Lecture 26: Evolution & Humans (2)

- Exploitation of evolving populations
  - Fisheries
  - Fish hatcheries
  - Hunting
- Evolving pathogens
- Evolution in agricultural pests

Exploitation of evolving populations (3)

Trophy hunting
- "Darwinian Game Management"?
- Trophy hunting of Bighorn sheep: harvest of males with rapidly growing horns
  - Ram Mountain, Canada
  - 1975-1996: 10% of males hunted

Coltman et al. (2003)
Nature 426: 655-658

Evolution in salmon hatcheries:
egg size

- Chinook salmon
- Fig 12.23
  (a) egg size vs egg number: trade-off
  (b) egg size vs juv. survival: favors large eggs

(c) Optimal size (hatchery): intermediate (0.15 g)
- Smaller than optimum in wild (larger juvs. favored)
- Evolution of egg size in hatchery?

Fig 12.23

Evolution & human health

“Darwinian medicine“?

- Predicting evolution of pathogens: resistance, virulence
- Adaptations to disease: fever?

Evolution of resistance: HIV

AZT breaks down reverse transcriptase step

Figure 1.3
EVOLUTION OF ANTIBIOTIC RESISTANCE

- Bacteria resistance tracks use of antibiotics (selection)
- Reduced penicillin use in Iceland, 1992-1995

RESISTANCE TO AZT

- Selection on Reverse Transcriptase

WHY ARE SOME PATHOGENS VIRULENT (MAKE HOST SO SICK)?

- Darwinian view: virulence depends on ease of transmission
- Virus E. coli experiment
- High virulence: when transmission is frequent
  - Virus reproduces faster in host
  - Faster reproduction -> more damage to host

H: FEVER AN ADAPTATION?

- Prediction: High temperature:
  - Decreases growth of pathogen?
  - Better immune response?
- Desert iguana: ectotherm
  - Behavioral fever

EVOLUTION IN AGRICULTURAL PESTS

- Behavior induces high temperatures
- Do high temperatures kill infection?

Infected iguanas held at high temperature survive better

RESISTANCE TO AZT: EVOLUTION IN AGRICULTURAL PESTS

- Traditional pest management:
  - Pesticide application
  - Selection for resistance alleles
Evolution of resistance to pesticides

Evolution in Agricultural pests

Example: Bt corn
- Genetically modified crops with genes from bacteria *Bacillus thurengensis*
- Crop plant makes Bt protein, toxic to insects
- Farmers must plant "refuge": non-BT crops

Is Evolution important?
- Human activities cause evolutionary change
- Evolutionary change in natural, exploited, pest, and disease organisms affects human welfare
- Evolutionary change can be rapid
- Incorporating this knowledge into management can improve human welfare