Figures and tables

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## Results

For methods

The hare cycle was increasing in 2015, peaked during the 2016-2017 winter, declined from 2017 to 2019, after which it remained in the low until 2021 (Figure 1). After initial data cleaning was complete, we analysed GPS data from 88 individuals, totaling 464 weekly home ranges. Home ranges were composed of an average of 298 fixes (38 - 1564). Within our sample, 20 individuals were male, 68 were female. Of the females, 26 were food supplemented while collared. A total of 234 home ranges occurred in early winter and 230 in late winter; 0 occurred outside our seasonal limits (i.e., November).

General summary

Over our study period hare densities ranged from 0.025 to 1.26 hares/ha, starting at 0.48 hares/ha during the increase in the 2015-2016 winter, reaching 0.94 hares/ha during the peak in 2016-2017, and decreasing to 0.065 hare/ha in the low of 2020-2021 (Figure 1). Meanwhile hare home range areas ranged from 0.38 to 11.43 ha from 2015-2021 (Figure 1). The mean areas of 90%, 75%, and 50% weekly home ranges (MCPs) were 2.76 +/- 1.96 ha, 1.84 +/- 1.5 ha, and 1.01 +/- 0.98 ha respectively. Results from 90%, 75%, and 50% MCPs were highly correlated (r > 0.78), and we completed subsequent home range size analyses with the 90% MCP results. Snowshoe hare home ranges were largest in the low of the cycle (2019-2020) and smallest in the peak of the cycle (2016-2017; Figure 1). We found no effect of sex on home range size excluding food add females (p = 0.25, t = 1.34, df = 322), so we did not include sex in our models.

When testing the relationship between home range size and population density on control individuals only (all years; only control individuals; n = 324) found that hare home ranges decreased with hare density (-1.5 +/- 0.3 ha per hare/ha increase). As hare density increased from 0 to 1.2 hares/ha, hare home ranges shrunk from 4.08 ha to 2.28 (Figure 2).

The models which included both food supplemented and control individuals continued to find a negative trend (years with food-add experiments; n = 443). Our seasonal model, which interacted hare density with season (early versus late winter) found a negative relationship for both seasons (-3.34 +/- 0.47; Figure 3). This model found hare density to be significant (t > 2) toward predicting home range size, but not season or the interaction between season and density (Table 1). Our food treatment model, found that as hare density increased from 0 to 1.2 hares/ha, controls slightly decreased their home ranges from 3.95 ha to 2.18 ha, and food-adds substantially decreased their home ranges from 5.51 ha to 0.69 ha (Figure 3). All terms in the model, hare density, food treatment, and their interaction, were significant (t > 2) in predicting home range size (Table 1). The model that interacted food treatment, season, and hare density was the top ranked model according to AICc (Table 1). It also found a negative relationship between home range size and density (-5.16 +/- 0.74 ha per hare/ha increase). Regardless of scenario, season or food treatment, home ranges decreased with hare density (Figure 3). The interaction between food treatment and density remained significant (t > 2; Table 1), with food adds in early winter showing the most negative response and controls in early winter showing the least negative response (Figure 3). The interaction between all three terms was not significant (Table 1).

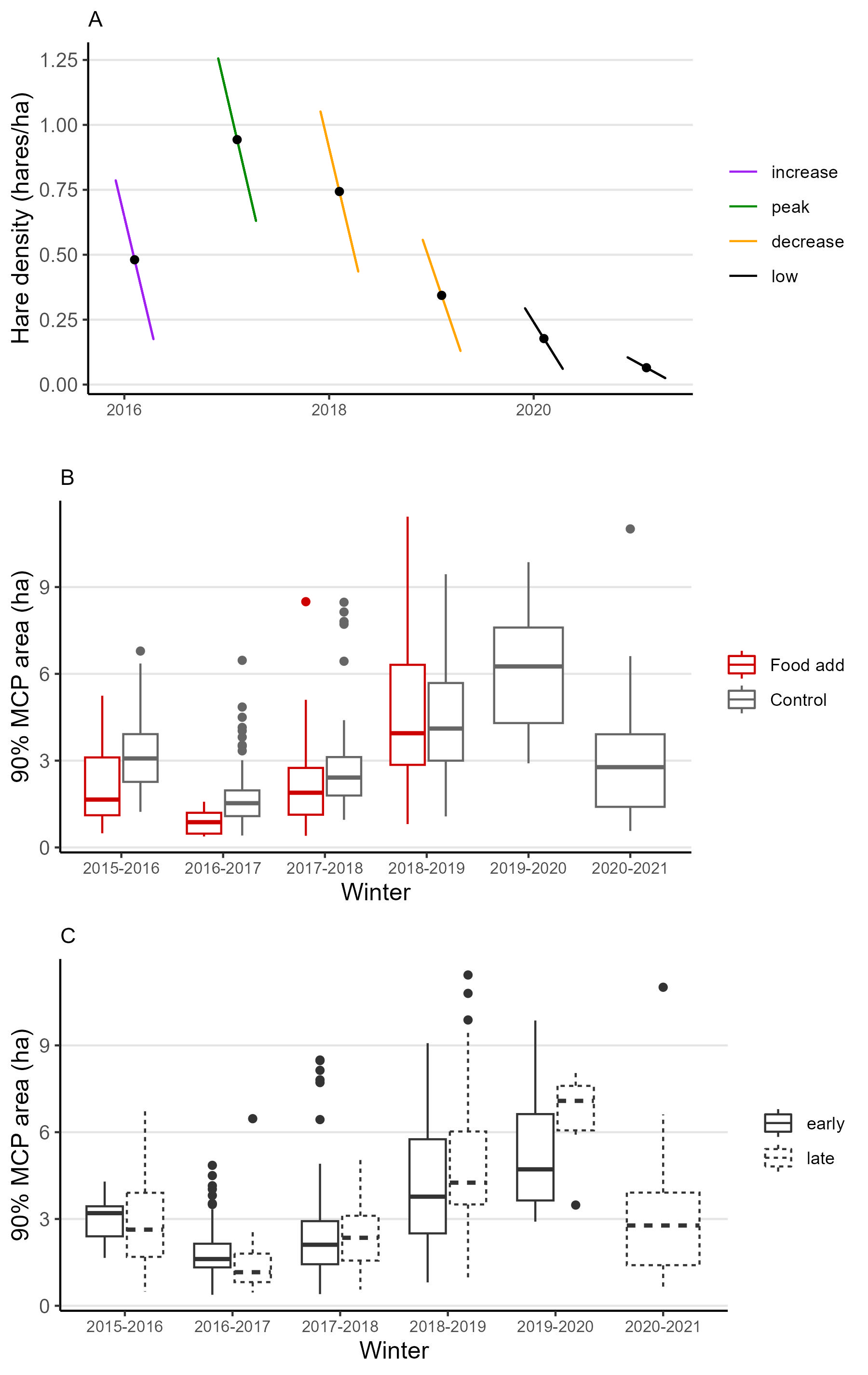


Figure 1. Summary of data

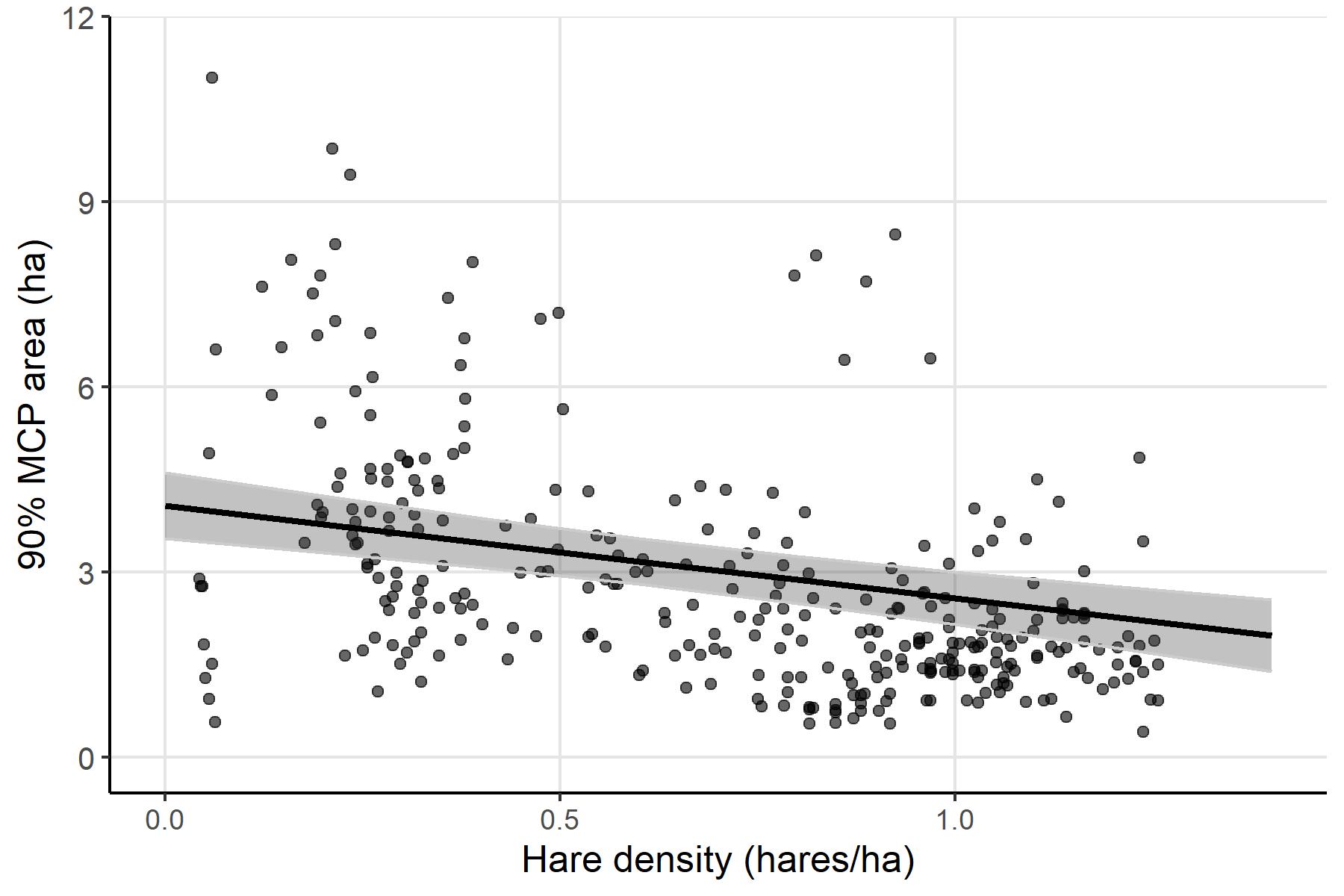


Figure 2. Home range size in response to density using control data only.

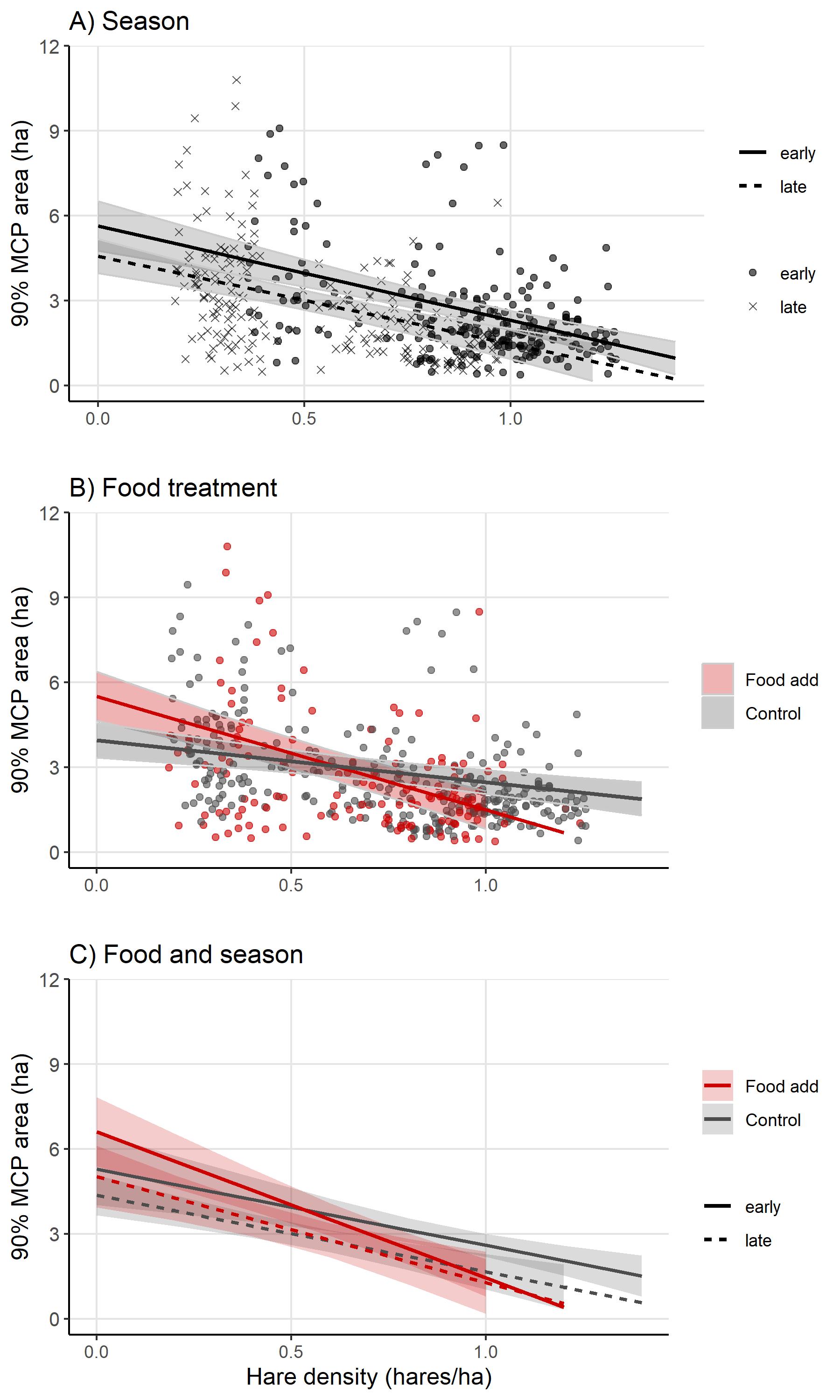


Figure 3. Home range size in response to density considering food conditions, both via season and food add treatment.