This appendix is in support of the main manuscript: Wilson et al. (In Review). Life-history variation along environmental and harvest clines of a northern freshwater fish: plasticity and adaptation. *Journal of Animal Ecology*.

***Prey occurrence and biomass trends***

Fish biomass and occurrence were available for 89 Yukon lake trout populations from gillnet sampling since the early 1990s. We used a linear mixed effect model with year as a fixed effect and lake as a random effect to assess temporal trends in log-transformed prey fish biomass on Yukon gillnet sets since the early 1990s. Prey were defined as round whitefish *Prosopium cylindraceum*, pygmy whitefish *Prosopium coulterii*, lake whitefish *Coregonus clupeaformis*, least cisco *Coregonus sardinella*, and kokanee salmon *Oncorhynchus nerka*. Overall, we found prey biomass was variable between lakes but no evidence of temporal trends (Figure S1.1).



Figure S1.1 – Prey fish biomass (kg∙hr-1∙ha-1) from 1991 to 2009. Mean trend fitted by linear mixed effect model in black line. Approximate 95% confidence intervals in grey.

We then assess whether species diversity and prey fish biomass were related to determine whether species diversity was related to the prey fish community. We used a linear mixed model with species diversity as the fixed effect and lake as a random effect to assess the relationship between fish species diversity and prey biomass (log-transformed). We found a strong, positive relationship between the two suggesting that species diversity increases prey biomass (Figure S1.2).



Figure S1.2 – Relative biomass of prey fish (round whitefish *Prosopium cylindraceum*, pygmy whitefish *Prosopium coulterii*, lake whitefish *Coregonus clupeaformis*, least cisco *Coregonus sardinella*, and kokanee salmon *Oncorhynchus nerka*) in lake trout lakes along fish species diversity gradient. Mean effect from generalized linear mixed model in black.

Below, we demonstrate the relationship between prey fish occurrence (the clinal gradient used in the main manuscript) and lake trout biomass. We used a generalized linear mixed model (gamma distribution with a log link function) to assess the effect of prey fish occurrence on total fish biomass with prey fish occurrence as the fixed effect and lake as a random effect. We found a strong, positive relationship between prey occurrence and lake trout biomass suggesting that the availability of prey fish improves lake trout biomass (Figure S1.3).



Figure S1.3 – Total lake trout biomass (log kg-1∙hr-1) in lakes with and without prey fish species (round whitefish *Prosopium cylindraceum*, pygmy whitefish *Prosopium coulterii*, lake whitefish *Coregonus clupeaformis*, least cisco *Coregonus sardinella*, and kokanee salmon *Oncorhynchus nerka*). Mean effect from generalized linear mixed model shown in red.

***Climate trends***

We compiled estimates of growing degree days > 5°C (GDD) data from 1976 to 2013 from the ClimateWNA software (Wang et al. 2012). We then used a linear mixed model with year as a fixed effect and lake as a random effect to assess temporal trends in our climate gradient. In general, annual degree days varied substantially over time and between lakes (Figure S1.4a). We estimated significant warming trends on only 13 of 452 lakes in this region (red lines in Figure S1.4a) and the average trend predicted an increase of 57 GDD since 1976. We then compared the annual average growing degree days from the normal period (1961-1990 from Wang et al. 2012) and contrasted this with annual GDD in 1989 as a baseline year. We used 1989 because this was the average hatch year for lake trout in our dataset (estimated as the mean of the survey year for all individual fish minus their age at the time of the survey). There was no systematic bias between estimated GDD in 1989 and mean annual GDD during the normal period (i.e., errors resulting from warming trends were consistent across lakes – Figures S1.4b). This suggests that mean annual GDD from the normal period provided an accurate indicator of relative climate differences between lakes.



Figure S1.4 – Temporal trends in growing degree days across 425 lake trout populations from 1976–2013 (panel a). Lakes with significant warming trends shown in red (i.e., *p*<0.05). Mean trend across lakes from linear mixed model shown with black line. Comparison between annual degree days in 1989 (average hatch year for lake trout in dataset) and mean degree days during the normal period (1961–1990). The 1:1 line shown in black.

***Exploitation and harvest trends***

We compiled information of total effort (number of angler trips) and catch per unit effort from 8 Yukon lakes that were repeatedly sampled for both catch and effort since 2005. We used a generalized linear mixed model with a Poisson distribution, year as a fixed effect, and lake as a random effect (to account for repeated measures within lakes) to assess temporal trends in total effort. We then used a generalized linear mixed model with a gamma distribution (log link function), year as a fixed effect, and lake as a random effect to assess temporal trends in angler catch rates. Overall, there was substantial variation in both angler effort and catch rates across lakes. We detected no temporal trend in angling effort and a mild (but insignificant) increase in angler catch rates since 2005 (Figure S1.5. This suggested that, while lake trout populations varied in the degree of exploitation from anglers, this exploitation cline did not trend through time.



Figure S1.5 – Temporal trends in angler effort (panel a) and catch rates (panel b) for 8 Yukon lakes (individual lakes shown as colored points) with repeated samples since 2005. Mean trend from generalized linear mixed models shown with black line. Asymptotic 95% confidence intervals shown in grey.