Zadock Thompson Zoological Collection

"Before and after" of the Invertebrate collection

By Sohath Zamira Yusseff-Vanegas

In the summer of 2012, the University of Vermont hired Dr. Agnarsson to be a professor in the Biology Department and the Curator of the invertebrate collection. Little did they know that thanks to this, the future of the Zadock Thompson Zoological Collection (ZTZC) would change forever.

The same year I came to UVM as a visiting student, and in January of 2013 I enrolled as a PhD student in the Biology Department. At this moment I already knew of the existence of the Invertebrate collection and I also knew that we had to do something to restore the collection and continue with the legacy Dr. Ross Bell had left after 50 years of work and dedication at UVM with the help of his wife Joyce Bell and his students.

Torrey Hall on the University of Vermont campus, location of the Zadock Thompson Zoological Collection

During the 1960s, the Bells began a program to study the fauna of Vermont and to compile extensive records of Vermont's natural history. Through this work they built the UVM Entomological Collection and in consequence they expanded the invertebrate collection dramatically. [*Editor's note:* The entomological collection portion of the ZTZC is referred to as the Carl T. Parsons Collection in honor of a previous professor and curator (1948-1955) who worked on insect identifications and later willed his Vermont collection to the museum after his death in 1973.] For more detailed information about the great contributions the Bells have made, see *VES News* number 82 (Winter 2014) and Dr. Dave Barrington's article (part of the BellFest celebration) about Ross and Joyce as mentors at the University of Vermont http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3286261/.

After the retirement of Dr. Bell, several people interested in the maintenance and preservation of the invertebrate collection helped to keep the collection safe. Among them was Heather Axen a former PhD student of the Biology Department, who with the help of members of the VES and the Vermont Center for Ecostudies, worked together to curate, identify and organize the collection. In 2007, Dr. Kurt Pickett became the museum's curator. During his short and highly productive tenure Dr. Pickett focused his efforts in maintaining and improving the conditions of the collection. He increased the numbers of Vespidae (Hymenoptera) specimens by ~3,000 and planned to find funds to restore the invertebrate collection, get adequate cabinetry for the specimens and keeping the collection safe. Unfortunately Dr. Pickett passed away in 2011 and with his absence the activities in the collection stopped.

When we received the collection in 2013 we faced some important challenges: the physical storage was inadequate, insecure and vulnerable, we did not

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have enough space for 60 Cornell boxes and 150 student collections, the pests were well established, the lack of trust made some donors send their samples elsewhere, the environmental conditions of the collection were inadequate, part of the collection was disorganized and unidentified, the collection was not digitized, and we didn't have funds. Because the solution of many of these challenges depended on funds, we focused all our efforts on finding money and starting to work on the collection as soon as possible to avoid losing more specimens.

Due to my interest in working on the collection, the experience gained through the trainings I received from the Integrated Digitized Biocollections (IdigBio) and the necessity to continue with the curation and organization of the collection, I went to talk with the director of the Biology Department, Dr. Jim Vigoreaux, to ask him if the Department had any funds to hire a curator technician for the invertebrate collection. Unfortunately the department did not have a budget for this purpose, nevertheless, Dr. Vigoreaux saw an opportunity of getting funds from a NSF grant and he encouraged us to apply for it. There were only two months left to submit the proposal. The NSF grant was our only chance of saving the collection.

Even though we just had two months to do it, we gathered a wonderful team, led by Dr. David Barrington, (Chair of the Plant Biology Department and Director of the Pringle Herbarium at UVM) and integrated with Dr. Jim Vigoreaux (Director of Biology Department), Dr. Ingi Agnarsson (Curator of the invertebrate collection), Dr. William Kilpatrick (Curator of the vertebrate collection), Dorothy Allard (assistant curator and digital herbarium coordinator), Dr. Michael Sundue (assistant curator in the herbarium) and myself.

The submission of the proposal in such short time was possible because Dr. Barrington, Dr. Kilpatrick and Dr. Pickett had previously been working to submit a grant in 2007. In this proposal they brought for the first time the idea of integrating the vertebrate, invertebrate and plant collections, creating The Museum of Natural History of the University of Vermont. Even though the proposal was not approved at that moment, the suggestions and recommendations were very useful for the submission of the 2013 proposal. Thanks to the hard teamwork and the inspiring leadership of Dr. Barrington, we submitted the proposal on time and a year later, in 2014, the proposal was approved by NSF.

Present and Future of the Invertebrate Collection

During this year of hard work, the Zadock Thompson Zoological Collection has changed dramatically. During the preparation of the NSF proposal, we evaluated the risk of the collection and we determined which specimens needed urgent attention (pest present). Then we disseminated information about the collection creating a web page http://www.uvmzoo.org/ to let the scientific, academic and general community know that the Invertebrate collection was active and open for donations,

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loans, visits, educational tours, and research. Thanks to the web page and the information provided by Dr. Agnarsson about the museum in his Field Zoology class, we recruited 12 undergraduate students and a retired Biologist, who have been helping throughout this year http://www.uvmzoo.org/volunteers-and-undergrads.html .

With the funds provided by NSF and a team of volunteers we were ready to start working on our two main goals, (1) to stabilize and protect the collection and reestablish our reputation as a well-curated center for the study of the biodiversity of Vermont and (2) to digitize the collection and make it available in electronic format for the research community, government agencies, students, educators, and the general public.

With the enthusiasm and positive attitude of the volunteers, we started working in securing the collection; we curated, organized and transferred to unit trays and Cornell boxes approximately 5,000 specimens from 150 student collections that were in inadequate boxes. We controlled the pests by extensive freezing of specimens, giving priority to the boxes that were at high risk .

After the collection was secured, we transferred all of the specimens (~60,000) that were not in standard boxes to Cornell boxes in order to have them ready for the new cabinets. In December of 2014 the old cabinets were replaced with 21 new cabinets with a capacity for over 1,000 Cornell boxes. In January of 2015, over 800 Cornell boxes were transferred, secured and organized in the new cabinets. The orders and families of insects that were identified were organized in phylogenetic order and genera and species in alphabetic order. We have organized the complete collection to order level and we continue with the organization and identification process of families and genera.

With the dry collection secured our focus shifted to the wet collection which needed urgent attention. In 2005 due to local fire regulations, the Biology department was ordered to remove the wet collection from

Securing specimens and relocating the collection to Cornell boxes

Pest-ridden specimens in the collection

the Torrey building. Because the department did not have the special rooms required to keep wet collections, the only solution at that moment was to store the collection in barrels and keep them in the environmental safety facility at UVM. This collection contains at least 50,000 specimens (vertebrates and invertebrates) that had not been curated for over a decade. We made an evaluation with Dr. Agnarsson in 2013 and we estimated that approximately 10% of the collection was lost and more than 30% was at high risk of loss. Curation of this collection was urgent but this was not going to be an easy task.

Considering the size of the collection and the limited time to work on it, I decided to do a "wet curation marathon". This was similar to a Blitz, but instead of identifying and counting specimens, we were going to curate the collection. During the marathon we replaced and filled all jars and vials with 70% ethyl alcohol and sealed them to avoid evaporation or leaking. This way we can keep the collection safe for years while we find a suitable place to locate it. To do this we worked in the wet collection for six days with a total of 20 people (professors, graduate and undergraduate students and people from the community). We worked in groups of six in blocks of four hours alternating groups. This curation marathon was very successful; in six days we curated ~50,000 specimens using 60 gallons of ethanol and we left the collection in 15 barrels labeled and secured.

With the collections secure, our next goal was to digitize the dry collection. With the new cabinets in place, the room was thoroughly cleaned and refurbished increasing the work areas. New tables, chairs, computers, cameras, barcode printers, barcode scanners, workflows, books and other equipment were set up to digitize the collection. The Digitization activities were initiated this summer (June 1st). Currently, approximately 10,000 specimens are digitized thanks to the efforts of the Vermont Center of Ecostudies. Emphasis was put on the butterfly, dragonfly and bumble bee collections. We will work during the summer and next academic year focusing our efforts on digitization and imaging. We will upload our data in the IdigBio portal https://www.idigbio.org/ for online access.

At the end of this academic year we can say with confidence that our dedication, enthusiasm, leadership and hard teamwork paid off and today the invertebrate collection is open and active for loans, visits, education and research activities. We reestablished our reputation and gained trust of the scientific community, evidenced by the wonderful donation of Bumble bees done last semester by Leif Richardson, Sara

Progressive organization and identification with volunteers

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Securing the wet collection

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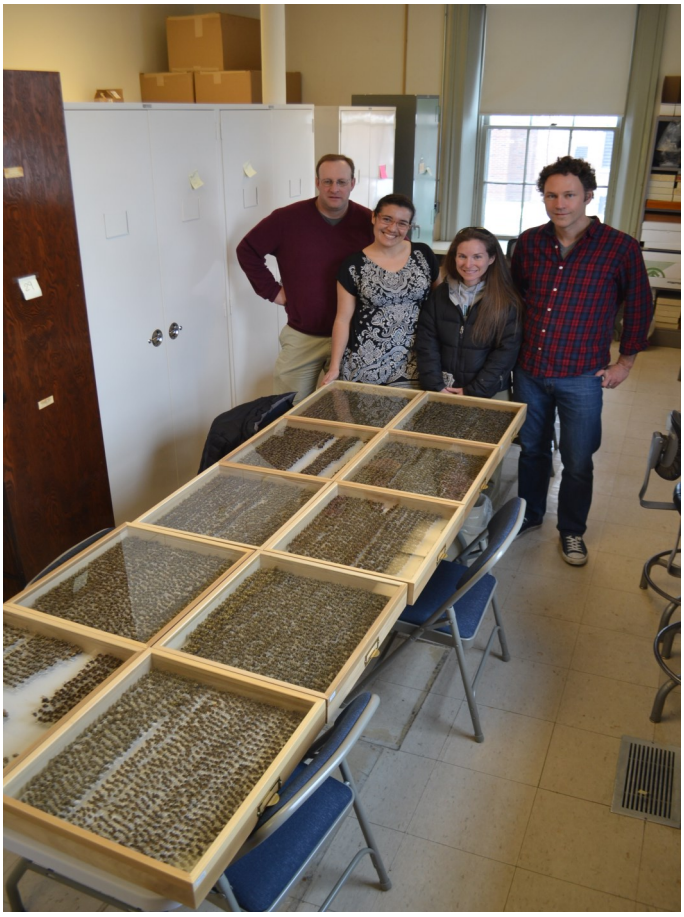
Barrels of wet specimens curated and secured

Zahendra and Kent McFarland from the Vermont Center for Ecostudies. This collection contained ~9,000 specimens completely identified, organized and digitized. We are really honored to receive this collection and we have allocated more space to receive more donations that are currently in process. This year also allowed us to train and involve students in the museum activities. They were trained in curation, relocation, reorganization and identification. They will receive more training in the areas of preparation of specimens for accession, digitization, imaging and data entry.

From now on the ZTZC will not be the same. Throughout the United States and abroad, the collection is well known as especially rich in the family Carabidae (Insecta: Coleoptera). Holdings of Vespidae also grew significantly thanks to Dr. Kurt Pickett. The arachnological collections, the focus of current curator Dr. Ingi Agnarsson, is growing rapidly with over 100,000 specimens added in the last two years, mostly from the Caribbean region, but also from Vermont. Finally, the Diptera collections are growing rapidly through my work; ~20.000 specimens have been added and similar additions are predicted for the next couple of years.

The future of the ZTZC is drawn, we will continue working on it, keeping it active, improving it day by day, but we cannot do it alone. We need to work in collaboration with other institutions, interacting with entities interested in biodiversity, conservation, natural collections, entomology and biology. It is important to integrate members of the Vermont Entomological Society in our activities of identification, digitization and imaging. With your help we can go further and strengthen the collection. Together we can show the community of the University of Vermont that this collection is unique. Our collection is the only large collection in the state with specimens dating from 1900 and it has contributed to important publications as *The Field Guide of Ants of New England*, *An Identification Guide of Bumble Bees of North America*, *A Faunal Checklist for Moths and Butterflies of Vermont* and *The Atlas of Vermont Dragonflies,* among others. Thus, it is our responsibility continuing with the legacy that several researchers left through years of hard work.



Kent McFarland, Sohath Zamira Yusseff-Vanegas, Sara Zahendra and Leif Richardson, commemorating the donation of the VCE bumble bee collection to ZTZC

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