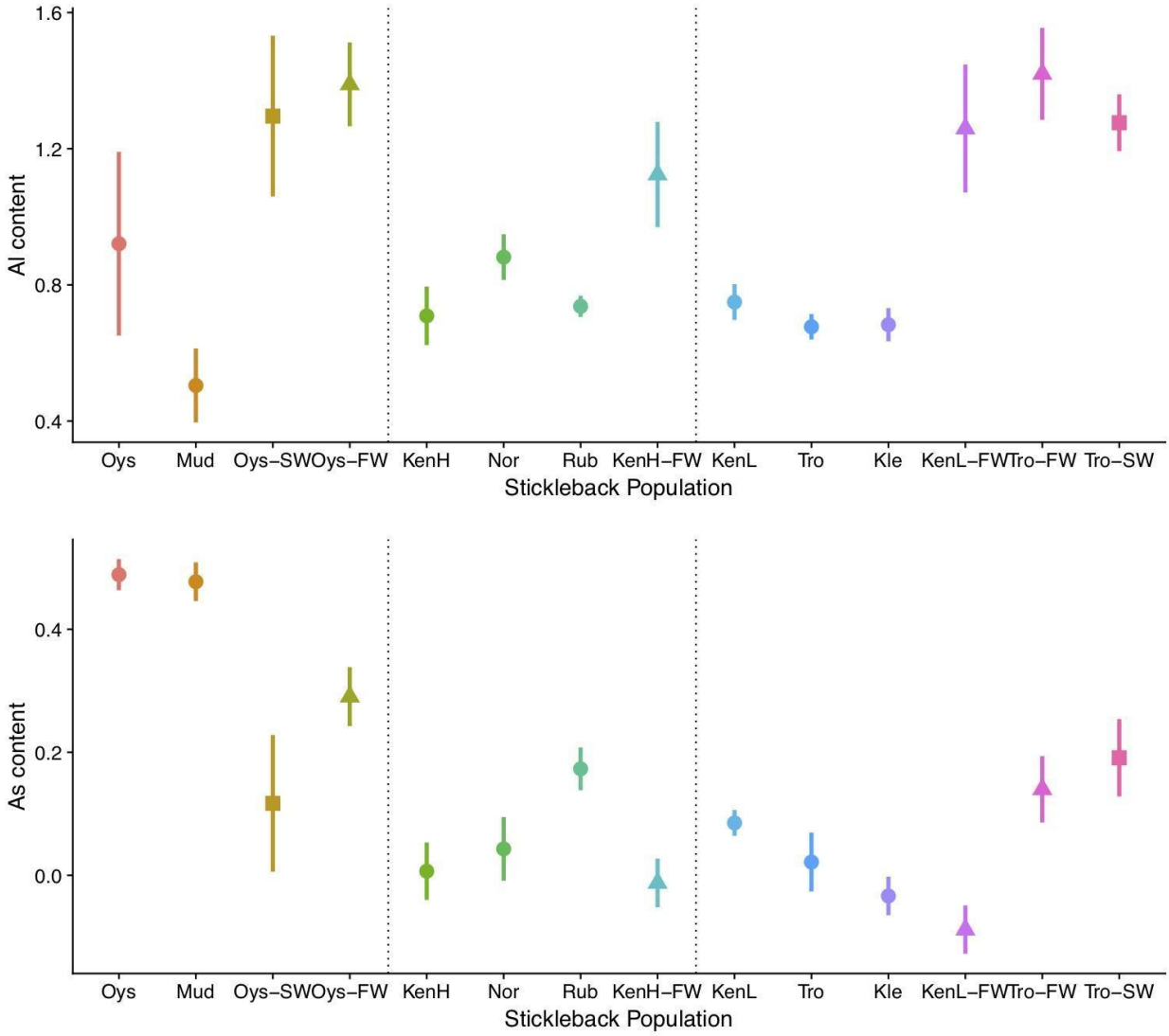
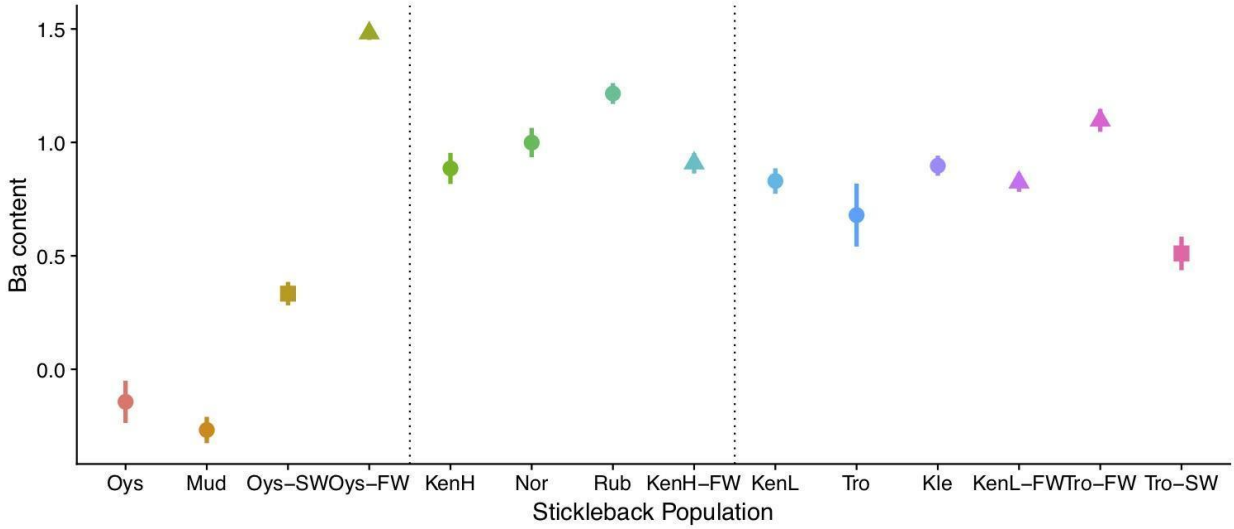
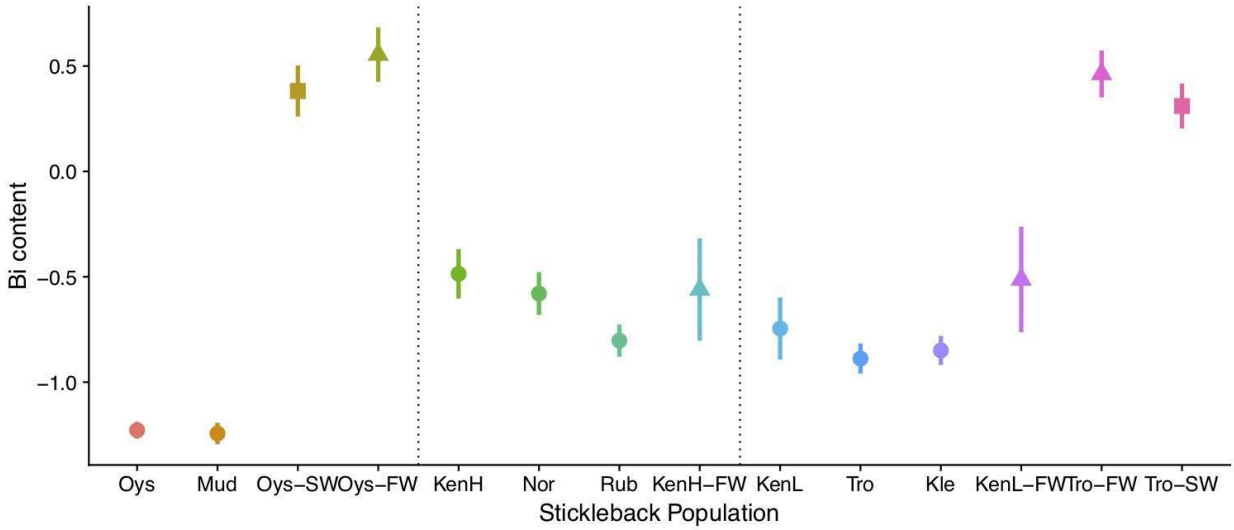
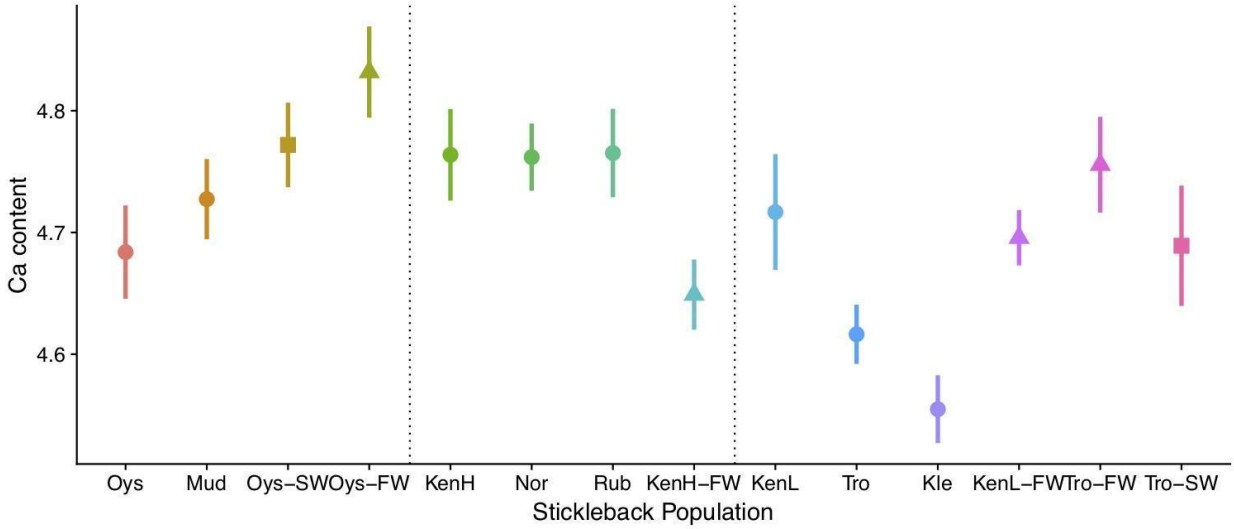
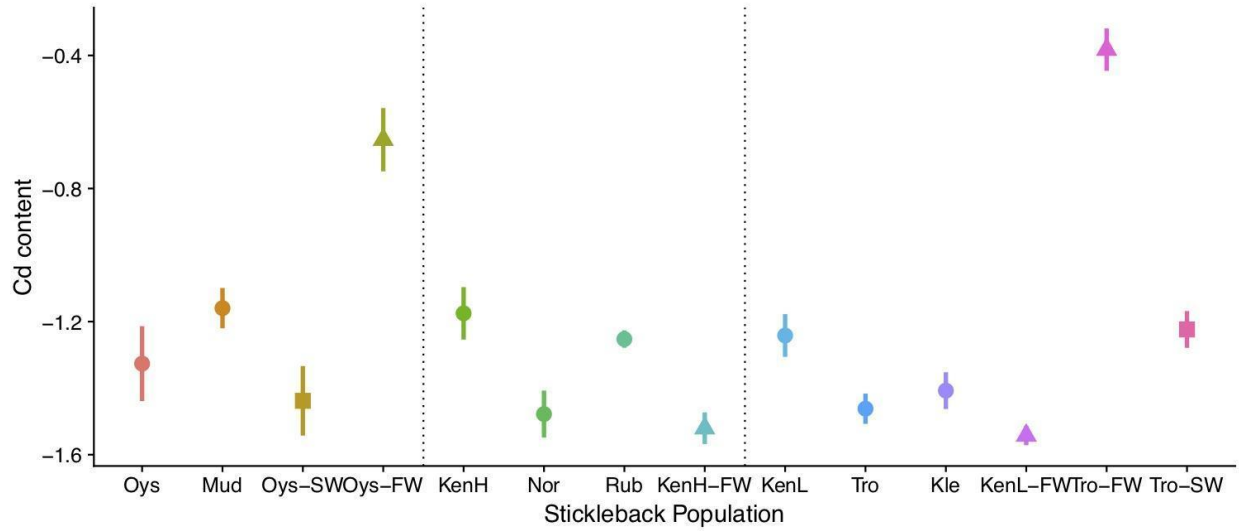
Fig S1 Plots for Individuals elements: Plotted as marine fish (left of first dotted line), freshwater high plated fish (between the two dotted lines), and freshwater low plated fish (right of the dotted lines). Shapes correspond to rearing environment (circles are wild caught, triangles are lab raised in freshwater, squares are lab raised in saltwater). Plotted as means +/- SEM.

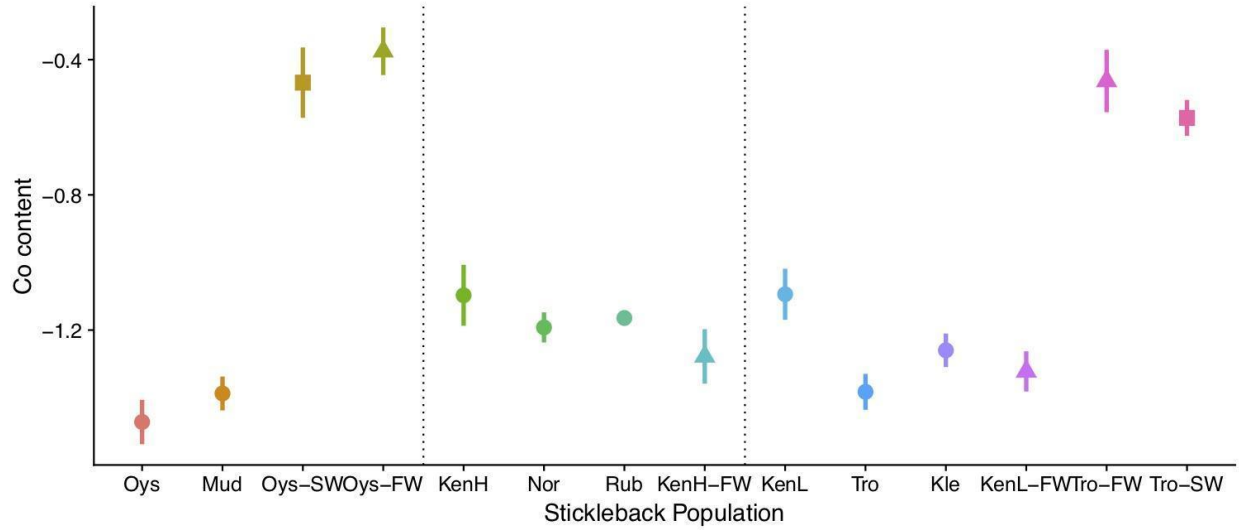


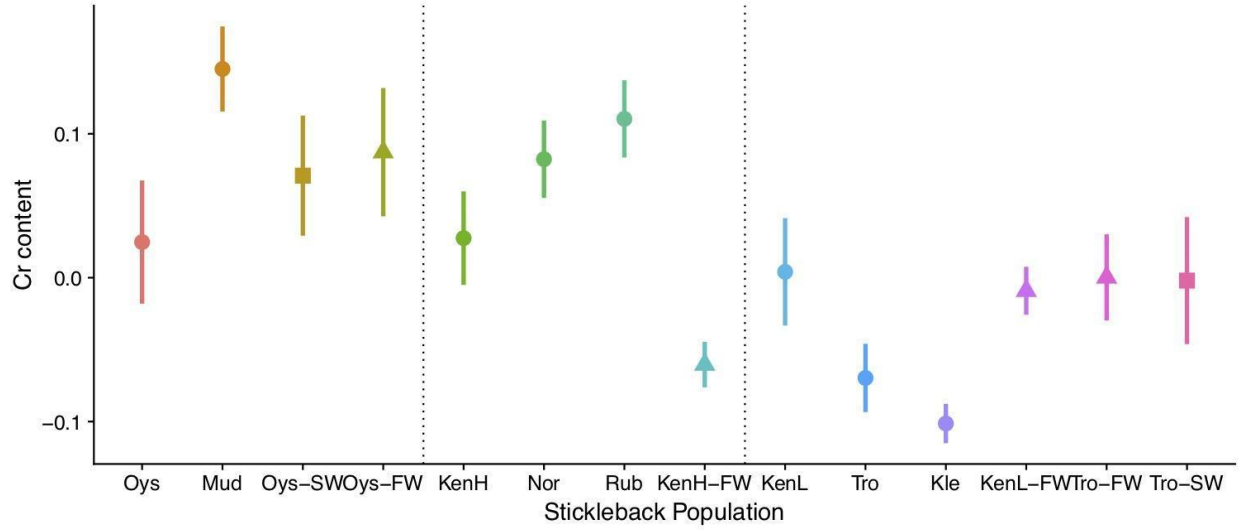

Ba content
1.5
1.0
0.5
0.0
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

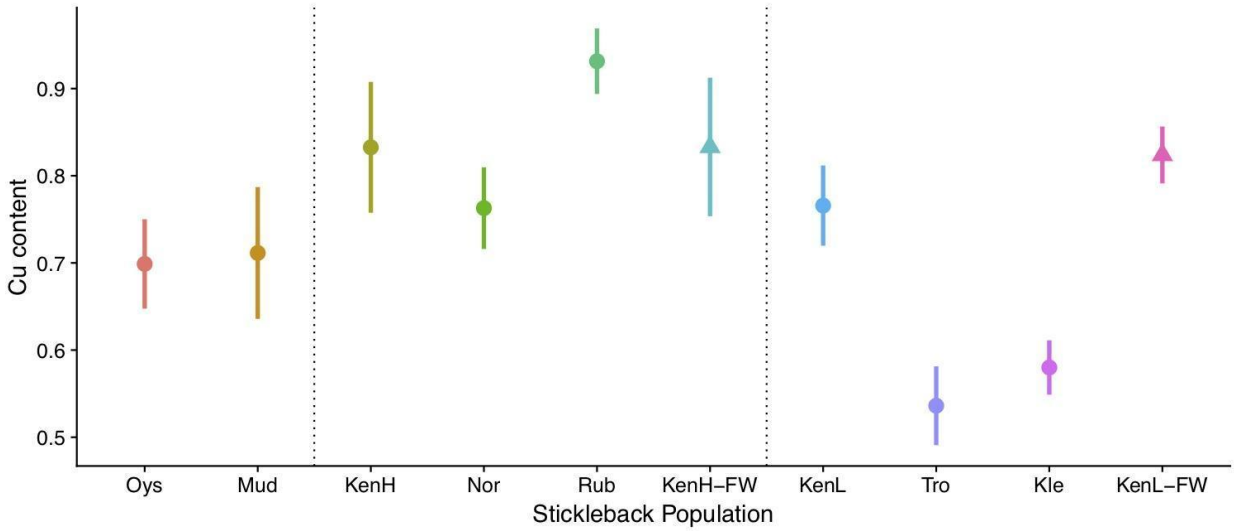

Bi content
0.5
0.0
−0.5
−1.0
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

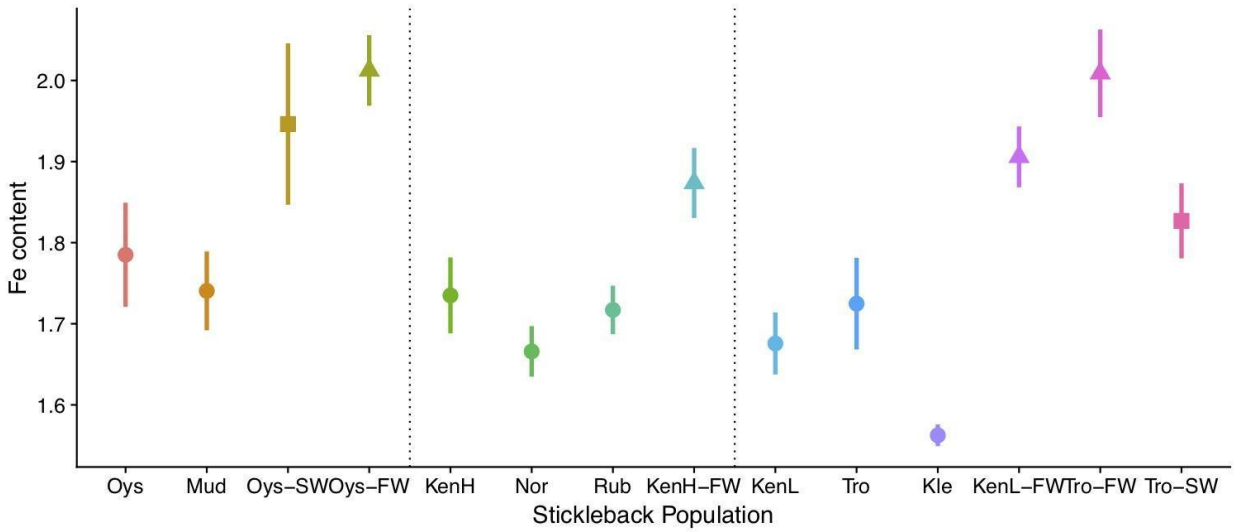

Ca content
4.8
4.7
4.6
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

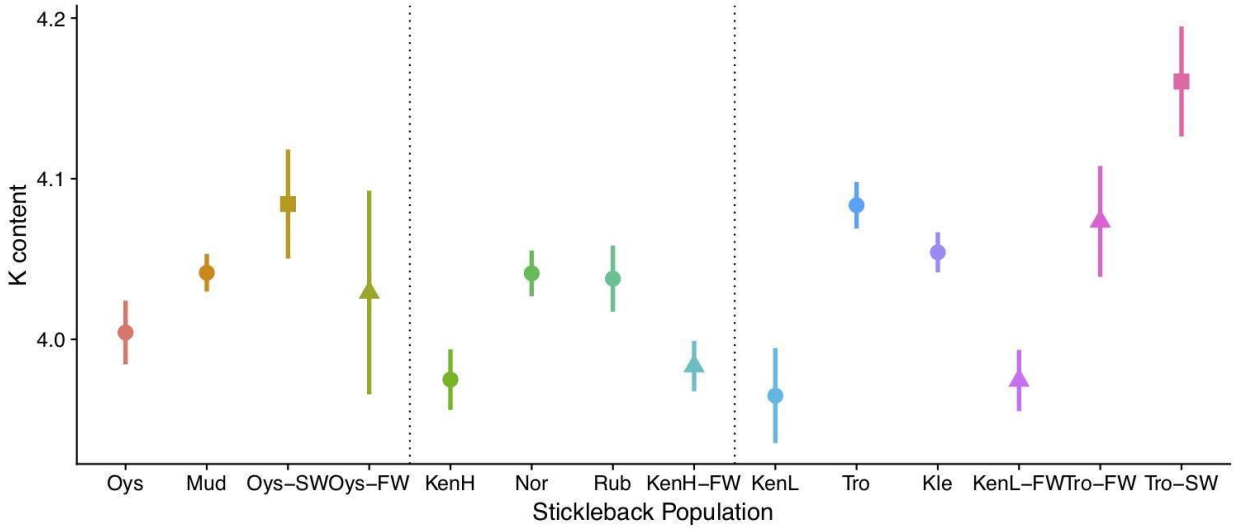

Cd content
−0.4
−0.8
−1.2
−1.6
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

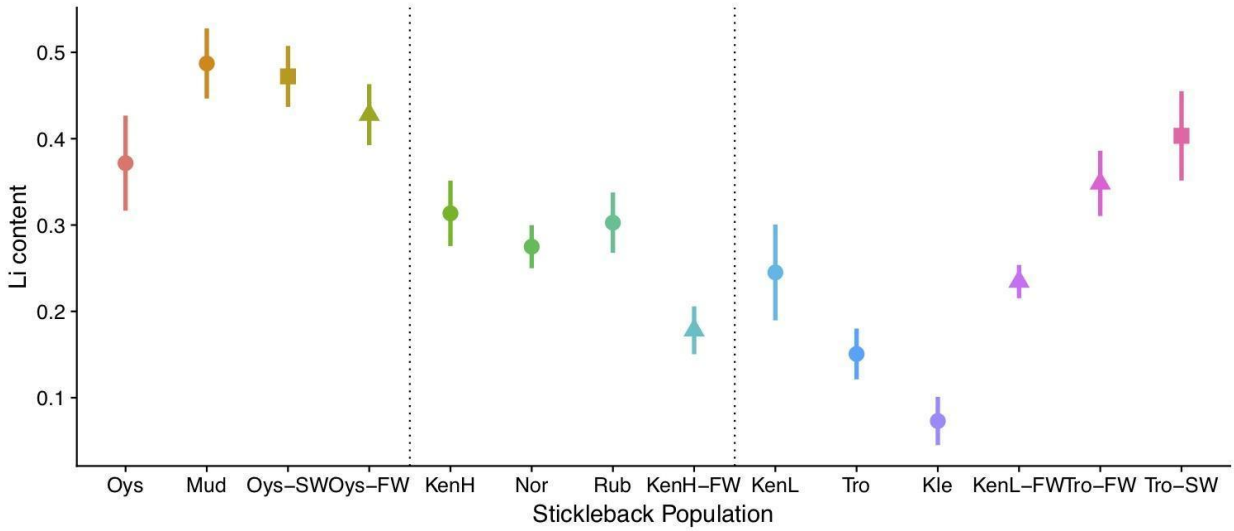

Co content
−0.4
−0.8
−1.2
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

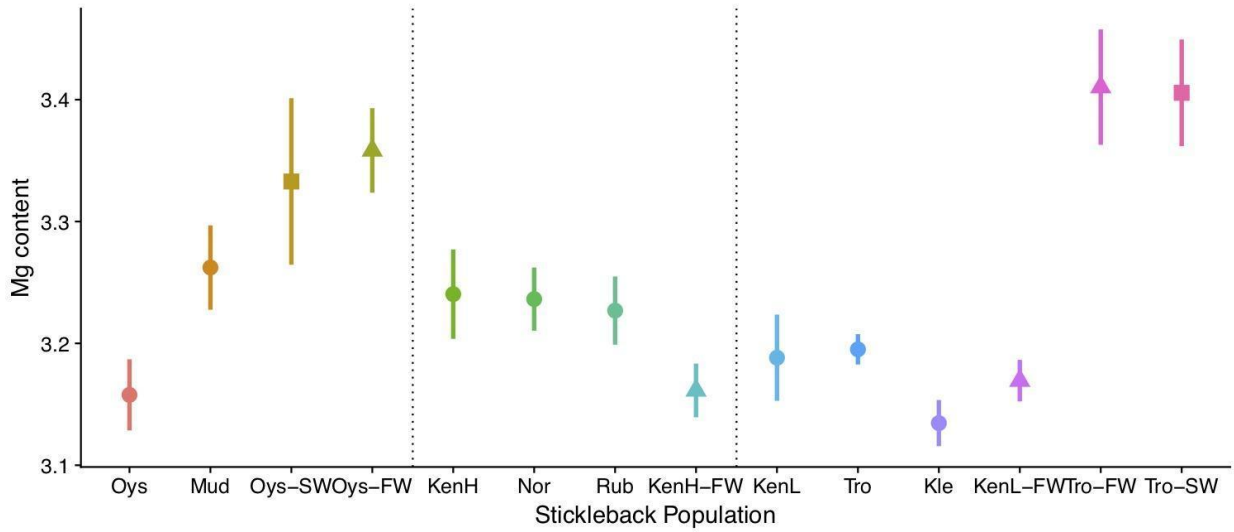

Cr content
0.1
0.0
−0.1
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

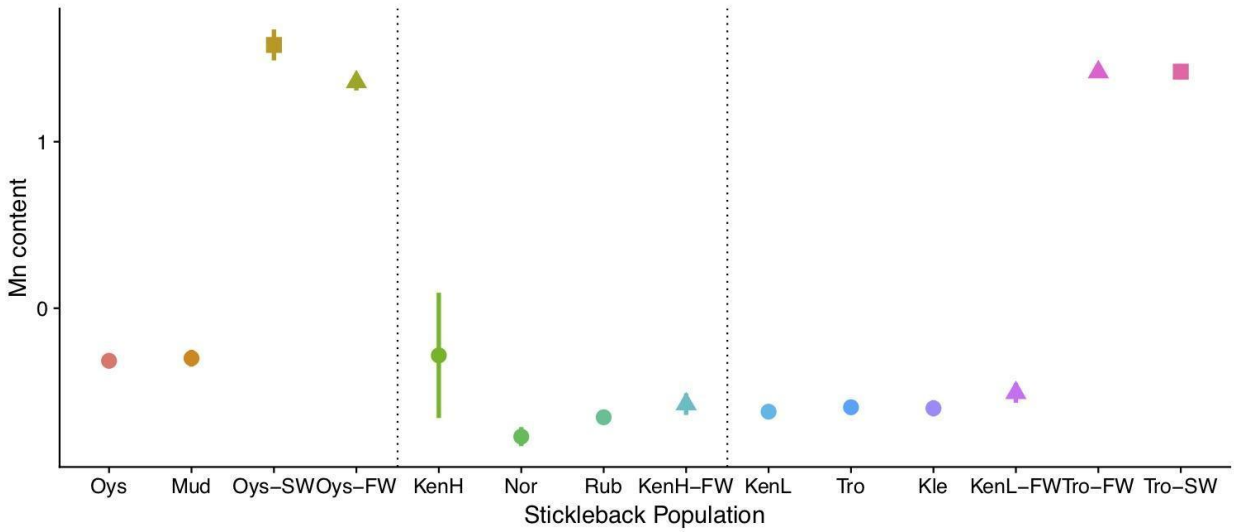

Cu content
0.9
0.8
0.7
0.6
0.5
Oys
Mud
KenH
Nor
Rub
KenH–FW
KenL
Tro
Kle
KenL–FW
Stickleback Population

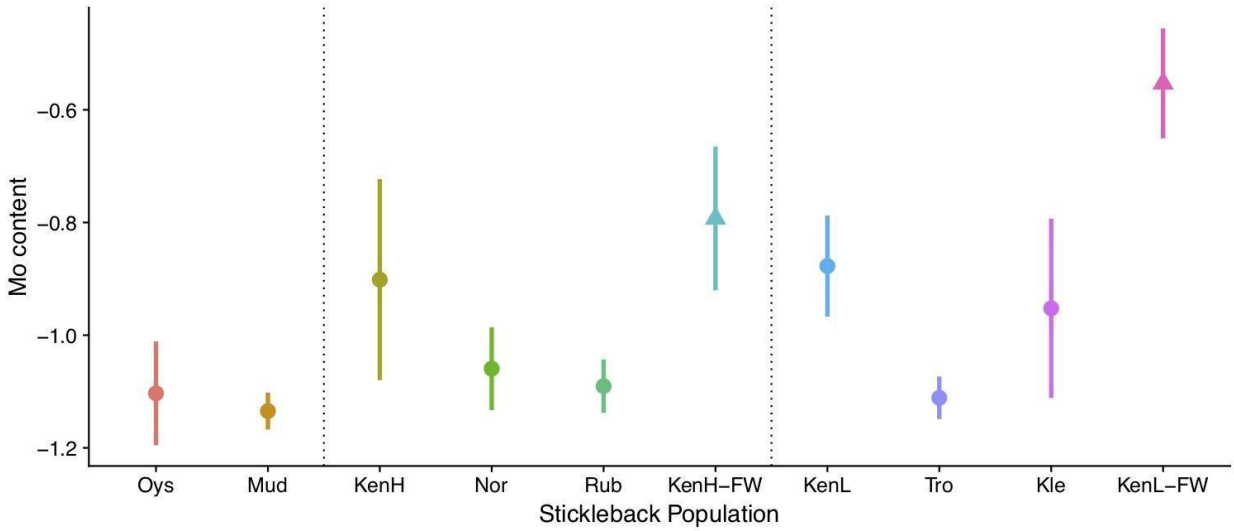

Fe content
2.0
1.9
1.8
1.7
1.6
Oys
Mud
Oys–SW
Oys–FW
KenH
Nor
Rub
KenH–FW
KenL
Tro
Kle
KenL–FW
Tro–FW
Tro–SW
Stickleback Population

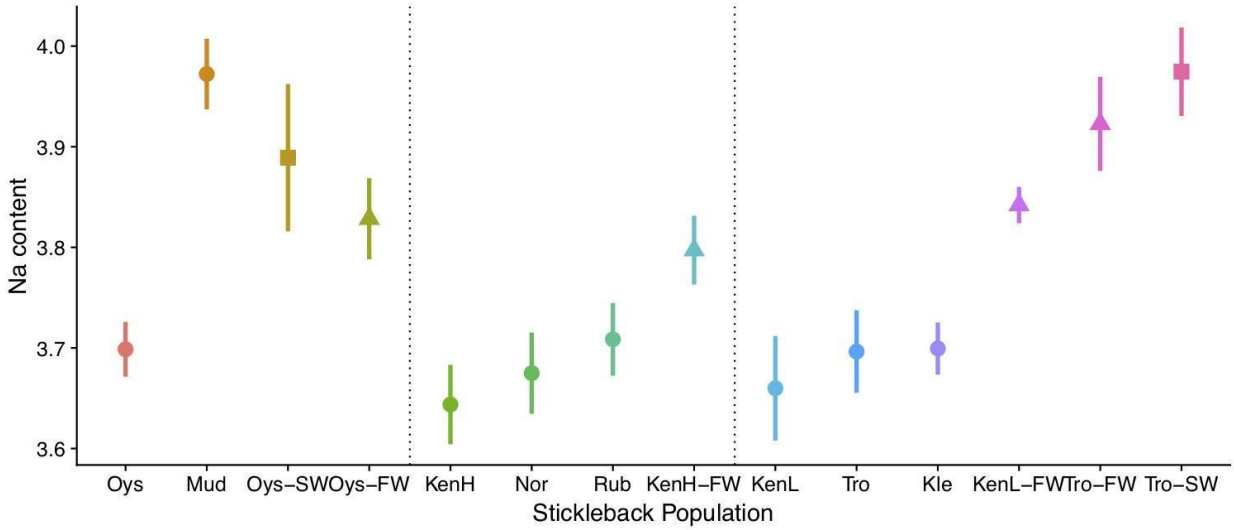

K content
4.2
4.1
4.0
Oys
Mud
Oys–SW
Oys–FW
KenH
Nor
Rub
KenH–FW
KenL
Tro
Kle
KenL–FW
Tro–FW
Tro–SW
Stickleback Population

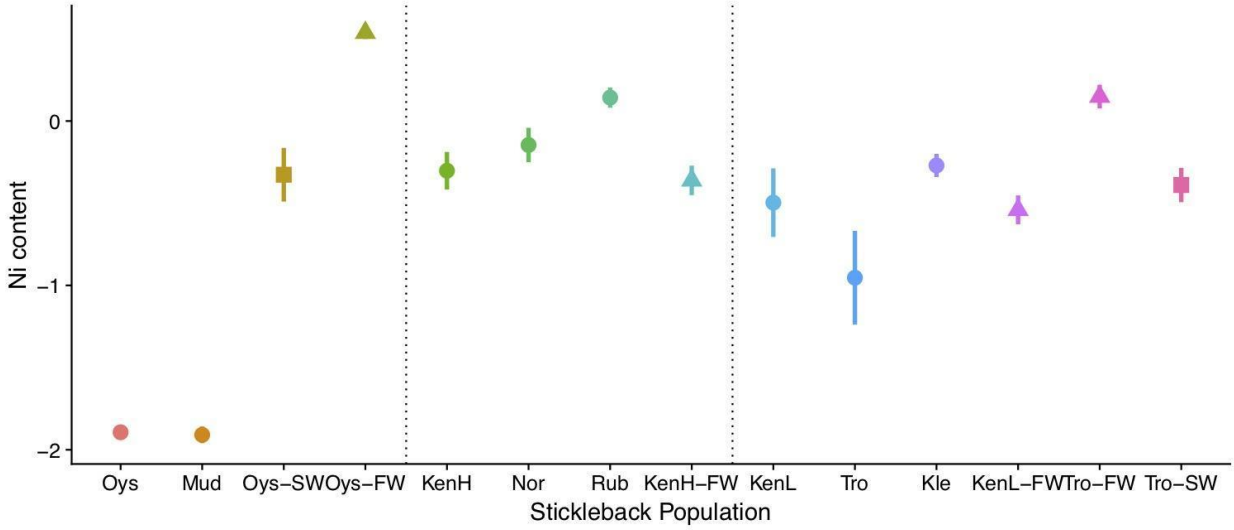

Li content
0.5
0.4
0.3
0.2
0.1
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

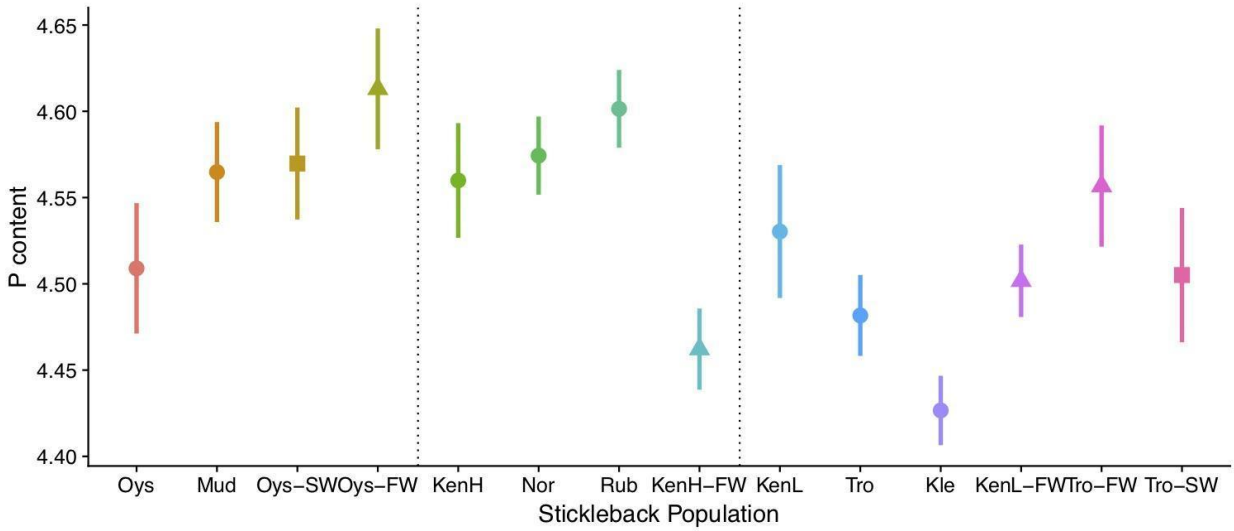

Mg content
3.4
3.3
3.2
3.1
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

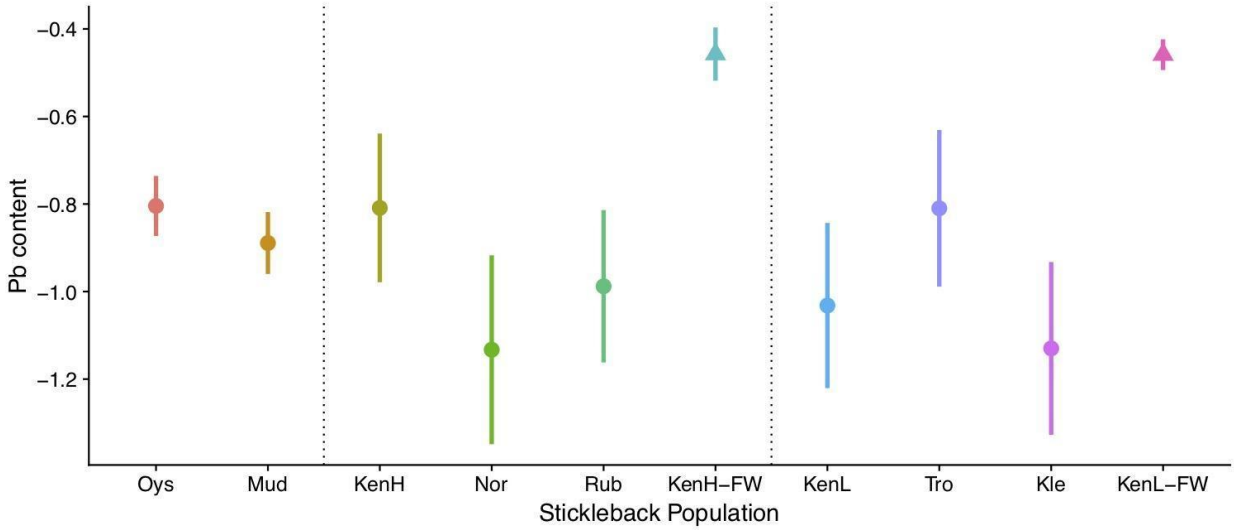

Mn content
1
0
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

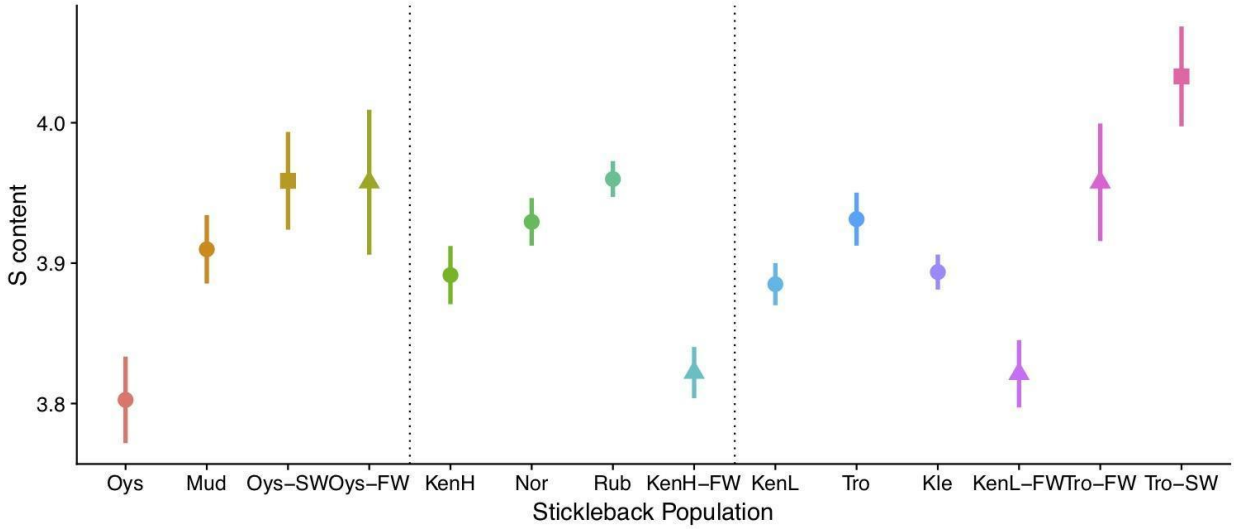

Mo content
−0.6
−0.8
−1.0
−1.2
Oys
Mud
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Stickleback Population

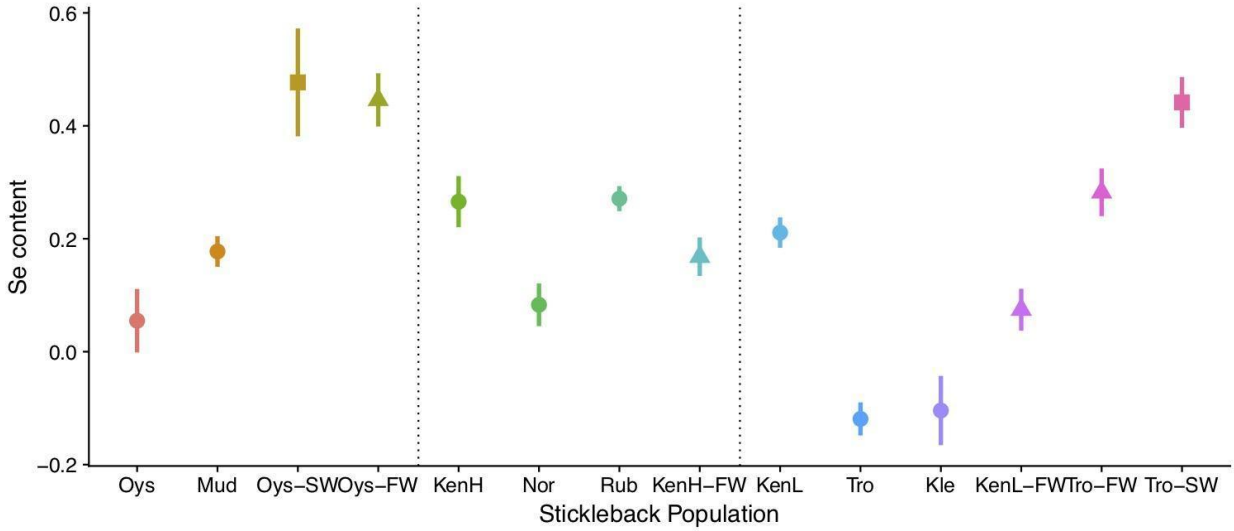

Na content
4.0
3.9
3.8
3.7
3.6
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

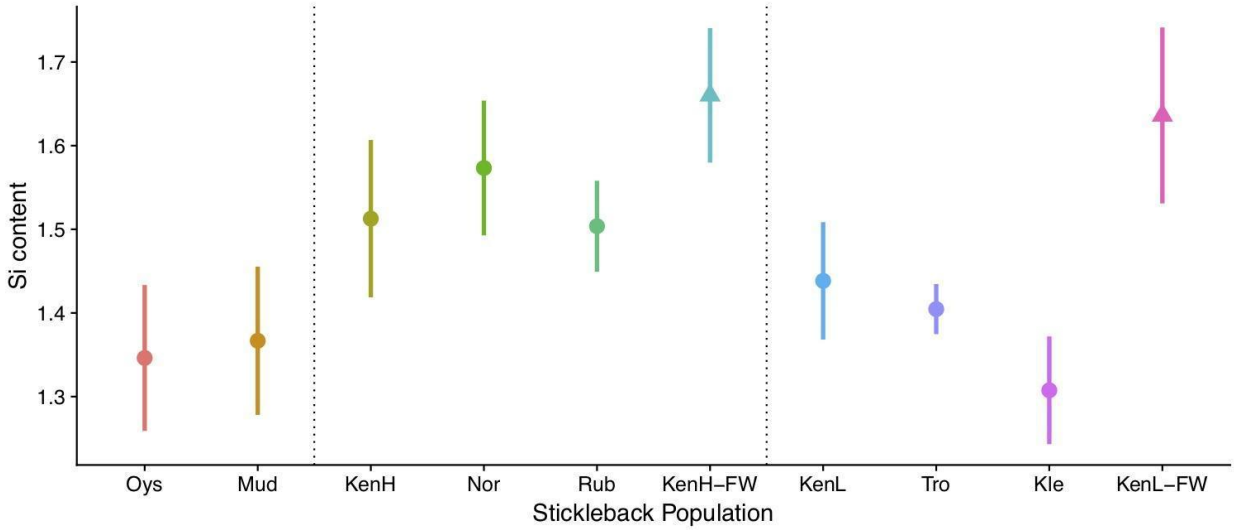

Ni content
0
−1
−2
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

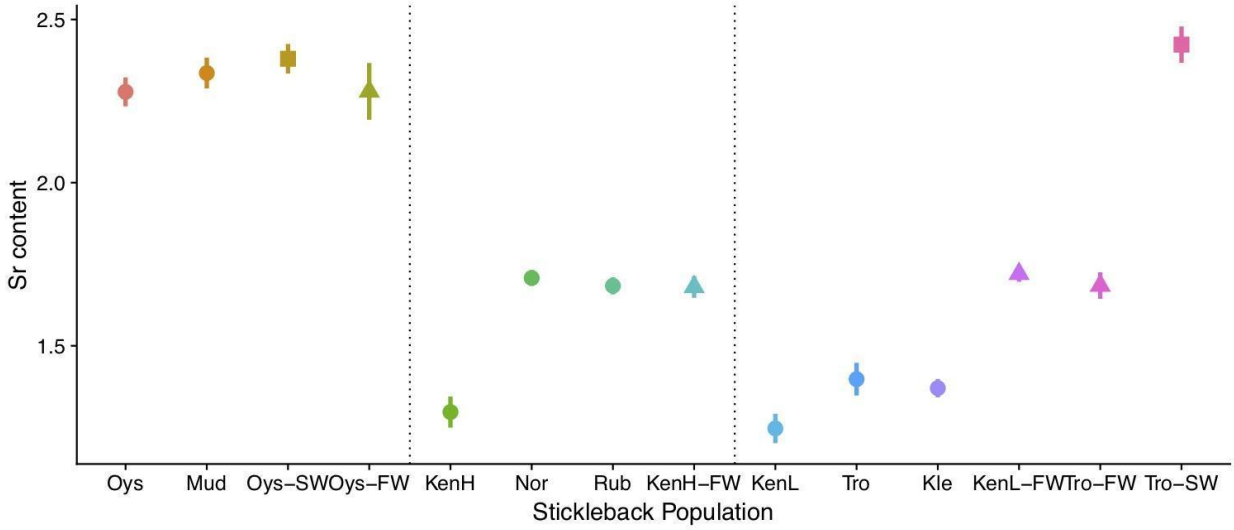

4.65
4.60
4.55
4.50
4.45
4.40
P content
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

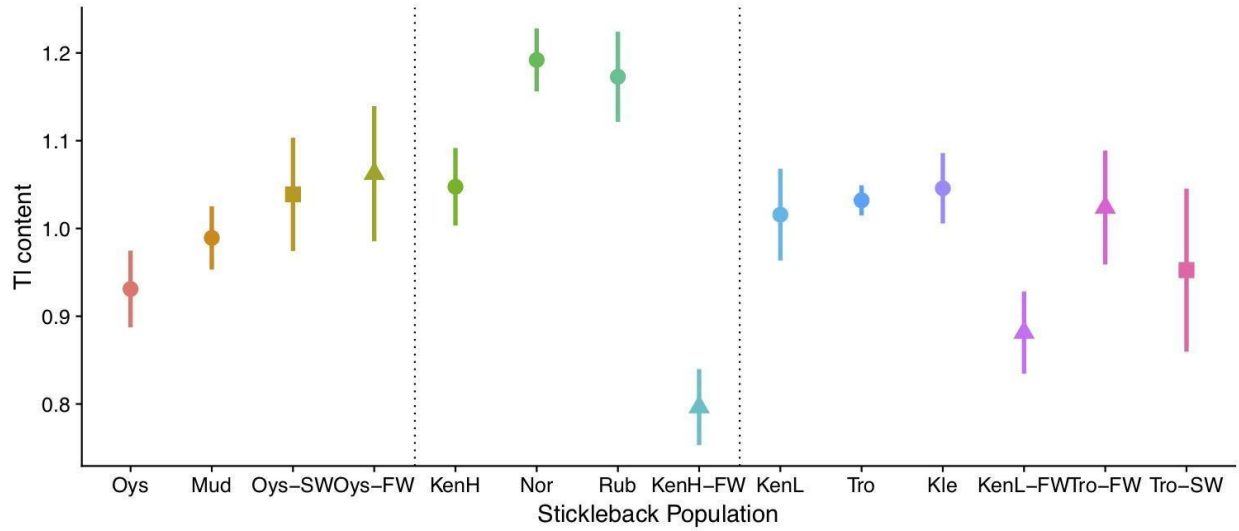

−0.4
−0.6
−0.8
−1.0
−1.2
Pb content
Oys
Mud
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Stickleback Population

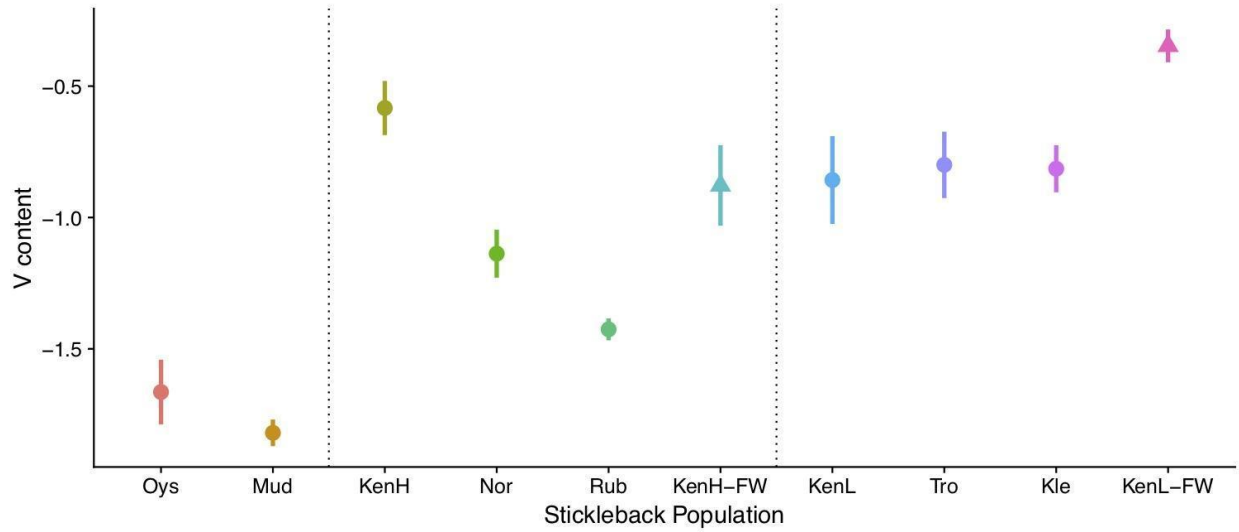

4.0
3.9
3.8
S content
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population


0.6
0.4
0.2
0.0
−0.2
Se content
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population


1.7
1.6
1.5
1.4
1.3
Si content
Oys
Mud
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Stickleback Population


2.5
2.0
1.5
Sr content
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population


Tl content
1.2
1.1
1.0
0.9
0.8
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population


V content
−0.5
−1.0
−1.5
Oys
Mud
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Stickleback Population

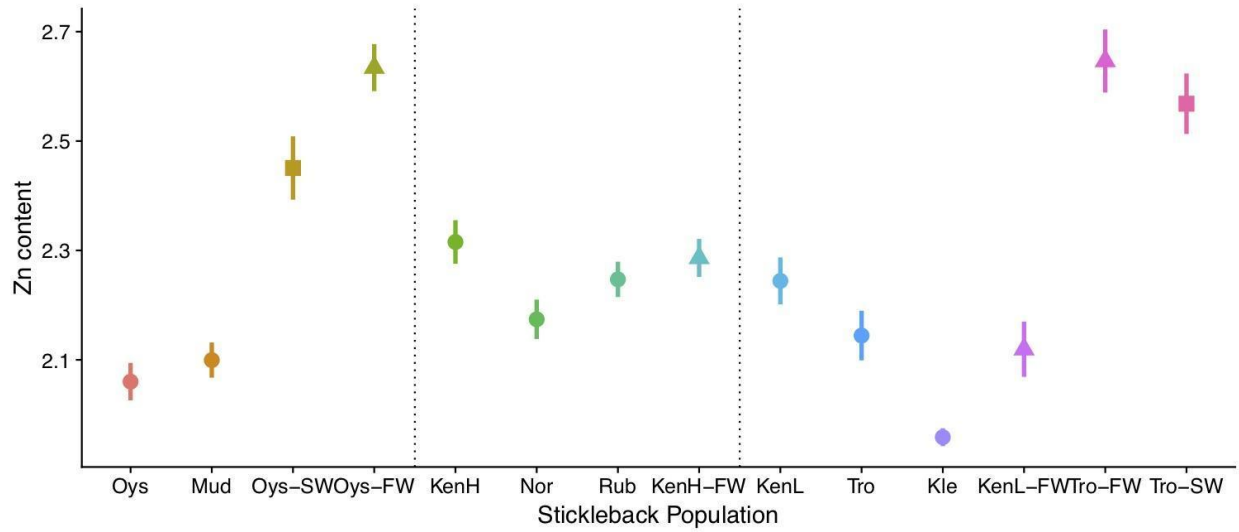

Zn content
2.7
2.5
2.3
2.1
Oys
Mud
Oys−SW
Oys−FW
KenH
Nor
Rub
KenH−FW
KenL
Tro
Kle
KenL−FW
Tro−FW
Tro−SW
Stickleback Population

Fig. S2: Ca uptake rate (nmol g^{-1} h^{-1}) for each stickleback population including marine populations (on left), high plated freshwater population (center), and low plated freshwater populations (on right). All individuals were wild caught and acclimated to the lab for >2 weeks. Plotted as means +/- SEM.

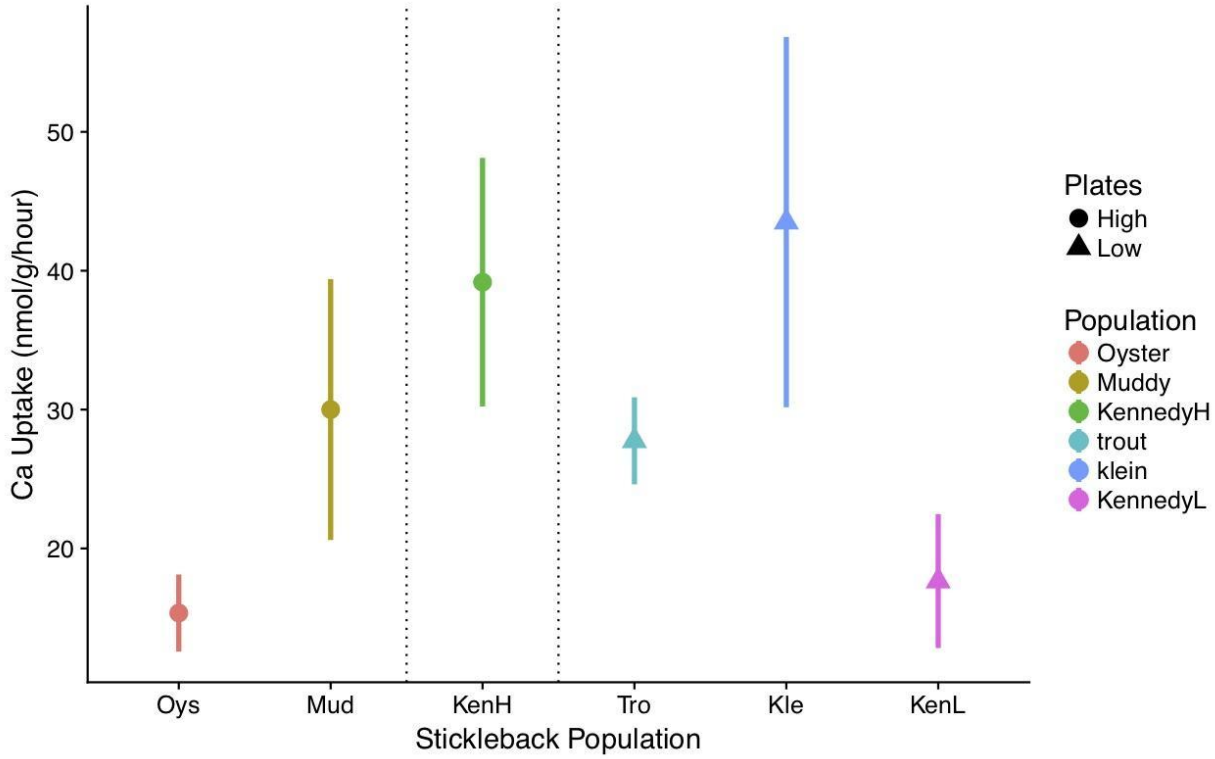


Fig S3: PC of elemental variation illustrating the differences in composition between wild-caught freshwater stickleback populations from nearby and similar lakes that differ in plate phenotype for all elements. The five main elements that load on PC1, which largely distinguishes individuals with between individuals with different plate morphs, are P, Cr, Sr, Ca, and Mg.

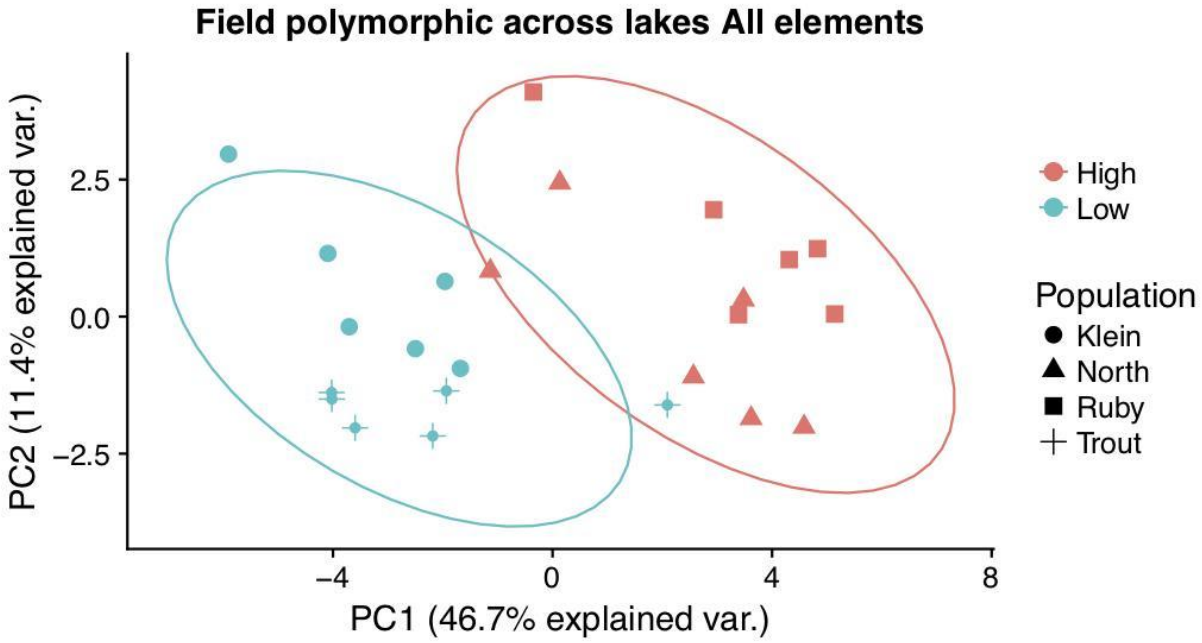
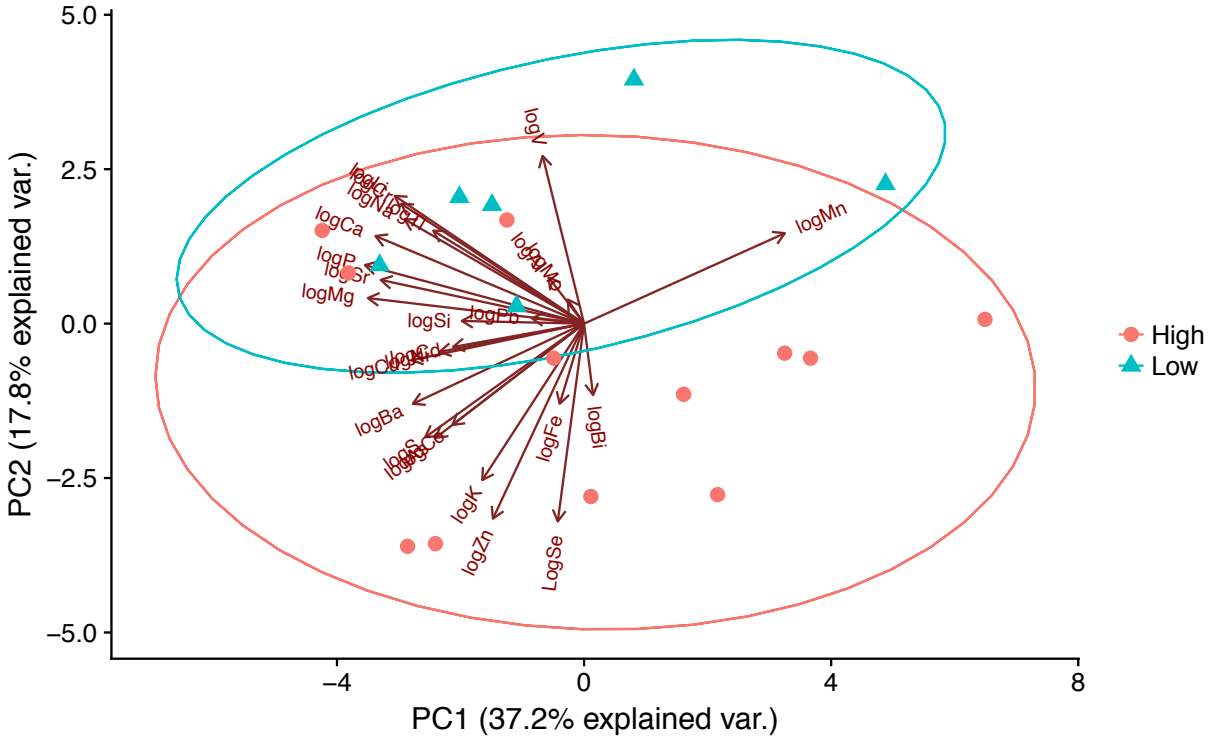
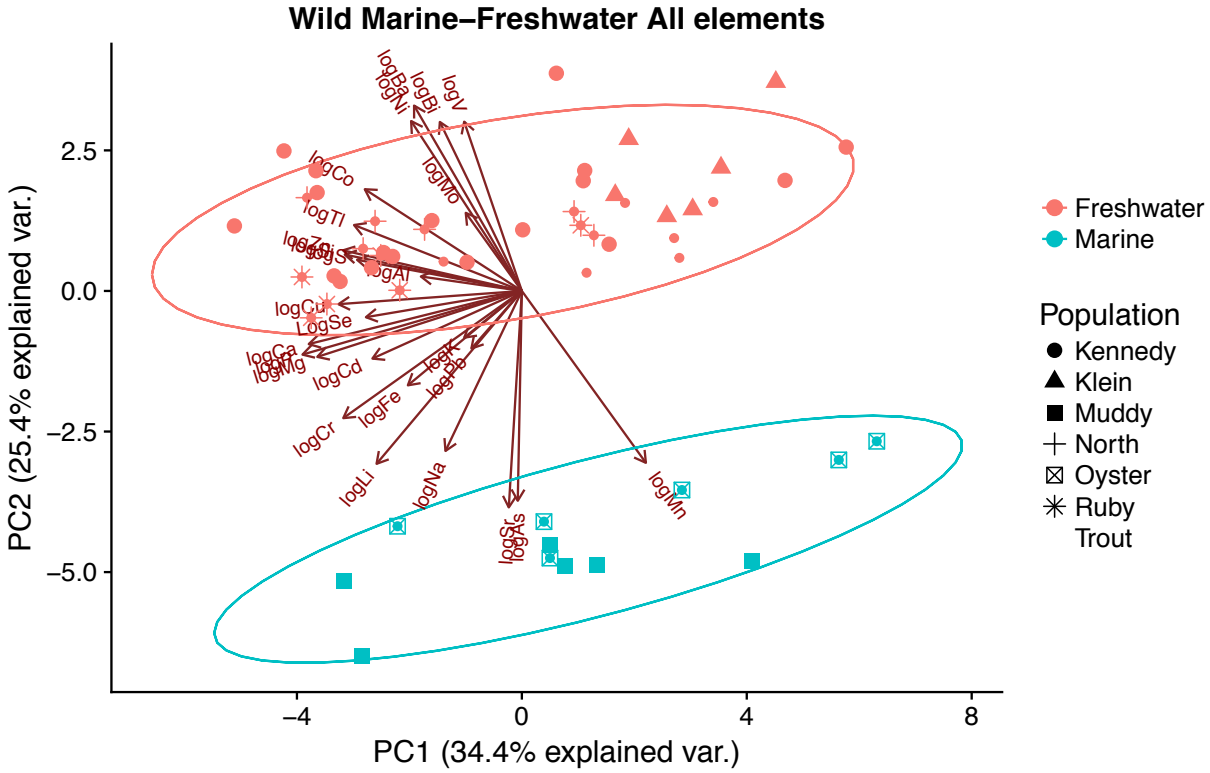


Fig. S4: Fig 1: PC plots showing the differences in the ionome between individuals across stickeback ecotypes with the loading of each element indicated seperately for: A) lab reared stickleback with high and low plate phenotypes (Fig. 1A), B) wild-caught marine (2 populations) and freshwater stickleback populations (5 populations) (Fig. 2A) C) marine and freshwater stickleback lab-reared in salt water (Fig. 2B) D) marine and freshwater stickleback reared in fresh water (Fig. 2C).

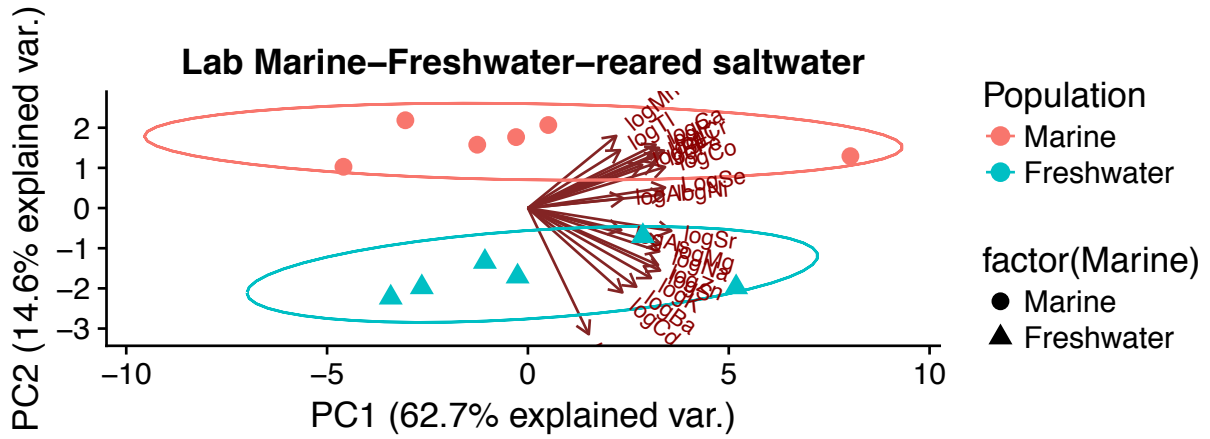
A



B


Wild Marine–Freshwater All elements
PC2 (25.4% explained var.)
PC1 (34.4% explained var.)
2.5
0.0
−2.5
−5.0
−4
0
4
8
logV
logCo
logTl
logMo
logCu
LogSe
logCd
logFe
logCr
logLi
logNa
logMn
logAl
Freshwater
Marine
Population
Kennedy
Klein
Muddy
North
Oyster
Ruby
Trout

C


Lab Marine–Freshwater–reared saltwater
PC2 (14.6% explained var.)
PC1 (62.7% explained var.)
2
1
0
−1
−2
−3
−10
−5
0
5
10
logSr
logMg
logBa
logCd
Population
Marine
Freshwater
factor(Marine)
Marine
Freshwater

D

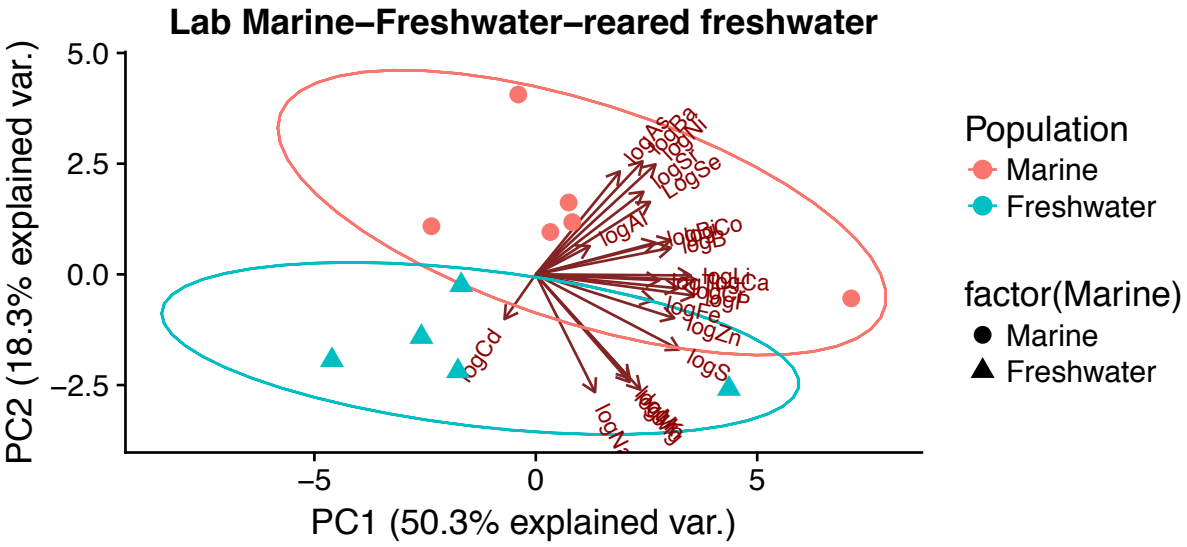

Lab Marine–Freshwater–reared freshwater
PC2 (18.3% explained var.)
PC1 (50.3% explained var.)
5.0
2.5
0.0
−2.5
−5
0
5
logAl
logCd
logZn
logS
Population
Marine
Freshwater
factor(Marine)
Marine
Freshwater

Fig. S5: The relationship between fish mass and P assimilation for a marine and freshwater stickleback population