Elevational Differences in Estimated Fattening Rates Suggest that High-Elevation Sites are High-Quality Habitats for Fall Migrants

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ELEVATIONAL DIFFERENCES IN ESTIMATED FATTENING RATES SUGGEST THAT HIGH-ELEVATION SITES ARE HIGH-QUALITY HABITATS FOR FALL MIGRANTS

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characterized by a mixture of young hardwoods, grassy meadow, and blackberry (*Rubus* spp.), and RPBO by a mix of tall grass meadow, hardwoods, and shrubs such as wild rose (*Rosa* spp.). In this region, the Coastal Western Hemlock zone has a mean annual temperature of ~ °C, with summer temperatures typically > °C (Pojar et al.). e mean annual temperature for the Mountain Hemlock zone is ~ °C, with temperatures exceeding °C only from mid-June through August.

Fox Sparrows are short- to intermediate-distance migrants

at either low or high elevation did not di er (P > . in both cases, controlling for mass and time of day). Overall, HY birds predominated in our sample of captured birds at both low-elevation (/ = . %) and high-elevation sites (/ = . %; age class was not available for birds captured at low elevation and at high elevation). Hatch-year birds predominated (> %) at both elevations in Golden-crowned Sparrows and Hermit rushes, and at low elevation in Fox Sparrows, whereas age distributions were more even in Orange-crowned Warblers and in Fox Sparrows at high-elevation sites (Fig.). Overall, there was no di erence in residual plasma triglyceride levels between HY and AHY birds for any species at either elevation (P (. in all cases).

Residual Plasma Triglyceride Levels, Body Mass, and Fat Score in Relation to Elevation

Fox Sparrow, Mean date of capture was earlier at high-elevation (September ± . days) than at low-elevation sites (September ± . days; P < .). However, birds were captured earlier

and time of day (P > .) or with Julian date (P > .) at either elevation. Fox Sparrows captured at high-elevation sites had greater fat scores than those at low-elevation sites (F = (. , df = and , P < . ; Fig B). However, fat score did not vary with time of day (P > .) or with Julian date (P > .) at either elevation. Fat scores ranged from to at high-elevation sites and from zero to at low-elevation sites.

Golden-crowned Sparrow. Mean date of capture was earlier at high-elevation (September ± . days) than at low-elevation sites (September ± . days; P < .), but birds were captured earlier and for a longer period at high-elevation sites (range: September… October) and again bracketed capture dates at low-elevation sites (range: September… October). Average time between capture and blood sampling did not di er between high-elevation (. ± . min, range: … , n =) and low-elevation sites (. ± . min, range: … , n = ; P > .).

Residual plasma triglyceride levels were dependent on elevation

no di erence in residual plasma triglyceride levels of birds sampled at the two di erent high-elevation sites in either or
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Fox Sparrows had lower residual plasma triglyceride levels than Golden-crowned Sparrows and Hermit rushes. Fox Sparrows eat a mixture of insects, seeds, and fruit during fall migration (Weckstein et al.), whereas Golden-crowned Sparrows and Hermit rushes are more strictly fruit- or seed-eaters (Norment et al. , Dellinger et al.). Our results therefore support the novel idea that high-elevation sites can represent high-quality fall stopover habitat where migrants are able to replenish fat reserves.

Our study illustrates the utility of estimating fattening rate from residual, mass-corrected plasma triglyceride levels and con-“rms the results and conclusions of many similar studies (Guglielmo et al. , ; Williams et al.) in that body mass, fat scores, and other metabolites (glycerol, beta-hydroxybutyrate) do not provide meaningful information on fattening rates. Body mass and fat scores provide static measures of putative body •conditionŽ at the time of capture; however, two individuals could have the same mass or fat score, but have opposite trajectories of mass change, one gaining and the other losing mass (Williams et al. , Schaub and Jenni , Guglielmo et al.). Plasma triglyceride analysis captures this dynamic nature of refueling. In the present study, body mass did not di er among birds captured in high- versus low-elevation sites for three of our four focal spe-