SCIENCE FOUNDATIONS

Population dynamics

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how wildlife managers decide how many deer a forest can support, or how many fish can be caught each year without the stock collapsing. A town that allows too many deer to be hunted one year can find the herd takes years to recover. A fishery that sets its catch limit above what the stock can replace watches the catch shrink year after year. Knowing population dynamics tells you how births, deaths, and food supply balance out, and why taking too much today leaves too little tomorrow.



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Worked examples

EXAMPLE 1

Q A population has 50 births, 30 deaths, 10 immigrants, 5 emigrants. Net change?

SOLUTION

Net change = births + immigration - deaths - emigration

Add gains:

50 + 10 = 60

Add losses:

30 + 5 = 35

Subtract:

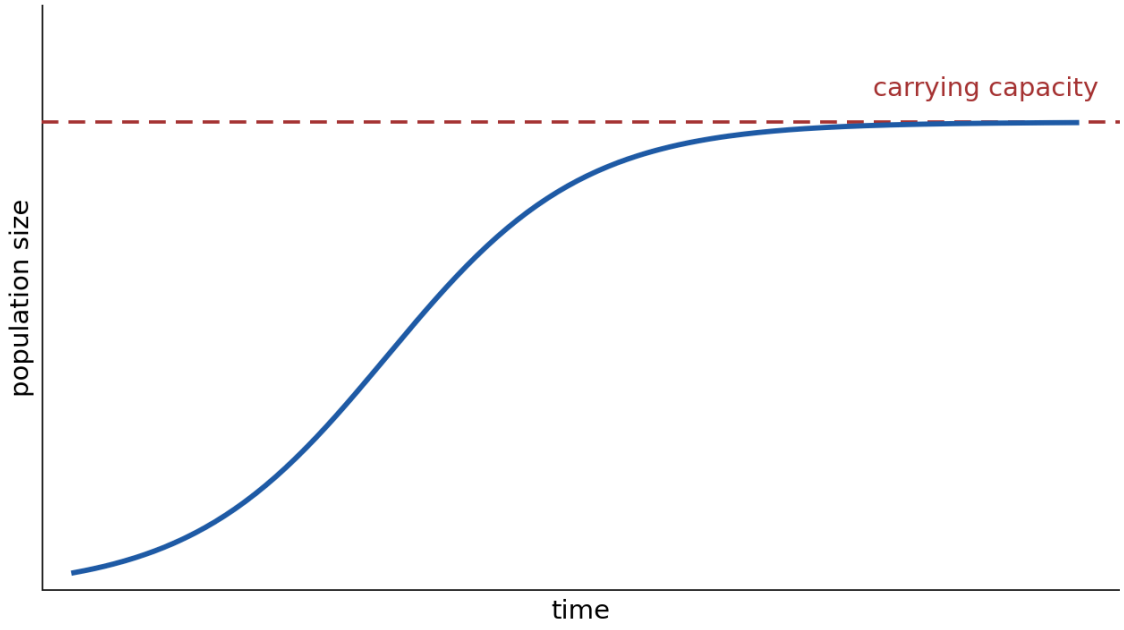
60 - 35 = 25

The result is net change +25.

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EXAMPLE 2

Q What happens as a population nears carrying capacity?



SOLUTION

Recall the limit: food and space run short.

Growth slows as limiting factors bite.

Conclude: the population levels off near carrying capacity.

The result is growth slows and levels off.

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Practice questions

1 **A population has 70 births, 45 deaths, 20 immigrants, and 5 emigrants. What is the net change? Show the gains and losses.**

- **A** Gains 90, losses 50, net change +40
- **B** Gains 90, losses 50, net change +140
- **C** Gains 70, losses 45, net change +25
- **D** Gains 95, losses 45, net change +50

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A population grew by 30 in a year. It had 50 births, 20 deaths, and 10 immigrants. How many emigrants were there?

- A 10 emigrants
- B 20 emigrants
- C 30 emigrants
- D 0 emigrants

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Which change would make a population shrink?

- A Births fall and deaths rise
- B Births rise and deaths fall
- C Immigration rises
- D Emigration falls

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A rabbit population is near the carrying capacity of its meadow. What will happen to its growth, and why?

A. Growth slows and levels off, because food and space run short

B. Growth speeds up, because food and space run short

C. Growth slows and levels off, because births stop completely

D. Growth keeps rising, because the meadow has no limit

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A disease spreads faster when deer are crowded together. Is disease a density-dependent or a density-independent limiting factor?

- A Density-dependent
- B Density-independent
- C Not a limiting factor
- D A birth rate

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What is carrying capacity?

- A The largest population an area can support
- B The smallest population an area can support
- C The number of births in a year
- D The number of animals that leave each year

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Name a limiting factor.

A Food

B The number of births

C The number of immigrants

D The size of the population

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If births exceed deaths, does the population grow or shrink?

A Grow

B Shrink

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9 What is the formula for population change?

- **A** Births plus immigration minus deaths minus emigration
- **B** Births plus deaths minus immigration minus emigration
- **C** Births minus immigration plus deaths plus emigration
- **D** Deaths plus emigration minus births minus immigration

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10 With unlimited resources, what shape does population growth take?

- **A** Rapid (exponential) growth
- **B** Slow, steady growth
- **C** No growth at all
- **D** Growth that falls to zero

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ANSWER KEY

1. Gains 90, losses 50, net change +40

2. 10 emigrants

3. Births fall and deaths rise

4. Growth slows and levels off, because food and space run short

5. Density-dependent

6. The largest population an area can support

7. Food

8. Grow

9. Births plus immigration minus deaths minus emigration

10. Rapid (exponential) growth

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