

TERRESTRIAL ARTHROPOD MONITORING PROGRAM

METABARCODING REPORT – ONTARIO PARKS

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Overview

From April to October 2018, Malaise traps were deployed in 55 protected areas across the Mixedwood Plains Ecoregion to collect arthropod samples for metabarcoding (Figure 1). Samples were processed using the 'bulk sample analysis protocol' outlined in a previous project called Ontario Provincial Park Malaise (OPP) Program (<http://biodiversitygenomics.net/projects/oppmp/>).

In short, the bulk samples were assembled into batches of ten for tissue lysis at the Canadian Centre for DNA Barcoding (CCDB; <http://ccdb.ca/>). Eight replicates for each trap sample lysate then underwent bulk DNA extraction. PCR amplification of the DNA barcode region was performed on three pooled replicates, followed by library preparation for high-throughput sequencing. Libraries were then submitted to the Centre d'expertise et de services Génome Québec for sequencing on an Illumina NovaSeq platform.

This report outlines the metabarcoding results obtained from the 354 samples collected from 30 Ontario Parks, 25 of which were repeated sampling sites from the previous 2014 study. For details on field sites and activities, please see November 2018 Field Report.

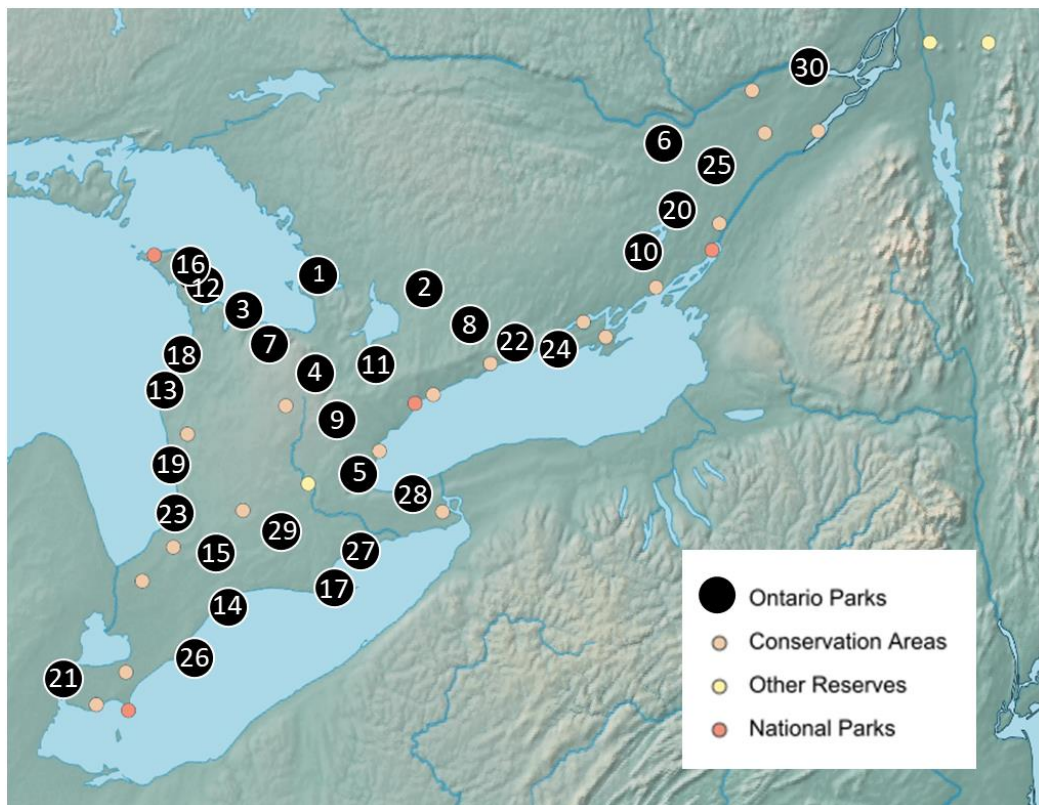


Figure 1. Map of 55 sampling sites across the Mixedwood Plains Ecoregion of Ontario and Quebec. Legend for Ontario Parks in Table 1.

Table 1. Legend corresponding to Figure 1 map. * indicate new sites not previously sampled in 2014. PP = Provincial Park, PNR = Provincial Nature Reserve.

Number	Code	Site	Number	Code	Site
1	AWEN	Awenda PP	16	LIOH	Lion's Head PNR
2	BALS	Balsam Lake PP	17	LONP	Long Point PP
3	BAYV	Bayview Escarpment PNR	18	MACG	MacGregor Point PP
4	BOYN	Boyne Valley PP	19	MORT	Morris Tract PNR
5	BRON	Bronte Creek PP	20	MURP	Murphy's Point PP
6	BURN	Burnt Lands PNR*	21	OJIB	Ojibway Prairie PNR
7	DUNC	Duncan Escarpment PNR	22	PETW	Peter's Woods PNR
8	EMIL	Emily PP	23	PINE	Pinery PP
9	FORC	Forks of the Credit PP	24	PRES	Presqu'ile PP
10	FRON	Frontenac PP	25	RIDR	Rideau River PP*
11	HOLL	Holland Landing Prairie PNR	26	ROND	Rondeau PP
12	HOPE	Hope Bay Forest PNR	27	SELK	Selkirk PP
13	INVH	Inverhuron PP	28	SHOH	Short Hills PP
14	JOEP	John E. Pearce PP	29	TRWD	Trillium Woods PP*
15	KMKA	Komoka PP*	30	VOYG	Voyageur PP*

Results

A pooled total of 18,021 different BINs (Barcode Index Numbers; a proxy for species) were encountered at the 30 Ontario Parks sites. The Chao species estimate suggests that approximately 23,669 BINs are present in these sites and could be collected with this method if sampling effort was extended (Chao et al., 2005; Figure 2). Just over half the BINs captured were flies (Diptera), followed by bees, ants and wasps (Hymenoptera), moths and butterflies (Lepidoptera), and beetles (Coleoptera; Figure 3).

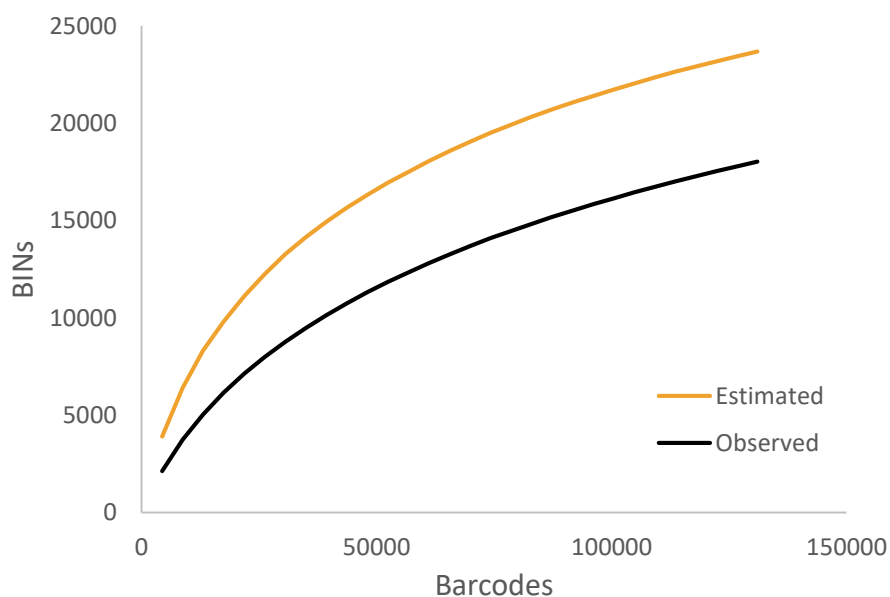


Figure 2. BIN accumulation curve of samples collected from Ontario Parks in 2018.

In total, 4172 species were named; 99.7% of BINs were assigned at least to family and 59% of the BINs were assigned to a genus. Specimens collected from this project represent 521 different families and 3137 genera.



The number of BINs detected from a single site ranged from a low of 974 at Hope Bay Forest PNR to a high of 4130 at Rideau River PP (Figure 4). Approximately 40.5% of BINs were only found in a single site while 11 BINs were found in all 30 parks. The proportion of BINs that were only collected at a single site (i.e. unique BINs) also varied with Selkirk PP having less than 7% unique BINs while Ojibway Prairie PNR had 19% of its BINs only detected at that site.

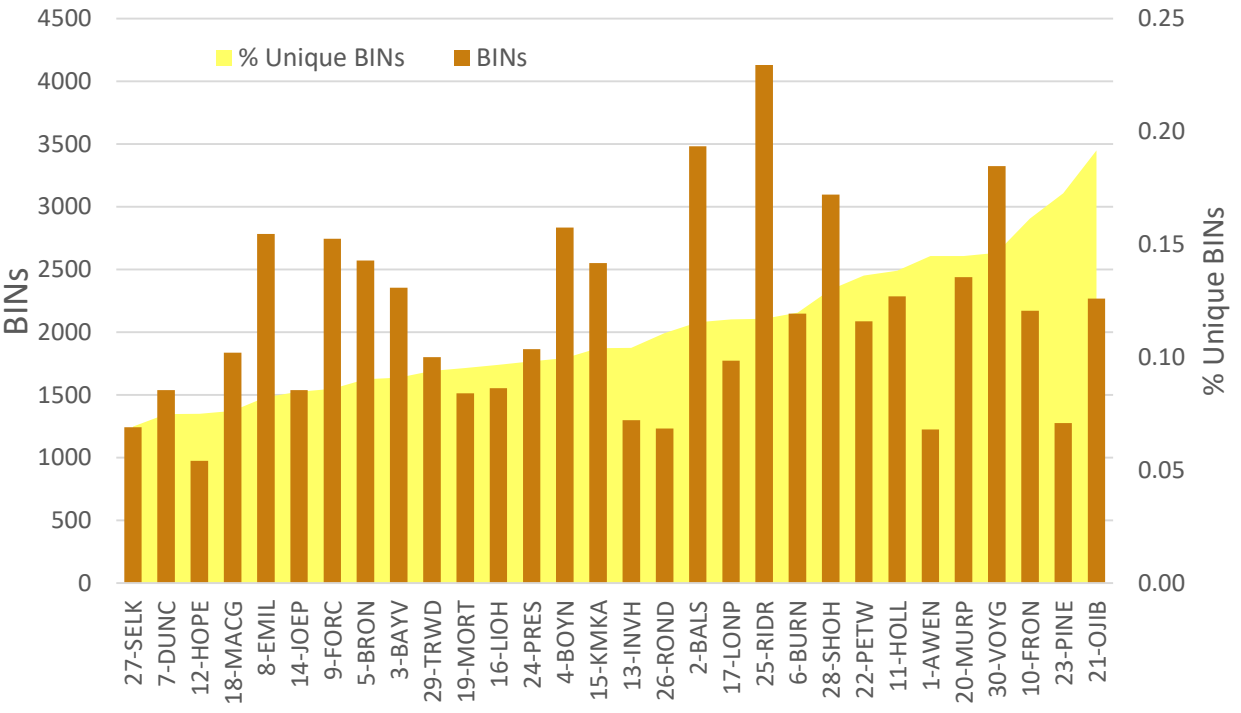


Figure 4. Total BINs generated and proportion of unique BINs detected at each sampling site. Numbers and parks codes correspond to Table 1.

In combination with the OPP Malaise Program run in 2014, a grand total of 28,482 BINs have been captured from 50 Ontario Parks. There was an overlap of 13,373 BINs between both sampling years and the 2018 Mixedwood Plains sites added 4,648 BINs to the total species pool (Figure 5).

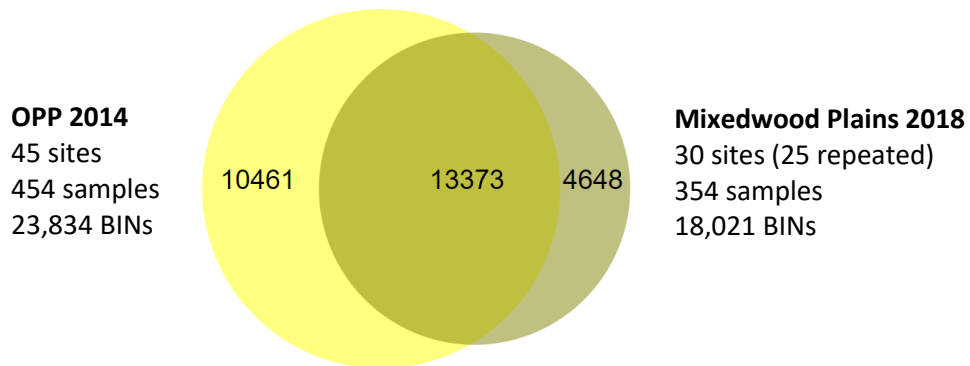


Figure 5. Venn diagram showing the species overlap between the 2014 and 2018 Malaise trapping projects.

Appendices

Appendix 1. Neighbour-joining tree of representative specimens from each BIN available on BOLD collected by Malaise traps in Ontario Parks in 2018 (colourized based on taxonomic order).

Appendix 2. Image library of 17,607 BIN representatives collected in Ontario Parks 2018 (in alignment with Appendix 1).

Appendix 3. Complete list of taxonomy and BINs collected in Ontario Parks 2018.

Appendix 4. List of individual summary reports for each Ontario Parks site involved, including names of their main contacts.

Appendix 5. Individual taxonomy reports (species inventories) for each Ontario Parks site in 2018.

Acknowledgements

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