II. Interactions between species

A. Classes of 2-species interactions

B. Effects of predation on population growth
   1. Huffaker’s mites
   2. Moose and wolves on Isle Royale

C. Effects of competition between species
   1. What is competition
   2. Gause’s paramecium
   3. The niche concept
      a. fundamental niche
      b. realized niche
   4. Connel’s barnacles
Population age-structure in China

1970 “Later-longer-fewer”
1979 “One child Policy”

Birth rate 1949 = 6 per female
Birth rate 1990 = 1.8 per female

Life expectancy 1949 = 35 yr
Life expectancy 1990 = 71.3

Current growth rate = 0.9% per yr

# in reproductive age classes expected to peak in 2010
The image shows three graphs and a diagram:

1. **Moose population size** graph:
   - Y-axis: Moose population size
   - X-axis: Year (1960-2000)
   - The graph shows a decline in population size around 1980, with a sharp increase around 1990.

2. **Commercial catch of male crabs** graph:
   - Y-axis: Commercial catch (kg)
   - X-axis: Year (1950-1990)
   - The graph shows fluctuations in catch with peaks around 1970 and 1980.

3. **Snowshoe hare and Lynx population size** graph:
   - Y-axis: Hare population size (thousands)
   - X-axis: Year (1850-1925)
   - The hare population size shows peaks and troughs, with a sharp increase around 1900.
   - The Lynx population size follows the hare population size, with peaks occurring when hare population sizes are high.

The graphs illustrate the ecological relationships and fluctuations in populations over time.
Predation and parasitism
Competition
Mutualism
CB Huffaker’s experiments with predator and prey mites on oranges
FIGURE 13.8

Population density of E. sexmaculatus (prey)

Population density of T. occidentalis (predator)

March 25 30

April 5 10 15 20 25

Prey

Predator

Eotetranychus

Typhlodromus
Moose and wolves on Isle Royale, MI
Fig 53.2

- **Chthamalus**
- **Balanus**

- High tide
- Realized niches
- Fundamental niches
- Low tide

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