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Competing for limited numbers of individuals in quota-driven decisions

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Many collective decisions are essentially competitive processes. Politicians compete for voter's ballots; shops compete for customers who may implicitly decide a business should close when they fail to patronize it; individual choices in vertebrates are arrived at as neurons in the brain compete to be active; and honeybees choose a home as scouts that support each potential nest site compete to attract other scouts to become committed to their choice. Each of these potential choices made by voters, customers, neurons or bees are finalized when the number of individuals that support a particular option rises above a particular threshold. The speed and accuracy of a decision may potentially depend on the number of options available and whether the pool of individuals that collectively make the decision is large or small compared to the threshold that the decision requires. We will examine threshold-determined decisions in the context of house-hunting honeybees. We will first explore the effects of the number of available scouts with a simple model before presenting experimental results from large and small swarms. Although these results do not at first sight agree with the predictions of the model, further exploration shows that the idea of 'competing for scouts' is valid for honeybee decision-making and has implications for other systems too.