



The sea urchin *Paracentrotus lividus* can see

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Tracks of each sea urchin in relation to the visual stimulus.

Fifty individuals tracked at six angular widths.

Track heading found from path of animal near centre in relation to stimulus.

Success scored on whether heading within 72° sector centred on stimulus.

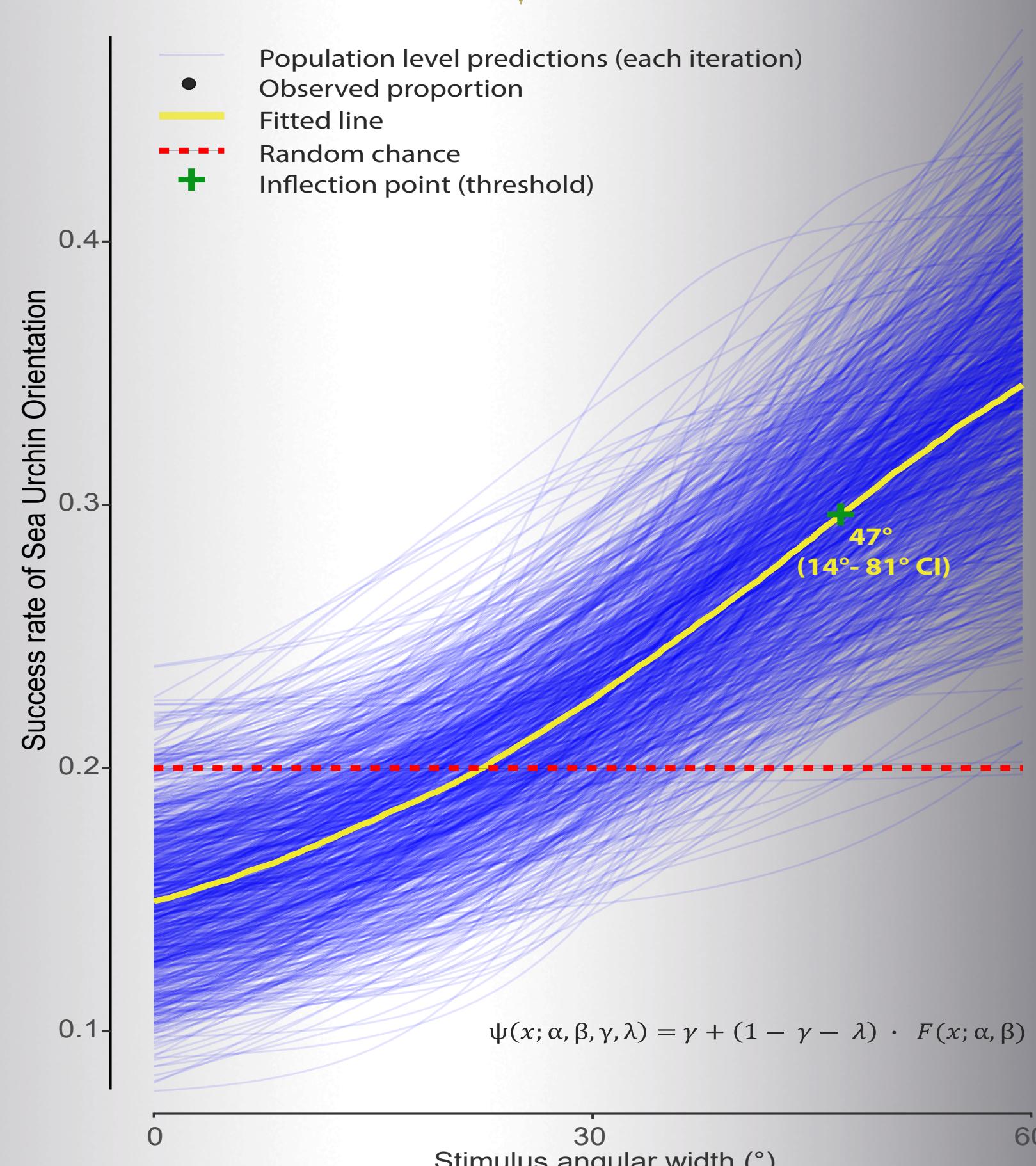
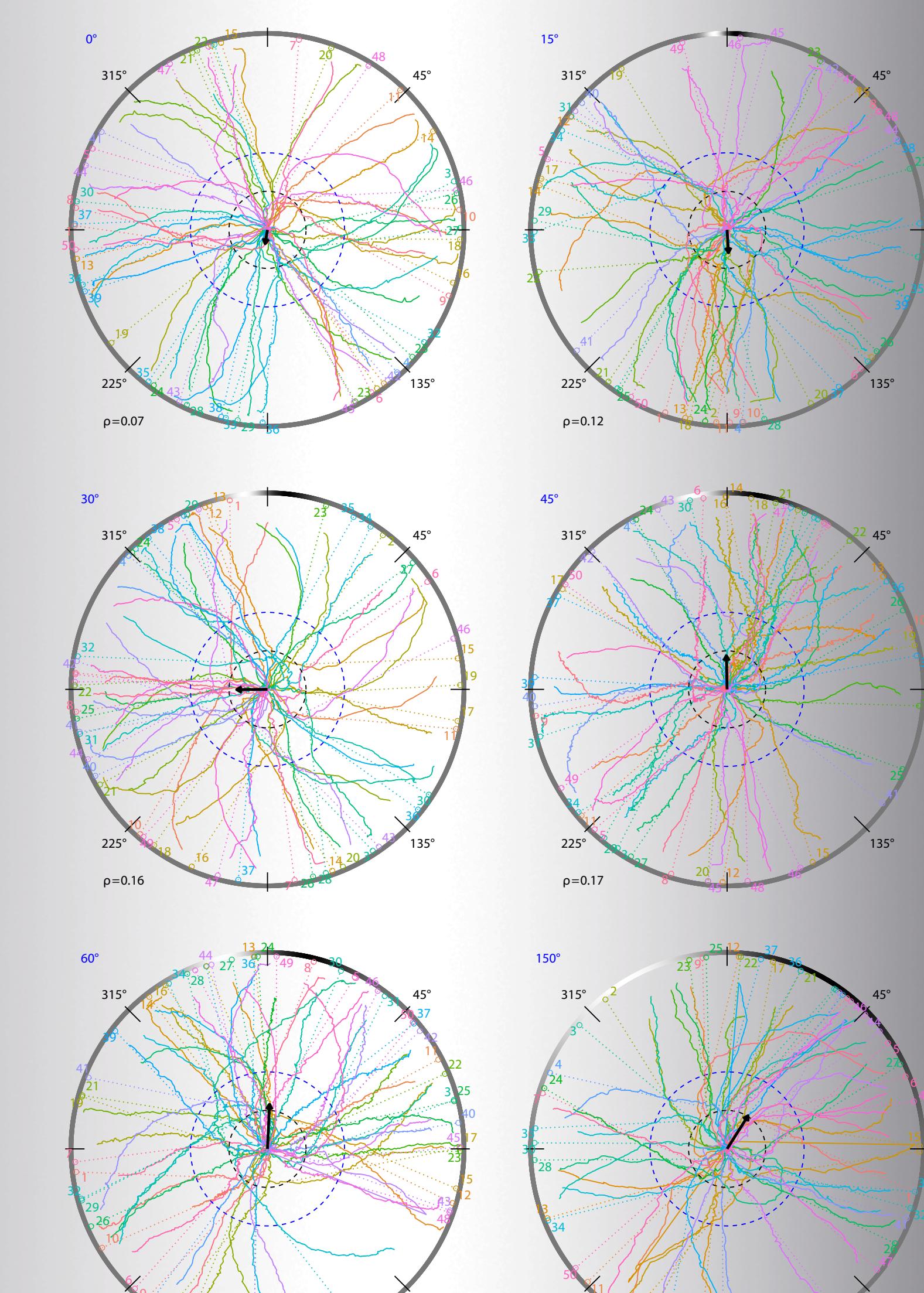
Orientation observed towards wide but not narrow stimuli.

Bayesian nonlinear logistic regression using Stan.

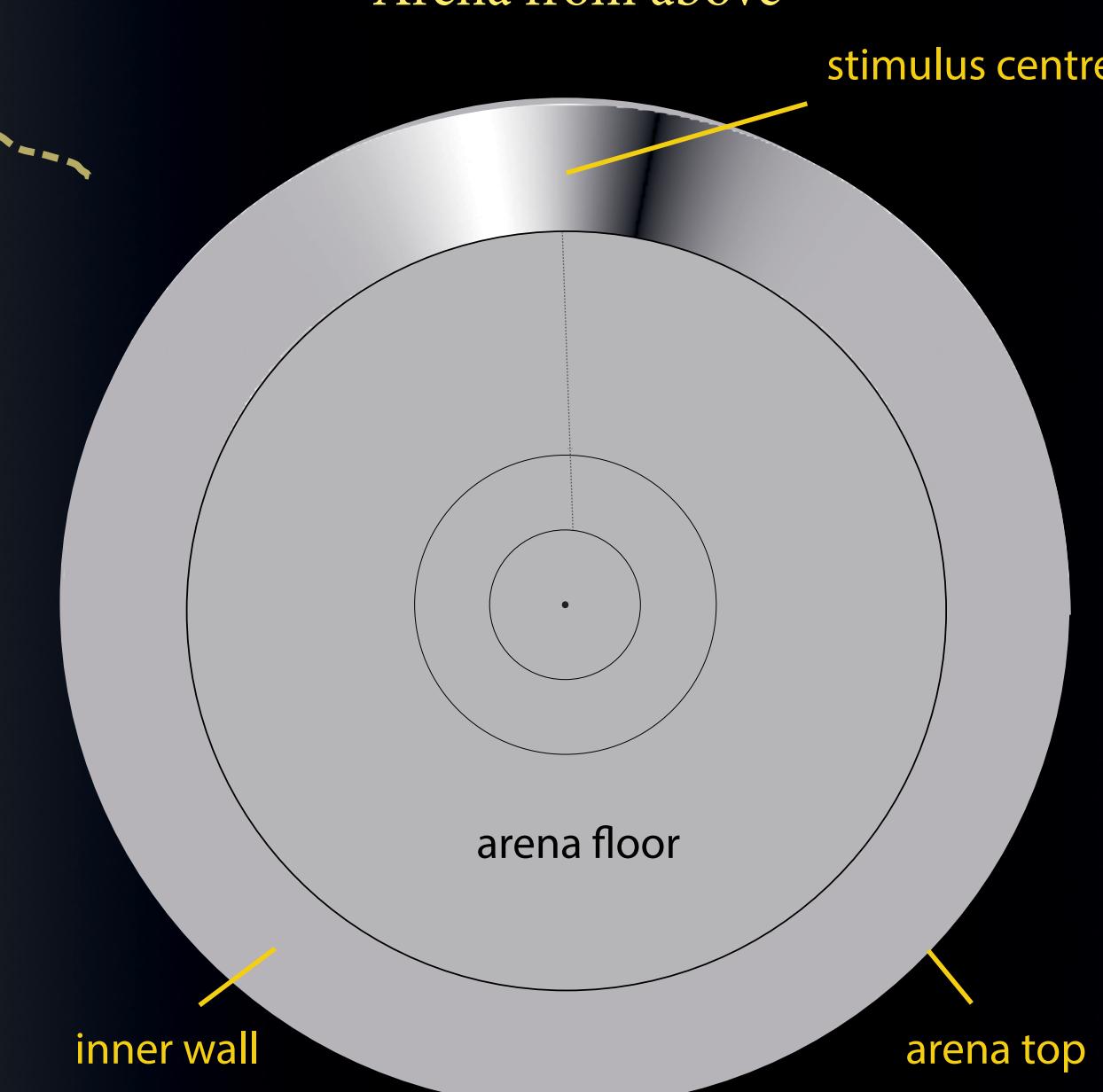
Applies psychometric function to find the visual resolution threshold.

Four chains, 5000 sampled iterations. Effect of individual as random intercept.

Exhibit coarse spatial resolution (47°), suitable for low acuity tasks, such as seeking shelter.



Arena from above

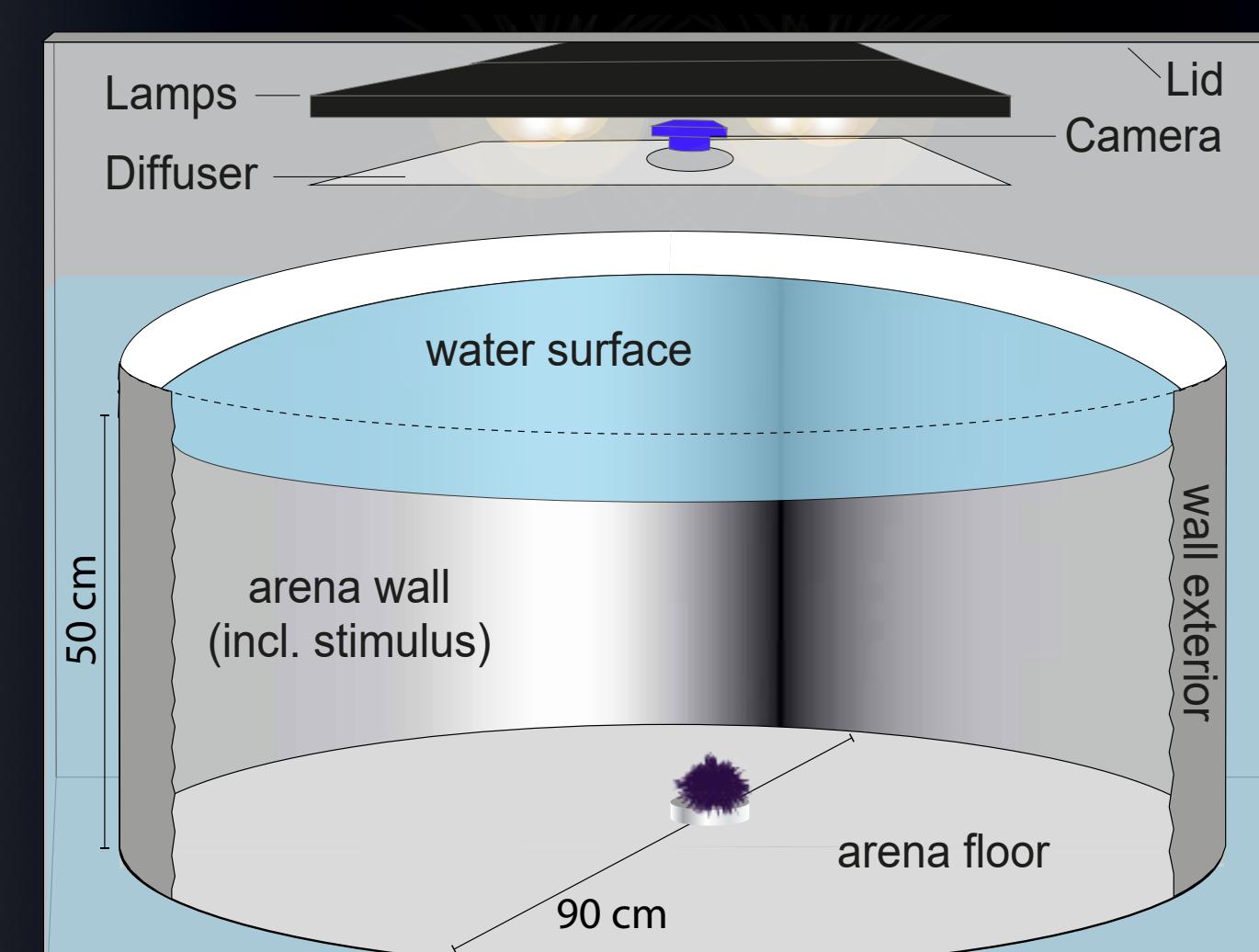


Quantify visual acuity (spatial resolution) via behavioural responses to visual stimuli.

Many invertebrates seek shelter from bright light.

Measure how they perceive and respond to isoluminant stimulus.

Arena side view



1st Hermitian wavelet (1st derivative of Gaussian) as stimulus around wall.

Continuous dual light and dark regions against grey wall.

Averaged radiance of the visual environment at 10 m depth (Gulf of Naples), using ELF camera (Smolka & Nilsson, 2021).

Adults inhabit shallow seafloors and graze macroalgae.

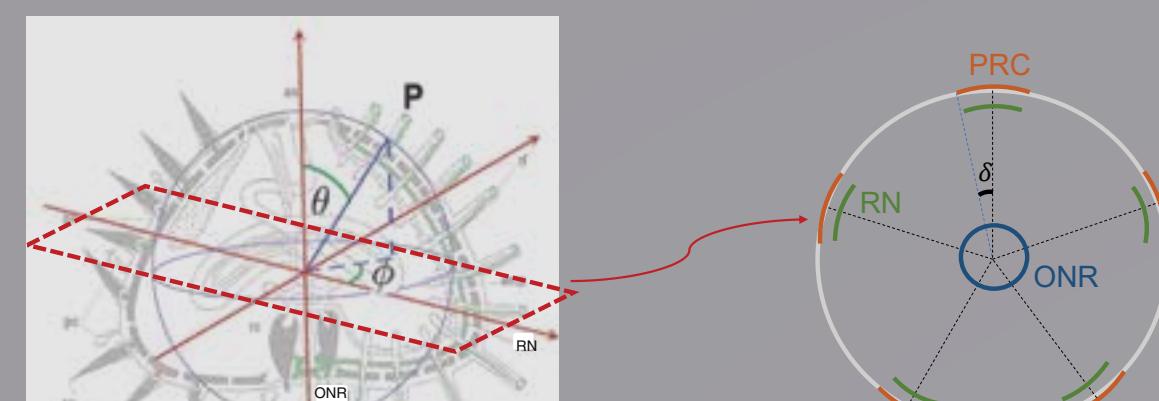
Frequently aggregate, including to brood spawn.

Preyed upon by fish, take shelter during daylight.

Respond to light, but true resolving vision untested.

Can *P. lividus* see?

Next: Model neuronal control of decentralized vision:



Li et al., A model of decentralized vision in the sea urchin *Diadema africanum*, bioRxiv 2022.05.03.490537
doi: 10.1101/2022.05.03.490537

Some sea urchins can see despite lacking eyes and a brain.

Does it have true resolving vision? If so, how well can *P. lividus* see?

For what can this vision be used?

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Photograph courtesy of Francesco Izzo.

