

### Introduction

Populations are dynamic - they change hourly, daily, seasonally, or annually - and depends on the species and environmental conditions

### Demography

- predicts the growth of a population
  - can protect endangered species
- can be determined by natality, morality, immigration, and emigration

### retrieving data

- done by routine sampling

### analyzing:

- through life tables and survivorship curves

### definitions

### definitions (cont)

#### Sex Ratio

the relative proportion of males and females in a population

### Changes in Population Size

- environmental conditions can increase or decrease population
  - biotic and abiotic factors affect the rates of natality, mortality, immigration, and emigration

#### calculations:

population change = (births + immigration) - (deaths + emigration)

#### analysis:

- if natality and immigration are equal to mortality and emigration → the population's size will remain stable
- when natality and immigration are greater than mortality and emigration → there is population growth
- when mortality and emigration are greater than natality and immigration → population will decrease

### Life Tables

### Life Tables (cont)

#### morality/survivorship calculations:

age-specific mortality = # that died during the interval / # alive at the start of the interval

age-specific survivorship = # still alive at the end of the interval / # alive at the start of the interval

#### survival probability

- the proportion of the cohort that survived at a specific age summarizes the survival probability of a newborn at that age

#### calculations:

probability of being alive at a specific age = # alive at the start of the age interval / # alive at the start of the initial age interval

### Fecundity

## Demography

the study of the growth rate, age structure, and other characteristics of populations

## Natality

the birth rate in a population mortality the death rate in a population

## Immigration

the movement of individuals into a population

## Emigration

the movement of individuals out of a population

## Life table

a chart that summarizes the demographic characteristics of a population

## Cohort

a group of individuals of similar ages

## Age-Specific Mortality

the proportion of individuals that were alive at the start of an age interval but died during the age interval

## Age-Specific Survivorship

the proportion of individuals that were alive at the start of an age interval and survived until the start of the next age interval

## Survivorship Curve

a graphic display of the rate of survival of individuals over the lifespan of a species

## Fecundity

the potential for a species to produce offspring in a lifetime

## Generation Time

the average time between the birth of an organism and the birth of its offspring

- a group of individuals born around the same time are marked

- monitored until they all die

- the lifespans of the individuals are divided into age intervals

### how?

- short life-span: labelled by days, weeks, or months

- long life-span: by years or ranges of years

### mortality and survivorship

- the mortality rate is the number of deaths in a population per unit of time

fecundity varies from species to species

- can increase or decrease depending on:

- environmental conditions

- age structure

- generation time

- sex ratio

### environmental conditions:

- plenty of food and the climate is optimal = species tend to have higher rates of reproduction

- little food and precipitation → reproduction rates drop

### age structure:

describes the relative number of individuals in each age category

- pre-productive: younger than the age of sexual maturity

- reproductive: reproducing age

- post-reproductive: older than the max. age of reproduction

this reflects its recent growth history to predict its future growth



### Fecundity (cont)

#### generation time:

- i.e. E. coli has a short generation time → they mature very quickly and reproduce quicker

- humans have a much longer generation time in comparison to E. coli

#### sex ratio:

# of females have a greater impact because they produce offspring

- a male can mate with several females → does not greatly influence reproduction

- but; some species have lifelong pairs and the # of males matter as much as females

### High Vs. Low Fecundity

#### high fecundity

= an animal that has many offspring

- but does little care for them

- e.x. hawksbill turtle lay as much as 100 eggs, but leave the nest (the offspring fend for themselves at birth)

#### low fecundity

= produces fewer offspring per year

- has more energy to care for them

- can be protective

- e.x. bears stay and teach their cubs how to survive

### Survivorship Curves

they are like life tables; but a graphical representation

- displays the survival of individuals over the lifespan of the species

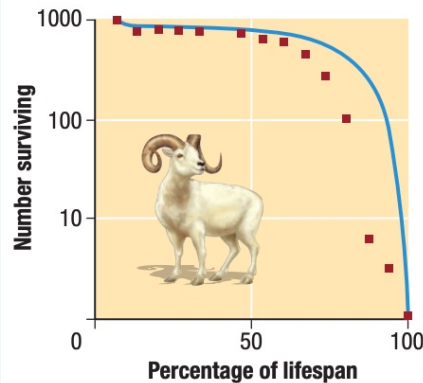
#### types:

- type I

- type II

- type III

### TYPE I CURVE



- flat at the start

- low death rate in the early and middle years

- death rate increases in older age groups

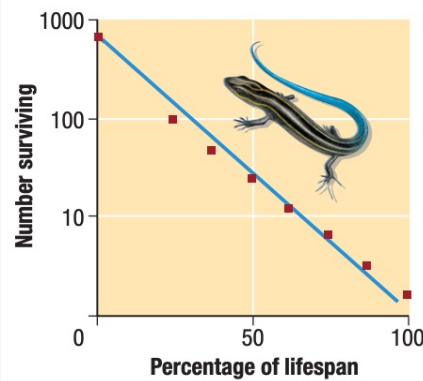
- has a long gestation period

- common in large animals

- produce few offspring and provide their offspring

with a lot of care for a long period of time

### TYPE II CURVE



- constant rate of mortality in all age groups

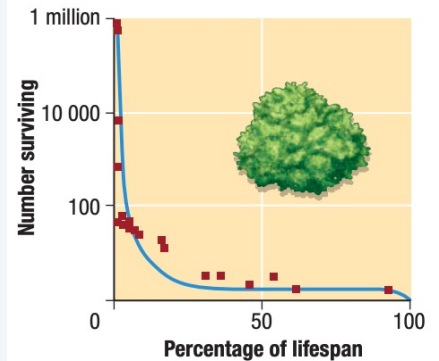
- steady declining survival rate

- preyed by type I organisms

- feed on type III organisms

- has a short gestation period

### TYPE III CURVE



- drops rapidly right at the beginning

- in early life, the death rate is really high and then flattens out later on in the life of the organism IF the organism survives

- organisms that produce a large number of offspring

- like plants, insects, and fish.

### Survivorship Curve Examples

#### Type I example

- humans; when a baby is born, we take great care of them until their young adult years in which they provide for themselves

#### Type II example

- lizard; they constantly face a number of diseases, predation, and starvation not matter their age

#### Type III example

- fish; has a high juvenile mortality (when they are babies - constantly surrounded by predators)