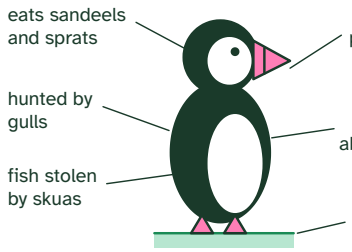
Every species has a *niche*

What to know, what to draw and what to say. Nothing else.

THE ONE IDEA

A niche is how a species lives: what it eats, what eats it and what it can tolerate. No two species can share one.



The Atlantic puffin, *Fratercula arctica*. All of this is its niche; the cliff is only its habitat.

B4.2.1 START HERE

A habitat is an address; a niche is a *job*

- The **ecological niche** of a species is its **role in the ecosystem**: how it lives there, not only where.
- **Biotic** interactions are with other living things: food, predators, competitors, parasites, mutualists.
- **Abiotic** interactions are with physical and chemical conditions: temperature, water, light, oxygen.
- Both affect its **growth, survival and reproduction**, including how it obtains food. The **habitat** is only where it lives.

WHAT GOES INTO A NICHE

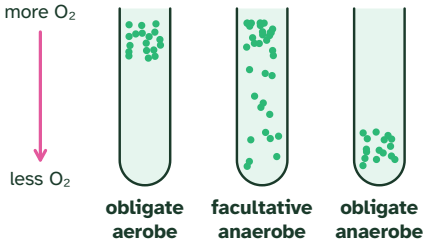
Hungry Ants Raid Insects

H	**Habitat** where it lives	**A**	**Activity** when it is active	**R**	**Resources** food, water, nest sites	**I**	**Interactions** predators, prey, competitors, partners

B4.2.2 TOLERANCE OF OXYGEN

Oxygen: needed, optional or *poison*

- **Obligate aerobes need oxygen**: without aerobic respiration they cannot make enough ATP.
- **Facultative anaerobes grow with or without oxygen**, but faster with it.
- **Obligate anaerobes cannot grow, or die,** where oxygen is present.



Broth open to the air: oxygen falls with depth

B4.2.8 INFER DIET FROM A SKULL

Reading a diet in the *teeth*

- **Nature of science:** a theory from living mammals lets us **deduce the diet of extinct species** from their skulls.
- **Skill:** from a skull, judge the size of the molars, the depth of the jaw and whether there is a crest.
- The cave of *H. floresiensis* holds stone tools and the bones of pygmy elephants.

Herbivore *Paranthropus robustus*
Large, flat, thickly enamelled molars and premolars, a heavy jaw and a **sagittal crest** for big chewing muscles.

Omnivore *Homo sapiens*, *H. floresiensis*
Smaller molars, and varied teeth for biting and grinding. No crest.

B4.2.3 to B4.2.7 AUTOTROPHS, HETEROTROPHS AND BOTH

Five ways to *feed*

	MODE	WHO	HOW IT GETS CARBON COMPOUNDS OR ENERGY	REMEMBER
P	**Photosynthesis** B4.2.3	Plants, algae and several groups of prokaryotes.	**Autotroph:** light energy makes glucose from carbon dioxide and water; oxygen is released.	Cyanobacteria do it **without chloroplasts**.
H	**Holozoic** B4.2.4	**All animals**, as heterotrophs.	Food is **ingested, digested internally**, absorbed and assimilated; the rest is egested.	Order: *I Despise All Algebra Exams*
M	**Mixotrophic** B4.2.5	Some protists: *Euglena*; many ocean plankton.	**Both autotrophic and heterotrophic**: photosynthesises in light; absorbs or ingests food in the dark.	**Facultative** (*Euglena*): either mode alone; **obligate**: both.
S	**Saprotrophic** B4.2.6	Some fungi and bacteria: the **decomposers**.	**Heterotroph: secretes enzymes onto dead matter**, then absorbs the soluble products.	Frees nutrients from dead matter for producers.
A	**Archaea** B4.2.7	One of the **three domains**; metabolically very diverse.	ATP from light, or from oxidising inorganic chemicals or carbon compounds.	Learn the three energy sources; no names needed.

Autotrophs make their own carbon compounds; heterotrophs take them ready-made.

Either the common or the scientific name is accepted.

Adaptations, and why every niche is *unique*

B4.2.9, B4.2.10 PHYSICAL, CHEMICAL AND BEHAVIOURAL

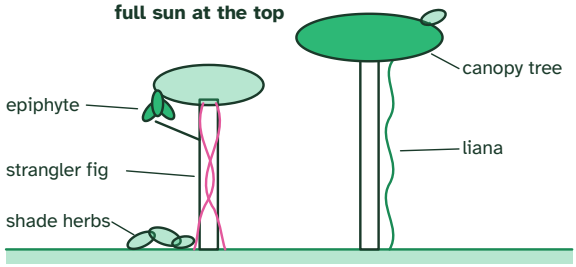
Arms races over food: *defence* and attack

ADAPTATION	PLANT RESISTS	HERBIVORE FEEDS	PREDATOR ATTACKS	PREY RESISTS
P **Physical** a structure	**Thorns** on acacias, spines on cacti, stinging hairs on nettles, silica in grasses.	**Chewing** mandibles in caterpillars; a **piercing** stylet in aphids, into the phloem.	**Pit organs** sense warm prey; a cheetah's long legs reach about 100 km/h.	Porcupine **quills**, armadillo armour, stick insect **camouflage**.
C **Chemical**	**Toxic secondary compounds** in seeds and leaves: nicotine, caffeine.	Some **detoxify** them, as koalas do in the liver; monarchs resist them.	Rattlesnakes kill with **venom**; a pit viper tastes the air to follow a trail.	Poison dart frogs carry **toxins** in their skin, advertised by bright colours.
B **Behavioural**	Plants cannot run away, so they defend where they stand. Each side selects for the other: an **arms race**.		Wolves **hunt in packs**, wearing down and surrounding elk.	Meerkat sentries give **alarm calls**; zebras herd; opossums play dead.

B4.2.11

Racing for the *light*

- In a rainforest, **light is in short supply**: the canopy absorbs nearly all of it, and the floor gets about 1 to 2%.
- **Lianas** climb trees, so need little trunk. **Strangler figs** start as epiphytes, root down and kill their host.

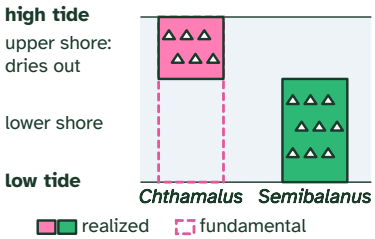


Top to floor: *Can Little Elves Steal Herbs*

B4.2.12

Fundamental and realized niches

- **Fundamental:** the **potential** niche, from **adaptations and tolerance limits**.
- **Realized:** the **actual** niche, when **competing with other species**.
- **Connell, 1961:** with *Semibalanus* scraped off, *Chthamalus* survived right down the shore.



B4.2.13

No two species can share a *niche*

- Species needing one limited resource **compete**.
- With the same niche, one in time removes the other: **competitive exclusion**.
- **So every niche is unique.** Partitioning lets similar species share a habitat.

OUTCOME 1
Elimination
Gause: *Paramecium aurelia* outgrew *P. caudatum*, which died out.

OUTCOME 2
Restriction
Each keeps to part of its fundamental niche, as warblers do in different parts of a spruce.

WATCH OUT

Five mistakes that *cost marks*

- ✕ **A niche is not a habitat.** The habitat is only where it lives.
- ✕ **Saprotrophs do not ingest.** They digest outside the body.
- ✕ **Facultative anaerobes grow best with oxygen:** it gives more ATP.
- ✕ **The realized niche is the smaller one,** cut down by competition.
- ✕ **A liana is not a parasite.** It uses the tree only for support.

COVER THE SHEET

Can you *answer these?*

1. Distinguish a habitat from a niche.
2. Describe where each oxygen group grows in broth.
3. Compare saprotrophic and holozoic nutrition.
4. Deduce the diet of a hominid with a sagittal crest.
5. Outline one plant defence and one prey defence.
6. Explain how a strangler fig reaches the light.
7. Explain how Connell showed a realized niche.
8. State the two possible outcomes of competition.

IN THE EXAM

Say what sets each limit: a tolerance limit, such as drying out, bounds the **fundamental** niche; competition bounds the **realized** one.

GO FURTHER

Animated figures, a dry lab and a marked Check are in the full guide online.