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Food availability affects the scent marking frequencies of wild brown bears

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For many species, chemical signalling is used to signal the competitive ability of individuals and therefore plays an important role in the breeding system. As breeding generally promotes intrasexual competition, the potential fitness costs associated with competitive behaviour may be mitigated if individuals are able to assess their own ability, and the competitive ability of others, prior to agonistic encounters. Due to their hierarchical social structure and large home-range size, bears (Ursidae) are thought to rely highly on olfactory methods of communication. Through camera traps orientated towards bear 'rub trees' over a three-year period, we have begun to establish the function of strategic tree selectivity and the social function of marking behaviour for brown bears *Ursus arctos* in the Glendale drainage, British Columbia. We hypothesised that marking trees function to signal competitive ability between individuals, with dominant individuals signalling their high competitive ability and receivers detecting these cues and modifying their behaviour accordingly. Here, we provide evidence to further these hypotheses by demonstrating how scent marking frequencies vary in relation to food availability.

Scent marking frequencies were analysed during the pink salmon *Oncorhynchus gorbuscha* run (August-October) of 2010 & 2011. Pink salmon stock monitoring by Fisheries & Oceans Canada provide a count of individuals entering the Glendale river system and spawning channel. As the diet of brown bears in the study area has previously been reported to comprise 82% marine meat, pink salmon return data provides a rare insight into food availability during hyperphagia. Moreover, 2010 was considered as a year of 'low' pink salmon return and 2011 a year of 'high' pink salmon return, providing a method of assessing scent marking behaviour in years of varying levels of competition.

Evidence was found to support the prediction that adult males would mark significantly more in years of low food availability (high competition). We also found evidence to suggest that adult males investigate marking trees more in years of lower food availability (high competition). Knowledge of the dominance of other individuals may be retained across seasons and affect social behaviour in the following breeding season. Adult females displayed an interesting change in behaviour between 2010 & 2011, by marking and investigating trees more in the year of higher food availability (low competition). They were more likely to engage with a marking tree by marking or investigating it when passing in 2011 than 2010. In plentiful years adult females may have more time and energy to display dominance for the following breeding season. As adult males reduce their frequency of investigation in such years, female scent marks may be signals to other females. The trend of marking & investigating trees did not change significantly for females with young or subadults between years of varying food availability/competition; they were associated with marking and investigating trees as expected from their frequency on trails containing marking trees. This study is the first to examine the plasticity of scent marking behaviour in relation to food availability in an ursid species.