12.2 Demography - SBI4U1 Cheat Sheet

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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

morality 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

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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

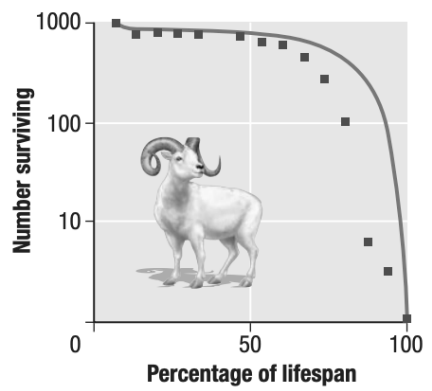
they are like life tables; but a graphical representation

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

types:

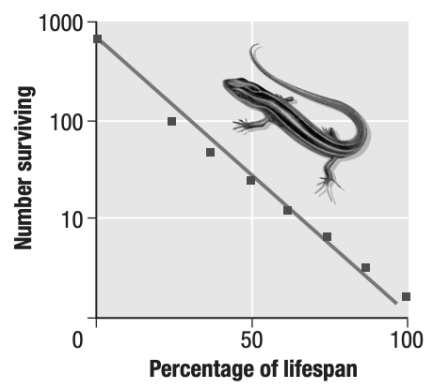
- type I
- type II
- type III

TYPE I CURVE



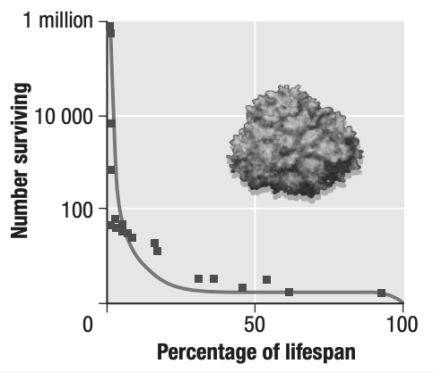
- flat at the start
- low death rate in the early and middle years
- death rate increases in older age groups
- has a long gestation period
- common in large animals
  - produce few offspring and provide their offspring
  with a lot of care for a long period of time

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)