Could saber-toothed cats form groups? Optimal group size based on foraging and competition for carcasses

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Inferring social behavior from fossil remains has always been a difficult and controversial task. Previous works on the topic included assessing family structure among dinosaurs based on nest remains, and assessing social behavior based on surmised sexual dimorphism of cranial morphology. For some saber-toothed cats, social grouping has been supported based upon healed broken bones and high remain densities in Rancho La Brea tar pits. In contrast, some authors casted doubts on these arguments. Furthermore, given the relatively small brain size found in such saber-toothed cats, it has also been stated that they were unable to socialize. In the present work we intend to assess whether Smilodon populator Lund could have formed groups based on Optimal Foraging Theory and competition for carcasses. We developed a mathematical model in which net energy gain is a function of group size, carcass competition intensity, individual hunting costs and gross food intake. When applied to African lion (Panthera leo Linnaeus), a likely modern analog of saber-toothed cats, the model correctly predicted observed group sizes, ranging from two to fifteen individuals. In the case of Smilodon populator group size, it strongly depended on competition for carcasses, hunting costs and gross food intake. It was found that optimal group size should have varied from one to four individuals. For instance, optimal group size tends to be minimal when competition for carcasses is low, and it tends to be maximal at high hunting costs, high competition for carcasses and intermediate gross food intake. Given that hunting costs escalate with prey size and that it has been proposed that competition for carcasses was high during the Pleistocene, it is plausible that average group size of Smilodon populator was closer to four individuals. The model was validated through counting of specimens with appropriate stratigraphic control.

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