

Demography:

The study of age-specific patterns of survivorship and reproduction within a population

e.g.



vs.



1. Divide population into age classes (e.g. years)
2. Describe averages for each age class
3. Generate population patterns

Abbreviations

x = age class (e.g. year, month, etc.)

n_x = number of individuals alive at the start of age class x

e_x = “life expectancy” = the average number of age classes yet to be lived by an individual at the start of age class x

l_x = “survivorship” = proportion of individuals surviving from birth to the start of age class x

An Example of a Life Table

Age class	n_x	l_x	e_x
1	1,000	1.00	0.6
2	40	0.04	2.0
3	30	0.03	1.5
4	20	0.02	1.0
5	10	0.01	0.5
6	0	0	

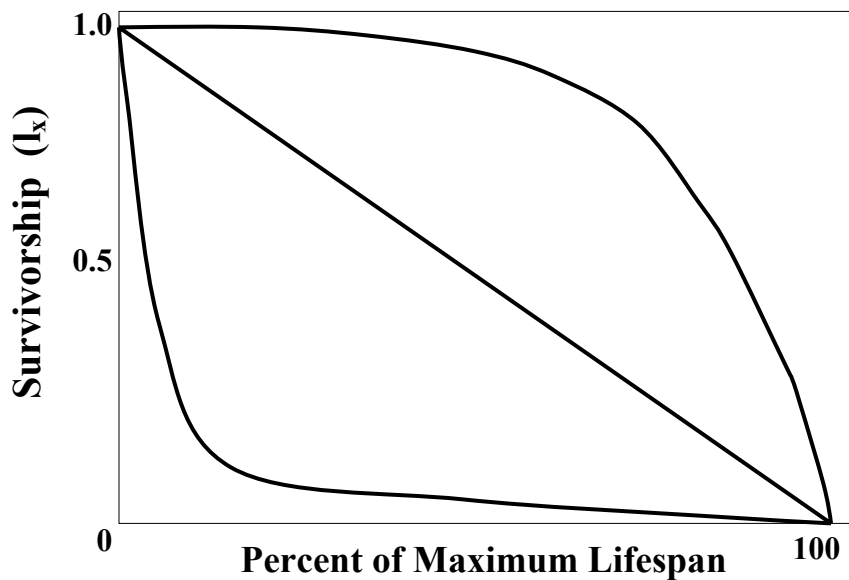
Proportion of newborns surviving to the start of age class 4?

0.02 = 2%

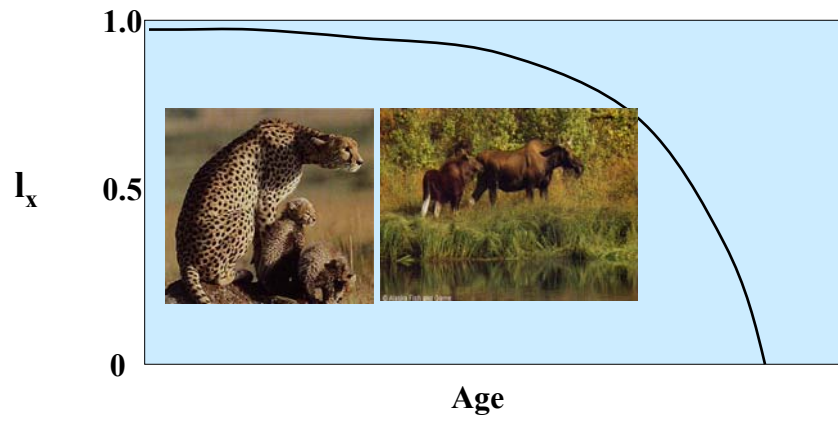
Life expectancy of an individual that has just entered age class 3?

1.5 years

Survivorship Curves

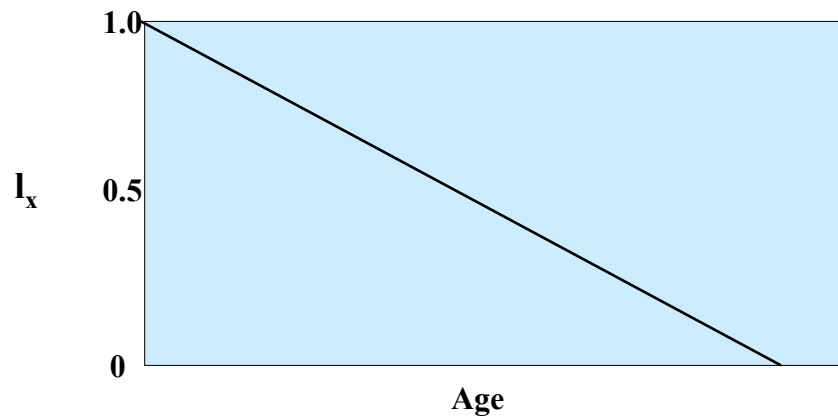


Type I



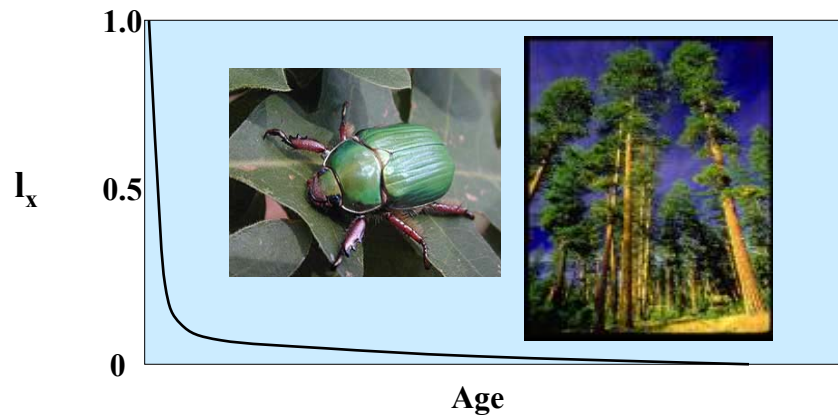
- much parental care
- few, large offspring
- “large mammal curve”

Type II



- rare

Type III



- many small offspring
- no parental care (offspring usually orphans at birth)
- > 99% of species

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What type of survivorship curve?

Type III

Reproduction Abbreviations

m_x = “fecundity” = average number of daughters born during age class x to a female who survived to age class x

$l_x m_x$ = “realized fecundity” = the average number of daughters a newborn female will produce during age class x

- average of survivors and non-survivors

R_0 = “net replacement rate” = average number of daughters produced over a female’s lifetime

$$= \sum l_x m_x$$

- when $R_0 > 1$, pop is growing

A Life and Fecundity Table for White-crowned Sparrows:

x	n _x	l _x	m _x	l _x m _x
1	100	1.00	0.0	0.00
2	17	0.17	3.1	0.53
3	8	0.08	3.3	0.26
4	4	0.04	3.6	0.14
5	0	0		

On average, how many daughters will a female who just entered age class 3 make during age class 3? 3.3

On average, how many daughters will a newborn female make during age class 3? 0.26

A Life and Fecundity Table for White-crowned Sparrows:

x	n_x	l_x	m_x	$l_x m_x$
1	100	1.00	0.0	0.00
2	17	0.17	3.1	0.53
3	8	0.08	3.3	0.26
4	4	0.04	3.6	0.14
5	0	0		$\Sigma = 0.93$

Is this population growing, shrinking, or staying the same size?

$\Sigma l_x m_x = 0.93$, so pop is shrinking

Demography and Life History Strategies

Every life and fecundity table describes a life history strategy

x	n_x	l_x	m_x	$l_x m_x$
1	100	1.00	0.0	0.00
2	17	0.17	3.1	0.53
3	8	0.08	3.3	0.26
4	4	0.04	3.6	0.14
5	0	0		

- we can calculate realized r from this table = - 0.03

- we can compare realized r for two different strategies to determine which natural selection would favor