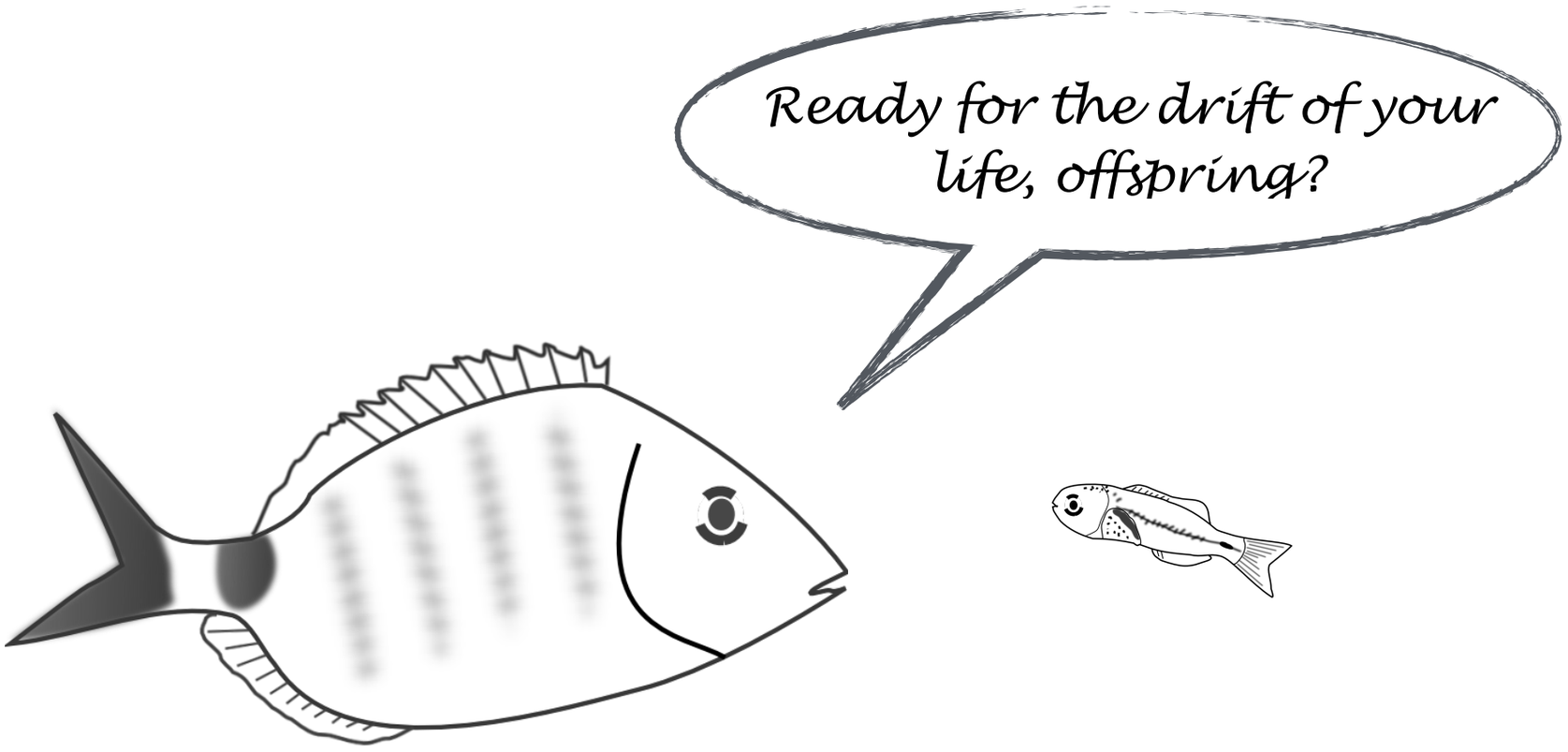
LARVAL FISH BEHAVIOR NUANCES HJORT'S ABERRANT DRIFT HYPOTHESIS

Robin Faillettaz, Claire B. Paris, Elysanne Durand, Jean-Olivier Irisson



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CMS Connectivity Modeling System

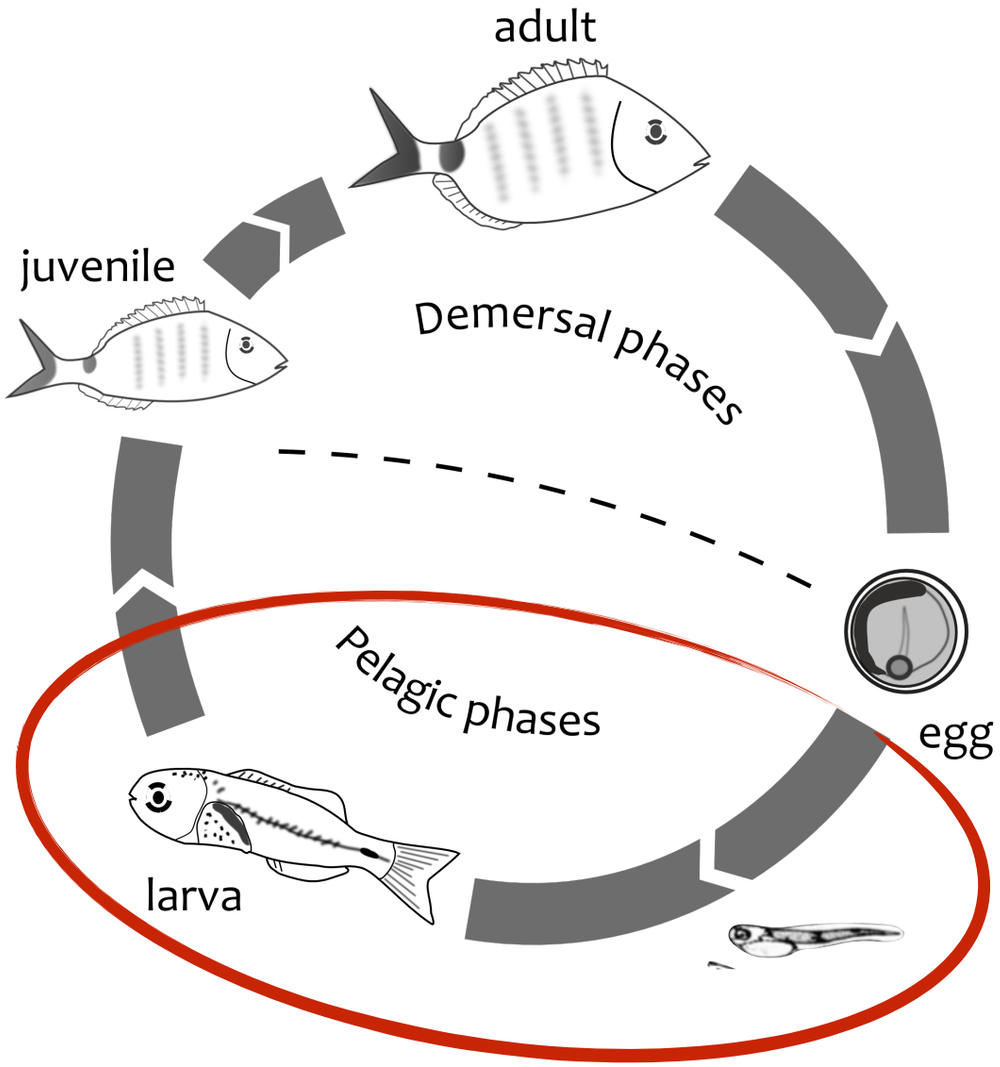
Larval Dispersal

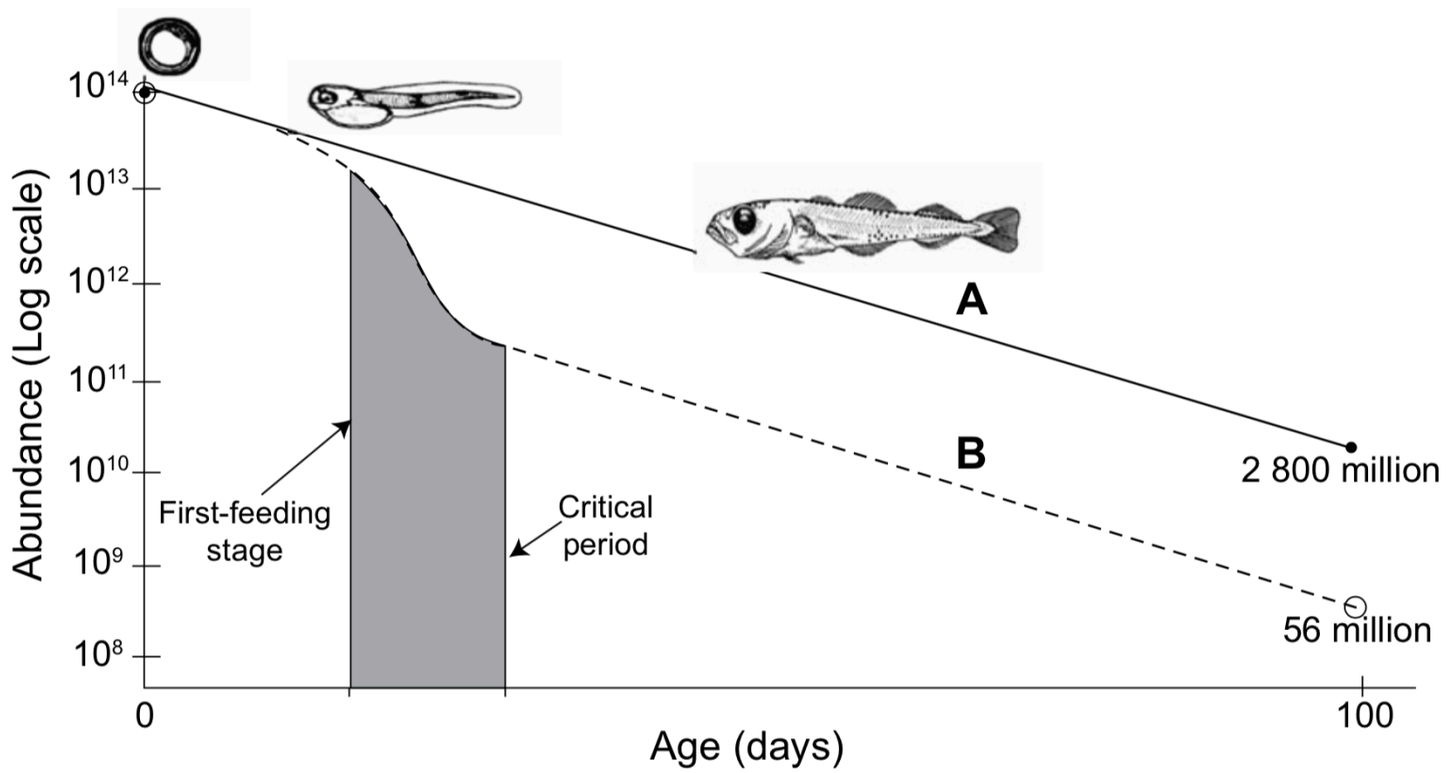
Connectivity

[Paris-Limouzy 2001, Cowen et al. 2001, 2006 *Science*]

- Conservation —> design of marine reserves
- Fisheries —> allocation of marine resources
- Anticipating migratory patterns in a changing climate

Larval fish and the **Critical Period** hypothesis [Hjort 1914]



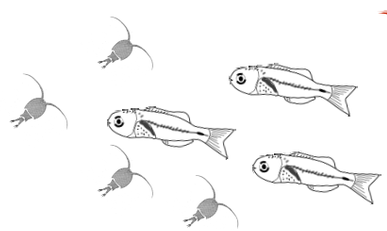


[Houde 2002]

Major concepts

Survival-based hypotheses

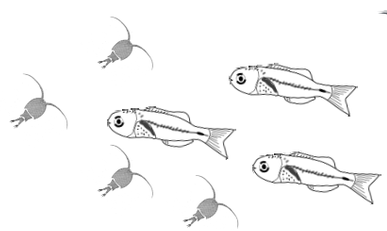
Critical period



Major concepts

Survival-based hypotheses

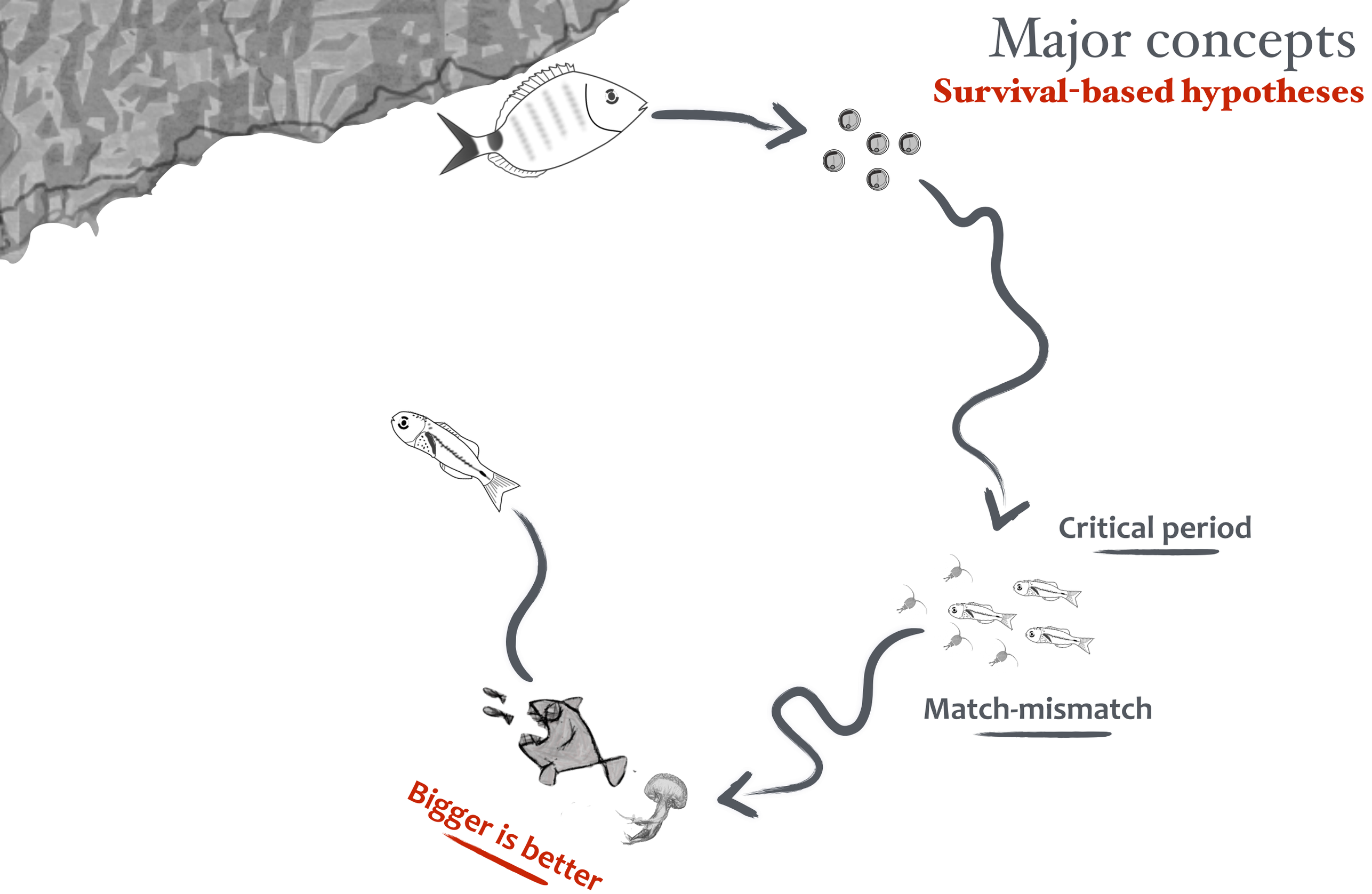
Critical period



Match-mismatch

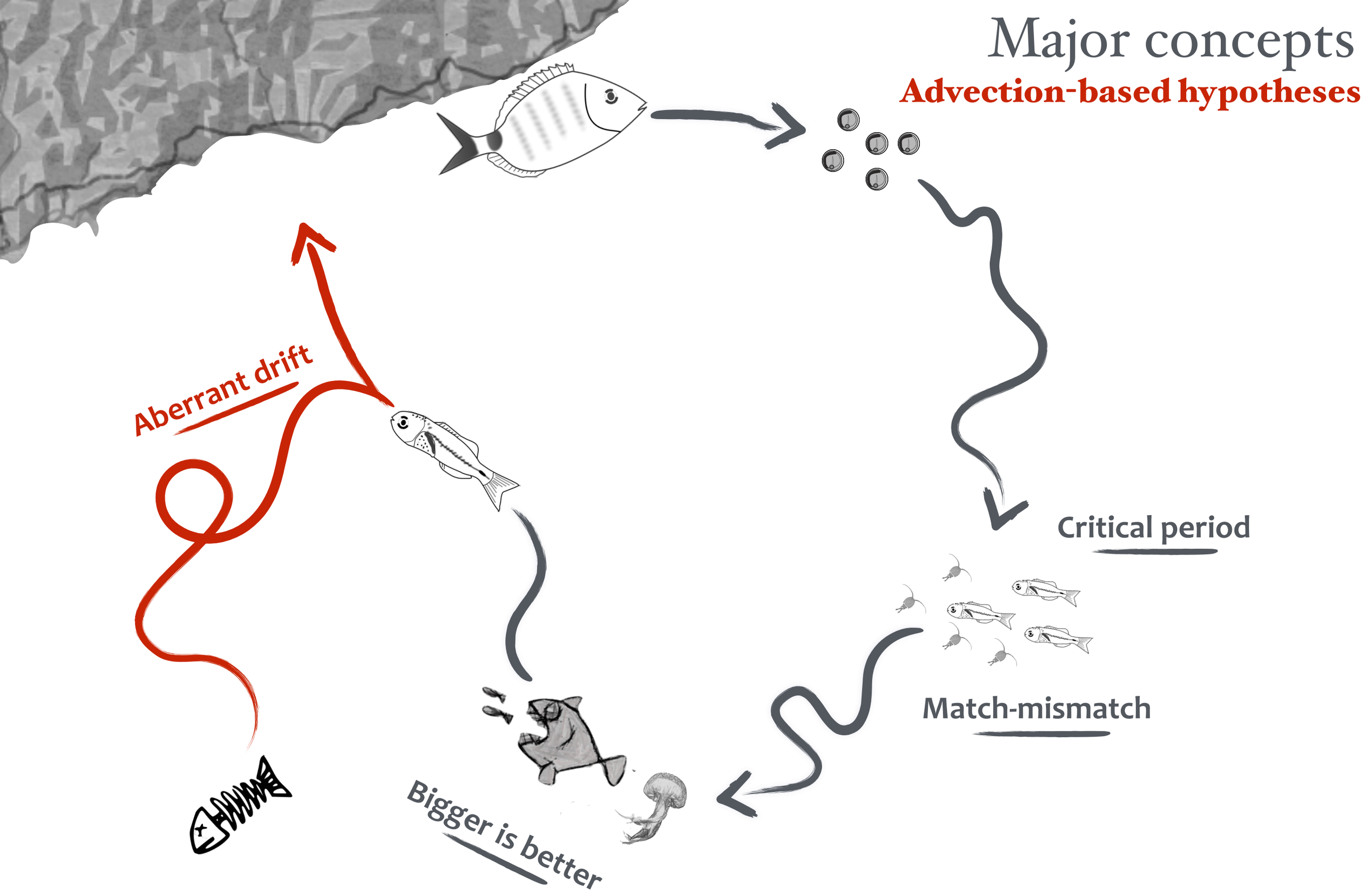
Major concepts

Survival-based hypotheses

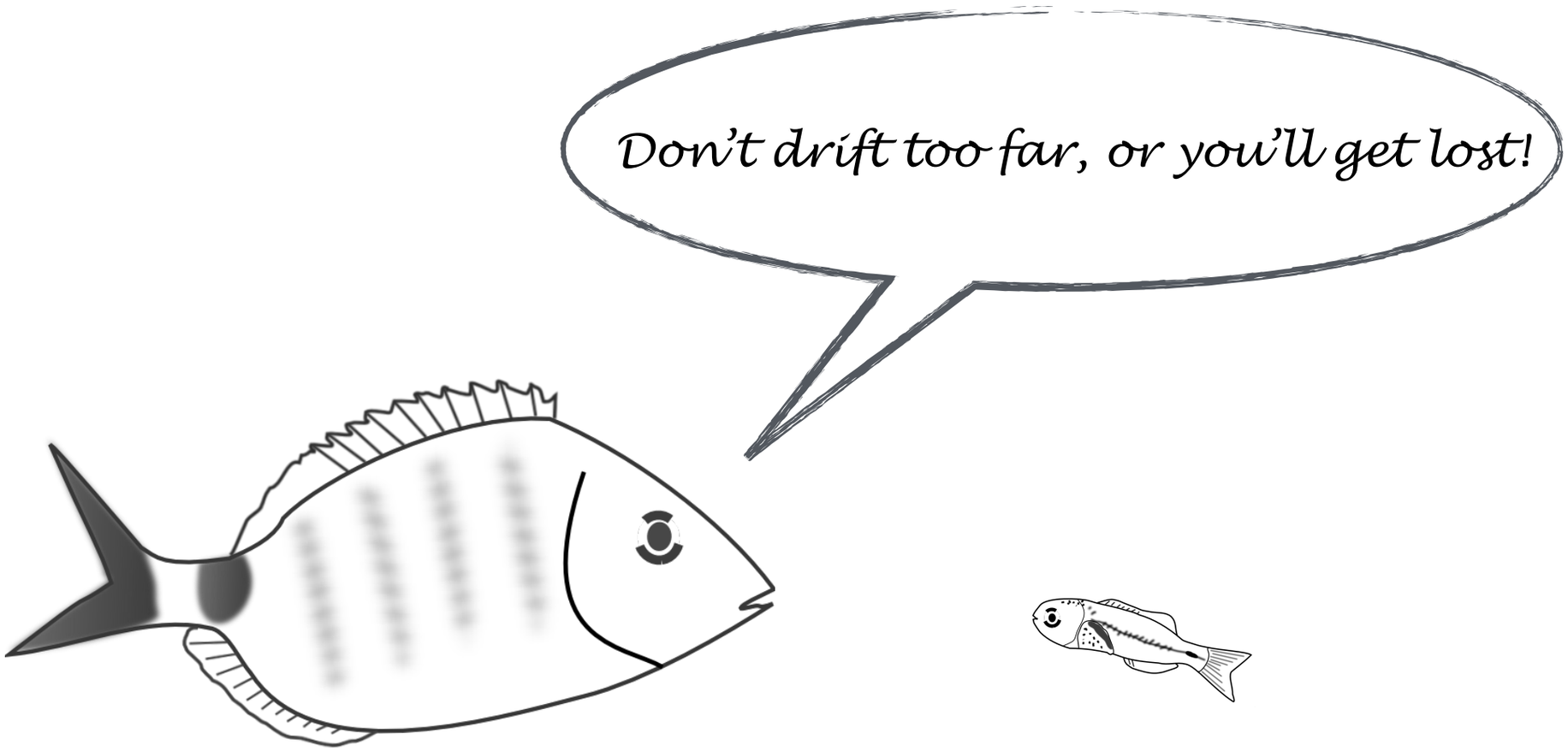


Major concepts

Advection-based hypotheses

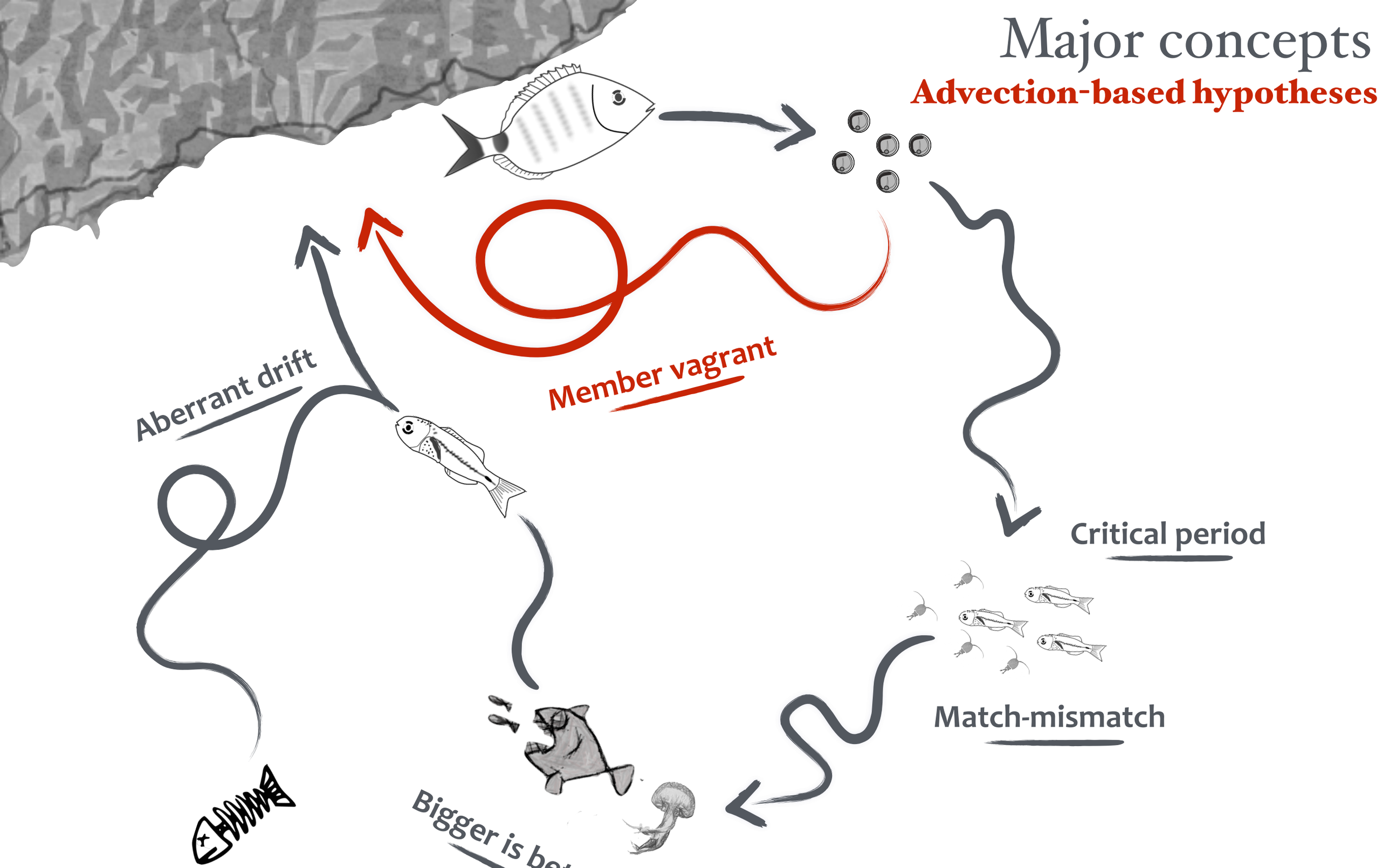


Larval advection-based hypothesis: **Aberrant drift** [Hjort 1926]

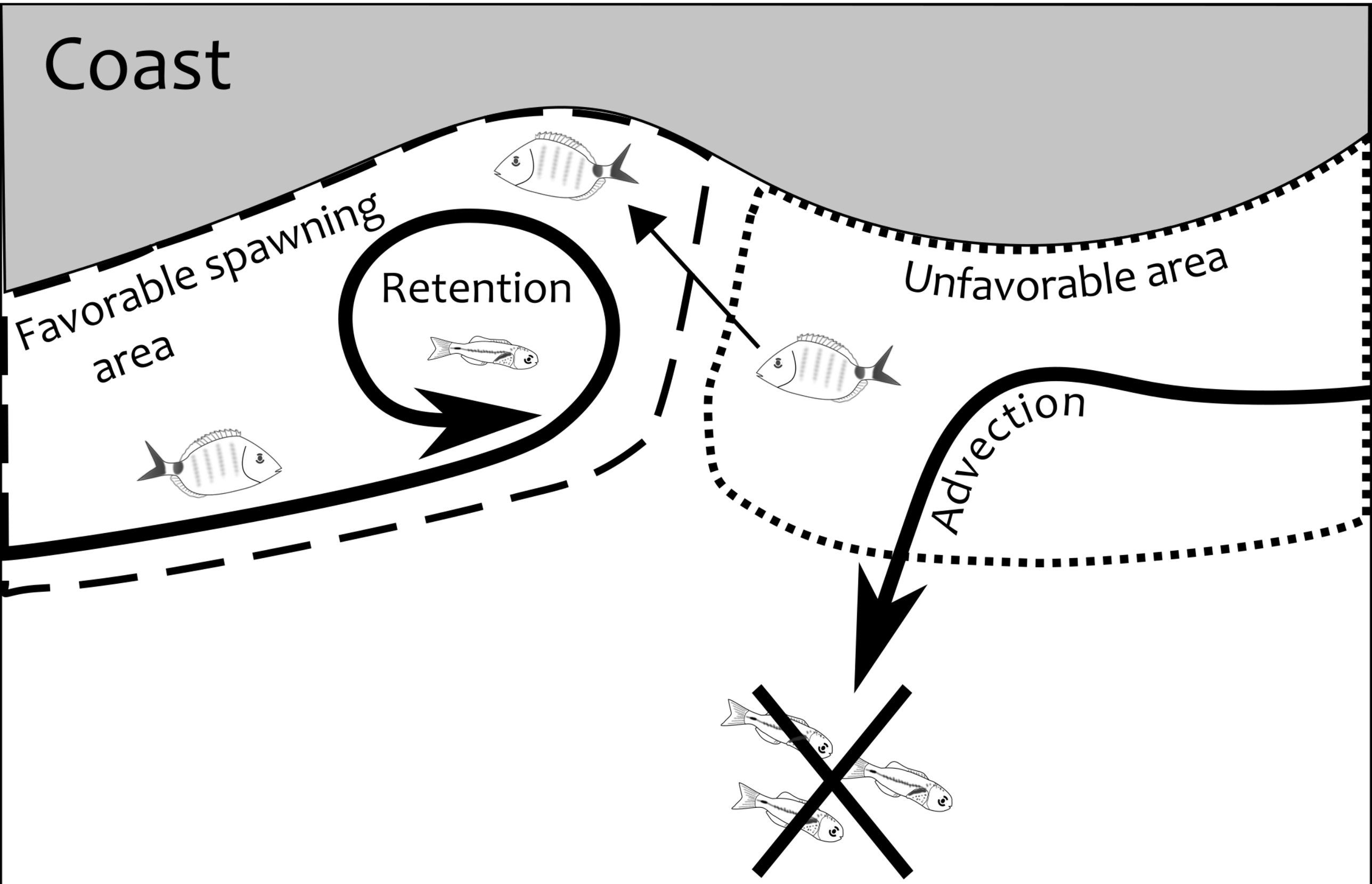


Major concepts

Advection-based hypotheses



Larval advection-based hypothesis: **Stable retention** [Iles & Sinclair 1982]



Major concepts

No larval BEHAVIOR hypothesis!

Stable retention

Critical period

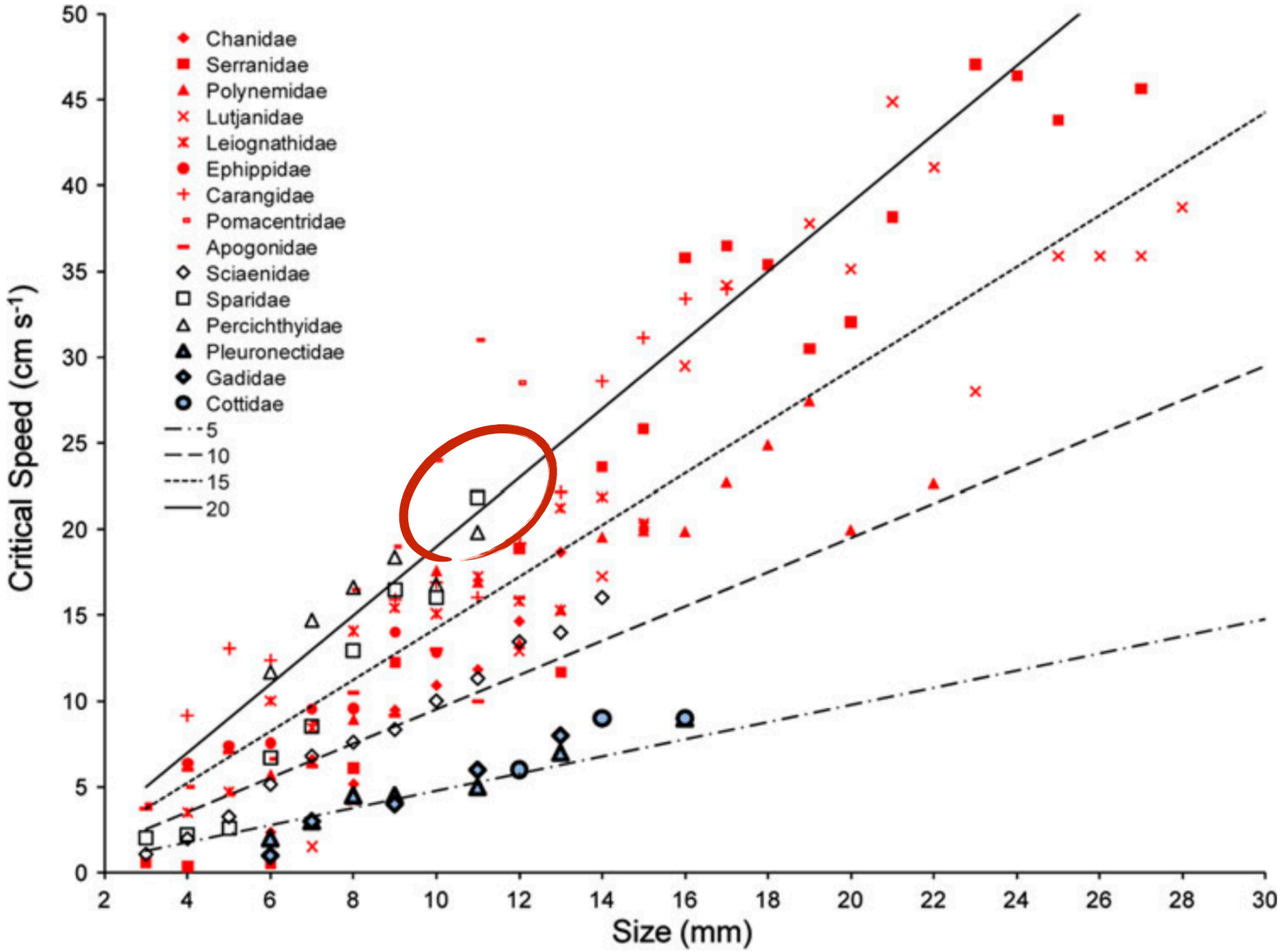
Match-mismatch

Bigger is better

Aberrant drift

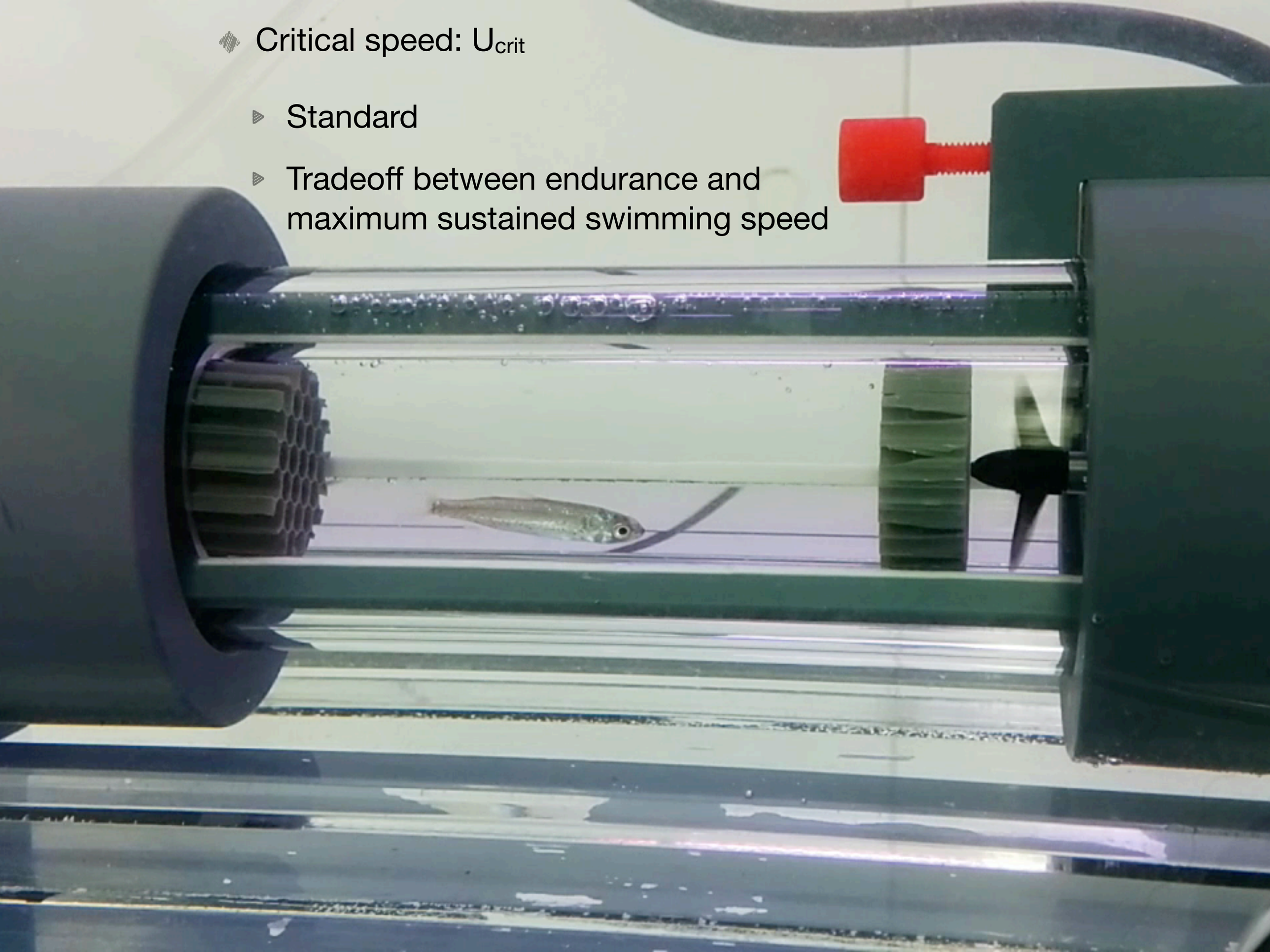
Testing the **Aberrant drift** hypothesis in the Ligurian Sea

In situ swimming speed of fish larvae increases during ontogeny

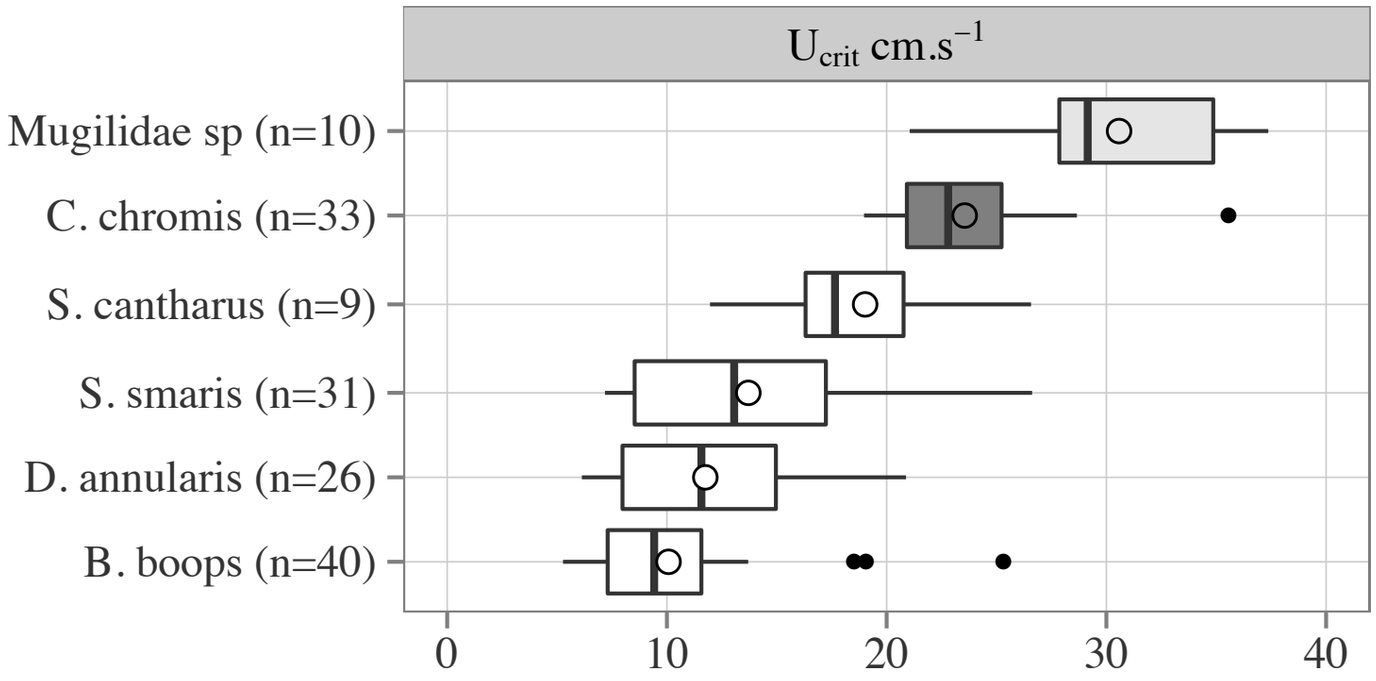


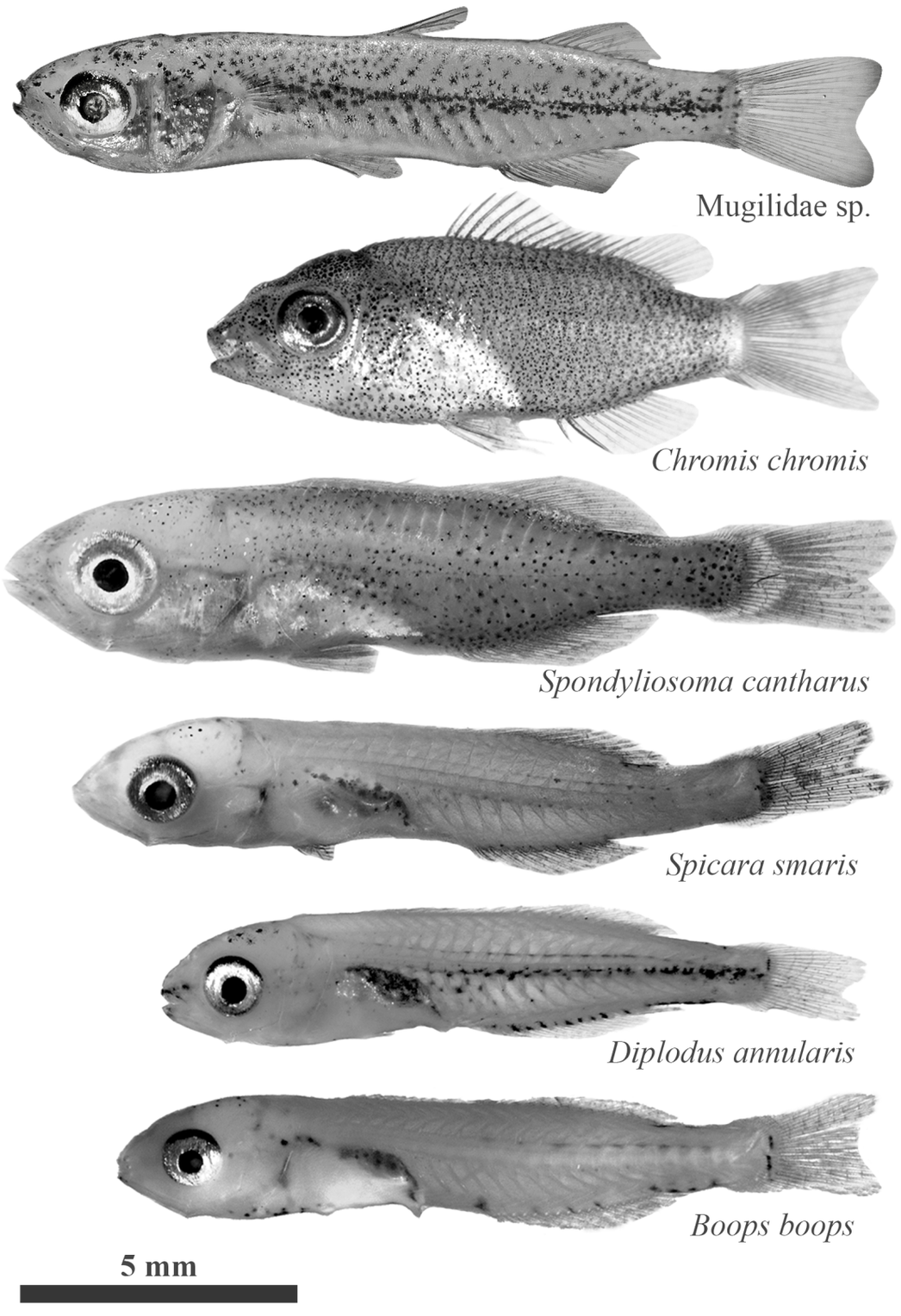
[Leis, 2010, Icht. Res.]

- Critical speed: U_{crit}
  - Standard
  - Tradeoff between endurance and maximum sustained swimming speed



Critical swimming speed of Mediterranean late-stage fish larvae





[Faillettaz et al. L&O 2017]

Fastest *Homo sapiens sapiens:* 2.5 m s^{-1}

1.1 BL.s^{-1}

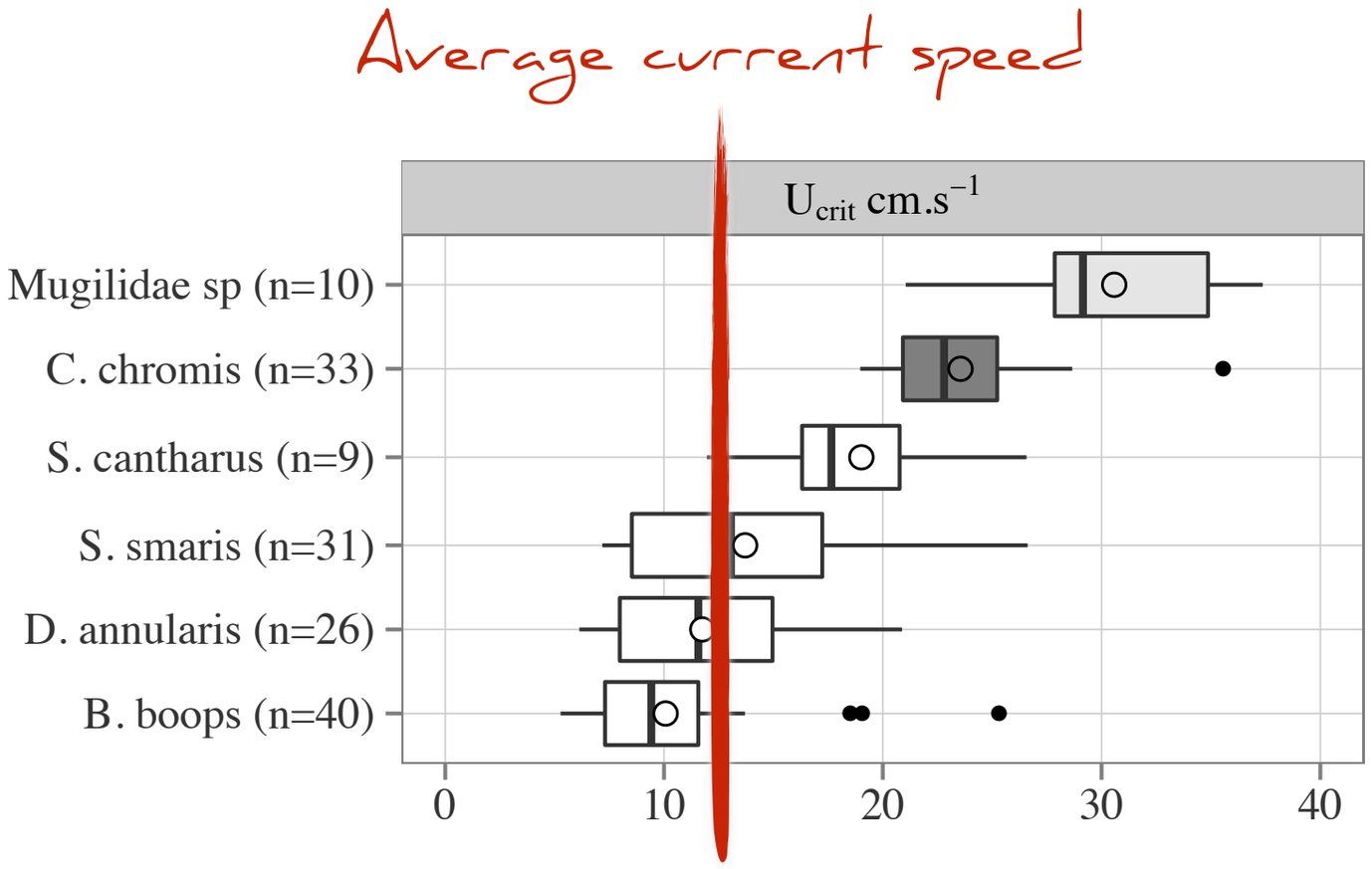
Fastest fish (*Istiophorus spp*) : 109 km/h

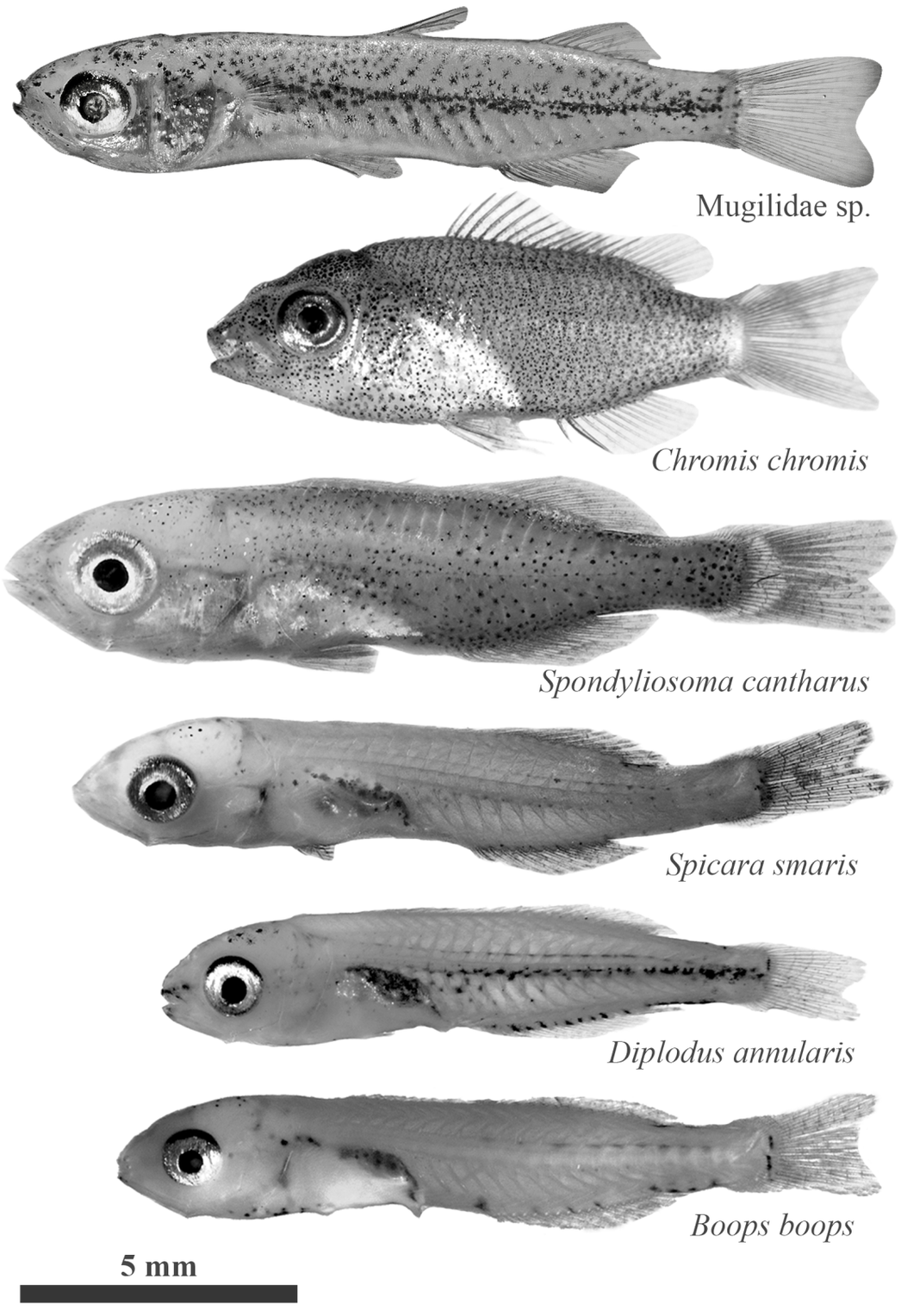
15.1 BL.s^{-1}

Fastest Mediterranean fish larvae: 0.35 m s^{-1}

30.4 BL.s^{-1}

Critical swimming speed of Mediterranean late-stage fish larvae



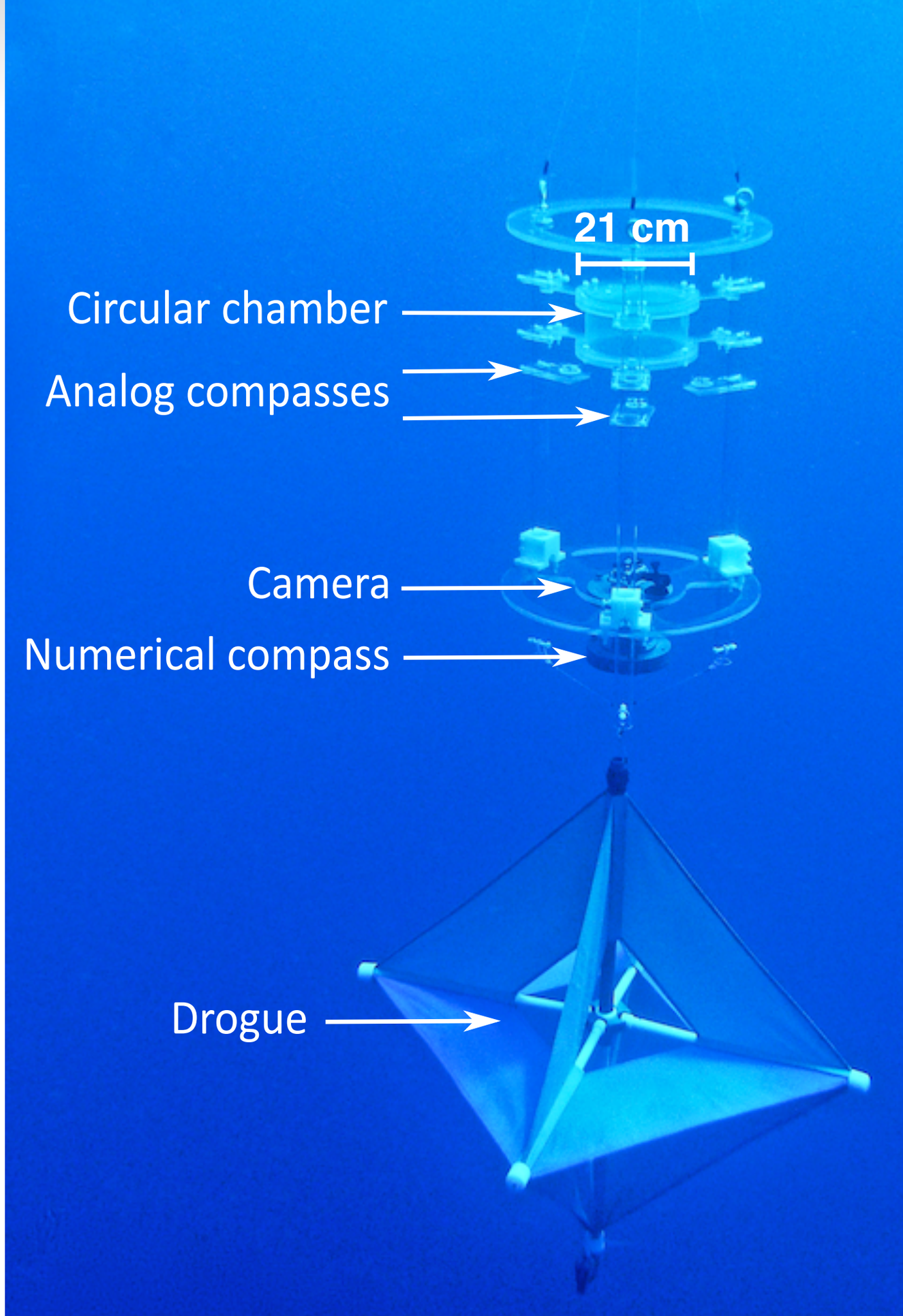


[Faillettaz et al. L&O 2017]

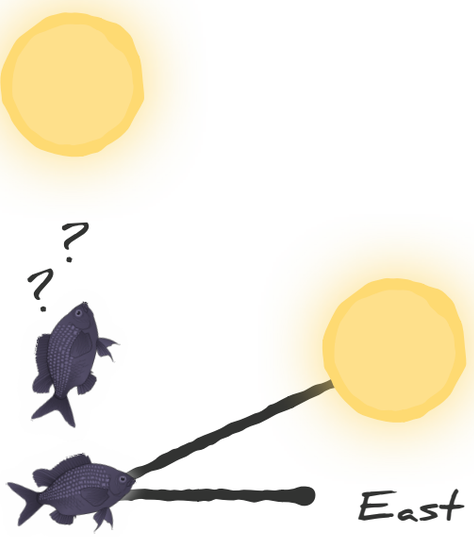
Estimating *in situ* orientation

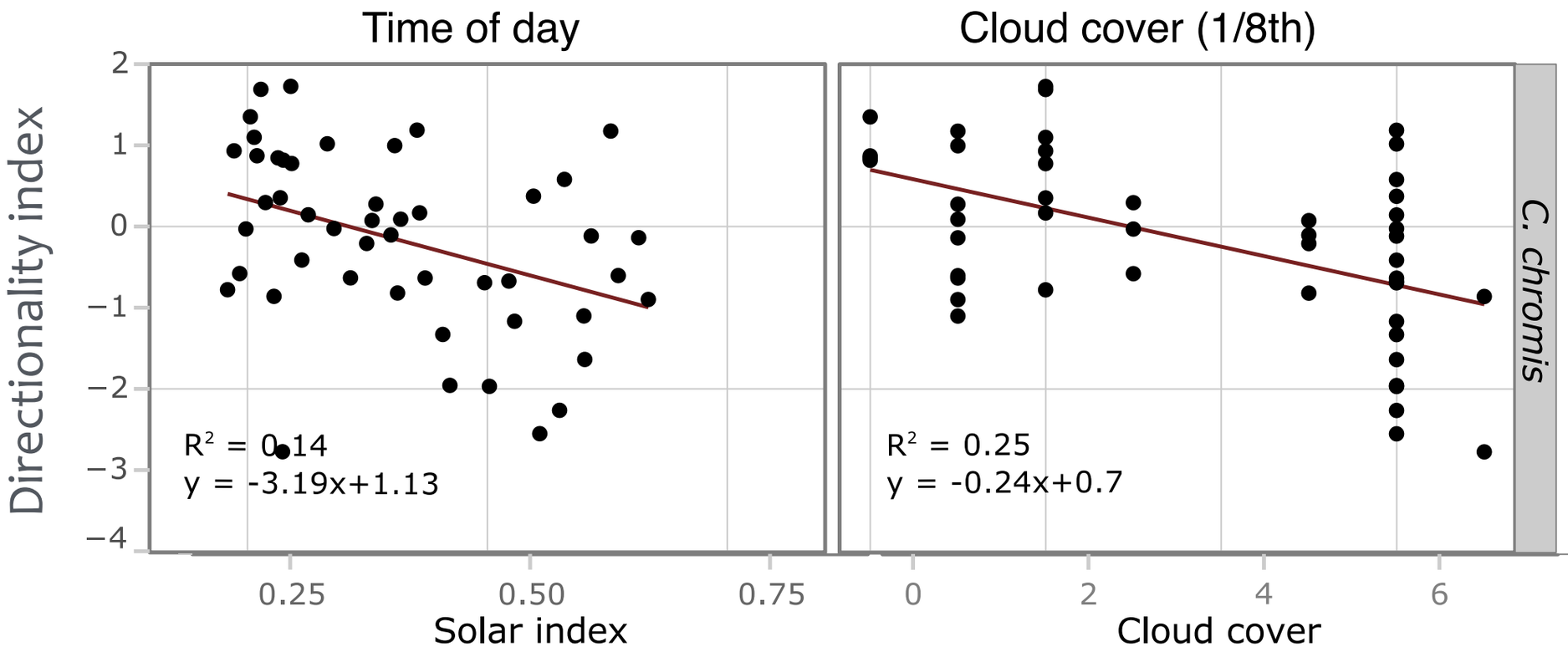
- Drifting *In Situ* Chamber: DISC
  - Lagrangian
  - *In situ* observations
  - No human interaction

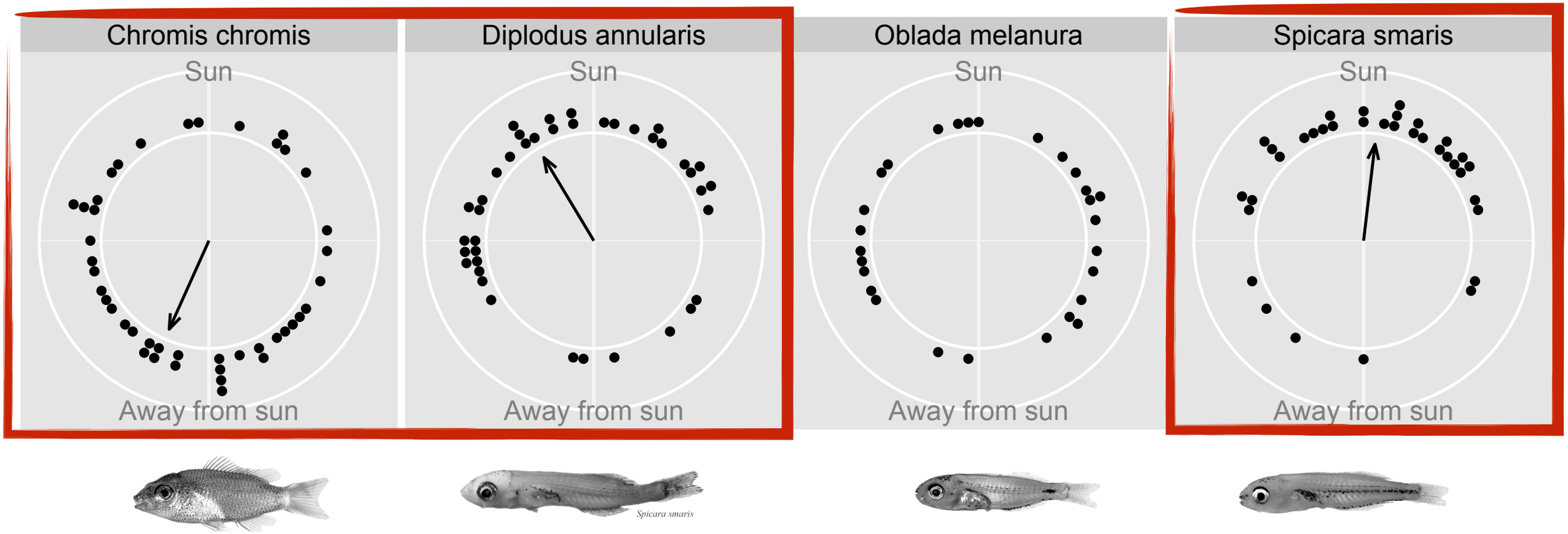
- For more details, check the **poster n°34**: Sun Compass Orientation in Mediterranean Fish Larvae, with **Claire Paris**



Celestial cues influence directionality - **fish larvae orient with the Sun**

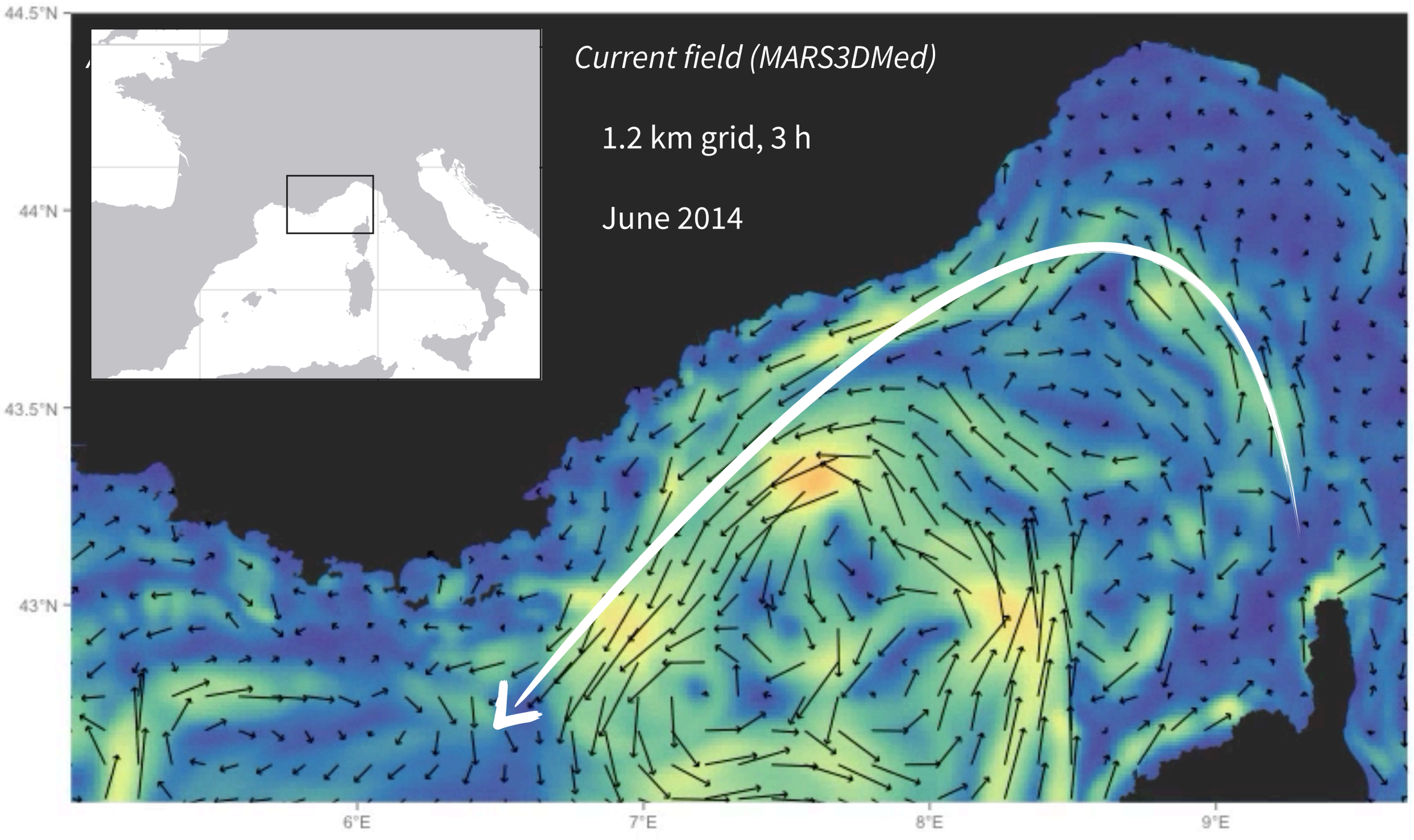




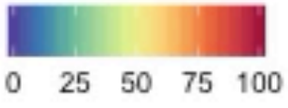


[Faillettaz et al. 2015 PONE]

Testing the **Aberrant drift** hypothesis in the Ligurian Sea



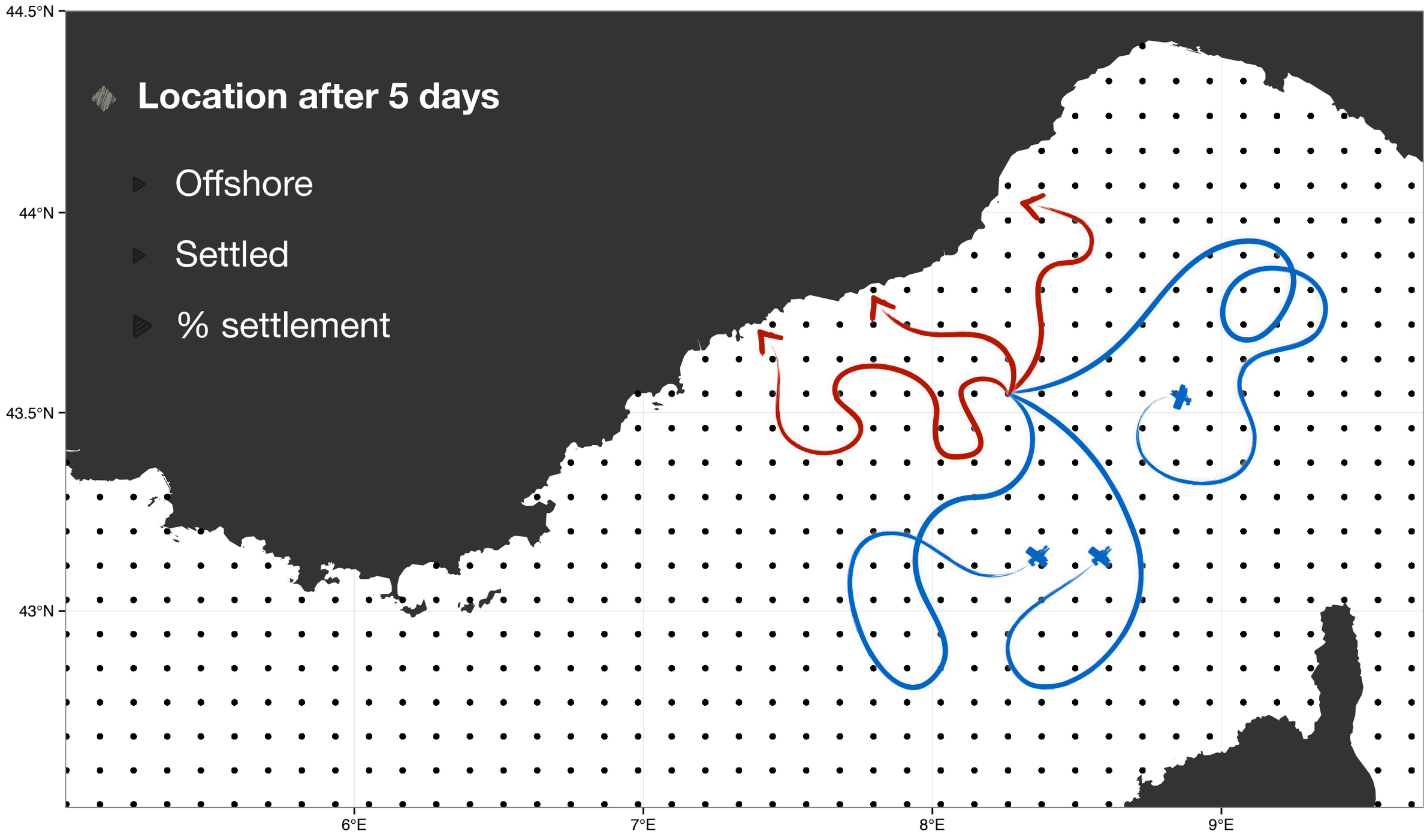
Flow velocity (cm s^{-1})



CMS Connectivity Modeling System

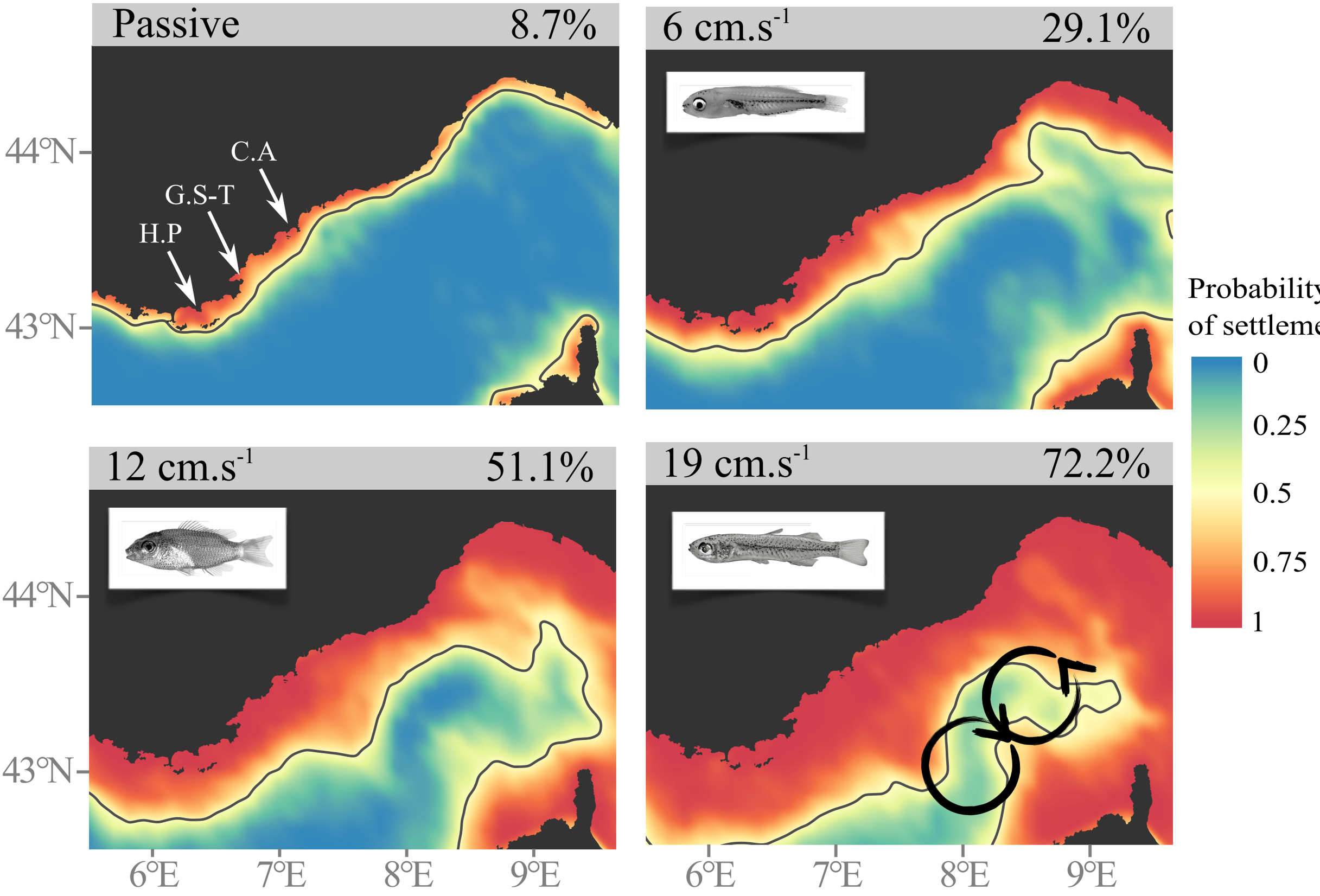
[Faillettaz et al. 2017 *Limn & Oceanogr*]

Testing the **Aberrant drift** hypothesis in the Ligurian Sea



[Faillettaz et al. 2017 *Limn & Oceanogr*]

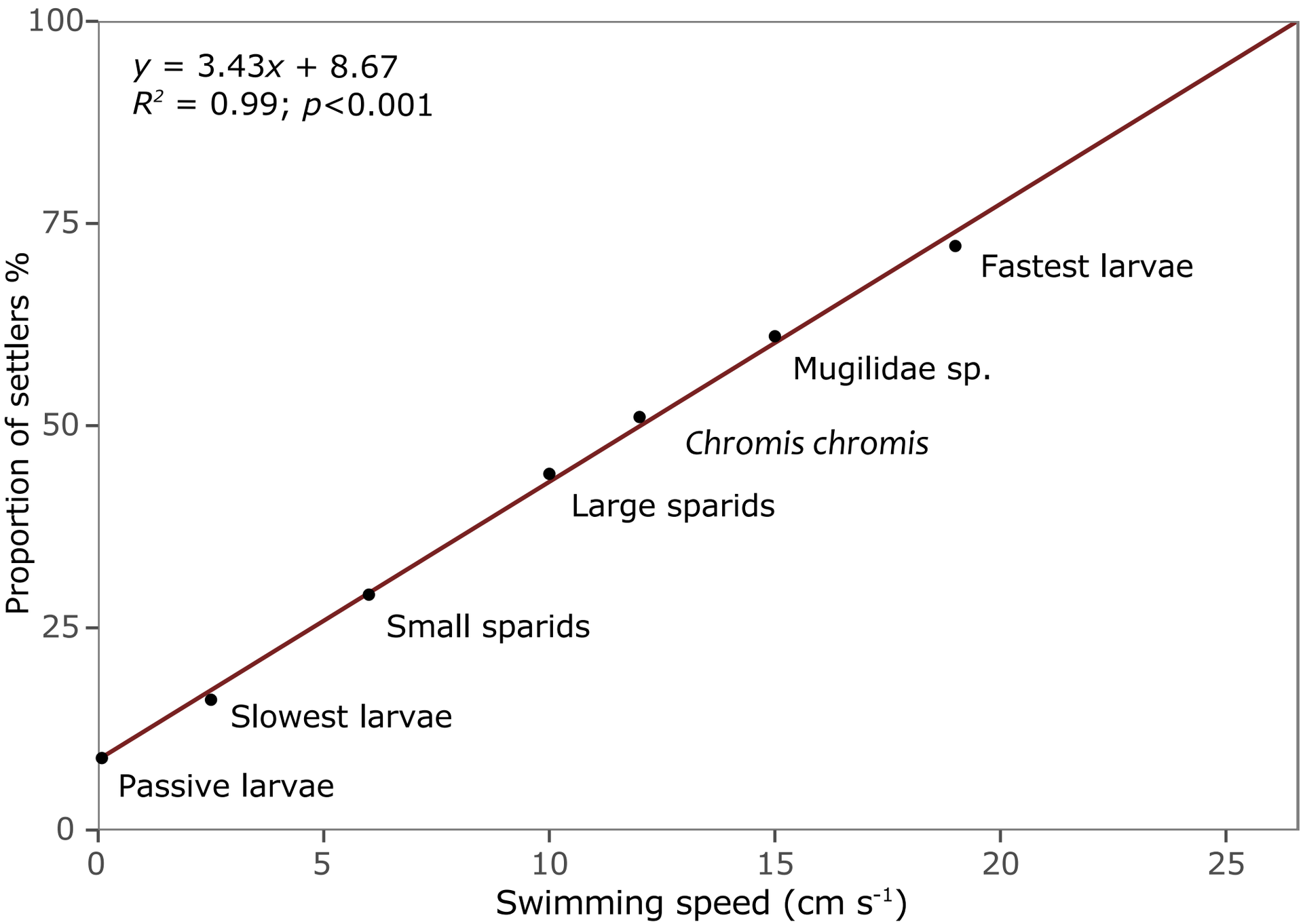
Fast swimming larvae may settle from anywhere



Larval Fish Conference 2019, Palma de Mallorca

[Faillettaz et al. 2017 *Limn & Oceanogr*]

Limited influence of hydrodynamics on settlement success

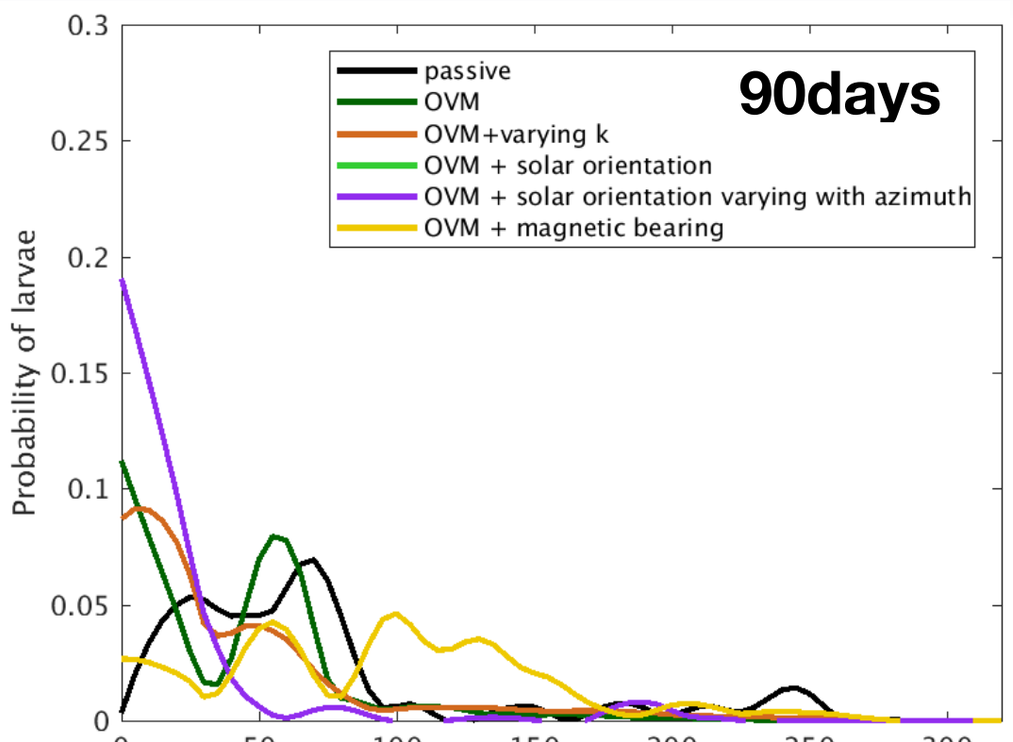


→ Oriented swimming = strong influence on advection

[Faillettaz et al. 2017 *Limn & Oceanogr*]

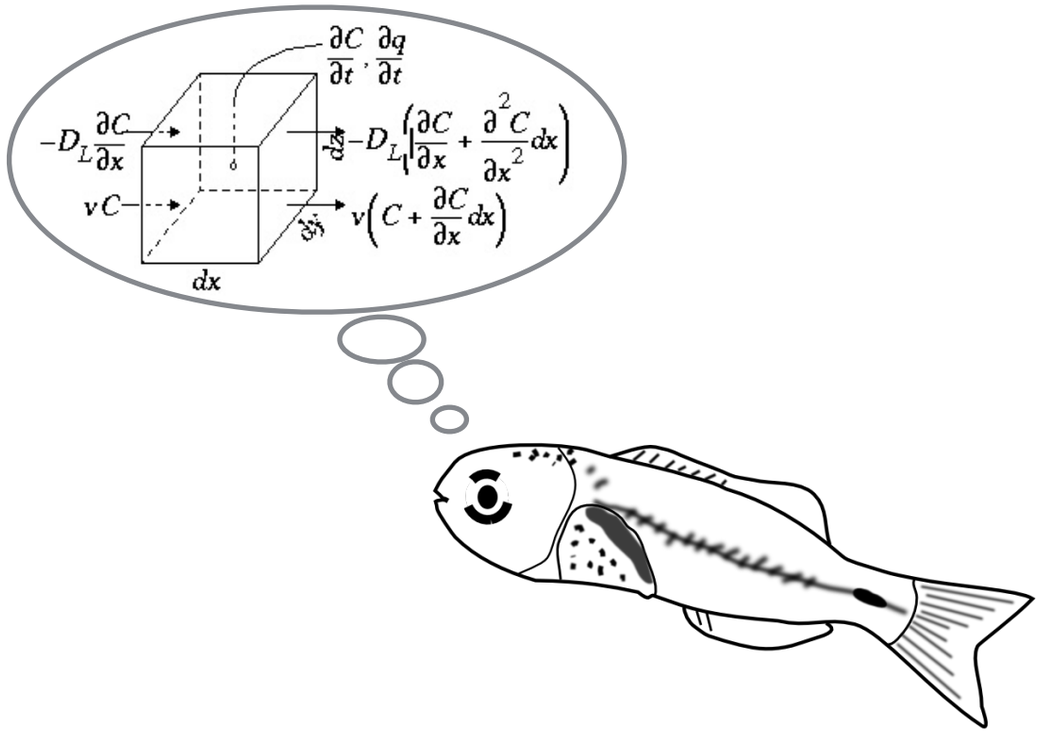
Conclusion and perpectives

- **Behaviour in dispersal models**
  - Strong influence on the dispersal output of Mediterranean fish larvae
  - Further disproves that fish larvae are passive drifters

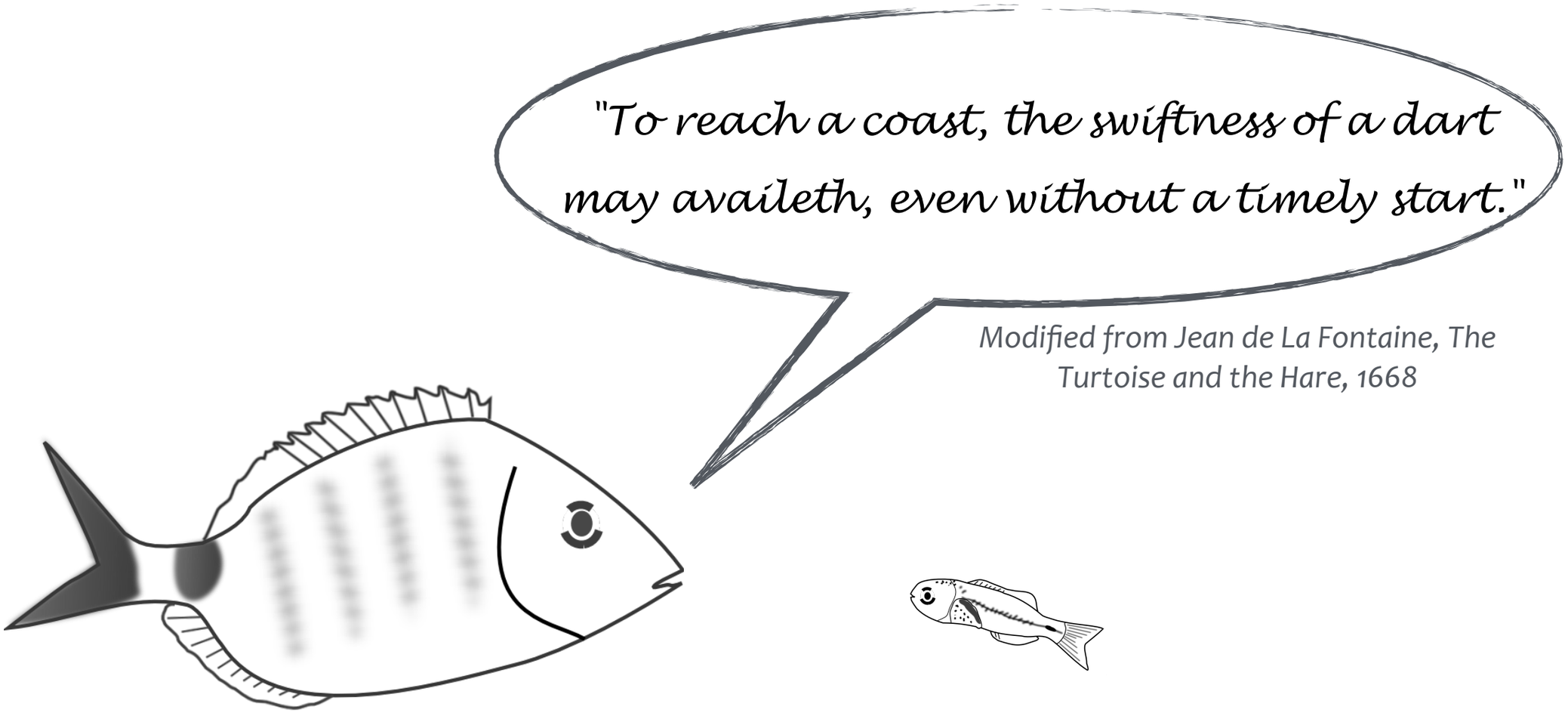


[Talk by Paris & Vaz, 3h ago]

- **Behavior in fondamental hypotheses in Larval fish Ecology**
  - Historical focus on poor-swimming species
  - In Mediterranean Perciformes, swimming nuances Hjort's aberrant drift hypothesis
  - Models are efficient tools for explicit testing fundamental hypotheses, maybe even more than at reproducing observed patterns



THANK YOU FOR YOUR ATTENTION!



Modified from Jean de La Fontaine, The Turtoise and the Hare, 1668

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