<div style="text-align:center">**Mathematical Ecology (Two Species)**</div>

Review of mathematical ecology with single species.

- Population

- Change in population

- $\dfrac{d}{dt}P(t) = rP(t)(K - P(t))$

Populations where $\frac{d}{dt}P(t) = 0$ are called

Now suppose we want to model two species, for example

Let $S(t)$ denote

Let $W(t)$ denote

Assuming seals have an endless supply of food, what would cause its population to change?

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What causes the orca population to change?

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Model 1:

Model 2:

Model 3:

Recall that fixed point in the single species models occur at populations $P(t)$ where $\frac{d}{dt}P(t) = 0$, meaning the population doesn't change. Therefore, two-species fixed points occur at values of $S(t)$ and $W(t)$ where neither population changes.

Therefore, we seek populations $S(t)$ and $W(t)$ such that

Consider the Orcas and Seals model

$$\frac{d}{dt}S(t) =$$
$$\frac{d}{dt}W(t) =$$

When is $\frac{d}{dt}S(t) = 0$?

When is $\frac{d}{dt}W(t) = 0$?