

Preview Material
Final Exam – Spring 07

A farmer has a pond on her property she calls “Little Pond”. The pond typically has a variety of plants and animals. After a few weeks into one spring season, there was an algae bloom in her pond.

Blues jays have a bluish gray body with bright sky-blue wings and tails. The males and females are similar in appearance. In the spring, males and females build nests together. The blue jay egg measures 29mm in height. The female sits on the eggs to incubate them for days and she may be fed by the male while on her nest. Both parents bring food for the hatchlings for up to 12 days.

Megan, a Zoology major and animal lover, adopted a small Quaker parrot from her neighbor. Megan noticed the parrot ate a very large amount of food, acted lethargic, and was very large. Concerned about her beloved pet, she took the parrot to a veterinarian. The veterinarian agreed the bird was overweight (Quaker parrots weigh about 180 grams on average) and injected the parrot with leptin. The results are below:

Parrot before the leptin injection	260 g
Parrot after the leptin injection	180g

Jim owns a farm with a couple of ponds on it. One of the ponds is located near an old oil-well site and has a high saline (salt) content because of saline-water extrusion from the well. He thinks the salt content is approximately (3.5%). His other pond is freshwater (0.01% salt) and contains 100,000 gallons of water. Within the freshwater pond there is a species of minnows (small fish) which become aggressive and cannibalistic under crowded conditions. This behavior becomes more pronounced as the population increases and the number never exceeds 100 minnows/gallon of water. He also notices algae growth in both ponds.

The Canary Islands are located off the west coast of northern Africa. Scientists hypothesize thousands of years ago one species of lizard drifted from the mainland and colonized the Canary Island. Now, the Islands are home to a variety of lizard species. The males of some species on the Islands have brightly red colored dewlaps (loose skin underneath the throat).

A small population (founder population) of bees was blown from the mainland of Australia (the place of the original population) to a small island in the pacific. At that time there were no bees on the island. 10,000 years later, the island has two populations of bees that can not interbreed and each one feeds on a different species of plant.

Striped skunks typically live solitarily, however they have been observed to inhabit dens communally (in groups) during winters at the northern limits of their range. While they remain active all year round, striped skunks do enter states of torpor in winter nights. During torpor, animals reduce their body temperatures and metabolic rates – torpor of long duration is commonly referred to as hibernation. Recently, Drs. Hwang, Larivière, and Messier studied whether differences in the way the skunks used dens (solitary v. communal) was the reason there was variation in the skunks in the spring. They found:

Over-wintering strategy	% body fat at end of winter	Average minimum body temperature (°C) during torpor	Average duration in torpor per session (hours)
Solitary	9.3	26.8	7.8
Communal	25.8	30.9	5.4

Whale meat is still consumed in Japan. Some endangered whales are protected and harvesting of these whales is prohibited. The carcass of a protected whale is found on a beach. Investigators take samples from restaurants serving whale meat and plan to compare the DNA of these samples to the carcass.

The COMT gene makes catechol-O-methyltransferase, which regulates the neurotransmitter dopamine in the prefrontal cortex of the brain and therefore affects working memory, problem solving, and abstract reasoning. COMT does to the neurotransmitter dopamine what acetylcholinesterase does to acetylcholine. Too little dopamine leads to Parkinson's disease; too much increases the risk of schizophrenia. There are two alleles for the COMT gene; the difference in the resulting COMT protein is the substitution of the amino acid valine (val) for a methionine (met) at one specific point. Those with two val alleles (VV) score high on certain tests of reasoning; those with two met alleles (vv) score low, those with one of each, score in between. In practice, this variation accounts for 3-4% of the variation in humans on reasoning and decision making tests – there are MANY other genes and environmental factors involved.