Population Ecology 4 - Life Tables

(Chap. 10)
- A. Patterns of survival and reproduction
- B. Age distributions
- C. Calculating rates of population change
  - a. non-overlapping generations
  - b. overlapping generations

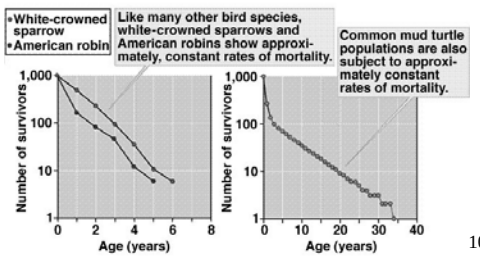
A. Patterns of survival and reproduction

What do we need to know about pop'n to figure out b and d so we can figure out r?

Are birth and death rates similar for all individuals in a population?

How do b and d vary with age?

1. Survivorship curves show how likelihood of death varies with age



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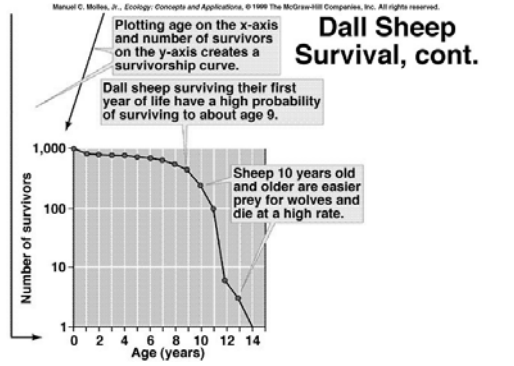

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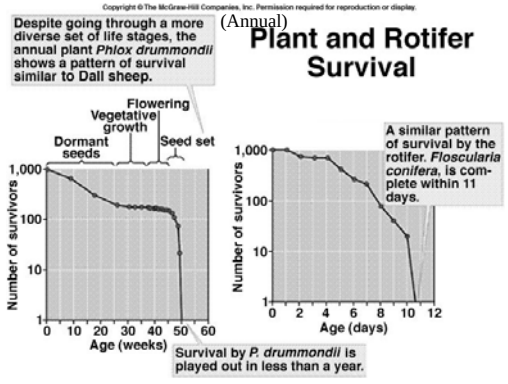
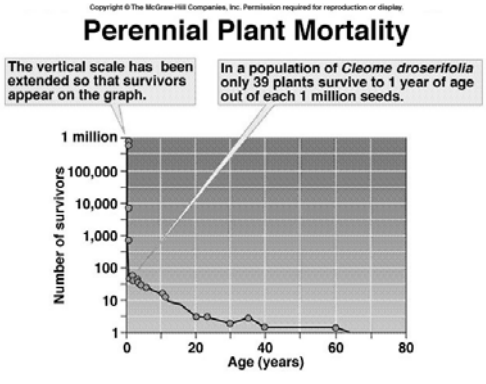


10.15

(Annual)

Humans too!



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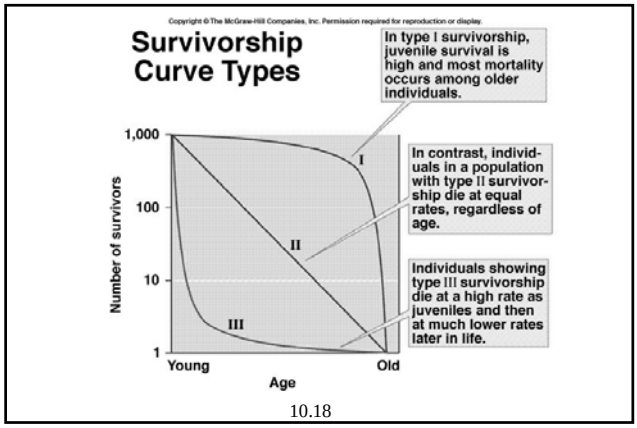

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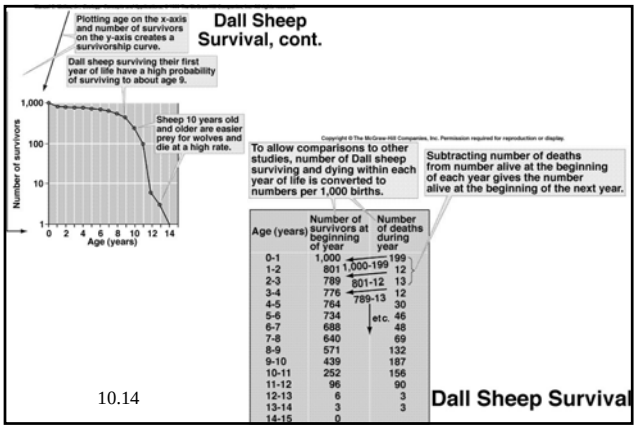
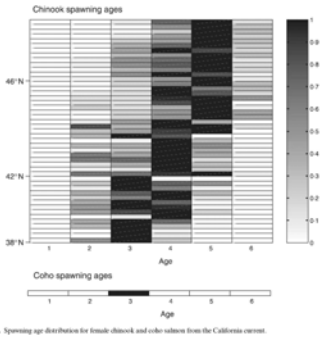


10.14

2. Fecundity curves: timing of reproduction

Different fecundity curves for Chinook and Coho salmon



Hill et al. (2003) J. An. Ecol. 72: 736

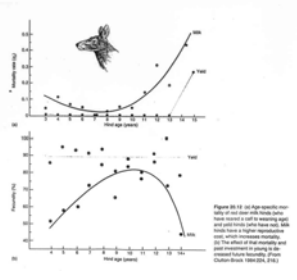
Fecundity for humans and oak trees

3. Relationship to life history traits

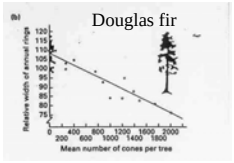
Reproductive allocation vs. growth/survival
- limited resources
- reproduction is energetically expensive
- different reproductive strategies
  - a. frequent disturbances
  - b. stable environments

a. Reproduction vs. growth tradeoffs: examples

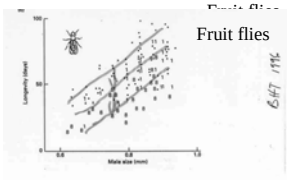
Red deer



Douglas fir



Fruit flies



b. r- vs K-selection

	r-selection	K-selection
A. Disturbance	Common, irregular	Rarer, more regular
B. Mortality	Variable, unpredictable	Constant, predictable
C. Competition	Low or variable	High, constant
D. Pop. size	Variable, below K	Rel. constant, near K
E. Consequence	High r	Good competitors

Small size
Rapid growth
Early reproduction
Many, small offspring
Little parental care

Large size
Slow growth
Late reproduction
Few, large offspring
More parental care

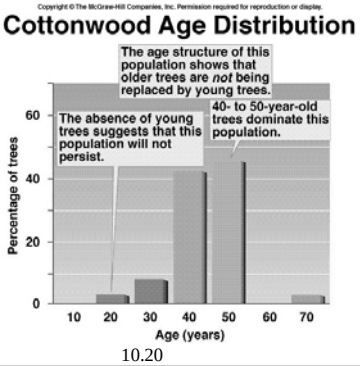
FIGURE 12.19 *Mouse and elephant: r selection versus K selection.*

K vs. r selection: extremes in parental care

Sea urchins

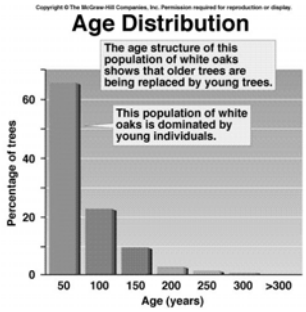
Humpback whales

B. Age distributions help tell if population is growing or shrinking.



10.20

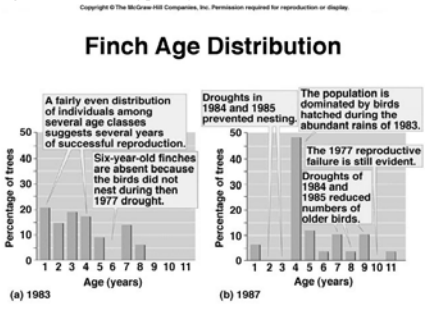
Is this population growing or shrinking?



10.19

Can't tell for sure: depends if age distribution is stable or not

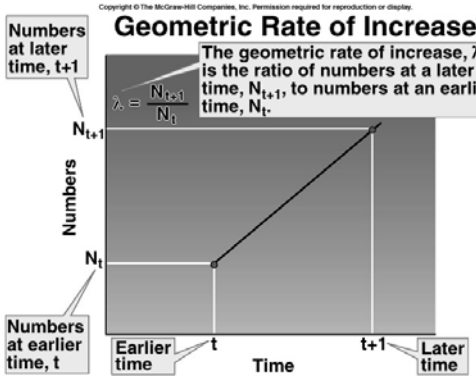
Are age distributions typically stable?



10.21 – Age distributions of large cactus finch, *Geospiza conirostris*, on Genovesa Is., Galapagos

C. Calculating rates of population change

1. Non-overlapping generations



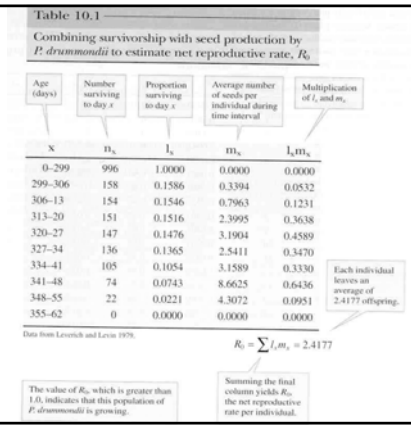


Table 10.1

Combining survivorship with seed production by *P. drummondii* to estimate net reproductive rate, R_0

Age (days) x	Number surviving to day x, n_x	Proportion surviving to day x, l_x	Average number of seeds per individual during time interval, m_x	Multiplication of l_x and m_x, $l_x m_x$
0–299	996	1.0000	0.0000	0.0000
299–306	158	0.1586	0.3394	0.0532
306–13	154	0.1546	0.7963	0.1231
313–20	151	0.1516	2.3995	0.3638
320–27	147	0.1476	3.1904	0.4589
327–34	136	0.1365	2.5411	0.3470
334–41	105	0.1054	3.1589	0.3330
341–48	74	0.0743	8.6625	0.6436
348–55	22	0.0221	4.3072	0.0951
355–62	0	0.0000	0.0000	0.0000

Data from Leverich and Levin 1979.

Each individual leaves an average of 2.4177 offspring.

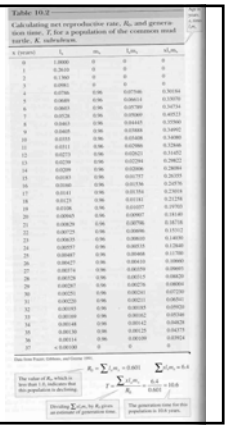
$R_0 = \sum l_x m_x = 2.4177$

The value of R_0, which is greater than 1.0, indicates that this population of *P. drummondii* is growing.

Summing the final column yields R_0, the net reproductive rate per individual.

2. Overlapping generations: life tables

(use board)



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