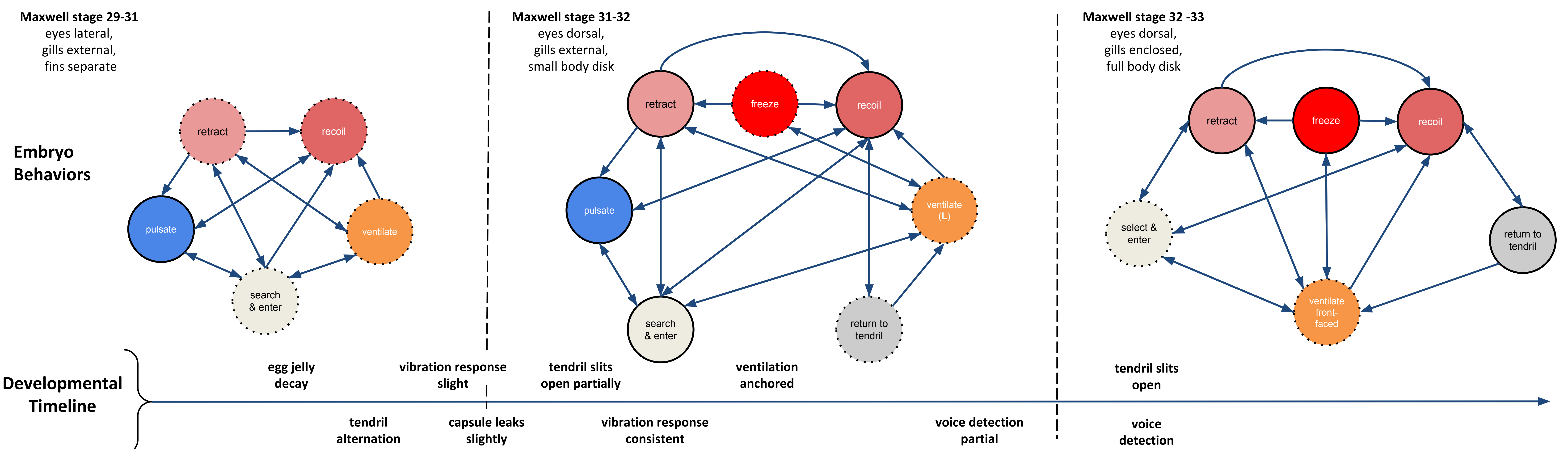


MODELING THE VENTILATORY BEHAVIOR OF THE EMBRYOS OF LITTLE SKATES

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Stages 30-31

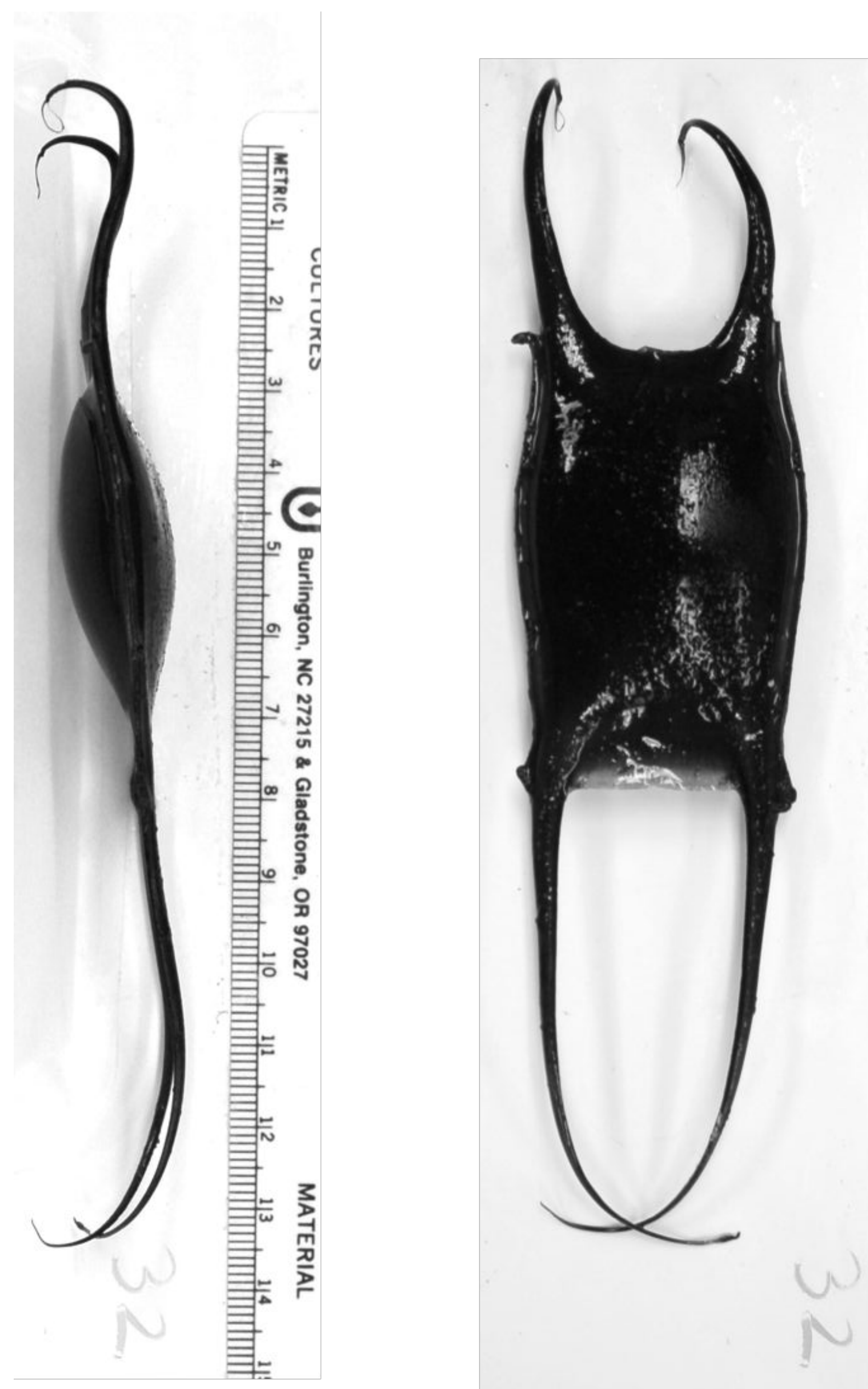
- Pulsate:** Gradual, slow undulation without insertion.
- Search & Enter:** Rapid undulation down to tail tip to find and insert into a tendril.
- Ventilate:** High frequency undulation within a tendril.
- Retract:** An incremental pull-back from tendril relative to sensitivity, amplitude, and frequency.
- Recoil:** Upon sufficient disturbance, pull the tail back to coil it around the body.

Stages 31-32

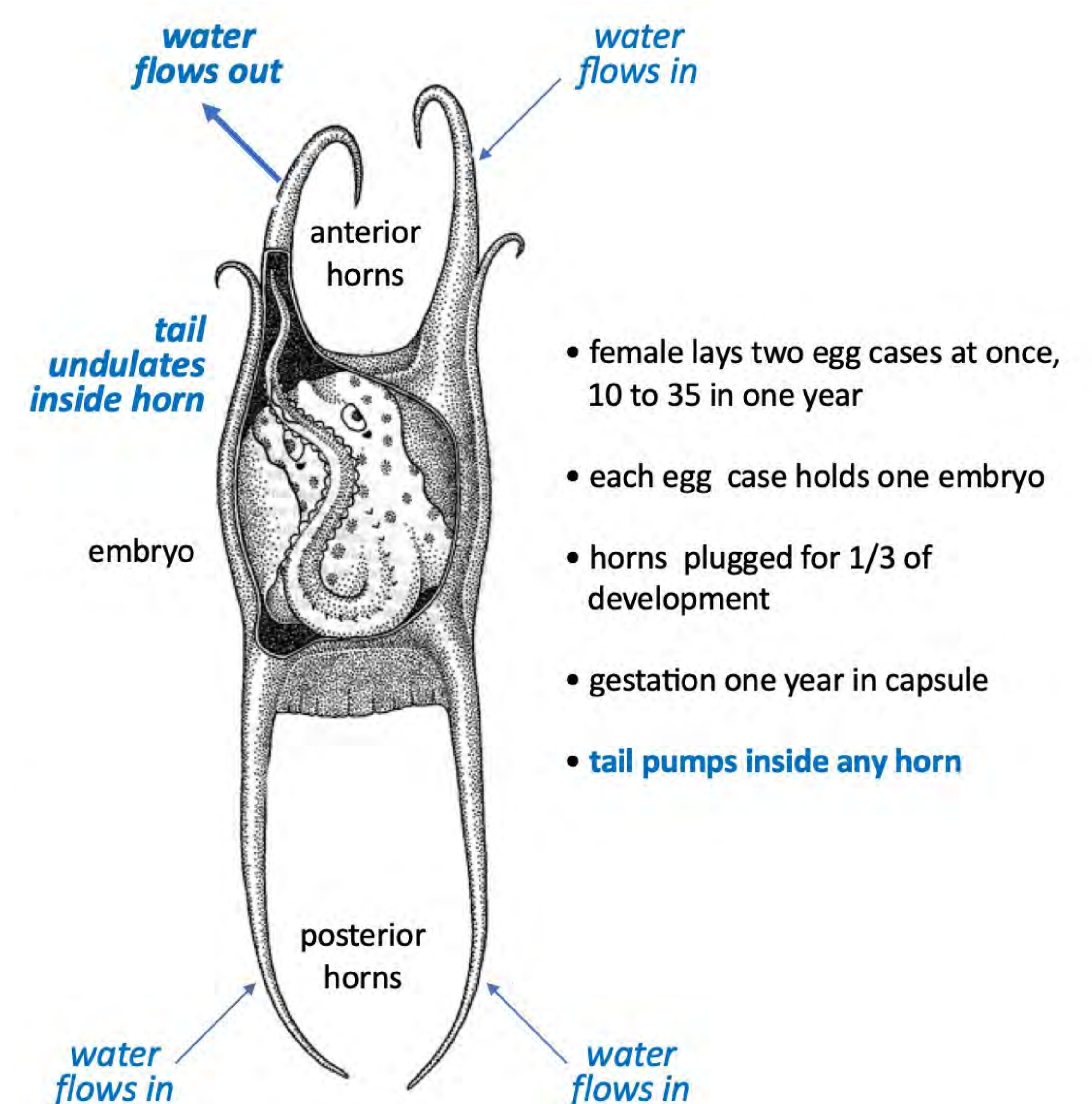
- Ventilate (L):** Ventilate with the body bent laterally at the base of the putative adult caudal fin.
- Return to Tendril:** After a full recoil, return to the same tendril that was being ventilated.
- Freeze:** Upon partial disturbance during ventilation, stop moving and wait before ventilating or moving out of the tendril.

Stages 32-33

- Ventilate Front-Faced:** Ventilate with the body bent sharply at the caudal fin so that the tail tip is looped back over the anterior portion of the body disk.
- Select & Enter:** Search & Enter, but with greater efficiency of selection and insertion.



- Embryos of elasmobranch fishes (skates and some sharks) develop for up to a year in a **leathery egg case**, the mermaid's purse.
- An embryo must ventilate by undulating its tail inside one of the four hollow tendrils (or horns) of the capsule to exchange deoxygenated for oxygenated water.
- The development of the embryo's behavior is intimately tied to changes in its own morphology as well as that of the egg capsule. This interaction has never been systematically investigated.
- We model this dynamic behavioral network as a **finite-state system** (see panel above).
- These are embryos of ***Leucoraja erinacea***, a North Atlantic species.



Listen to Connor's narration of the highlights of his research.

Scan this QR code with your phone.

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