

Exercise walk-through

Population Ecology ■ 8.3

eXercise

You must be able to

- distinguish **exponential** 指数 from **logistic** 逻辑斯蒂 growth
- explain **carrying capacity** 环境容纳量 K
- read a growth curve

Method — Exponential growth

With unlimited resources, a population grows **exponentially** — a **J-shaped** curve that keeps steepening. Rare in nature except briefly (e.g. new habitat).

Method — Logistic growth

With limited resources, growth **slows** as the population rises, leveling off at the **carrying capacity** K — an **S-shaped** curve.

Method — Carrying capacity

K is the **maximum** population the environment can support long-term. Near K , births deaths and growth stops.

Method — A worked reading

An S-curve that flattens at 500 individuals has a carrying capacity of 500. Growth is fastest in the middle of the curve, not at the top.

Practice 2.1 ■ 1 mark

What shape is an exponential growth curve?

Solution 2.1

Method: Exponential growth

Worked steps

J-shaped **B1**.

Practice 2.2 ■ 1 mark

What does carrying capacity mean?

Solution 2.2

Worked steps

The maximum population the environment can support long-term **B1**.

Practice 2.3 ■ 1 mark

What shape is a logistic growth curve?

Solution 2.3

Method: Logistic growth

Worked steps

S-shaped **B1**.

Exam-style 3.1 ■ 1 mark

Logistic growth levels off at the

- A** origin
- B** carrying capacity
- C** exponential phase
- D** zero point

Solution 3.1

Method: Logistic growth

A origin

B carrying capacity



C exponential phase

D zero point

Worked steps

B — the carrying capacity.

Exam-style 3.2 ■ 1 mark

A population grows and then levels off at 1200 individuals.

- (a) State the carrying capacity.
- (b) Explain why growth slows as the population approaches this value.

Solution 3.2

Method: Logistic growth

Worked steps

(a) 1200 **B1**. (b) As the population grows, resources (food, space) become limited and competition rises, so births fall and deaths rise, slowing growth toward K **M1** **A1**.

Exam-style 3.3 ■ 2 marks

Explain the difference between exponential and logistic growth in terms of resources.

Solution 3.3

Worked steps

Exponential growth assumes unlimited resources, so it keeps accelerating; logistic growth accounts for limited resources, so it slows and levels off at the carrying capacity **M1** **A1**.