Wind direction as a primary factor determining abundance and diversity of midge *exuvia and adult* population distributions near shores of Sproule Bay, Lake Opeongo

Midges: Chironomidae

- They are among the most **commonly encountered** insects globally
  - In immature stages they live as aquatic **freshwater ground burrowers**
  - They are an important **aquatic and terrestrial food resource** in ecosystems they populate
  - When they undergo metamorphosis into their mature larval forms **they leave behind exuvia(skin)** and emerge from water
  - **Exuviae** are left in the water and float with a low weight
  - **Simple to sample**
  - Gives a good r**epresentation of diversity and abundance in ecosytems**
  - **Bioindicators**

EXUVIA: the remains of an exoskeleton and related structures that are left after ecdysozoans (including insect, crustacean or arachnid) have moulted.

Hypothesis

- Midge **exuvia abundance will be higher in areas in which wind is directed**
- Midge **frequency will differ in exuvia and adult specimens**

Expectation

- **Wind will be the primary factor** determining Chironomid abundance in some areas
- **Exuvia diversity** will represent *longer time periods* **adult specimens** will represent *local and recently emerged populations*

- Determine what factors are involved in dispersal of midge(chironomid) populations (wind, circulation, locality)
- Determine if there are **differences in chironomid diversity evidenced from exuvia and adult samples**

If traps oriented in different directions relative to wind catch different amounts of chironomid species, we may infer with some confidence that the wind is primarily responsible for such differences. Or that wind is primarily responsible for dispersal.

If **exuviae** and **adult chironomid** diversity in areas **spatially close** to each other are similar, we may also infer that **exuviae represent the proximate local population**

Method

- Collected exuviae with D-net in 5m sections **<50cm from edge**/ shore at Harkness and campsite
- Edge sections were **differing orientations relative to wind and current**
- Observed wind, current, and proximate obstructions/ substrates qualitatively
- Collected, counted, typed and quantified captured specimens

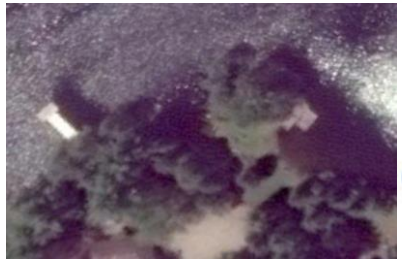
Sites

Upwind and downwind locations

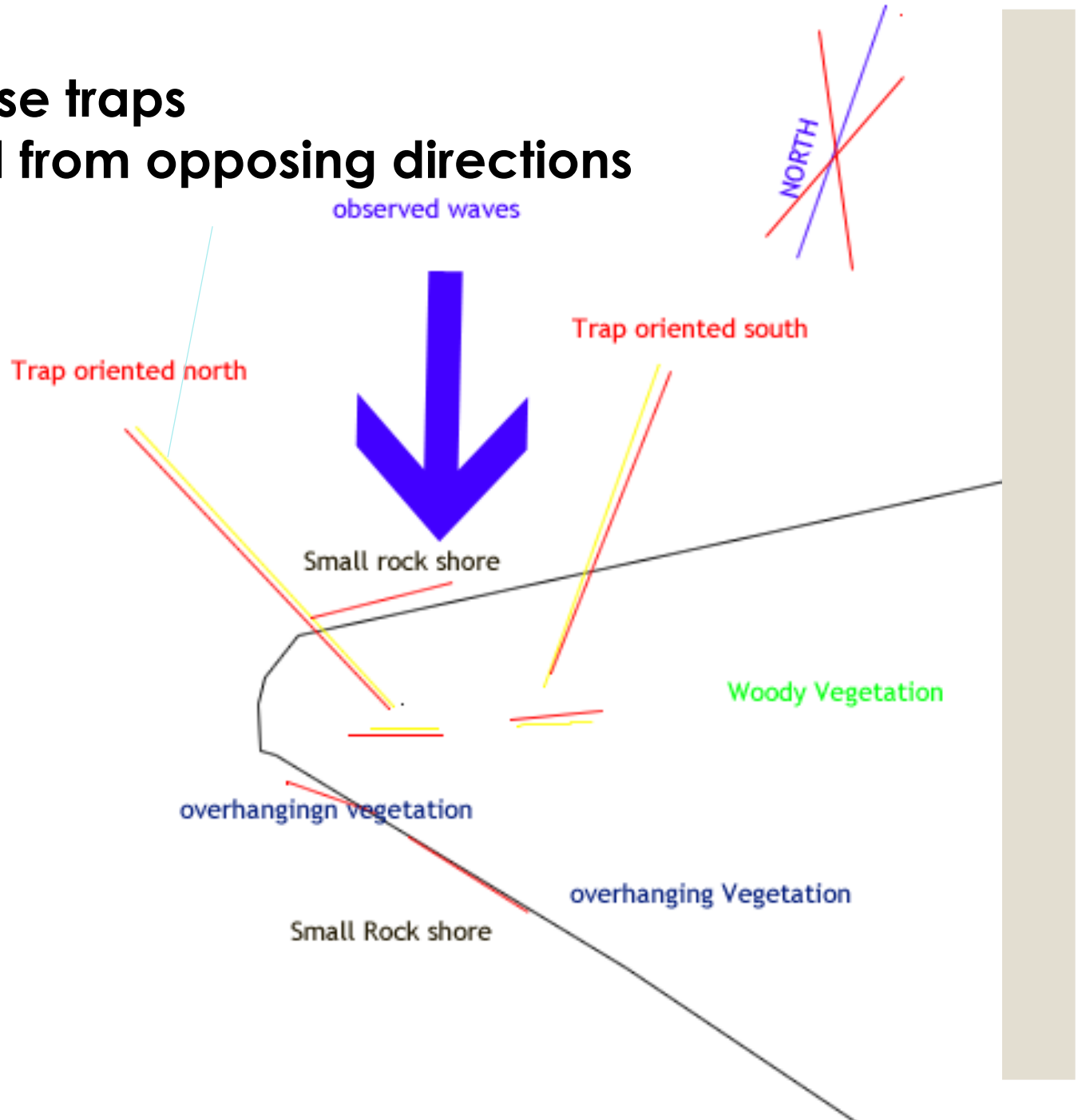
Stayed at **Harkness** because of **convenience** and to measure day by day dynamics

Tested at **campsite penninsula** because of feasibility

10 Sites with D-Net <50cm from edge
5 passes over 2 days,
10am- 5pm ~2hour intervals
1 Malaise Trap over 8 days



6 D-net exuviae samples
4 malaise trap samples from 2 malaise traps
Malaise traps oriented to catch wind from opposing directions



Results

- Average Windspeed was similar (29-30m/s) Over the three days
- Shore/ edge orientation relative to these winds appear to have been detrimental to the abundance of specimens collected
- Samples taken from shores perpendicular to wind captured more specimens

Chironomid Abundance Comparison: Harkness

Examined surrounding features and local conditions of shore area at Harkness

No features seemed to be related to quantity of midge populations collected

(there could be some relationship with species discovered to local feeding niche, however this would require more research)

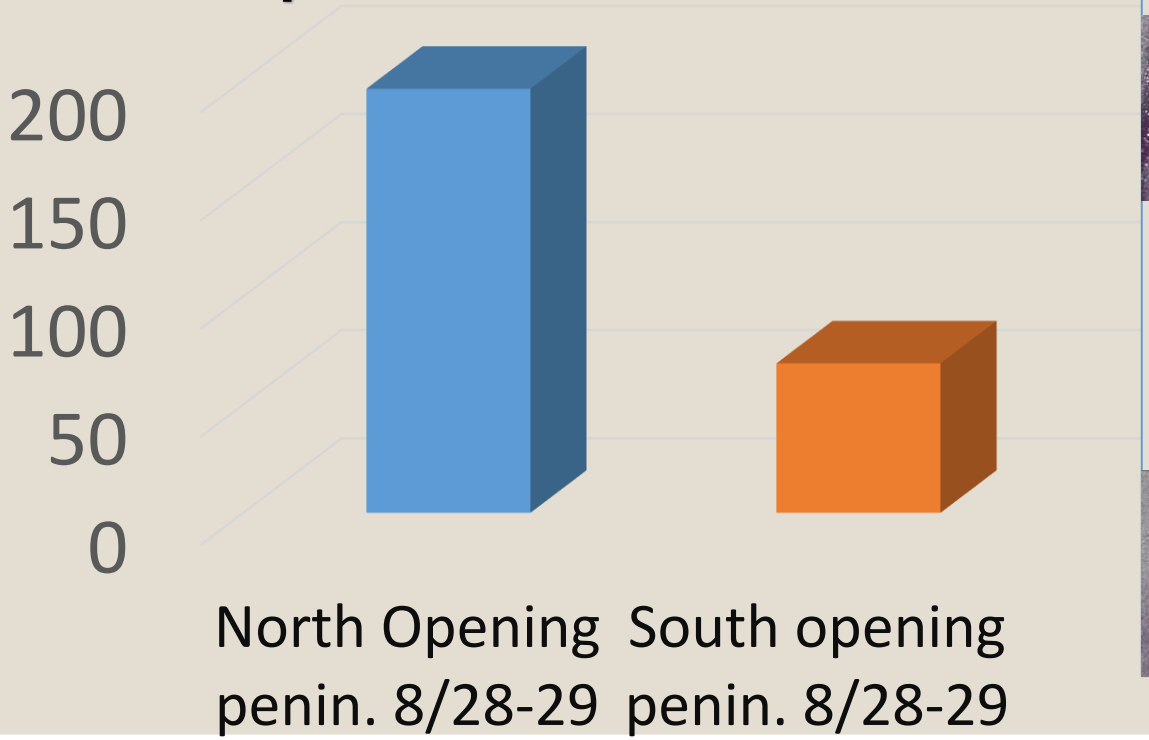
Variables included substrate at edge of shore, depth, vegetational cover

No variables showed correlation with the data other than wind (observation)

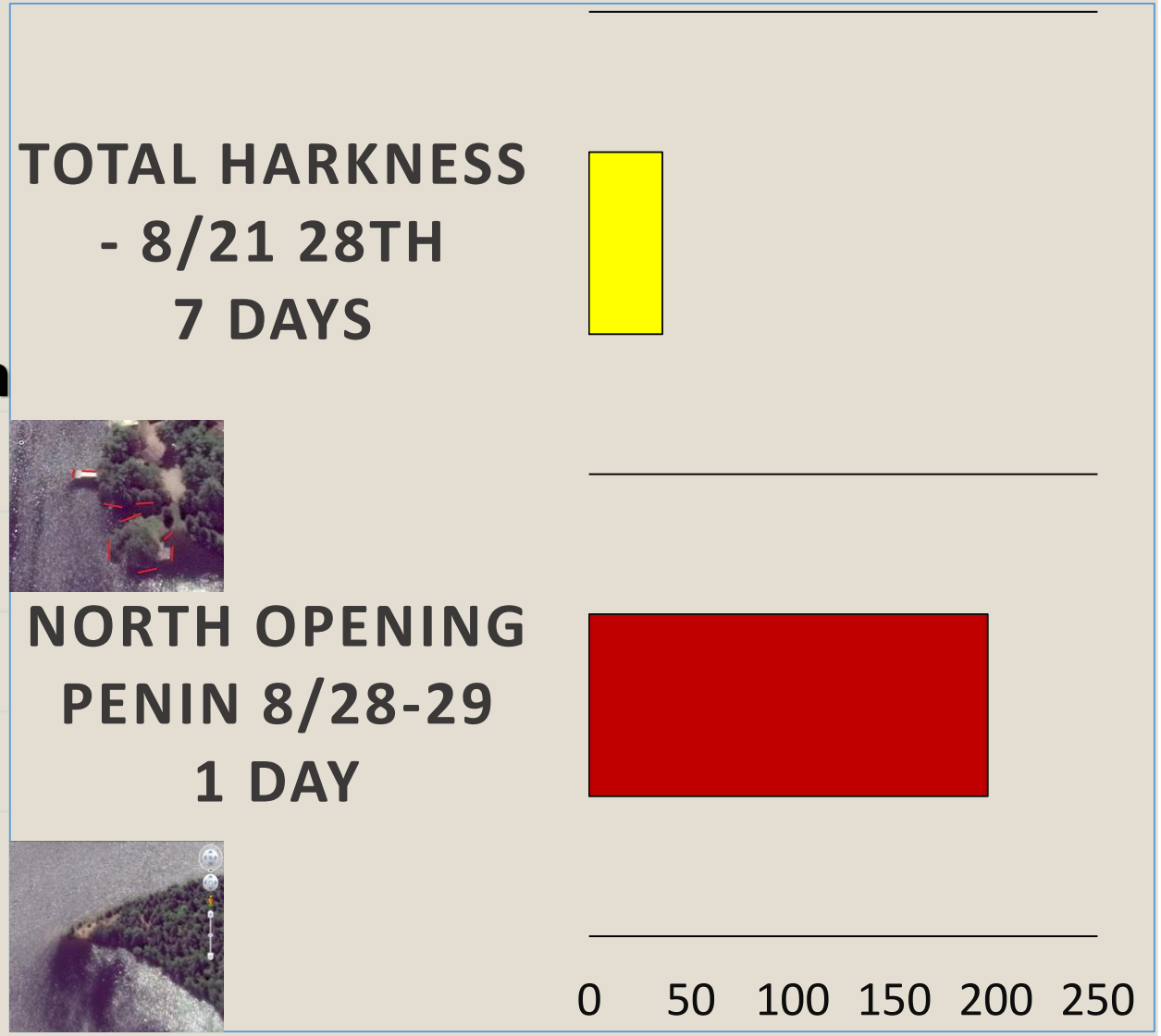
These may have an effect however the magnitude was not comparable to the affect of wind exhibited in the small time frame in which sampling took place

Chironomid Abundance Comparison:

Malaise Trap North vs. South orientation



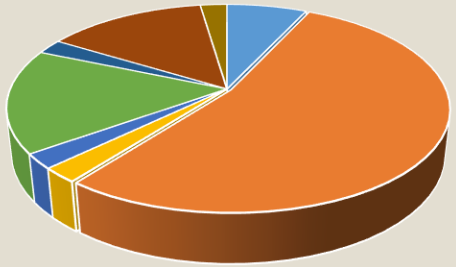
Malaise Trap Peninsula Vs Harkness



Chironomid Species frequency Comparison:

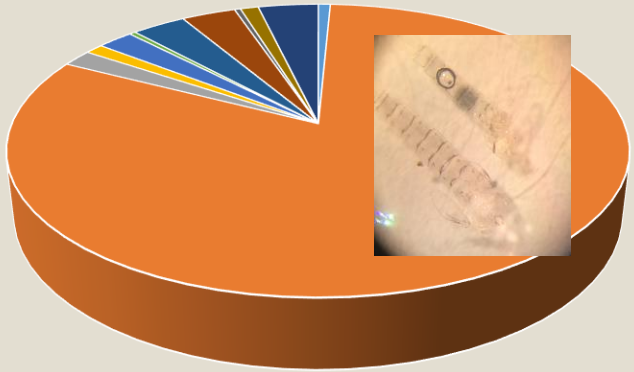
Exuvia D-Net Samples from shore

Peninsula

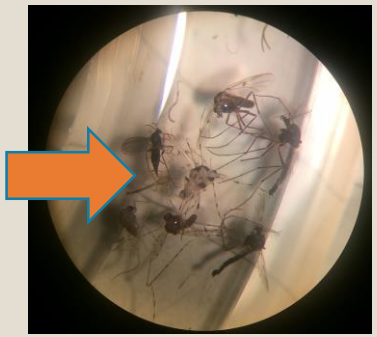


8 Species
(43 specimens)

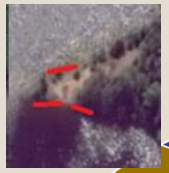
Harkness



11 species
(269 specimens)

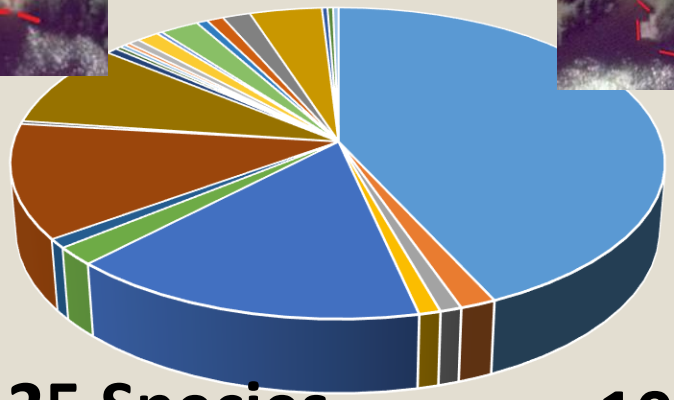


Adult Chironomids From Malaise Traps

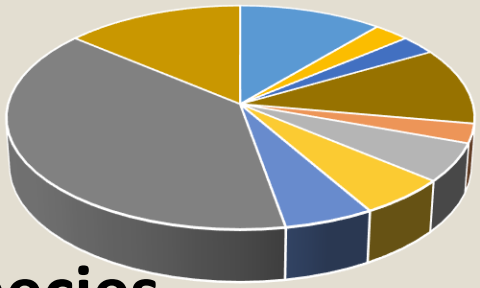


Peninsula

Harkness



25 Species
(320 specimens)



10 species
(36 specimens)

-Similarity in proportion of (orange) Type in both locations Suggests exuvia may **reflect broad scale populations** over a **longer period of time**

-Suggest that malaise trap species composition results reflect **proximate spatial and temporal ecology**

Conclusion

- Chironomid specimens were more abundant when malaise traps were oriented against wind
- Chironomid specimens were more abundant when D nets skimmed shores oriented perpendicular to wind current
- Measurements of proportional chironomid diversity suggested that exuvia may represent broader populations than malaise trap samples