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Effect of Habitat on Forage Fish Condition in Prince William Sound



Objectives

Our objective is to compare the condition of fish in different habitats by examining growth, energy content and proximate composition. BIA allows us to maximize sample size thereby improving our ability to resolve differences among habitats.



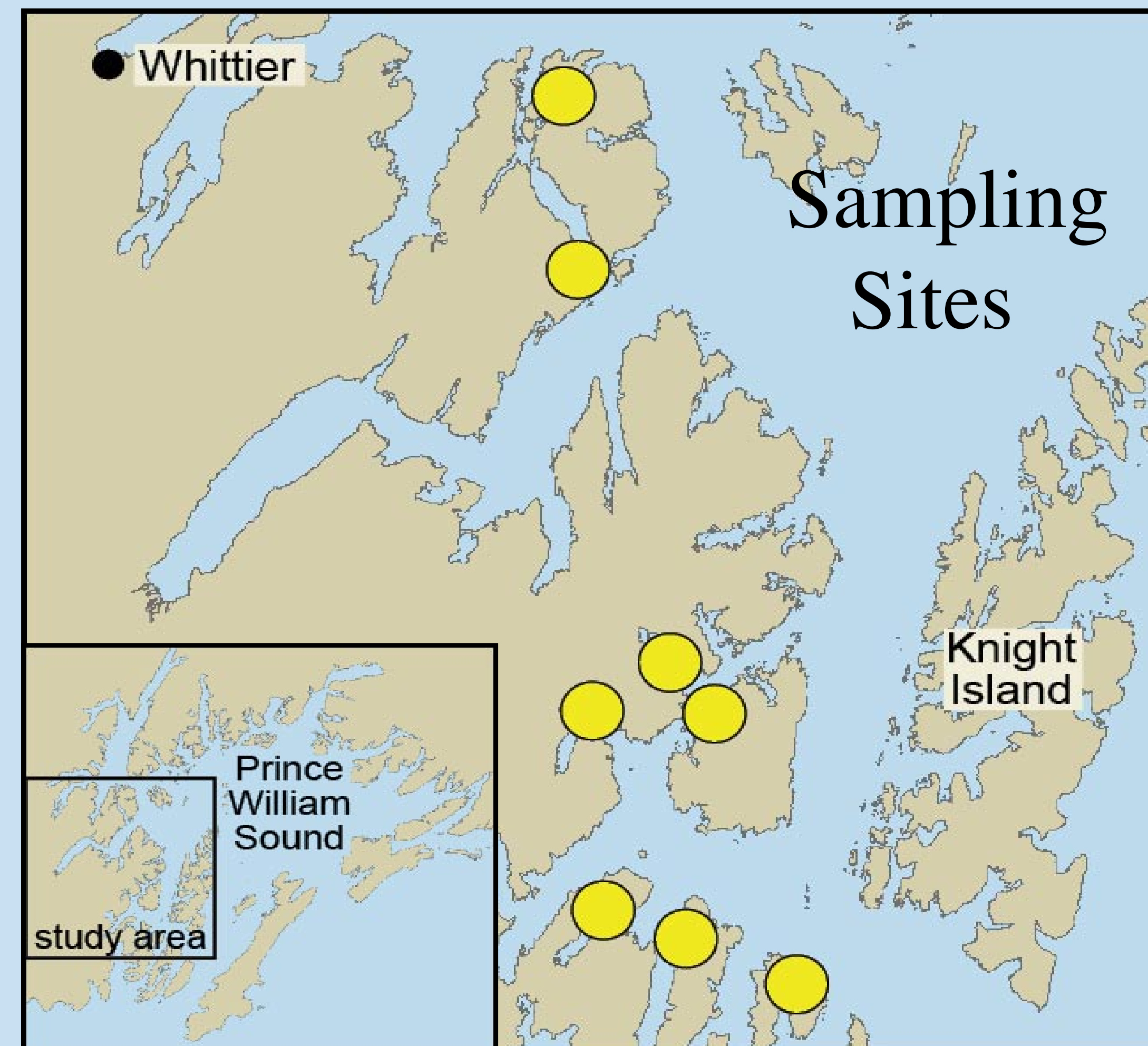
Kelp



Bedrock



Eelgrass



Sampling Sites

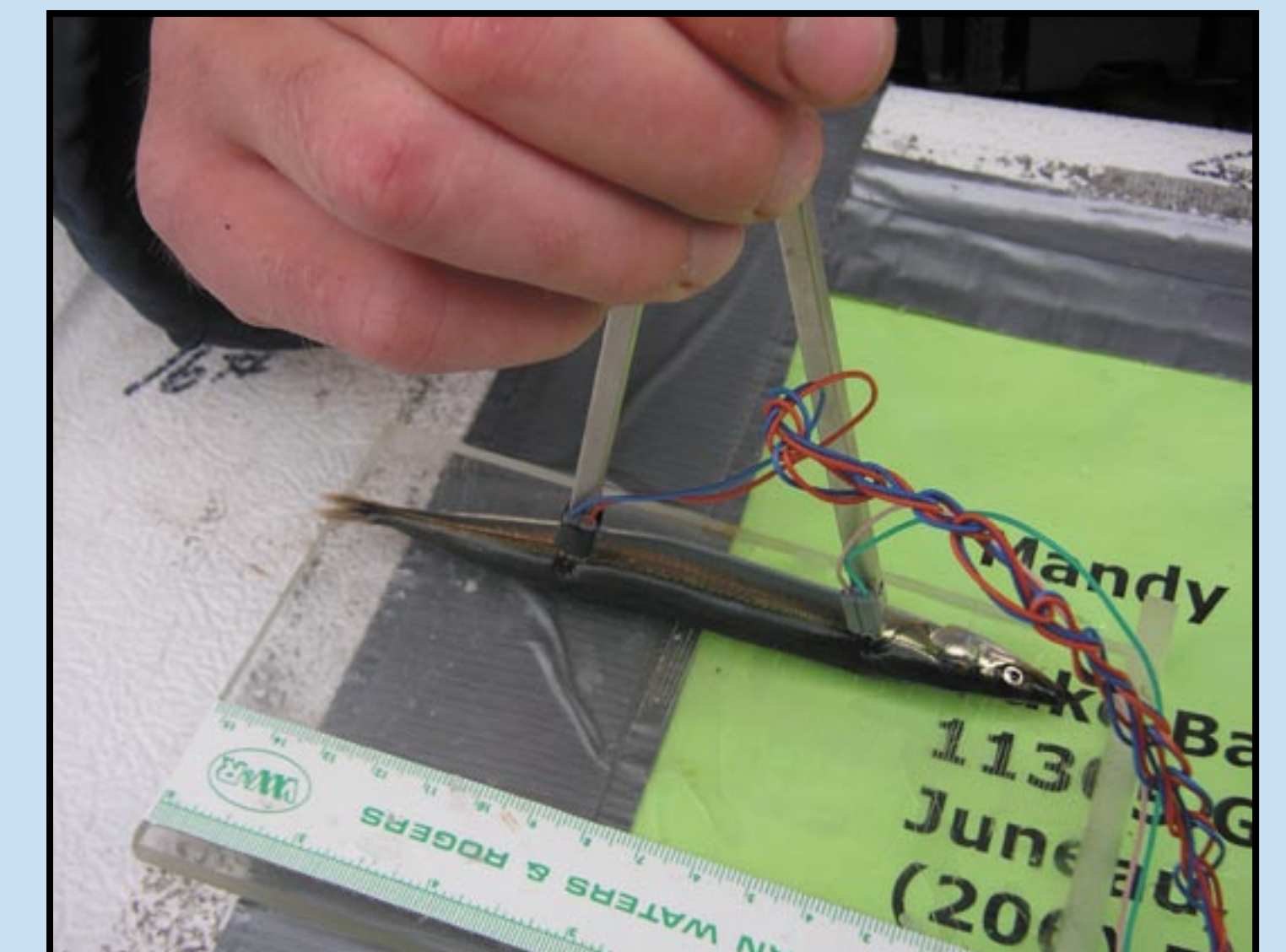
BIA

The impedance (resistance and reactance) of a current is measured as it passes through a fish.

These values are used to estimate the body composition of fish using models derived from proximate analysis voucher samples. BIA allows us process samples in a cost effective manner compared to employing analytical chemistry techniques alone.

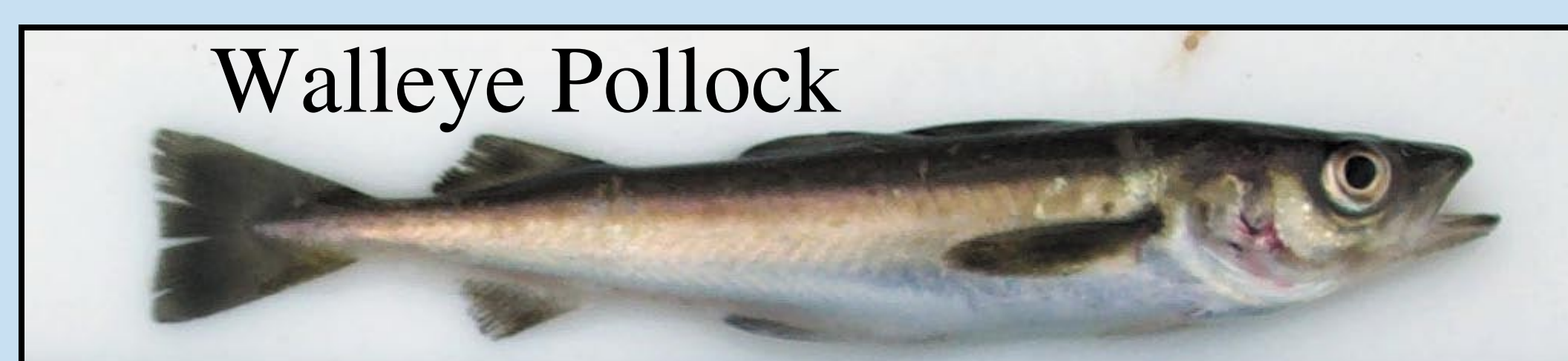
BIA is quick, inexpensive, can be non lethal and performed in the field. This allows for greater numbers of observations, which improves the statistical power to resolve condition differences among habitats.

Bioelectrical Impedance



Voucher Samples

Samples were collected in July and September, 2007 as part of a larger NPRB and Oil Spill Research Institute funded study investigating seasonal distribution and habitat abundance of nearshore forage fish in PWS (see Johnson et. al poster: Forage Fish in Nearshore Waters of PWS, AK).



Walleye Pollock



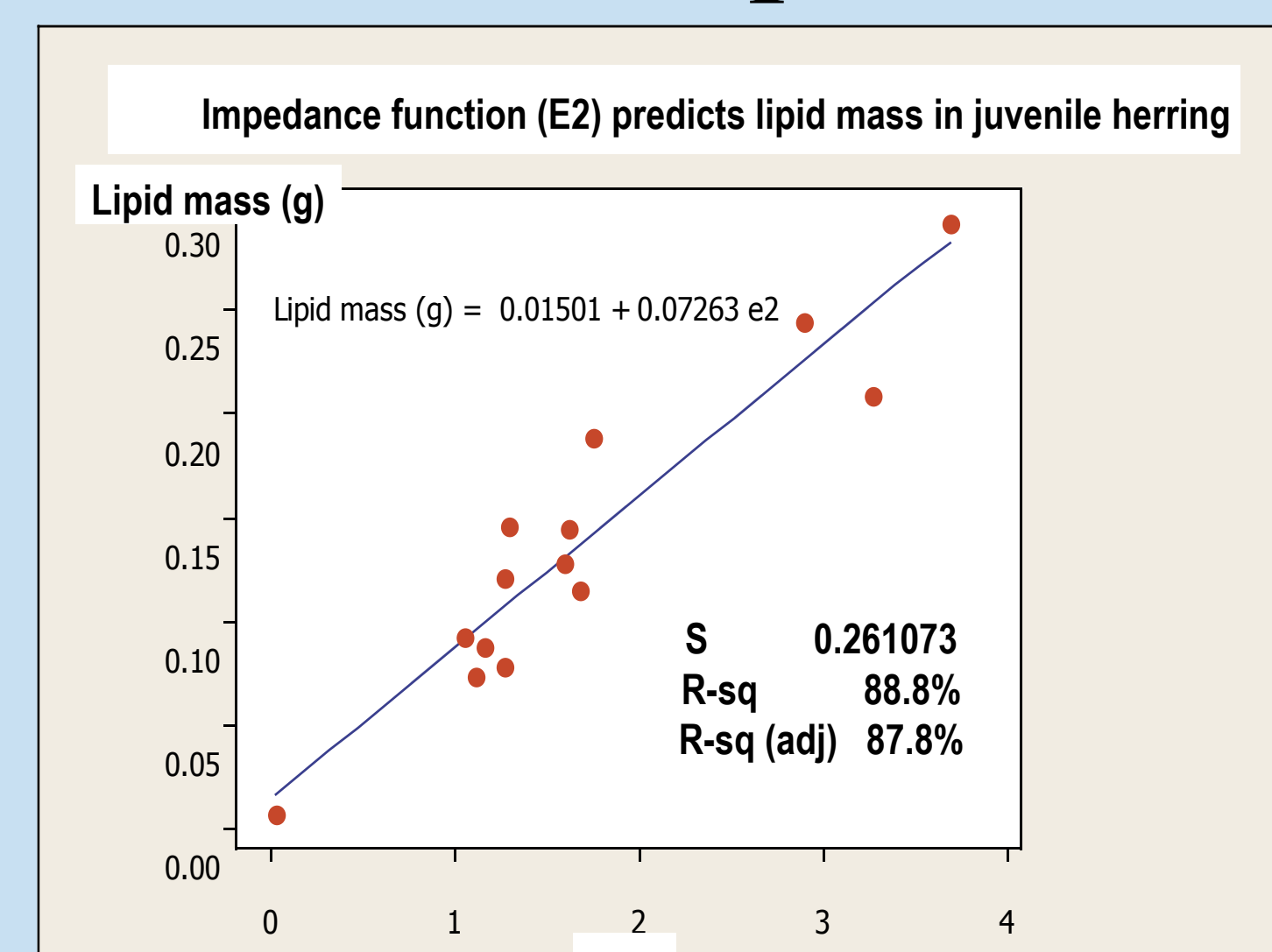
Crescent Gunnel



Pacific Herring



Saffron Cod



The figure above shows the relationship between E2, one of the impedance functions, and the observed lipid mass of juvenile herring collected from PWS in July.

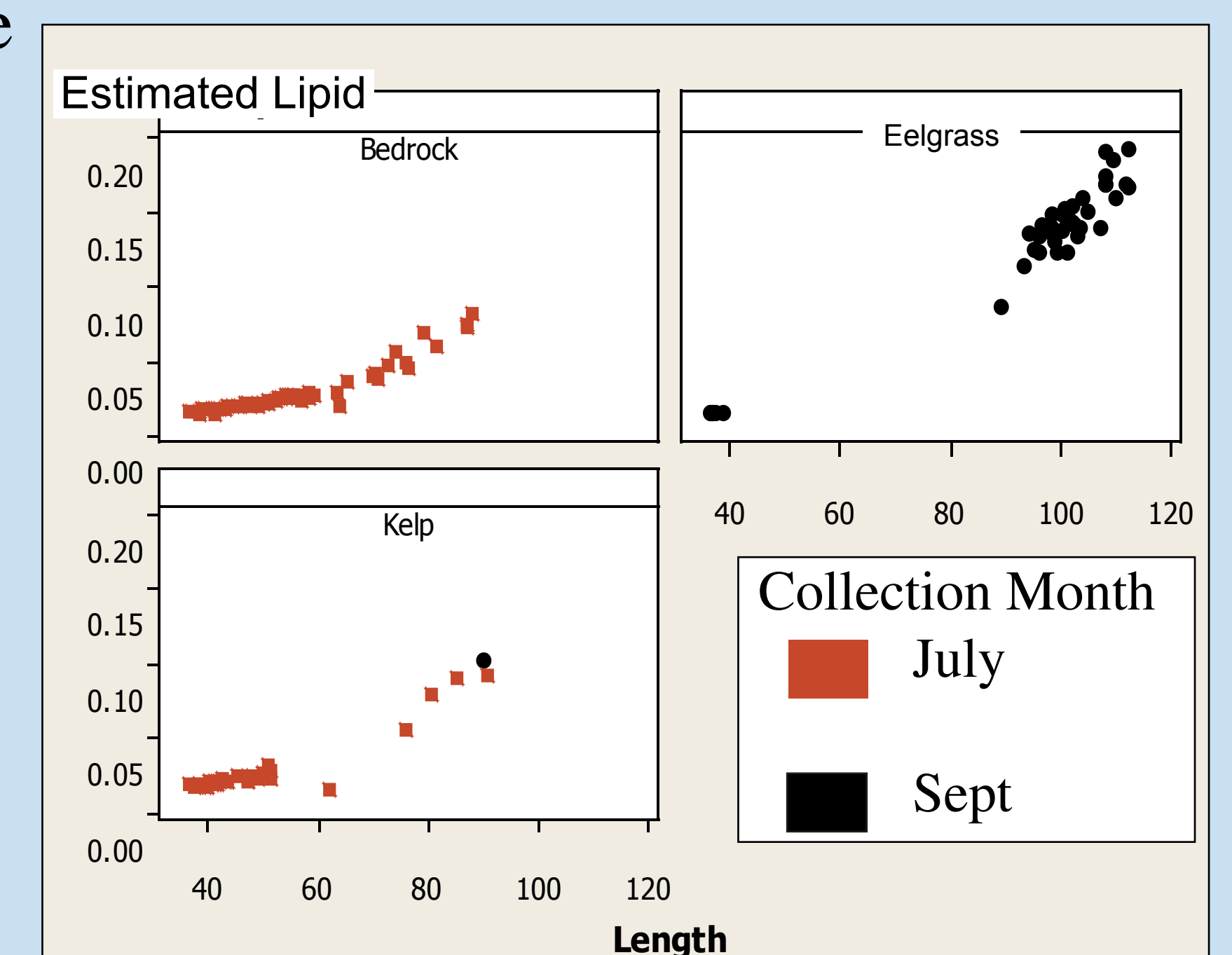
$$E2 = L \times \frac{2}{\Omega + \left(\frac{R^2}{\Omega} \right)}$$

L = distance between electrodes, Ω is the resistance and R = reactance. Fish were analyzed using both BIA and analytical chemistry.

Data Analysis

In the figure to the right, we have used the relationship between E2 and lipid content (shown left) to estimate the lipid content of herring in different habitats in PWS.

Comparing the relationships between length and lipid content among the habitats revealed that habitat influences the way in which lipid mass scales with length ($P < 0.005$).



The figure on the left shows the relationship between E2, one of the impedance functions, and the observed dry mass of different species collected from PWS in July.

Note that the slopes relating E2 and dry mass depended on species.

