$$\frac{dN}{dt} = rN - aNP$$

$$\frac{dP}{dt} = baNP - mP$$

$$\emptyset = rN - aNP$$

$$rN = aNP$$

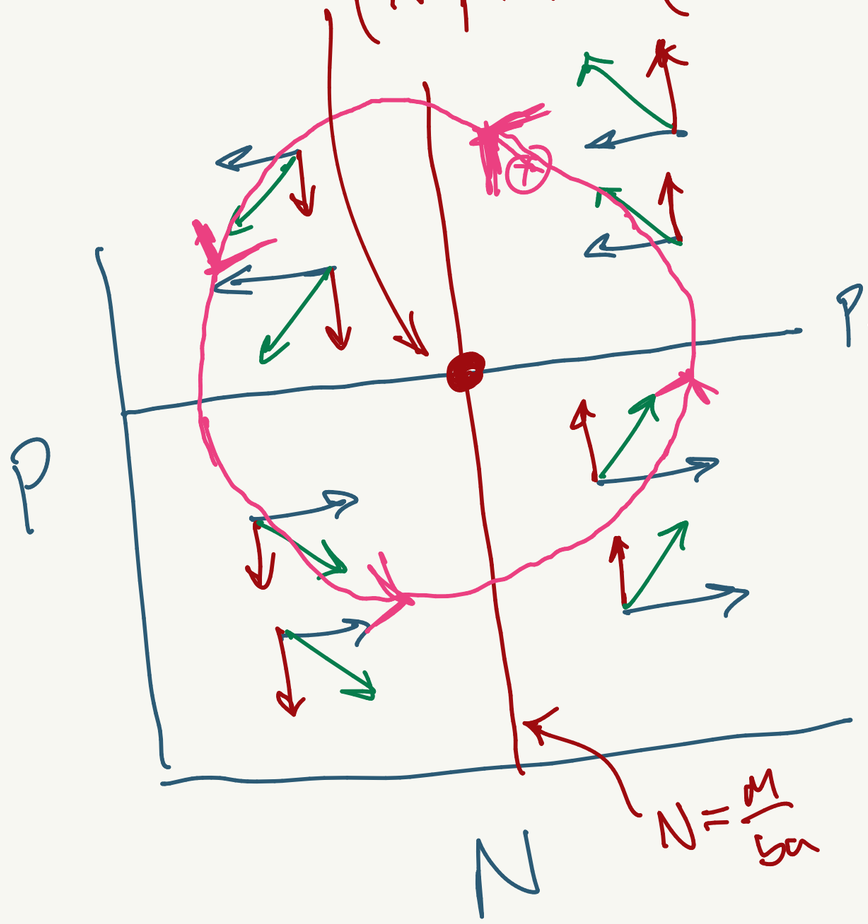
$$P = \frac{r}{a}$$ Prey Isocline

$$baNP - mP = \emptyset$$

$$baNP = mP$$

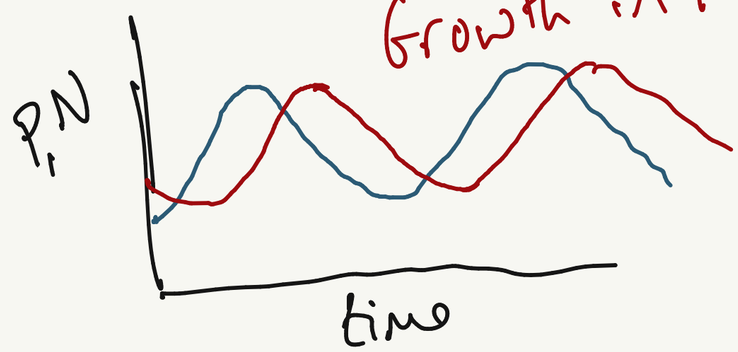
$$N = \frac{m}{ba}$$ $b \sim \emptyset.1$

$(N^*, P^*) = \left(\frac{m}{ba}, \frac{r}{a}\right)$



Growth in N $(\rightarrow)$ $\frac{dN}{dt} > \emptyset$

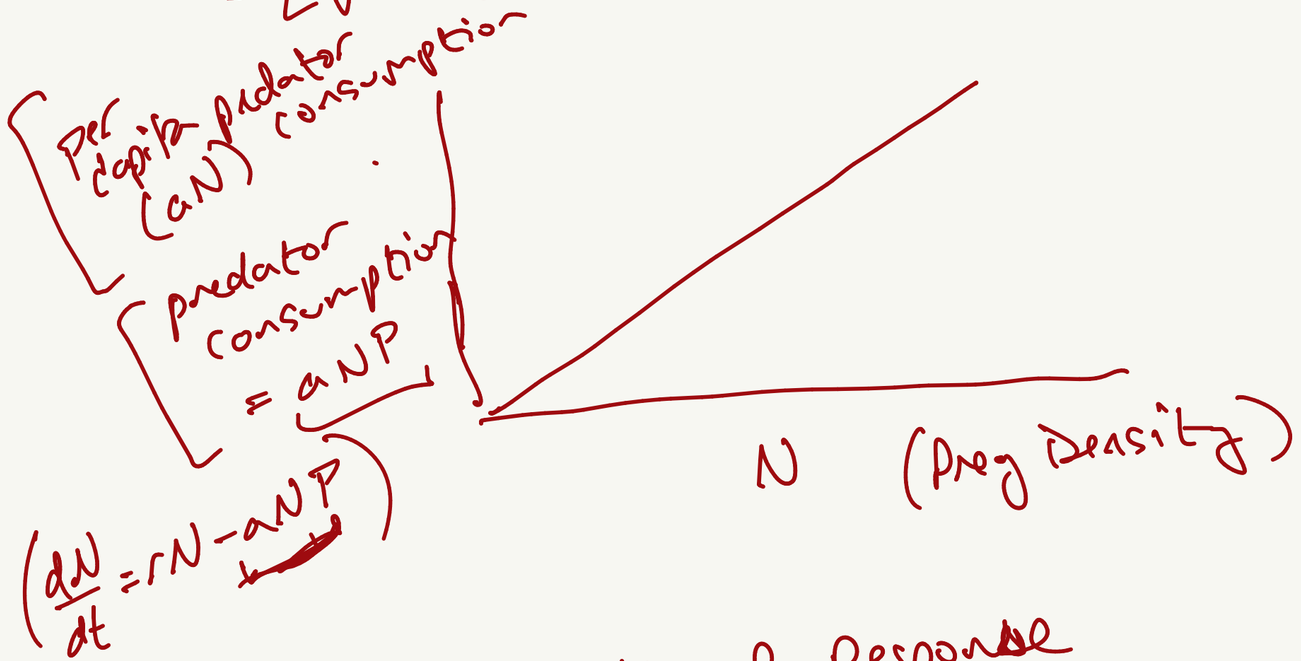
Growth in P $(\uparrow)$ $\frac{dP}{dt} > \emptyset$



Predator prey cycles

The Functional Response

- LV assumes a Type I Functional Response

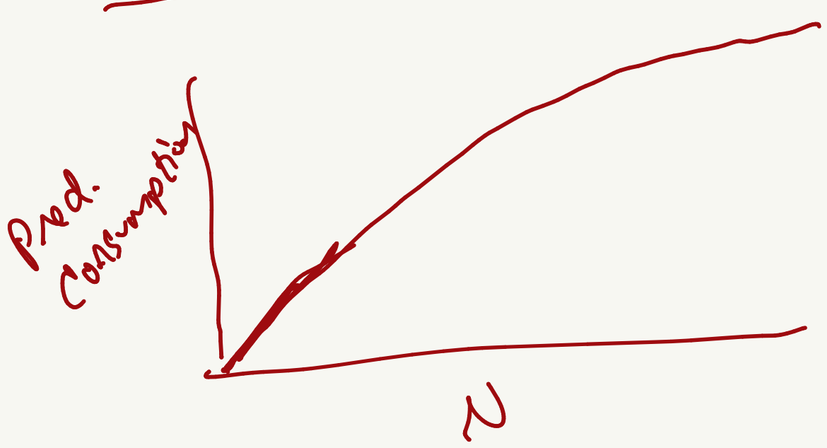


- Unrealistic for 2 reasons

1) Predators become satiated and stop feeding

2) Predators are limited by handling time: the time required to capture and consume prey

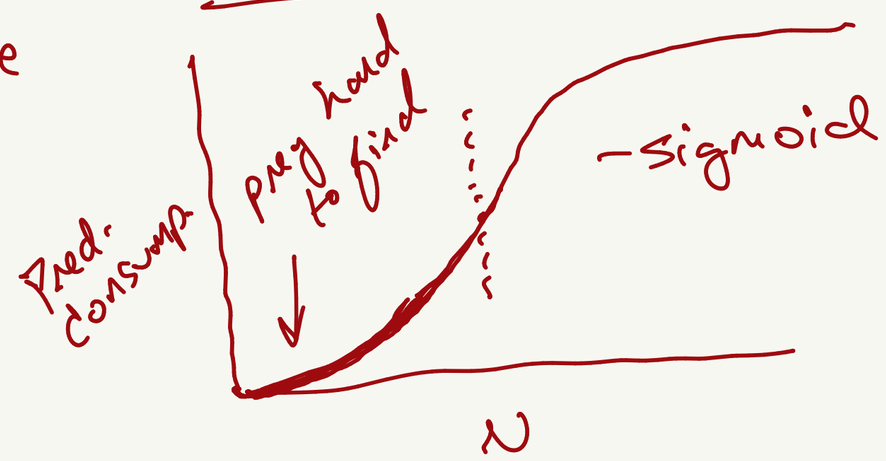
Type II Functional Response



Saturating Functional Response

- Consumption rate hits a plateau

Type III Functional Response



Parasites & the dynamics of disease

Parasitism is a trophic interaction where the consumer lives on its resource = symbiosis $\begin{cases} (+,-) & \underline{\text{parasites}} \\ (+,+) & \text{mutualists} \end{cases}$

- Generally does not kill the host
- Live on its host for all or part of its life cycle

Parasitoides → larvae that feed on a host, almost always killing it

Horizontal transmission: from one host to another within a generation
(within species)
(between species)

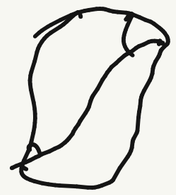
Vertical transmission: transmission from parent to offspring
(btw. individuals across generations)

Toxoplasmosis, Zika, HIV

Parasites must have adaptations to circumvent host defenses

Ectoparasites: live on surface of hosts
- aphids can pierce the protective coating of host plants
- similar to issues faced by herbivores/predators
- More exposed to predators/parasites/parasitoids

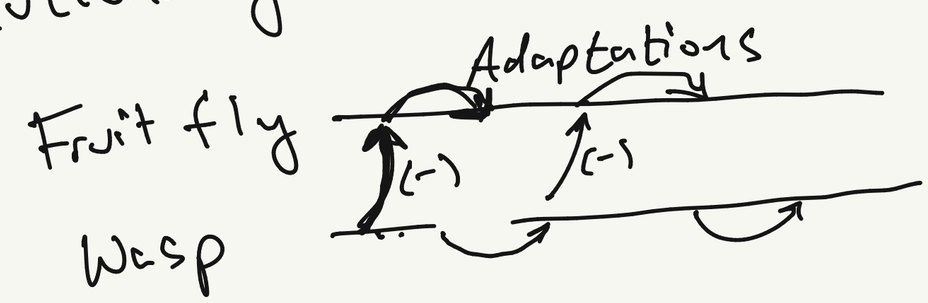
Endoparasites: Live inside hosts, often within the alimentary canal
- Must circumvent the immune system
- Encapsulation → host's I.S. covers the parasite with capsules



Fruit flies have lamellocytes that encapsulate wasp eggs

Wasps can inject virus-like particles into the host that infect and disable lamellocytes
- other wasps will lay eggs in filaments that bury themselves in the fat cells of the fly

Coevolutionary Arms Race



Rabbit Invasion in Australia

1859 24 rabbits → Australia → by 1900s 10^7 rabbits → 1950 myxoma virus → 99.8% mortality rate → virus-resistant rabbits

Host regulate biochemistry to prevent parasitic growth

- Bacterial/fungal endoparasites require Fe
- Vertebrate hosts remove Fe from blood w/ Transferrin proteins
  - ↳ Stores Fe in intracellular compartments

- Some plants have wide variety of secondary compounds to battle parasite

- Some non-plant hosts will consume the plants to combate their own parasites

Chimp — consume bitter plants
↑(-)
nematodes

||

Wooly-bear Caterpillars — consume Hemlock
↑
parasites

- Malaria caused by Plasmodium falciparum