

If you haven’t done so already, check out the picture of James wearing a white tuxedo as he proudly stands beside his Mickey while on a Caribbean cruise. He rented the tux online, unknown to his other travelling companions — Michelle’s family, his mom, and sister, Millie. James showed up one night proudly dressed in this tuxedo. I’m sure he must have contributed to delighting all around him, not just with his tux, but with his charming joie de vivre. I know that he cherished all of his family members because countless times and in many ways, he said so.

As some of you know, every year James and Michelle host a cocktail party on James’ birthday in December, when they weren’t travelling. James was thrilled to organize the cocktail snacks and music. He was always the perfect host. He even went out of his way for his smoking guests when he started to set up a smoking seat in his backyard, complete with tropical fruit lights and an old-fashioned ashtray. One year, he surprised everyone by renting a gold-sequin tuxedo, complete with shiny white shoes (Make sure to check out that picture of him, too.) All of us women went wild when we saw him. The magic he exuded put a spell on us. We each bent down and kissed his white shoes until they were covered in various shapes and bases of lip imprints. The magic didn’t just affect the women. Both women and men alike were hypnotized as we took turns wearing the magic white shoes — they seemed to awaken the Fred Astaire in all of us as we danced the night away!

This past December — we celebrated James’ last cocktail party and Michelle says he was so happy that he didn’t have to set up a smoking seat since one of his guests — me — had quit smoking. Michelle says he was very proud.

To wrap up ... As we move on in our own lives — I hope that a little bit of James’ magic, and the warm and happy memories we have of him, will continue to touch each and every one of us. I’m sure they will because... just as a basic expectation of science is to document, archive, and share all data and methodology so they are available for careful scrutiny by other scientists, this process of happily sharing, honouring, and remembering our wonderful experiences with James will allow all of us, I’m sure, as his fellow researchers, loved ones, and friends, the opportunity to verify these results by attempting to reproduce them through our collective memories.

To my dear friend Michelle, thank you for giving me the honour to share a little bit about your sweet James. I know that it’s a small consolation, but I want you to know that as long as I’m here, you can count on me for any support you need.

Chris Belanger
“Larger than Life”

This was Kit’s comment on one of the photos in the Facebook Memorial page “Remembering Dr. James Fullard”. James was, to so many of us, “larger than life”.

When James came into a room, you knew it, not only from the Hawaiian Shirts but from his effective manner of adding to the conversation. It made you listen, he spoke with such conviction. He was a natural professor.

There are a few phases like “larger than life” that I think apply to James like “No Shrinking Violet”. From his “big-bonking-get-out-of-my-way” bike to the way he ran down the hall once at Erindale to break up a fight between a student & a prof over marks. He never backed down from a fight, always stuck up for himself and aired his opinion. We knew this as the “Fullard Rant”.

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"Man of his word" comes to mind to describe James. I like to think of the time he promised Owen, a post doc at Erindale, that he would give him a lift home, back to Toronto, after work. But James forgot and got all the way to the 427 cut-off before he remembered. He turned around, came back & got Owen who was still waiting. Some people would have kept going but James kept his word.

Speaking of his word, you always knew where you stood with James. He didn't mince words. One day I wore a sweater I had bought at an Ecuadorian kiosk in the mall and it still had hay in the wool as it was unprocessed and James told me I smelled like a goat. I still can't wear it without worrying.

"Comedian" is the way I want to remember James because I worked for him for so long and he made work fun. I loved to come to U of T every day because I knew I was going to laugh & enjoy myself. He picked up on our similar vulgar sense of humour and so much of what he said can't be repeated here but in my heart I am still laughing at his razor sharp wit and comebacks. Some days we got along like "peas and carrots" to borrow a phrase from Forrest Gump.

Which brings me to my next point about James, he loved movies. He told me he got a job once reviewing movies for the U of T newspaper so he could see movies for free. He loved that, getting paid for something he enjoyed doing. We once had an argument about the movie Cast Away with Tom Hanks and he went back that night, paid admission and watched it again, alone to prove me wrong. I was wrong, he was right. He was happy about that too.

Lastly he was caring. We stopped once in the hall at Erindale to check a sleeping student. He wanted to see if he was really sleeping or needed medical attention. I thought that was admirable. He cared about life and he really was "Larger than life".

Amanda Soular

Michelle asked me to read this poem, and I'm glad she did because I was struggling to find the words to say. I think this poem describes James well... although he certainly didn't choose the way he died, he, more than anyone I've ever known, chose the way he lived. He treated his career like his passion, his relationship with Michelle like the idea of fading romance was impossible, and his students, his lab, like his kids. We always joked about that but it always felt true. He looked out for us like family... he always made sure that we were happy, challenged and inspired, had opportunities to travel the world, was proud of us when we found our places in the world (even if it wasn't academic), always had enough wine, ice cream and topics to rant about, and even after his academic duty to us was done, he remained a great friend.

the lesson of the moth
Don Marquis

i was talking to a moth
the other evening
he was trying to break into
an electric light bulb
and fry himself on the wires

why do you fellows
pull this stunt I asked him?
because it is the conventional
thing for moths or why?
if that had been an uncovered
candle instead of an electric
light bulb you would
now be a small unsightly cinder.
have you no sense

plenty of it he answered
but at times we get tired
of using it
we get bored with the routine
and crave beauty
and excitement.
fire is beautiful.
and we know that if we get
too close it will kill us
but what does it matter

it is better to be happy

for a moment
and be burned up with beauty
than to live a long time
and be bored all the while.

so we wash all our life up
into one little roll
and then we shoot the roll.
that is what life is for.
it is better to be a part of beauty.
our attitude toward life
is come easy go easy.
we are like human beings used to be
before they became
too civilized to enjoy themselves

and before I could argue him out of
his philosophy
he went and immolated himself
on a patent cigar lighter.
i do not agree with him.
myself I would rather have
half the happiness and twice
the longevity

but at the same time I wish
there was something I wanted
as badly
as he wanted to fry himself

8
Background info: The narrator is a poet reincarnated in a cockroach's body. He types by jumping on the keys of a typewriter, hence the lack of caps.

Naureen (Nat) Macdonald

It's not the same this summer without James. It just doesn't feel right.

For almost 25 years, James and I shared this wonderful and affectionate friendship centred around our summer here on Lake Opinicon. I always felt that he enjoyed my Hughson Island, and through the years he brought his family, his mother and sister, so many students and friends.

For many years whenever I needed to be away for a few days, if he could, he would stay and look after my dog, Brutus. Michelle would join him for the weekends.

I would be amused that people at the Station whom I had never met before would tell me that they had been to the island with James and knew Brutus!

James loved Indian food and through the years we enjoyed many dinners with friends like Kit, Bruce, and Amanda. We would spend the afternoon cooking several dishes together and enjoy them in the evening with wine and good conversation. We tried to do it every year, at least once. Then, with the moon to light their way, they would leave by boat, canoe or kayak!

James, I treasure these precious memories and your friendship. I thank you for your affection, your joy of life and exuberance, and your wonderful humour. And also, for teaching me to love bats!

Final Announcement:

There is another side to James Fullard that most people here are not aware of. James was a devoted conservationist. He was a monthly donor to the Nature Conservancy of Canada for over ten years, making a significant contribution to the protection of the natural lands and waters of Canada. The Nature Conservancy of Canada is a non-profit charitable organization that acquires and manages land for the protection of habitat and the species that depend upon it. Since the organization was founded in 1962 NCC has protected more than two million acres across Canada. This was something very near and dear to James' heart. And of course, James loved this landscape – Lake Opinicon and the Frontenac Arch.

The Nature Conservancy of Canada is not the only organization working to protect land. Land trusts throughout the country do similar work and we often partner with them to achieve our conservation goals. I'd like to introduce Dianne Clipsham of the Rideau Waterway Land Trust to tell you about a new project here on Lake Opinicon.

Dianne Clipsham

For the past year the Rideau Waterway Land Trust and NCC have been working to protect an area of shoreline on Lake Opinicon called the Murphy's Bay Wetland. Finally, this spring, the Land Trust was able to negotiate an agreement of purchase for the 30-acre Sugarbush Island at the entrance to the wetland. This beautiful island includes more than 1.5 kilometres of shoreline, much of it on the wetland. It has many rare species including Map Turtle, Black Rattlesnake, and Red-shouldered Hawk.

Gary Bell: I realize you're all wondering why we are telling you so much about Sugarbush Island. Well, once acquired, the property will be known as the James H Fullard Nature Reserve. And the Nature Conservancy of Canada has committed to raise $30,000 towards the purchase of Sugarbush Island in dedication of James. You are all invited to make a contribution to help make this happen to honour our friend James Fullard.

4th Song: Esa Lei, Navini Islanders:

We're going to close with the Fijian song of farewell, Esa Lei. James and Michelle spent their last days in Fiji on Navini Island. James gave all his lecture notes to a professor at the University of the South Pacific at Suva along with a computer program with all his labs so they can now do a course in Acoustics at the University of South Pacific. How very appropriate – in a way James is now teaching acoustics to Fijian students in the islands he loved.

This recording is actually the staff of the resort at Navini Island singing the Fijian Farewell hymn. With this I bid you all farewell and invite you all to stay, visit, eat Forfar cheese, and remember James Fullard. Esa Lei.

On October 15, 2010, the Rideau Waterway Land Trust closed the deal on the purchase of the Sugarbush Island property to create the James H. Fullard Nature Reserve. The acquisition was a three-way partnership between the Land Trust, Nature Conservancy of Canada ($30,000 in donations from many supporters and friends of James) and the Biological Station.
Dr. Seward R. (Ted) Brown

Dr. Seward "Ted" Ralph Brown, age 92, passed away peacefully at Kingston General Hospital on Friday, June 18, 2010 with close friends by his side. He is survived locally by sister, Isabel Fraser, Salt Springs; nieces Shirley (Kenny) MacDonald, New Glasgow; Frances (Clark) Savage, Mount William; and Janet (David) Hogan, Calgary, Alberta and their families.

The son of Harry and Margaret Brown, Seward received his early education in Salt Springs and obtained Grade 12 from Pictou Academy. He attended Normal College and taught school in Isaac's Harbour and in Pictou. After five years of decorated military service in Europe during World War II, Dr. Brown traveled to Kingston to study. He returned to Queen's University after completing his doctorate at Yale University to accept a position as assistant professor and director of the Queen's University Biological Station. He continued to teach and do research until he retired in 1982.

In 1985, a new laboratory at Queen's University was named the S. R. Brown Lab in Seward's honor. All through the years, Seward devoted his life to his students. He also maintained a great interest in music and gardening and thoroughly enjoyed his visits to Nova Scotia.

Cremation has taken place. There will be no visitation. A grave side service will be held on Wednesday, July 7 at 2 p.m. in the Stillman Cemetery, Salt Springs, Rev. Barb Fotheringham officiating with a reception to follow at St. Luke's Presbyterian Church Hall. Donations in Seward's memory may be made to the Stillman Cemetery or to St. Luke's Presbyterian Church, Salt Springs. Arrangements are under the direction of Eagles Funeral Home, Westville, Nova Scotia (as published in New Glasgow News July 5, 2010).

Retirement of Dr. Raleigh Robertson

Raleigh Robertson retired from Queen's at the end of Aug 2010 after 39 years service on the faculty. As you know, he was also Director of QUBS for 35 years, retiring from that position in 2005. To honour his career and wish him well on his retirement, Queen's Biology Department hosted a party for Raleigh at the Queen's University Biology Station on 9 Sept 2010 from 4 to 9 pm. It was an evening of food, drink, camaraderie, presentations, and mercifully few speeches. The event was organized by Dr. Bob Montgomerie, Dr. Rachel Vallender and Mary Stapleton (two of Raleigh's former students). Past students and colleagues attended the event and Raleigh was presented with a book of reminiscences.

During Raleigh's tenure as QUBS Director, the station grew from a small outpost of some 80 acres to a thriving complex, the largest inland field station in Canada, with property acquisitions pushing the land base to nearly 7,000 acres. Also, Raleigh landed NSERC funding for 25 years and a Canadian Foundation for Innovation/Ontario Research Development Fund grant to replace the old lodge, the central building and base of operations at QUBS. The new building was completed in 2000. As a remembrance of Raleigh's dedication, he was presented with a painting of the new lodge done by local artist Eleanor Pinsonneault. During the presentation, Dr. Mel Robertson indicated that a proposal was being put forward to name the new building in Raleigh's honour. O The Raleigh J. Robertson Biodiversity Centre.
Floyd Connor Retires

After some 25 years at QUBS as Assistant Manager, Floyd Connor retired at the end of February 2010. To celebrate his years of service to the field station and to wish him the best in retirement, a party was held at QUBS on June 26. Dr. Steve Lougheed and Kit Muma organized the event, which allowed attendees to offer stories, funny anecdotes and reminiscences following a tribute from Dr. Raleigh Robertson. Floyd was presented with a book of remembrances and a keepsake – a first edition of Aldo Leopold’s classic book, A Sand County Almanac (1949). Many past users, friends and colleagues attended the event which concluded with a turkey dinner in the lodge.

NSERC and Other Support

Principal’s Development Fund

Early in the year, QUBS was awarded funding for an Outreach Coordinator with the intent to develop outreach activities to increase the use of QUBS and eventually increase revenues from outreach activities. The gist of the proposal is outlined below (directly from the application):

Main Concept: We are proposing that the Queen’s University Biological Station (QUBS) is in an ideal position to develop an entire program of nature oriented workshops that could eventually fund a self-sustaining position at QUBS, as well as create a profit that could be used to help with the operation of the field station. This idea has already been tested at QUBS in the past and has proven to be profitable, but has never been scaled up to a significant degree because of time constraints on available staff. The main points in our rationale for this proposal are as follows:

- The Queen’s University Biological Station (QUBS) is largely unused for a significant portion of the year (Sept – April). In addition, there are times during the summer field season (in particular July & August) when there is enough room at QUBS to accommodate additional groups.
- Based on our past experience (see appended list of past workshops held at QUBS), there is a great deal of interest from people outside of the university in educational outdoor experiences such as nature workshops.
- QUBS also has access to a wealth of expertise to offer nature programs 1) because of our close relationship with a vibrant Biology Department at Queen’s, 2) as a field station hosting experts from other universities in many areas of biology and 3) because we have strong links to many naturalists outside the university who use QUBS for their activities.
- Non-university nature workshops at QUBS have already been shown to be profitable.

Funding was granted for this initiative, including $40K 1st year (2010), $20 K 2nd year (2011) and $10K 3rd yr (2012). The tapering of funding over three years reflects the anticipated recovery of funding of the position from proceeds of activities with the aim to become self-sustaining.

The Outreach Coordinator position was shared by three persons in 2010: Dr. Fran Bonier (part-time June, July and 1st week of August), Georgia Lloyd-Smith (part-time June through Sept) and Mark Conboy (part-time October thru December) in succession.

Activities carried out under this program are outlined on pp. 66 – 67.
Endowment Fund

The newly-established Endowment Fund has been growing thanks mainly to the efforts of Director Dr. Bruce Tufts. This fund is intended to provide supplemental funding for activities, programming, equipment as needed at the field station. The fund currently stands at $135,000 and is starting to generate interest which we can use to support the operation of QUBS. The principal in the fund will remain untouched. This year, a new high-efficiency coin-operated clothes dryer to match the HE washer (bought with endowment funds last year) was purchased. In order to better inform and engage visitors to the station, digital signage (42 inch flat screen) was purchased and installed in the foyer of the lodge.

Thanks to all who have contributed to this important fund. We have set a target of $500,000 to be held in the endowment – still some way to go.

Warner Lake Ecological Observatory (WLEO)

With the recent winter kill in Warner Lake (a result of low oxygen), and muskrat activity (chewing on cabling) which has compromised many of the cable linkages of the hydroacoustic array, little real research work could be done in 2010 using WLEO. Many of the projects which used the array intensively have wound down, so this year will be a major decision year concerning the ultimate fate of the array. Repairs are needed to cabling and a couple of hydrophones need replacement. In addition, one of the receivers is not functioning and in need of repair. This list of repairs will have to be balanced against anticipated use in the short- and long-term as a decision is taken on the fate of the array.

SCHOLARSHIPS AND BURSARIES

There are a number of awards available to QUBS researchers. Among these are:

- Wes and Dorletta Curran Memorial Award
- Karen Huntley Memorial Award
- Alexander and Cora Munn Summer Research Award
- J. Allen Keast Lake Opinicon Undergraduate Research Fellowship Endowment Fund
- Kingston Field Naturalists

Details of these awards and application procedures are available through Queen's Registrar
http://www.queensu.ca/registrar/awards/toolbox/ArtsSciAwards.htm

This past spring the Cora and Alexander Munn Summer Research Award afforded me (Natasha Koomen) the opportunity to work as a team member for PhD candidate Ann McKellar, who is supervised by Dr. Laurene Rattcliff. The team was based at the Queen’s University Biology Station and the project focused on the breeding season of the American Redstart, a migratory wood warbler. The population data that was obtained during the course of the 2010 breeding season will be incorporated into a long-term American Redstart dataset that has been ongoing since 2001. The data will be used to answer questions concerning the influence of climate on migratory patterns, demography, and carry-over effects from the wintering grounds. The dataset is not only important to Ann’s work, but is an exemplary and valuable resource in a larger sense.
Summary of Completed Tasks

Over the course of the 2010 season, we recorded arrival dates and mapped territories of 60 American redstart pairs within a predetermined grid. We sampled (claw, feather, and blood), banded, and measured (wing, tarsus, bill, and mass) a total of 46 birds (13 females, 33 males). In addition, we obtained blood samples from 37 nestlings in 10 nests and recorded the eventual fate of 41 nests. Additionally, the team maintained and revitalized the spatial grid that allows American redstart team members to orient and navigate the designated study area.

The team also spearheaded a new project aimed at examining male song patterns involving the installation and maintenance of a stationary microphone array for the month of May. The array spanned the territories of approximately 6 male American redstarts, recording singing from 5-11am each day. This project will lead to insight concerning communication among males early in the breeding season and how song types might change as more males arrive and as males attract female mates. Overall, the opportunity to be a part of the data collection process was a stimulating and enriching introduction to field research and practical methods.

In addition to the awards above specifically tailored to QUBS, the following is a partial listing of awards available to biologists at Queen's:

- Allen and Mary Lou West Memorial Award
- Fran and Tom McClung Scholarship in Biology
- Wallace Near Prize in Biology
- Ann Eliza Stafford Prize in Biology
- The Gray Family Student Initiatives Fund
- Pearl E. Williams and Llewellyn Hillis Fund
- NSERC Summer Undergraduate Research Awards

QUBS Outreach Programs

Seminars

Seminars are a big part of our outreach programs at QUBS. The weekly Wednesday night seminars were popular with regulars and neighbours alike. The seminar program was well-attended with standing room only crowds for many of the offerings. A summary of seminars for 2010 is found on pp. 64 – 65.

Open House

The 39th annual Open House was held on June 27, 2010. Approximately 275 visitors attended. QUBS regulars offered tours of the station and displays of current research projects.

The 2010 version of the Community Newsletter (27th edition) was distributed to some 1500 households and cottages in the Chaffey's Lock, Elgin, Perth Road, Massassauga Road and Hutchings Road area. This annual circular serves much the same purpose as the Open House, providing information to those interested but unable to attend the Open House itself.
Outreach activities have become a part of the mandate of QUBS, providing educational and research opportunities and information to a wide audience. Outreach activities are an important part of the continuing success of the field station. By way of outreach activities, interested neighbours become stakeholders in the field station itself. The contacts developed are instrumental in maintaining close relations with the local public and in enlisting broad-based support of the field station and its activities. Without the continuing support of the local community, opportunities at QUBS would become somewhat restricted.

QUBS Logistical Support

GIS/GPS and SWEP

This year at the Queen’s University Biological Station Queen’s students, Fiona Munro and Cally Toong were hired for four months to fill the positions of Geographic Information Systems (GIS) and Global Positioning Systems (GPS) technician. They were hired through the Summer Work Experience Program (SWEP). Through the experience of field work and computer work this job position allows for the students to increase and develop many skills.

One of the general tasks was the updating of antivirus software on all four computers. This also included ensuring other programs and printers were kept up to date and running smoothly. The computers were also reorganized and cleaned of any unnecessary files and folders.

The expired licensing files for the ArcGIS program were renewed on all computers and given an independent address, to prevent the need for annual renewals. This involved reinstalling ArcGIS 9.3 and ArcEditor with the proper license files.

The large collection of photographic slides spanning from the 1940’s to the present, were scanned to create an electronic library of the pictures. They were saved on the shared drive to increase accessibility for reproduction, editing, or printing for other station users. The past Annual Reports of the field station were also scanned to create electronic pdf’s for the QUBS website.

The students worked on many GIS projects during the summer by helping ongoing research projects. One of these projects was the mapping of temporary woodland ponds once a month from April to August. A total of nine ponds were mapped in the field by the students to collect the GPS data, followed by the creation of maps illustrating the ponds changes using ArcGIS. ArcGIS was also used to analyze changes in circumference and surface area of the study sites. Another project that took place was mapping of the locations of the Columbine plants within various properties. For this project the students collected GPS data and created maps and excel spread sheets of the corresponding UTM locations. An additional GIS project for this year, was mapping of the nest locations of American Redstarts. The students went into the field to GPS and then created maps and spreadsheets of the locations. A similar project completed was to GPS the locations of all of the American Redstart microphones set up as a part of another study.

A major task was the creation of a ‘Master Map’ using ArcGIS, containing all relevant layers of information in a single .mxd file. This involved thoroughly searching past maps for layers and adding new layers (such as all Lock Stations and the Rideau Canal trail). The purpose of the master map will be
to make and condense all available GIS information into a single location for increased efficiency and convenience.

In an effort to increase the amount of map information on ArcGIS, trails were GPS’d on the Hughson, Bracken and Massasauga Tracts. Property lines were also GPS’d to update changes in land ownership and correct errors in property lines for Bracken and Hughson Tracts.

The students aided with community outreach projects that took place during the summer. This included constructing several new display boards and posters for the July open house. The students collected 8 live snake specimens and supervised the snake and GPS/GIS booth for the event. Students also created a new poster and helped man the information booths at the Festival in Newboro in August.

This year, the students interacted with several incoming field courses and a Kingston school group. The students presented their new, student-friendly PowerPoint on GIS and GPS-ing and took the school group on a GPS activity around the property to demonstrate the use of the GPS equipment and importance of their work.

Acknowledgements

QUBS has become a very busy field station with a multifaceted role to play in research, education, conservation and outreach. A lot of the success of the station is due to the dedication of our staff in core roles, especially general maintenance and foodservice. Thanks to Roger (Rod) Green, our Maintenance Assistant, our Food Service Staff – Veronika Jaspers-Fayer (Head Cook/Kitchen Manager), Angela Baldwin, Helen Crowe and Alaina Jaspers-Fayer and our Cleaning Staff, Klara Jaspers-Fayer and Cody Acton. Don Best and Jessica MacQueen also helped out by scraping and painting Curran Cottage in late summer.

QUBS Properties

Agreement Properties

This category includes property which is not owned outright by QUBS/Queen’s. As a result of developing partnerships with other Non-Government Organizations with similar aims in conservation and stewardship, acquisitions of significant lands may be done by collaboration and sharing of effort. Below is outlined a recent successful acquisition, a three-way effort between QUBS, the Rideau Waterway Land Trust and Nature Conservancy Canada.

During 2009 and 2010, ongoing discussions with the Nature Conservancy of Canada are/have been focussed on Elbow Lake – a property just to the southeast of current QUBS holdings. Nature Conservancy Canada has purchased the property and we are working with them to lease the buildings for use as an interpretive and outreach centre and perhaps to become a full partner in the entire property. Discussions are under way to delineate a lease-to-own arrangement that will permit QUBS-sponsored outreach programming next year.
Sugarbush Island – James H. Fullard Nature Reserve

Sugarbush Island was on the market and local interest was high in its preservation, championed by local residents Vince Watters and Dianne Clipsham. They were looking for support of an initiative to preserve the area. When they came to QUBS, of course we were interested – the island is well known to QUBS researchers and is within a Class I wetland, home to many rare and interesting species. It was soon determined that QUBS was not in a position to make and outright purchase of the property, so we played a supportive role. The costs of the appraisal was paid from the QUBS Land Trust Fund. Working with the local Rideau Waterway Land Trust and the Natura Conservancy of Canada, a deal was struck to effect the purchase. In the name of Dr. James Fullard, whose recent death was noted above, contributions to the purchase were made to NCC. Thirty percent of the purchase price was raised through this means, which gave effective naming rights to the property. Thus, the property of Sugarbush Island has become the James H. Fullard Nature Reserve, in honour of a long-time user of QUBS and staunch conservationist. Title to the property is held by RWLT and QUBS is involved in ongoing monitoring, study and the development of a management plan for the property.

Hughson Farm

In 2010, the Hughson Farm was used for studies of Tree Swallows (endocrine studies, populations and survival/recruitment), American Redstarts, American Goldfinch, Yellow Warblers, *Dendroica* warblers, road noise on bird vocalizations, frog phenology, damselflies, dragonflies, hoverflies, moths, butterflies, water mites, Largemouth Bass, Smallmouth Bass, Pumpkinseed Sunfish, Central Mudminnow, cortisol stress in various fish species, bats, plant competition (seed quality, size of plants), plant growth and reproduction, herkogamy in Red Columbine, floral variation in Wild Blue Phlox, food webs in ponds and nitrogen and carbon cycling.

The various bird box grids were used by Dr. Fran Bonier, taking over from Dr. Raleigh Robertson upon his retirement, and her students for work on Tree Swallows.

Rotation plots in the Lane Sargent field were used by Dr. Aarsen’s lab for a variety of projects. The fenced plot in the New Barn Field is maintained for plant competition studies.

Haying of the open fields was done by and Ken Young in 2010.

Bonwill Tract

The Bonwill Tract was used for studies of American Redstarts, Cerulean Warblers, *Dendroica* warblers, frog phenology, pond amphibians, damselflies, dragonflies, water mites, Largemouth Bass, plant competition (seed quality, size of plants), plant growth and reproduction, food webs in ponds and carbon/nitrogen cycles in 2010.

The Ontario Ministry of Natural Resources (Eric Boysen - Kemptville) maintains several growth and yield plots flanking the Bedford Road. Canadian Wildlife Service Forest Bird Inventory plots are located within the Bonwill Tract, lying north and east of the Wire Fence Field. Haying of the wire fence field was not done in 2010 to allow development of growth plots for Dr. Aarsen’s research team.
John M. Cape - Charles Sauriol Environmental Studies Area

The Cape-Sauriol Tract was used for studies of Map Turtles, amphibians in ponds, food webs in ponds, Largemouth Bass, Smallmouth Bass, Bluegill, Pumpkinseed and water mites in 2010.

Initial investigations of the Bell and Claxton mine site near the Mill Pond (Pothole Lake) was undertaken in late summer and fall.

Hilda and John B. Pangman Conservation Reserve

In 2010, the Pangman Reserve was used in studies of American Redstarts, Cerulean Warblers, Dendroica warblers, deer browse (exclusion plots), frog phenology, amphibians in ponds, Largemouth Bass, Northern Pike, Bluegill, dragonflies, damselflies, water mites, zooplankton community ecology of lakes, predator-prey systems and Copper in lakes, food webs in ponds, herkogamy in Red Columbine, floral variation in Wild Blue Phlox and plant growth and competition.

With a severe winterkill in Warner Lake, the Lotek Ecological Observatory was used sparingly to monitor the movements of the remaining Largemouth Bass. Transmitters implanted in bass enable 3D locations along with pressure (depth) and temperature data. Pumpkinseed Sunfish from Warner were also used for studies of stress.

In Lindsay and Poole Lakes, Northern Pike were implanted with PIT (Passive Integrated Transponder) tags as part of a long-term study on growth, behaviour and movements of pike.

West of the Lindsay Lake Road, five deer exclosures were monitored to study of the impact of deer browsing on local vegetation. This will be a long-term study.

The Lindsay Lake Road continues to be a popular place for nature hikes and local history walks by various groups.

Bracken Tract

The Bracken Tract was an important site for studies of Golden-winged Warblers, Dendroica warblers, Yellow Warblers, Song Sparrows, American Goldfinch, road noise on bird vocalizations, frog phenology, plant competition (seed quality, size of plants), carbon and nitrogen cycling and a resource addition experiment in plants in 2010.

Drs. Lonnie Aarssen and Paul Gorgan established a dedicated plot just north of the mine entrance to investigate the critical requirements of plants in a controlled study. This will be a 10-year project aimed at delineating the importance of various factors (water, nutrients, competition, grazing, soil properties) to plants.

In fall, the property was intensively used by students from Geology 221 (Geological Field Methods). Doug Archibald and his students lay out baselines and pickets. With regular sampling, the students determine the stratigraphy of surficial sediments (lacustrine clay and/or sand over till for the most part) using soil augers. In addition, a magnetometer survey determined the location of the buried
contact line between the gneiss and the very magnetic gabbro that hosts the magnetite. This work is of interest since the area used to be the site of the Matthews Mine, a very successful iron (magnetite) mine.

Tim Tobin was permitted to graze cattle on this tract in exchange for keeping an eye on the property. Ecologically, the cattle will help to keep some of the property in early successional stages.

**Moores Tract**

In 2010, the Moores Tract was used in studies of Black-capped Chickadees, Yellow Warblers, American Goldfinch, frog phenology and water mites.

**Crabbe Property**

The Crabbe House has again been a base of operations for study of Song Sparrows in 2010. A neighbour, Jim Hales, has been engaged to cut the grass on a regular basis.

**Massasauga Tract**

The Massasauga property was used in studies of Yellow Warblers, *Dendroica* warblers, frog phenology, road noise and bird vocalizations and carbon and nitrogen cycling in 2010. The plots with deer fencing were removed from the Quonset field and an adjacent field as the study of the invasinesess of *Silene* has wrapped up.

Ken Young uses the barn for cattle and hay. The open fields were hayed by Ken in 2010. Camp Outlook made use of the property for hiking and camping in fall and winter.

**Boston Wildlands**

The Boston Tract was used in studies of *Dendroica* warblers in 2010. A start was made on investigating the "mystery road" which apparently runs/used to run through the property.

The Boston family will continue to monitor the property and, by agreement, have limited use of the property for maple syrup, wood cutting and recreation.

**Queen's Point**

In 2010, the islands and mainland property of Queen’s Point were used for studies of Black-capped Chickadees, American Goldfinch (aviaries), Yellow Warblers, frog phenology, *Map Turtles*, bats, *Largemouth Bass*, *Smallmouth Bass*, *Bluegill Sunfish*, *Pumpkinseed Sunfish*, various fish species and stress, various fish species and muscle physiology, moths, fireflies, water mites and zebra mussels.

Some necessary repairs were made to the boardwalk to Cow Island. The interpretive trail to Cow Island was completed, replete with a self-guided leaflet and numbered stations provided by the OSPREY students from Opeongo High School and their teacher, Mr. Tim Demmons (a QUBS alumnus).
Animal Care, Safety and Training

Animal Care

In November of 2001, a specific policy on animal care was put into place for QUBS. The policy meshes animal care at the field station with University Animal Care Committee (UACC) protocols and approvals. All QUBS users must adhere to the QUBS policy guidelines (http://biology.queensu.ca/~qubs/AnimalCare.pdf).

As ethical field researchers and educators, animal care issues are of paramount importance and the welfare of any animal which is the subject of either field or lab study must be foremost in planning and procedures.

Summary of requirements and procedures (get the full policy at website above):

- All activities involving vertebrates must obtain UACC approval
- Activities include: collecting, capturing, tagging, marking, handling, biosampling and housing
- Housing is short-term (less than thirty days)
- Non-Queen's researchers must provide a copy of approved protocol(s) from the home institution along with Animal Use Data Form (AUDF) to Queen's UACC for review.
- Copies of all protocols will be kept with UACC and at QUBS
- Copies of permits should be filed with UACC and QUBS

Dr. Andrew Winterborn is Queen's University Veterinarian and Director of University Animal Care. He is available for discussion of animal care issues at andrew.winterborn@queensu.ca. UACC communications can also be accessed/delivered at UACC@queensu.ca or via Natalie Kolomeitz Douglas, Secretary UACC

Off-Campus Activity Safety Policy

As of September 2004, Queen's University has adopted a new Off-Campus Safety Policy (OCASP) which supersedes the previous Field Safety Policy. Under the new policy, QUBS is considered to be off-campus, so all of the provisions of the new policy apply to activities at QUBS. The policy document and supporting material can be accessed at http://www.safety.queensu.ca/policy/activity.

All Queen's Principal Investigators are required to complete safety planning records in advance of arrival at QUBS, which include risk assessment and risk management. Further, PIs must conduct information sessions with their field and/or lab workers and establish principles and procedures for safety in the field and/or lab. Non-Queen's PIs should undertake a similar process using the materials provided by OCASP as a guideline.
Workplace Hazardous Materials Information System

Queen’s University has made it mandatory for all employees to have current training and certification under WHMIS. Under new regulations, all lab workers must have training and must renew this training each year. Even office workers and others not directly working in labs must have exposure to WHMIS training. If a lab uses any chemicals at all at QUBS, it is imperative that all lab workers have WHMIS training. Please arrange for this well before arriving at QUBS.

QUBS is not an appropriate place for extensive chemical usage. Each PI must supply a list of chemicals brought to QUBS when application is made for space. All chemicals brought to QUBS must be accompanied by current MSDS (Material Safety Data Sheets). These sheets must not be more than 3 years old. Place MSDS sheets in the binders at the entrance to your lab.

Bring only small amounts of chemicals to QUBS. Discuss appropriate safe storage, handling and proper disposal with QUBS safety officer, Manager Frank Phelan.

Watercraft Safety

In compliance with current legislation, all users of QUBS motorboats must have proof of operator competency. There are a variety of means of obtaining proof of competency, via local courses or web-based training/testing. A good place to start looking for information is the Canadian Coast Guard (http://www.ccg-ggc.ca).

Particular care must be taken when operating QUBS boats, both for safety reasons and because of visibility. Our boats and personnel are easily identified. Therefore, operation of these vessels must be beyond reproach.

Regulations are currently changing. Under new legislation, all QUBS vessels will be considered as commercial vessels. Transport Canada will soon recognize only two classes of vessel - either pleasure craft or commercial craft. Inspection and certification of all QUBS boats will need to be done by Transport Canada. Our two new pontoon boats (DMH II and DMH III) have arrived and are ready for use. These vessels must be piloted by a captain with MED A3 training and are limited to 11 persons (10 passengers and the captain). A session for MED A3 training was held in summer, instruction by Navtex (Ray Throop – Kingston Coast Guard Captain). Depending upon interest and need, we can arrange further courses for this training through Captain Ray.

All-Terrain Vehicle Safety

All-terrain vehicles are considered research tools at QUBS. While ATVs are useful tools, especially when equipment must be carried into remote areas, ATVs are also expensive and potentially dangerous. All operators must take a training program before operating ATVs. Proof of training from an established authority is acceptable. For those requiring on-site training, QUBS uses the program developed by 4-H Clubs. Study of safety material and passing a written test, followed by a practical test aboard an ATV is required.
Drinking Water Safety

In the aftermath of Walkerton, stringent regulations were put into place for all water systems in Ontario. QUBS has complied with these as a small, non-municipal drinking water system with a well supply.

To obtain compliance, the following has been done:

- Inspection by a professional engineer (March 2002)
- UV units installed to treat all incoming well water
- Certification of QUBS staff in operation of small drinking water systems (June 2002)
- Weekly water testing for microbiological parameters (Accutest - Kingston)
- Multiparameter test of chemicals, minerals, pesticides and radionuclides (June 2002) - next test in June 2007 - done - all OK
- Weekly check of water treatment equipment
- Replacement of main septic field as suggested in Engineer's report (fall 2003)
- Annual report filed with Ministry of Environment (May 2004)
- Application to halve the frequency of sampling (May 2005) - we sample water for microbiological parameters every two weeks

We are fortunate that our well provides a good quantity of quality water. Nevertheless, QUBS is in full compliance with current regulations and staff make every effort to ensure the continuing safety of our drinking water.

Fire Safety

QUBS users are probably unaware that monthly fire and general safety inspections are undertaken by QUBS staff at the first of each month. All fire extinguishers, alarms, monitors, first aid kits, eyewash stations etc. are checked in all labs and accommodations. In the process, a check for any and all safety hazards is made across the station. The portable fire pump is also tested and emergency procedures reviewed. When possible, familiarization tours with the local volunteer fire department are conducted so that they can appreciate the requirements of QUBS before arriving during an emergency.

QUBS staff is committed to providing a safe environment at QUBS.

Renovations and Additions

A summary of various projects in 2010:

The Workshop overhangs were levelled – frost had heaved some of the footings. The old woodstove stove was removed and replaced with a renovated airtight stove from MacLean Place garage.

At the MacLean Place – all the old wiring in garage was removed – all breaks in the walls and ceiling were repaired – the inside room was removed – the west facing windows were removed (they were broken) and replaced with plastic greenhouse panels – the outside was wrapped with Typar – new garage doors were installed (Commercial Door Systems) – the rear door was strengthened and security bars added - all old junk was removed from grounds – in the house, all fixtures and miscellaneous were removed. The garage is now functional as a large storage space.
In Maplewood Cottage – the bathroom was repainted with mildewcide paint – the small bedroom was also painted

In Curran Cottage – the shower room was remodeled - a new shower with curved glass doors was installed – the shower enclosure was sheathed with cement board and covered with tiles – a new vanity and fixtures were installed – the room was newly painted with mildewcide paint - a new mirror and floor covering finished the reno. In addition, the two two-piece bathrooms were fitted with new vanities and fixtures. In late summer, the exterior of building was completely scraped, primed and painted with two topcoats

In Keast Cottage – the old shower enclosure was removed - cement board added to the enclosure and covered with new tiles – the old shower doors were then reinstalled

In the Boathouse – new front (facing the lake) double doors were built – in the upper lab, old cabinets were removed and replaced with two new worktables to provide more open, useable space – the upper lab windows were reworked – cut in half to allow easy opening

In Ironwood Cottage – reroofing of house with steel over wood strapping and edging (C/W Roofing – Newboro) - window trim and buildouts were finished throughout - a new ceiling (drywall) and closets were added to the main bedroom (basement) – a new small cedar deck was built on the lake side

In the Lodge – digital signage was installed in the entryway courtesy of the QUBS Endowment Fund - the ceiling (drywall) in the men’s bathroom was replaced after being damaged by water leaking from the ice machine above – new paint (mildewcide) was applied to finish the project - to enable better air circulation in the conference room downstairs, a new heating supply and return system was installed in fall (Brunet - Kingston)

In Cedar Cottage – a new refrigerator, beds, dressers were installed to complete the outfitting of this cottage

At Cabin 9 – old cabin 9 was removed – a new Cabin 9 was built in a higher location nearby – the new cabin is our Bunkie Senior style – this one is complete with a maintenance-free exterior (vinyl siding)

At Basswood Cabin – the old shingles were removed from the roof and a new galvalum roof replete with aluminium soffit and fascia was installed – the old glass-on-glass sliders were removed and replaced with new vinyl sliding windows – new doors, steps and vinyl siding completed the makeover

Aquarium – repaint all walls and ceilings with mildewcide paint

Considerable time was spent developing plans for new aviary (Paul Martin CFI) to be built in 2011 below the barns at the Hughson Farm

In fall a new small truck was purchased – 2010 Toyota Tacoma – the extended cab should allow more versatility in terms of carrying gear and passengers when required

A new high-efficiency clothes dryer (coin-op) was purchased to match the washer courtesy of the QUBS Endowment Fund
OUPFB Field Courses 2010 held at QUBS

February 19 – March 4 – Winter Ecology – Dr. Paul Martin (Queen’s) – TA Catherine Dale – 11 students

May 2 – 15 – Amphibians and Reptiles – Dr. Steve Lougheed (Queen’s) and Dr. Gabriel Blouin-Demers (U Ottawa) – TAs – Scott Taylor (Queen’s) and Catherine Millar (U Ottawa) – 10 students

May 2 – 15 – Plant Reproductive Ecology – Dr. Chris Eckert (Queen’s) – TA Sara Dart – 14 students

August 15 – 21 – Insect Taxonomy and Ecology – Mr. Marvin Gunderman (McMaster U) – TA – David Cheung - 5 students

August 13 – 25 – China-Canada Exchange Course – Dr. Yuxiang Wang (Queen’s) and Dr. Min Sun (Fudan U) – 14 students

August 15 – 28 – Wildlife Ecology – Dr. Greg Bulte (U Ottawa) – 1 TA (shared among several) - 12 students

Other Field Courses offered at QUBS in 2010 (non-OUPFB)


August 12 – 21 – River Habitats and Hydraulics – Drs. Rick Cunjak and Michelle Gray (Canadian Rivers Institute, University of New Brunswick) – 14 students
Summaries of Research Work Carried Out at QUlS in 2010

Dr. Lonnie W. Aarssen
Department of Biology, Queen’s University

Plant Ecology and Evolution

Research in this lab focuses on the interpretation of adaptive strategies for growth, survival and reproduction in plants along environmental gradients and how these strategies help to explain patterns in the abundance, distribution and diversity of organisms, taxa, biomass and productivity within and between habitats.

Dr. Lonnie Aarssen and Dr. Paul Grogan (Department of Biology, Queen’s University)

“Long-term resource addition experiment.”

A long term experiment at the Bracken Tract was initiated in the summer of 2009 in a field near the old mine shaft. Set-up and installation of treatment apparatus continued in 2010, together with baseline plot data collection for soil properties and species composition. The study involves 240 plots measuring 2 m x 2m each, with treatments involving rain-out shelters, enclosures to prevent deer grazing, annual soil nutrient manipulation, and weekly plot watering during the growing season. Treatments will continue for 10 years, and both vegetation and soil sampling will be conducted periodically. This project represents the first large-scale, long-term test of whether, in non-arid habitats, water or nutrients is the most limiting resource affecting productivity, plant competition, and community structure and assembly in natural vegetation. This study will also permit an examination of how these soil resource effects depend on the effects of deer and rabbit herbivory (using caged versus uncaged plots). As the project unfolds, the plots will also be used to explore several questions about effects of water and nutrient limitation on functional plant traits, phenotypic plasticity, competitive interactions, diversity, species composition/coexistence, and associated soil properties.

Assistants: Sarah Dombroskie, Stephanie Wight, Tomo Nishizawa.

Acknowledgements: Funded by NSERC research grants to Lonnie Aarssen and Paul Grogan.

Tomo Nishizawa -“The relationship between seed quality and maternal plant size in crowded vegetation.” – BSc(Hons) Thesis.

Most natural plant populations are crowded and display a prominently right-skewed distribution of body size, i.e. the majority of the resident plants are relatively small, suppressed weaklings that manage to survive and reproduce despite severe competition. In fact, recent studies have shown that the vast majority of the collective offspring production for the next generation within crowded populations comes from resident plants belonging to the smaller half of the plant size distribution. However, the question remains: is the quality of these offspring just as high as for the offspring produced by the biggest plants? The implication is that if the quality of seeds from relatively small plants is as high as from large plants, this validates the interpretation that under intense crowding/competition, gene transmission to future generations is facilitated not so much by being able to produce offspring that have a large maximum
potential body size, but rather by being able to produce offspring, that—although mostly severely suppressed—are nevertheless able to produce at least some offspring of their own. Accordingly, several species were sampled in 2010 to test the hypothesis that the quality of seeds (reflected by seed mass and nitrogen content) produced by the smallest reproductive plants within crowded populations does not differ significantly from that produced by the largest plants.

**Assistants:** Sarah Dombroskie, Stephanie Wight

Acknowledgements: Funded by NSERC research grant to LWA.

**Stephanie Wight** – “Effects of big plants on neighbourhood species richness and size distributions in herbaceous vegetation.” – MSc Thesis (co-supervision with Brandon Schamp, Algoma University).

According to traditional plant competition theory, and evidence from several plant competition experiments, relatively large species are generally better competitors, particularly for above-ground resources, and are expected therefore to limit the number of species that can coexist with them. However, several recent field studies have shown that the sizes of coexisting species are neither more similar nor more different than expected by random assembly—in both herbaceous, and woody vegetation—and that larger species in woody vegetation do not generally limit the number of species that can coexist within their immediate neighbourhoods. In the present study the latter is investigated for herbaceous vegetation. In 2010 plots were surveyed to test the following hypotheses: compared with randomly chosen neighbourhoods of equivalent area (but not dominated by relatively large species), those that are dominated by relatively large species within vegetation: (1) do not contain fewer resident species (contrary to traditional theory); and (2) do not locally exclude relatively small species (contrary to traditional theory); and in fact have greater representation of relatively small species (that are generally more reproductive than the resident larger species)

**Assistants:** Sarah Dombroskie, Tomo Nishizawa

Acknowledgements: Funded by NSERC research grant to LWA.

**Theses** (involving work done at QUBS):

Tracey A. 2010. Species size and reproductive economy in vegetation. BSc(Hons) Thesis, Queen’s University.

Dante, K. 2010. Organization of Plant Communities with respect to Flowering Phenology. BSc(Hons) Thesis, Queen’s University.

**Publications** – last two years (involving work done at QUBS):


Dr. Shelley Arnott – Environmental Studies, Queen’s University and

Dr. Greg Pyle – Biology, Lakehead University

Colleen Inglis – “Response of Daphnia to the predator Chaoborus” – MSc Thesis, co-supervised by S. Arnott (Queen’s) and G. Pyle (Lakehead)

Colleen conducted a study to assess variation in Daphnia response to the macroinvertebrate predator, Chaoborus, under a range of environmentally-relevant copper concentrations. Daphnia respond to a kairomone that Chaoborus release into the water by altering life history characteristics, such as age of first reproduction, number of neonates produced in each brood, and the body length of the neonates. We compared the response of Daphnia from several lakes in the Sudbury-region (and area with a history of metal-contamination) to uncontaminated lakes in the Muskoka-region and in QUBS. There was high variation in Daphnia response to Chaoborus in the absence of Cu. When exposed to Cu, Daphnia from contaminated lakes tended to retain their ability to respond to Chaoborus kairomone whereas Daphnia without previous exposure to metals in uncontaminated lakes could were not able to respond to Chaoborus kairomone when exposed to Cu. This suggests that Daphnia in contaminated lakes may have adapted to high metal concentrations in the water column. Amanda Bresnehan, an MSc student working with S. Arnott, is currently testing this hypothesis by comparing Daphnia response to Cu and Chaoborus before and after regional metal contamination using zooplankton populations hatched from each time period.

Dr. Gabriel Blouin-Demers - Department of Biology, University of Ottawa, Ottawa

Behavioural and Physiological Ecology of Reptiles

Our long-term research objective is to decipher how behaviour and phenotype, modulated by physiological constraints, affect whole-organism performance and, thus, fitness-related life-history traits. We use a functional evolutionary approach and most of our work integrates controlled laboratory experiments with field observations. Because reptiles are, proportionally, the most threatened vertebrate group in Canada (according to COSEWIC listings), another long-term objective in our laboratory is to contribute to their conservation. In 2010, in addition to the projects listed below, we continued our demographic monitoring of map turtles in Lake Opinicon in collaboration with Dr. Grégory Bulté.
Nicola Banger - "Fecundity selection and multiple paternity in the map turtle, Graptemys geographic" - MSc Thesis co-supervised by Dr. Steve Lougheed at Queen's

Although it has long been recognized that males of many species can increase their reproductive success by mating with multiple females, corresponding benefits of female promiscuity have only recently been recognized. Multiple mating by females is widespread and females of many taxa often produce progeny sired by multiple males. In map turtles, females receive no direct benefits such as nuptial gifts or parental care from males. Therefore we may expect that females that mate multiply may derive genetic benefits (inferred from variation in offspring fitness.) However, variation in offspring fitness could simply be a result of maternal quality, affecting the number of mates a female can attract, rather than a product of the number of mates. In other words, fitness of the offspring may be related to either the behavioural or the physiological characteristics of the female. In this study I propose to investigate the relative importance of these possible explanations.

Assistant: Dalal Hanna

Dalal Hanna - "Effect of road noise on red-winged blackbird vocalizations" - Bsc Thesis in collaboration with Dr. Dan Mennil at Windsor

The objective of this study will be to evaluate if redwing blackbirds' increase the minimum frequency of their vocalizations in areas with anthopogenic noise disturbance. Through this study, I hope to provide additional support to the limited current literature concerning the effect of anthropogenic noise on this species' as well as the mechanism by which they may adapt to noise.

Publications:


Theses:


Dr. Frances Bonier – Department of Biology, Queen’s University

**Field Endocrine Studies of Tree Swallows**

Our research focuses on causal and correlative relationships between environmental challenges, hormonal responses, and reproductive success in tree swallows. In previous years we documented natural correlations between these parameters, with stress hormone levels measured early in breeding negatively correlating with reproductive success, while hormone measures collected late in the breeding effort positively correlate with reproductive success. This year we continued collecting correlative data from all of the tree swallows breeding in nest boxes at QUBS, and also conducted a study aimed at testing the hypothesis that the energetic demands of the birds’ reproductive investment (i.e., the cost of caring for and feeding the brood) actually cause increases in stress hormones in the parents, leading to the observed positive relationship between these hormones and reproductive success. Those birds with larger broods work harder to feed them, but also fledge more offspring, leading to both high stress hormone levels and high reproductive success. We tested this hypothesis by manipulation the tree swallows’ brood size (either increased or decreased by 2, or a control swap with 2 nestlings removed and 2 “foreign” nestlings added). We predict that with experimentally enlarged broods, the adults should have to work harder to provision their offspring, leading to an increase in their stress hormone levels. This is exactly what we found; females with enlarged broods had greater increases in the stress hormone levels, and females with greater increases in stress hormone levels provisioned their offspring at a higher rate. The results of this study are already in review in a submitted manuscript (submitted in February 2011 to *Biology Letters*).

**Assistants:** Dana Drumm, Ainsley McGregor, Tristan Willis, Emily Dobson

**Collaborators:** Raleigh Robertson and Ignacio Moore

**Dana Drumm - “Is the QUBS tree swallow population in decline?” - B.Sc. Thesis**

Dana completed her thesis in 2010, and came out to QUBS this year to train the new field assistants. The results of her thesis work documenting dramatic declines in the QUBS tree swallow population are currently in preparation for publication.

**Assistants:** Carla Crossman

**Collaborators:** Raleigh Robertson, Steve Lougheed, Bill Nelson, and Wallace Rendell
Tristan Willis - “Do metrics measured on the breeding ground predict among-year survival in Tree Swallows?” - B.Sc. Thesis

Tristan was a field assistant on the brood size manipulation experiment during 2010, and was also working on his B.Sc. thesis. For his thesis, Tristan is mining the 35 year dataset looking for correlates of adult return (survival) in the Tree Swallows. He has found the reproductive productivity is a strong predictor of survival – both males and females that fledge more offspring are more likely to return to the QUBS population than birds with lower reproductive success. Tristan is currently writing up his thesis, and will be preparing his results for publication as well.

Publications:


Dr. Steven J. Cooke - Fish Ecology and Conservation Physiology Laboratory, Department of Biology and Institute of Environmental Science, Carleton University, Ottawa

Fish Ecology and Conservation Physiology

Our laboratory maintains broad interests in all aspects of aquatic ecology, conservation biology, physiological ecology, animal behaviour and environmental science. Much of our research programme is based at QUBS where freshwater fishes are used as research models for experiments conducted in laboratory tanks, enclosures, and experimental lakes. Specific interests are (1) determining the energetic, fitness, and potential evolutionary consequences of a variety of natural (e.g., winter, reproduction) and anthropogenic (e.g., angling, environmental pollution) stressors and, (2) understanding the diversity of energetic, physiological, and behavioural responses of fish to stress at the individual, population, and species level. We then apply the fundamental knowledge derived from these basic research activities to aid in the conservation and management of aquatic resources. Of late, we have been involved with defining the new discipline of “conservation physiology” – a field dedicated to understanding the mechanisms underlying conservation problems. Because our work is heavily based in the field, we rely on technologies including underwater videography and telemetry to monitor free-swimming fish in the wild. Specific research projects currently underway at QUBS include evaluating the sublethal consequences of catch-and-release angling, exploring the physiological correlates of reproduction and fitness in centrarchids (our NSERC-funded research programme), and understanding the factors influencing the spatial ecology of fish.

QUBS Collaborators: Dr. Cory Suski, Dr. Gabriel Blouin-Demers and Dr. David Philipp
Dr. Tom Binder – “Ecology of stress in wild fish” - Post Doctoral Fellow. Dr. Binder provided support to work conducted by Sarah McConnachie and Katrina Cook.

Connie O’Connor – “Endocrine aspects of life-history variation” - Ph.D. Student

Connie used QUBS as a base to conduct research at Millers Lake with Dr. D. Philipp. Summary - As anthropogenic challenges continue to impact our ecosystems, it is becoming increasingly important to understand the physiological and ecological impacts of stress in wild animals. This thesis presents a cohesive and multidisciplinary investigation of the ‘ecology of stress’. Integrating tools from physiological, behavioural, and population ecology, I provide a comprehensive overview of the life-history mediators and individual- and population-level consequences of physiological stress in wild smallmouth (Micropterus dolomieu) and largemouth bass (M. salmoides). First, I demonstrated that in these parental care-providing fish species, regulation of the endogenous endocrine stress response during parental care is correlated with life-history traits. Specifically, larger, older, more experienced parents display an attenuated endocrine stress response when faced with a standardized challenge during parental care. Furthermore, I demonstrated that all parents display an attenuated endocrine stress response when compared with non-parental fish. Using exogenous stress hormone implants, I then determined that a chronic increase in circulating stress hormones during parental care is associated with premature nest abandonment and decreased immune function. The combination of results provides evidence that a robust endocrine stress response serves as a mechanism to reduce investment in current reproductive opportunities, and is influenced by current life-history stage as predicted by life-history theory. Expanding the scope of the thesis, I employed exogenous stress hormone implants to demonstrate that a transient endocrine stress response is associated with long-term carryover effects. Specially, fish treated with cortisol hormone implants exhibited accelerated mortality during a natural challenge that occurred 5 months following the cessation of the initial endocrine stress response. I further demonstrated that a transient endocrine stress response is energetically costly, and is associated with long-term decreases in individual growth rates that are sufficient to cause decreases in population growth rate. As a whole, this dissertation improves our understanding of the ecology of stress by demonstrating that life-history variation underlies inter-individual variation in endocrine stress responses, and by providing potential mechanisms underlying population-level consequences of stress.

Marie-Ange Gravel – “Parental care and predation threats” - Ph.D. Student

Marie-Ange used QUBS as a base for the last year of her Ph.D. data collection on the effects of nest predation pressure on parental bass and their offspring. Summary - Predation pressure is an important ecological variable which can influence the morphology, behaviour, physiology and survival of prey species. A particular focus has been given to individuals engaged in reproduction because traits or behaviours associated with reproduction often make individuals more prone to predation. For many taxa, reproduction also involves specialized parental care behaviours. Under these circumstances, individuals engaged in parental care may not be directly threatened by predators, but guard vulnerable offspring. However, parental care often imposes physiological and energetic costs on parents which can influence their survival. In this thesis, I tested whether variation in nest predation pressure had consequences for parents, as well as offspring. I used a teleost fish that provides male-only parental care as a model (smallmouth bass, Micropterus dolomieu). I used six populations which differed in predation pressure to test a number of hypotheses. First, I tested whether variation in nest predation pressure influenced
parental care behaviour. I found that males from populations with increased nest predation pressure were more often engaged in antipredator behaviours relative to males from populations with lower predation pressure. Second, I tested whether variation in nest predation pressure influenced the cost of providing care. Traditional energetic approaches (i.e., lipid analysis) showed that energy status declined during parental care for all populations but individuals from populations with increased predation pressure did not lose relatively more energy stores. An in-situ approach (i.e., electromyogram telemetry) showed that males from the populations at the opposite extremes of predation pressure differed in overall swimming activity. Third, I tested whether variation in predation pressure influenced indicators of performance in parental males. I found that males from all six populations had similar indicators of swimming performance, a proxy for parental care. Finally, I tested whether nest predation pressure influenced the antipredator behaviour of offspring. Here, I found that offspring from all populations were similarly able to avoid an introduced nest predator. From a physiological perspective, offspring from the site of highest predation pressure had lower active metabolic rates and recovered more quickly from a simulated predator attack compared to offspring from the population with the lowest predation pressure.

Sarah Larocque – “Turtle bycatch reduction” - M.Sc. Candidate

Sarah was leader of a bycatch study (in collaboration with Dr. G. Blouin-Demers) that was intended to quantify and reduce bycatch of at-risk turtles. Sarah developed and tested a variety of tools to prevent turtles from entering nets and to facilitate escape.

Assistants: Graham Raby (M.Sc. student in the Cooke Lab), Keith Stamplescoskie (Lab Manager in Cooke Lab), Paige Watson, Undergrad Thesis Student from Carleton and Vanessa Sangschagrin, Vet Tech Intern from Algonquin College

Sarah McConnachie, Katrina Cook and Alex Nagrodski – “Cortisol dynamics in freshwater fish” - M.Sc. Candidates

These three M.Sc. candidates collaborated on a series of projects to understand cortisol dynamics in a range of freshwater fish. Studies occurs in the wetlab, large tanks on the dock and field and at Warner Lake.

Recent Papers from Cooke Lab based on Work at QUBS


O’Connor, C.M., K.M. Gilmour, G. Van Der Kraak and S.J. Cooke. In Press. Circulating androgens are influenced by parental nest defense in a wild teleost fish. Journal of Comparative Physiology A 00:000-000.


Dr. Christopher G. Eckert – Department of Biology, Queen’s University

Limits of Adaptation in Plants

The research in my lab investigates the process of and limits to adaptation in plants. We are currently tackling two unresolved questions: the evolutionary transition from outcrossing to self-fertilization and the evolutionary limits to species geographic ranges. We also study biological invasions as an opportunity to study evolutionary adaptation in action, and apply the evolutionary and population genetic approaches to the management of plant species at risk.

We use a combination of large-scale geographical populations > surveys, manipulative experiments in natural populations, DNA and protein marker-gene analysis of reproductive patterns & genetic structure, plus a variety of lab-based tools, including > quantitative genetics, developmental analyses, image analysis and computer modeling.

Our field work takes place in a variety of locations across North America and Europe. Currently, we have projects on the coevolution of geographic range limits and the mating system based on the pacific coast of North America, a large-scale analysis of adaptive evolution during biological invasion based in Europe and eastern North America, and studies of mating system evolution and plant reproductive ecology at the Queen’s University Biological Station in eastern Ontario.

Andy Y.-C. Wong – “Herkogamy in Red Columbine, Aquilegia canadensis” - Ph.D. Thesis

Plants are often viewed as passive and perhaps boring organisms, but their sessile nature is in fact an opportunity for bewildering adaptations. I am interested in how sessile organisms such as flowering plants determine the fate of their gametes. Flowering plants have been widely studied because they often have intricate floral structures that help constrain and control its interactions with pollinating vectors. My on-going Ph.D. thesis project investigates just one of these floral structures and its effects on the reproductive success of the Red Columbine (Aquilegia canadensis). Herkogamy is the spatial separation of male and female reproductive organs, and this trait functions to reduce selfing (the plant producing offspring through its own ovules and pollen). The Red Columbine has substantial variation in herkogamy even though producing selfed offspring is very disadvantageous because they almost never survive till reproduction. The maintenance of this variation may be due to contrasting directional selection on herkogamy for male and female reproductive fitness components. Within- individual sexual conflict may explain the seemingly sub-optimal massive variation in herkogamy.

Assistants: Amanda J. Shelley; Lindsey Button (now M.Sc. candidate at SFU).

Victoria Sin – “Floral variation in Wild Blue Phlox, Phlox divaricata” - BSc Honours thesis

I am interested in how aspects of floral trait variation (such as color and petal size) influences seed production in Phlox divaricata (the Wild Blue Phlox).
Dr. Mark Forbes – Department of Biology, Carleton University

Ecological Parasitology

**Dr. Laura Nagel – “Fitness impacts of parasites”** - Postdoctoral Fellow, Ecological Parasitology and Wildlife Health Lab, Carleton University

We use natural populations of Odonates (dragonflies and damselflies) and ectoparasitic aquatic mites to examine patterns of parasitism and host defense. In 2010, my research with Dr. Mark Forbes and Julia Mlynarek focused on testing whether artificial inserts were useful measures of natural immune responses in damselflies. Our study was unique because most researchers working in this area do not deal with odonate populations with such high natural rates of parasitism. Furthermore, there has been precious little testing of whether resistance to parasites co-varies with melanization of implants, as assumed.

**Assistant:** Victoria Putinski

**Dr. Gregory Bulté – “Impacts of invasive species on host-parasites relationships”** - Postdoctoral Fellow, Ecological Parasitology and Wildlife Health Lab, Carleton University.

Invasive species are disrupting many ecological interactions including predator-prey interactions. Indeed, invasive species can outcompete native prey species and thus often become themselves a replacement prey for native predators. Invasive species typically have very few parasites compared to native species; the parasites they acquire tend to be generalists. Thus, individual predators feeding on invasive species may be less exposed to a wide range of trophically transmitted parasites (i.e. parasites transmitted by ingestion of infected prey) but may be more exposed to generalist’s parasites. This idea has never been tested despite the fact that many native predators are known to feed on invasive species and that this phenomenon is likely to become more common as the number and abundance of invasive species is constantly increasing. Zebra mussels are one of the most successful invaders of freshwater ecosystems in Eastern and Central North America. Many wildlife species feed on zebra mussels including the pumpkinseed sunfish. In summer 2010, we use pumpkinseed as a model to test if the diet shift from native molluscs to invasive zebra mussels is affecting the intensity and prevalence of parasites infecting this native fish.

**Assistant:** Victoria Putinski

**Julia Mlynarek – “Geographic range and parasitism”** - PhD Candidate Fellow, Ecological Parasitology and Wildlife Health Lab, Carleton University.

Zygopterans are infected by several types of parasites. Damselflies are most commonly infected by internal parasites known as gregarines. Gregarines are apicomplexan protozoans that develop in the gut of its host. This summer I had the opportunity to learn the intricacies of the system for my doctoral dissertation. I investigated how parasitism levels differ between host species pairs when the hosts are members of the same community. I collected 12 species of damselflies from several marshes, a bog, lake sides and an ephemeral pond. When I was not collecting, I was processing the samples; identifying the hosts, taking host measurements, dissecting the hosts to determine levels of parasitism, and storing the
gregarines for future identification. Due to the lack of baseline data concerning differential parasitism levels of gregarines in damselflies, this data allows us to see if generalisations can be made in the gregarine-zygooptera system. One of the main questions I was addressing this summer was whether geographic range related of hosts related to measures of parasitism by gregarines.

Assistant: Victoria Putinski

Daniel Tocman Gonzales - “Does juvenile hormone influence measures of resistance or parasitism in dragonflies” - Visiting PhD student UNAM - Ecological Parasitology and Wildlife Health Lab, Carleton University

This past summer Daniel tested whether juvenile hormone was associated with either rates of engorgement by mites parasitic on Celithemis dragonflies or degree of encapsulation of nylon implants. He also measured various covariates including fat levels, muscle mass, body size, and controlled for approximate age.

Assistant: Victoria Putinski

André Morrill - “Possible covariation between gregarine and water mites in Lestid sister species” - Undergraduate honors student - Ecological Parasitology and Wildlife Health Lab, Carleton University

My research focus was to investigate whether internal and external parasite of damselflies covaried. While damselflies are potential hosts for a range of parasites, two of their more common parasites are larval water mites (acarids; external) and gregarines (protozoan apicomplexans; internal). During the past summer, I collected hosts from a number of different sites around QUBS while concentrating on the genus Lestes. Having counted the ectoparasitic mites and dissected the damselflies to determine their gregarine loads I am now able to compare expected with actual levels of coinfection. It appears levels of coinfections follow from combining probabilities of infection for the two parasites. With respect to intensity data, a recurrent pattern seems to be damselflies are not heavily infected by both parasites simultaneously.

Dr. Paul Grogan - Department of Biology, Queen’s University

Carbon and Nitrogen Cycling

Our overall goal is to understand the factors that control carbon and nitrogen cycling and pool sizes in the forests and low intensity agricultural ecosystems of southeastern Ontario.

“Carbon and nitrogen dynamics in abandoned agricultural soils of Southeastern Ontario”

We are investigating the influence of soil type and time on patterns of soil carbon accumulation and nitrogen mineralisation as shrublands and forests regenerate on abandoned agricultural lands across the region. Several fields and forests in the QUBS properties have been included in this study. The manuscript on the carbon aspects of the study was published (details below)
“The effects of atmospheric nitrogen deposition on plant productivity and nitrogen cycling in hay fields”

We are investigating the influence of nitrogen availability and soil texture on soil microbial community and plant productivity in hay grasslands using annual nitrogen additions to two sections of Stokes Field on the QUQS property. Fertiliser additions were made in June 2010.

“The responses of forest vegetation to protection from deer”

We wish to determine the influence of deer browsing on plant community structure, tree seedling regeneration, soil communities and biogeochemical processes. We visited the site as part of the BIOL 416 Terrestrial Ecosystems field course, and checked the integrity of the fences. Several large fallen limbs were removed from fences in plots C, D, and E in late December.

“The relative importance of water, nutrients and deer herbivory on plant community structure and primary production in mesic hay grasslands”

This project is a collaboration between Dr. Aarssen and myself and will be the first large-scale, long-term test of whether, in non-arid habitats, water is the most limiting resource affecting plant competition and community structure and assembly in natural vegetation. It is located on the Bracken tract property and contains a total of 240 1 m² plots. We predict that on average, over several years (i.e. including across dry and wet years) water is the most important object of competition and limitation on biomass production in the mesic temperate deciduous forest climatic region of eastern Ontario Canada. In other words, compared with nutrient supplementation, we predict that plain water supplementation within vegetation plots will cause most of the increase in biomass production over control plots. This study will also permit an examination of how this water-limitation effect depends on the effects of deer and small mammal herbivory (using caged versus uncaged plots), and on the effects of between plot variation in local soil water holding capacity (affected by plot elevation, soil texture and soil depth). The fertiliser and herbivore treatments were begun in early summer and late summer 2010 respectively. The watering manipulation infrastructure was manufactured over the summer of 2010. Dr. Aarssen took the lead in coordinating and managing the project and field assistants.

**Assistants:** Dr Linda Cameron (Technician); Tara Zamin (PhD student), Sarah Farrow, Mary Punzel (undergraduates)

**Dr. Stephen C. Lougheed** - Department of Biology, Queen’s University

**Anuran Advertisement Call Phenology & Proximate Predictors of Chorusing**

Frogs are sensitive indicators of environmental change due to their biphasic nature. Indeed anecdotal evidence suggests that some frog species in northeastern North America have shifted onset of breeding markedly earlier over the last few decades, and also that the ranges of some organisms are moving northward presumably in response to climate change. While the former trends are remarkable, they are based largely on anecdotal evidence provided by keen amateurs, and typically are of such broad
resolution that they cannot provide detailed insight into the biology that might underlie such changes in
distribution and timing of breeding. In May 2008 we began a long-term project to study directly temporal
changes in the onset of male calling (a proxy for breeding) and microclimatic correlates of calling for nine
species of frog that occur at the Queen's University Biology Station. In 2008 we put out 11 automated
survey stations, each consisting of a digital audio recorder programmed to record choruses at dusk, and a
data loggers to measure relative humidity and air temperature. In 2009 (beginning in March) we put out
22 survey stations. This year we put out 21 stations again beginning in March. We hope these long-term
data will provide key insights into the proximate factors that control initiation of breeding for Eastern
Ontario anurans, and enhance the possibility for adaptive responses to changing temperature regimes. Our
study also will allow us to better predict responses to continued climate change.

Volunteer Field Assistants: Leonardo Campagna, Luciano Calderon
Graduate Student (starting Fall 2010): Samantha Klaus

Opinicon Natural History Blog (http://opinicon.wordpress.com/)

I created a natural history blog in the summer of 2009 to provide a venue for interesting natural
history observations or new biological insights from Eastern Ontario and particularly from the environs of
our university biological station (see below). The blog has had 16,790 views as of Monday March 7th
2011. The site also provides us with a venue for publication of what we hope ultimately will be a book of
the natural history of QUBS (& environs). We envision a series of chapters spanning topics like
topography, geology, soils, hydrology, and climate (Section 1), and another series of chapters on
vegetation patterns, phenology of particular organismal groups, invasive species and cultural history of
the region (Section 2). For the penultimate suite of chapters (Section 3) we will include species accounts.
Obviously we cannot include all species but we had thought to include accounts of a suite of focal species
that are of research interest to particular people or are particularly emblematic of the region. The
chapters are to be written by students (senior undergrads or grads), faculty or other interested natural
historians. Each chapter will be reviewed by two experts. The target audience is intended to be broad,
spanning both educators and scientists, but also the educated lay public. Thus far we have 9 completed
and reviewed species accounts (3 amphibians, 3 reptiles, and 3 birds), plus a chapter on the soils and
vegetation at QUBS. We have a number of other chapters in various stages of preparation or review and
anticipate many more in 2011.

Editorial Assistant: Natalie Morrill

Dr. Beth MacDougall-Shackleton, Department of Biology, University of Western Ontario

Mating signals, genetic variation and disease resistance in songbirds

Research in my lab focuses on the interactions between mating strategies, disease resistance, and
population genetic structure within and among wild songbird populations. Our overall objective is to
understand how mating behaviour and gene flow interact to shape birds’ ability to produce healthy
offspring. My students and I combine cutting edge genetic and immunological techniques with intensive,
long-term field studies of free-living songbirds. To this end, we have studied the breeding biology of song sparrows breeding at the Bracken tract for several years.

In 2010 we expanded the geographic scale of our longterm study site, with PhD candidate Yanina Sarquis-Adamson collecting genetic samples from song sparrows breeding in other QUBS properties and farther afield, to conduct genetic assignment tests and identify the source population of birds immigrating to Bracken from elsewhere. These data will inform our research on local adaptation and population connectivity. In an ambitious common-garden experiment, PhD candidate Kim Schmidt collected and hand-reared nestlings fathered by males with high versus low song complexity, and is now examining their song complexity and stress profiles. MSc candidate Shawn Kuhli initiated another new research direction, assessing multiple measures of innate immune function and asking whether male song complexity or vocal performance function as honest advertisements of immunocompetence. MSc candidate James King continued our ongoing study of inbreeding and outbreeding depression in this large and open population, examining the degree to which heterozygosity at expressed versus nonexpressed microsatellite markers predicts song complexity. MSc candidate Ainsley Furlonger examined relationships between different components of the stress response, and how variation in stress responsiveness relates to variation in fitness. Our research program was also supported by, and provided research opportunities for, NSERC USRA winners Sommer Foster and Julia Burke.

Publications:


Theses:

Kewin, Jenna: MSc conferred August 2010. Genetic Diversity, Fitness and Behavior in Song Sparrows.

Lapierre, Janet: MSc conferred June 2010. Song as a Multi-component Signal in Song

Dr. Paul Martin - Department of Biology, Queen's University

Biodiversity in Birds

We are broadly interested in how biodiversity forms and why biodiversity varies across the globe. We study how populations diverge from one another and adapt to their local environments (Vanya Rohwer), the process of allopatric speciation, how new species come into secondary contact and sympatry to increase local diversity (Mark Conboy), and the evolutionary causes of latitudinal variation in diversity. We also study species of conservation concern, including the Cerulean Warbler.

Vanya Rohwer - "Local adaptation in nest structure between two populations of Yellow Warbler, Dendroica petechia." MSc. thesis

Yellow Warblers at Churchill, Manitoba build large, bulky nests, presumably as an adaptation to the cold environment, while Yellow Warblers at the Queen's University Biological Station build thin-walled nests that presumably require fewer trips to construct and provide less of a cue for nest predators. Vanya used intensive video-taping and nest transplant experiments to test the fitness benefits of having local nest structure. Vanya collected nests from QUBS and transplanted them to Churchill, Manitoba. At Churchill, he substituted QUBS nests for Churchill nests during incubation (experimental), and other Churchill nests for Churchill nests as a control. Vanya's experiments were successful. In response to the switch, female Yellow Warblers changed their incubation behaviours to cope with reduced insulation of nests.

Mark Conboy - "Ecological differentiation and coexistence in Dendroica warblers." MSc. thesis

Warblers in the genus Dendroica represent the largest radiation of breeding birds in the QUBS region. Mark is studying the spatial patterns of occurrence of Dendroica warblers, and how they differ in habitat use. Mark randomly selected individual territories from across all of the QUBS properties, colour-banded the males, and mapped territories (with the help of four field assistants). He later measured details of vegetation from within the territories of focal males. Mark's work will address how new species come
together in sympatry, and how spatial and habitat relationships between species change over evolutionary time.

Mark Conboy - "Population size of Cerulean Warblers on QUBS properties."

Cerulean Warblers are a species of concern globally and were recently listed as endangered in Canada. Mark and Liz surveyed QUBS properties for Cerulean Warblers and coloured banded 70-80 males to estimate overall population size. We estimate approximately 100 pairs of breeding Ceruleans on QUBS properties based on this work.

Assistant: Elisabeth Purves
Collaborator: Dr. Raleigh Robertson

Elisabeth Purves - "Insight into a possible honest signal of quality in male Cerulean Warblers (Dendroica cerulea)." Honours thesis

During banding of Cerulean males, Liz photographs and measured the amount of white on the rectrices (tail feathers) and took a small blood sample to measure blood parasites. For Liz's honours thesis, she tested the hypothesis that the amount of white in the tail of male Cerulean Warblers varies with age, size, and body condition.

Assistant: Mark Conboy
Collaborator: Dr. Raleigh Robertson

Publications:


Theses:


Rohwer, Vanya G. 2010. Evidence for local adaptation in birds and fitness consequences and selective mechanisms favouring local nest morphologies in Yellow Warblers: nest transplant experiments between subarctic and temperate populations. MSc Thesis, Queen's University.

**Dr. Daniel Mennill - Department of Biological Sciences, University of Windsor**

The Ecology and Evolution of Communication Systems and Mating Strategies in Birds

The goal of my research program is to explore the astonishing complexity of vocal behaviour in birds. Together with my students, I use a combined field-based and laboratory-based approach to study conflict and cooperation in the communication behaviour and breeding activities of wild birds. Our research includes detailed studies of colour-marked populations of birds in the tropics (at Santa Rosa National Park, Costa Rica) and in the temperate zone (at QUBS).

In 2010, our QUBS-based research focused on studies of Black-capped Chickadees, with a focus on the *chick-a-dee* alarm call and the *fee-bee* song. In addition to the research by Dr. David Wilson (MRI and NSERC Postdoc), Tyne Baker (MSc) and San Dundas (BSc) described below, we continued to collaborate with Dr. Beth MacDougall-Shackleton and her student Janet Lapierre on studies of QUBS Song Sparrows. We wish the best to Dr. Jennifer Foote (Mennill Lab NSERC Postdoc and long-time QUBS collaborator) the best as she begins her faculty position at Algoma University in Sault Ste. Marie.

Full details of the Mennill Lab, including photos of the QUBS research team, are available at my homepage: [www.uwindsor.ca/dmennill](http://www.uwindsor.ca/dmennill)

**Dr. David Wilson – “Complex communication by Black-capped Chickadees” – Postdoctoral Research 2010**

The “*chick-a-dee*” call of Black-capped Chickadees is a structurally-complex signal that conveys food- and predator-related information to a broad audience, which includes other chickadees and other avian and mammalian species. Although it is considered to be one of the most sophisticated signalling systems known, the basic mechanism by which it communicates information is unclear. Previous research suggests that variation in the number of “*dee*” notes is important, but this structural trait has not been tested independently from other signalling traits such as calling rate. My research examines the behavioural responses of chickadees and other species to carefully manipulated “*chick-a-dee*” calls, with an overall goal of understanding how chickadees communicate complex information. The results of my playback experiments show that neither calling rate nor the number of “*dee*” notes per call sufficiently explain receiver responses. Rather, it is the combined effect of these two parameters on the overall vocal output of the signalling sequence that is critical. When vocal output is high, both conspecific and
heterospecific receivers are more likely to approach the signaller and, ultimately, the predator or the food source that initially evoked the calls.


Many animals engage in territorial contests to defend mating or food resources. These animals may use a variety of signalling modalities to communicate their presence on and willingness to defend these spaces. Songbirds use acoustic signals in their ritualized singing contests to ward off rivals. I study these contests in male Black-capped Chickadees on the QUBS main property. Specifically, I use passive playback coupled with presentation of a taxidermic model to examine males’ vocal reactions to simulated territorial intruders. I will examine the vocal behaviours that immediately predict attack and any patterns that indicate a graded signalling system. In the winter, prior to the spring playback study, I observe dominance interactions between males at feeders to assign each male a rank. I can compare these ranks with the signalling strategy information from the playback study to understand what effect rank has on aggressive signalling. This summer I worked as a field assistant for Dr. Dave Wilson and Samantha Dundas. I also observed nesting behaviours of the chickadee population on the main QUBS property and surrounding area for Dr. Dan Mennill’s long-term data set. This work allowed me to familiarize myself with the population and the techniques that will be used in future work on my thesis project.

Samantha Dundas- “Heterospecific and Conspecific Response to Fine Structural Variation in Chick-a-dee Calls” - Undergraduate Summer Research Assistant

A variety of animals use variations in vocal signals to indicate presence, size, and potential threat of predators. My undergraduate research conducted this past summer at QUBS examines the response of Black-capped Chickadees, and other avian and animal species, to fine structural variation in Chick-a-dee alarm calls when being presented with a predator model. To examine this I conducted a playback experiment using four treatments of manipulated Chick-a-dee calls and three owl predator models. During the experiment I dictated all behavior into a marantz recorder. From the recordings I will be able to analyze the overall response to the varied alarm calls. These findings will be used to complete my undergraduate thesis at the University of Windsor.

Publications:


**Dr. Chris Moyes – Department of Biology, Queen’s University**

**Mechanisms of Muscle Physiology**

The Moyes lab studies the mechanisms that animals use to modify muscle in response to environmental challenges. This past year, we explored the mechanisms that fish use to remodel muscle in response to temperature. The work involved 2 current graduate students, Katrinka Koche and Katharina Bremer, as well as summer SWEP students Trevor Snider and Chris Monk. We focused on local species caught at QUBS including mudminnow, red bellied dace, pumpkinseed, bluegill, pike, stickleback and largemouth bass. We collect fish on site, record water conditions and process the samples for analysis of proteins, RNA and DNA.

**Publications:**


**Dr. Troy G. Murphy- Trinity University, San Antonio, Texas**

**Do Female and Male American Goldfinches Signal Dominance with Bill Color?**

Although male sexual ornaments have been the focus of many evolutionary studies, little attention has been devoted to understanding the adaptive function of elaborate traits in females. Female ornaments may function as signals to attract males by revealing female genetic or parental quality, or they may function as status signals that allow competitors to assess each other’s dominance. American goldfinches are sexually dimorphic songbirds in plumage (males are saturated yellow, and females a drab yellow), yet both males and females change bill color from grey-brown to bright orange during the breeding season. We investigated whether the orange female bill signals dominance when birds compete for access to food. We tested for status signaling by examining whether caged females avoided feeding adjacent to female taxidermic models as a function of the model’s bill color, which was experimentally augmented or dulled. We found that females avoided feeding near model females with colorful bills, supporting the role of female bill color in signaling dominance. This represents the first
experimental evidence that a carotenoid-based coloration of females functions to mediate contest competition. We then expanded on this to test if males also use their bill color in a similar way. We found no evidence that males use bill color to communicate dominance, which means that we are working with a fascinating system wherein the female ornament has a communication value (and we thus infer bill color is maintained by selection), yet it remains unknown what, if anything, males use their colorful bills for. This research is ongoing and will continue in the summer of 2011.

**Student researchers:** Tiffany Pham, Jordan West, Tim Knoedler. All are undergraduate biology students from Trinity University.

**Publications:**


**Tiffany Pham – “Relationship between circulating testosterone and dominance signaling with carotenoid-based bill color in female American Goldfinches” – Undergraduate Thesis**

**Dr. Bryan Neff – Department of Biology, University of Western Ontario**

**Sunfish Mating Systems and Speciation**

During the summer of 2010, my research group continued our collaboration with Dr. Rosemary Knapp from the University of Oklahoma in our investigation of the role of reproductive hormones and parental care in bluegill sunfish (*Lepomis macrochirus*). Chandra Rodgers worked on this endocrinology research by experimentally manipulating levels the primary reproductive hormone, 11-ketotestosterone, in parental males and observing their parental care behaviours over several days. Additionally, Chandra assessed the changes in hormone and mRNA levels to examine the relationship between hormone level, parental care and gene regulation during reproduction. Also, during this summer Scott Colborne continued his PhD research using the sunfish of Lakes Opinicon and Warner to study the early stage of sympatric speciation. Through sampling of pumpkinseed (Opinicon and Warner) and bluegill (Opinicon) we are investigating resource polymorphisms within each species, which may lead to reproductive isolation and genetic differentiation, and would ultimately indicate the early stages of speciation in these fish.

**Scott Colborne – “The potential role of foraging polymorphisms and assortative mating in sympatric speciation of North American sunfish (*Lepomis* spp.)” - Ph.D. Thesis**

Scott’s research is focused on the early stages of sympatric speciation in sunfish (*Lepomis* spp.). In some sunfish populations there are foraging polymorphisms that separate the population into subpopulations of pelagic zooplanktivores and littoral macroinvertebrates. In addition to differences in diet, foraging polymorphisms are associated with adaptations to morphology, behaviour, and habitat use which increase foraging success and efficiency. These adaptations may be further reinforced through assortative mating behaviours which over time can lead to population divergence and, if maintained for enough time, speciation. During the summer of 2010, Scott sampled the sunfish of Lake Opinicon (pumpkinseed and
bluegill) and the nearby Warner Lake (pumpkinseed sunfish) as the first study populations in this research program. Scott determined differences in diet through stomach contents and stable isotope analyses. Further investigations will examine differences in morphology and will look for genetic divergence between the fish.

Adrianna Clapp – “Foraging dynamics of pumpkinseed sunfish (Lepomis gibbosus) following the invasion of zebra mussels (Dreissena polymorpha) into Lake Opinicon, Ontario” - Undergraduate Thesis

The invasion of zebra mussels into the freshwater ecosystems of North America has resulted in dramatic changes to the littoral environments of many lakes. Even though zebra mussels are often associated with the decline of native species, they may represent an ecological opportunity for species that can adapt to their presence. For her undergraduate thesis project, Adrianna focused on pumpkinseed sunfish, the only sunfish species in the area with the pharyngeal jaws and musculature to crush hard shelled prey, such as snails and mussels. We collected pumpkinseed sunfish from various areas of Lake Opinicon to determine if these fish are incorporating these invasive zebra mussels into their diet. The sunfish were examined for zebra mussel consumption using stomach contents, indicating their diet at the time of collection, and stable isotopes, a long term measurement of diet over a longer time scale. Our preliminary results from stomach content analysis indicates that pumpkinseed sunfish are commonly consuming zebra mussels, providing evidence of a native species effectively adapting to an invasive species.

Chandra Rodgers – “Effects of androgens on parental care in bluegill sunfish (Lepomis macrochirus)” - M.Sc. Thesis

The Challenge Hypothesis suggests that high levels of androgens, which likely mediate defensive behaviour, are incompatible with the expression of nurturing behaviours. Thus there can be a trade-off between nurturing and defensive behaviours in parental care. Such a situation can be less than ideal because offspring need both nourishment and protection to survive. In the summer of 2010, Chandra explored the Challenge Hypothesis and the role that androgens play in parental care in bluegill sunfish (Lepomis macrochirus). At the beginning of the parental care period, parental males were implanted with a natural androgen, 11-ketotestosterone, or an anti-androgen, flutamide. Subsequently, we observed and recorded the frequency of nurturing and defensive behaviours displayed by the parental males during the care period. Consistent with the Challenge Hypothesis, we found that males with elevated levels of androgens provide less nurturing behaviours and more defensive behaviours than controls, whereas males that had their androgen receptors blocked (through flutamide) provided more nurturing behaviours and less defensive behaviours than controls. We are now working towards identifying the genes that code for nurturing and aggressive behaviours via finding differences in parental male mRNA expression. We hope that this research will contribute to our knowledge about androgens and their involvement in parental care, and additionally, we hope to be among the first to identify some of the genes involved in parental care behaviour.

Kristal Proulx – “Phenotype, hormones, and paternity in pumpkinseed sunfish (Lepomis gibbosus)” - Undergraduate Thesis
In nesting fishes, paternity is defined as the percentage of offspring within a nest directly related to that nest's owner. The paternity a male manages to maintain within his nest directly influences his biological fitness and may predict the success of his lineage. Such physiological factors as hormone levels, body condition and body colouration may be correlated with a parental male's paternity. During the summer of 2010, Kristal began exploring these factors and their relationship to paternity levels in pumpkinseed sunfish (Lepomis gibbosus). We thus collected blood samples to examine levels of testosterone, 11-ketotestosterone, estradiol and cortisol. Additionally, we assessed body condition and colouration patterns of parental male pumpkinseed through taking morphometric measurements and colour-standardized photographs. Finally, to assess the percent paternity of each male, we also collected samples of larvac from each nest. We hope to find correlations between some of these factors and nest paternity and compare to previous research on the closely related bluegill sunfish.

Assistant: Michael Rhoubakha

**Tim Hain, Ph.D. Candidate, University of Western Ontario**

Having spent multiple field seasons studying the bluegill in Lake Opinicon, Tim’s role in the summer of 2010 was to provide valuable assistance collecting and observing fish for the research projects outlined above.

Dr. William Nelson – Department of Biology, Queen’s University

**Community Ecology of Lakes**

Amy MacMullin - "The influence of in situ temperature and oxygen on individual Daphnia pulicaria growth and survivorship in a thermally stratified lake" – BSc Hons Thesis - Curran Award winner for 2010)

The effects of temperature and oxygen on individual Daphnia pulicaria growth and survivorship were studied in a series of field experiments in Round Lake, Ontario. During the summer, Round Lake is thermally stratified with an oxygen-depleted hypolimnion. Individual Daphnia pulicaria were incubated at different temperatures and oxygen levels within the lake. There was a decreasing trend in growth with decreasing temperature. However, this trend did not approach significance, likely due to the limited sample sizes and limited duration of the experiments. There was also a decreasing trend in survivorship with depth. Temperature did not have a significant effect on individual survivorship. Oxygen had a significant effect on survivorship. Short-term survivorship tests suggested an oxygen threshold of 0.29mg/L to 0.47mg/L for Daphnia pulicaria. There was a high risk of mortality from anoxia at depth, lending support to the hypothesis that oxygen depletion in the hypolimnion may influence depth selection and diel vertical migration of individual Daphnia.

Dr. David P. Philipp - Illinois Natural History Survey at the University of Illinois, Champaign, Illinois

**Long-term Monitoring of Largemouth Bass and Smallmouth Bass Reproductive Success**
Documenting trends and long-term changes in populations is essential for understanding many natural phenomena or the potential significance of human activities. For almost two decades, we have run a long-term monitoring program for largemouth and smallmouth bass, recording the total reproductive activity at four island sites within Lake Opinicon. These habitats have been surveyed annually during the spawning season by visual swims using a mask and snorkel. Data collected for each individual fish that spawns within the study area: date of spawn, location of the nest, depth, assessment of mating success (number of eggs laid), assessment of reproductive success (number of fry), size of parental male, and duration of parental care for each male, as well as the occurrence of hookwounds from angling. Visual swims to determine number of age-1 and age-2 largemouth and smallmouth bass are also done to assess year class strength. By determining the success or failure of each male in raising a brood, we can calculate total fry production for each site each year, as well as determine the subsequent year class strength. Due to the length of this program, we are currently assessing how possible climatic changes could be affecting reproductive activities in bass.

**Project Team Members:** David Philipp, Julie Claussen, Liane Nowell, Matt Basile, Adam Fuller, Zack Zuckerman, Andrew Weatherhead, Mickey Philipp

**Reproductive Ecology and Seasonal Movement of Smallmouth Bass in the Mississippi River Watershed (Ontario)**

Smallmouth bass are found in both rivers and lakes in southern Ontario. The portion of the Mississippi River that flows into Millers Lake has been a unique setting to look at the reproductive ecology of smallmouth bass that inhabit this connected river-lake environment. Our studies have focused on the long-term monitoring of the reproductive success of individual nesting males within this system. For the past several spawning seasons, the nesting males in this system have been captured and pit-tagged, so that the spawning, nesting and reproductive success is known for all individuals. The data gained from these ongoing projects continue to provide insight into recruitment mechanisms and nest-site fidelity, improving our ability to manage and conserve smallmouth bass populations. Our work has also led to the hypothesis that multiple life history strategies may be present among the fish in this system. This comprehensive project will continue to improve the understanding of the ecology of smallmouth bass.

**Project Team Members:** David Philipp, Brandon Barthel, Julie Claussen, Liane Nowell, Matt Basile, Adam Fuller, Zack Zuckerman, Andrew Weatherhead, Mickey Philipp

**Growth, Survival and Movement of Northern Pike**

Northern Pike, *Esox lucius*, are a slender predatory fish, popular with anglers and are found throughout the northern hemisphere. Despite their popularity as a sportfish, few long-term studies have been conducted to determine basic population level size and growth data. We have conducted a continuous mark and recapture effort on the northern pike population in both Lindsay and Poole Lakes over the past eleven years. We are capturing these pike repeatedly using hook-and-line angling techniques. Once captured, the fish are measured, sexed, given a pit tag, and released. These data are providing measurements of growth and survival, as well as territoriality among these fish. Data analysis is indicating a high level of within and among year fidelity to small summer home ranges by almost all of the pike in this population, with more movement observed between seasons.
Assessment of Spring Management Scenarios for Bass Recruitment

Sportfish species with long-term parental care, such as bass, are especially vulnerable to angling during their reproductive season. To determine how various management regulations on nesting bass effect population level reproductive success and recruitment, six lakes within the Kenauk reserve in Quebec were given different management scenarios. Each lake was then monitored during the entire spawning season. Using a mask and snorkel to locate nesting bass, we recorded nest location, date of each individual spawn, mating success, size of nesting male, and duration of parental care for each male, as well as catch-and-release angling activity for each lake. Visual swims to determine number of Age-1 and Age-2 largemouth and smallmouth bass were also conducted to assess year class strength. In addition, the same methods are being applied to study lakes in Missouri and Florida to determine how angling pressure during the spawning season may differ with changes in latitude.

Project Team Members: David Philipp, Cory Suski, Steve Cooke, Julie Claussen, Liane Nowell, Matt Basile, Adam Fuller, Zack Zuckerman, Andrew Weatherhead, Mickey Philipp

Publications:


Dr. Heather Proctor - Department of Biological Sciences, University of Alberta

Water Mite Phylogeny (part of NSERC Discovery program)

Dr. John Ratcliffe – Department of Biology, University of Southern Denmark

What moths hear as a bat approaches them in search of a meal ...

Echolocating bats hunt insects at night and, as a result of this evolutionary selective pressure, many moths bear ears with which they listen to the echolocation calls of bats. For a number of years, my colleagues James Fullard, Matt Jackson and I have been interested in exactly how moths process the information contained in bats calls and how they use it to decide when and what defensive behaviours to initiate. We have done this, primarily, using neurophysiological methods requiring that the moths be fixed and partially dissected – certainly unable to fly. In doing so, we can decipher how moths’ auditory nerves encode bat-like sounds and even the recordings of real bats in the field, but, until very recently, never replicate what exactly the moth would have experienced in the face of a real bat. Recent improvements in ultrasonic recording techniques now allow us to reconstruct a bat’s flight path as it attacked a real moth in the wild. From these recordings we can not only position the bat in space, but position the now eaten moth or one that was lucky enough to escape, and, through simple calculations, recreate exactly what each moth would have heard just before it was killed and eaten and got safely out of harm’s way. We made such recordings of bats at both QUBS and at Pinery Provincial Park during the summer of 2008 and will this summer (2011) playback the actual bat acoustic attack sequences (as reconstructed to reflect what actually happens in the wild) to moths of the same species as those taken during our field observations. We can then match the neural activity measured at the moth’s auditory nerve to the defensive behaviours their fellow moths of the same species exhibited in nature. Stay tuned ...

Dr. Laurene Ratcliffe - Department of Biology, Queen’s University

"Behaviour and conservation ecology of birds"

My 2010 research program at QUBS completed our work on black-capped chickadee cognitive behaviour, and continued our investigation of effects of climate change on American redstarts, including an experiment manipulating the effective arrival date of males.

(A) Dr. Laurene Ratcliffe – Department of Biology and Dr. Dan Mennill – University of Windsor

"Transitive inference in black-capped chickadees"

This study uses novel field experiments to explore whether chickadees are capable of inferring social relationships (relative dominance) of conspecifics they have not directly witnessed interacting in aggressive encounters. This cognitive skill, termed “transitive inference”, might aid individuals in navigating complex social encounters during winter flock formation, and influence decisions in territorial
and mate choice contexts. To date transitive inference (TI) has been demonstrated conclusively in humans and in operant experiments with captive animals, but evidence from free-living animals is lacking.

(1) Cory Toth – “Can black-capped chickadees (Poecile atricapillus) determine social rank of unfamiliar individuals through transitive inference?” – MSc thesis

During early spring 2010, Cory completed a series of playback experiments on territorial male chickadees in the QUBS population. He adopted an “eavesdropping” protocol previously developed by Dan Menmill to test the abilities of focal male black-capped chickadees to evaluate the threat levels of multiple unknown territorial intruders using simulated song contests. He used a multiple-speaker acoustic design to simulate three male territorial intruders (A, B, and C) engaging in two successive dyadic song contests, presenting focal males with the information that A was more threatening than B, and B was more threatening than C. He then assayed the response of focal males when presented with simulated intruders A and C without relative information, predicting males would defend against the intruder perceived to be the greater threat. Focal males chose the more-threatening intruder (A) significantly more than the less-threatening intruder (C), consistent with predictions from TI theory. Male chickadees were therefore able to combine relative threat information from separate song contests to evaluate novel pairings.

Assistant: Amanda Xuereb

(B) Dr. Laurene Ratcliffe – Department of Biology and Dr. Peter Marra – Smithsonian Migratory Bird Center, National Zoological Park, Washington, DC

“Seasonal Interactions, Population Ecology, and Sexual Selection in a Long-distance Migratory Songbird, the American Redstart (Setophaga ruticilla)”

2010 marked the 10th year of our long-term population study of the factors that influence a) individual fitness, b) population abundance, and c) sexual selection and behaviour in American redstarts, a long-distance migratory bird. In addition to collecting standard data on reproductive success in the Bedford and Skycroft study plots, we began a novel experimental study of the importance of spring arrival timing versus quality in determining reproductive success in male migratory birds.


By using the long-term dataset and continuing to collect data on arrival dates, individual and territory quality, and reproductive success on this population, Ann is investigating how inter-annual climate variation influences various aspects of the fitness and behaviour of the American redstart. In 2009 she completed a study on the impact of climatic factors on the tropical non-breeding grounds and en route towards the breeding grounds on patterns of arrival and egg-laying in breeding redstarts at QUBS. 2010 was her second year of data collection at the long-term study site at QUBS. She began a unique arrival date manipulation experiment at QUBS to test the relative importance of spring arrival date, individual quality, and territory quality in mediating redstart breeding success. The experiment involves catching experimental males as they arrive in early May and holding them temporarily in large aviaries in order to simulate a later arrival date. They are then released and their reproductive success is compared to
control males, whose arrival dates have not been manipulated. In this way she is testing the hypothesis that arrival date per se, rather than individual quality, is responsible for the higher reproductive success of early-arriving male redstarts. Preliminary results from 2010 indicate that factors other than arrival timing per se, such as habitat and mate quality, may be driving the relationship between early arrival and high reproductive success in this species. More data will be collected in 2011 to confirm this result. In addition, breeding data collected in 2011 will contribute towards a study which examines associations between annual variation in climate and variation in the ratio of males to females on the breeding grounds, and how sex ratio variation might consequently influence breeding behaviour.

**Assistants:** Celina Willis, Carla Crossman, Ross Kresnik, Natasha Koomen, Ainsley Furlonger

**Publications:**


2010 STUDENT PUBLICATIONS

McKellar, A.E. 2010. Female American redstart (Setophaga ruticilla) reuses red-eyed vireo (Vireo olivaceus) ncest. Canadian Field-Naturalist.


Thesis:


Dr. Tom Sherratt – Department of Biology, Carleton University

Evolution of Polymorphism in Damselflies

Jennette Fox, MSc student, Carleton University
Arne Iserbyt, PhD student, University of Antwerp, Belgium

Chris Hassall, Postdoctoral Research Fellow, Carleton University

The above researchers completed a summer field session at Queen’s University Biological Station in 2010. They collected data on the behavioural interactions of two closely related species of damselfly (Nehalennia irene and Nehalennia gracilis) that co-occur at several locations on the QUBS property. QUBS was particularly suitable because N. gracilis is extremely specific in its habitat needs, occupying boggy marshes. The researchers were studying allopatric and sympatric phenotypes of the two species, specifically the morphological (thorax colour) and behavioural (mating rates) where they occur together compared to where they occur separately. These results have been used to extend our base of knowledge on the evolution of female polymorphisms in these species and simultaneously allows us to investigate the nature of character displacement in this group. QUBS fulfilled our specific needs with several easy to access sites for data collection and we have a long history of working on this species group in this location.

The results of 2010 data collection at QUBS were used towards Jennette Fox’s ongoing Masters of Science and also two poster presentations¹. One poster was presented at a local conference by the Ottawa-Carleton Institute of Biology, while the other was presented at a national conference of the Canadian Society for Ecology and Evolution, Banff, Alberta. Our participation in these conferences gave national representation to Carleton University and exposure of the research to a national level of scientists and researchers. Some aspects of the work conducted in 2010 will also be included the doctoral research of Iserbyt Arne, University of Antwerp. In particular, QUBS provided some key sites for analysing morphological variation in Nehalennia irene and some patterns in the extent of male mimicry by females in different locations across Canada were evident².

Publications:


Heather Penney, MSc student, Carleton University

Brent Lamborn, Undergraduate student, Carleton University

Heather and Brent caught syrphids (flower flies or hover flies) in the field, particularly Barb’s Marsh, on a number of occasions throughout the 2010 summer season. They caught about 30 syrphids there from 4 or 5 different species and assayed them for behavioral mimicry (leg waving, wing wagging or mock stinging). It turns out that only the better morphological mimic species engaged in behavioural mimicry, supporting the view that the behavioural trait is additive rather than compensatory. One key species (Spilomyia fusca – a behvioural mimic) was caught at Barbs, but was not found in any other
location in Ontario. Heather has recently submitted her MSc thesis for evaluation and it includes the first phylogenetically controlled analysis of the perfection of mimicry and its correlates that has ever been conducted.

Dr. Bruce P. Smith – Department of Biology, Ithaca College, Ithaca, NY

Sex Ratio Skew in Water Mites

I spent a short (5 week) field season in Summer 2010, as in 2009, primarily spent collecting and raising family lines of Arrenurus manubriator water mites. My previous research had documented that there are profound sex ratio skews in this species, with individual females producing anywhere from a male bias of 50:1 to a female bias of 50:1. There appears to be a continuous range of variability between these extremes, and the bias seen in clutches of progeny is apparently consistent throughout the life of the maternal parent.

We have now completed selective breeding experiments, documenting that the sex ratio bias is inherited only through the maternal line. Maternal inheritance is consistent with vertical transmission of endosymbionts via egg cytoplasm (e.g., Wolbachia, Orientia, and microsporidians). The cause of this sex ratio bias remains unclear: screens for Wolbachia or related rickettsial sex-ratio distorting endosymbionts were negative, and we are now screening for microsporidians.

For a second, related study, I raised engorged larval mites of three species from three different host species (Arrenurus reflexus from Leucorrhinia intacta, A. fissicornis from Libellula luctuosa, an unnamed Arrenurus species near reflexus from Leucorrhinia frigida). Mites were kept separate for each individual host, and the sex ratio of resultant adults were recorded. In a previous season, I discovered that the sex ratio shifts throughout the season, starting as 1:1, then shifting to profoundly female-biased (ca. 50:1) for the end of the season. Given that newly hatched larval mites of species with parasitic associations attach to hosts only when the host transforms into an adult, and that newly hatched larvae can only survive without a host for about one week, all larvae on a given host individual must have hatched within a week of each other. Larval mites spend 7-10 days on a host, so mites sampled from a host represent a relatively narrow window in time.

The resultant adult mites from the second-mentioned study were to be used in an unrelated study, testing for cross-reactivity in female-emitted sex pheromones, and possible prezygotic isolating barriers. In past studies conducted in my research lab, it has been evident that in general, sex pheromones are not species-specific, but that other premating isolation mechanisms may be employed in close-range interactions.

Dr. Cory Suski - Department of Natural Resources and Environmental Sciences, University of IllinoisChampaign, IL

Biotic and Abiotic Influences on Reproduction in Fish

56
Annual year class strength for fish is highly variable and can be dictated by many factors. Currently, variation in the survival of embryo & egg stages is believed to be one of the most important drivers of year class strength in fish. Largemouth bass and smallmouth bass are excellent model species for studies regarding factors influencing year class strength in fish due to their protracted parental care period, accessible nests and predictable spawning behaviours. In largemouth bass and smallmouth bass, the mechanism dictating survival of eggs embryos are not well understood and could be related to biotic and abiotic factors such as timing of reproduction, temperature fluctuations, nutritional status of embryos, and general embryo ‘quality’. Our research in this area seeks to quantify factors that define year class strength and recruitment for bass, with efforts focusing mainly on the egg/larvae/embryo stages.

Zachary Zuckerman – “Why do male bass prematurely abandon their broods?” – MSc Project.

Each spring, when water temperatures reach 15° C, male largemouth bass make nests in the shallow areas of lakes. Male bass remain at their nest site for approximately 3-6 weeks to increase the likelihood of successfully contributing offspring to future generations by defending their defenseless offspring from predators. Not all bass that begin nesting in the spring successfully rear their offspring, however, and a portion of nesting attempts each year fail. Failed nesting attempts negatively impact the reproductive output of a population of bass, which can have implications for bass populations. The reasons why male bass prematurely abandon broods are not well defined, and may result from a host of factors that include properties of the offspring, properties of the attending male, or environmental parameters (or some combination). The current study is designed to test hypotheses regarding why male bass prematurely abandon broods, and will be carried out at two locations. In Long Lake, a series of brood devaluation experiments will be performed whereby differing proportions of offspring will be removed from bass nests in an effort to quantify the importance of brood size and brood loss on abandonment decisions. Complimentary studies will be carried out at lakes in Quebec, but, at these sites, the physiological properties of nesting bass (blood-based metrics that include hormone levels, nutritional status, etc.) will be quantified and compared to abandonment rates. The results of this study will improve our understanding of the factors driving reproductive success and year-class formation in fishes.

Assistants: Lianne Nowell, Matt Basile, Adam Fuller

Publications:


Dr Bruce Tufts – Department of Biology, Queen’s University

Fisheries Biology and Physiological Ecology of Fish
In recent years, we have been conducting both basic and applied studies on fish in the waterbodies around QUBS. In 2010, we were involved in studies that examined issues related to growth in largemouth bass and pike. More specifically, we were investigating whether the size versus age relationships for these species were similar in local waterbodies or whether there was any evidence of stunted growth in some of our local populations. Anecdotal observations suggest that the pike in Lake Opinicon may be smaller than those in other waterbodies in this area. This could be explained by years of selective harvest for the largest fish in the recreational fishery. We also hypothesized that the complete absence of harvest in some populations (eg largemouth bass in Elbow Lake) could also result in stunting due to overcrowding and associated resource limitations. Analyses of collected scales, otoliths and cleithra in our lab at Queen’s will determine whether these hypotheses are correct.

**Assistants:** Phil Carbert (summer student), Jeremy Holden (MSc candidate)

**Dr. D. Dudley Williams - Ecology and Evolutionary Biology, University of Toronto**

**Ecology of Aquatic Communities**

**Tiffany Schriever - “Food web ecology along a pond permanency gradient.”** - PhD candidate

Food webs depict consumer-resource interactions by characterizing trophic relationships among species in a particular habitat. Food chain length measures the length of the food web or the number of trophic transfers from basal resources to the top predators of a system. A current paradigm in food web ecology is to understand how environmental variation influences food web structure and function and why mechanistically, food chain length changes within an ecosystem.

We tested two hypotheses proposed to explain the variability of and the factors determining food chain length. The dynamical constraints hypothesis, which predicts habitats subject to disturbance have shorter food chains based on theoretical models that suggested longer food chains tended to be less resilient to perturbations than shorter food chains (Pimm and Lawton 1977, Pimm 1982). The ecosystem size hypothesis predicts food chain length will be greater in larger ecosystems because of higher species diversity, habitat availability and heterogeneity (Post et al. 2000).

During the spring and summer of 2010 we concluded our three year study investigating the spatial and temporal variability in aquatic food web ecology of ponds along a hydroperiod gradient using seven ponds on the QUBS property. We categorized the aquatic food web structure along a natural habitat duration gradient to test the dynamic constraints and ecosystem size hypotheses using carbon ($^{13}$C) and nitrogen ($^{15}$N) stable isotopes. We hypothesized that food chain length would increase with increasing permanence and increasing pond size.

Our data support the dynamic constraints hypothesis, however pond size did not correlate with food chain length. Publications resulting from this work are in preparation.

**Assistants:** Monica Candelaria (U of T) and Tristan Willis (Queen’s)

**Acknowledgements:** Funded by NSERC Discovery grant awarded to D. Dudley Williams
Tiffany Schriever, PhD candidate, and Prof. D. Dudley Williams, Ecology and Evolutionary Biology, University of Toronto

“Cross habitat linkages between ponds and surrounding forest via amphibian life cycle events and insect emergence.”

Habitats are linked by the flow of nutrients, detritus, and organisms all of which have the potential to influence population, consumer-resource, food web, and community dynamics of the recipient system. Freshwater systems are linked to the surrounding terrestrial landscape via energy flow of emerging aquatic insects and metamorphosing frogs. As well, terrestrial systems contribute to aquatic food webs by leaf fall and nitrogen deposition from waterfowl.

Organisms of aquatic origin, metamorphosing amphibians and emerging insects, represent an energy subsidy to the terrestrial habitat in three ways: 1) as a prey source for terrestrial vertebrate predators; 2) as a nitrogen and phosphorus source via excretion for soil and plant uptake; and 3) as a release of nutrients, through death, for decomposers, primary producers, and scavengers. Thus, energy subsidies provided by emerging insects and amphibians could influence recipient food webs by directly and indirectly affecting predators, decomposers, herbivores, and plants. There are few studies that have quantified the movement of amphibians and insects from temporary ponds and its effect on terrestrial food webs. Given the extensive occurrence of temporary ponds in the global landscape, ignoring their connections to surrounding habitat hinders our understanding of system dynamics.

In spring and summer of 2010, I quantified both the movement of emerging aquatic insects and metamorphosing amphibians entering the terrestrial habitat and the leaf fall entering six ponds that ranged from temporary woodland ponds to permanent fishless marshes. This project addressed three questions; 1) How much energy (carbon) is transferred between aquatic and terrestrial habitats through amphibian egg deposition, larval production, and metamorphosis? 2) Does the amount of energy exported correlate with pond hydroperiod or ecosystem size? And 3) how much insect subsidy emerges from ponds.

Analysis and lab work are ongoing for this project.

Assistants: Tristan Willis and Klara Jaspers-Fayer

Acknowledgements: Funded by NSERC Discovery grant awarded to D. Dudley Williams

Dr. Jayne E. Yack - Department of Biology, Carleton University

Acoustic Communication in Insects

Research in the Yack lab focuses on the identification and characterization of novel acoustic communication systems in invertebrates. In 2010, three projects were facilitated through research at QUBS: (i) sound production in Bombycoidea caterpillars; (ii) hearing in butterflies, and (iii) vibratory communication in hooktip moth caterpillars.
Veronica Bura - "The Function and Diversity of Sound Production in Bombycoidea Caterpillars" - M.Sc. Thesis

Veronica's M.Sc. project focuses on the phenomenon of sound production in caterpillars. Although caterpillars are generally thought to be mute, we have discovered that airborne sound production is widespread in the large group Bombycoidea, which includes the silk- and hawk-moths. To date, Veronica has discovered several different sound producing mechanisms including clicking, stridulation, whistling, and evidence that sound production has evolved multiple times in the Bombycoidea. Several of the sound producing species were collected at QUBS over the past 3 years. Sounds play a role in defense, and we are currently investigating their specific roles in startle, aposematism, and mimicry.

Jean Paul Fournier "What do Butterflies Hear?" - M.Sc. Thesis

Until recently, butterflies were thought to lack a sense of hearing. However, research over the past several years from our laboratory has revealed that many species belonging to the large cosmopolitan family Nymphalidae (brush footed butterflies) possess well-developed tympanic hearing organs at the base of their forewings. At present, we do not know the function of hearing in these butterflies. Jean Paul Fournier is testing the hypothesis that butterflies can detect the flight sounds, or contact calls of predatory birds. Jean Paul is working in collaboration with Drs. Paul Martin and Frances Bonier to characterize the sounds that birds make when feeding on insects. These sounds will be played back to neurophysiological recordings of butterflies to determine if butterflies are capable of hearing these sounds.

Jaclyn Bowen (Ph.D. Thesis), Sarah Bond (M.Sc. Thesis), Raul Guedes, Jayne Yack
"Vibratory Communication in Hook tip moth Caterpillars"

During the past 10 years we have been studying vibratory communication signals in hook tip moths (Drepanoidea). These caterpillars use vibrations to defend silken leaf shelters, and to communicate with nestmates using complex vibratory signals. We are studying several aspects of the communication system, including the function of signaling in social groups, sensory capabilities for detecting and processing vibrations, factors affecting motivation to signal, and the evolutionary origins of vibratory communication. Experiments are conducted in our laboratory at CarletonUniversity, and wild gravid female specimens are collected at QUBS each year to maintain our colony.

Publications:


## Summary of Conference, Meeting and Field Trip Use of QUBS in 2010

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Seminars 2010

Wednesday, May 12

Dr. Steve Loughheed (Queen’s University) – The Diversity of East Africa

Wednesday, May 19 and 26

Introduction of Current Researchers and Projects

Wednesday, June 2

Scott Taylor (Queen’s University) – Boobies, Upwellings, the Pacific and Mangoes: Thoughts from an adventure in Peru

Wednesday, June 9

Mark Conboy (Queen’s University) – 50 species in 50 minutes: A local Bestiary

Wednesday, June 16

Dr. Jenn Foote (Algoma College) – Dawn Chorus Communication Networks in Black-capped Chickadees

Wednesday, July 23

Dr. Bruce Tufts (Queen’s University) – The Future of World Fisheries

Wednesday, June 30

Vanya Rohwer (Queen’s University) - Contributions and Controversy of Museum Collections: Conservation Lessons from the Past.

Wednesday, July 7

Dr. Stephane Courteau (Queen’s University – Physics) – Great Astronomical Discoveries of the 20th Century

Wednesday, July 14

Dr. Troy Murphy (Trinity College, San Antonio, Texas) – Dinosaurs, Feathers and the Evolution of Beauty in Birds

Wednesday, July 21

Jeff Row and Dr. Steve Loughheed (Queen’s University) – Landscape Approaches to Conservation: Snakes on a (fragmented) Plain

Wednesday, July 28

Mark Conboy (QUBS) – Cerulean Warbler Research and Conservation Status of Similar Neotropical Migrants
Seminars 2010 (Cont’d)

Wednesday, August 4

Matt Jackson (U of Toronto) – Sabermetrics and the Evolution of the Moth Ear

Wednesday, August 11

Jeremy Holden (Queen’s University) – Fish and fisheries: The Evolution of Management

Wednesday, August 18

Emily Gonzalez (Parks Canada) – Parks Canada: Where Protection meets Management

Wednesday, August 25

Dr. Greg Bulte (Carleton University) – Map Turtles: Ecology and Conservation
Outreach Activities at QUBS in 2010

Feb 10-12  Counselling and Skills Development Class  8 participants
           Kathy Marrocco (Amherstview Public School)

May 27    Kingston Collegiate and Vocational Institute
           Ecology Field Trip  72 participants
           Sheri Finlayson (KCVI)

May 29    Queen’s Mini-U Field Trip  22 participants
           Melanie McEwen (Queen’s Alumni Relations)

June 26   Wetlands Workshop – Elbow Lake  17 participants
           Instructor - Dale Kristensen (Queen’s – Biology)

June 27   Open House – QUBS (39th annual)  275 visitors

July 16   Chinese Delegation on Land Management  50 participants
           Dr. John Meligrana (Queen’s Urban and Regional Planning)

July 25   Dragonfly Workshop – QUBS  9 participants
           Instructor – Mark Conboy (QUBS)

August 31 3rd Annual Community Dinner  75 attendees
           Speaker – Dr Steve Lougheed

Sept 13-15 North Park Collegiate Ecology Course  24 participants
           Ted Thomas (NPC – Brantford)

Oct 13    NDSS Lake Environments Field Module  25 participants
           Tim Cross (Napanee District Secondary School)

Oct 16-16  Art Workshop  9 participants
           Instructor – Marta Scythes
**Wednesdays**  
Summer Seminar Series – 16 seminars  
193 participants  
(excluding QUBS regulars)

**Saturdays**  
Weekly Interpretive Hikes with Mark Conboy -  
13 individual walks  
125 participants
## Documentation of Research Use of QUBS in 2010 - User-Days

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Documented Use of QUBS in 2010 - User-Days

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</tr>
<tr>
<td>% Queen's</td>
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<td>0</td>
<td>26</td>
<td>49</td>
<td>43</td>
<td>37</td>
</tr>
<tr>
<td>% Non-Queen's</td>
<td>50</td>
<td>100</td>
<td>74</td>
<td>51</td>
<td>57</td>
<td>63</td>
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<tr>
<td>User-Days in Teaching Activities</td>
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<td></td>
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<tr>
<td>Conference, Meeting and Field Trip Use</td>
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<td>Outreach Programs</td>
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<td>SWEP Program</td>
<td></td>
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<td>224</td>
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<td>Other*</td>
<td></td>
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<td><strong>Grand Total User-Days</strong></td>
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<td></td>
<td></td>
<td>9608</td>
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</tbody>
</table>

* QUBS Staff, their families and visitors are not included

** down 4.2% from 2009
# Fee Schedule for 2011

## University Research and Teaching Rates

**Board Charges** - Meals only
- $697/month/person  - no obligation for chores
- $487/month/person  - includes obligation for chores on a rotating schedule

**Accommodation Charges** - Housing only - no linen service
- $53.80/month/person  - dormitory (White House or Curran Cottage)
- $107.50/month  - small cabin (Cabins 1, 4, 5, 6, 7, 11 and shaker)
- $215/month  - medium cabin (Cabins 2, 3, 8, 9, 10, 13, 14)
- $289/month  - large cabin (Cabins 12, 15)
- $345/month  - White House Apartment
- $475/month  - Cottage (Keast, Earl or Maplewood)
- $526/month  - Sumac or Cedar

**Room and Board Rates for Field Courses** - no linen service
- $380/person  - weekly R&B for OUPFB field courses
- $415/person  - weekly R&B for other field courses - incl. facilities use fee

**Room and Board Rates for Short-Term Users and Guests** - no linen service
- $48.00/day/person  - 24 hr. room and board
- $7.20  - breakfast or lunch only
- $14.40  - dinner only
- $23.50  - overnight accommodation
Bench Fees

Basic* 1 (Queen's Biology researchers)
$1.40/day principal investigator/graduate student/lab coordinator
$0.70/day assistant

Special Requirements** 1 (MFA co-applicants/Queen's Biology)
$3.50/day principal investigator/graduate student/lab coordinator
$1.40/day assistant

Basic* 2 (non-Biology Queen’s researchers)
$3.50/day principal investigator/graduate student/lab coordinator
$1.40/day assistant

Special Requirements** 2 (non-MFA Queen’s researchers)
$7.00/day principal investigator/graduate student/lab coordinator
$3.50/day assistant

Basic* 3 (non-Queen’s researchers)
$7.00/day principal investigator/graduate student/lab coordinator
$3.50/day assistant

Special Requirements** 3 (non-MFA non-Queen’s researchers)
$14.00/day principal investigator/graduate student/lab coordinator
$7.00/day assistant

*Basic - desk/lab bench space only - electricity and/or water

**Special Requirements - tanks, pumps, heating, cooling, air, disposables, extra space

NOTE - If sufficient funds are not available, bench fees may be waived or reduced upon written application to the Director.
Electronic Equipment Charges

Local Area Network Connection /Internet $13.85 per person per month

GPS/GIS Equipment

Charges for maintenance of equipment and systems will be charged back to users based on intensity of use

Boat Rental

All QUBS boat users will require Operator Proficiency cards to rent a boat
MEDA3 Training and certification required to operate pontoon boats

$400/month, $170/week - includes maintenance from normal use - gas and oil not included
$90.00/day - includes gas and oil for one day rental

NOTE - Fees for use of pontoon boats are negotiated directly with the Manager or Director

Conference and Group Rates

$7.20/person/day facility day use fee - no meals
$72.00/person/day 24 hr R&B and day use - summer season (April 30 - September 10)
$18.50/person/day linen service (must be pre-arranged for groups)

Rates for groups outside of summer season and for special requirements are negotiated directly with the Manager or Director
Rates are based on provision of basic services (dining hall meals, conference room use, dormitory style accommodation) - additional requirements will increase rates

50% booking deposit required (non-refundable if cancellation made less than two weeks prior to event)

Provincial Sales Tax

P.S.T. is applicable to non-Queen's users for oil used in boats, photocopies and Fax.

Goods and Services Tax

G.S.T. is applicable to non-Queen's users for charges for boat rental, photocopies, direct sales (e.g. equipment) and all charges for room and board from casual users.

_QUBS Management reserves the right to allocate space to maximize accessibility to all users of the facility. This may mean sharing space at times of intense use._

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