

The demogenetic strategy of bees

The characterization of species by a set of life-history traits - such as reproductive age and fecundity - that oppose two major types of demographic (or **demogenetic**) strategies, one (called '*r*') of rapid multiplication and dispersal in **unstable or ephemeral habitat**, and the other (called '*K*') of survival and competition in **stable or predictable habitat**, is a stimulating heuristic but not a complete and rigorous conceptual framework. Thus, many species combine life traits that are *a priori* typical of these two opposing strategies. This is the case of social insects and other so-called **eusocial** species, such as mole rats and dwarf mongooses, which are characterized by both the high fecundity of the reproducers (*an a priori* '*r*'-type characteristic) and the care of the young (a '*K*'-type characteristic).



Figure 1. Queen surrounded by workers, within a hive. [Source: Waugsberg, CC BY-SA 3.0, via Wikimedia Commons]

The paradox of this *a priori* incompatible combination of life traits, in honey bees and other eusocial species, falls away quite quickly however when one remembers that these are **not the same individuals**: it is the "queen" of the bee colony -or the "royal" couple in termites, as well as the "alpha" couple in eusocial mammals- who gives birth to numerous offspring, but it is the "workers" (in social insects) or the "parental helpers" (in eusocial mammals and birds), usually closely related to the reproducers, who are responsible for feeding and defending them.

In other words, when it involves the help of other members of the group (adults or subadults), the evolution of care for the young relaxes the constraints on the fecundity of the breeders, while restricting that of the parental helpers - whose sexual maturation, in eusocial species, is inhibited by the presence of an adult breeder of the same sex in the colony.



Figure 2. Swarming of a bee colony. The queen bee is accompanied by thousands of worker bees, searching for a suitable site to establish a new colony. [Source: Fir0002/Flagstaffotos, CC BY-NC, via Wikimedia Commons]

So what is the **demogenetic strategy of bees** and other eusocial species? Freed from the care of juveniles as well as the maintenance and defence of the colony, and fed by her "workers", the "queen" of a bee colony can lay tens of thousands of eggs each year... but her reproductive success is measured by the number of her offspring reproducing in turn. These are the **new queens formed** each year by the colony, which after mating during a so-called nuptial flight manage to found a new colony with the help of their asexual worker sisters, and any sexual males that succeed in fertilizing a future queen during a nuptial flight. However, this **number** - which depends on the quantity and quality of local food resources (flowering plants), climatic hazards and, as we know today, on various anthropogenic factors [\[1\]](#) - is **very low**: only a few individuals at most per hive and per year.

All in all, **despite their small size and the high fecundity of the reproductive females**, the demogenetic strategy of a bee colony is similar to that of the '**K**' species in terms of the limited fecundity/productivity of the social groups (colonies in the case of eusocial species), the longevity of the reproducers and the care of the juveniles, which, overall, reduce the vulnerability of the social groups to the unpredictable variations of their habitats.

Notes and references

Cover image. Worker bee loaded with pollen. [Source: © Jacques Joyard]

[\[1\]](#) Ellis, J., 2012. The honey bee crisis. *Outlooks Pest Manag.* 23:35-40.

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