

Comparative analysis of sampling methods to develop habitat-use models of fish productivity in the littoral zone of reservoirs

N.A. Satre, G. Bourque and D. Boisclair



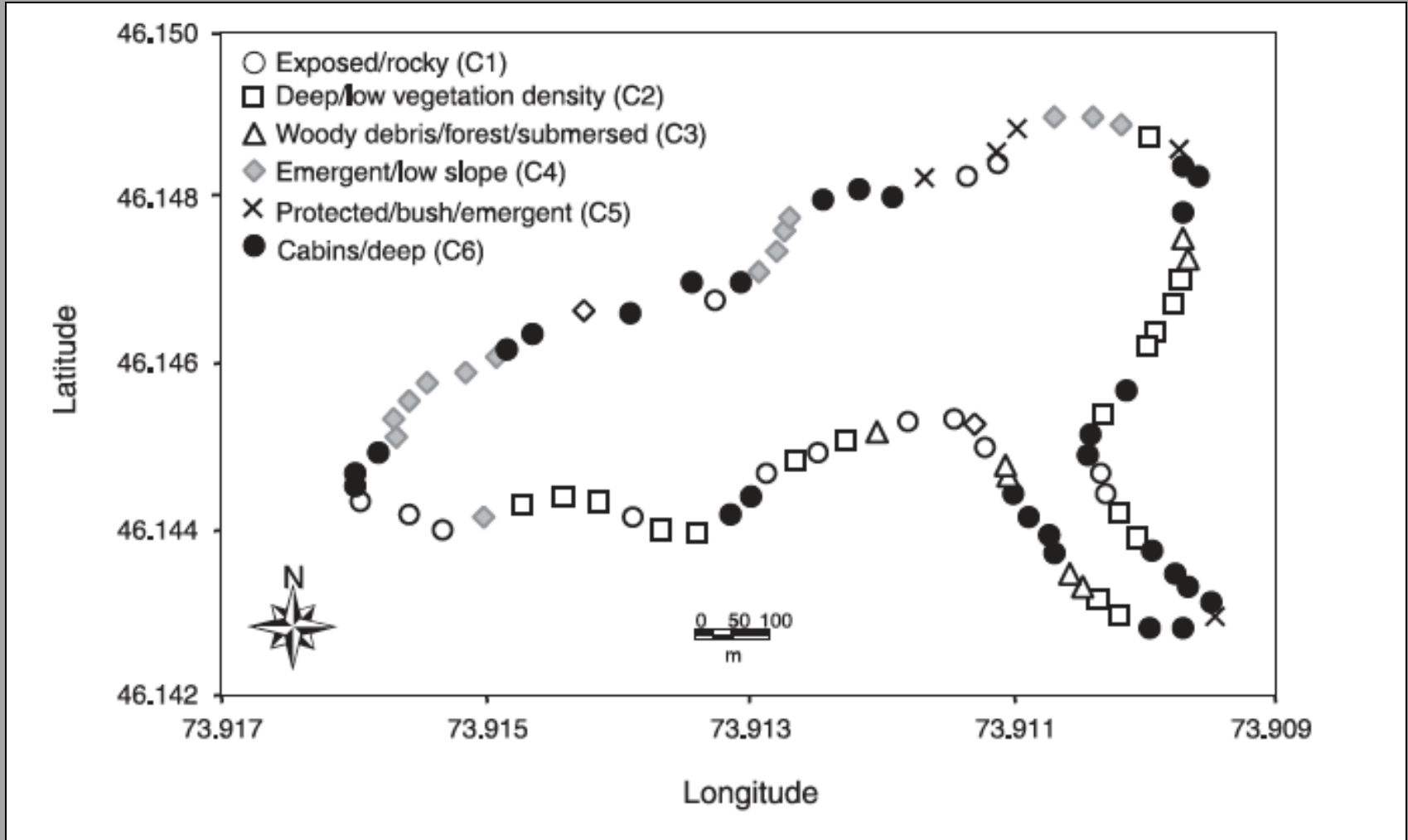
Nathan Satre
Département de sciences biologiques
Université de Montréal

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Context and rationale:

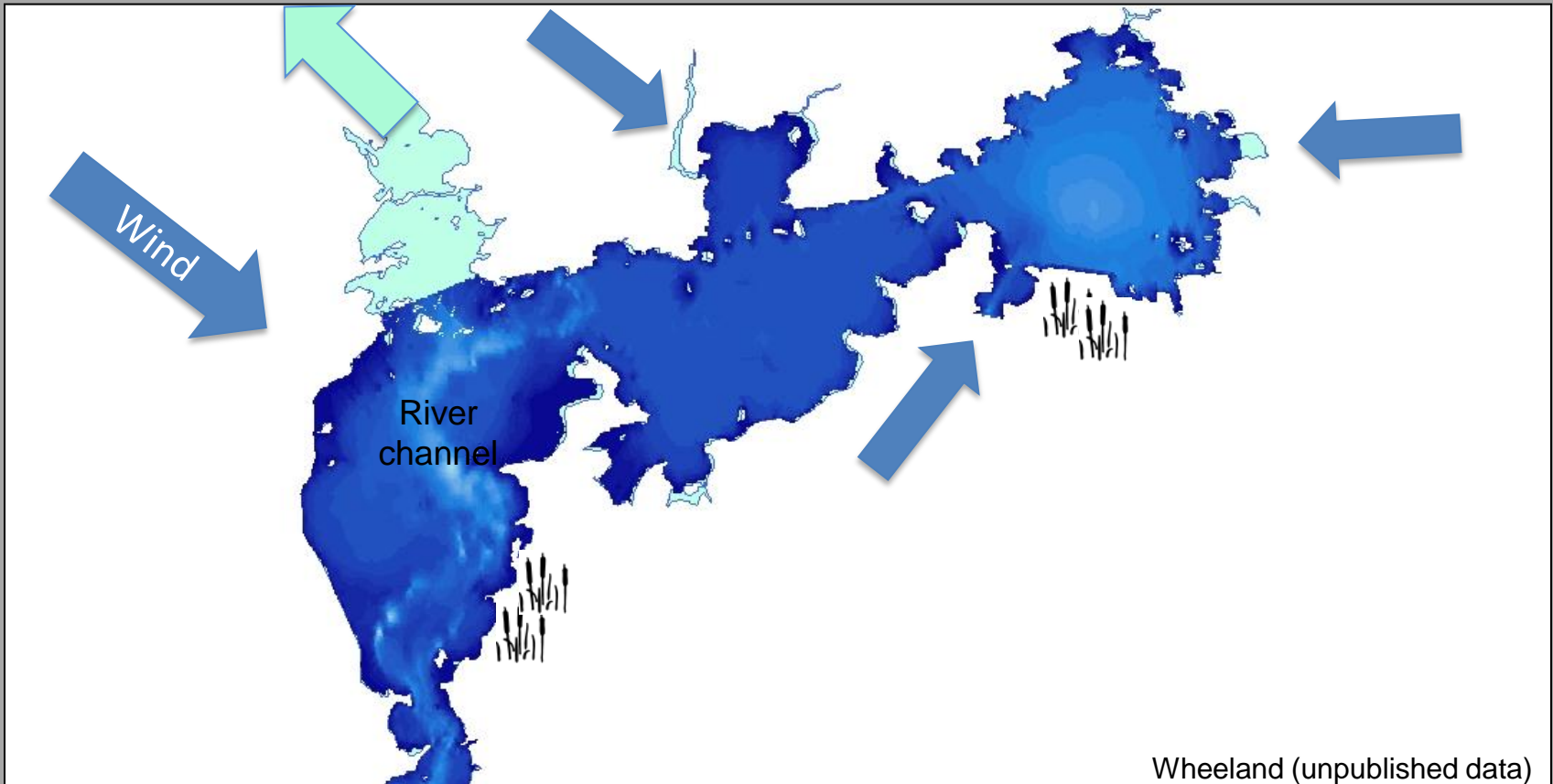
- Ecosystems are **comprised of different habitat types (mesohabitats)** that play **different roles** for fish.



Context and rationale:

- In addition to **local and lateral habitat variables**, the **spatial context** of these habitat types may also affect fish.
 - distance to tributaries
 - distance to main channel
 - exposure to fetch etc.

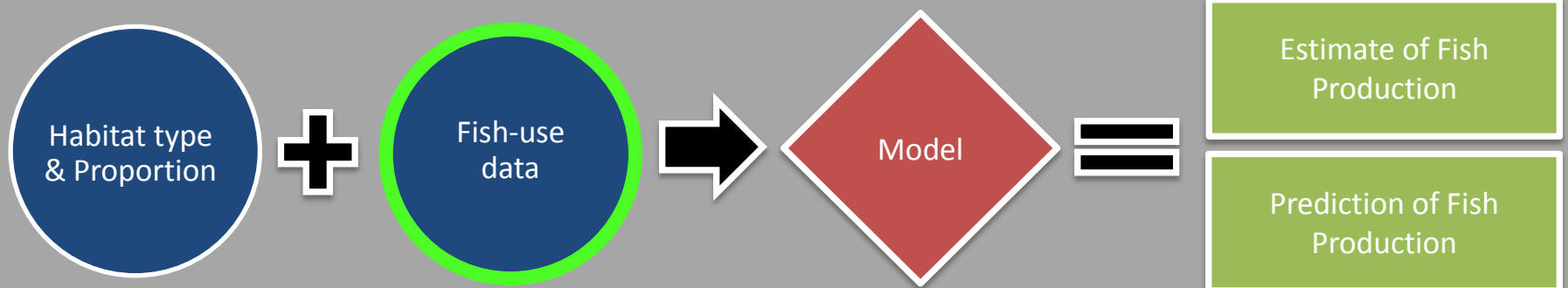
Brind'Amour and Boisclair (2006)



Wheeland (unpublished data)

Context and rationale:

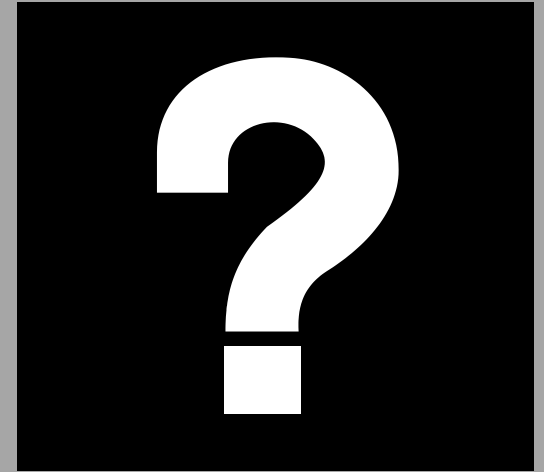
- Like lakes, reservoirs also have different habitat types, but the proportion is subject to changing water levels.
- Managers may need models in which the spatial context and proportion of habitat types are explicitly considered.
- Given a **habitat type and proportion** along with **fish-use data**, we can develop models to estimate and predict fish production.



Knowing the value of habitat, we can spatially manage (or develop) reservoirs as quality fisheries.

Specific objectives:

- Identify what sampling method or combinations of methods may be best to estimate/predict metrics of production.
- Assess the relative roles of local, lateral, and contextual variables on metrics of production.



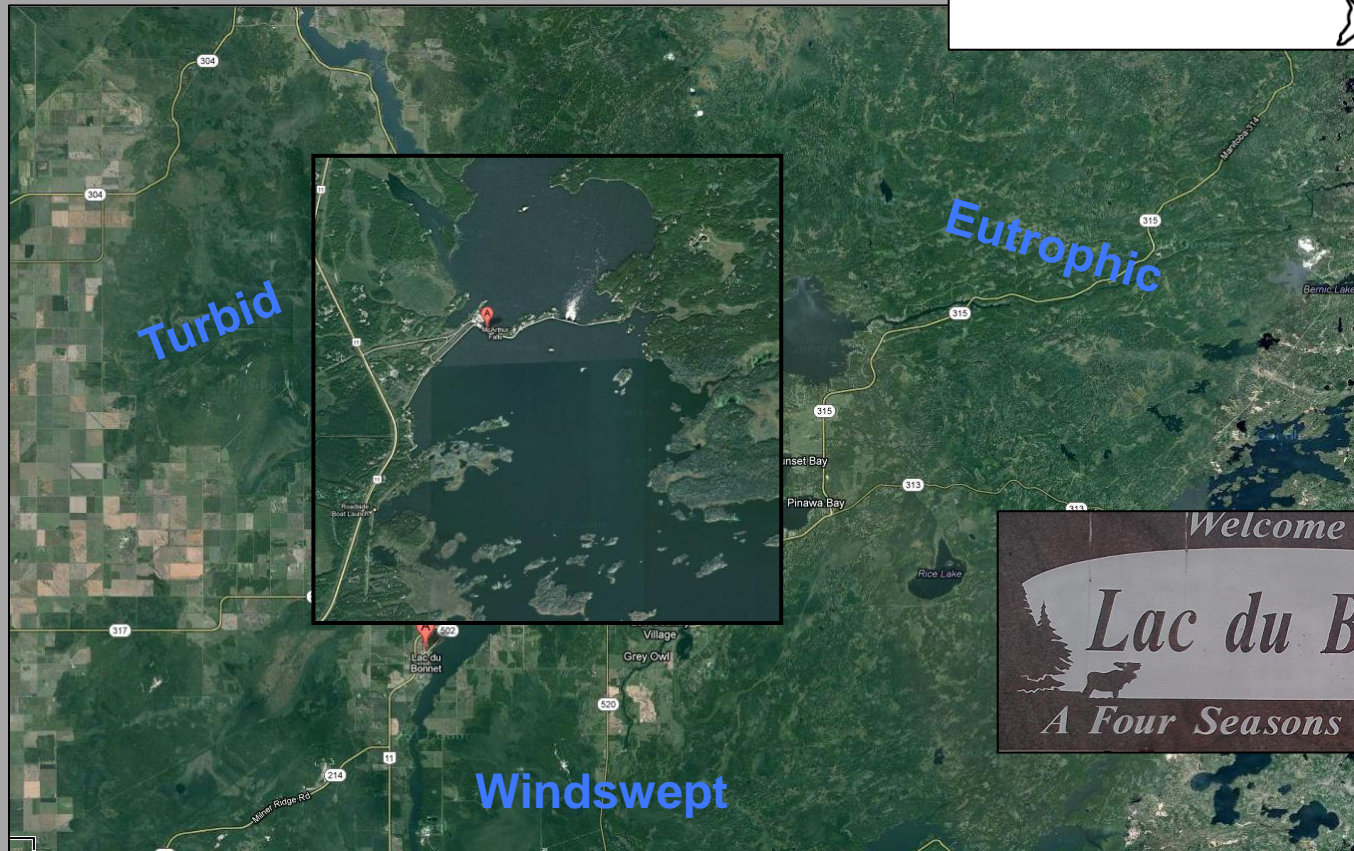
Specific hypotheses:

- Active methods (seining, and boat electrofishing) will allow us to develop mesoscale models with higher explanatory power than passive methods (gill netting).
- Local and contextual environmental conditions will play a similar role in explaining metrics of production (Brind'Amour and Boisclair 2006).



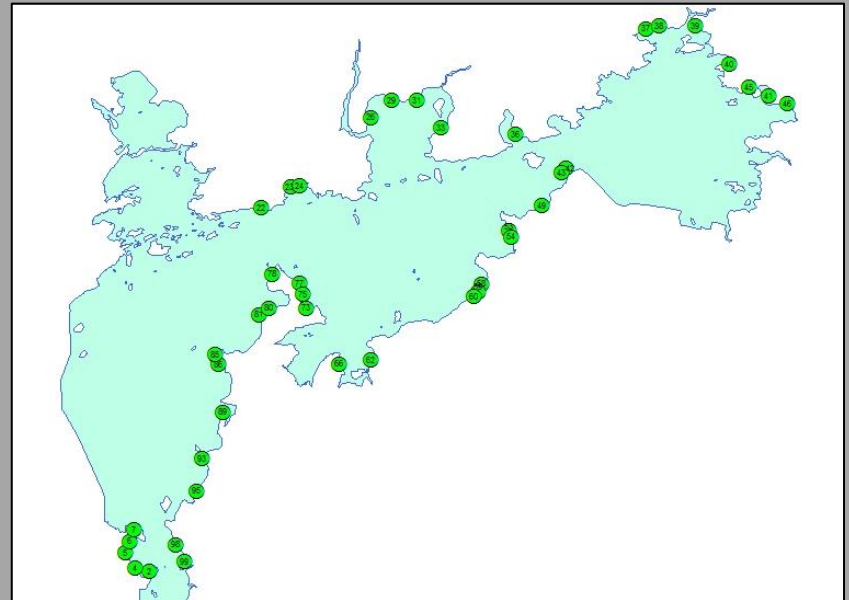
Study Site:

- Lac du Bonnet, Manitoba
 - 7.7 m mean / 25.2 m max depths
 - Reservoir area: 115 km²



Methodology:

- 43 + sites established
- Site requirements:
 - 200 homogeneous meters in length
 - Meet depth constraints of littoral zone (0-3 m)
 - Exclude cottages, islands, and drastic slopes ($\geq 10\%$)
- Site placement based on feasibility, requirements, contextual habitat variables.



Sampling Methods:

- Three sampling methods were selected based on their performance in the system and based on a review of literature.
 - Seining
 - Gillnetting
 - Electrofishing



Seining:

- Active method
- 35 m x 1.5 - 3 m, ½ in mesh
- Developed unique / functional method without beaching the seine.
- Seine hauls ranged in depths between 0.5 - 1.1 m (min) to 1.5 - 3 m (max).
- **Mean sampling area- 160 m²**

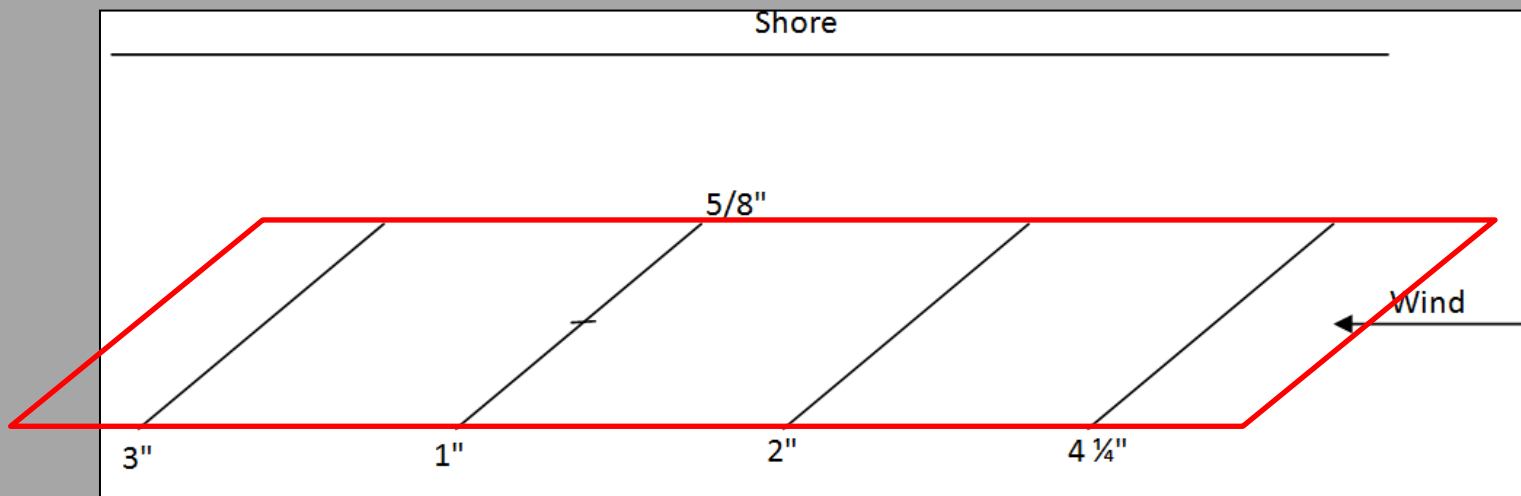


Gill Netting:

- Passive method
- Used 5/8 in, 1 in, 2 in, 3 in, 4¼ in mesh
- 4 nets each 20 m in length
- Nets set at 45° between the 2 and 3 m isobaths ± 0.5 m
- Distance of 20 m ± 5 m between nets
- Mean fishing time- 1h33
- **Mean sampling area- 1,120m² (Estimated)**



Min. estimate of Gill net sampling area
(60+20) x 14 m = 1,120m².



Electrofishing:

- Active method
- Used DFO electrofishing boat (Smith-Root SR20 w/5.0 GPP electrofisher).
- Shocked a 100 m transect in waters ranging from about 1-1.5 m median depth.
- Mean shocking seconds- 220 (3 min 40 sec)
- **Mean sampling area- 500 m² (Estimated)**

Coarse estimate of Electrofishing sampling area
100 m (transect) x 5 m (boat width & shock range)= 500 m²

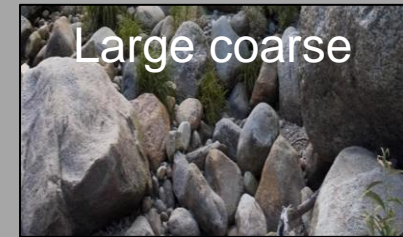


Habitat Sampling:

- Mapped the 1, 2 and 3 m isobaths and assigned percentages of the site as a whole
- Used a 1/4 m² quadrat to measure substrate and macrophyte cover 10x over the entire site
- Location of these measurements was dependant on the percent composition of depth zones over the site

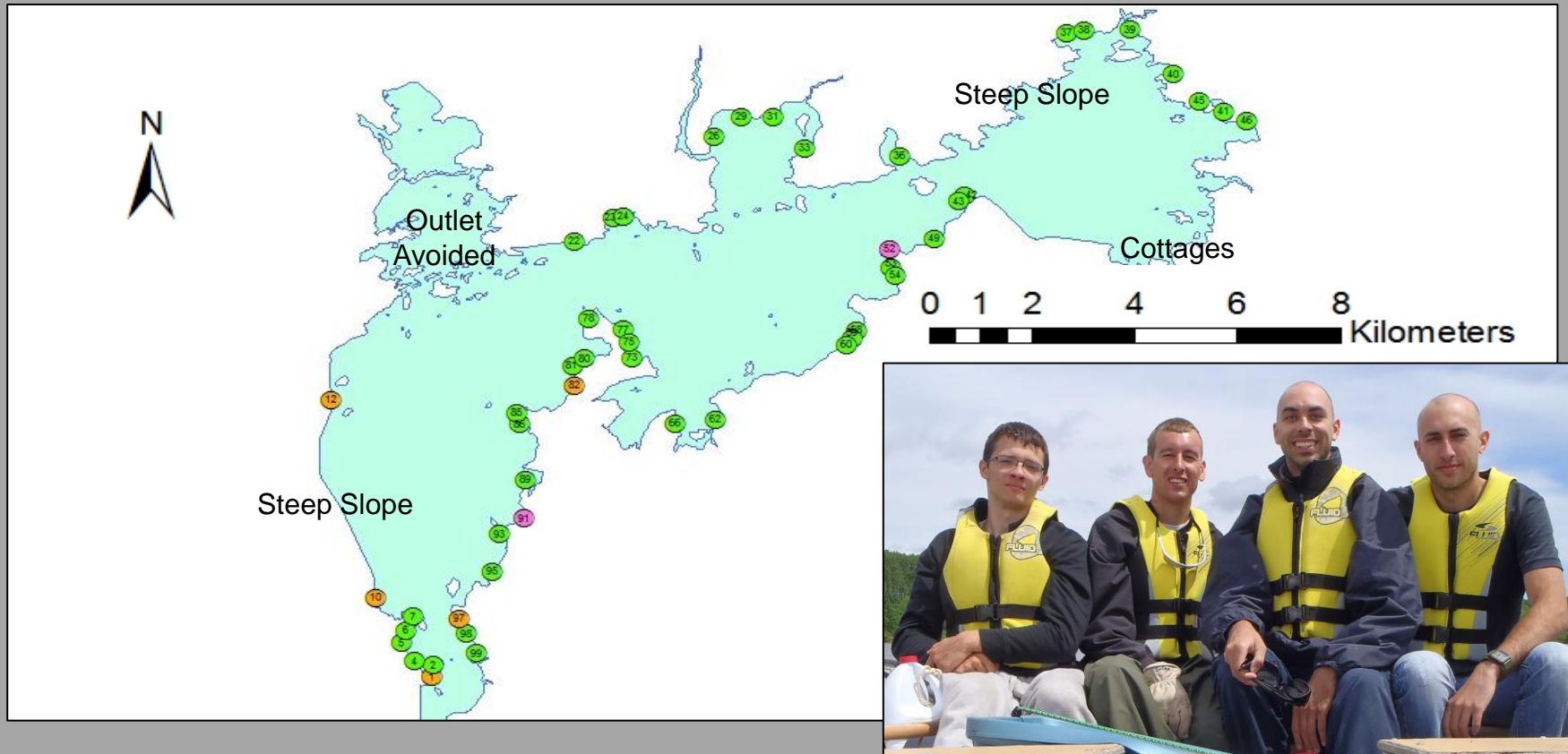
0-1 m depth	70%	7 samples
1-2 m depth	20%	2 samples
2-3 m depth	10%	1 sample

- Assessment of lateral and contextual variables can be conducted offsite



What we've accomplished in 2012!

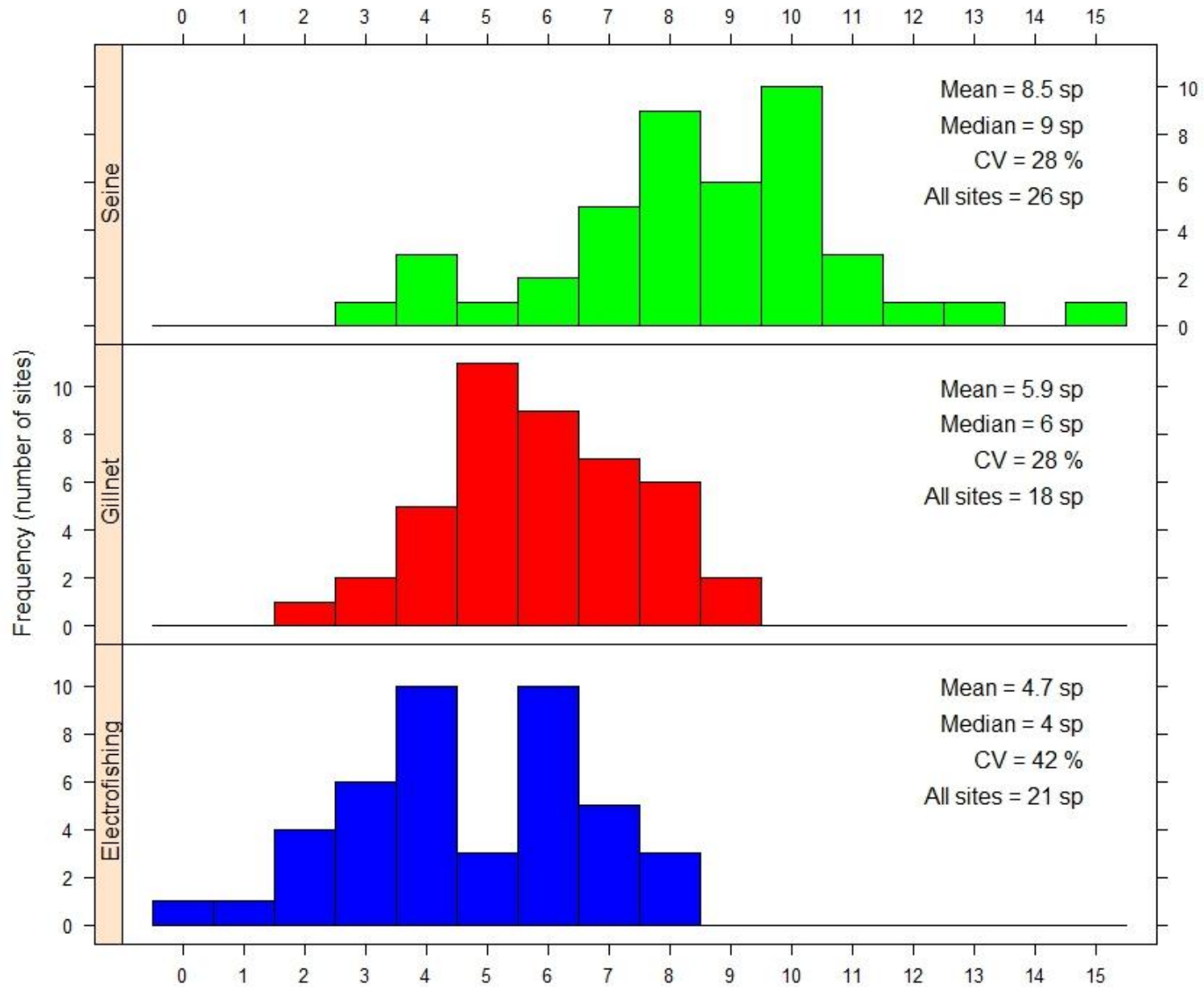
- Daytime sampling of Lac du Bonnet was conducted:
 - **43 sites** using all **three** sampling gears (green)
 - **5 sites** using **two** gears (orange)
 - **2 sites** using **one** gear (pink)
 - Total of **50 sites** sampled



What we collected in 2012!

- 27 fish species
- 28,989 individuals!
- 360.14 kg of fish

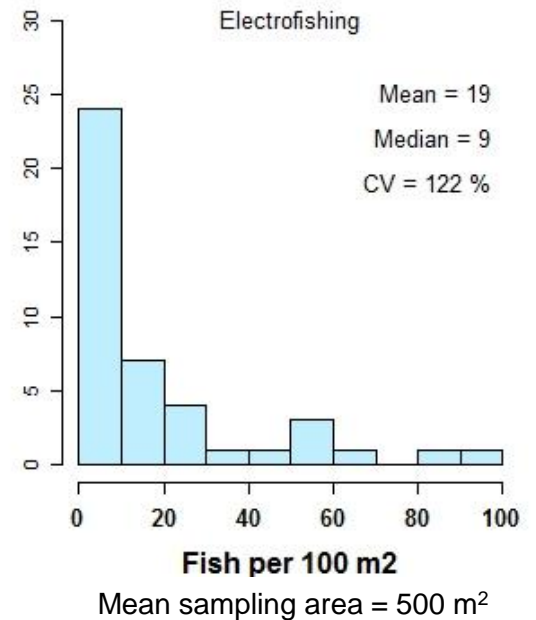
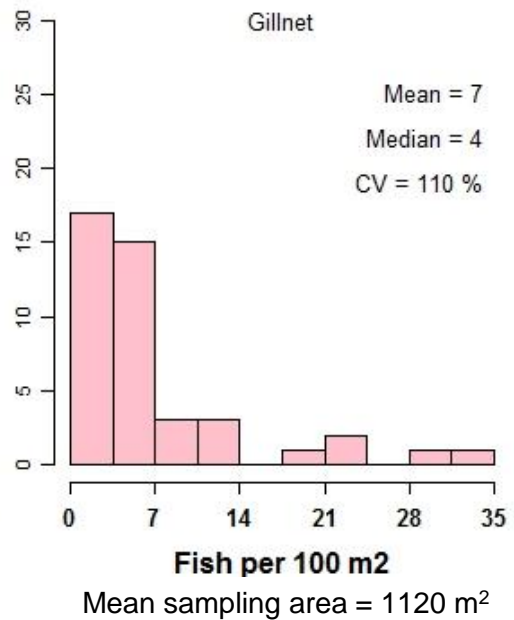
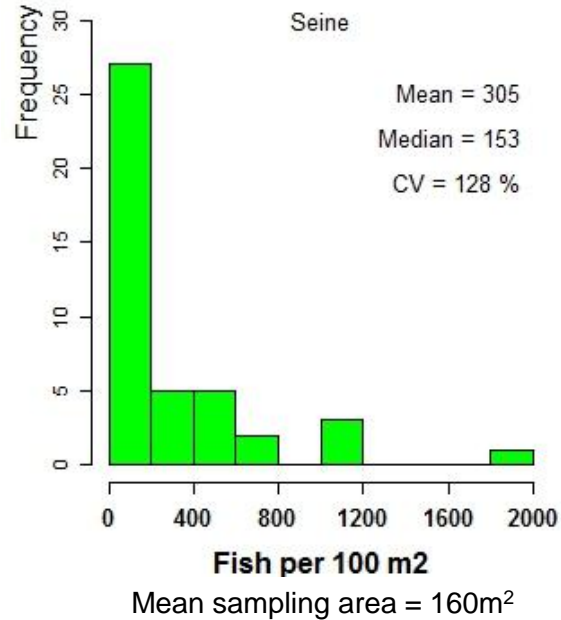
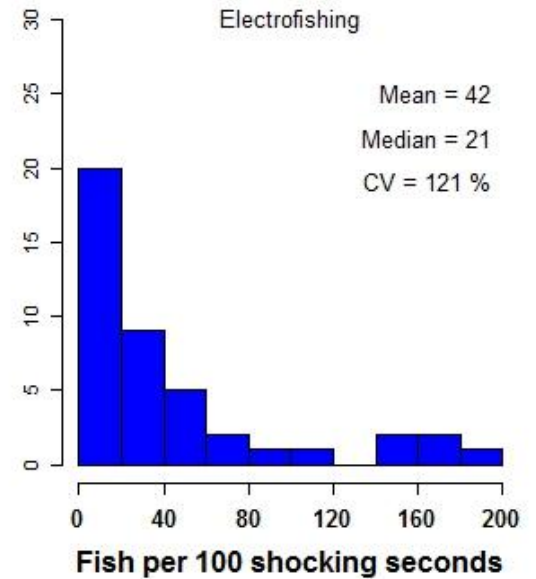
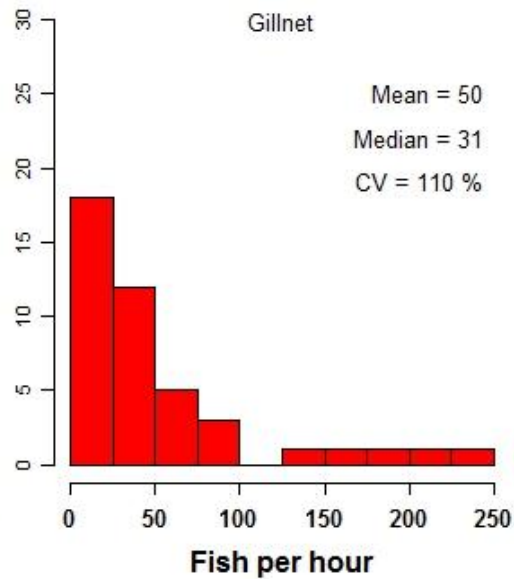
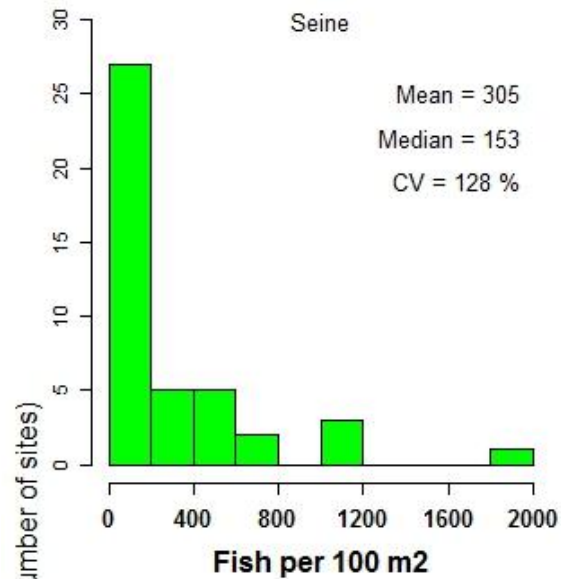




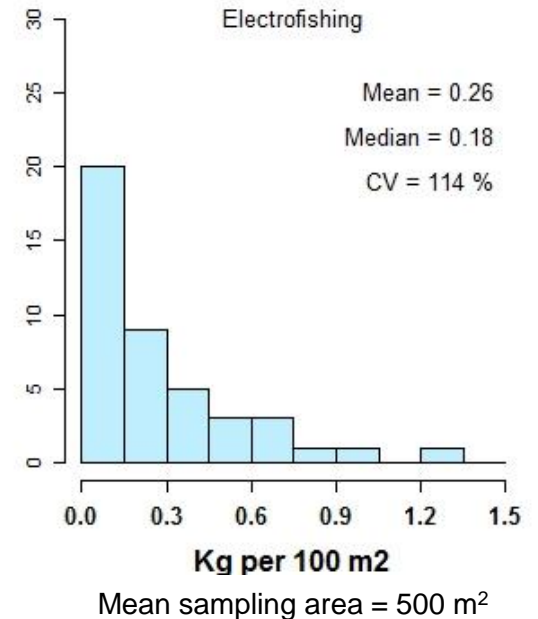
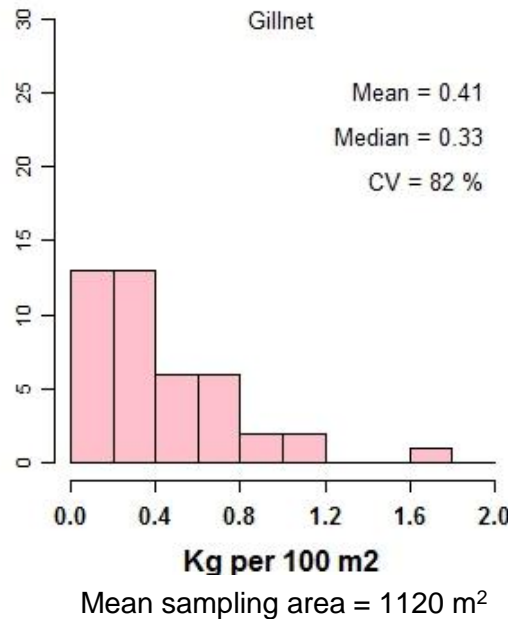
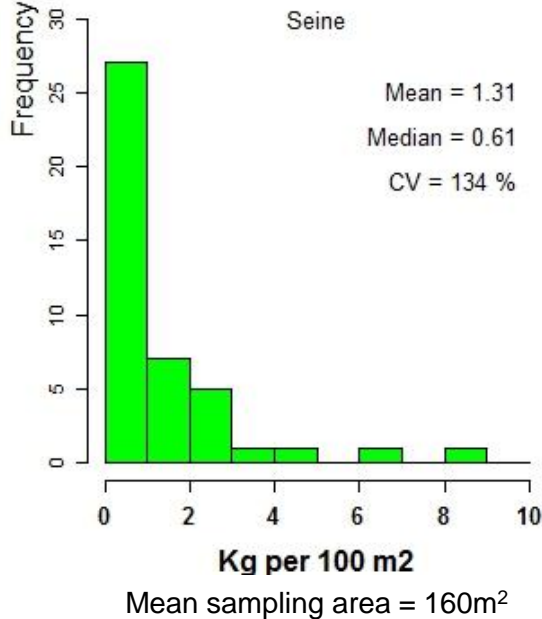
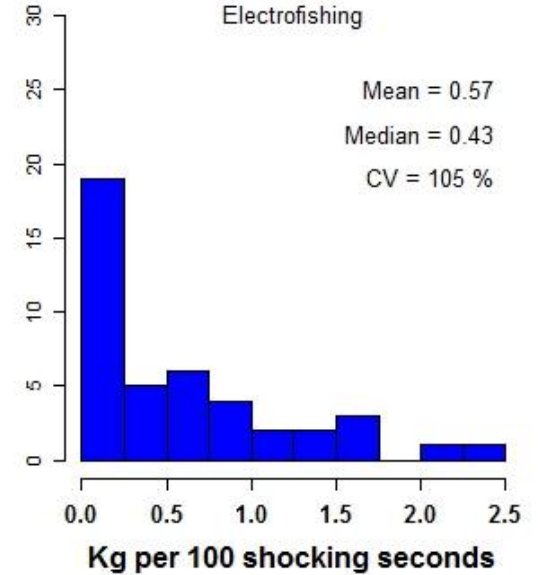
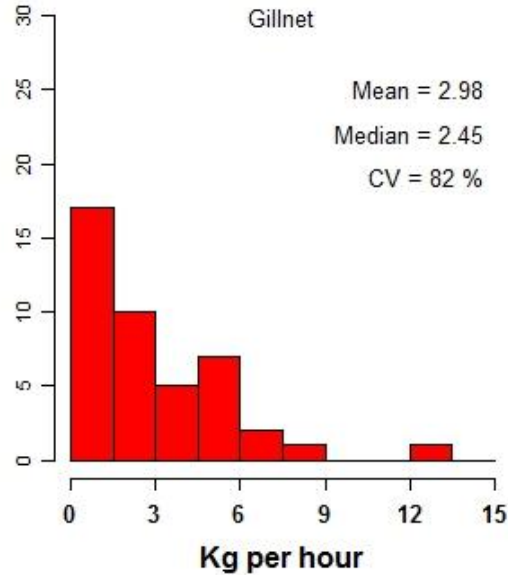
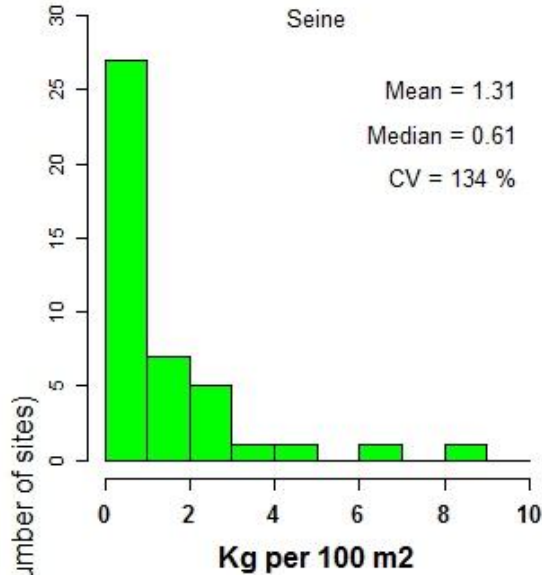
Species Richness (Total captured = 27 sp)

***All gears are significantly different

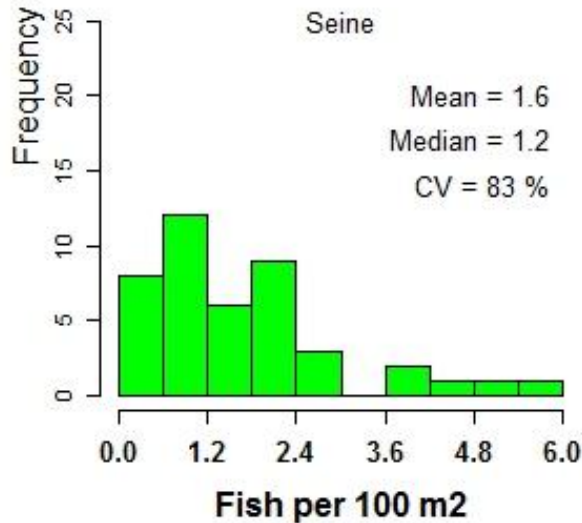
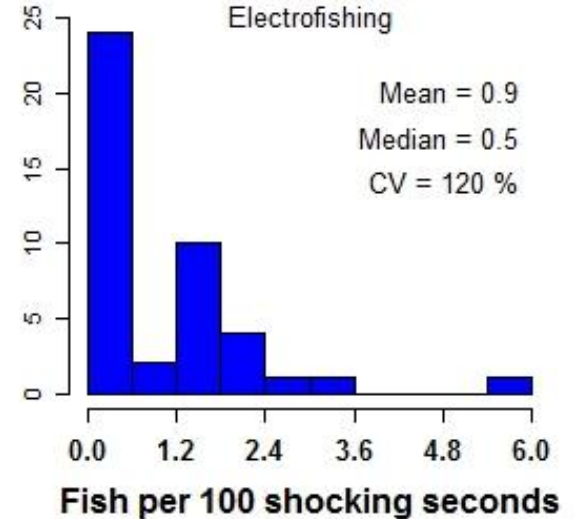
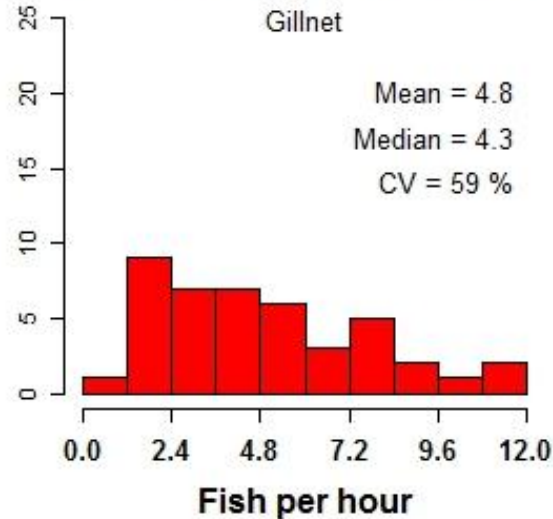
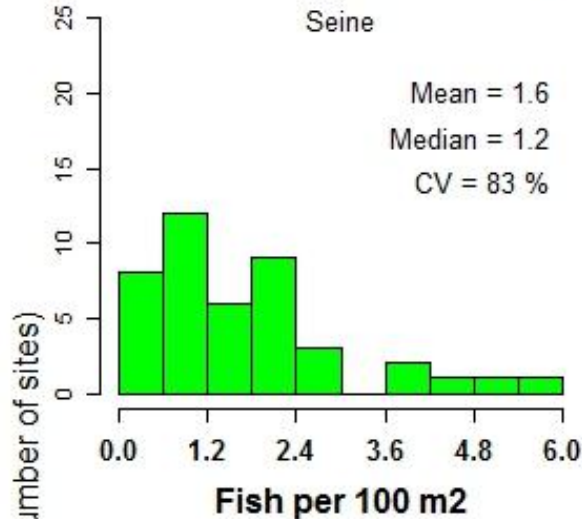
CPUE - Abundance



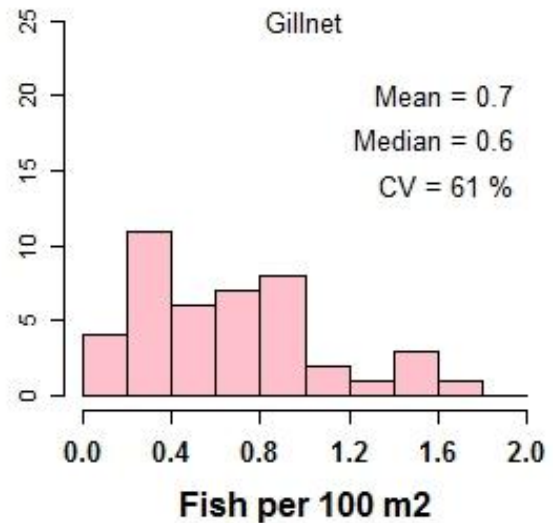
CPUE - Biomass (kg)



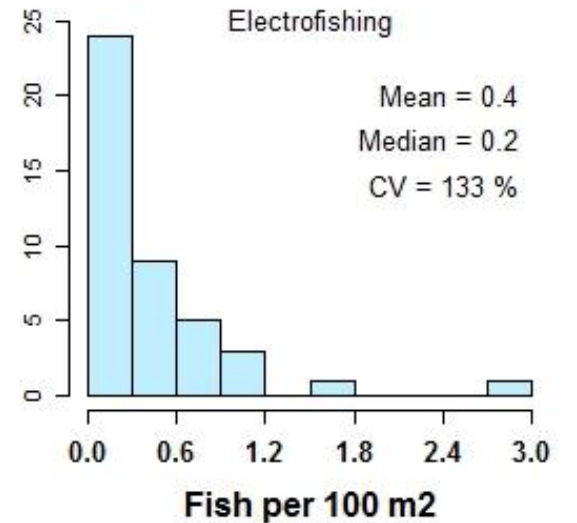
CPUE - Abundance >15cm



Mean sampling area = 160m²

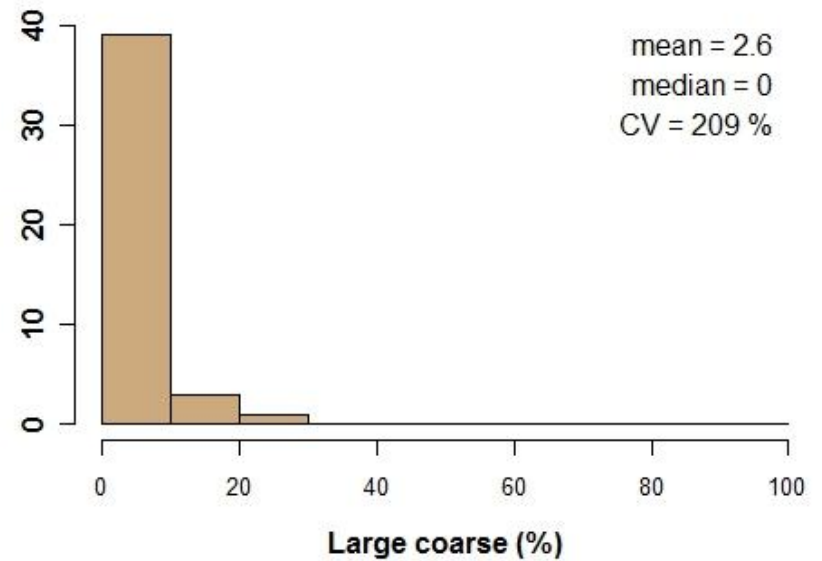
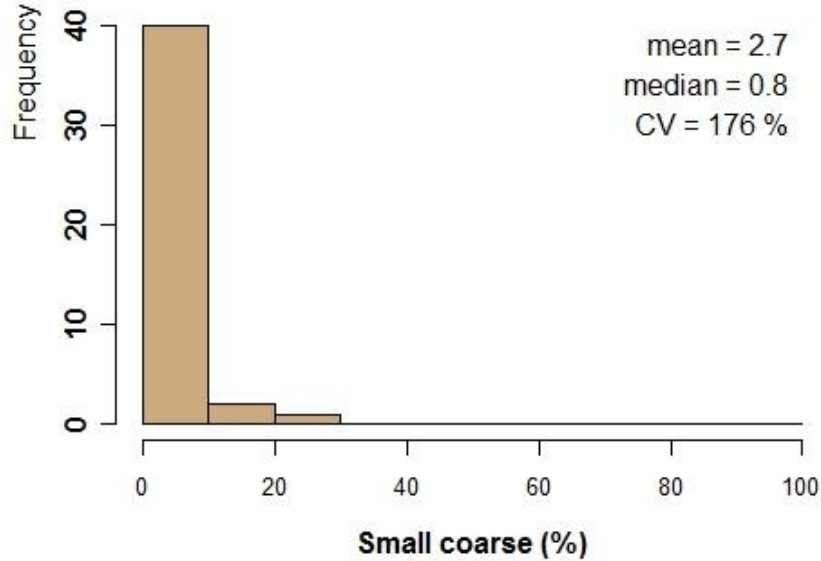
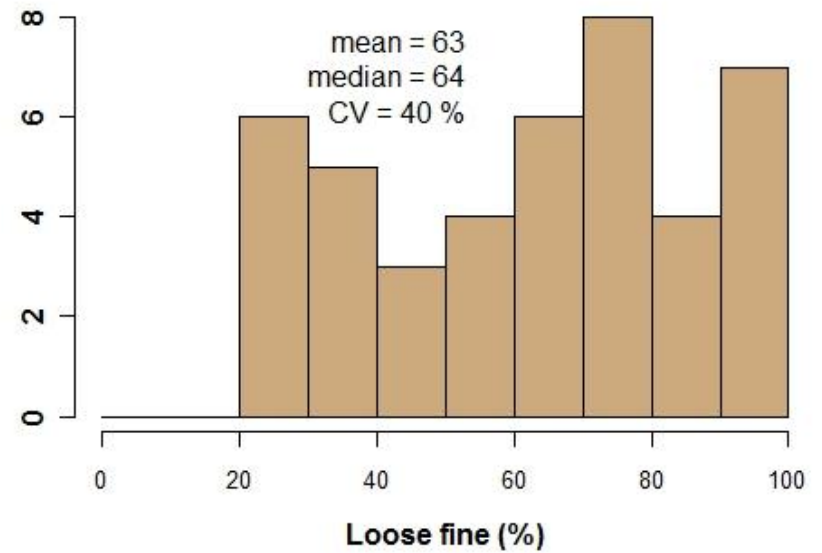
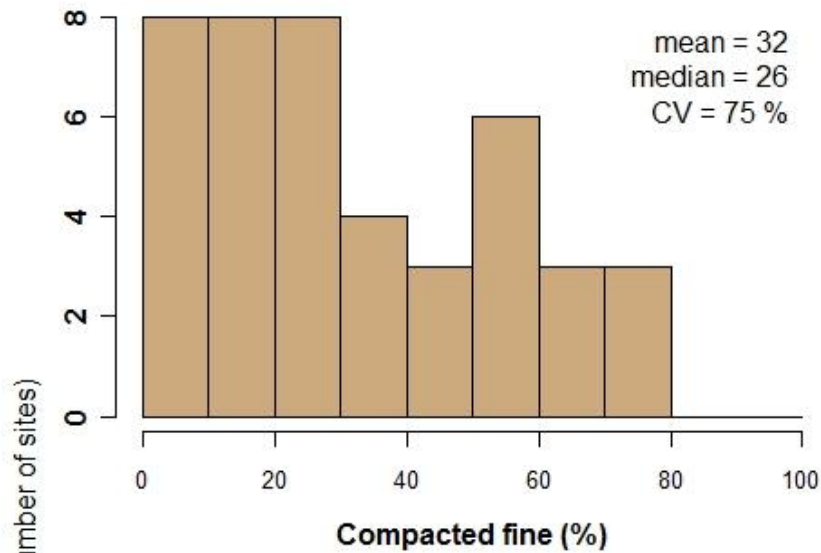


Mean sampling area = 1120 m²

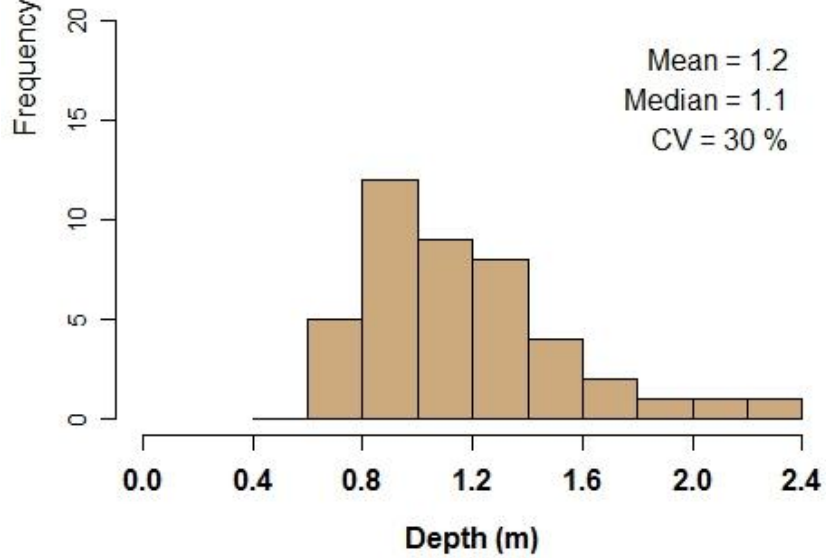
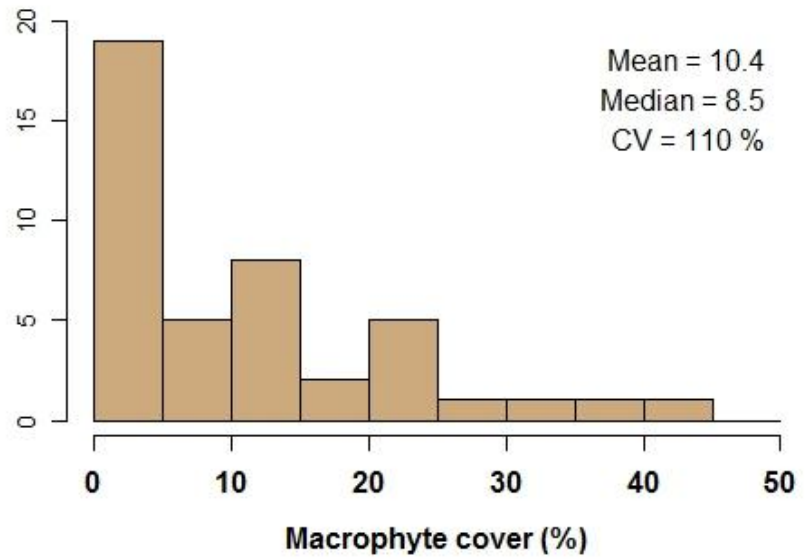
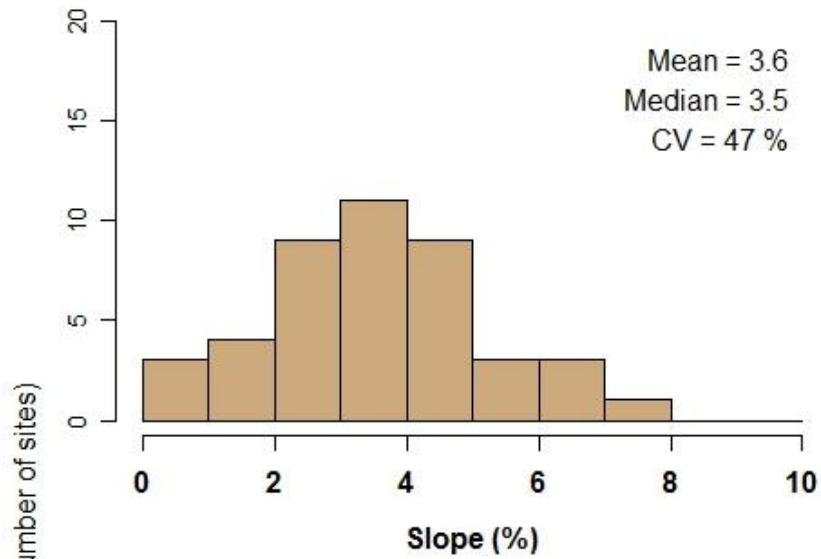


Mean sampling area = 500 m²

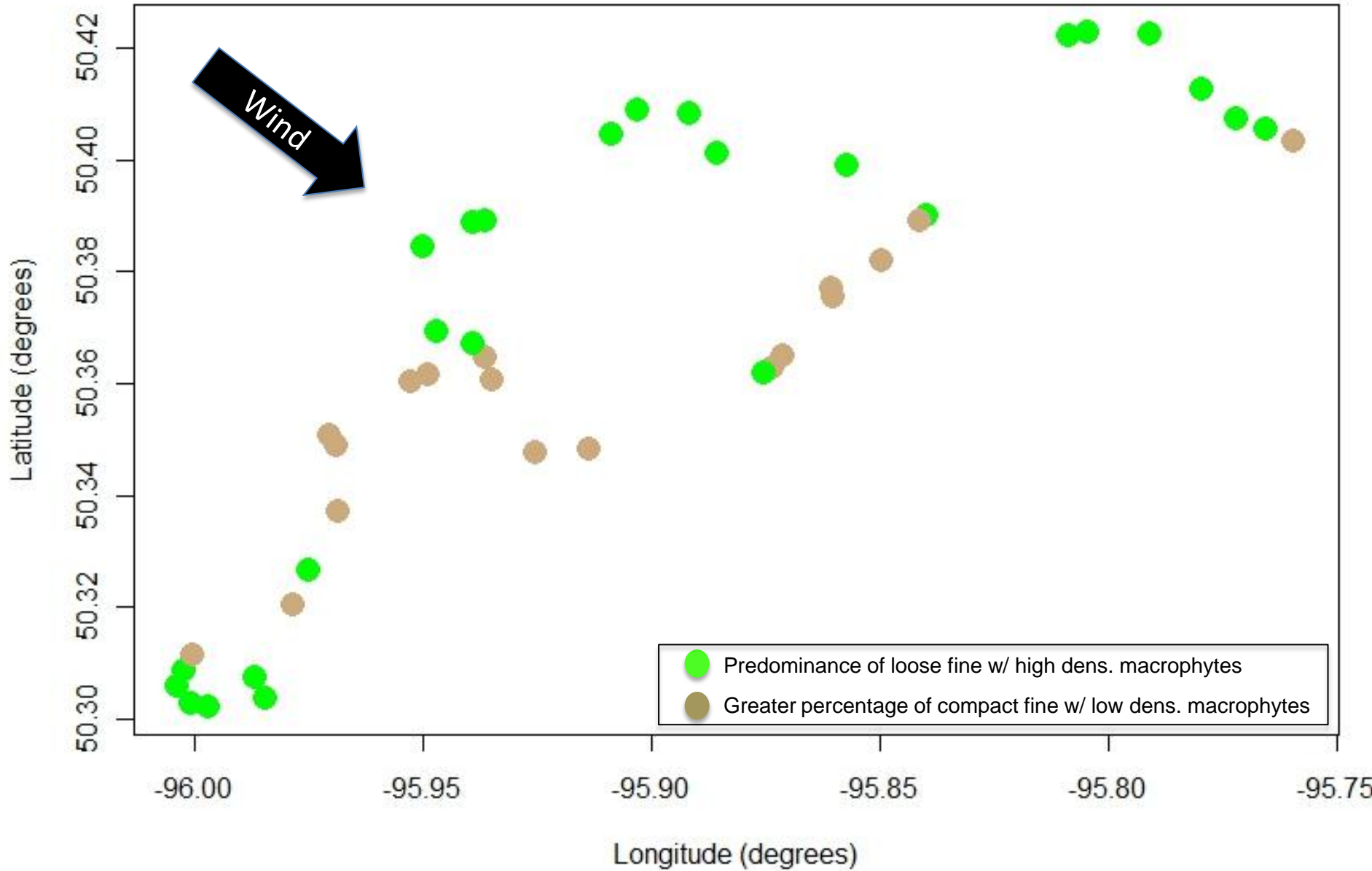
Substrate cover



Habitat variables



Map of habitat types



Looking Ahead

- Repeat sampling at night in 2013
 - Using seine and electrofishing as our main gears.
- Develop and compare habitat-use models using each gear's data
- Compute offsite, lateral and contextual variables (Objective 2)
- Compare local, lateral and contextual habitat variables (Objective 2)





Questions?

2012 HydroNet Reservoir Team (Wheeland, 2012)