ECOLOGY, LECTURE 2: ETHOLOGY, AND THE ECOLOGY OF INDIVIDUALS (1120–1121, 1131–1140)

Ethology is the scientific study of animal behavior. The field was made famous in the mid-20th century by **Konrad Lorenz** (1903–1989), **Niko Tinbergen** (1907–1988), and **Karl von Frisch** (1886–1982), who received a joint Nobel Prize in 1973 for their contributions.

In lecture we looked at examples of the research of these three pioneering ethologists, including the studies of **imprinting** by Lorenz (Fig. 51.10); the studies of **spatial learning** based on visible **landmarks** in wasps by Tinbergen (Fig. 51.11); and the studies of **animal communication** in honeybees by von Frisch (Fig. 51.8). Please refer to those figures if you need to refresh your memory.

Because behavior varies across individuals, and because at least some behaviors are heritable (genetically based), natural selection can act directly on behavioral processes. Because behavior is usually correlated with physiological and anatomical features, natural selection acting on behavior can have complex effects on a population.

Tinbergen suggested that a thorough understanding of animal behavior requires an investigation of both **proximate** and **ultimate causes**. Proximate causal mechanisms pertain to "how" a behavior works, and ultimate mechanisms relate to "why" a behavior exists (in the context of evolutionary theory).

Behavioral ecology is the study of the ecological and evolutionary basis of behavior. Many studies in behavioral ecology are conducted in the terms of **cost-benefit analysis** based on an assumption that natural selection *optimizes* behaviors for their functions. For example, **optimal foraging models** assume that natural selection leads to food-finding behavior that *minimizes* the cost of food procurement while it *maximizes* the returns.

We briefly reviewed the major types of **mating behavior**, and the circumstances in which the various types are expected to evolve. **Monogamy** refers to long-term pair bonding, and it is common, for example, in birds with young that are born helpless, where both parents are needed to raise the young successfully (it behooves the male to stick around so that his investment is not wasted). By contrast, bird species with young that are born at a more advanced developmental stage are more likely to be **polygynous** (it behooves the male to mate with as many females as possible). Please be familiar with the associated terminology (**polygamy**, **polyandry**, **promiscuity**) from the text.

Mating systems and **parental care** behaviors are closely related. Parental care by males is most typical of species in which paternity is easily established (for example, in the context of some types of external fertilization in amphibians and fishes). Also note that **sexual dimorphism** is often related to the type of mating system. In polyandrous species, which sex is likely to be more ornamented, the female or male?? Why?

Finally, we looked at the costs and benefits of **flocking behavior** (the tendency of species to form social groups). Among the benefits that we discussed were safety in numbers through increased vigilance or group defensive behavior, as in pigeons; greater success in finding and capturing food (including food items that may be larger than the individual consumer, as in ants or wild dogs); and thermal advantage (penguins). The costs associated with flocking behavior include increased risk of disease as a result of living in close proximity to conspecifics; more acute competition for food with close neighbors; and a greater risk of predation by association with a conspicuous group.