Extinction Transitions in a Seascape Population Model

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The Fisher Equation

$$\dot{y} = \mu y - a y^2 + D(\bar{y} - y)$$

- μ sets growth rate
- a sets saturation population.
- $D(\bar{y} - y)$ is mean-field diffusion.

Implementing noise

$$\dot{y} = \mu y - a y^2 + D(\bar{y} - y) + \boxed{\sigma y \eta}$$

- $y\eta$ is **seascape noise**
- Represents randomness in fitness values

Large fluctuations near extinction

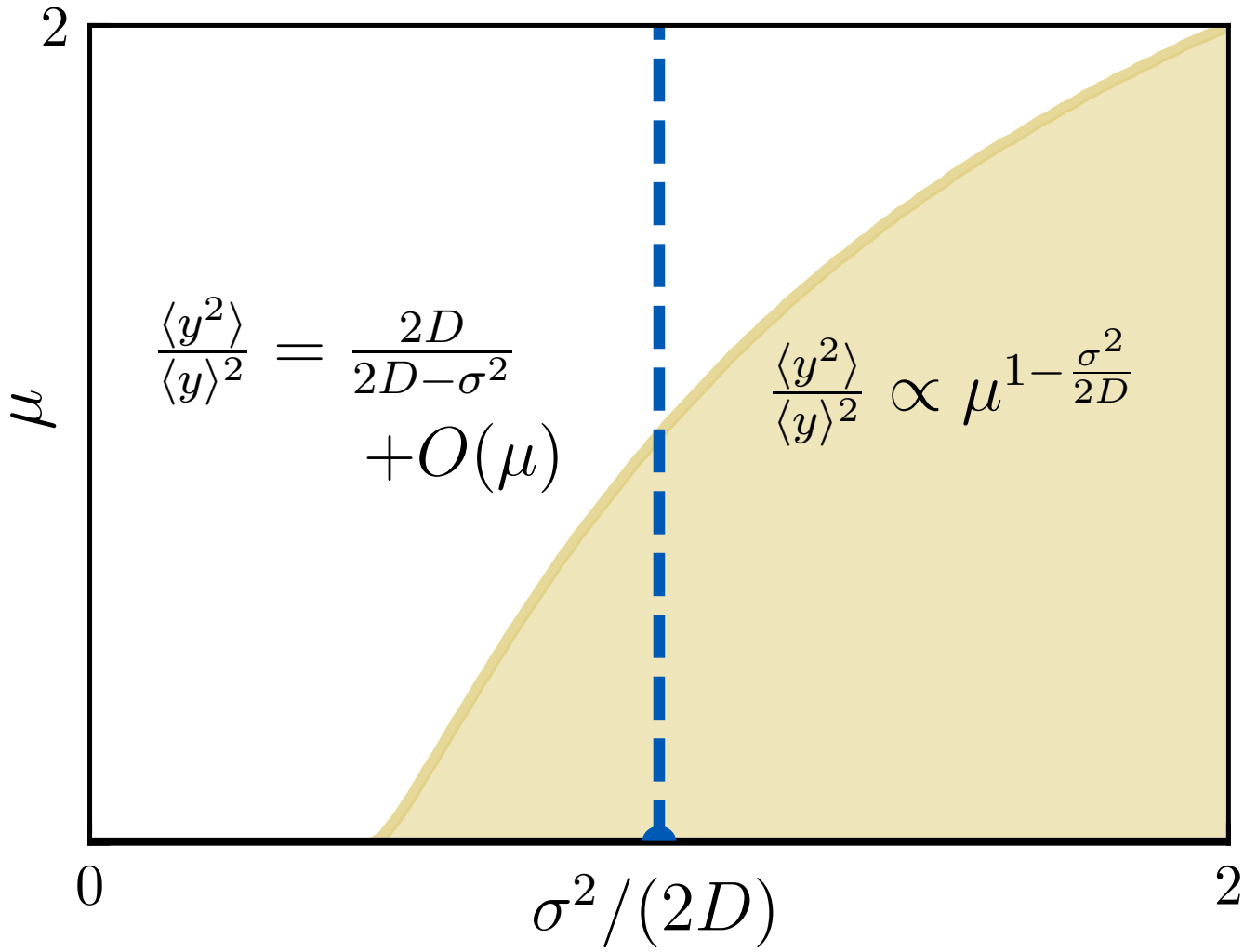

Figure: Yellow shows when the ratio is > 2.

Implementing noise

$$\dot{y} = \mu y - a y^2 + D(\bar{y} - y) + \boxed{\sigma \sqrt{y} \eta}$$

- $\sqrt{y}\eta$ is **demographic noise**
- Representation of finite-size errors

Large fluctuations guaranteed

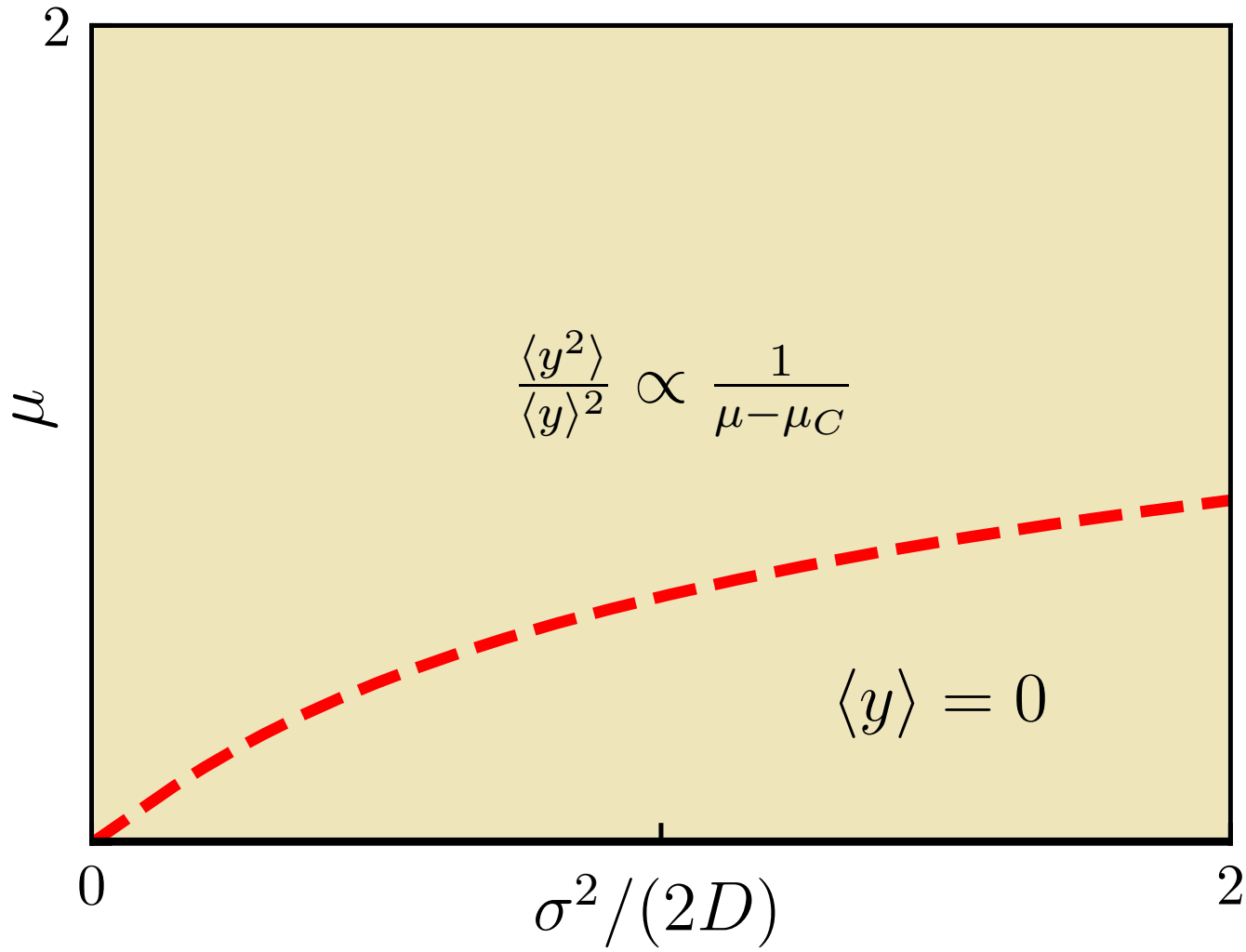

Figure: Yellow shows when the ratio is > 2.

The main point:

Seascape noise alone is a special case.