**Focus Topics for Ecology:**

Vocab review for Animal Behavior Notes:

A **behavior** is the nervous system’s response to a stimulus and is carried out by the muscular or the hormonal system.

A **fixed action pattern** is a sequence of unlearned, innate behaviors that is unchangeable

A fixed action pattern is triggered by an external cue known as a **sign stimulus**

**Circadian rhythm** is a daily cycle of rest and activity.

A **signal** is a behavior that causes a change in another animal’s behavior.

**Communication** is the transmission and reception of signals.

Communication through odors emit chemical substances called **pheromones**

**Innate** behavior is developmentally fixed and does not vary among individuals

**Learning** is the modification of behavior based on specific experiences.

**Imprinting** is a behavior that includes learning and innate components and is generally irreversible. It is distinguished by a sensitive period.

A **sensitive period** is a limited developmental phase that is the only time when certain behaviors can be learned.

**Spatial** **learning** is a more complex modification of behavior based on experience with the spatial structure of the environment

In **associative learning**, animals associate one feature of their environment with another.

**Classical conditioning** is a type of associative learning in which an arbitrary stimulus is associated with a reward or punishment.

**Operant conditioning** is a type of associative learning in which an animal learns to associate one of its behaviors with a reward or punishment. It is also called **trial-and-error learning**

**Cognition** is a process of knowing that may include awareness, reasoning, recollection, and judgment

**Problem solving** is the process of devising a strategy to overcome an obstacle

**Social learning** is learning through the observation of others and forms the roots of culture

**Culture** is a system of information transfer through observation or teaching that influences behavior of individuals in a population.

**Foraging**, or food-obtaining behavior, includes recognizing, searching for, capturing, and eating food items

**Optimal foraging model** views foraging behavior as a compromise between benefits of nutrition and costs of obtaining food

In **monogamous** relationships, one male mates with one female

In **polygamous** relationships, an individual of one sex mates with several individuals of the other sex

In **polygyny**, one male mates with many females. The males are usually more showy and larger than the females.

In **polyandry**, one female mates with many males. The females are often more showy than the males.

**Intersexual selection**, members of one sex choose mates on the basis of certain traits.

**Intrasexual selection** involves competition between members of the same sex for mates

**Mate-choice copying** is a behavior in which individuals copy the mate choice of others

**Game theory** evaluates alternative strategies where the outcome depends on each individual’s strategy and the strategy of other individuals

Some animals behave in ways that reduce their individual fitness but increase the fitness of others. This kind of behavior is called **altruism**, or selflessness

**Inclusive fitness** is the total effect an individual has on proliferating its genes by producing offspring and helping close relatives produce offspring

**Kin selection** is the natural selection that favors this kind of altruistic behavior by enhancing reproductive success of relatives

Altruistic behavior toward unrelated individuals can be adaptive if the aided individual returns the favor in the future. This type of altruism is called **reciprocal altruism.**

**Four Types of Tissues and Examples:**

Epithelial tissue**:** covers the outside of the body and lines the organs and cavities within the body. It contains cells that are closely joined. The shape of epithelial cells may be cuboidal (like dice), columnar (like bricks on end), or squamous (like floor tiles). The arrangement of epithelial cells may be simple (single cell layer), stratified (multiple tiers of cells), or pseudostratified (a single layer of cells of varying length)

Connective tissue: mainly binds and supports other tissues. It contains sparsely packed cells scattered throughout an extracellular matrix. The matrix consists of fibers in a liquid, jellylike, or solid foundation. Examples are cartilage, tendons, and ligaments

Muscle tissue: Skeletal muscle, or striated muscle, is responsible for voluntary movement. Smooth muscle is responsible for involuntary body activities. Cardiac muscle is responsible for contraction of the heart.

Nervous tissue: senses stimuli and transmits signals throughout the animal. They contain Neurons, or nerve cells, that transmit nerve impulses and Glial cells, or glia, that help nourish, insulate, and replenish neurons.

**Organism Energy Use:**

Bioenergetics is the overall flow and transformation of energy in an animal. It determines how much food an animal needs and it relates to an animal’s size, activity, and environment.

Animals harvest chemical energy from food. Energy-containing molecules from food are usually used to make ATP, which powers cellular work. After the needs of staying alive are met, remaining food molecules can be used in biosynthesis. Biosynthesis includes body growth and repair, synthesis of storage material such as fat, and production of gametes. Metabolic rate is the amount of energy an animal uses in a unit of time.

Metabolic rate can be determined by an animal’s heat loss. The amount of oxygen consumed or carbon dioxide produced. Metabolic rates are affected by many factors besides whether an animal is an endotherm or ectotherm. Two of these factors are body size and activity.

Activity greatly affects metabolic rate for endotherms and ectotherms. In general, the maximum metabolic rate an animal can sustain is inversely related to the duration of the activity.

Torpor is a physiological state in which activity is low and metabolism decreases. Torpor enables animals to save energy while avoiding difficult and dangerous conditions

Hibernation is long-term torpor that is an adaptation to winter cold and food scarcity

Summer torpor, called estivation, enables animals to survive long periods of high temperatures and scarce water. Daily torpor is exhibited by many small mammals and birds and seems adapted to feeding patterns.

**Advantages and disadvantages of reproduction types (sexual and asexual)**

-Sexual reproduction is the creation of an offspring by fusion of a male gamete (sperm) and female gamete (egg) to form a zygote. Almost all eukaryotic species reproduce sexually.

 Advantages: A genetic recombination occurs with the creation of a new organism with genetic material from both sperm and egg. This creates diversity and variation. The more variation in a population gene pool, the more stable the population is in regards to environmental or pathogenic stresses. Other benefits include: 1) An increase in variation in offspring, providing an increase in the reproductive success of parents in changing environments. 2) An increase in the rate of adaptation. 3) A shuffling of genes and the elimination of harmful genes from a population

 Disadvantages: Some species are solitary and interactions between males and females may be limited.

-Asexual reproduction is creation of offspring without the fusion of egg and sperm.

-Advantages: All your genes are passed on. Offspring are clones of the parent. Can reproduce without a partner. May be able to produce more offspring in shorter amounts of time than sexual reproduction. -Disadvantages: limited gene pool in population. Can be susceptible to environmental or pathogenic problems. Offspring may have less chance of survival.

-Forms of Asexual reproduction:

-Many invertebrates reproduce asexually by fission, separation of a parent into two or more individuals of about the same size

-In budding, new individuals arise from outgrowths of existing ones

-Fragmentation is breaking of the body into pieces, some or all of which develop into adults. Fragmentation must be accompanied by regeneration, regrowth of lost body parts

-Parthenogenesis is the development of a new individual from an unfertilized egg. Sexual females have half as many daughters as asexual females; this is the “twofold cost” of sexual reproduction

**Limits in Ecosystems:**

Ecosystems are limited by many factors. There may be a finite amount of water, sunlight, tolerable temperatures, food, mates, habitat, abundance of predators, nutrients, disease etc.

**How energy and nutrients move through an ecosystem:**

Energy movement starts with energy from the sun which is captured by plants (autotrophs). They are the 1st level of all food chains. They are consumed by a primary consumer (heterotroph). These are consumed by a secondary consumer etc. Food chains usually go
up only 4 or 5 levels. All levels connect to decomposers. Only about 10% of energy is available to be passed onto the next trophic level. The other 90% is used for living processes.

**Population Growth Rate Factors:**

-sex ratio: how many females vs. males?

-generation time: at what age do females reproduce?

-age structure: how many females are at reproductive age in cohort?

**K Selected vs R Selected Strategies:**

K-selected: late reproduction, few offspring, invest a lot in raising offspring. Examples: primates, coconut

r-selected: early reproduction, many offspring, little parental care. Examples: insects, many plants

Cost Tradeoff: Number & size of offspring vs. Survival of offspring or parent

**Exponential vs Logistic Growth Comparisons**

-Exponential growth model-ideal conditions. Unrestricted growth. No limiting factors. Forms a J shaped curve on graph

-Logistic Growth model- Exponential growth until limiting factors begin to influence growth. Growth levels out at the carrying capacity.

**Symbiotic Relationships:**

competition (-/-): Both species are harmed. Species compete for limited resources. Includes competitive exclusion which is that no two similar species can occupy the same niche at the same time. Example:

predation / parasitism (-/+): One species benefits and the other is harmed. Example: Snowshoe Hares and Lynx.

mutualism (+/+): Two species are both benefited. Example: lichens (algae & fungus)

commensalism (+/0): One species benefits and the other is not harmed. Example: Barnacles attached to whales