Lower Columbia Estuary Program – Ecosystem Monitoring Program
2021 Annual Science Work Group Meeting

Juvenile salmon prey availability and diets, presented by: Kerry Accola
Wetland Ecosystem Team – School of Aquatic and Fishery Sciences, University of Washington

Process Salmon Prey Availability and Salmon Diets
Potential prey – Neuston and Benthic

- **Sample Methods**
- Neuston – open water (OW) and emergent vegetation (EV), deployed from boat, top 20 cm of water, 2x/month at each
- Benthic – cores sampled; 2" PVC pipe depth of 10 cm
- **Lab Methods**
- Number of individuals counted in each group (order or family)
- Blot each group dry and weigh to nearest 0.0001g
- 2020 samples from **Feb – March**; 2020 data entry finished recently; preliminary neuston plots

Salmon Diets

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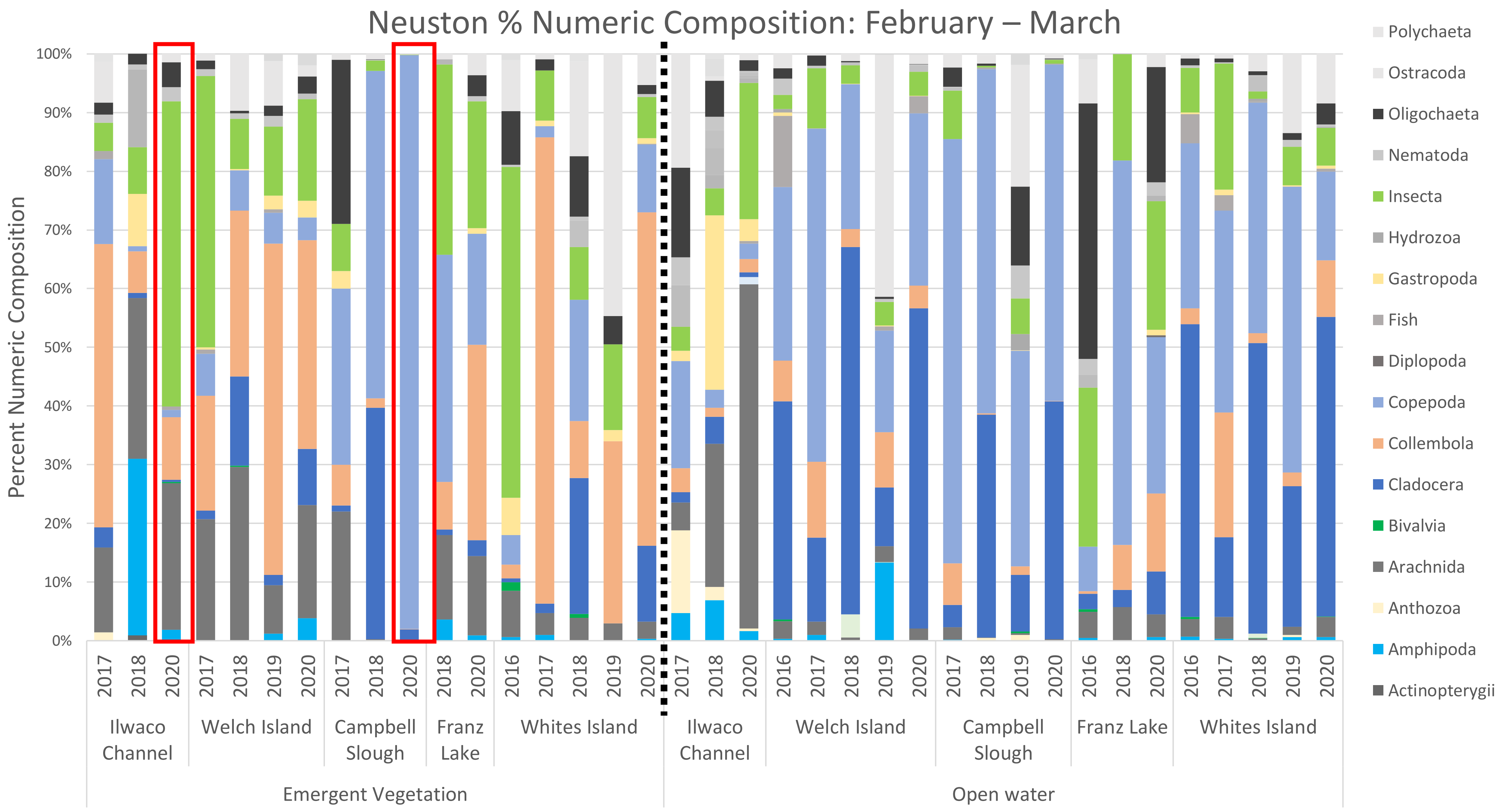
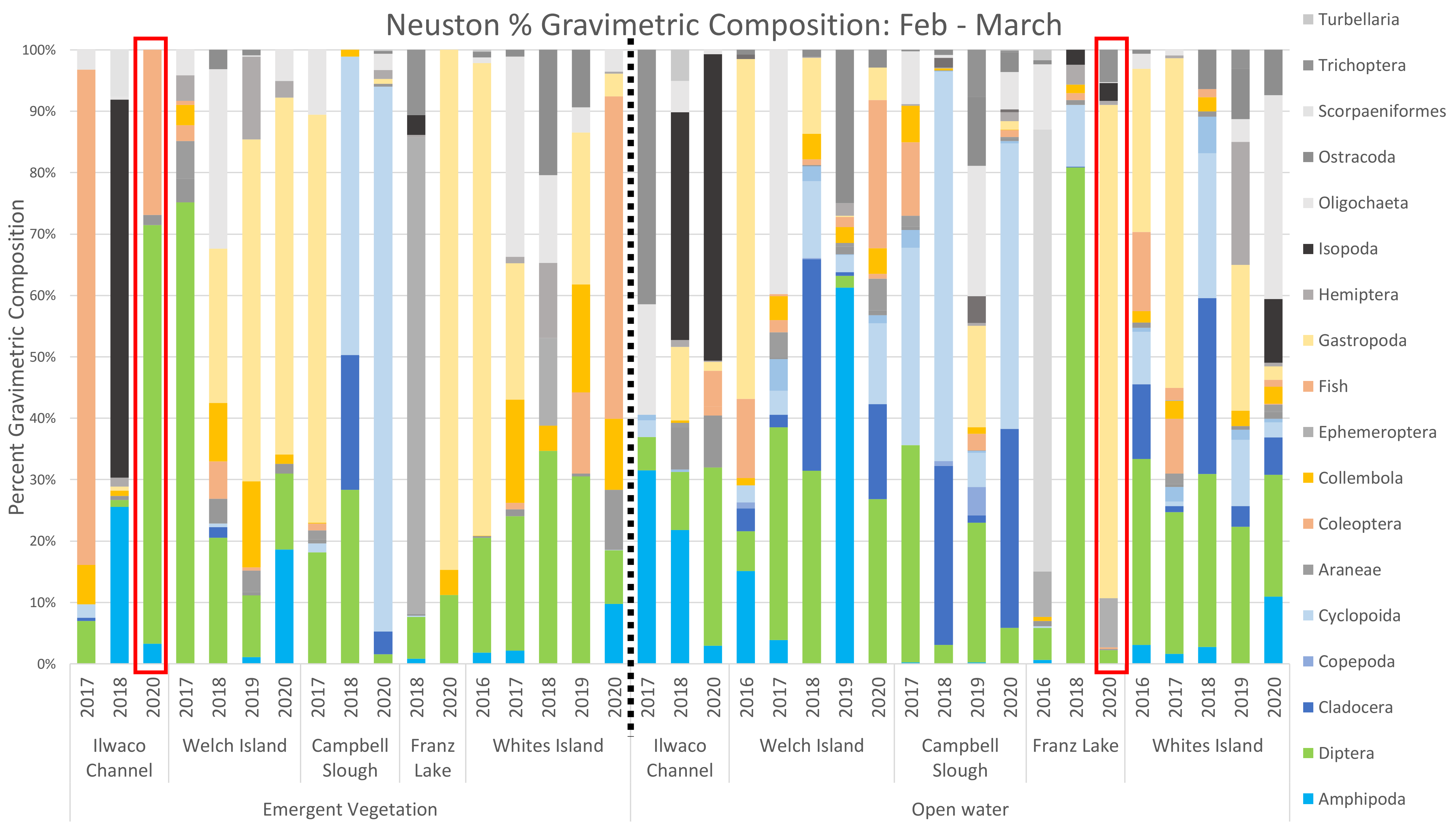
- All 2020 diets were sampled in **February – March**
- All 2020 fish lengths were **30 – 59 mm**



Neuston % Numeric Composition: February – March
Percent Numeric Composition
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2017 2018 2020 2017 2018 2019 2020 2017 2018 2020 2018 2020 2016 2017 2018 2019 2020 2017 2018 2020 2016 2017 2018 2019 2020 2017 2018 2019 2020 2016 2018 2020 2016 2017 2018 2019 2020
Ilwaco Channel
Welch Island
Campbell Slough
Franz Lake
Whites Island
Ilwaco Channel
Welch Island
Campbell Slough
Franz Lake
Whites Island
Emergent Vegetation
Open water
Polychaeta
Ostracoda
Oligochaeta
Nematoda
Insecta
Hydrozoa
Gastropoda
Fish
Diplopoda
Copepoda
Collembola
Cladocera
Bivalvia
Arachnida
Anthozoa
Amphipoda
Actinopterygii



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Open water
Turbellaria
Trichoptera
Scorpaeniformes
Ostracoda
Oligochaeta
Isopoda
Hemiptera
Gastropoda
Fish
Ephemeroptera
Collembola
Coleoptera
Araneae
Cyclopoida
Copepoda
Cladocera
Diptera
Amphipoda

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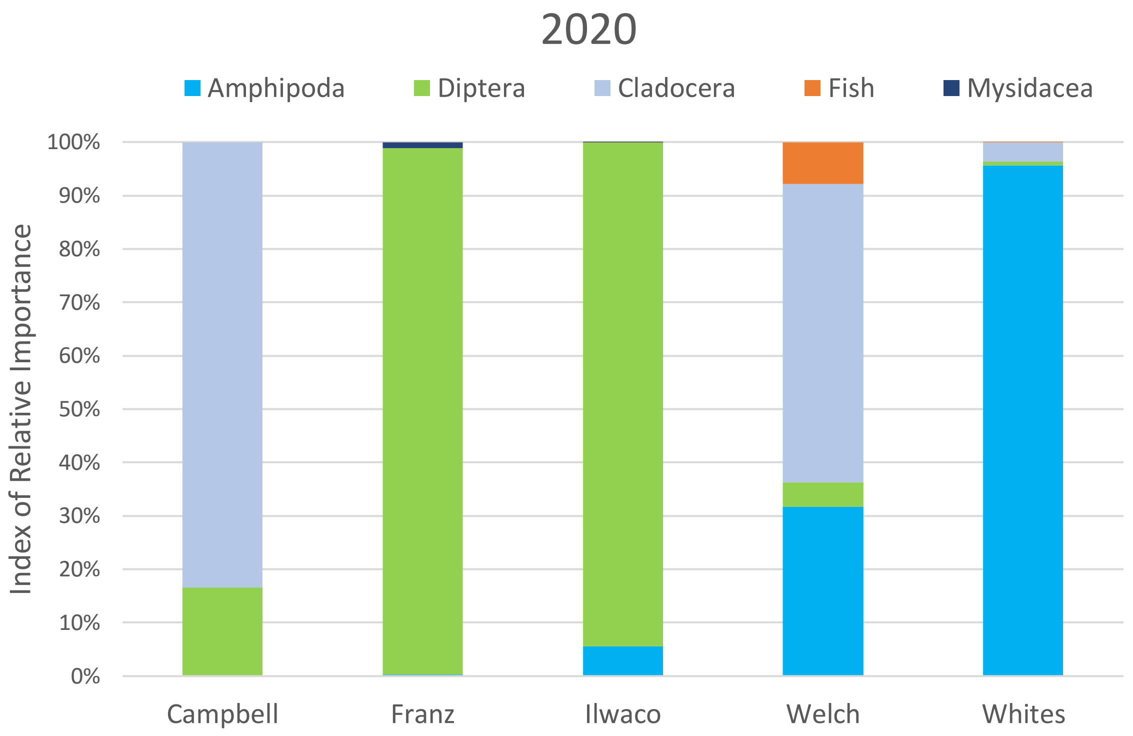
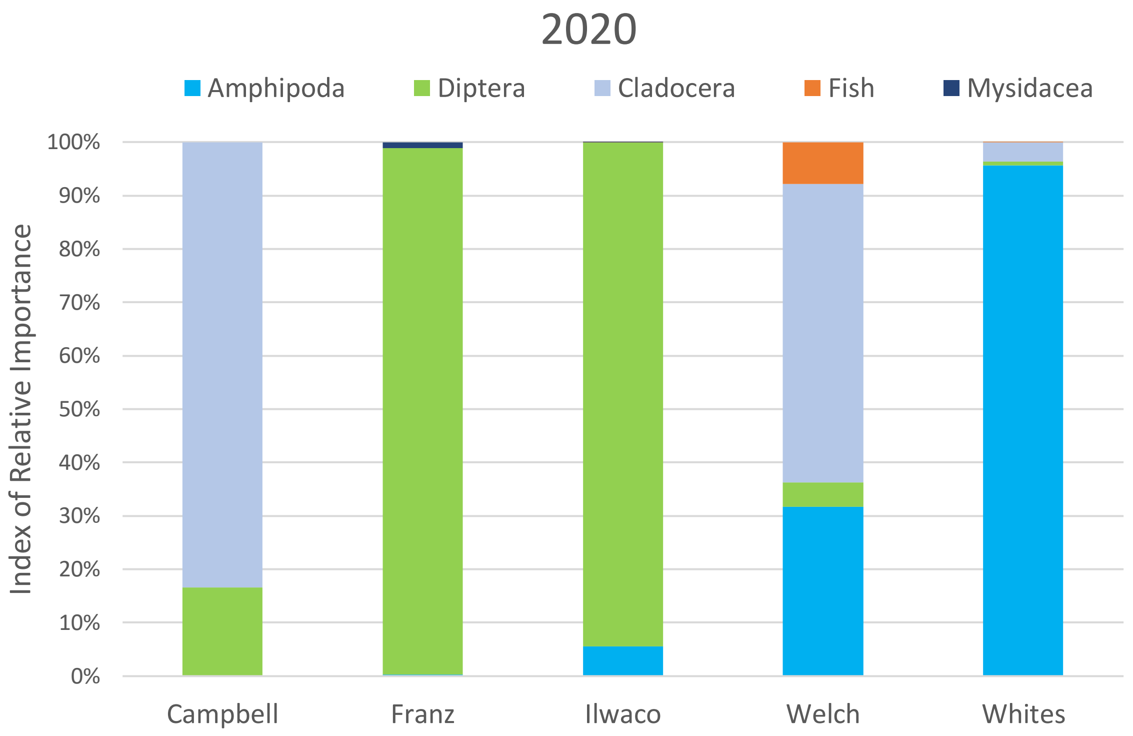
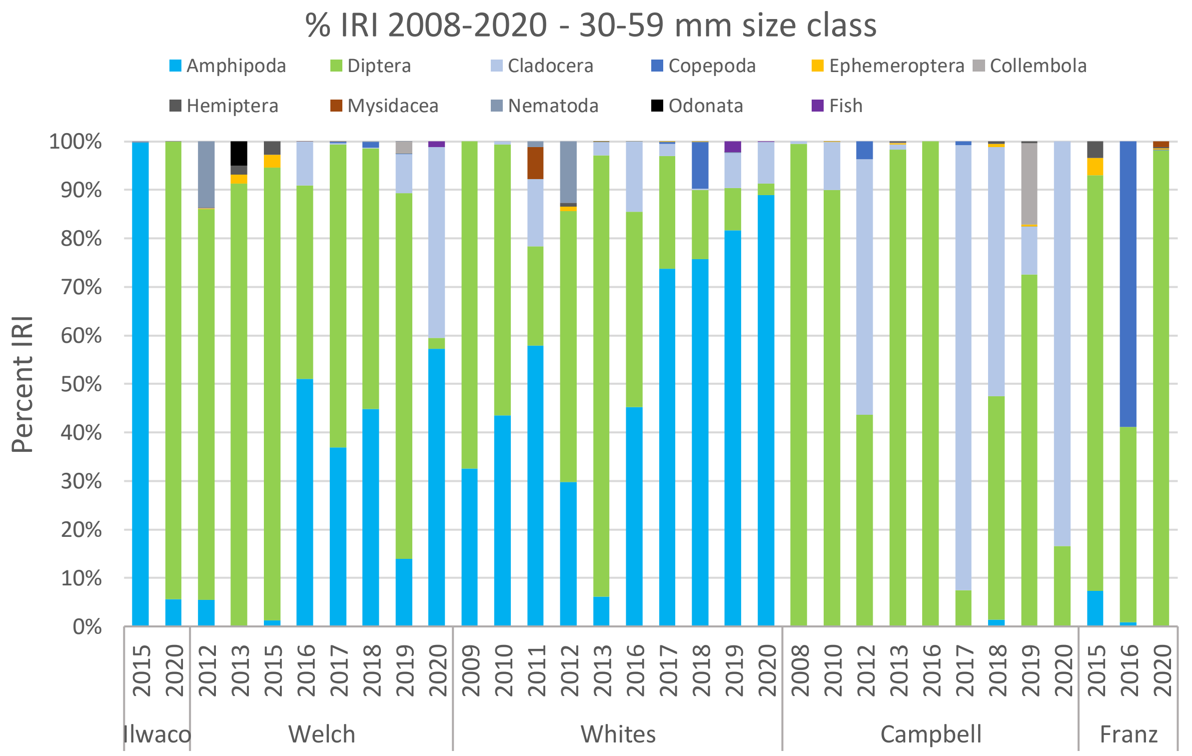
Diets



$$IRI = \mathrm{FO} * (\%\ Numeric\ Comp + \%\ Gravimetric\ Comp)$$

Dipterans -> chironomids
Amphipods -> *Americorophium* spp.
Cladocerans -> *Daphnia* spp.





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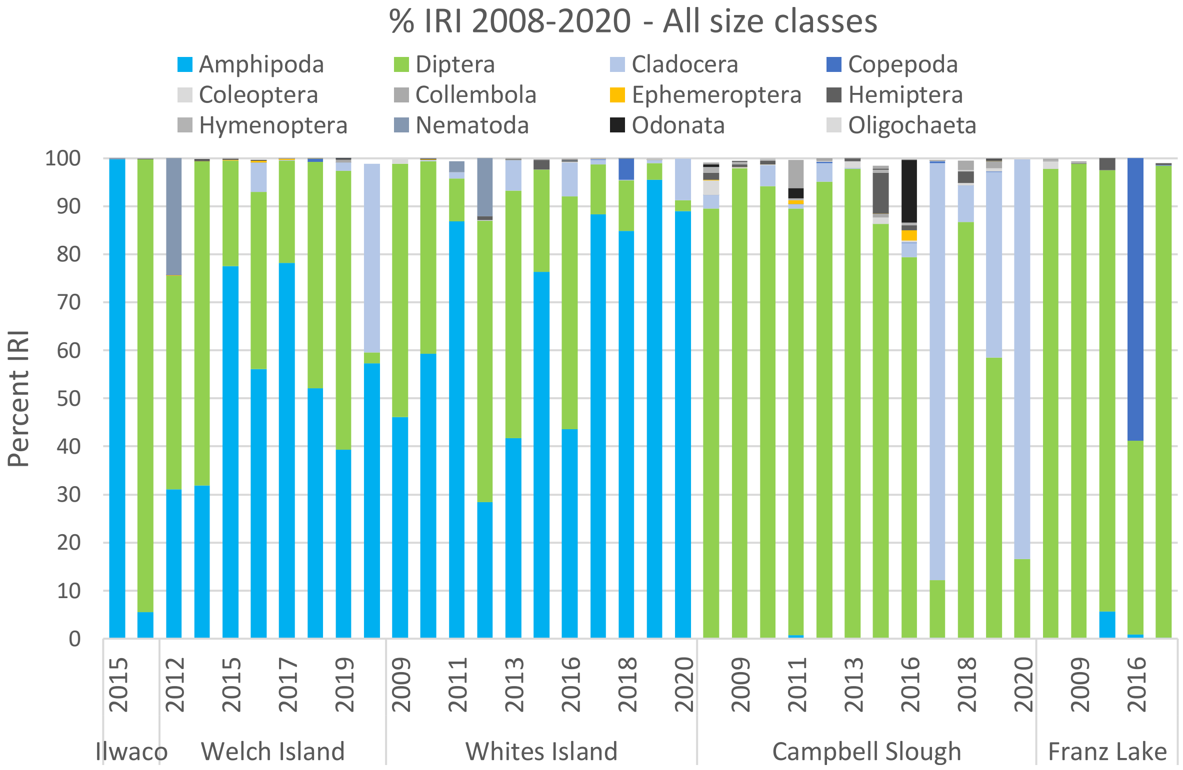
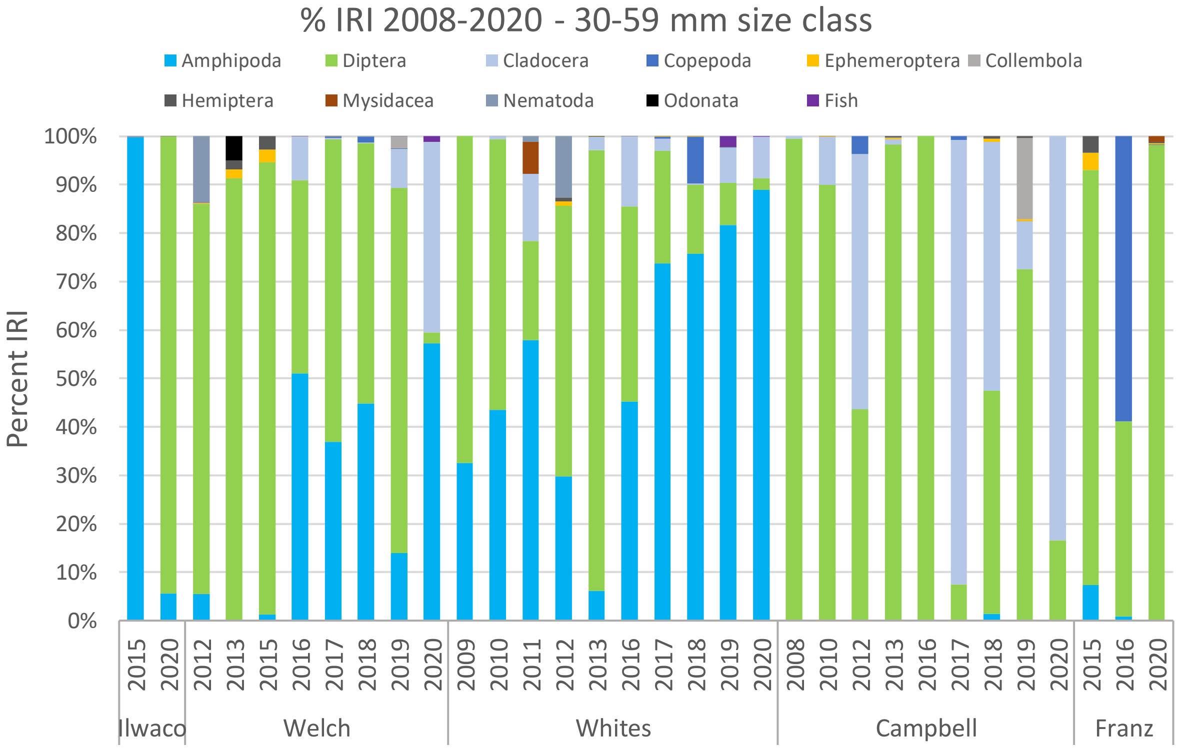
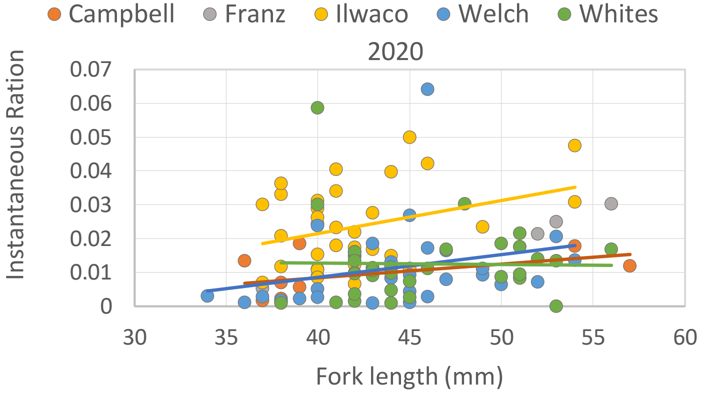




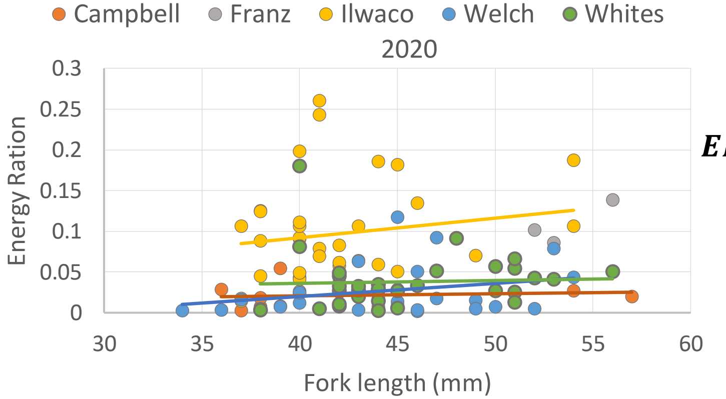
$$IRI = \mathrm{FO} * (\%\ Numeric\ Comp + \%\ Gravimetric\ Comp)$$

$$IR = \frac{\textbf{sum of prey weight}}{\textbf{field weight}}$$

Instantaneous Ration

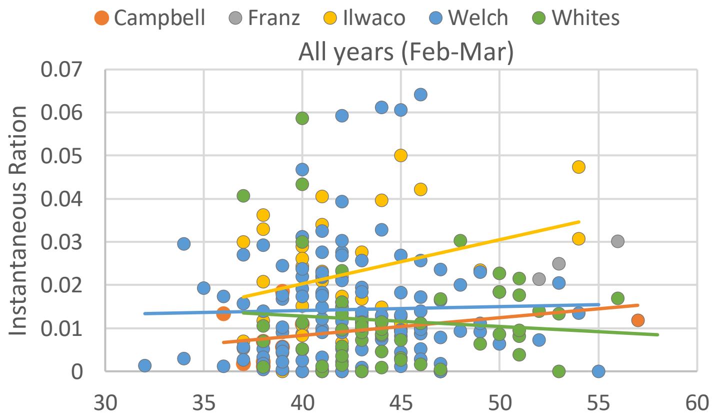


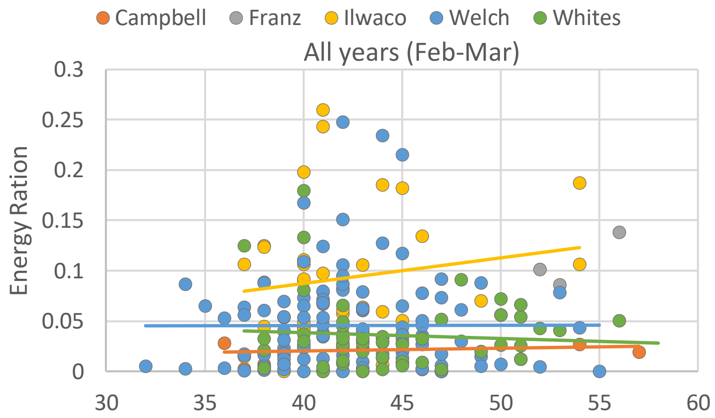
Energy Ration



$$ER = \frac{\textbf{sum of prey energy density}}{\textbf{field weight}}$$

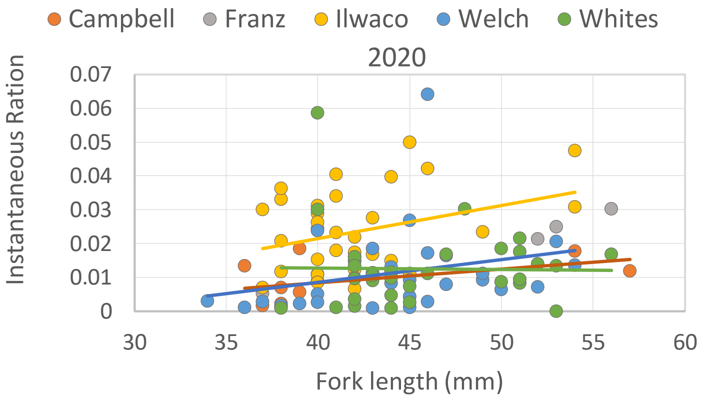
Measure fish foraging performance





$$IR = \frac{\textit{sum of prey weight}}{\textit{field weight}}$$

Instantaneous Ration



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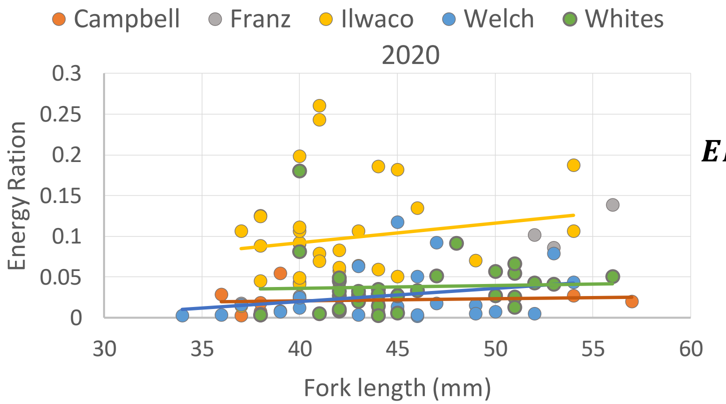

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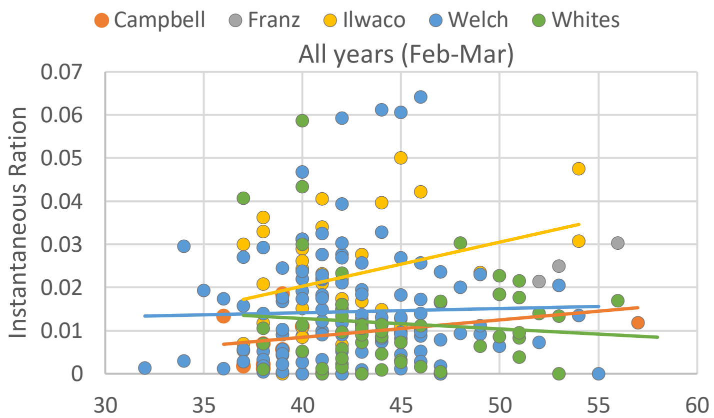
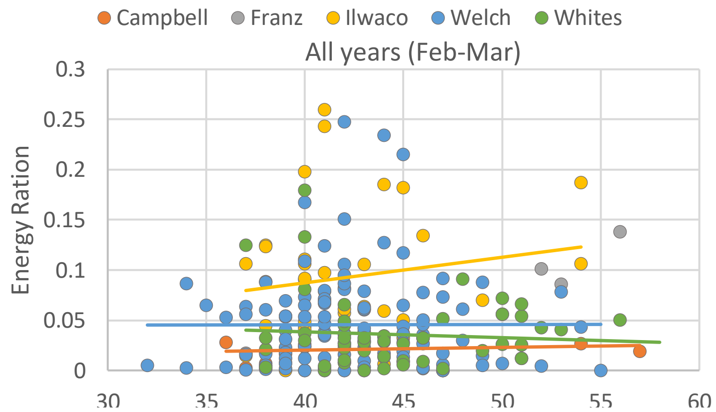
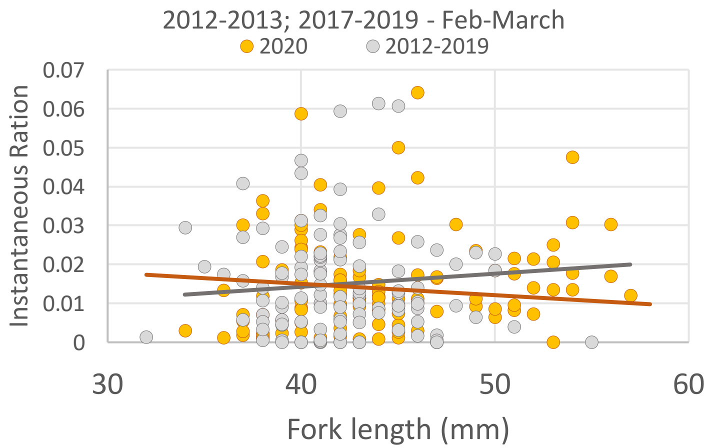
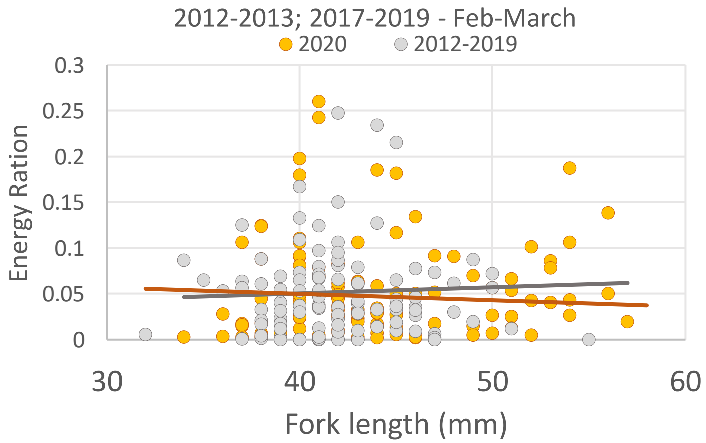








$$J_m(maintenance\ metabolism) = j_m * e^{dt} * W$$

Represents metabolic upkeep; general assessment of habitat quality; affected by temp and body mass

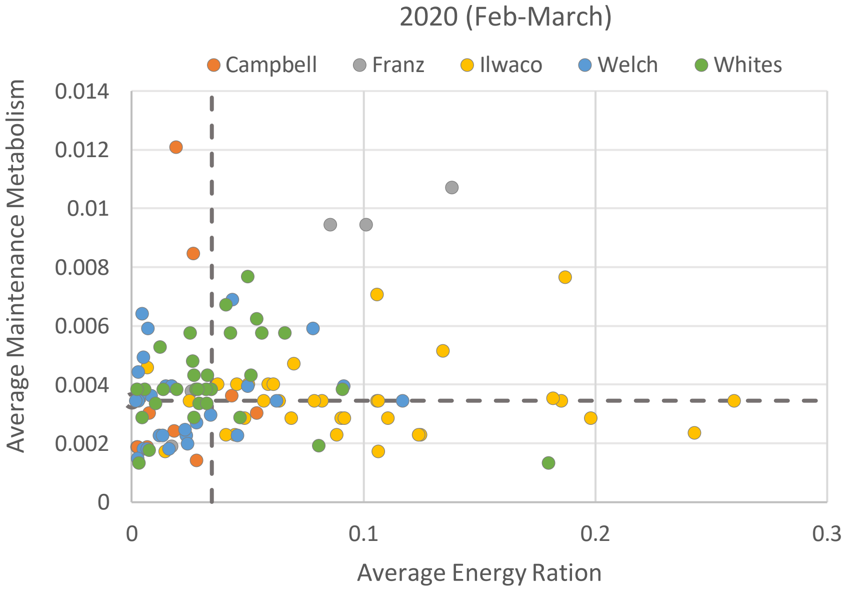
j_m = mass specific maintenance costs at 0° C

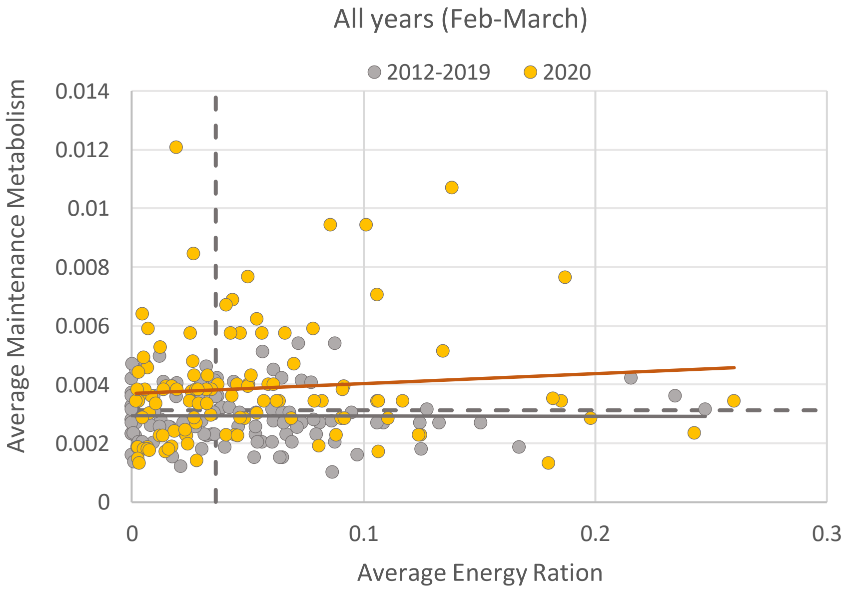
d = temperature coefficient for biomass assimilation

T = water temperature in °C; W = fish body mass

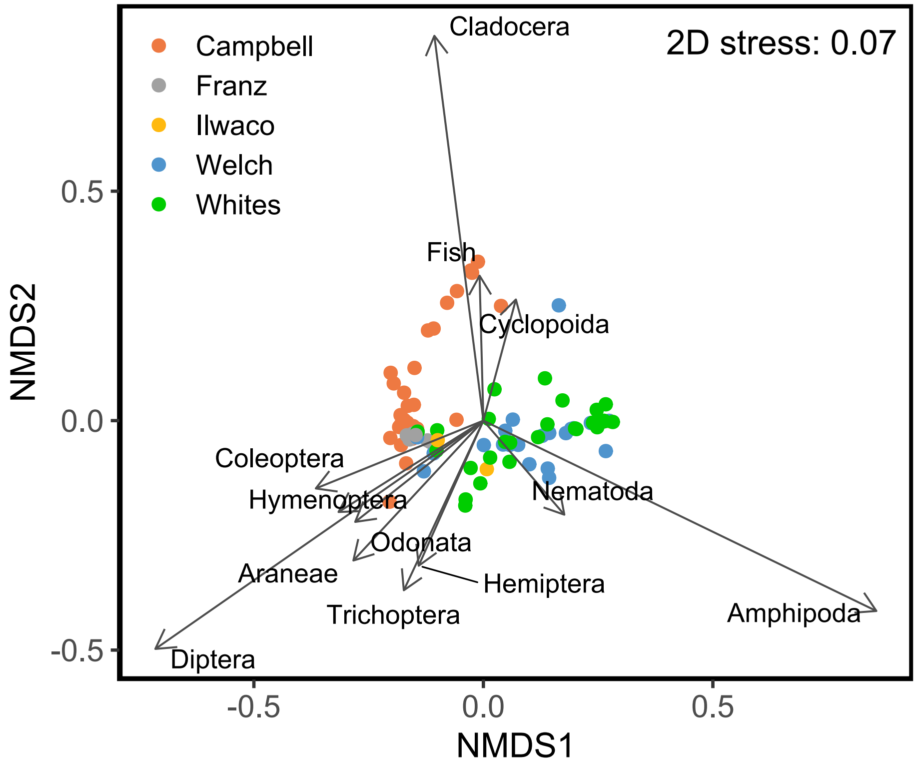
High energy, low metabolic costs = positive growing conditions (lower right)

2020 -> above average metabolic costs





Rank-based



Pairwise comparisons - ANOSIM			Cumulative Contr.	
Groups	R-value	Bonferroni p	Amphip	Diptera
Campbell – Ilwaco	0.45	0.096	0.41	0.77
Campbell – Welch	0.44	0.006	0.39	0.73
Campbell – Whites	0.44	0.006	0.39	0.74
Franz – Ilwaco	0.63	0.042	0.46	0.91
Franz – Welch	0.49	0.006	0.86	0.44
Franz – Whites	0.36	0.006	0.86	0.45

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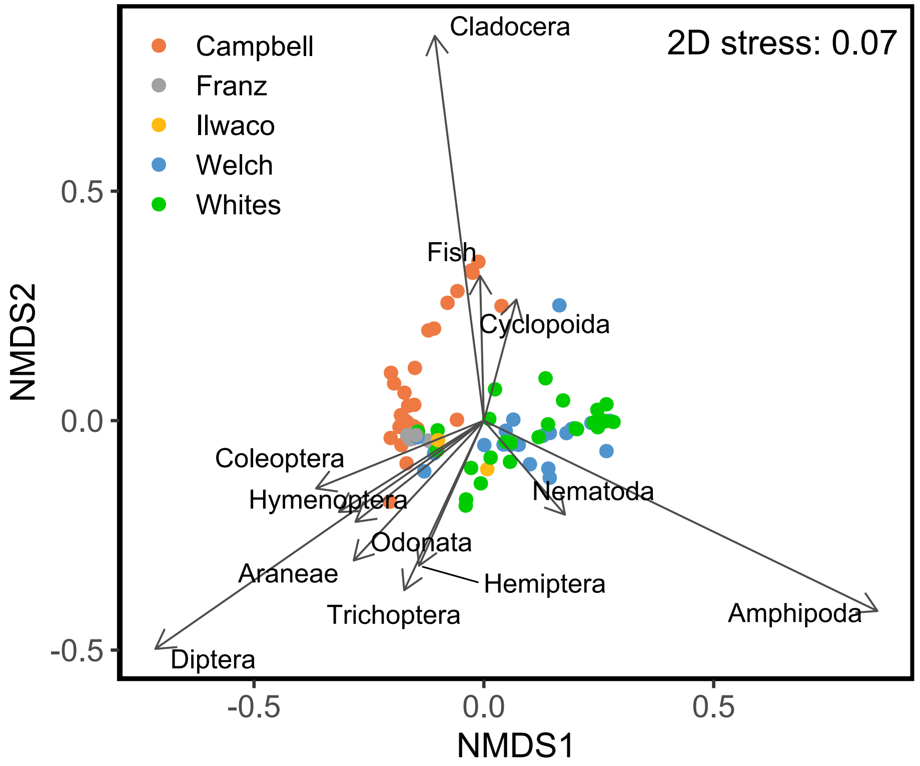
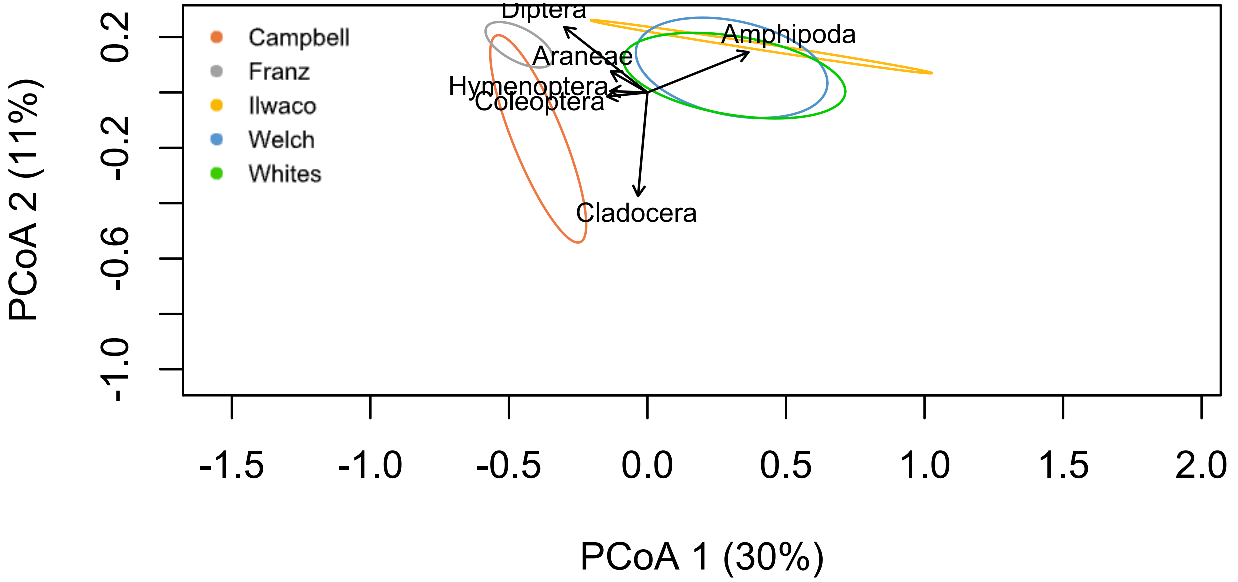


Variance-based



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PerMANOVA	R-value	p-value
Site	0.35	0.001
Year	0.08	0.001
Size class	0.06	0.002
Site*Year	0.06	0.002
Year*Size class	0.03	0.06
Site*Size class	0.06	0.21

Summary

- Relatively few taxa are driving diet composition differences among sites
- Sites are more dissimilar than years or fish class size
- Benthic and neuston analyses coming

Next steps

- Reed canary grass manuscript – nearly ready to submit
- Future manuscript ideas?