

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
faillettaz@obs-vlfr.fr



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.

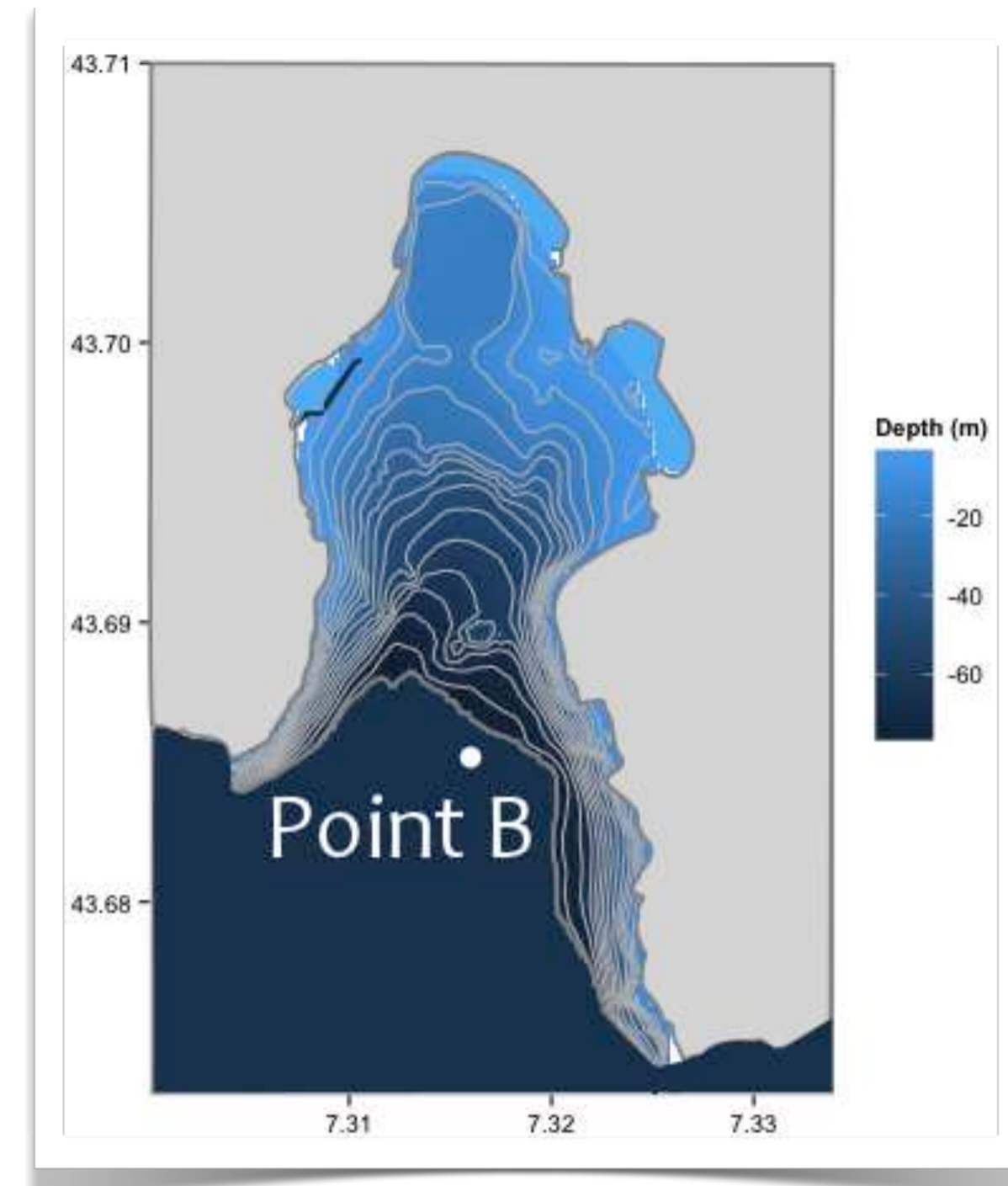


Figure 1: Location of Point B in Villefranche bay, France. This station allows the capture of both coastal and pelagic influences, since it is close to the shore while remaining in the pelagic environment because of the absence of continental shelf.

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**.

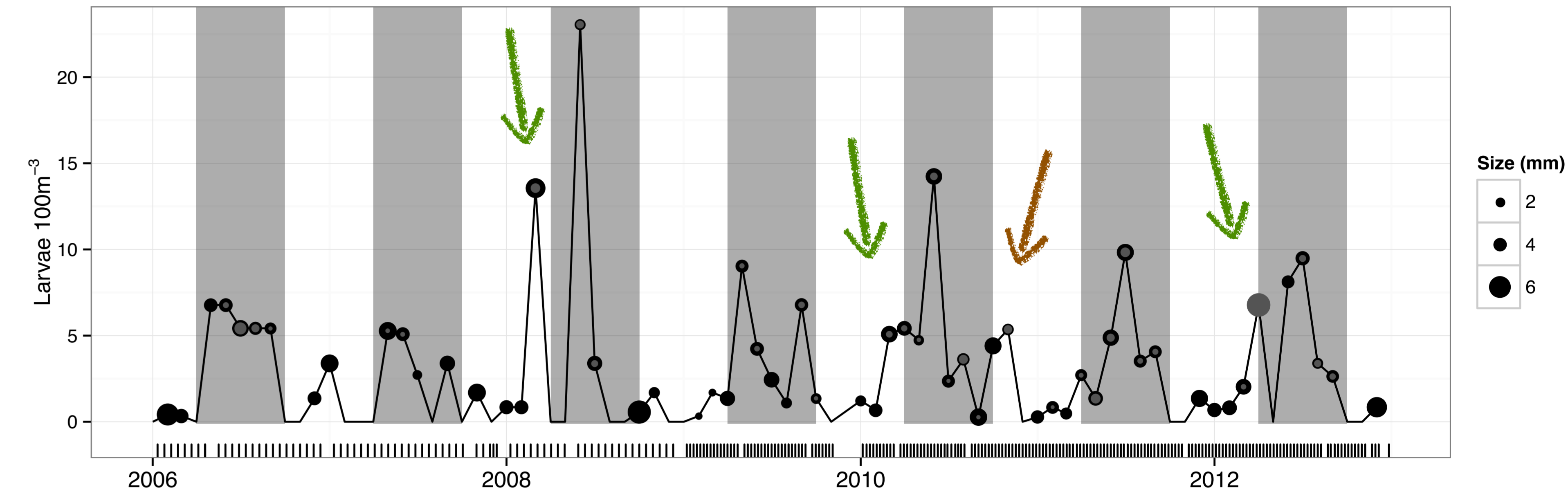


Figure 2: Complete time series of monthly averaged larval fish abundance. Original dates of processed samples are shown as the x-axis. Grey bands correspond to the theoretically favorable spawning period in the Northwestern Mediterranean Sea, from April to October. Arrows highlight the main peaks that 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.

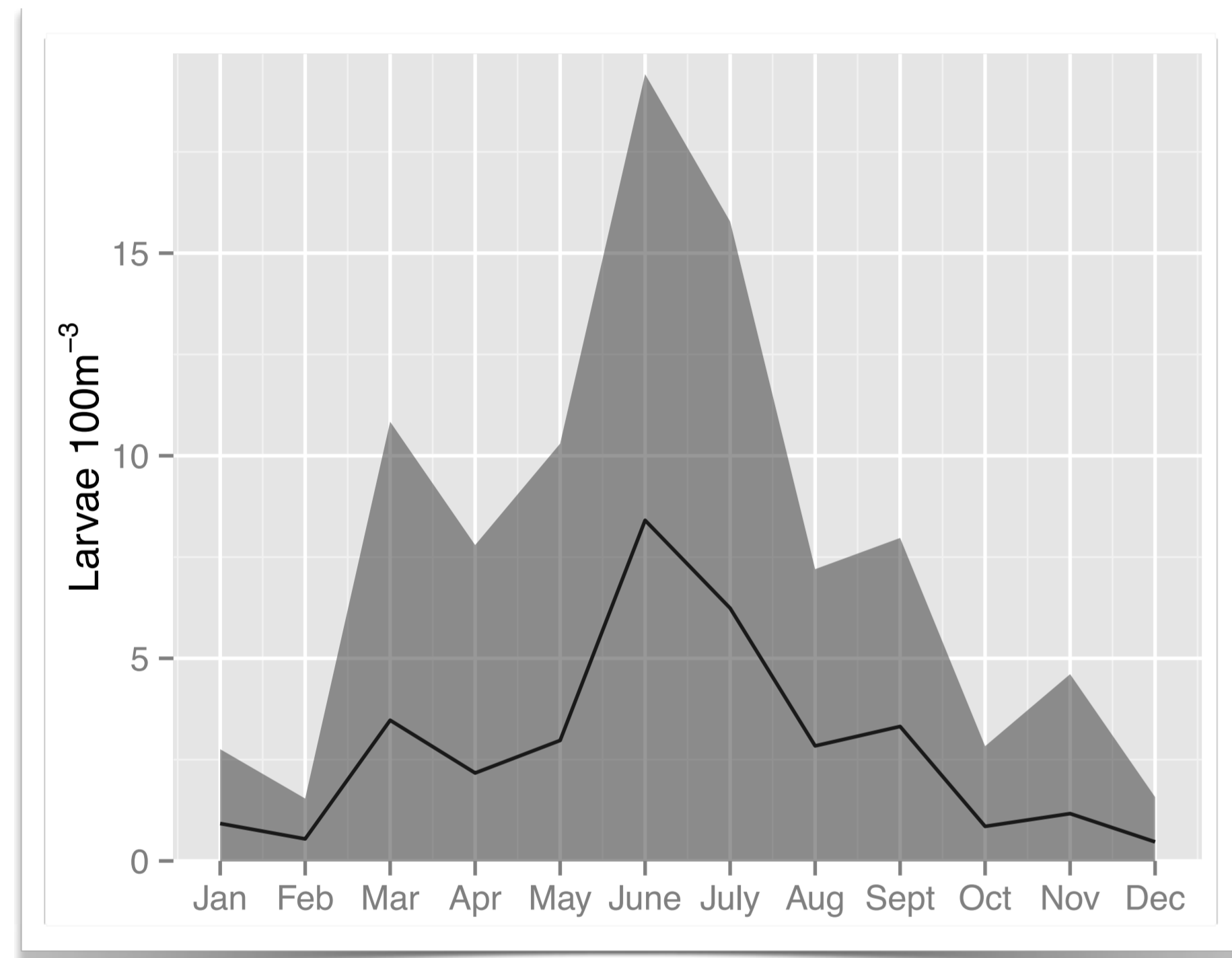


Figure 3: Monthly averaged larval fish abundance (black) \pm standard deviation (gray area).

COMPARISON WITH ENVIRONMENTAL VARIABLES

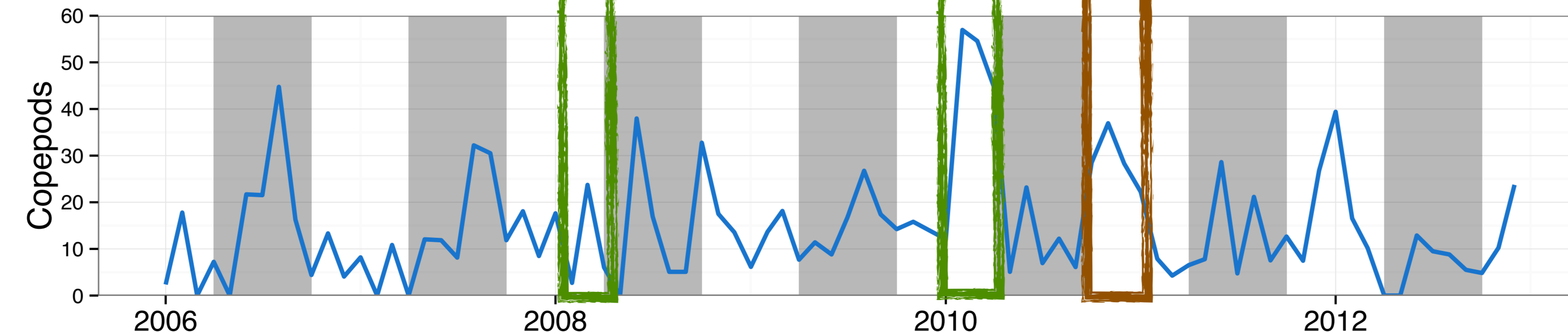
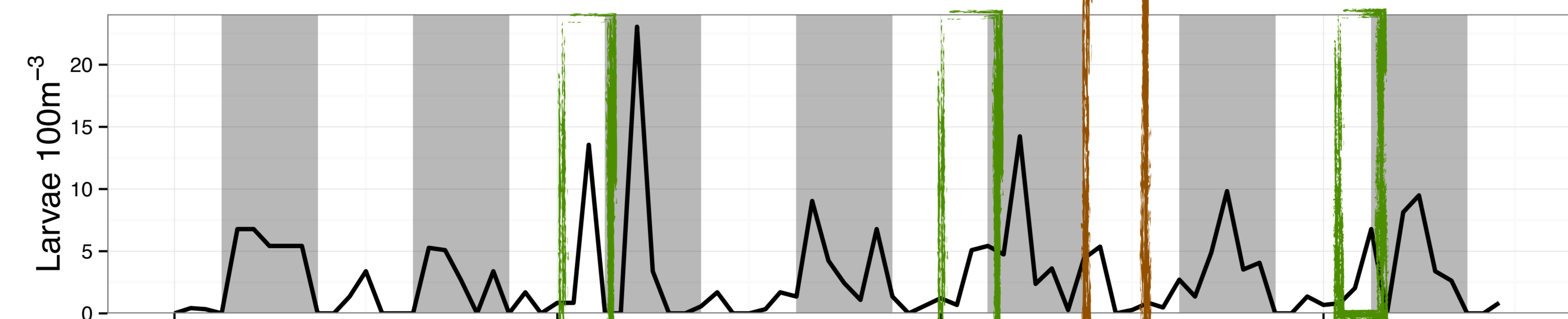
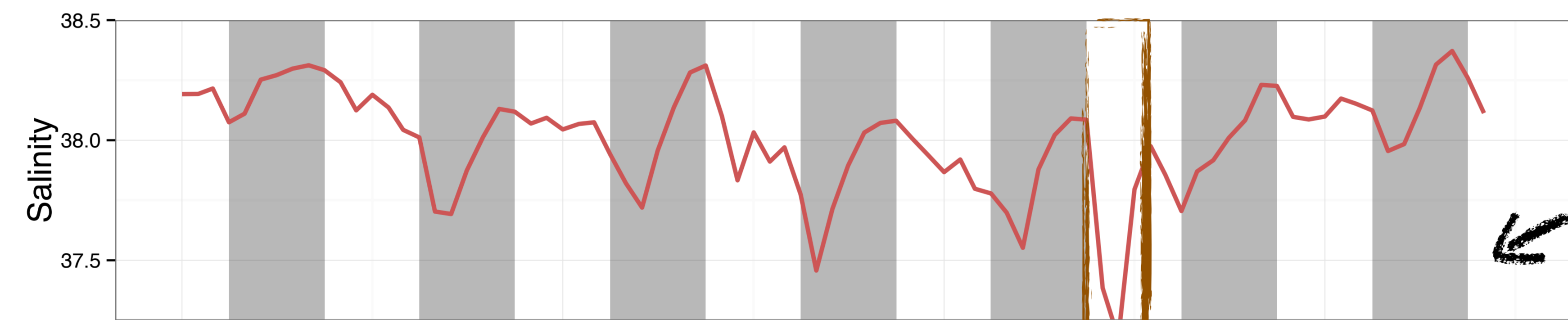


Figure 5: Time series of the variables significantly correlated to larval fish abundance between 2006 and 2012 (Pearson's correlation test, $p < 0.05$, $r_{\text{salinity}} = -0.23$, $r_{\text{copepods}} = 0.12$). Larval fish abundance is in black; copepods (in blue) are *Candacia* spp, potential prey 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).

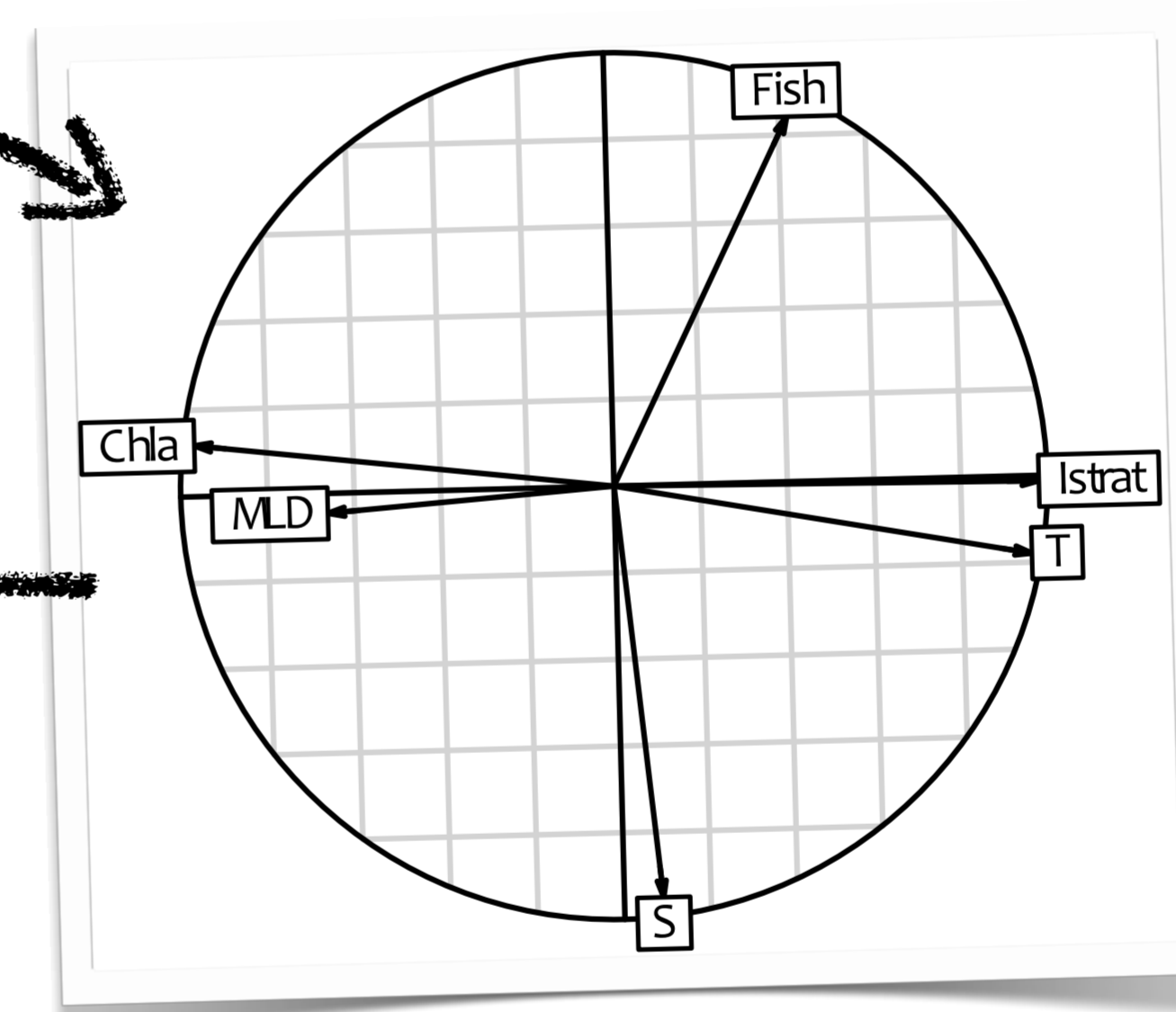


Figure 4: Principal Component Analysis with larval fish abundance and environmental data (Chla: Chlorophyll a; MLD: Mixed Layer Depth; S: Salinity; T: Temperature; Istrat: Stratification index) between 2006 and 2012.

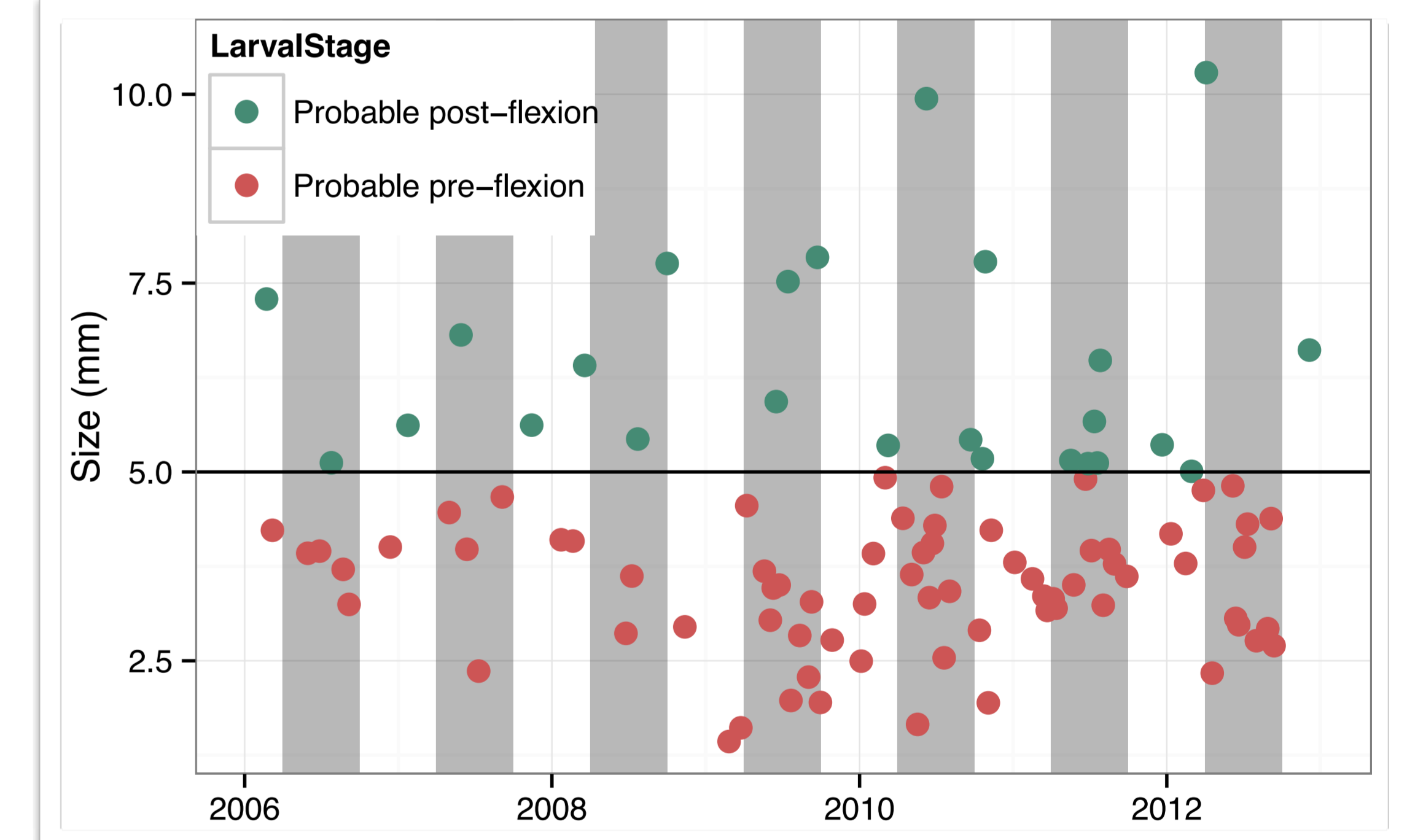


Figure 6: Larval fish size distribution between 2006 and 2012. Gray rectangles correspond to summer. Red dots are larvae $< 5\text{mm}$ (potentially pre-flexion) and green dots larvae $> 5\text{mm}$ (potentially post-flexion).

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 100m^{-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.

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

