4.5: Group selection

A proposed alternative to inclusive fitness is the concept of group selection. In this type of evolutionary scenario, small groups of organisms of the same species are effectively acting as single (perhaps colonial) organisms. It is the reproductive success of the group, compared to other groups of the organism, that is the basis of selection. Groups that display cooperative and altruistic traits have a selective advantage over groups that do not. Again, the mathematical analysis is similar (and it has been claimed that mathematically group and kin selection are equivalent)\(^\text{124}\). The costs of a trait must be offset by the benefits, but now the key factor is membership in a particular group (and typically, members of a group tend to be related to one another). The life cycle of the bacterium *Myxococcus xanthus* provides an example of this type of behavior. When environmental conditions are harsh, the cells aggregate into dense, 100μm diameter, “fruiting bodies” containing about 100,000 stress resistant spores each. When the environment improves, and prey becomes available, the spores are released en mass and return to active life. They move and feed in a cooperative manner through the release of digestive enzymes, which because they are acting in a quorum mode, can reach high levels\(^\text{125}\). A well-coordinated group is expected to have a significant reproductive advantage over more anarchic collection of individuals.

While their functional roles are clearly different, analogous types of behavior are seen in flocks of birds, schools (or shoals) of fish, swarms of bees, and blooms of algae\(^\text{126}\). Each of these examples represents a cooperative strategy by which organisms can gain a reproductive advantage over those that do not display the behavior. While the original behavior is likely the result of kin selection, in the wild it is possible that different groups (communities) could be in competition with one another, and the group(s) that produces the most offspring, (i.e., the most reproductively successful groups) will come to dominate.
References


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