

Ecology

AP Biology • Unit 8

AP Biology



Ecology

What we will cover

- 1 Responses to the environment
- 2 Energy flow
- 3 Population growth
- 4 Density factors
- 5 Community ecology
- 6 Biodiversity and disruptions



1 Responses

Ecology
↳ Responses

Responses to the environment

Organisms react to survive and keep **homeostasis** 稳态:

- **innate** 先天的 (built in) vs learned behaviour
- a **tropism** 向性: growth toward a cue (light, gravity)
- **signals** 信号 coordinate a group (the bee dance)

A lizard basks then shades to hold its temperature – behaviour protecting homeostasis.



Tropisms bend growth toward useful cues

2 Energy flow

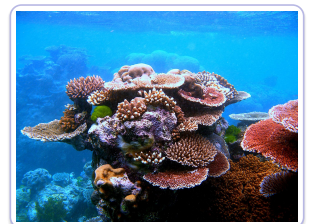
Ecology
↳ Energy flow

Energy flow

Energy enters through **producers** 生产者 and climbs the **trophic levels** 营养级.

- **consumers** 消费者 eat others
- **decomposers** 分解者 recycle nutrients

Only ~10% passes up each level – the **10% rule** – so food chains stay short.



Energy enters at producers; chains stay short

3 Population growth

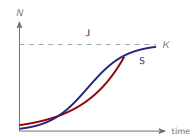
Ecology
└ Population growth

Population growth

Two growth models:

- **exponential** 指数增长: a J-curve,
 $\frac{dN}{dt} = rN$
- **logistic** 逻辑斯谛增长: an S-curve,
slowed by resources

Growth levels off at the **carrying capacity** 承载力 K : $\frac{dN}{dt} = rN \frac{K - N}{K}$.



4 Density

Ecology
└ Density

Density factors

What limits a population splits by whether crowding matters:

- **Density-dependent** 密度制约 – competition, predation, disease
- **Density-independent** 非密度制约 – floods, fire, frost



Crowding intensifies density-dependent limits

Together they make a population rise and fall around K rather than sitting still.

5 Community

Ecology
└ Community

Community ecology

A **community** 群落 is all the species interacting in one area. **Symbiosis** 共生 sorts by who benefits:

- **mutualism** 互利共生: both win (+/+)
- **commensalism** 偏利共生: one wins (+/0)
- **parasitism** 寄生: one harmed (+/-)

A **keystone species** 关键种 (sea otter) holds up the whole community.



Mutualism: both partners gain

6

Biodiversity

Ecology
└ Biodiversity

Biodiversity and disruptions

Biodiversity 生物多样性 makes an ecosystem stronger:

- more **stability** 稳定性 and recovery
- free **ecosystem services** 生态系统服务 (clean water, pollination)

Invasive species 入侵物种, **habitat** 栖息地 loss, and **climate change** 气候变化 ripple far through food webs.



Habitat loss ripples through food webs

7

Recap

Ecology
└ Recap

Unit 8 – key takeaways

1 Energy flow

producers up the trophic levels; only ~10% passes on

2 Growth

J exponential vs S logistic; levels off at K

3 Limits

density-dependent vs independent factors around K

4 Community

symbiosis +/+ , +/- , -/- ; key-stone species; biodiversity

Ecology
└ Recap

Check yourself

- 1 About how much energy passes to the next trophic level?
- 2 Which growth curve is J-shaped?
- 3 Is a drought density-dependent or independent?
- 4 Name the symbiosis where both species benefit.



Answers 1. about 10% 2. exponential 3. density-independent 4. mutualism