

**Mactaquac Aquatic Ecosystem Study
Report Series 2015-009**



**METHODS PAPER:
Grand Lake Meadows sampling:
Odonate exuviae and Cobblestone
Tiger Beetle surveys**

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DISCLAIMER

Intended use and technical limitations of the report, "Methods Paper: Grand Lake Meadows sampling: Odonate exuvia and Cobblestone Tiger Beetle surveys". The sole purpose of this report is to provide documentation of the methods for sampling Odonate exuviae and Cobblestone Tiger Beetles in the Grand Lake Meadows area for the MAES project. Methods are subject to change as our field methods are further refined and developed during the course of the larger MAES project.

Project summary

Preserving and protecting vulnerable species requires a thorough understanding of their life-histories and habitat requirements [1]. This information is sorely lacking for many invertebrate species and creates a significant impediment to their conservation and survival [2]. The details of their life cycle and the habitat requirements of specific developmental stages of even charismatic species such as dragonflies and tiger beetles remain largely unknown. Likewise, some ecosystems and habitats are as unique and vulnerable as the species they support. The existence of rare and threatened species in such an environment provides a critical opportunity to evaluate the interrelationships between species and habitat.

Three invertebrate species-at-risk in New Brunswick: *Gomphus ventricosus* (Skillet Clubtail Dragonfly, Endangered), *Ophiogomphus howei* (Pygmy Snaketail Dragonfly, Special Concern), and *Cicindela marginipennis* (Cobblestone Tiger Beetle, Endangered) occur within the ecologically significant Grand Lake Meadows (GLM) region of the Saint John River (SJR) watershed [3, 4, 5, 6] (Figures 1 and 2). Portions of the GLM provide the only known populations of Cobblestone Tiger Beetle to occur on a lake rather than a river [5, 6]. Likewise the highest concentration of emergence of Skillet Clubtail in the province occurs along the SJR in the region of the GLM [3, 4]. The Pygmy Snaketail is less frequently observed within the SJR system, but existing records (NB DNR) suggest that this species may co-occur with the Skillet Clubtail along the northern region of Grand Lake. Each of these species can be linked to larger ecosystem processes including hydrological dynamics and vegetation succession. Our knowledge of the relationships of these species-at-risk to their habitat will help support the management required to address both the aquatic and terrestrial needs for each of these invertebrate species and many other species within the GLM.

Evaluating habitat suitability for each of these species under current flow conditions will form the basis for environmental flow requirements that maintain the aquatic and terrestrial conditions required for persistence of these, and other species, in the SJR. For both dragonfly species, water level at the time of emergence ensures access to stable, safe emergence sites. For the tiger beetle, flows that maintain access to vegetation free zones and clean cobble substrate are required for at least the adult stage, and presumably the larval stages as well. Therefore, it is critical to understand how the flow regime might be managed for the protection of ecological structure and function (i.e., environmental flows) in riparian habitats modified or maintained by current and proposed changes to flow, specifically the timing and magnitude of flows required by each species to access their respective habitat.

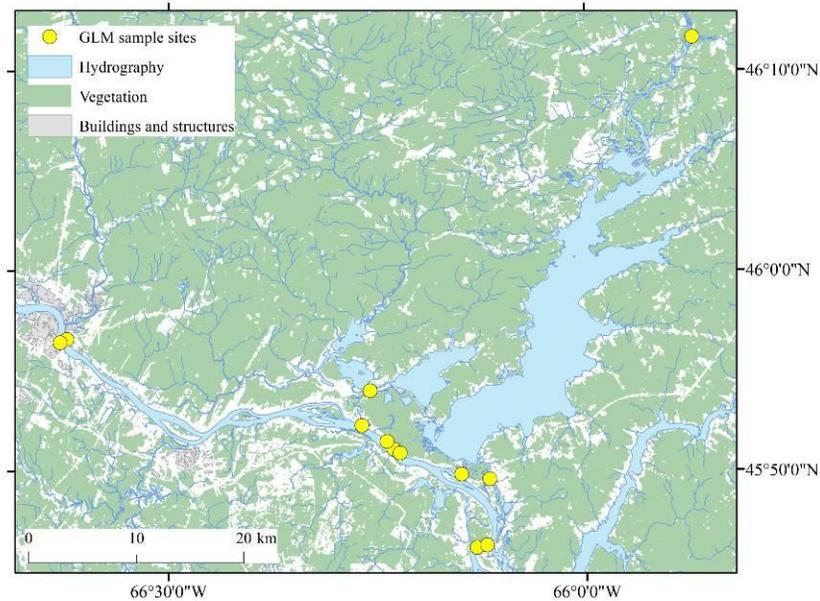


Figure 1: Map of 2014 sample sites

Project objectives

Our primary objective is to describe the association between three invertebrate species-at-risk in the GLM to current water level conditions and riparian habitat in order to protect these habitats and species under future flow scenarios. Information collected from both field seasons will assist conservation efforts and provide novel data on the application of environmental flow approaches to protect vulnerable invertebrate species with complex life histories along with their unique aquatic and riparian habitats.

The work was supported by the Grand Lake Meadows Endowment fund in 2014, and an application has been submitted for the 2015 call for the fund.

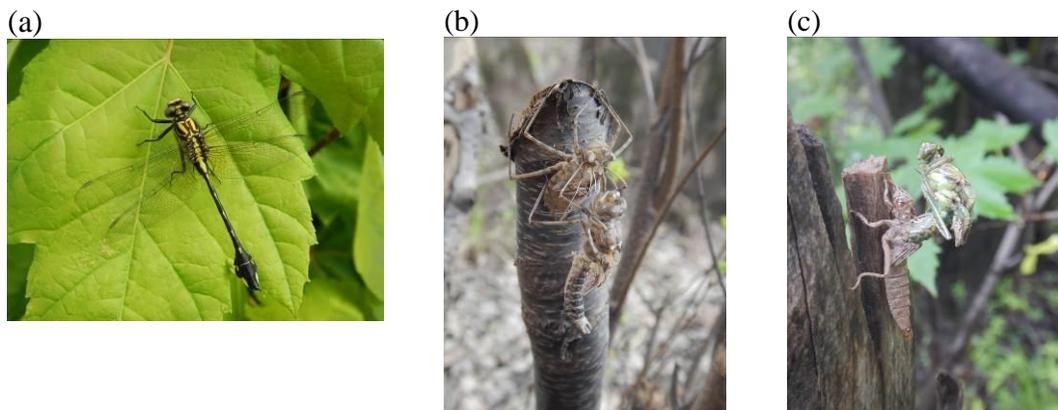


Figure 2: Images collected during the 2014 field season by Zoe O'Malley. (a) Adult *Gomphus vastus* observed on 23rd June 2014; (b) emerging adult Odonate observed on 5th June 2014; and (c) emerging adult Odonate observed on 25th June 2014

Sample methods: Odonates

Dragonfly surveys are conducted during the period of peak emergence from early June to early July. Visual surveys of vegetation and riparian structures are used to collect exuvia [7,8]. Transects have been

established at each site and the trees within each transect have been surveyed (including species identification, GPS point) (Figure 3). Transects are then sampled and each exuvia is coupled to water level and riparian habitat information, including GPS location; distance from the wetted edge of water and/or height above the water surface; tree or vegetation species and size. Each exuvia is placed in an individual sample cup with an ID number and date of sample noted. Following the transect survey, the general area is searched for exuvia on the ground and these are stored in 500ml sample jars.

In 2015, prior to the emergence period, a series of water level data loggers will be deployed to provide more precise information on water level fluctuations at the site of emergence. These loggers will also collect continuous water temperature information at each location.

In the laboratory, the individual exuvia are identified to species-level (where possible), sexed, and an estimate of body size taken via measurement of the tibia using a Leica M80 microscope with an ocular micrometer. A subset of individual are submitted to the Barcode of Life Database for genetic sequencing for identification confirmation.



Figure 3: Example of identified individual trees for repeat exuvia observations. Site Gv48 (northside of Princess Margaret Bridge)

Sample methods: Cobblestone Tiger beetle

Specimen scale variables will be combined with site and regional variables to assess overall habitat quality and hydrology. Geospatial and physical habitat data collected during the survey season will be used to determine the location and extent of suitable habitat and habitat accessibility for each species under different environmental flow scenarios.

Tiger beetle activity surveys are conducted from mid-July to late-August during peak abundance for the adult stage. Several permanent transects are established at each location proportional to site size and orientation. Transects are established by choosing a section of beach with large cobble at the site. A GPS point is taken at the start and end of the transect, which is marked with flagging tape or a flag. Each season (or following a major storm/flood event where alteration of site structure is suspected), a pebble count is conducted to determine the size frequency of cobble substrate in the region where adult tiger beetles were observed. The b-axis of 100 rocks randomly found along the transect is recorded.

The number of adult tiger beetles and habitat conditions where they occur are recorded by pairs of searchers walking along the transects at a constant rate for 20 to 60 minutes per visit [9,10]. Locations where each tiger beetle was first observed are marked and assessed relative to the water line and the permanent transect line. Surveys will be conducted only during suitable weather conditions (i.e., temperatures >13°C, no precipitation, wind speed <15 km/h). Non-destructive sampling is used to verify *C. marginipennis* identity in the field. In the case of accidental mortality, specimens are to be submitted as vouchers to the New Brunswick Museum (NBM).

Each time the site is visited, a measurement of water distance from a predetermined landmark is made and GPS points at the edge of the water in line with the start and end points of the transect are collected.

Sample permits

Permits for the study and potential collection of protected species have been obtained from the proper authorities (NB-DNR and Environment Canada, Canadian Wildlife Service). The NBM has agreed to receive insect or exuvial specimens. Access to sites managed by the Nature Trust of New Brunswick has also been obtained.

References

- [1] New, T.R. (2007) *J. Insect Conserv.* 11:95-97
- [2] Cardoso et al. (2011) *Biol. Conserv.* 144:2647-2655
- [3] COSEWIC (2008) Ottawa. 34pp.
- [4] COSEWIC (2010) Ottawa. 32pp.
- [5] Sabine, D.L. (2004) *Cicindela* 36(3-4):53-56.
- [6] COSEWIC (2008) Ottawa. 27pp.
- [7] Foster, S.E. & D.A. Soluk (2004) *Biol. Conserv.* 118:15–20.
- [8] Raebel, E.M., T. Merckx, P. Riordan, D.W. Macdonald & D.J. Thompson (2010) *J of Insect Conserv.* 14:523–533.
- [9] Hudgins, R., C. Norment & P.G. Novak (2011) *Am. Midland Naturalist*, 165:304–318.
- [11] Hudgins, R.M., C. Norment & M.D. Schlesinger (2011) *J. Insect Conserv.* 16:447–455.
- [10] www.nbpower.com/html/en/about/media/media_release/2013/10-08-EN_Mactaquac.html

