APPLICATION FOR SCIENTIFIC STUDY IN BAXTER STATE PARK

1. TITLE:
   Inventory of the ants of Baxter State Park II: Ants in the Katahdin area above treeline

2. NAME OF RESEARCHER:
   Aaron M. Ellison

3. RESEARCHER'S CREDENTIALS:
   Full cv at:
   http://harvardforest.fas.harvard.edu/sites/harvardforest.fas.harvard.edu/files/ellison-pubs/Ellison-cv.pdf

4. BENEFITS TO BE DERIVED FROM RESEARCH:
   A 2011 review of ant species diversity and sampling intensity of New England[1] identified 132 known ant species in New England; statistical estimators suggested at least 21 more should occur but had not yet been recorded. At the same time, analysis showed that interior Maine has been one of the least-sampled areas of New England, and therefore the expected "return on investment" in terms of detecting new species for the region would be expected to be quite high for samples collected in Piscataquis County.

   With this background in mind, in mid-July 2013, I led a research group to collect ants in the Travelers section of Baxter Park. In four days of sampling, we collected samples of worker ants from 266 nests representing 27 species. Thirteen of these species were new records for Piscataquis County, and one, *Formica adamsi*, was a new species record for Maine and for all of New England.[2]

   I propose to return to Baxter State Park in August 2014 to sample and inventory ants in and around Mount Katahdin. The extensive tablelands and diversity of alpine and subalpine vegetation community types will be the focus of this summer's sample. In addition, I will spend one day revisiting the locality where we collected *Formica adamsi* in 2013 to photograph the nest and the colony in situ.

   The proposed 5-day sampling and inventory of ants in Baxter State Park will:
   a. Increase the understanding of the baseline biological diversity of the park;
   b. Provide new information on ant species diversity in understudied and little-sampled regions of the State of Maine;

[1] Aaron M. Ellison, Nicholas J. Gotelli, Elizabeth J. Farnsworth, and Gary D. Alpert. 2011. *A Field Guide to the Ants of New England*. Yale University Press, New Haven.
[2] A full report of the 2013 ant collection at Baxter State Park was submitted on 6 November 2013. Voucher specimens have been deposited at ELMF and MCZ.

c. Produce two sets of vouchered specimens, one to be accessed with the Maine State collection in Augusta (ELMF) and the other to be accessed at Harvard's Museum of Comparative Zoology (MCZ), that will be a permanent record of the findings of the survey and will be available to future researchers;

d. Provide detailed information on ants in rare plant communities above treeline, including Heath Alpine Ridge, Windswept Alpine Ridge, Alpine Snowbank, and Sedge Meadow that can be used to further inform management alternative for trail relocation proposed for the Abol and Hunt trail intersection near Thoreau Spring.[3]

5. DETAILED DESCRIPTION OF RESEARCH:

Summary:

During a five-day period (between August 18–31; exact dates to be determined in consultation with Jean Hoekwater and other park staff), the lead researcher (Ellison) together with at most two others from the Maine Entomological Society, will collect ants in plant communities above treeline at Baxter State Park using a combination of hand-collecting, sifting/sorting/drying of leaf litter, and attracting ants to baits (Pecan Sandies cookies). Ants will be collected into ethanol-filled vials; on return to Harvard Forest, specimens will be dried, mounted, and identified. Identifications will be confirmed at the MCZ, and voucher specimens will be deposited at ELMF and MCZ. A summary report, including text, data, and metadata, will be filed with the State Park, and all data will be made publicly available through the Harvard Forest Data Archive (http://harvardforest.fas.harvard.edu/data-archive), in Dataset HF-147 (The Ants of New England).

Details

Methods of collection – Ants will be collected in plots of fixed size in different vegetation community types with a combination of hand-collection, litter sifting (when litter is available), and baiting. These three methods generally yield >90% of the local ant fauna in northeastern regions[4] and do not cause soil disturbance or unwanted by-catch associated with pitfall traps. Plot size will depend on area available within each plant community type, but will not exceed 25 × 25 m to minimize impacts on rare plants and rare plant communities Number of plots per vegetation community type will be proportional to the habitat area (subalpine/alpine krummholz > fellfield > heath-shrub-rush > birch-alder > cliff > cushion-tussock > herbaceous snowbank > sedge meadow).[5] We will collect ants within the plot for 30 person-minutes, yielding a quantitative measure of collecting effort (specimens per area-time); note that if three people are participating, we would

[3] Doug Weihrauch (2010) *Sedge meadow at Thoreau Spring: options to reduce impacts*. Report to Baxter State Park, November 2010.

[4] Aaron M. Ellison, Sydne Record, Alex Arguello, and Nicholas J. Gotelli (2007) Rapid inventory of the ant assemblage in a temperate hardwood forest: species composition and sampling methods. *Environmental Entomology* 36: 766-775.

[5] Area rankings based on data in Kenneth D. Kimball & Douglas M Weihrauch (2000) Alpine vegetation communities and the alpine-treeline ecotone boundary in New England as biomonitors for climate change. USDA Forest Service Proceedings RMRS-P-15-VOL-3: 93-101.

spend only 10 minutes collecting in a given plot (3 people × 10 minutes each = 30 person-minutes). During the collection period, we will visually search for individual ant nests, and collect not more than 3 workers from each nest we encounter. Nest locations will be photographed and logged with portable GPS units. After we complete our visual searching, we will set out baits (12-g of crumbled cookies on a white index card) and leave them for 30 minutes to attract ants. Workers found at baits will be collected. Finally, we will collect 1 L of leaf litter (if leaf litter is available in a plot; unlikely, for example, in a fellfield) into a ziploc bag. Litter will be sifted in the field, any ants present will be removed, and then litter will be redistributed across the sample plot. Ants collected by all three methods will be stored in labeled vials filled with 95% Ethanol.

6. AREA(S) OF THE PARK FOR THE RESEARCH:

Based on consultation with Park Naturalist Jean Hoekwater, and additional site reconnaissance during summer 2013, I propose to sample in 2014 in the tableland areas above treeline on Mount Katahdin (south/west of Baxter Peak between the Baxter Peak Cutoff and the Hunt Trail; and south/north/ west of Hamlin Peak along and around the North Peaks Trail, Northwest Basin Trail, and Hamlin Ridge Trail). These extensive areas of arctic/alpine/sub-alpine habitat are the most likely areas to yield ant taxa new to Maine and new to New England, and are areas of important management concern for Baxter Park. Collection and identification of new species for Maine or New England in these localities could be used to guide ongoing and planned management of these high-elevation areas.

7. IMPACT ON THE PARK:

Walking to and on sites and collecting ants are likely to cause minor disturbance to vegetation and soil surfaces. When walking to and from sample sites on the tablelands, we will "rock-hop" whenever possible to avoid impacting fragile vegetation. Wherever possible we will establish temporary sample plots adjacent to established trails. Because we will not be using pitfall traps, we will not dig deeply into the soil. Similarly, without using pitfall traps, hand-collecting, baiting, and litter sampling also virtually eliminates by-catch of non-target species (i.e., anything other than ants). Our focus will be on ground-foraging ants and ants nesting under rocks, lichens, mosses, or fallen wood. Any object moved during searching for ants will be replaced immediately. The plant-aware leader of the research team (Ellison) will ensure that we avoid disturbance or damage to rare, threatened, or endangered plants.

8. BUDGET:

Lead researcher Ellison will provide all sampling equipment and supplies: ethanol-filled vials, GPS units, baits, sieves for litter collection; flagging, *etc.* Team members will be responsible for their own food and camping gear as needed. We are also able to cover any costs associated with park entry, park use, or camping/accommodations.

9. TIMETABLE FOR RESEARCH AND COMPLETION OF APPLICATION:

Field work: 5 consecutive days between August 18–31, 2014 (exact dates tbd).

Sorting and preliminary identification of specimens: September 2014

Final identification of specimens, voucher preparation, and database creation: October – December, 2014

Delivery of final report and recommendations to Baxter Park authorities: January 31, 2015.

DATE: 7 January 2014