Suivi de l'arrivée des larves de poissons en phase d'installation en Méditerranée NW

Laboratoire de Villefranche-sur-Mer
Responsable données : Jean-Olivier Irisson

Robin Faillettaz
2017-07-11 — RESOMAR, Paris

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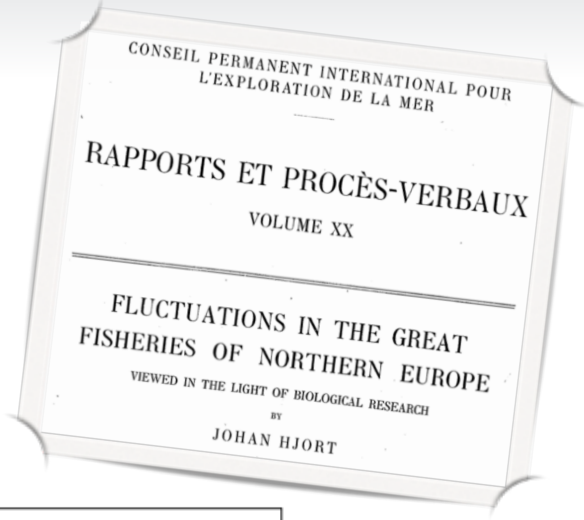
Laboratoire d'Océanographie de Villefranche (LOV)

40 professors/researchers + 30 science staff + ~60 PhD, post-docs, fixed-term jobs

3 teams

- Marine optics and biogeochemistry (remote sensing, floats, gliders, ...)
- Biodiversity and biogeochemistry (ocean acidification, toxic algae, microplastics, ...)
- Processes in pelagic ecosystems (plankton, imagery, carbon pump, Tara, ...)

Why studying fish larvae? Fish stock fluctuate


CONSEIL PERMANENT INTERNATIONAL POUR
L'EXPLORATION DE LA MER

RAPPORTS ET PROCÈS-VERBAUX

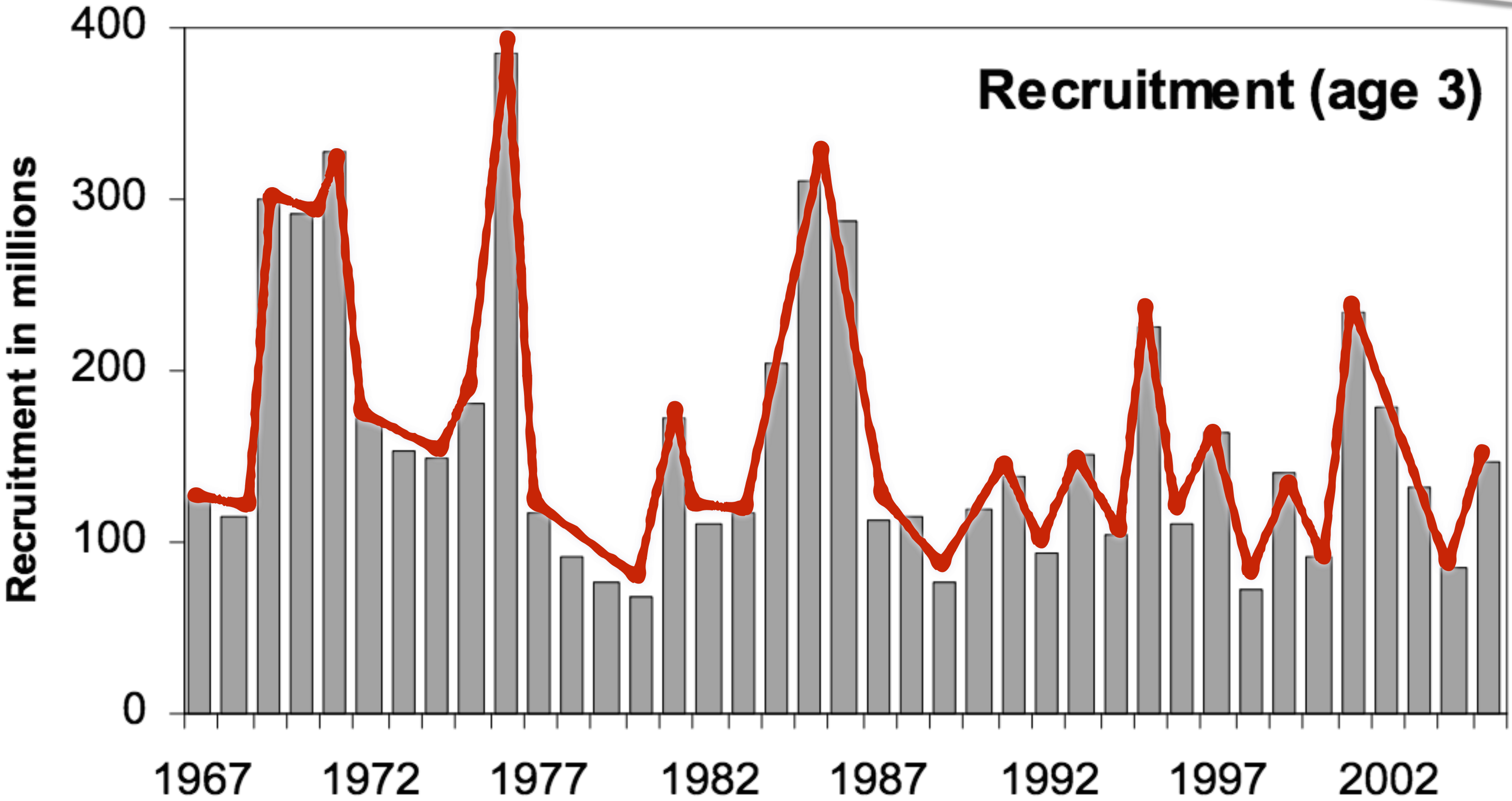
VOLUME XX

FLUCTUATIONS IN THE GREAT
FISHERIES OF NORTHERN EUROPE

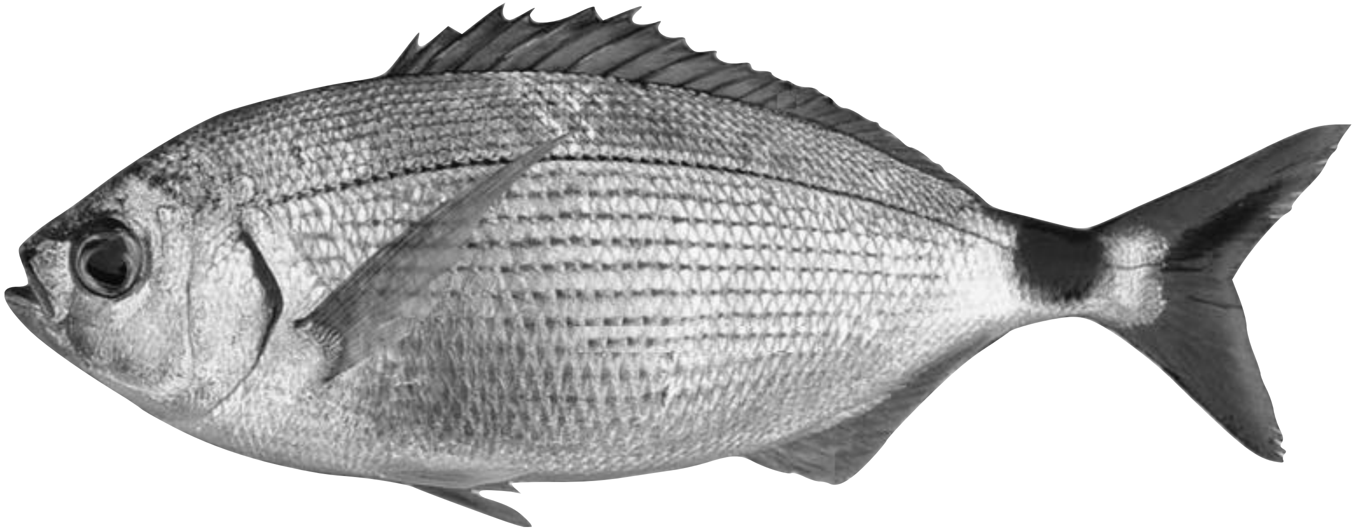
VIEWED IN THE LIGHT OF BIOLOGICAL RESEARCH

BY

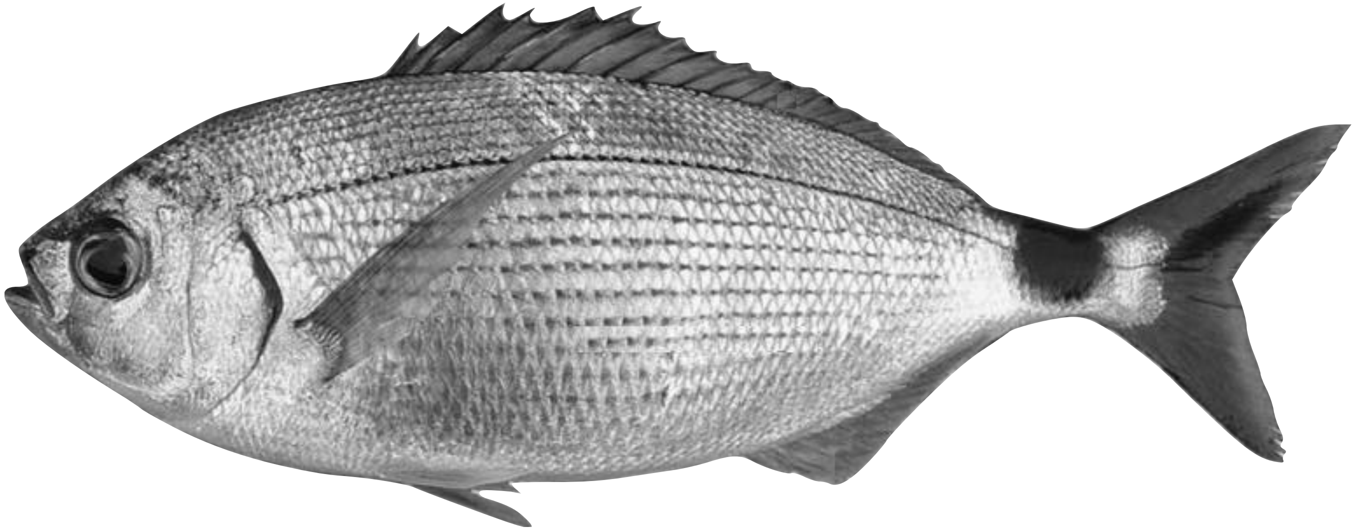
JOHAN HJORT

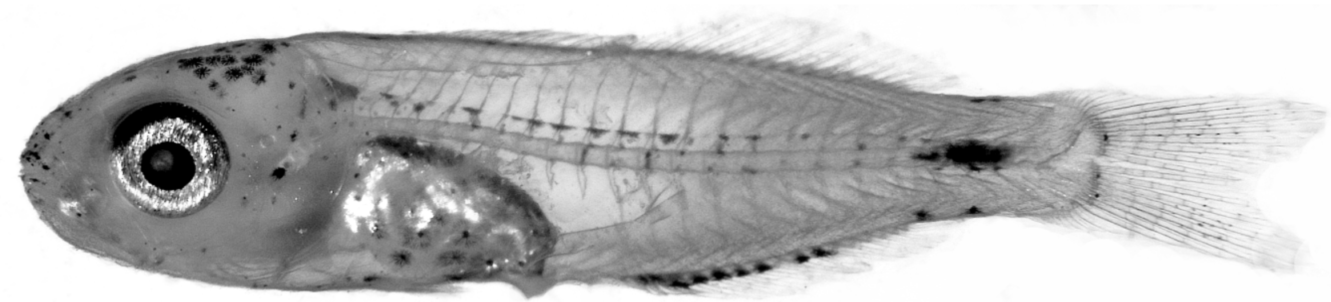


What is a fish larva ?

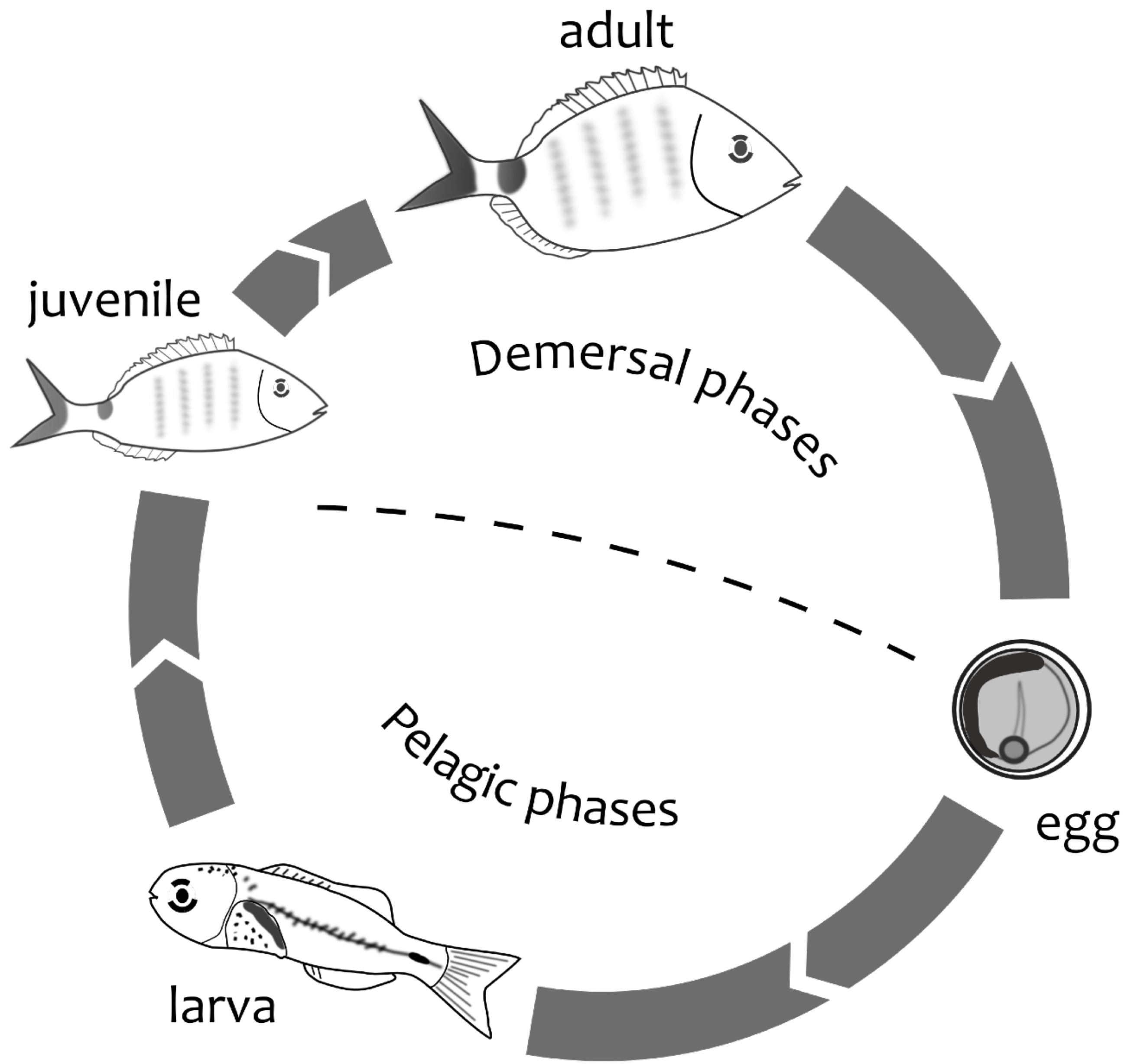


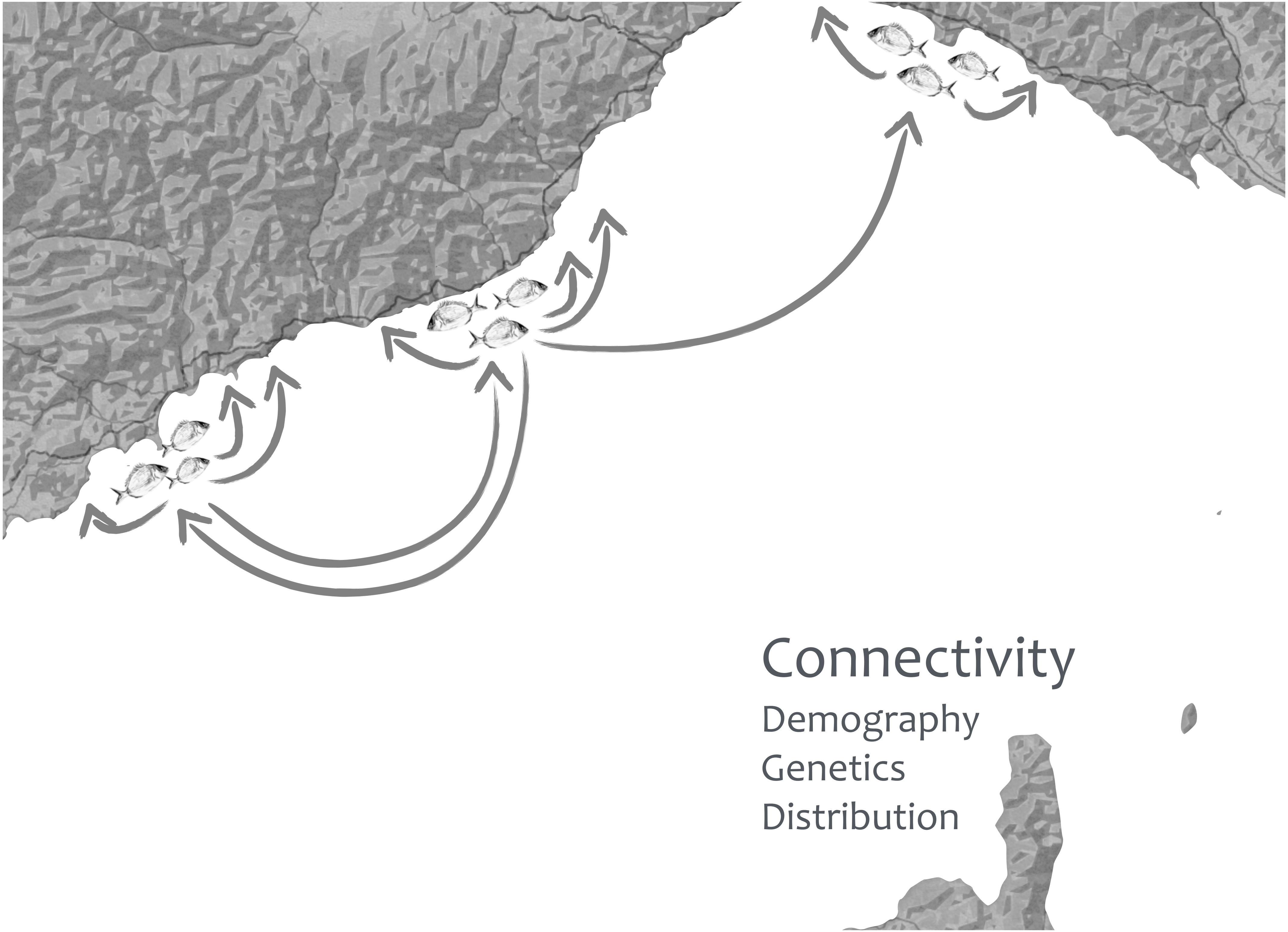
What is a fish larva ?





Complex life cycle





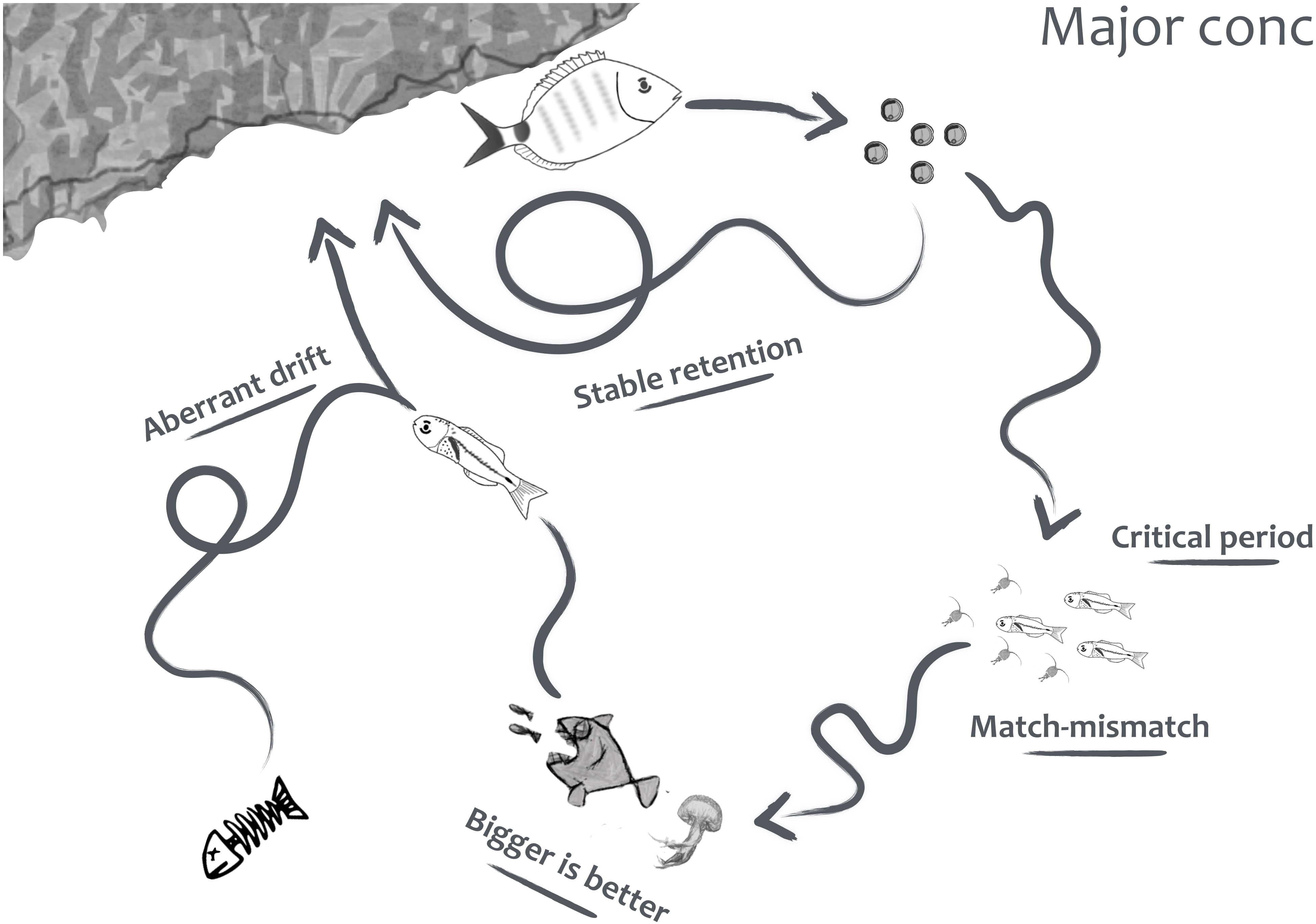
Connectivity

Demography

Genetics

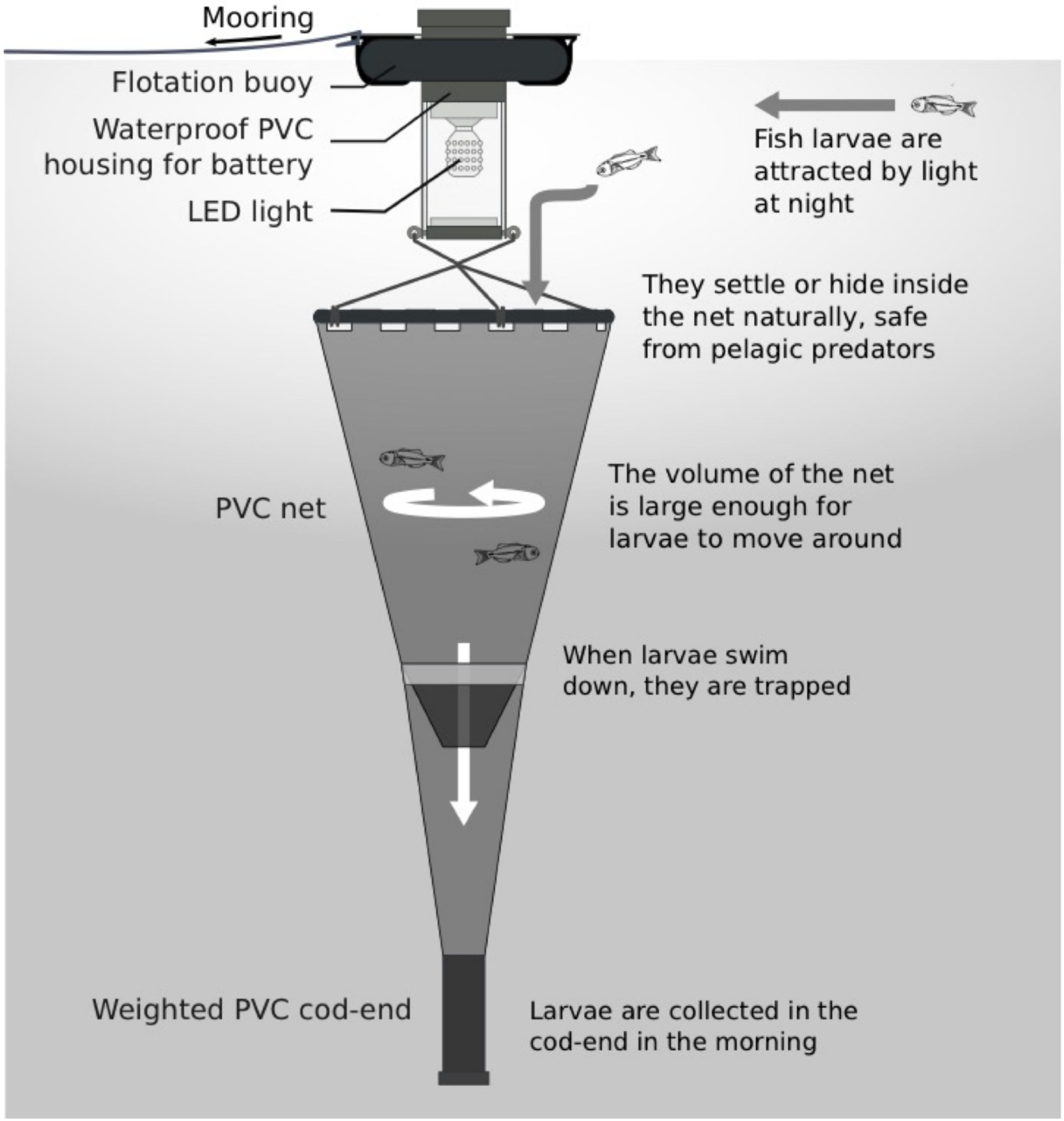
Distribution

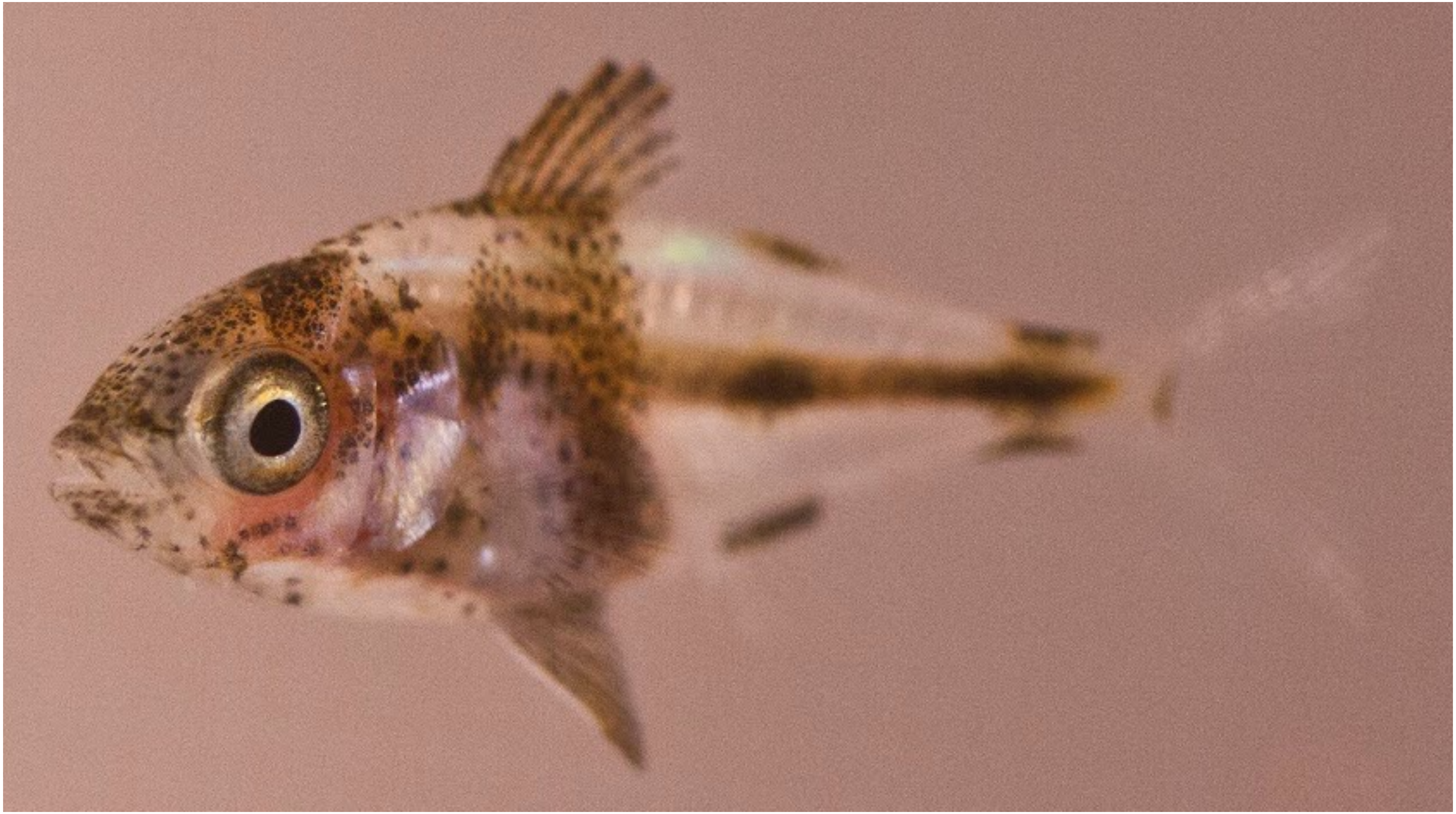
Major concepts



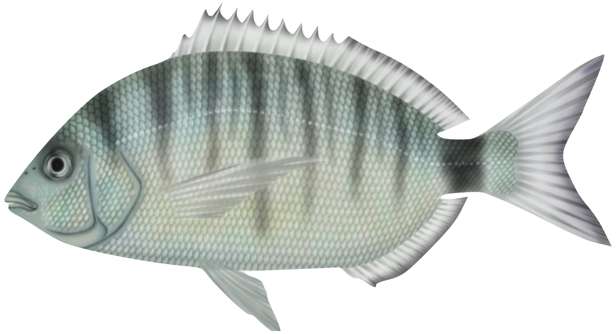
Sampling settlement-stage fish larvae with light-traps

- Selective gear
- Easy to set and retrieve
- Relatively cheap

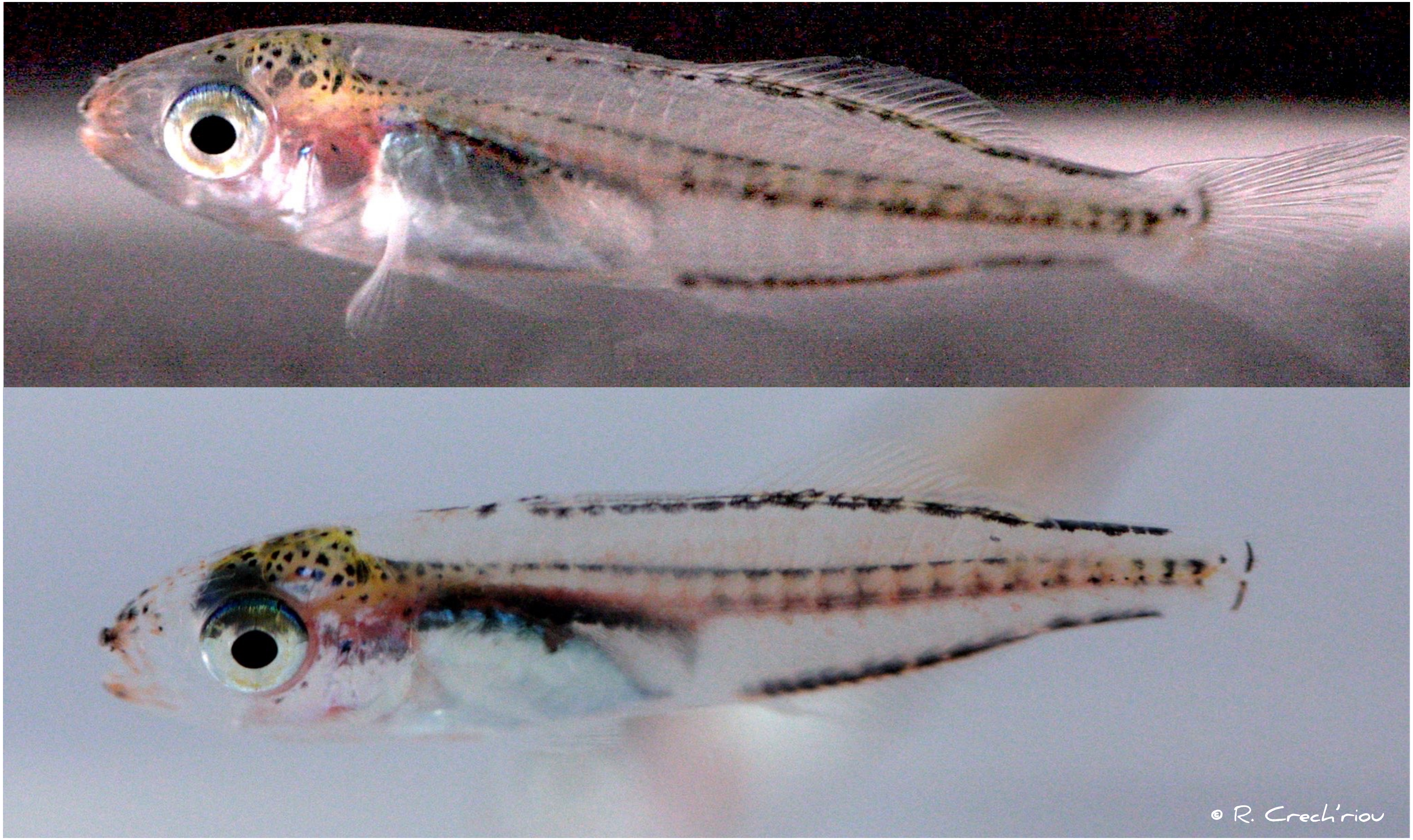


c.a. 12mm



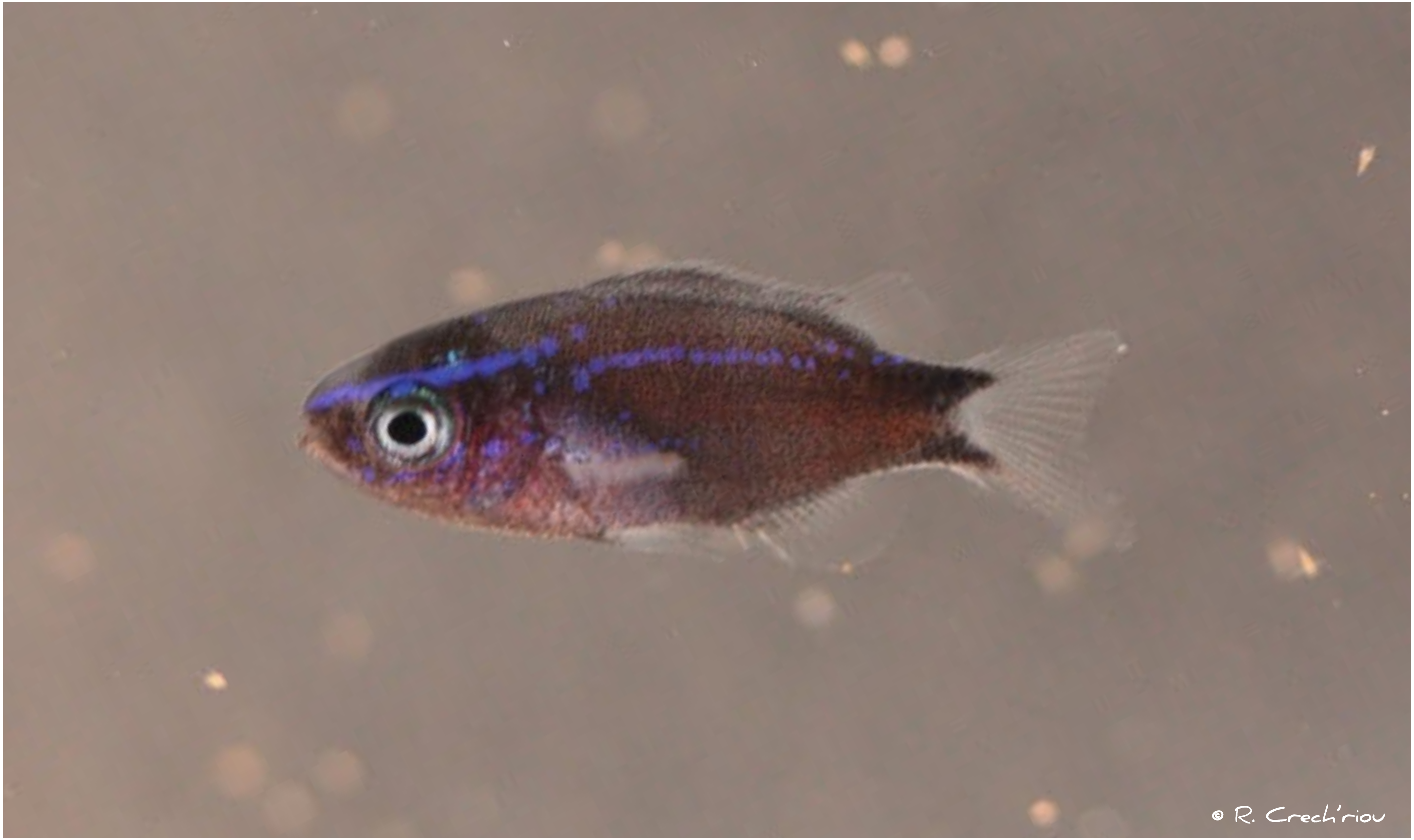
Diplodus puntazzo



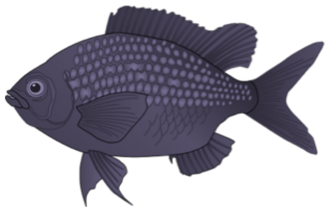
c.a. 12mm

Sarpa salpa

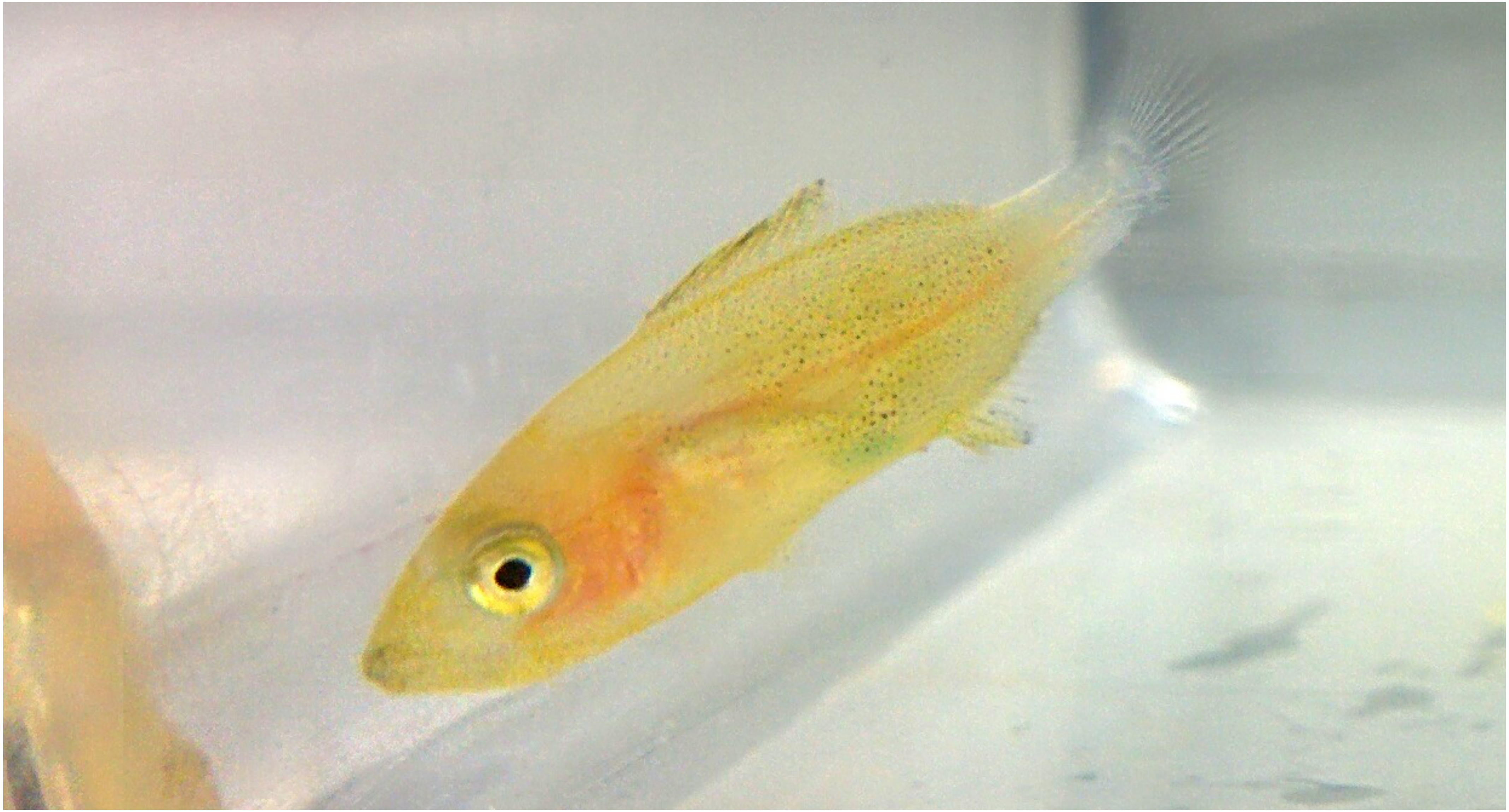

c.a. 13mm
Mugilidae
© R. Crech'riou



c.a. 10mm

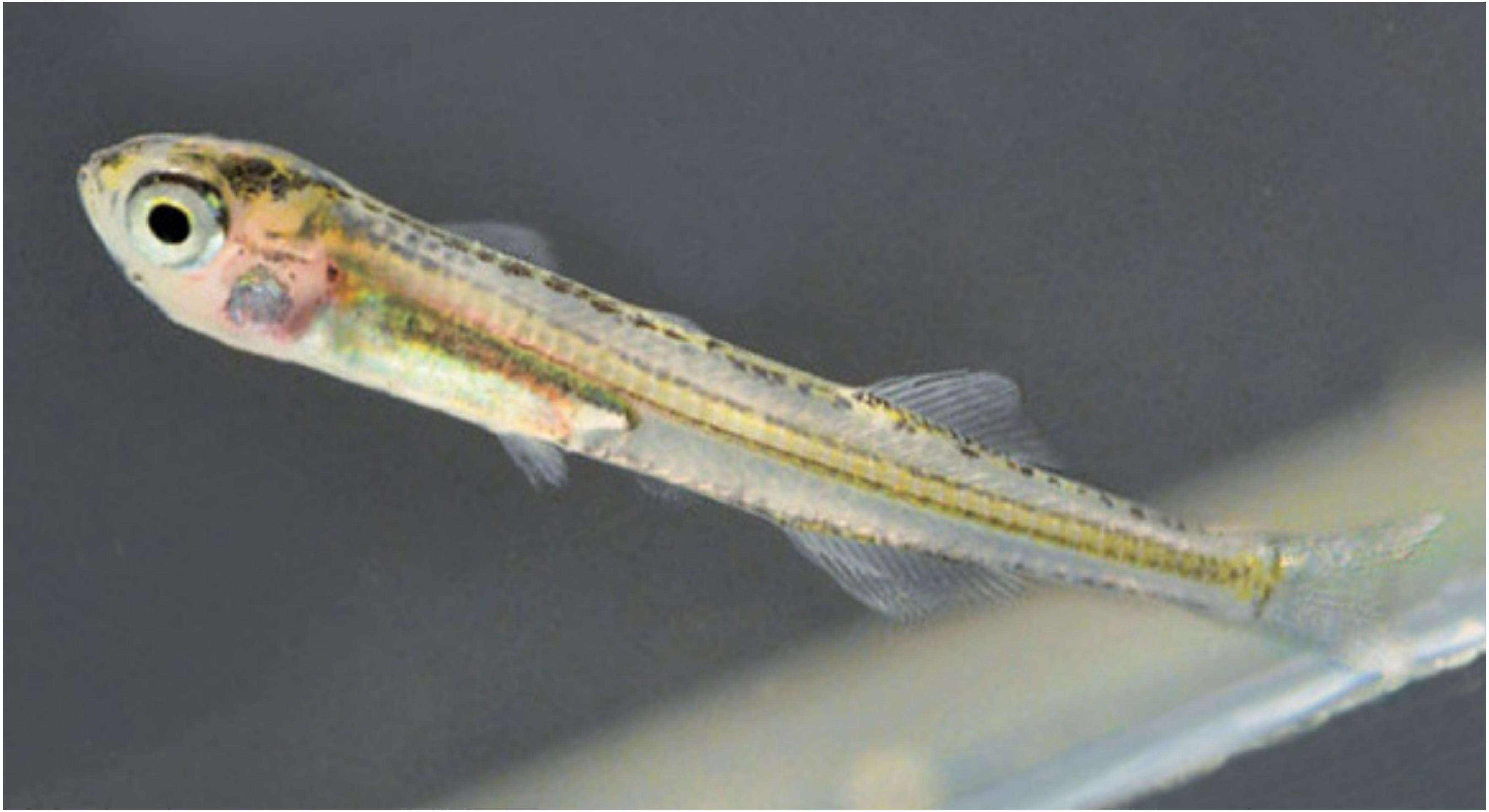


Chromis chromis

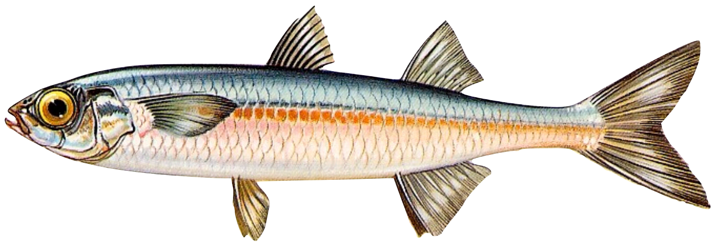


c.a. 15mm

Dentex dentex



c.a. 12mm



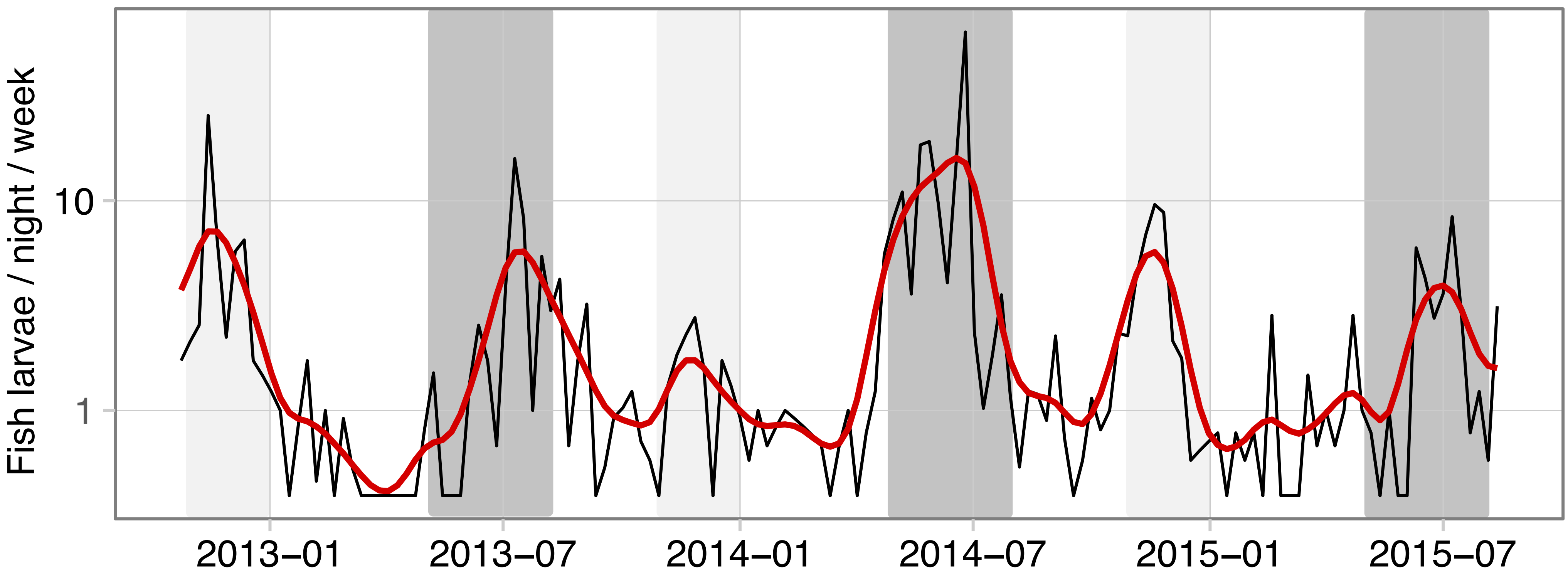
Atherina hepsetus

c.a. 25mm

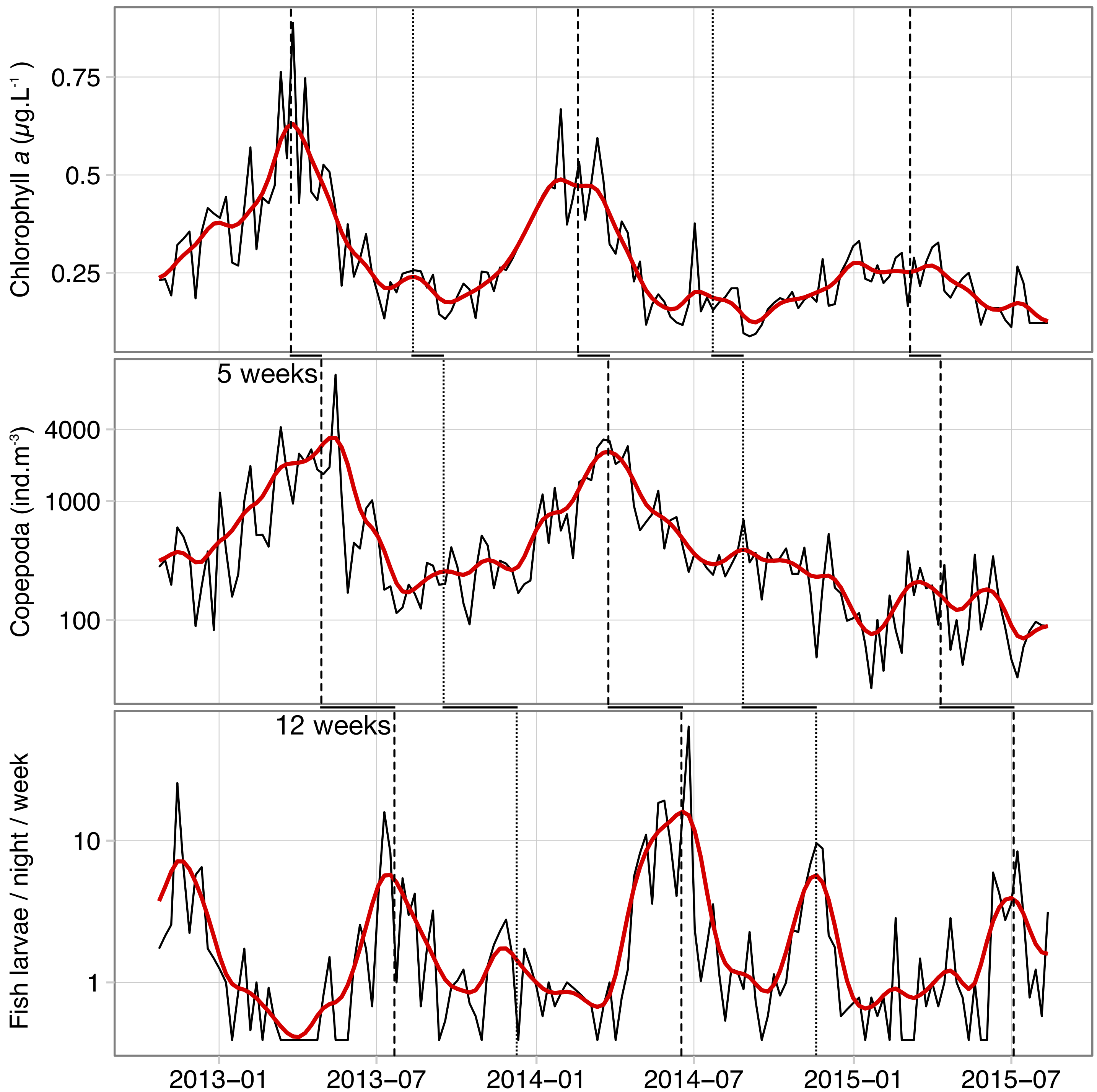
Ephinephelus marginatus

Fluctuations in abundance and link with environmental variability

- Strong seasonality
- High abundance : early summer and autumn

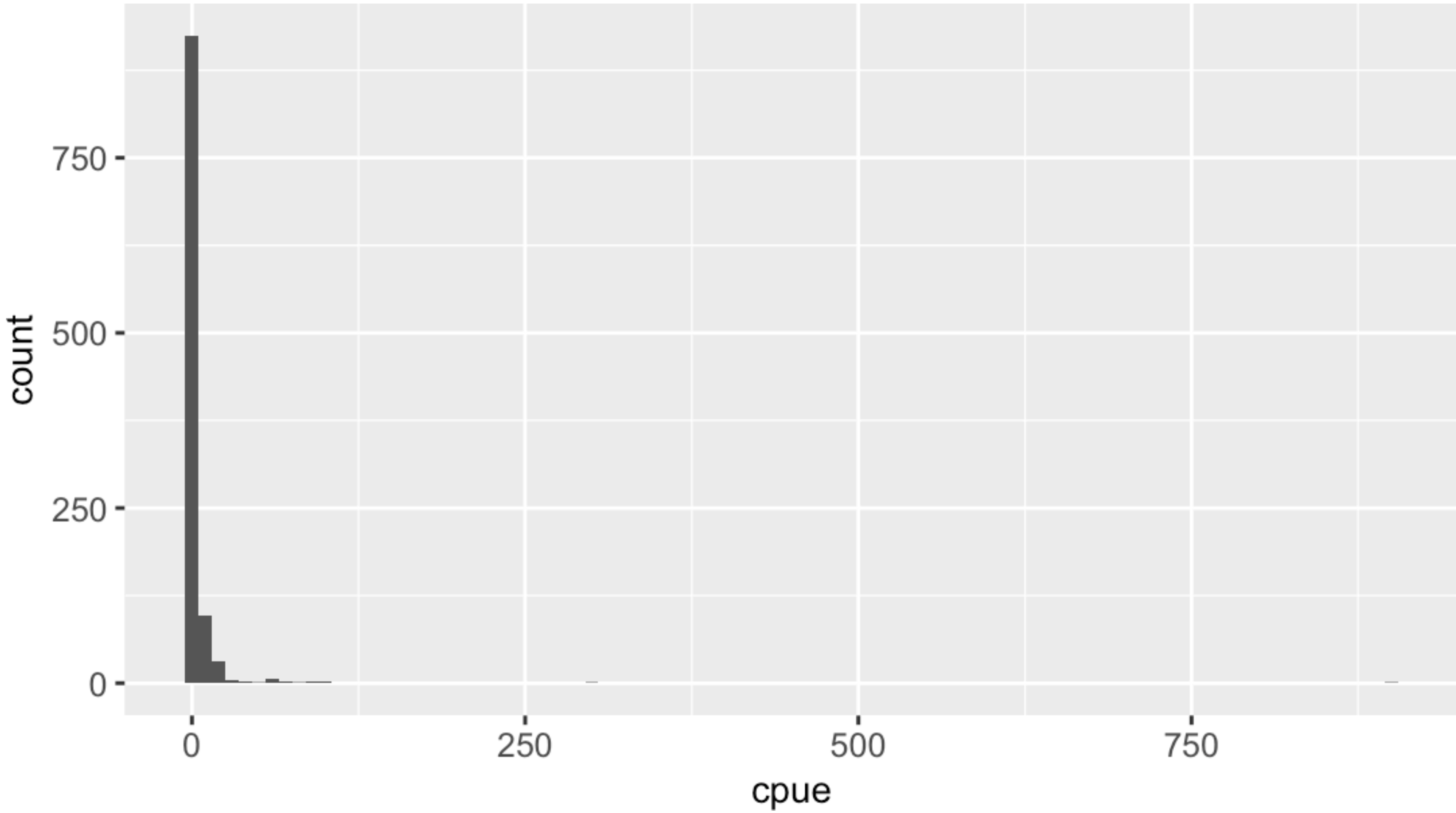


Fluctuations in abundance and link with environmental variability



Fluctuations in abundance

- Median CPUE = 0
- Statistical analyses based on **quantiles** (qANOVA, quantile regressions)



Fluctuations in abundance

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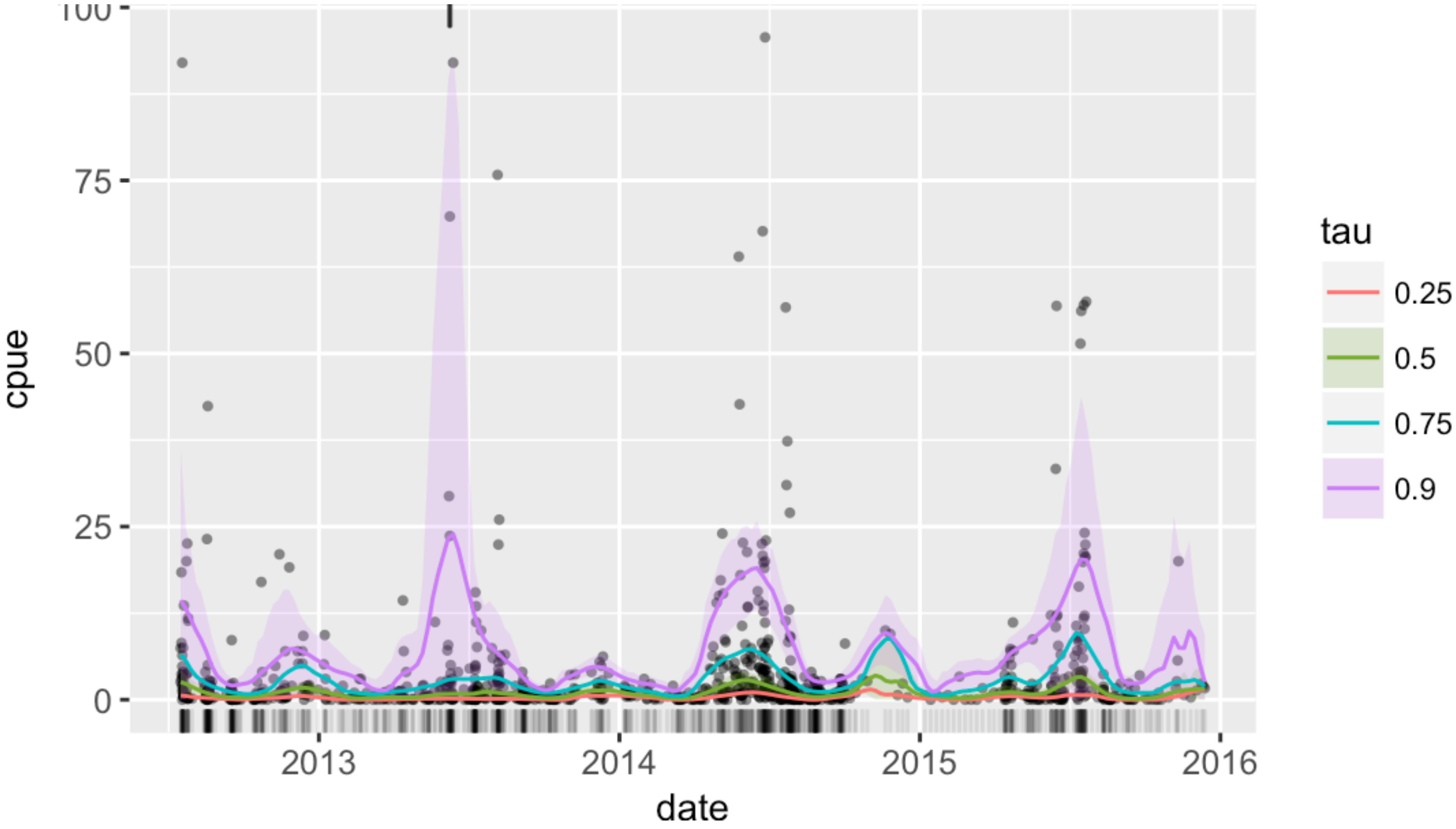
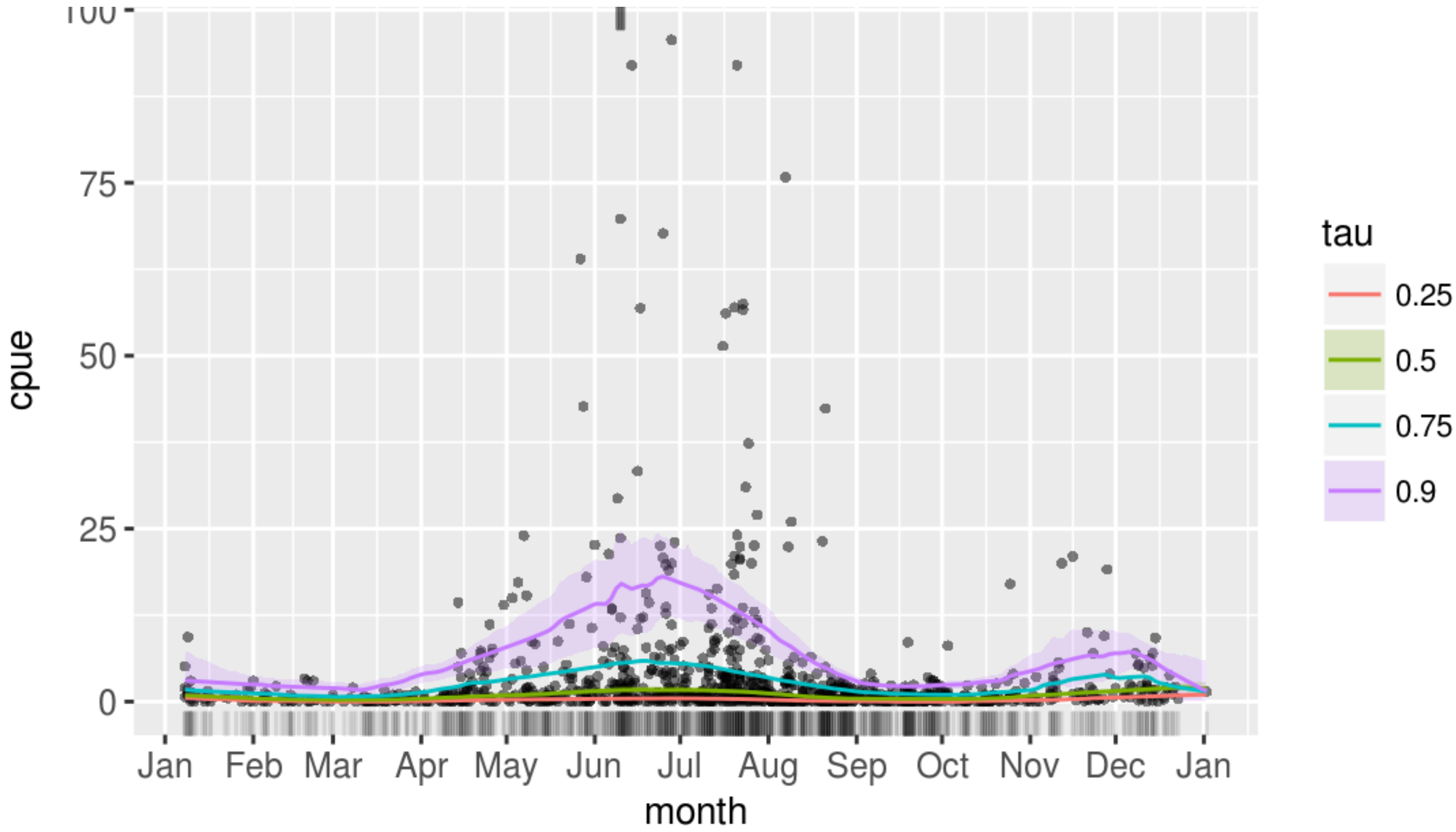
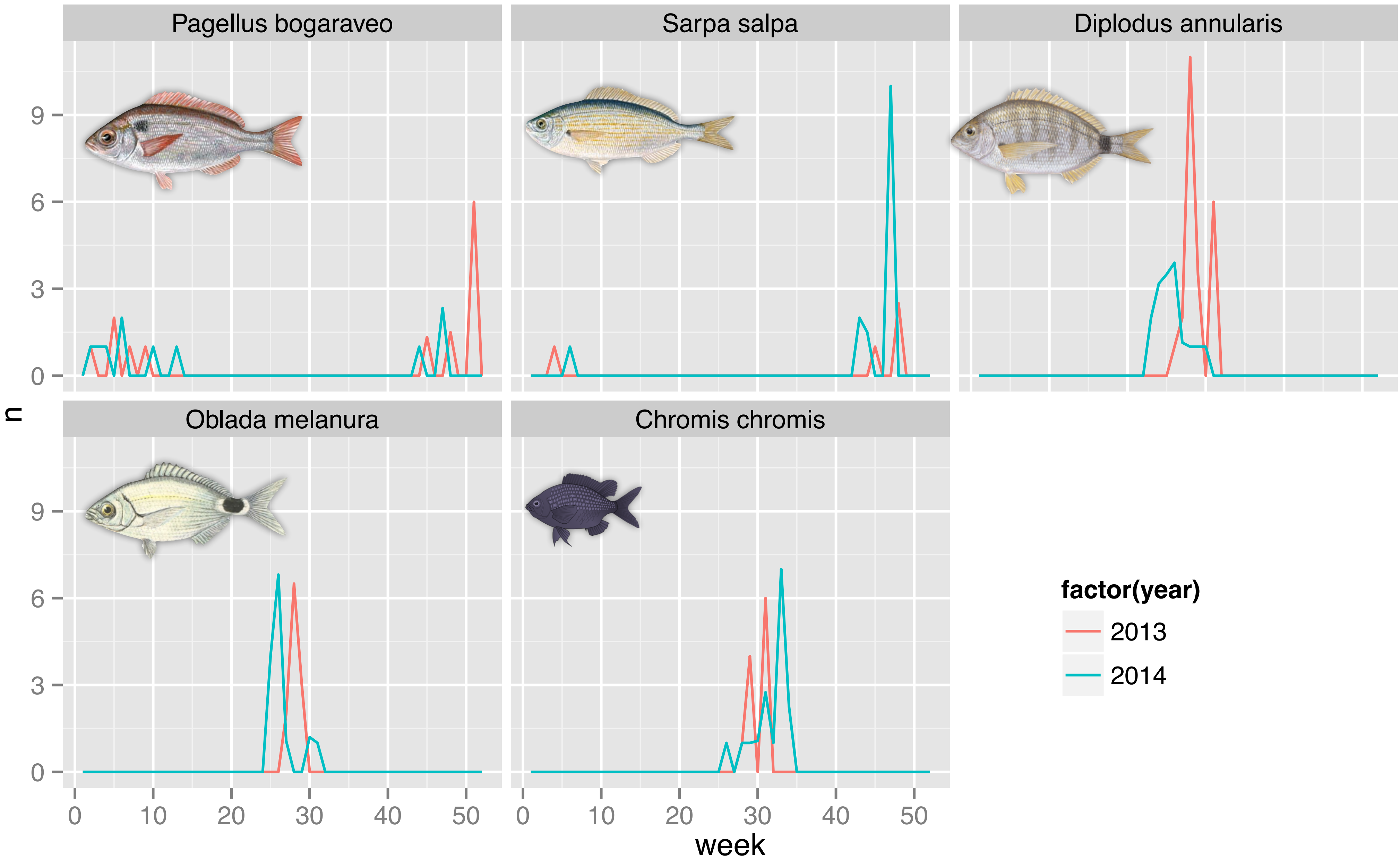


Fluctuations in abundance

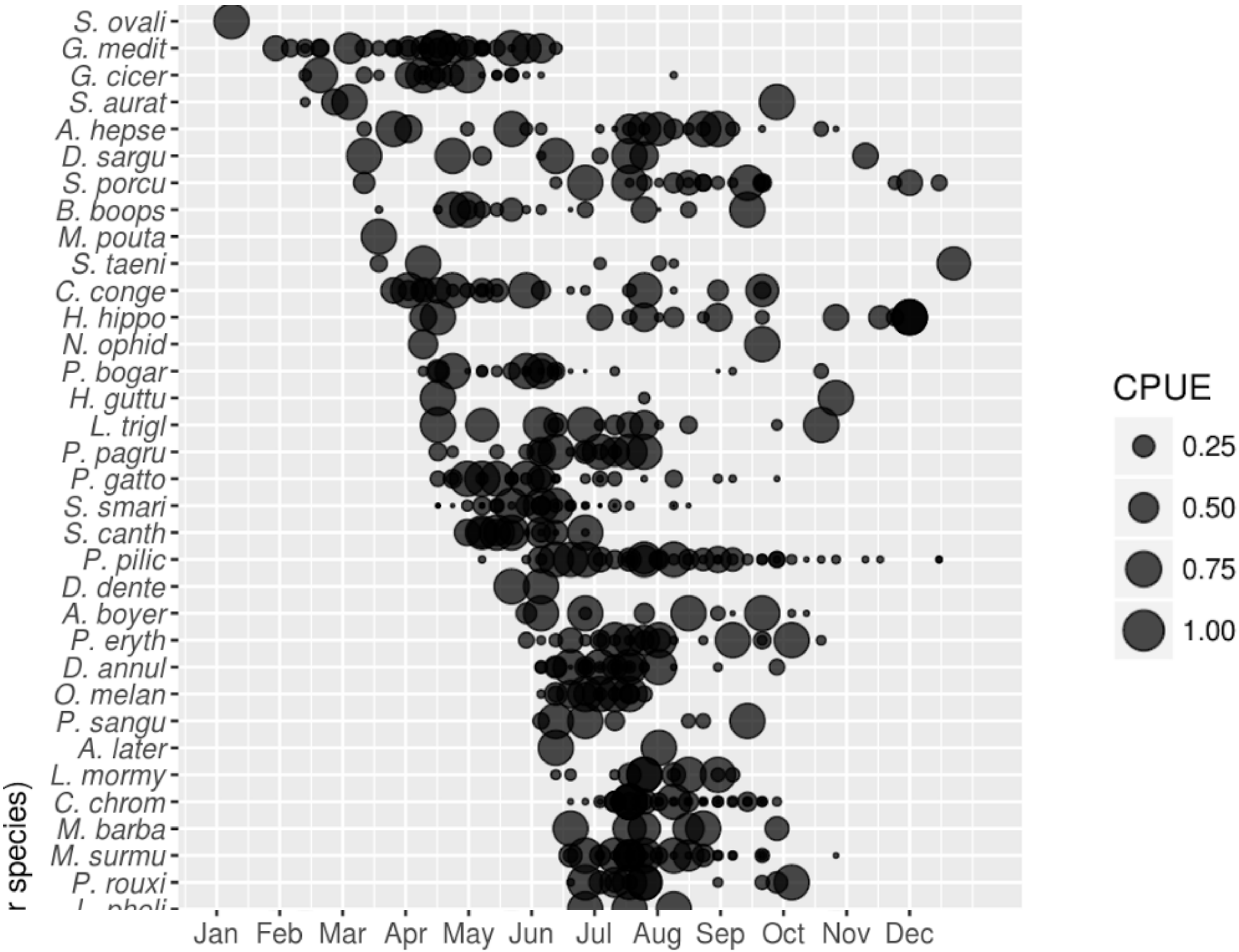
- Statistical analyses based on **quantiles** (qANOVA, quantile regressions)



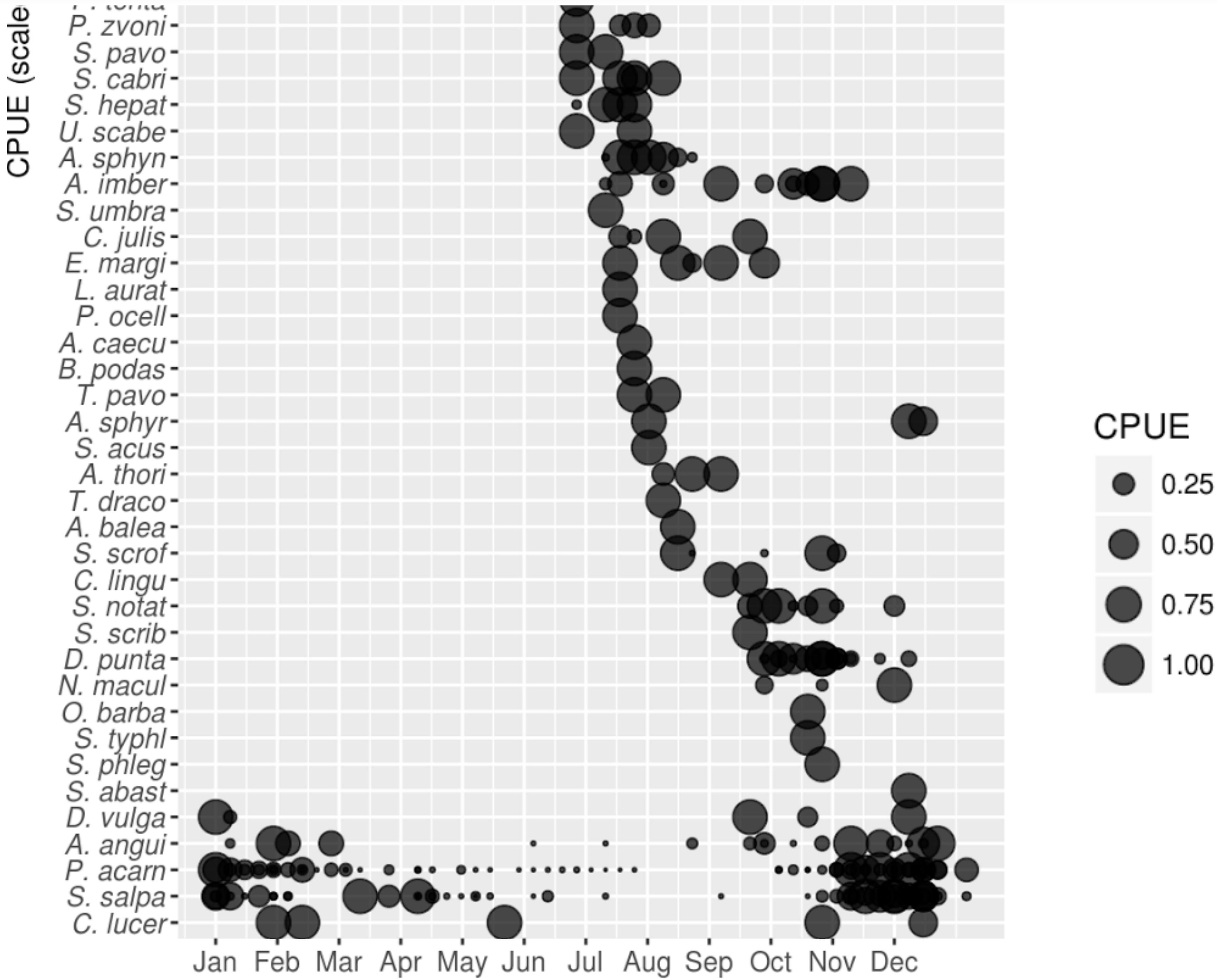
Strong seasonality among years



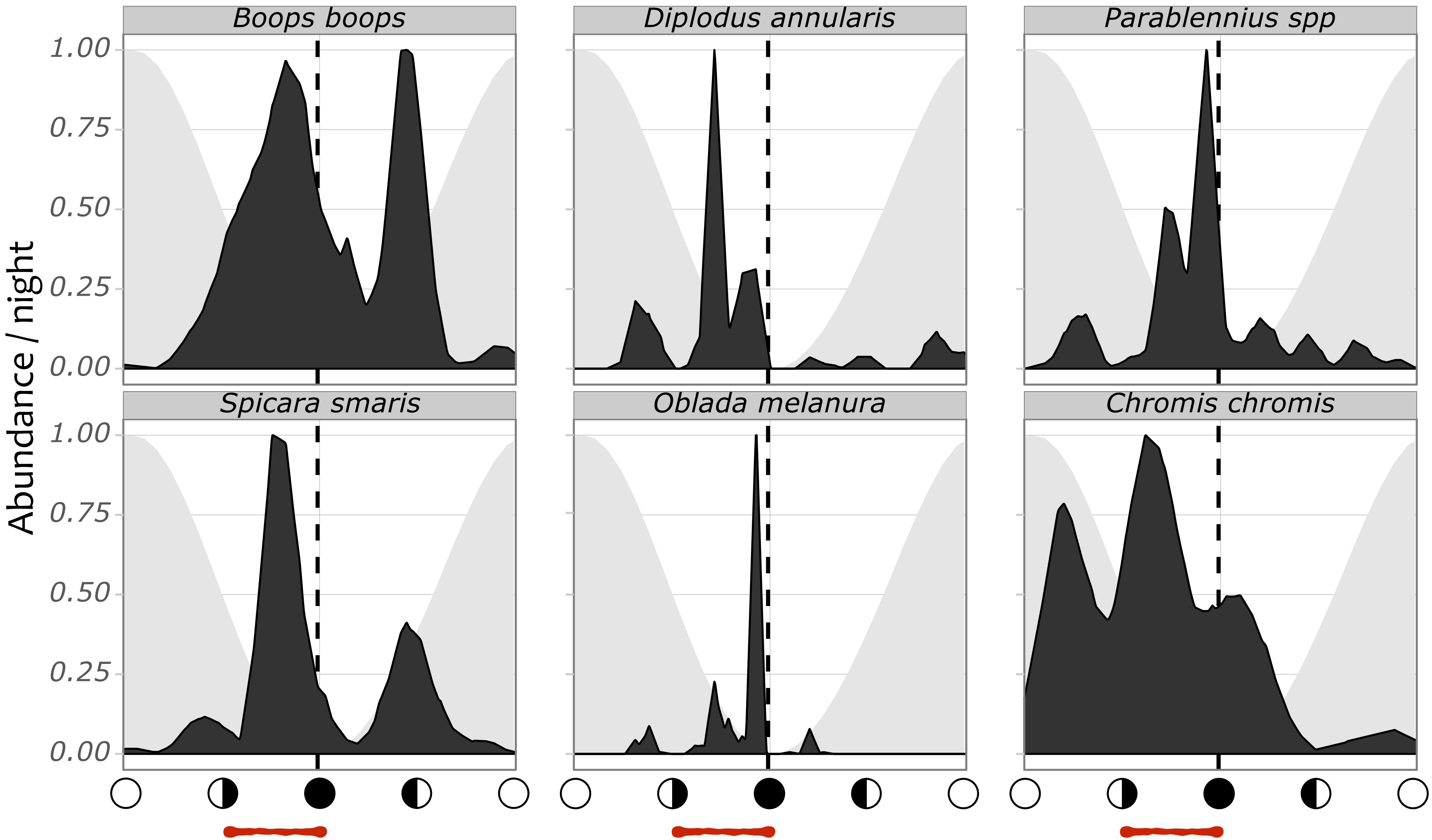
Strong seasonality per species



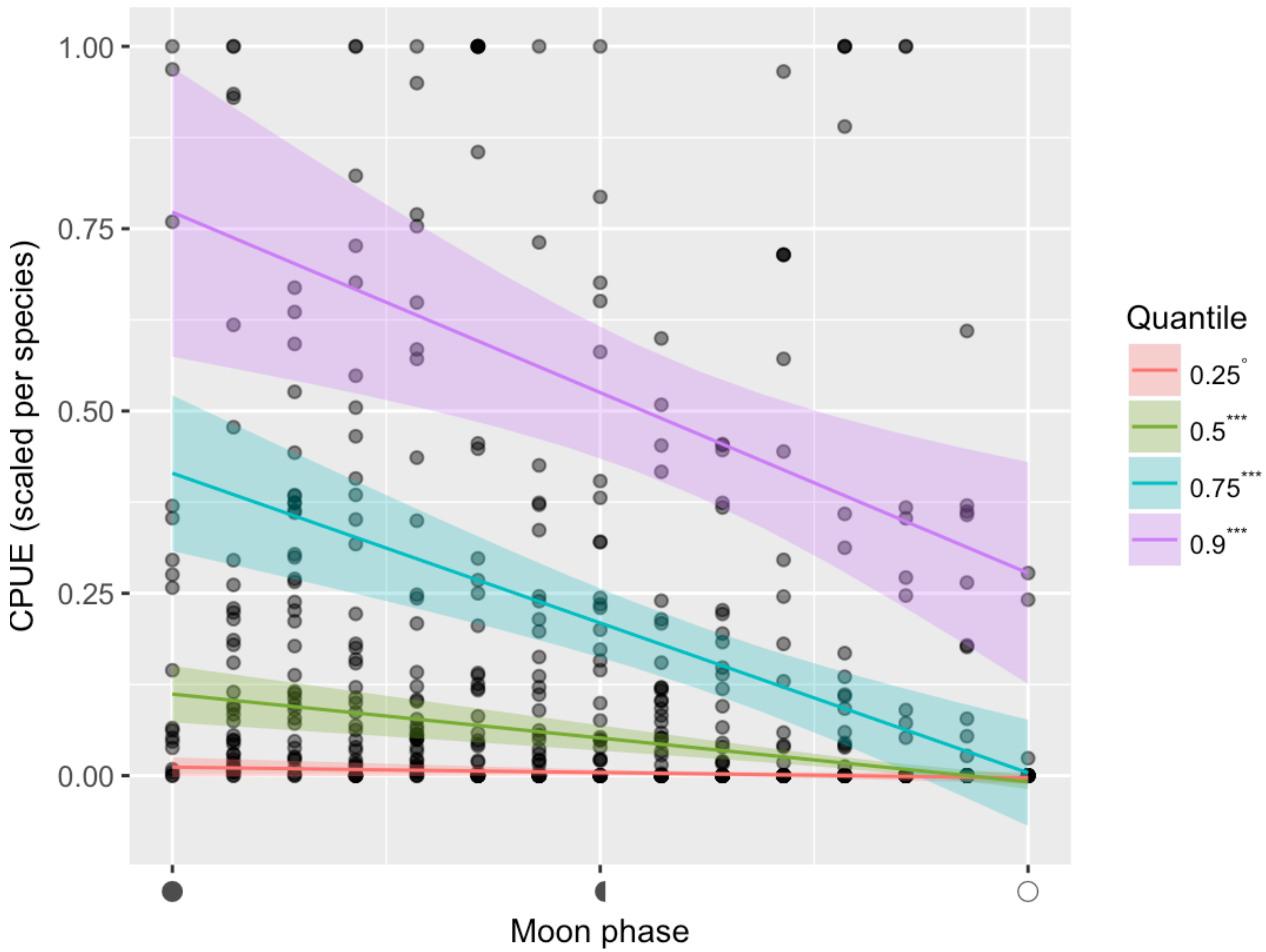
Strong seasonality per species



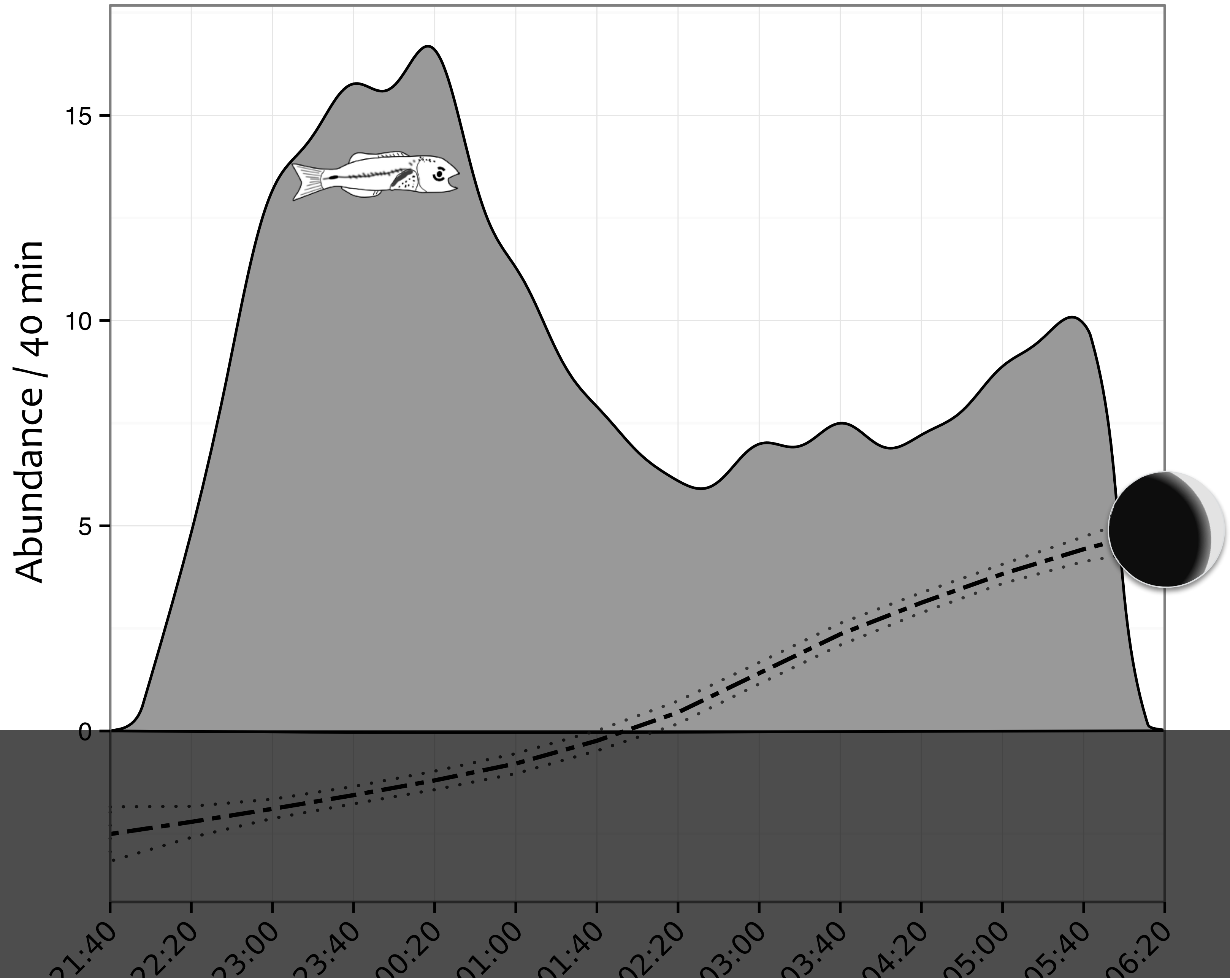
Month-scale timing of settlement: before the new moon

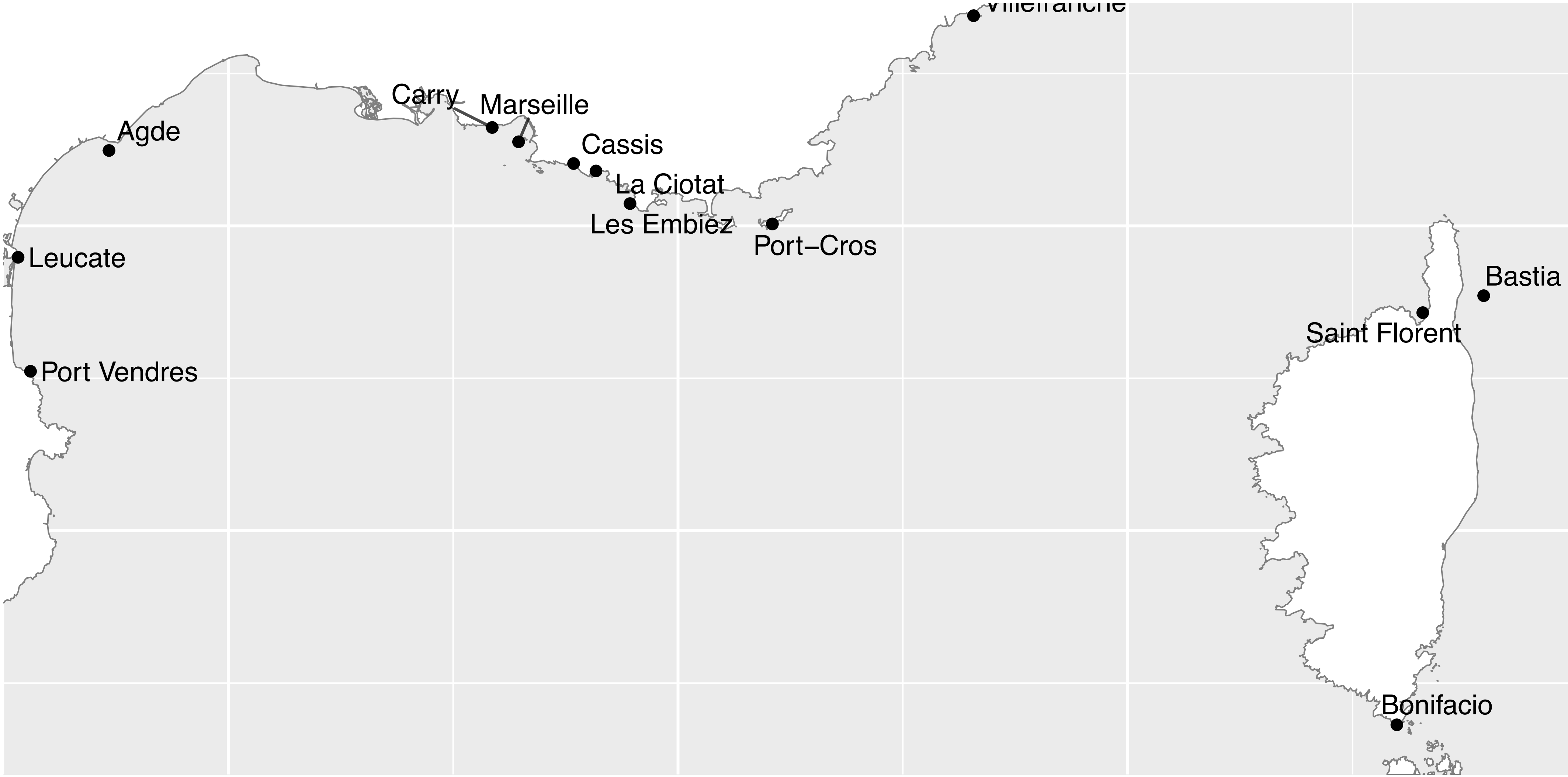


- Analyses statistiques basées sur les **quantiles** (qANOVA, regressions quantiles)



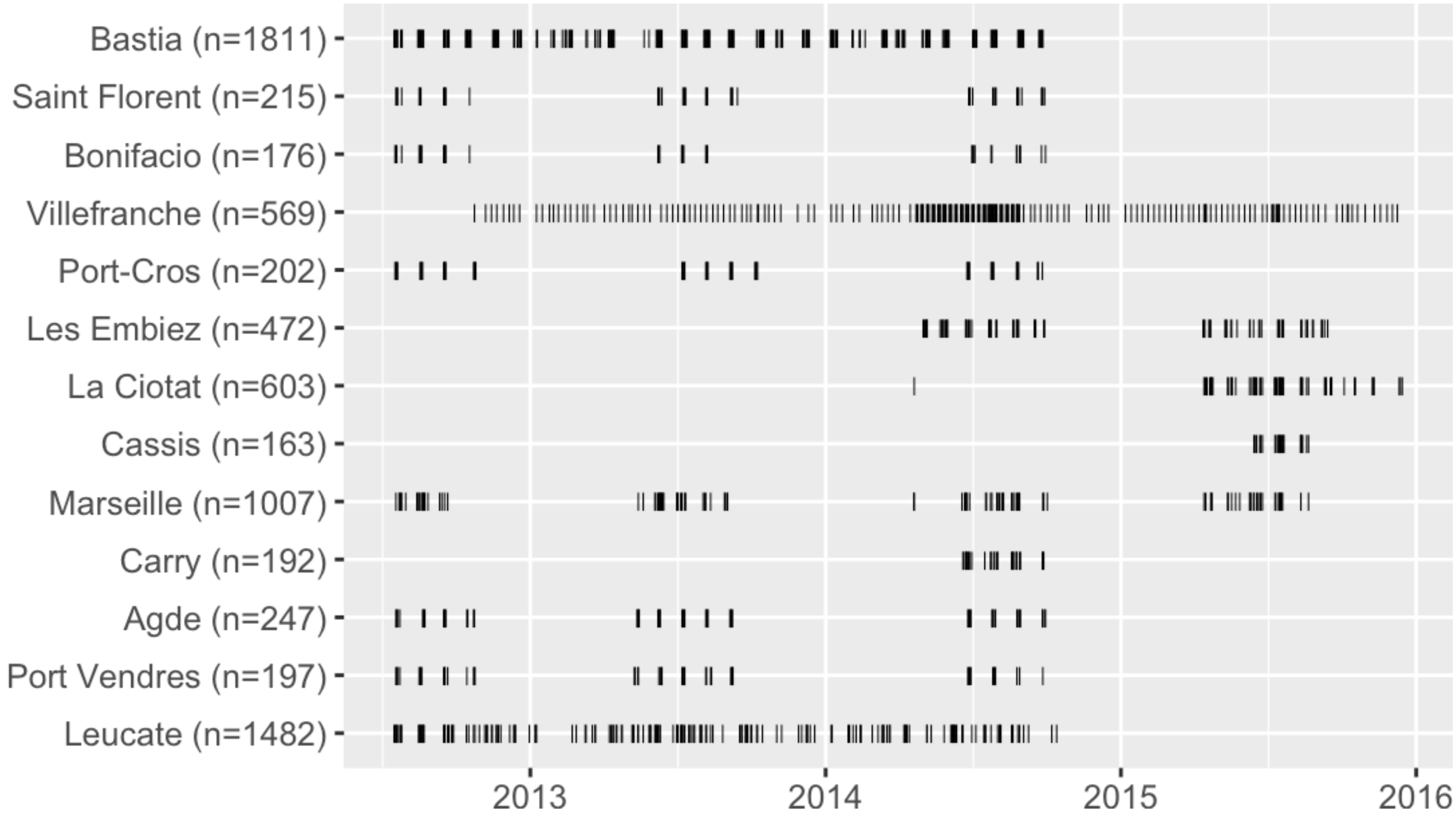
Night-scale timing of settlement: during darkest hours





- Université Pierre et Marie Curie - Paris 6
- Université de Corse
- Université de Perpignan
- ECOCEAN

Sampling effort



- Université Pierre et Marie Curie - Paris 6
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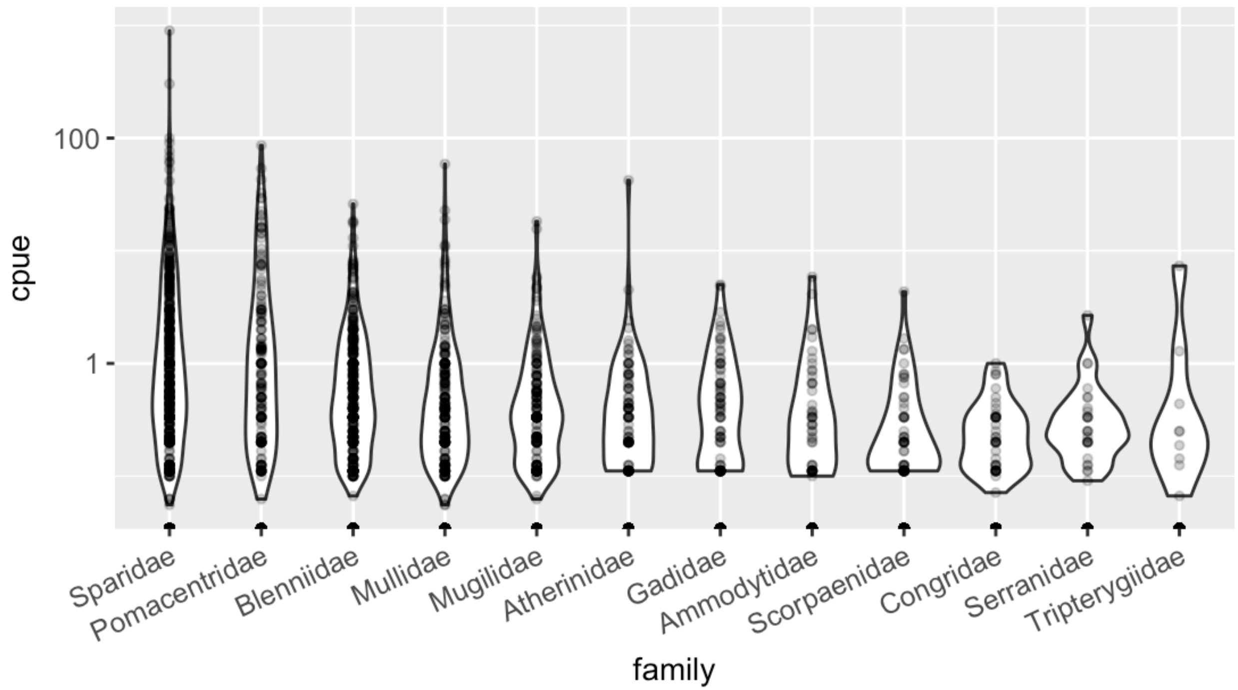
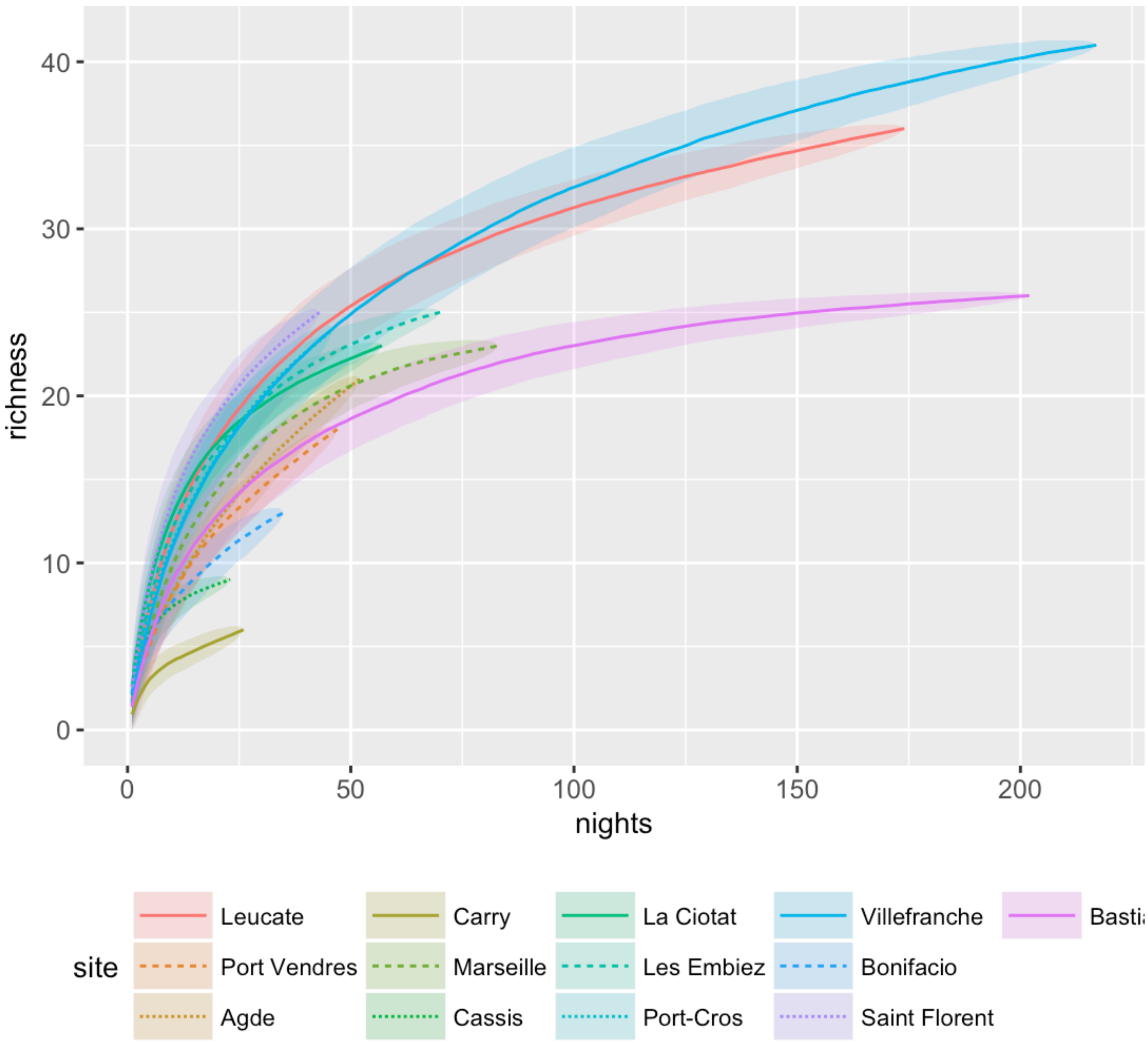
Species richness

- Comparison with **adults diversity in the Mediterranean**
  - 40% of families
  - 31% of genera
  - 30% species
- and with **demersal fishes diversity**
  - 57% of families
  - 39% of genera
  - 33% of species

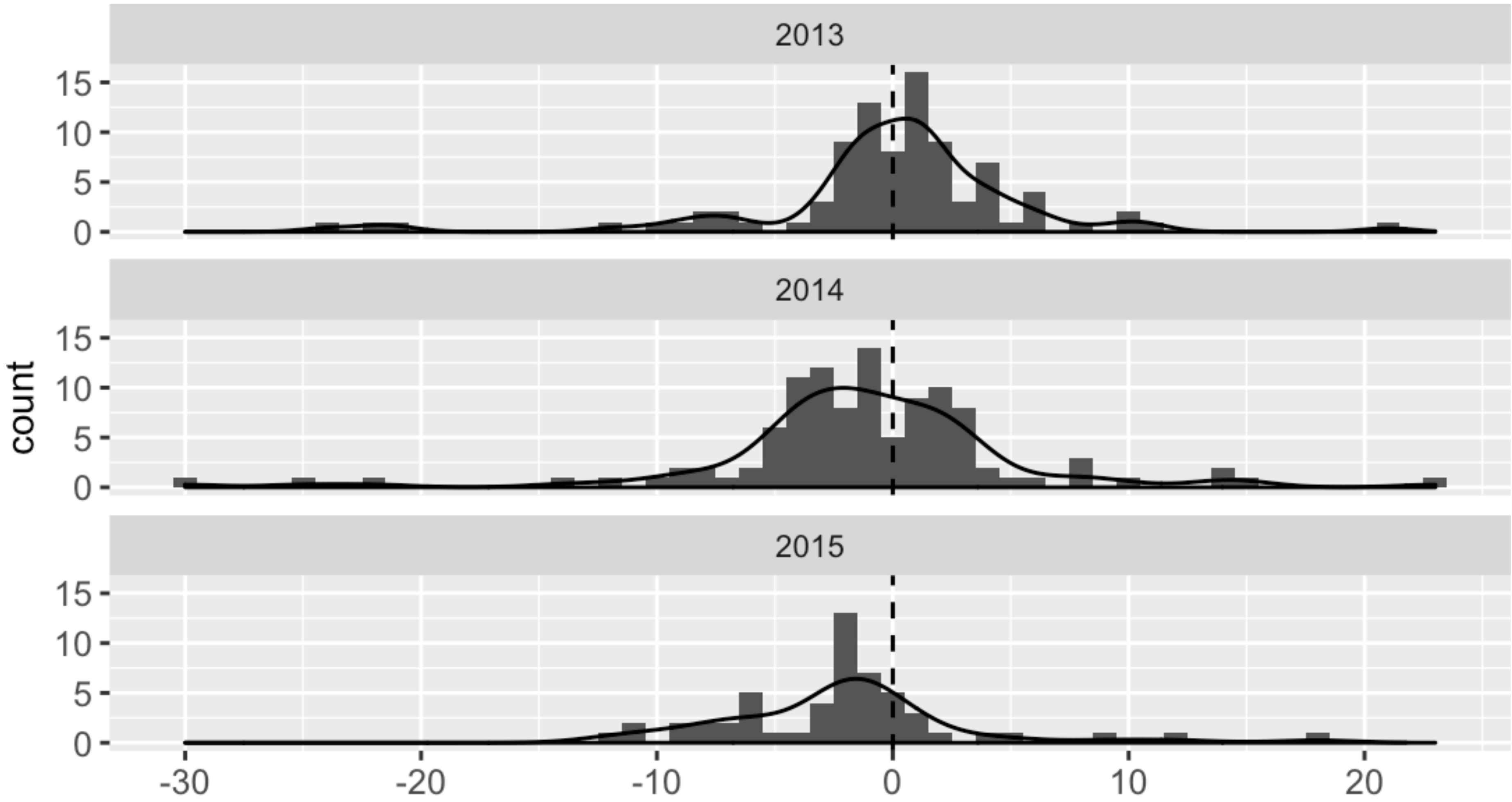
family	rel. abund. %	cum. abund. %
Sparidae	57.86	58
Pomacentridae	15.53	73
Blenniidae	10.04	83
Mullidae	6.42	90
Mugilidae	4.29	94
Atherinidae	1.68	96
Gadidae	1.47	97
Ammodytidae	0.83	98
Scorpaenidae	0.36	98
Congridae	0.27	99



Species richness



Among year anomalies in the timing of settlement



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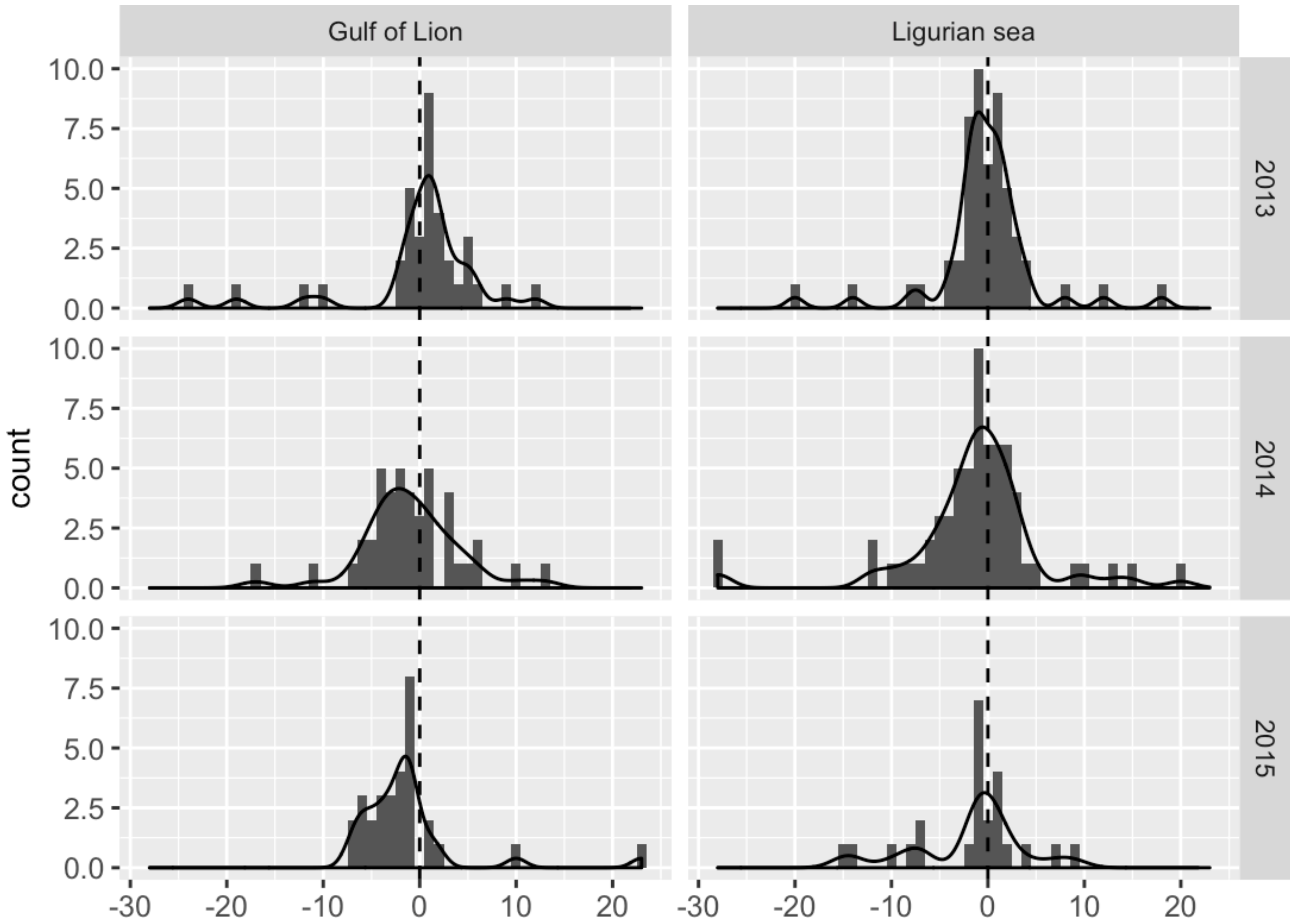

Discussion

- Generally consistent with the available literature
  - Time of settlement within a 1-2 month window around observed spawning dates in the Mediterranean
  - Large patterns comparable to Felix-Hackart *et al*.
- Strong influence of the moon on settlement
  - Comparable with patterns observed in the tropics
  - But not lunar-tides related (as no tides here)
- Gregarious behavior?
- Regular sampling required

Discussion

- Provides information on the success of the pelagic phase
- Regular sampling required (1 night / week)
- Easy to set up
- Relatively cheap

Point B time series : Larval Fish Conference 2013

DRIVERS OF TEMPORAL VARIABILITY OF LARVAL FISH ABUNDANCE IN VILLEFRANCHE BAY (NORTHWESTERN MEDITERRANEAN SEA) OVER A 7-YEAR TIME SERIES (2006-2012)

Robin Faillettaz; Jean-Olivier Irisson
UPMC Univ Paris 06, UMR 7093, LOV, Observatoire océanologique, F-06234, Villefranche/mer, France
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OBJECTIVES

EXPLORE A PART OF THE **50-YEAR POINT B TIME SERIES** TO STUDY **LARVAL FISH ABUNDANCE**

INTRODUCTION

Understanding the dynamics of larval fish has been of major interest in the past century, but temporal patterns are still difficult to predict. Few studies have tackled larval abundance in the Mediterranean Sea, all of them short term. We extracted a 7-year time series (2006-2012) with plankton and physical-chemical data from the work of the SO-RADE at point B station in the bay of Villefranche-sur-Mer, France, where zooplankton is **sampled daily since 1966**.

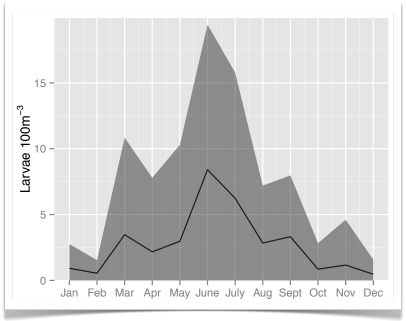

Figure 3: Monthly averaged larval fish abundance (black) ± standard deviation (gray area).

TEMPORAL PATTERNS

The time series showed strong seasonality, with higher abundances during late spring and early summer (highest captures in June with 8.8±10.7 individuals 100 m^{-3}; Fig. 3). Then, larval fish abundance tended to decrease throughout summer. A second peak was observed in early fall, which may suggest two main spawning periods. Yet, this data did not highlight any temporal pattern of larval size.

In 2008, 2010 and 2012 an early increase of abundance (March or earlier) has been observed and related to environmental parameters.

Data provided by "Service Observation en MIlieu LITtoral-SORade, INSU-CNRS-UPMC, OOV".

All analyses made in R 2.15.1, with packages stats and pastecs for time series decom-

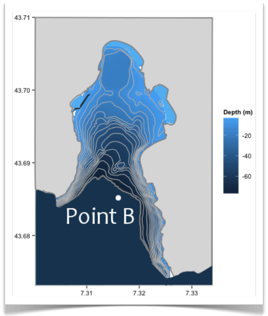

Figure 1: Location of Point B in Villefranche bay, France. This station allows the capture of both coastal and pelagic influences, since it is close to the shore while remaining in the pelagic environment because of the absence of continental shelf.

DATASET

Zooplankton data were obtained from daily samples with **Régent net** (opening 1 m, mesh 680 μm), pooled by week and analyzed using computer-assisted identification (**ZooScan**; Gorsky et al., 2003). Even though this sampling does not target ichthyoplankton, **fish larvae were caught in 185 of the 364 samples** (42.6%). Yet, no taxonomical resolution was available.

Data were regularized with a 7-day time step with a constant interpolation. This resulted in a **364 data point time series**.

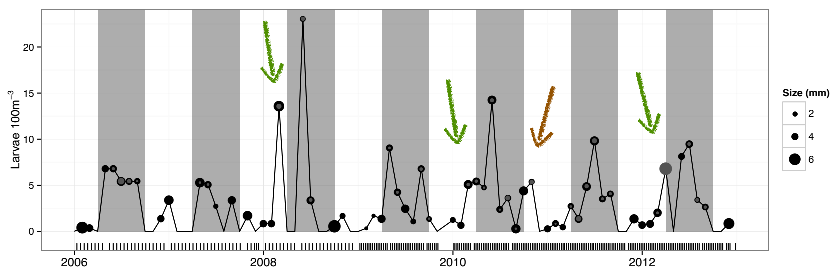

Figure 2: Complete time series of monthly averaged larval fish abundance. Original dates of processed samples are shown as the x-axis. Grey bands correspond to the theoretically favorable spawning period in the Northwestern Mediterranean Sea, from April to October. Arrows highlight the main peaks that occurred outside this period (green: earlier, orange: later). Dots are proportional to larval size averaged per month; gray dots inside black dots are larval size standard deviation.

COMPARISON WITH ENVIRONMENTAL VARIABLES

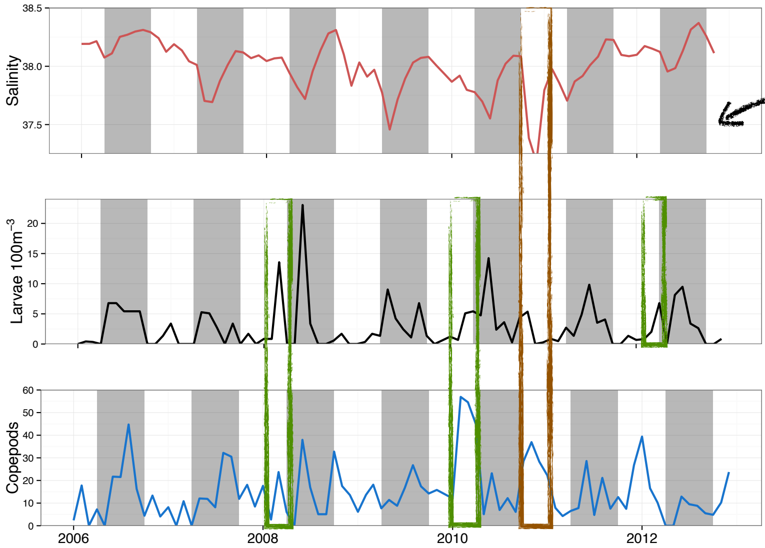

Figure 5: Time series of the variables significantly correlated to larval fish abundance between 2006 and 2012 (Pearson's correlation test, $p < 0.05$, $r_{(salinity)} = -0.23$, $r_{(copepods)} = 0.12$). Larval fish abundance is in black; copepods (in blue) are Candacia spp, potential prey for fish larvae; salinity is in red. Grey bands correspond to the theoretically favorable spawning period in the Northwestern Mediterranean Sea, ranging from April to October. Rectangles highlight the main events that occurred outside this period and that were observed in other variables (green: earlier, orange: later).

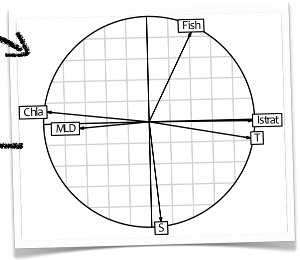

Figure 4: Principal Component Analysis with larval fish abundance and environmental data (Chla: Chlorophyll a; MLD: Mixed Layer Depth; S: Salinity; T: Temperature; Istrat: Stratification index) between 2006 and 2012.

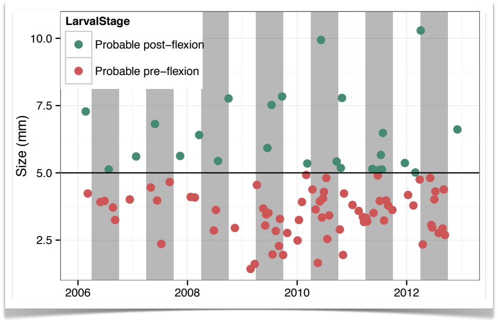

Figure 6: Larval fish size distribution between 2006 and 2012. Gray rectangles correspond to summer. Red dots are larvae < 5mm (potentially pre-flexion) and green dots larvae > 5mm (potentially post-flexion).

TAKE HOME MESSAGE

LARVAL FISH ABUNDANCE OF THIS **7-YEAR** TIME SERIES PRESENTED INTERESTING PATTERNS

- Strongly seasonal
- Inversely correlated to salinity
- Correlated to copepods abundance
- Doesn't seem to be related to moon phase

➡ SMALL LARVAE: **REPRODUCTION DYNAMICS**

➡ LARGER LARVAE: **RECRUITMENT DYNAMICS**

NO TAXONOMICAL INFORMATION AVAILABLE NOR ON SMALL TEMPORAL SCALES, BUT…

MORE THAN 40 YEARS OF WEEKLY SAMPLES ARE **AVAILABLE** THAT WILL BE ADDED TO STUDY **LONG TERM ICHTHYOPLANKTON DYNAMICS**