Community Ecology

A specie’s role in the ecosystem is its **niche**.

The place where the species lives, gathers food, and reproduces is its **habitat**.

Most most interspecies relationships center around the struggle for the resources needed to survive and reproduce.

Interspecies relationships can be **adversarial, beneficial, or neutral**.

Robber fly preys on a bee.

With the exception of **scavengers and detritivores**, all animals are adapted to **consume another living organism**. Consequently, many animals and plants employ strategies and adaptations to minimize being eaten by their adversaries. These include:

- camouflage
- physical barriers
- toxins
- warning colors on some toxic species.
- mimicry of warning colors found on toxic species.
- speed

Scavenger

Detritivores

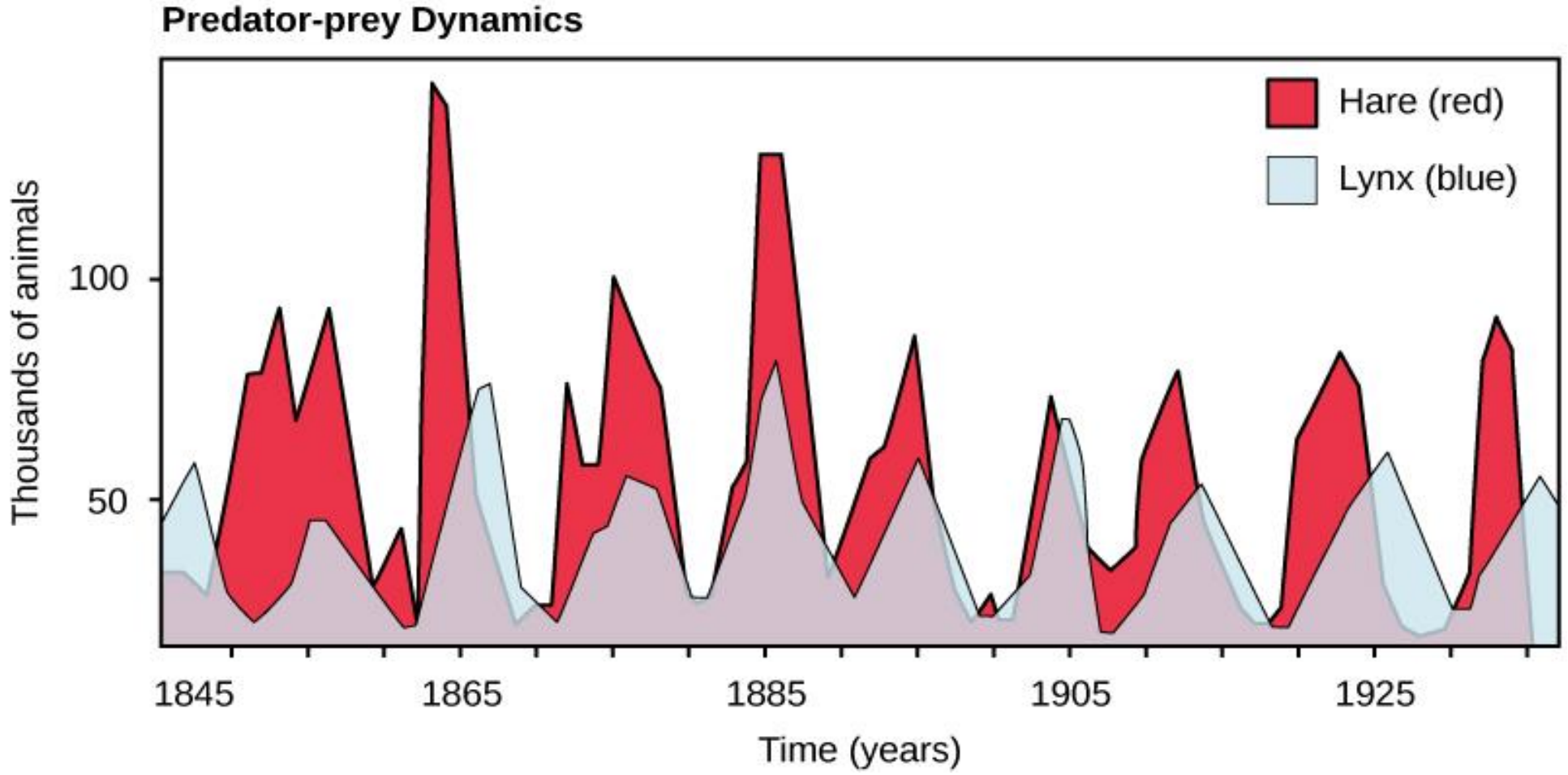
Puffer Fish

Tobacco

Dart Frog

Monarch & Viceroy

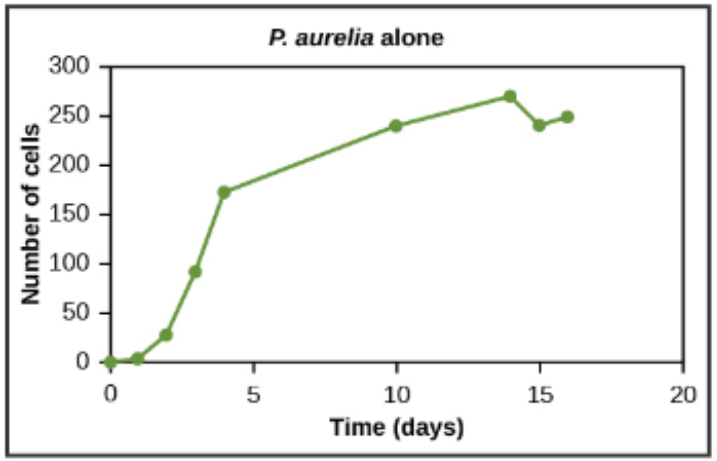
Predator-prey relationships are **adversarial for the prey**, but they prevent population explosions that might otherwise result in habitat destruction and mass starvation.



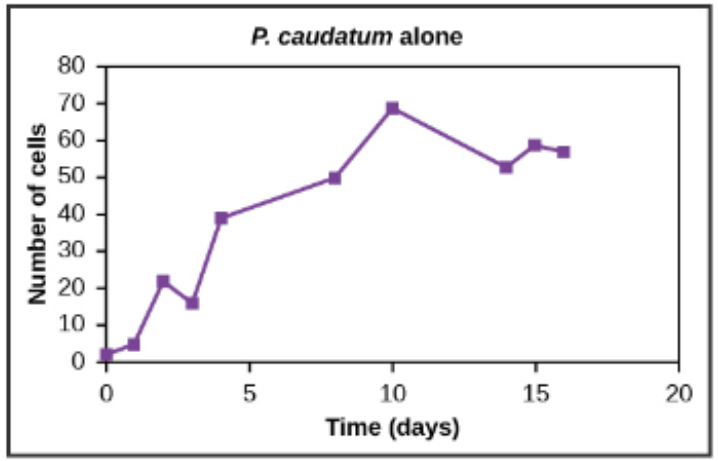
Graph from “Environmental Issues” by Andrew Frank https://pressbooks.bccampus.ca/environmentalissues/front-matter/introduction/

Competition for limited resources is an adversarial relationship for both sides, and according to the **competitive exclusion principle** only two outcomes are possible when two species occupy the same niche:

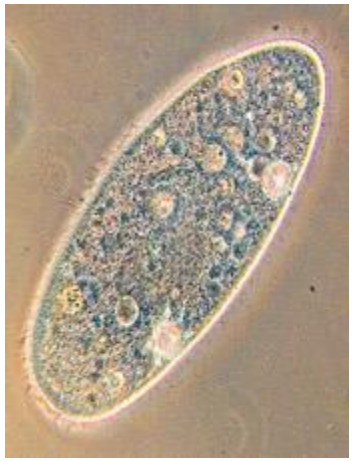
- One species is eliminated.
- Both species adapt through the strategy of **resource partitioning**.

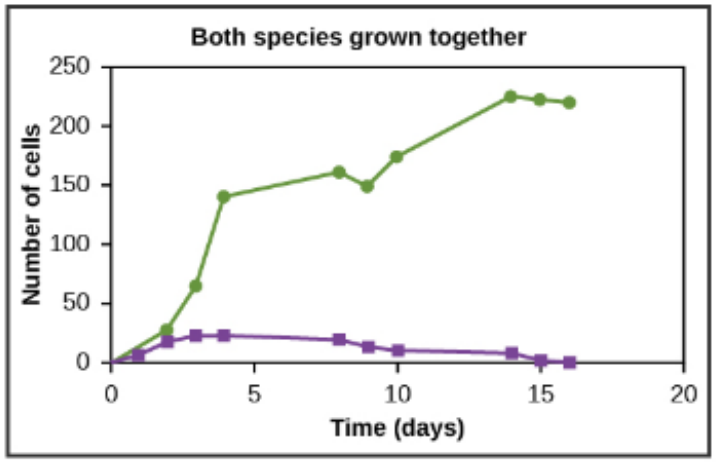


(a)



(b)





(c)

In the example on the left, two species of barnacle co-exist by occupying different levels of the shoreline.

Graphs from “Environmental Issues” by Andrew Frank https://pressbooks.bccampus.ca/environmentalissues/front-matter/introduction/

In **mutualism both sides benefit**. This is the opposite of competition.

When a pollinating animal visits different flowers, the pollinator is provided with a nectar reward for helping the plant reproduce.

Cleaning services from small birds and fish provide food for the service provider and relief from parasites for the crocodile and the dragon wrasse.

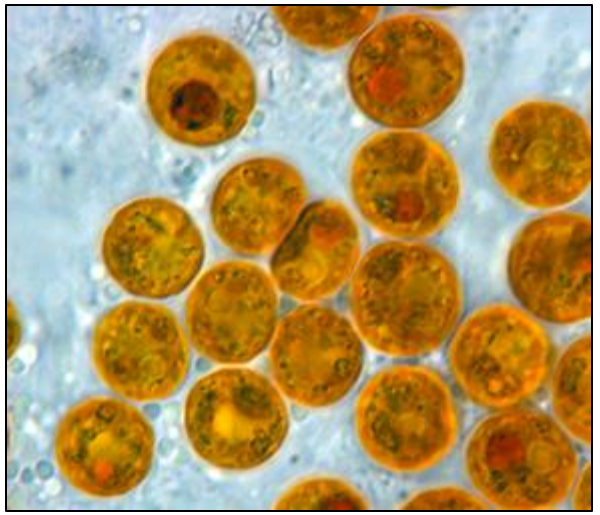
Symbiosis is a close relationship between two species. This term is often mistakenly confused with mutualism, but this is inaccurate because **symbiotic relationships can also be adversarial**:

In **parasitism**, the parasite benefits at the expense of the host. The hookworm for example, lives in the intestine and consumes nutrients provided by the host.

In **commensalism**, the occupant benefits with no evidence of harm or benefit to the host. Epiphytes are plants that grow on trunks and branches of trees to get access to more sunlight.

In **mutualistic symbiosis** both sides benefit. Zooxanthellae is a species of algae that live in the tissues of coral polyps. The polyp provides a secure environment for the algae and products of photosynthesis from the algae feed the polyp.



Not all niches are equal: Some species play a pivotal role in providing the habit or maintaining biodiversity.

Foundation species like oysters and corals “create” the habitat for the entire community.

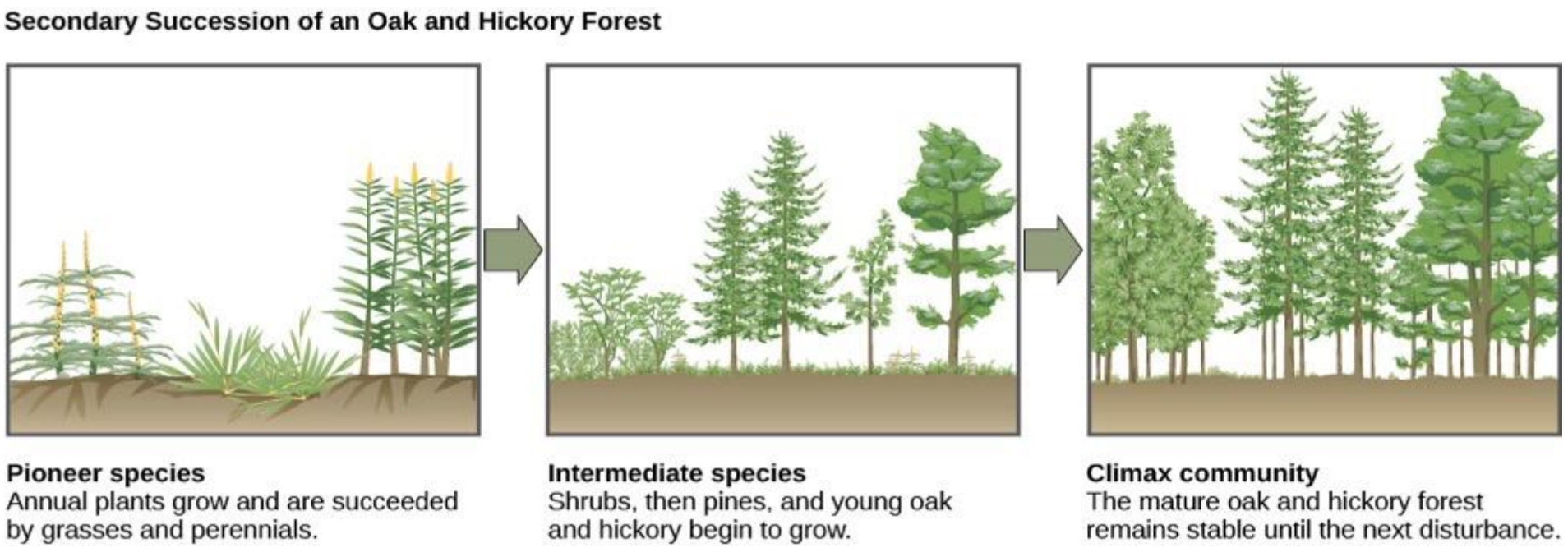
Keystone species maintain biodiversity by keeping certain populations in check:

- **African elephants** prevent trees from overtaking the grasslands that support the grazing community by preferentially grazing on woody plants. For this role they are also referred to as “ecosystem engineers.”
- **Sea otters** prey on sea urchins, which in turn, graze on kelp. This prevents sea urchins from overgrazing kelp forests which are the foundation for a diverse community of fish and invertebrates that rely on kelp for both food and shelter.

Disruptive events such as forest fires destroy the entire standing crop of vegetation, but they leave behind nutrient-rich soil due to the release of minerals that were previously locked up in the biomass.

Fast-growing grasses and weeds soon cover the landscape and protect the soil from erosion. This meadow of **pioneer species** is then replaced by a series of increasingly larger plants until the original **climax community** is restored.

This overall process is referred to as "**secondary succession**."

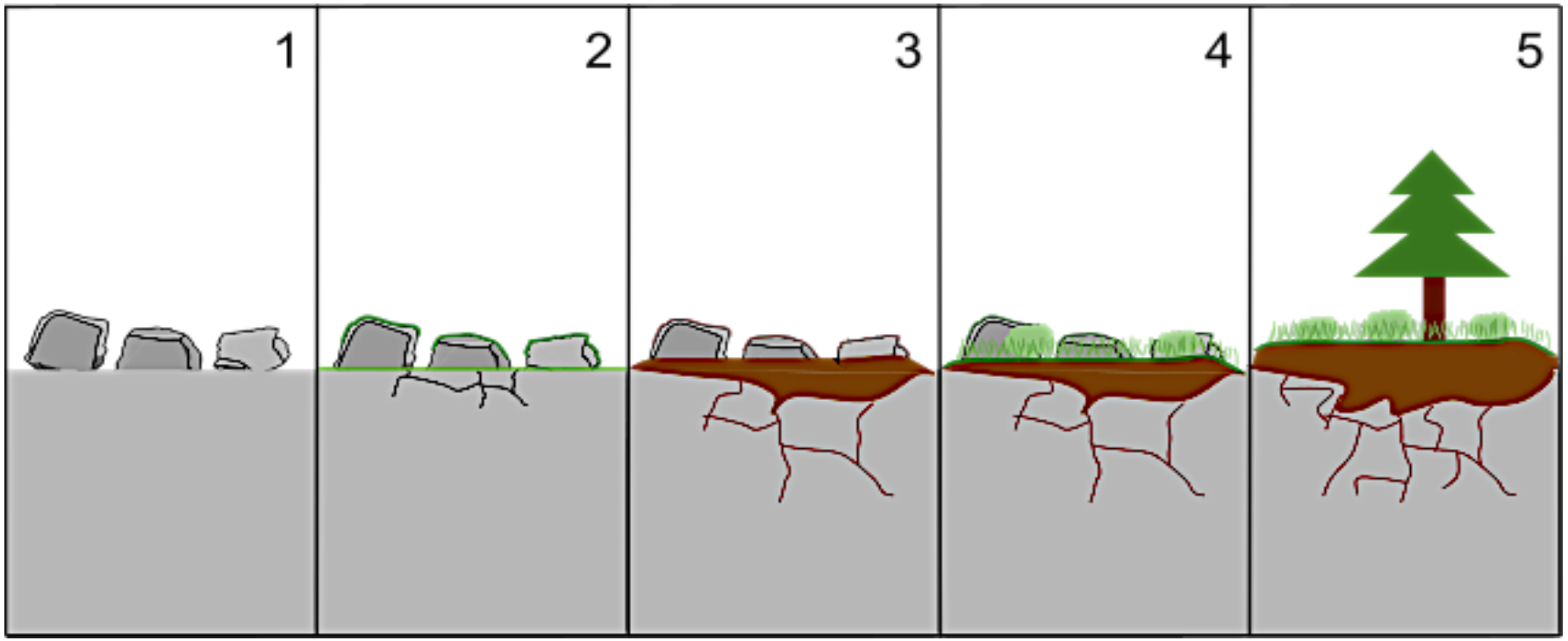


Succession image from "Environmental Issues" by Andrew Frank https://pressbooks.bccampus.ca/environmentalissues/front-matter/introduction/

“**Primary succession**” is much more prolonged because the starting material is bare rock. Consequently, new soil needs to be generated by means of weathering.

This process typically occurs following some form of extreme **geological upheaval** such as a major earthquake or volcanic eruption.

Lichens are the **pioneer species in primary succession** because they are capable of thriving on bare rock. Lichens can do this because of they consist of **fungi and algae** living in a **mutualistic relationship** where the algae provides food and the fungi provides protection.



Acknowledgement:

Unless otherwise indicated, all images in this presentation were downloaded from **Wikimedia Commons**: https://commons.wikimedia.org/wiki/Main_Page