The importance of behavior for self-recruitment: a modeling approach

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[1]Biologie et Écologie Tropicale et Méditerranéenne
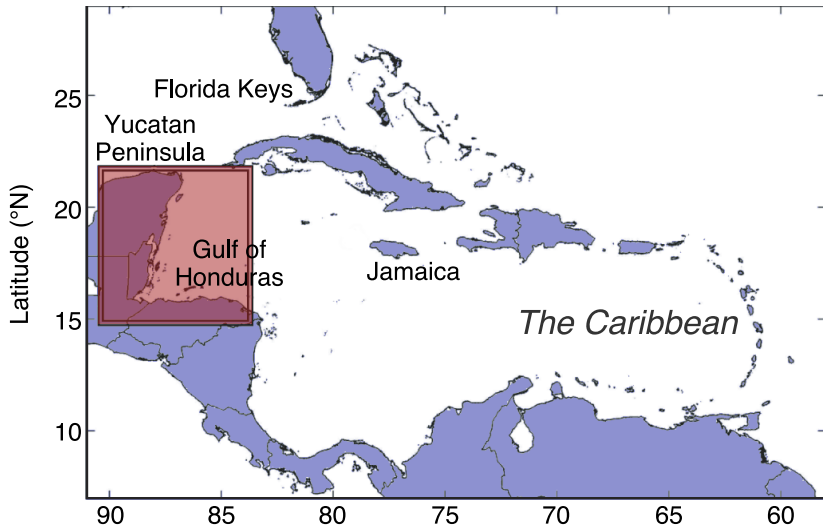UMR 5244 EPHE–CNRS–UPVD, Perpignan

[2]Rosentiel School of Marine and Atmospheric Sciences
University of Miami

[3]CERMICS
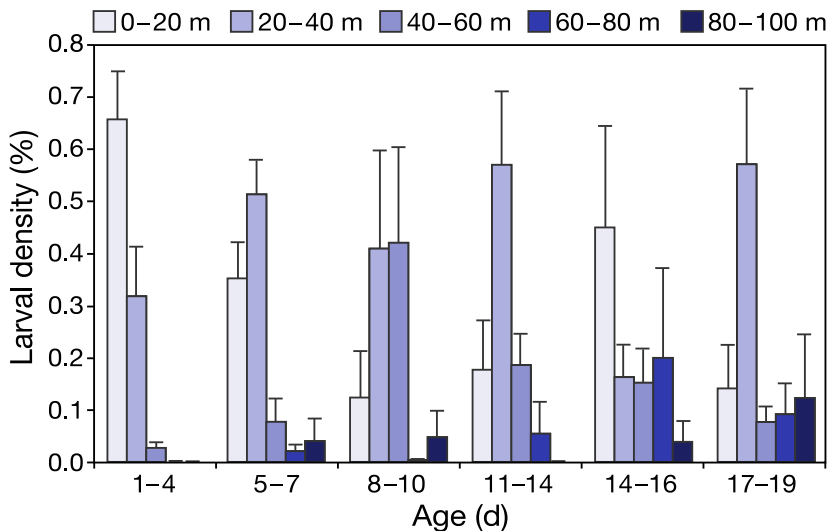École Nationale des Ponts et Chaussées, Paris

ICRS, 2008

Study area
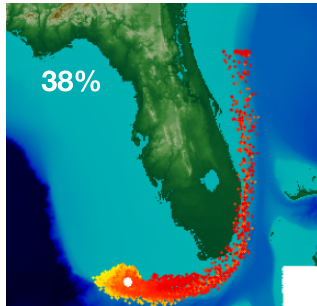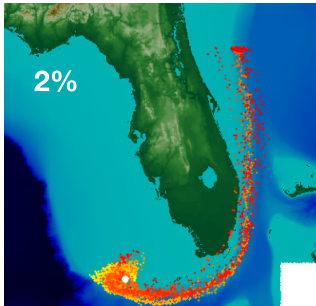
Paris *et al*, 2007 MEPS

Parameterized vertical migration

Legend: 0–20 m, 20–40 m, 40–60 m, 60–80 m, 80–100 m

Y-axis: Larval density (%)
X-axis: Age (d) — 1–4, 5–7, 8–10, 11–14, 14–16, 17–19

Consequences on trajectories

Passive

Ontogenetic migration

Dry Tortugas
Florida April 2004

2%

38%
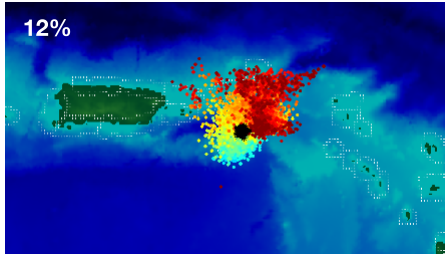
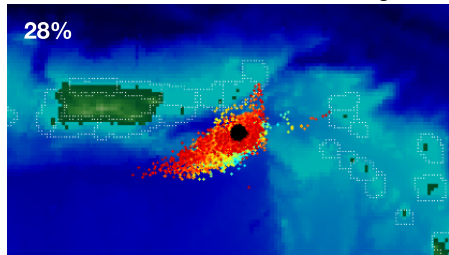- 1-5
- 6-10
- 11-15
- 16-20
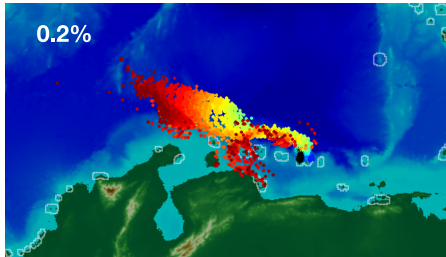- 21-25
- 26-30

Consequences on trajectories

Passive

Ontogenetic migration

St Croix
UVI August 2004

12%

28%

- 1-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-30

Consequences on trajectories

Passive

Ontogenetic migration

Dispersal kernel

Probability of occurence vs Radial distance (km)

Vertical migration

Passive
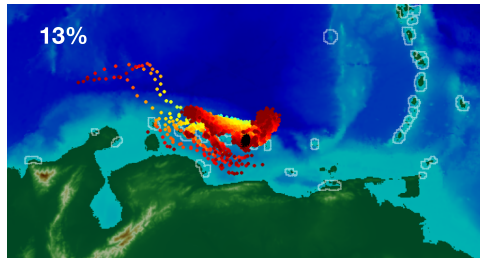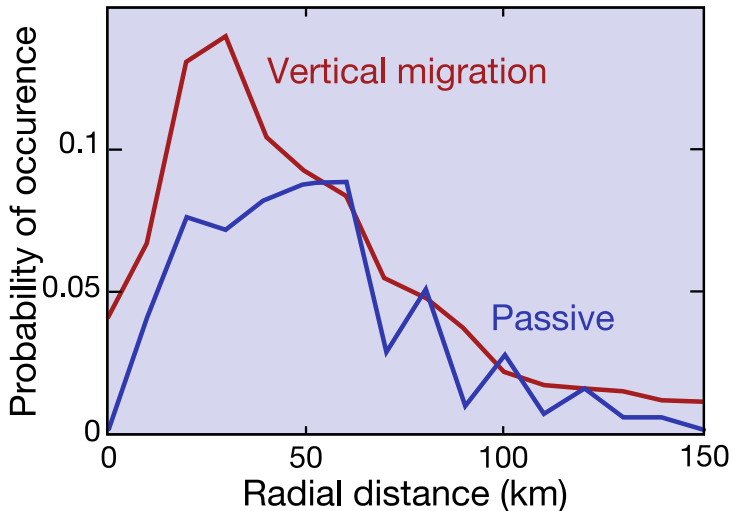
2 × 2 case studies
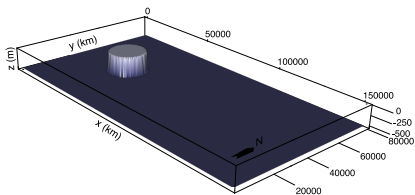
Pomacentrus amboinensis
25 d, 3.5 → 35 cm s^{-1}, 46.33 h
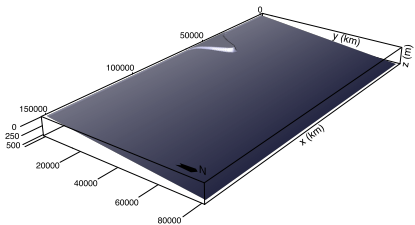
Temperate larva
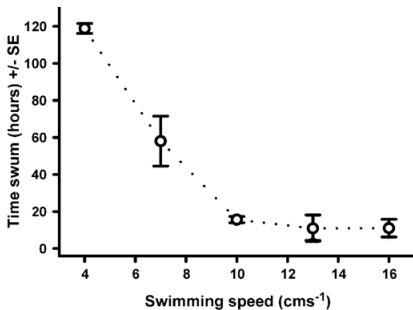4+23 d, 0.5 → 5 cm s^{-1}, 15 h

Active larvae
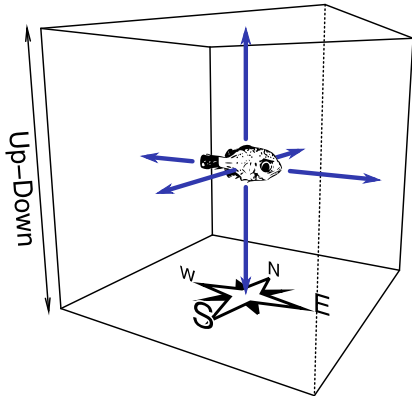
- **Choice** between possible decisions
- Gain/Cost **balance** for each decision
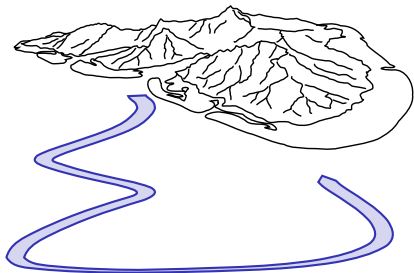- Criterion = **self-recruit** with **minimum energy** expenditure

Active larvae

Fisher and Bellwood 2002
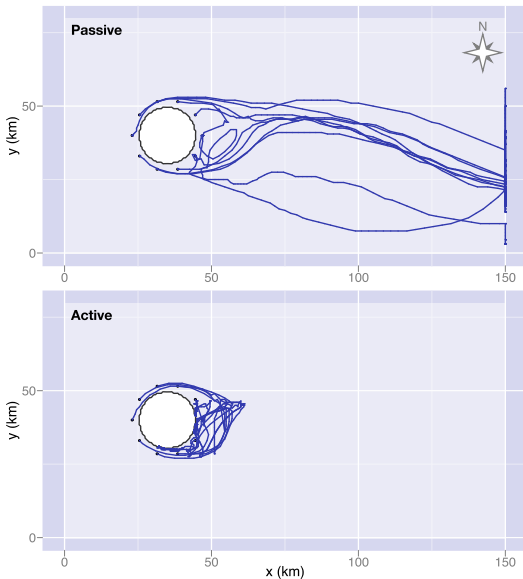
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Active larvae
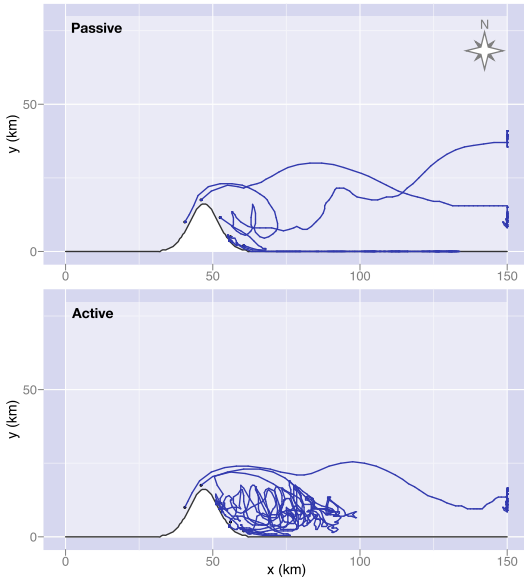

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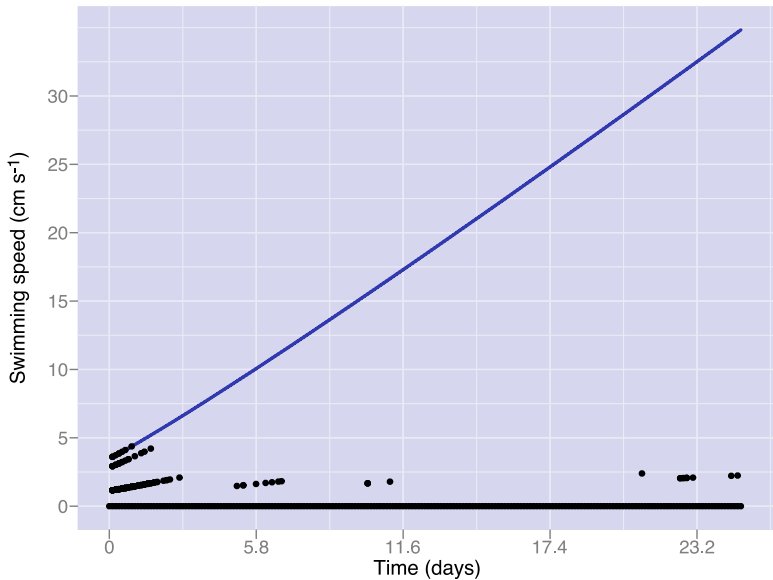# Consequences on trajectories

Consequences on trajectories

Self-recruitment rate

		Passive	Active
P. amboinensis	Promontory	2 %	95 %
	Island	0 %	95 %
Temperate	Promontory	1 %	72 %
	Island	0 %	45 %

Self-recruitment rate

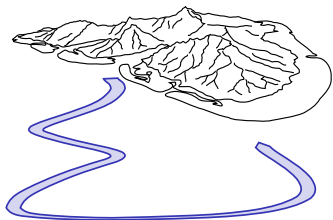|		Passive	Active
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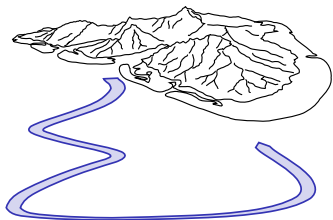# Swimming decisions

Swimming decisions
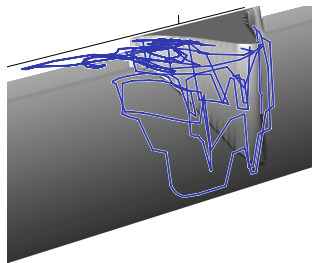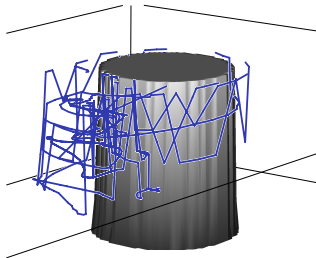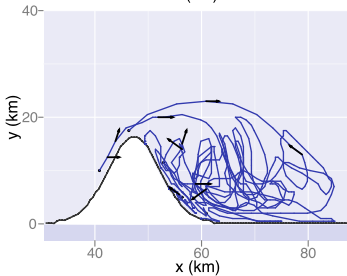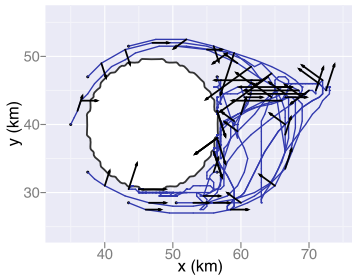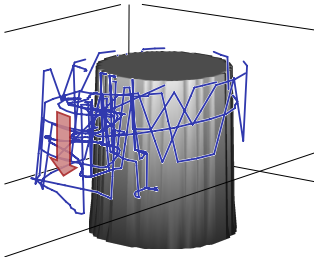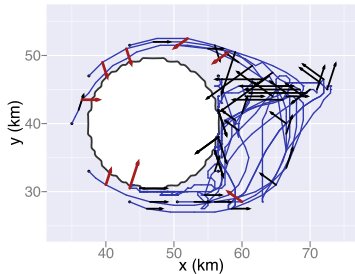
Why self-recruit?

- Observed percentage $> 50\%$
- Parental habitat of sufficient quality for reproduction

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Unify approaches

Derive behavioral **strategies** from the local model and include them in **large scale** Lagrangian models.

Thank you for your attention