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1.6.1 Summary Quiz: A General Predator-Prey Phase Plane

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Question 1

1/1 point (graded)

Let's look at the general predator prey system with constants ${f a,b,c,d}>0$ and

$$rac{dS}{dt} = \mathbf{a}S - \mathbf{b}SM$$

$$rac{dM}{dt} = -\mathbf{c}M + \mathbf{d}SM$$

There are two nullclines on which $\frac{dM}{dt}=0$. One of these is the line M=0. What is the equation of the other line?

- S=0
- \circ $S = \frac{\mathbf{a}}{\mathbf{b}}$
- $S = \frac{\mathbf{c}}{\mathbf{d}} \checkmark$
- $M = \frac{\mathbf{a}}{\mathbf{b}}$
- $M = \frac{\mathbf{c}}{\mathbf{d}}$
- None of the above.

Explanation

Factoring $rac{dM}{dt}$ we get $rac{dM}{dt}=0$ if M=0 or $(-\mathbf{c}+\mathbf{d}S)=0$. Thus the other nullcline equation is $S = \frac{\mathbf{c}}{\mathbf{d}}$.

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You have used 1 of 3 attempts

1 Answers are displayed within the problem

Question 2

1/1 point (graded)

Let's look at the general predator prey system with constants a,b,c,d>0 and

$$rac{dS}{dt} = \mathbf{a}S - \mathbf{b}SM$$

$$rac{dM}{dt} = -\mathbf{c}M + \mathbf{d}SM$$

There is one equilibrium point at (0,0) (meaning no sardines and no marlin). There is one other equilibrium point. What is it?

- $(\mathbf{c}/\mathbf{d},0)$
- \bigcirc $(0, (\mathbf{a}/\mathbf{b})$
- \bigcirc (a/b, c/d)
- None of the above.

Explanation

The other equilibrium point is $(\mathbf{c}/\mathbf{d}, \mathbf{a}/\mathbf{b})$. We can solve for these by finding where $\frac{dS}{dt}$ and $rac{dM}{dt}$ are both zero. This the same as finding the points at which the nullclines for Sintersect the nullclines for M.)

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You have used 2 of 3 attempts

1 Answers are displayed within the problem

Question 3

1/1 point (graded)

The nullcline you found above is separated into two parts by a nullcline on which $\frac{dS}{dt} = 0$. On the part of the $rac{dM}{dt}$ nullcline closest to the $m{S}$ axis, how is the value of $m{S}$ changing with time? (Hint: Think about values of M very close to 0.)

- ullet is increasing. \checkmark
- lacksquare S is constant.
- lacksquare is decreasing.

Explanation

S is increasing, and if Mpprox 0, then $rac{dS}{dt}pprox {f a}S$ so the population of sardine would be increasing almost exponentially.

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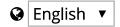
You have used 1 of 1 attempt

1 Answers are displayed within the problem

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