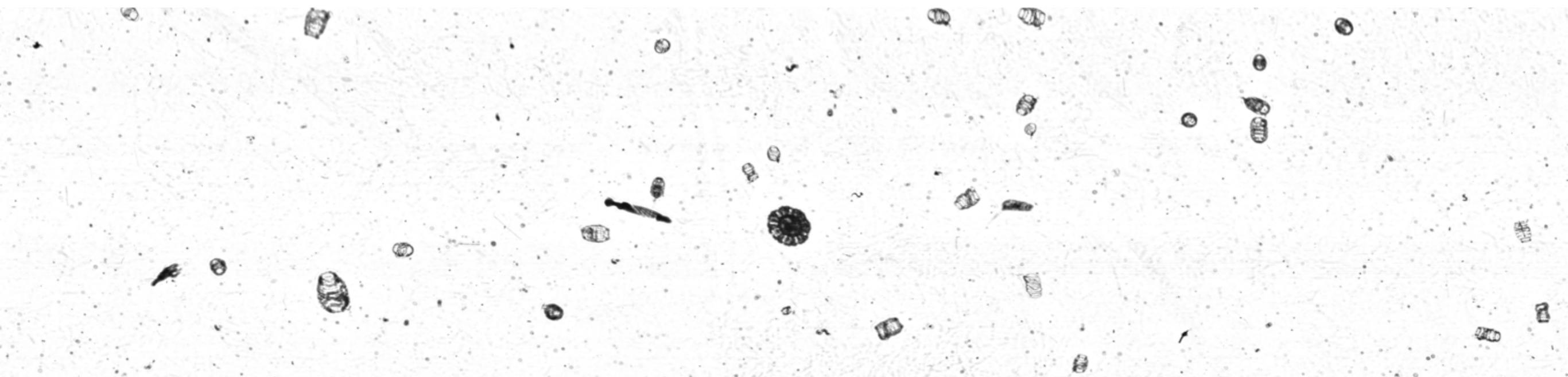


Aquatic Sciences Meeting, Granada, 22-27 Feb. 2015
J-O Irisson, R Faillettaz, JY Luo, CM Guigand, RK Cowen



Fine-scale distribution of zooplankton over a mesoscale front

explored through high frequency imaging

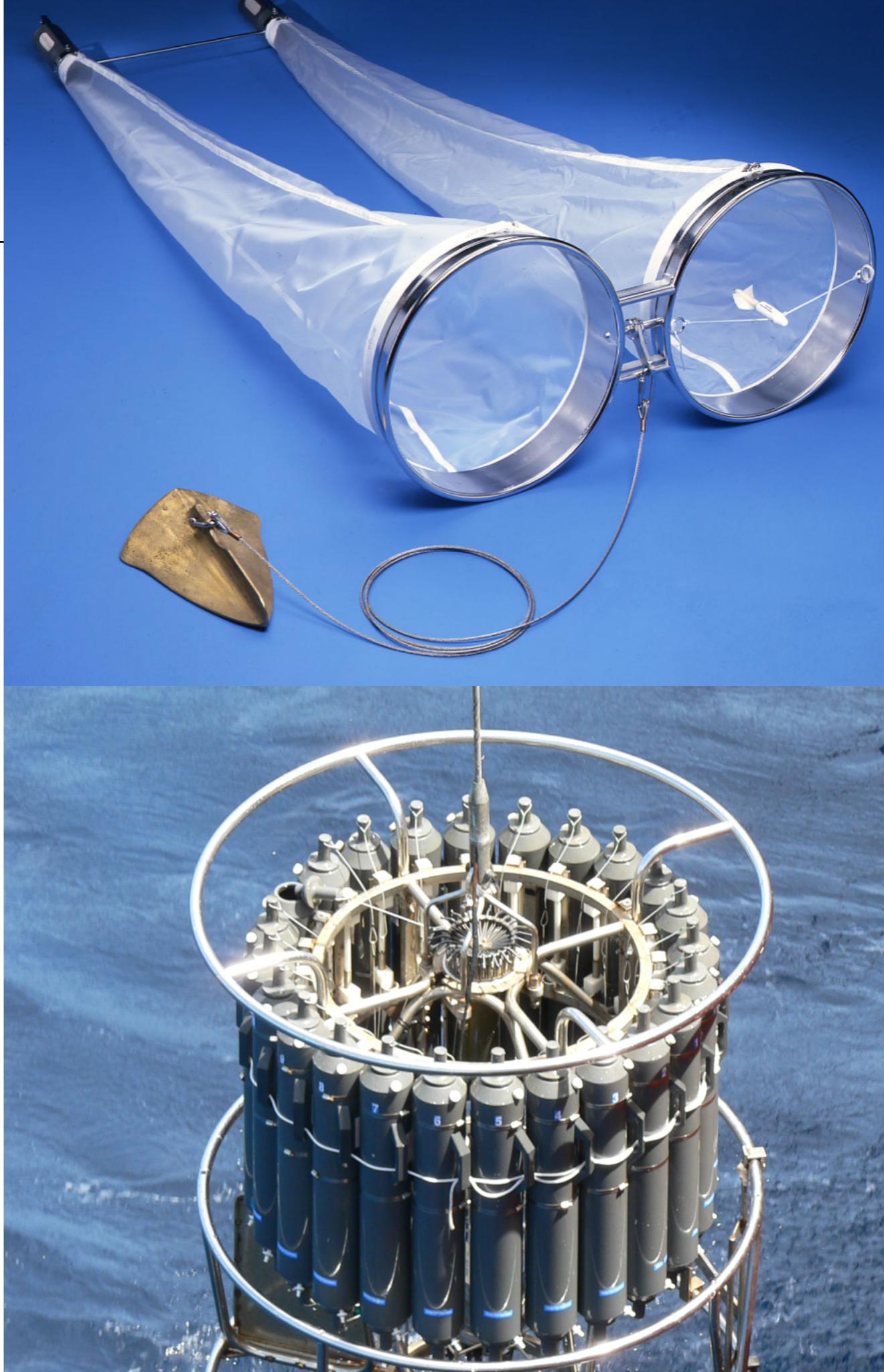


Plankton sampling

The problem:

decoupling environment-organisms

low spatio-temporal resolution



Plankton sampling

The problem:

decoupling environment-organisms

low spatio-temporal resolution

One
The solution:

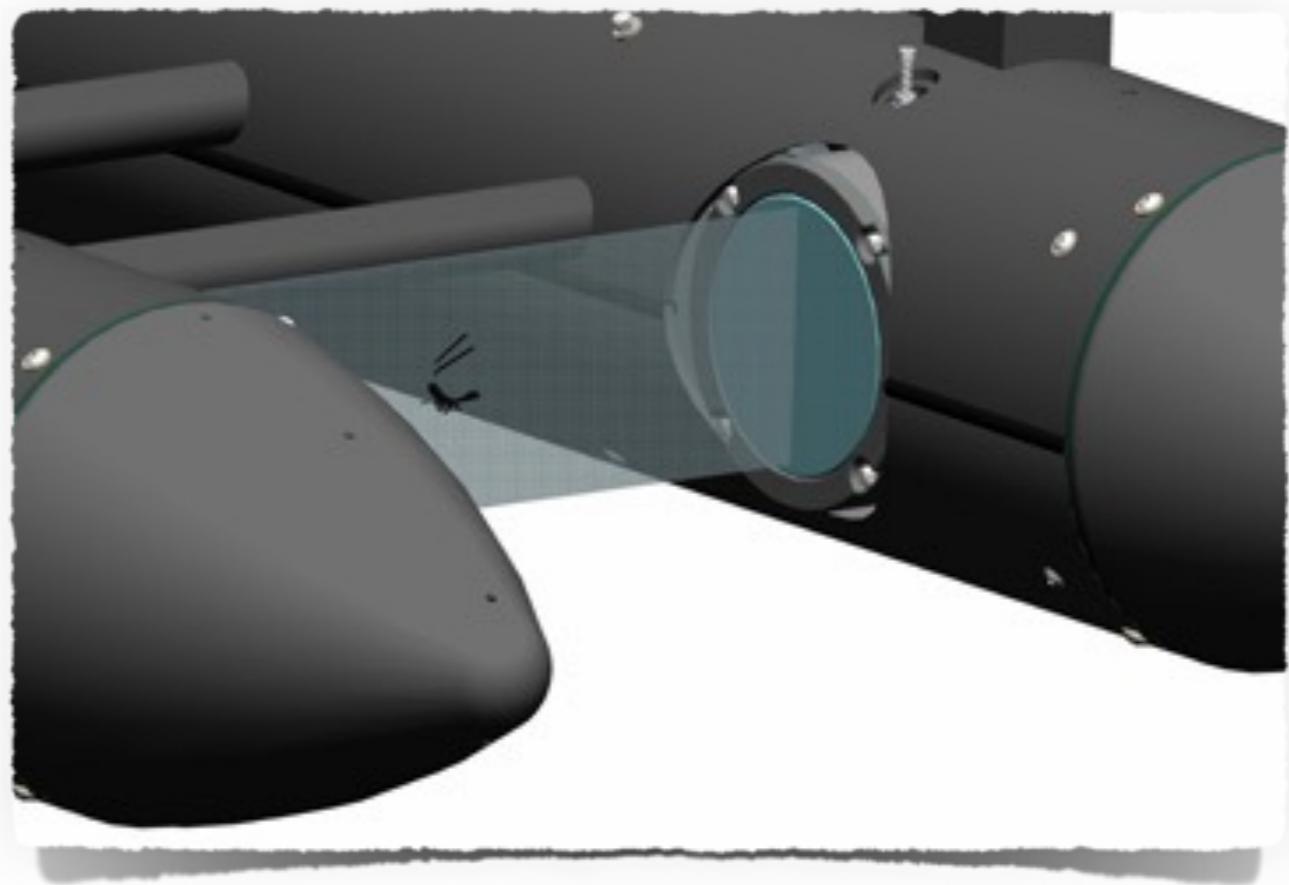
high-frequency simultaneous
sampling through high resolution
imaging



In Situ Ichthyoplankton Imaging System (ISIIS)



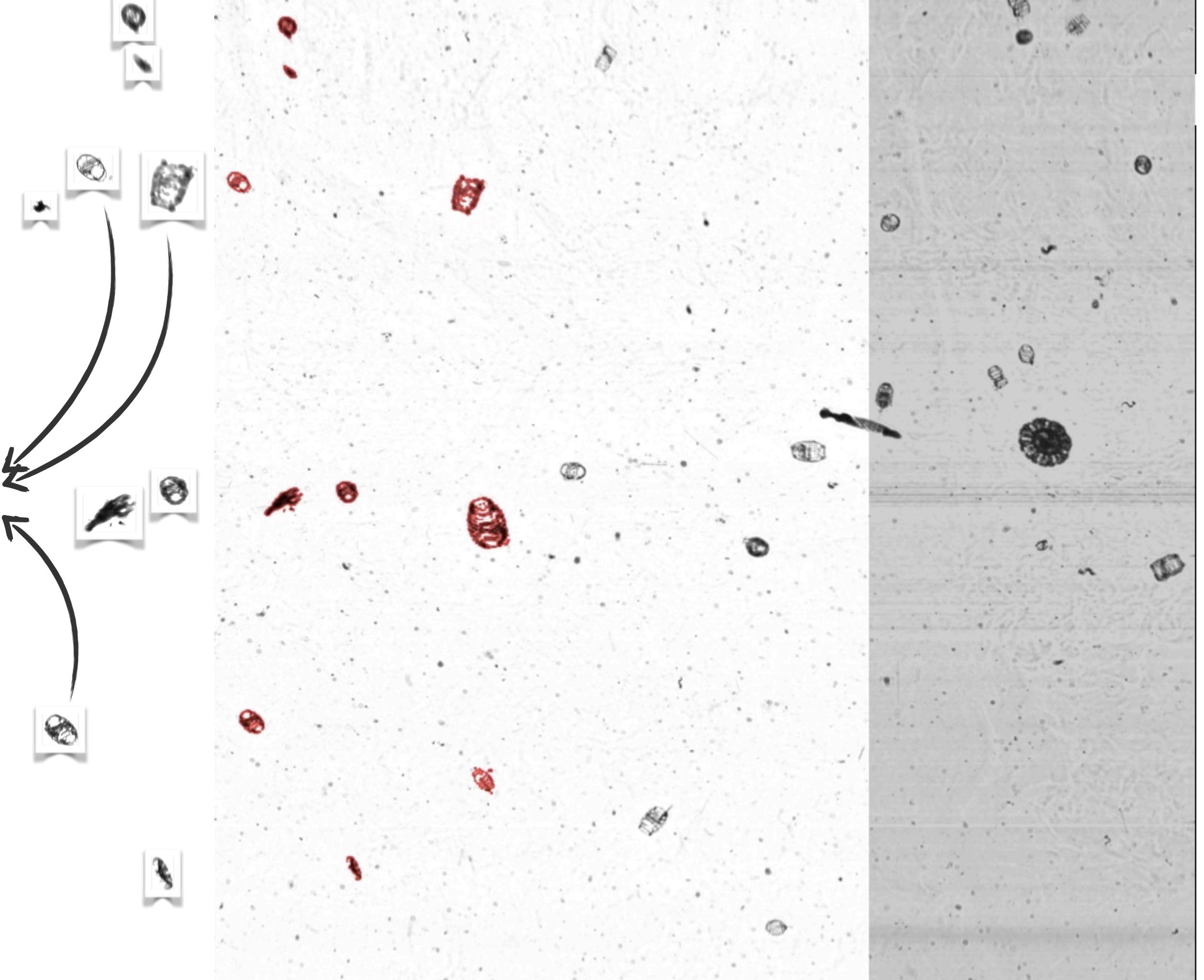
CTD
Fluorometer
Oxygen
ADCP



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SCHOOL of MARINE &
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Computer-assisted identification



Scientific questions

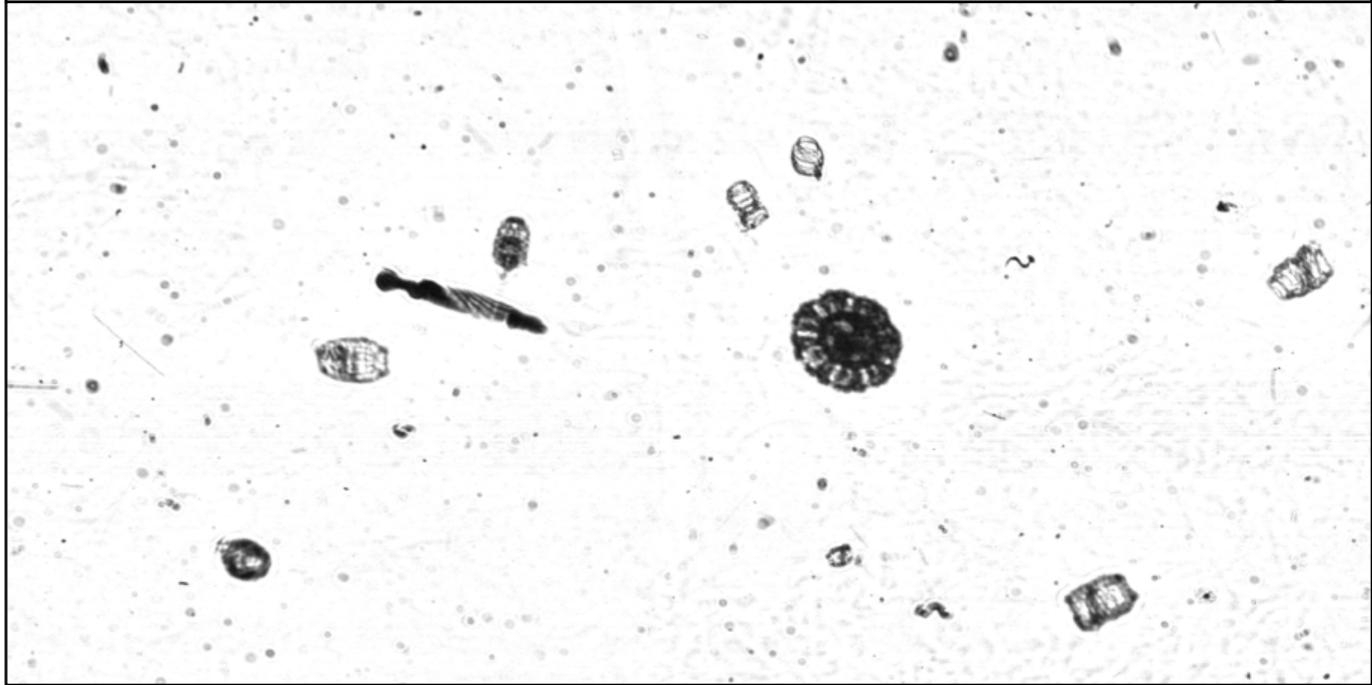
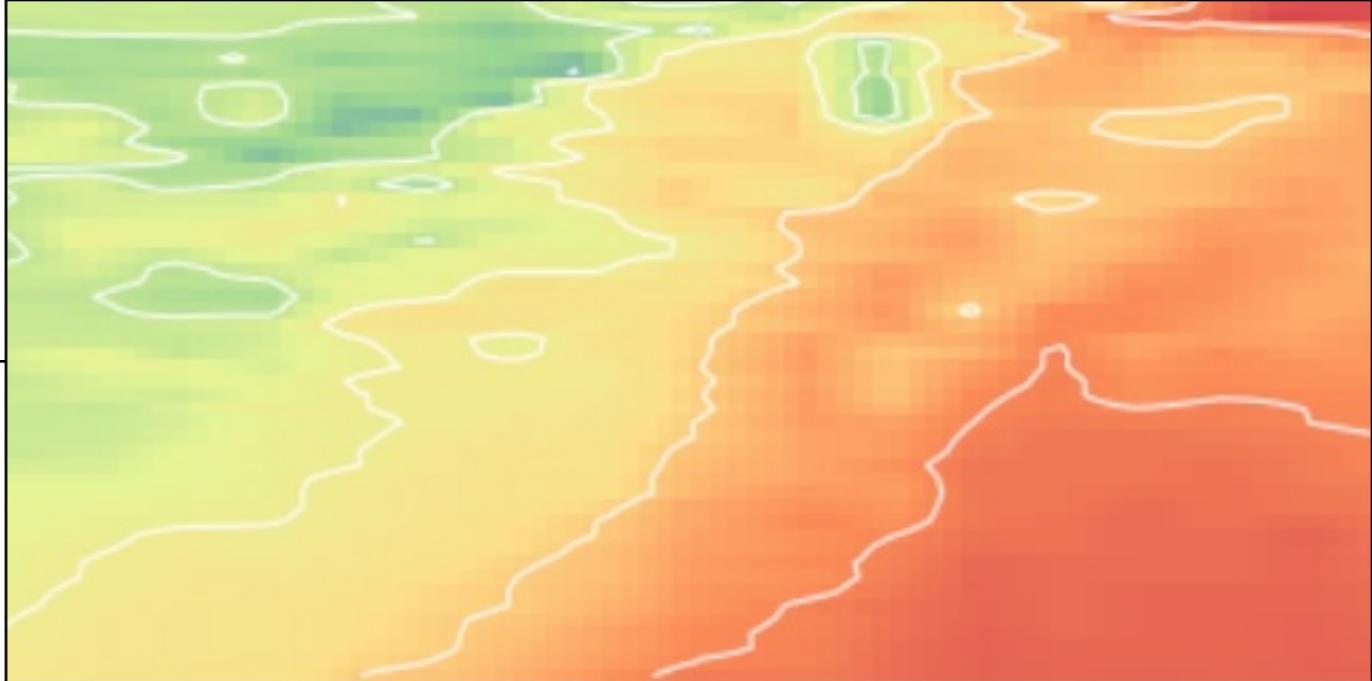
cm-scale, ~10Hz data resolution

Bio-physical interactions (including very small scale)

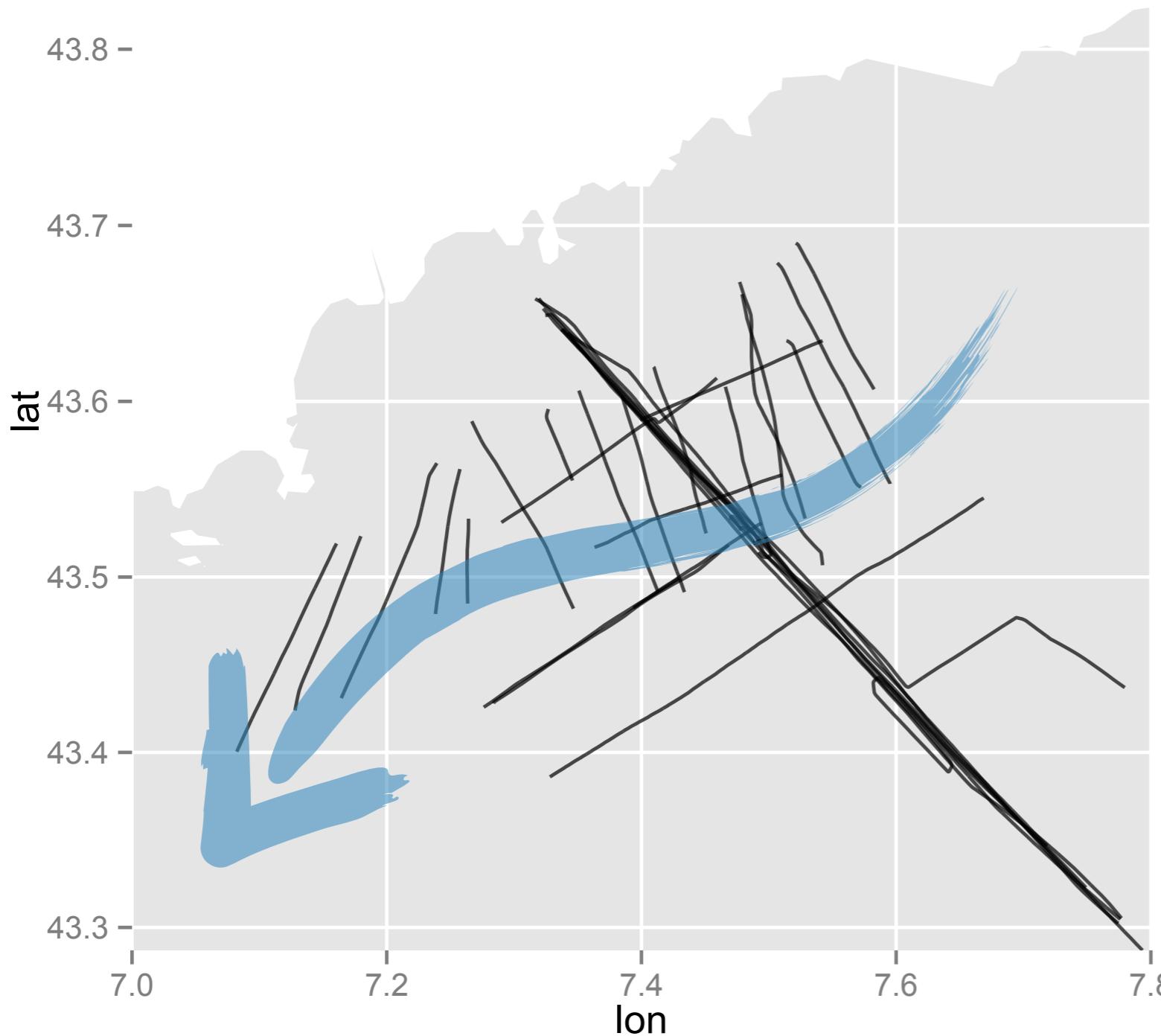
Thin plankton layers

Co-occurrence (predation, cooperation)

etc.



Sampling strategy



Describe a mesoscale front

Cross-front transects

day or night

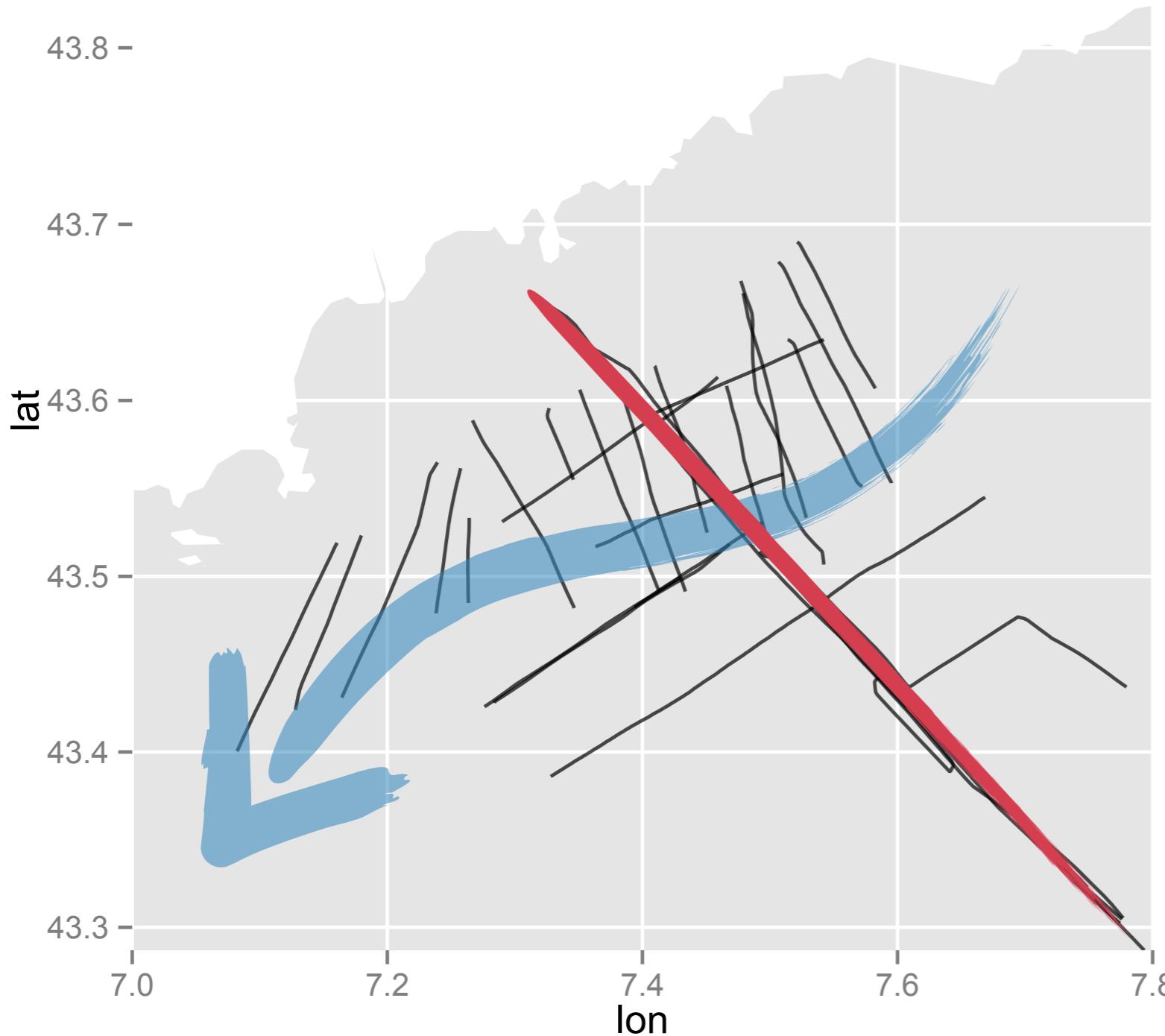
Along-front transects

dawn or dusk

Lagrangian transects

48h

Sampling strategy



Describe a mesoscale front

Cross-front transects

day or night

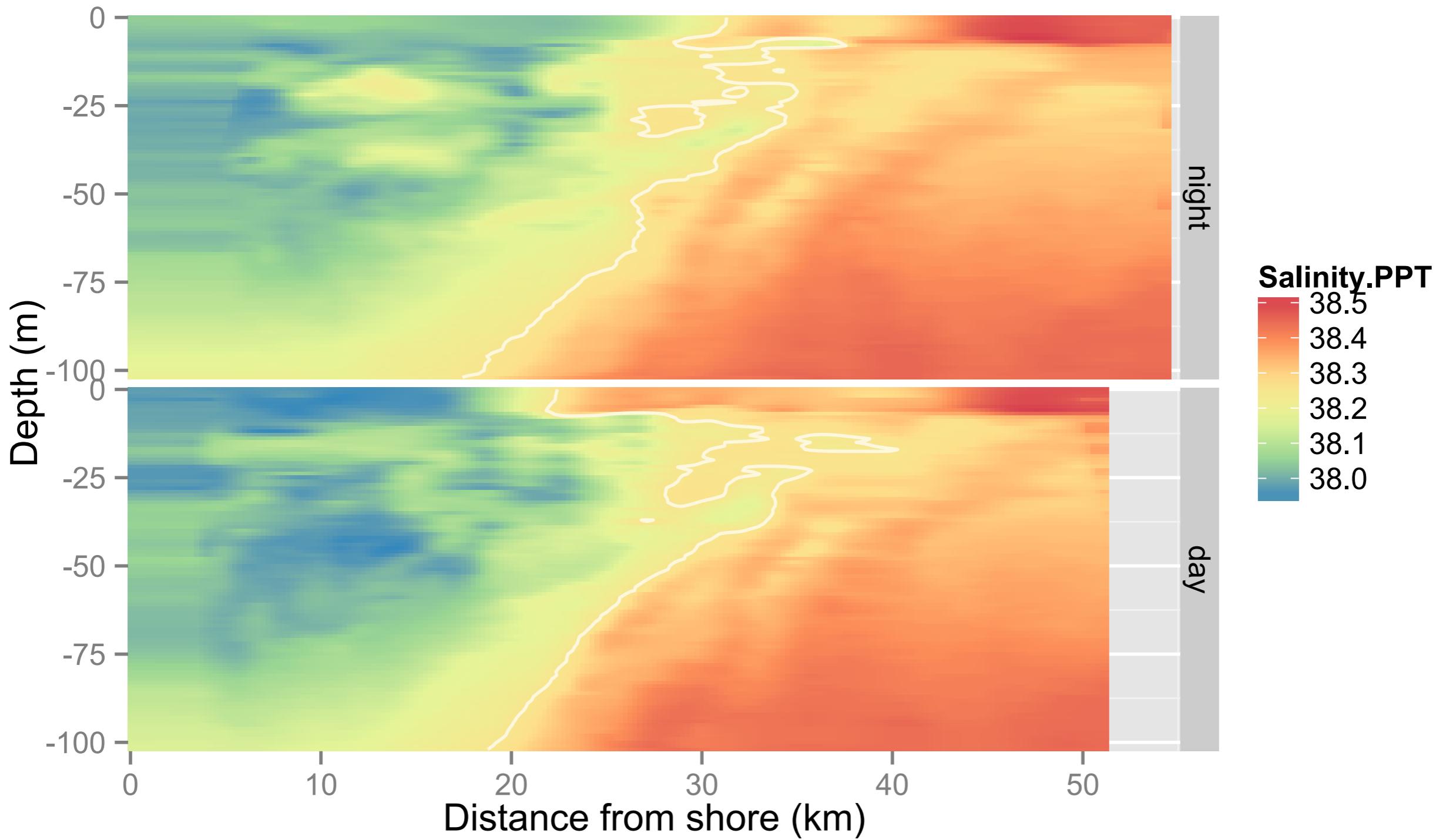
Along-front transects

dawn or dusk

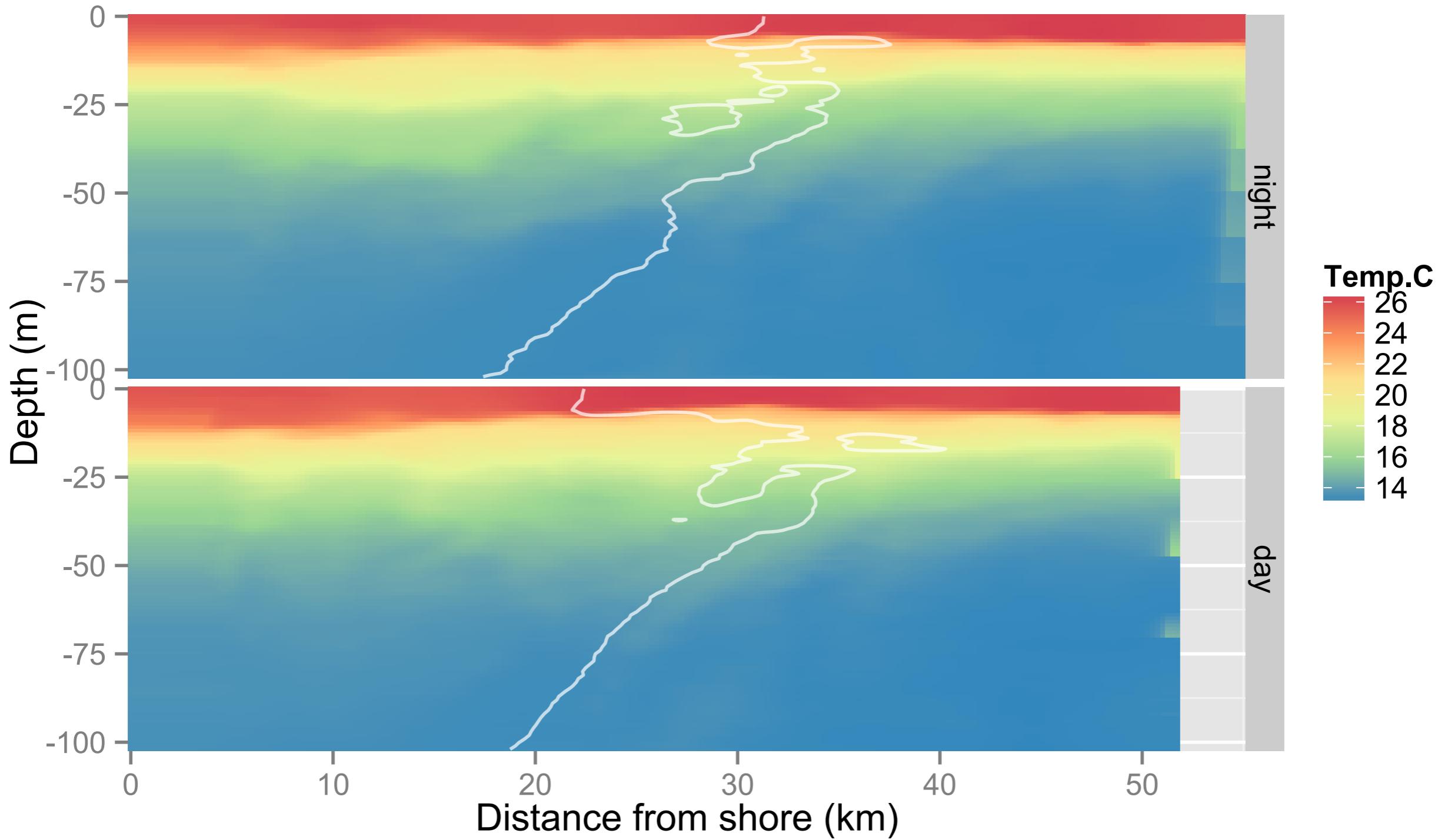
Lagrangian transects

48h

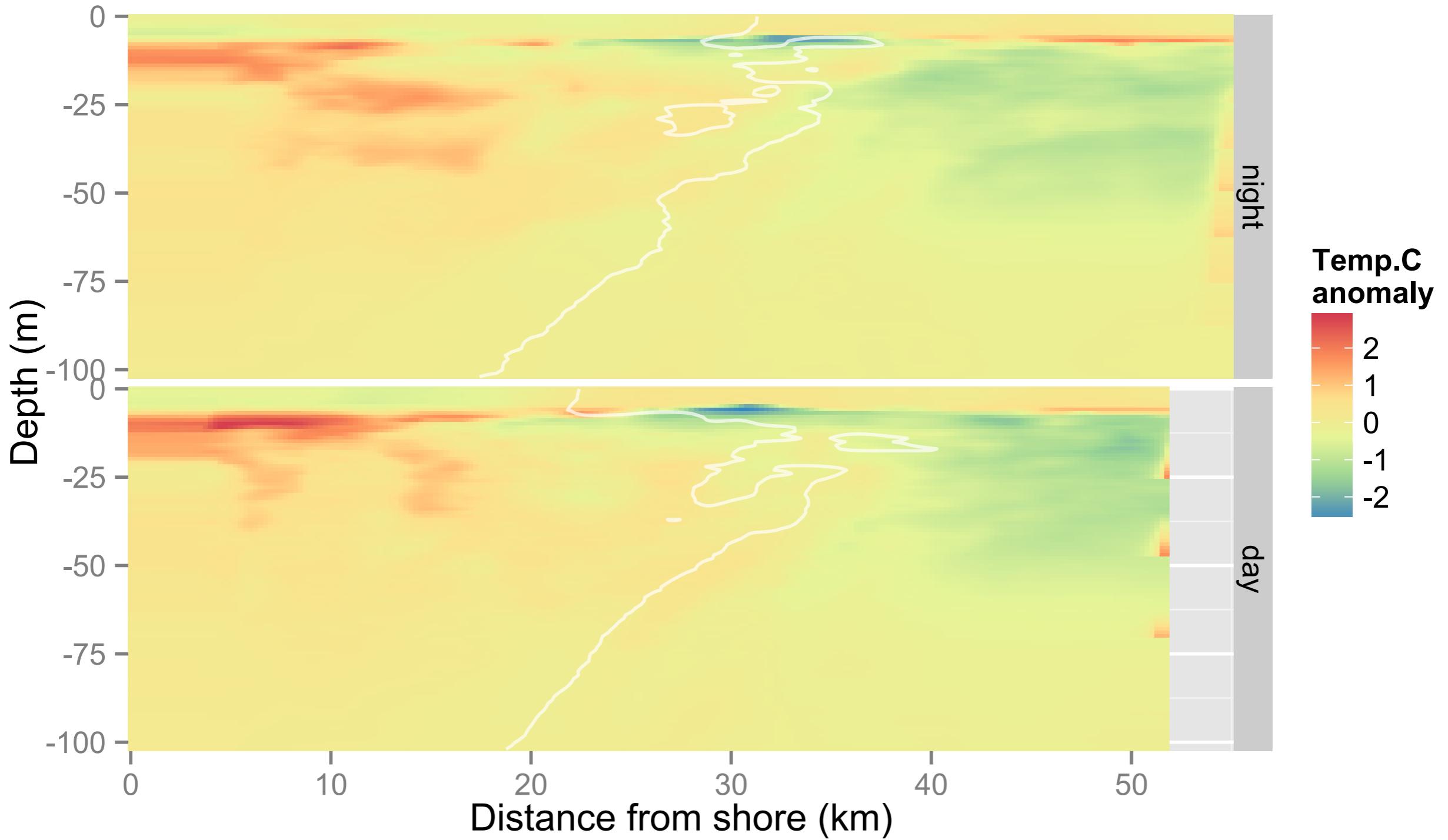
Physical structure



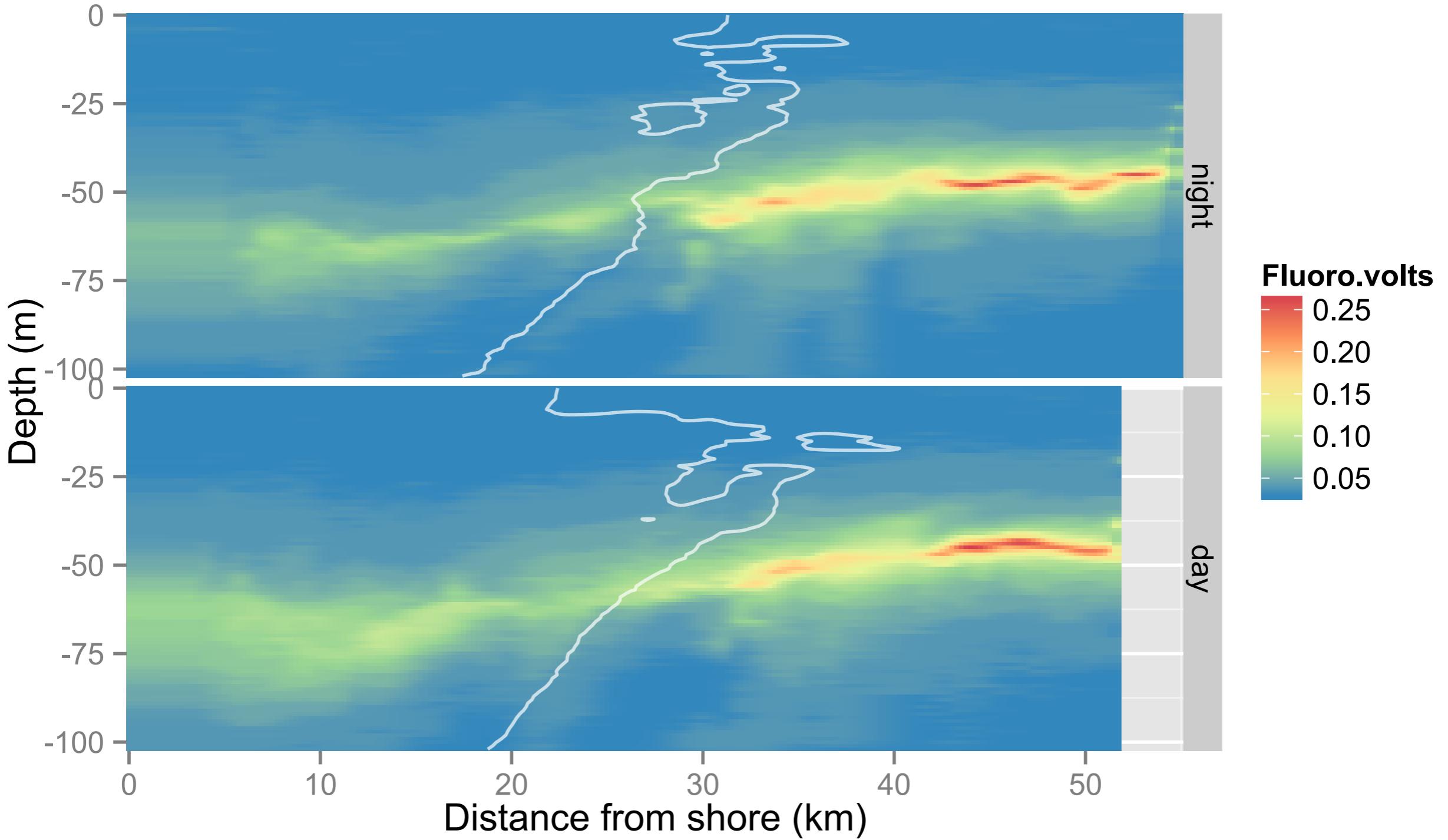
Physical structure



Physical structure

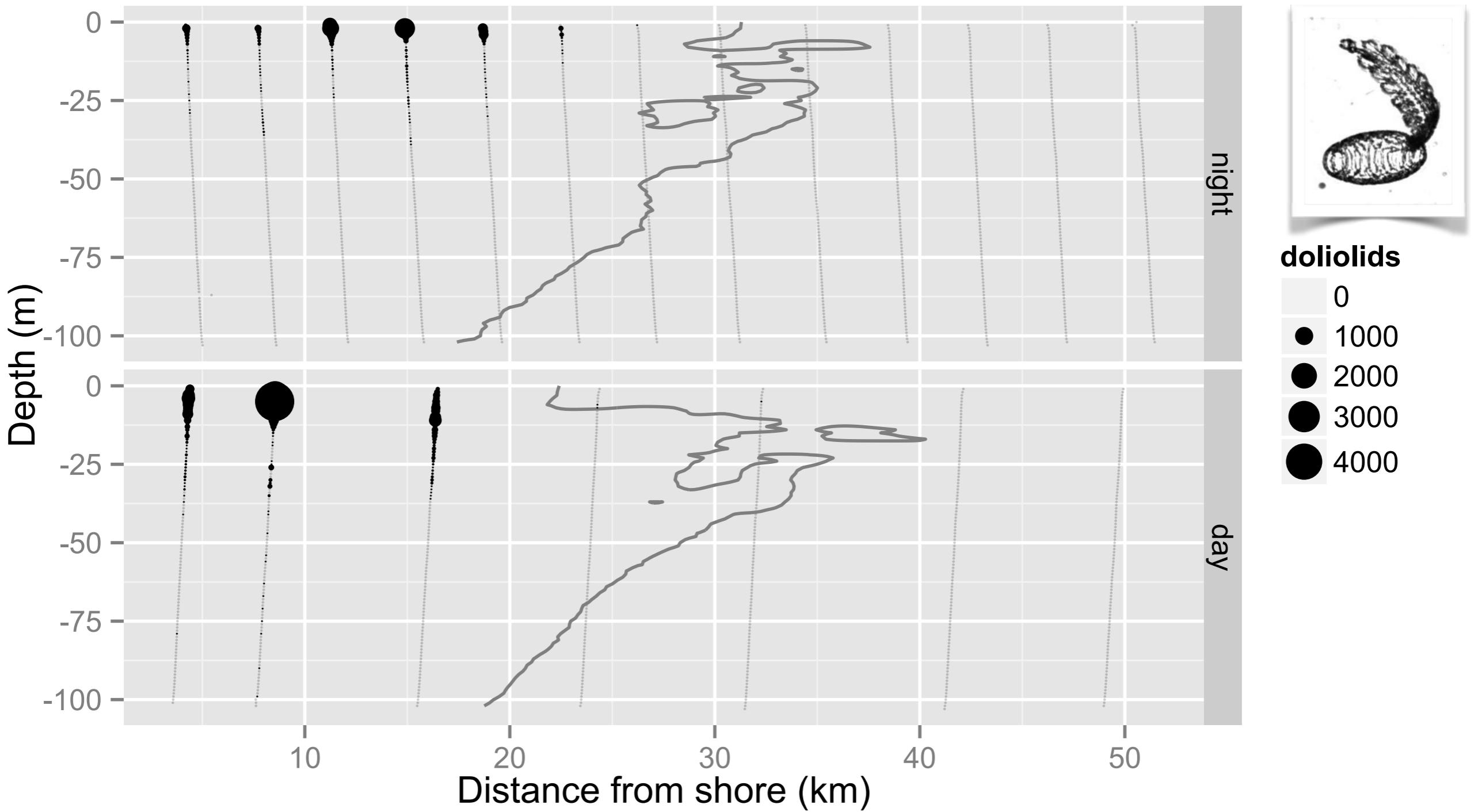


Physical structure



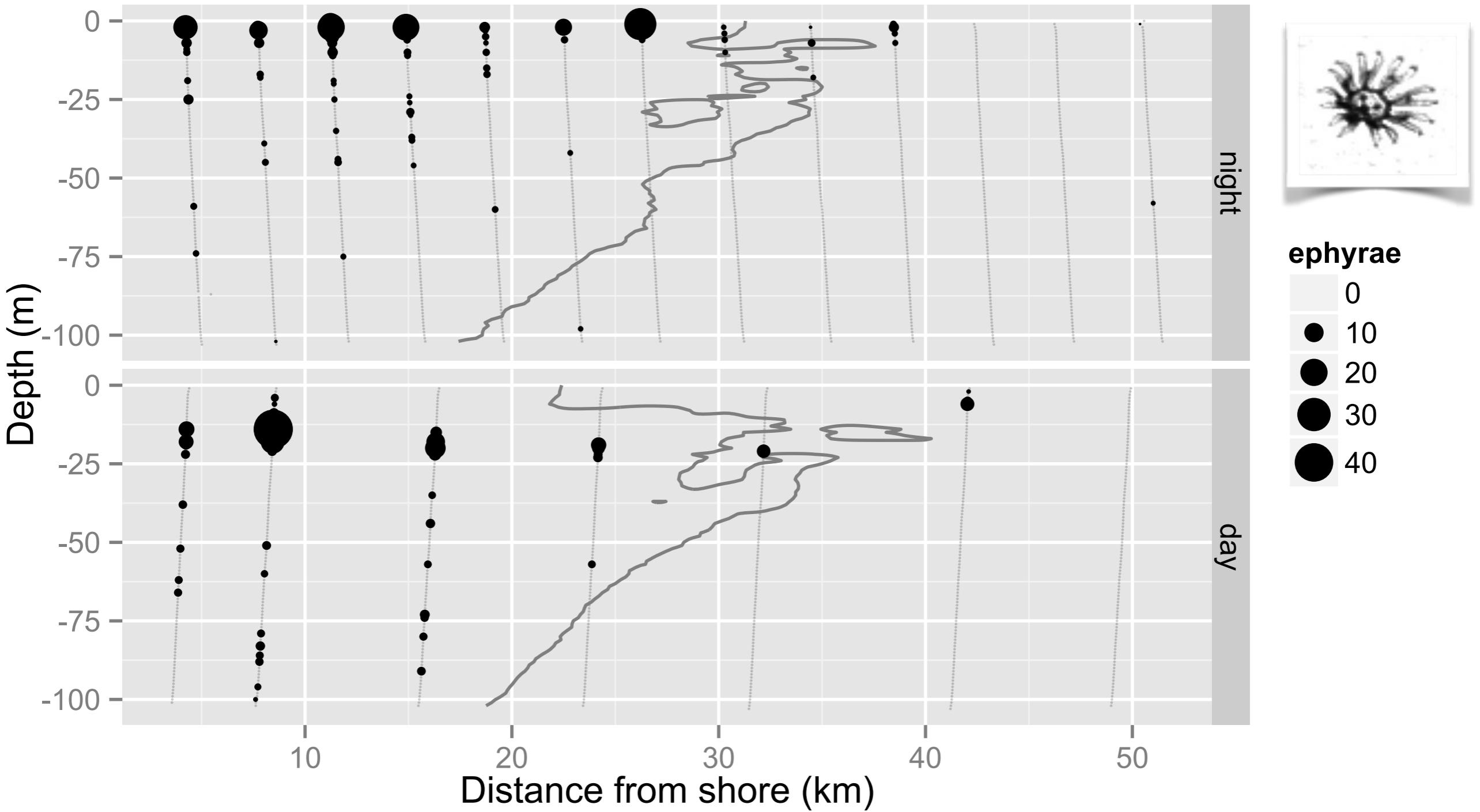
Spatial distribution

3% of data = 113,000 biological particles, sorted in 38 groups



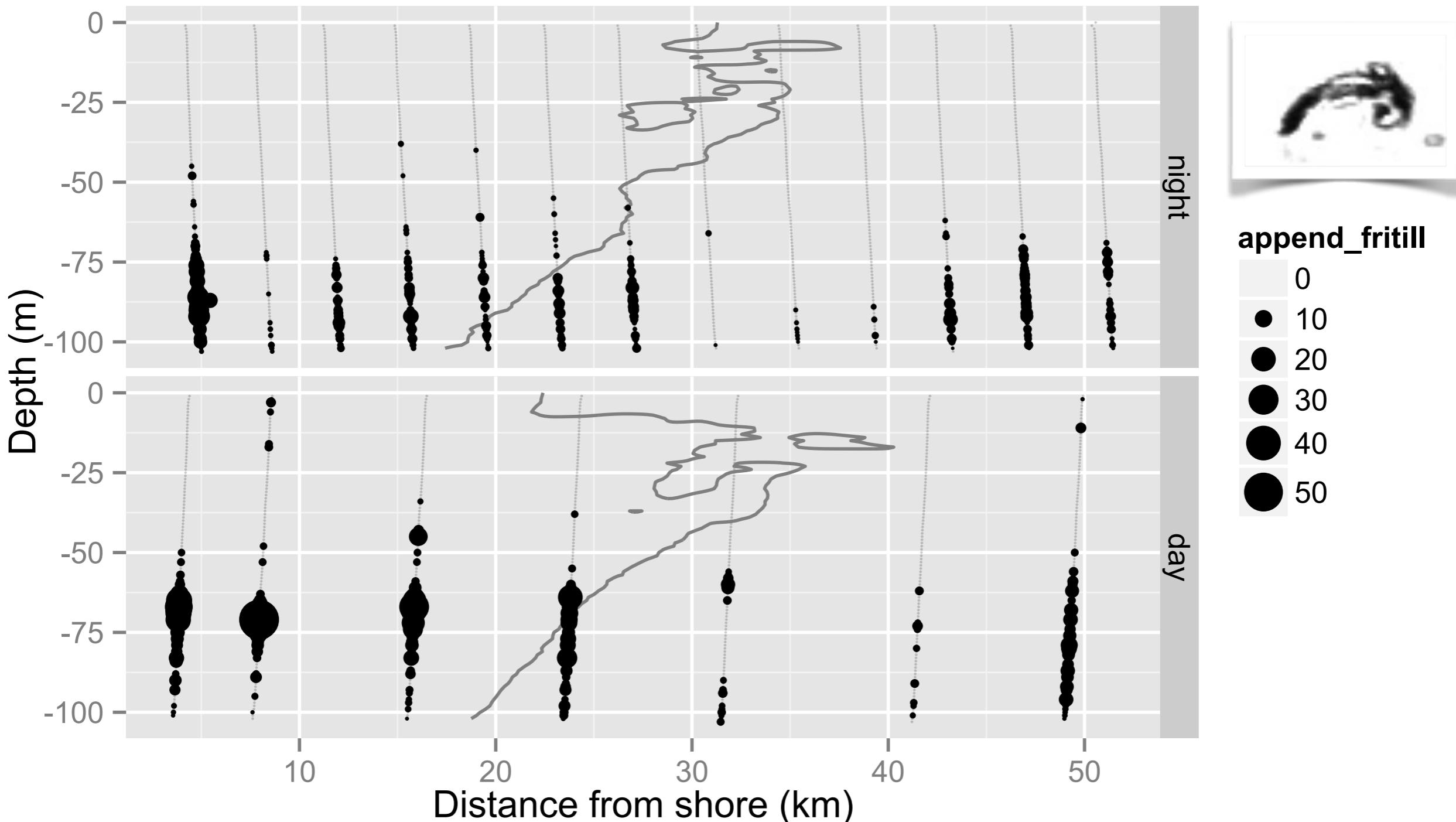
Spatial distribution

3% of data = 113,000 biological particles, sorted in 38 groups



Spatial distribution

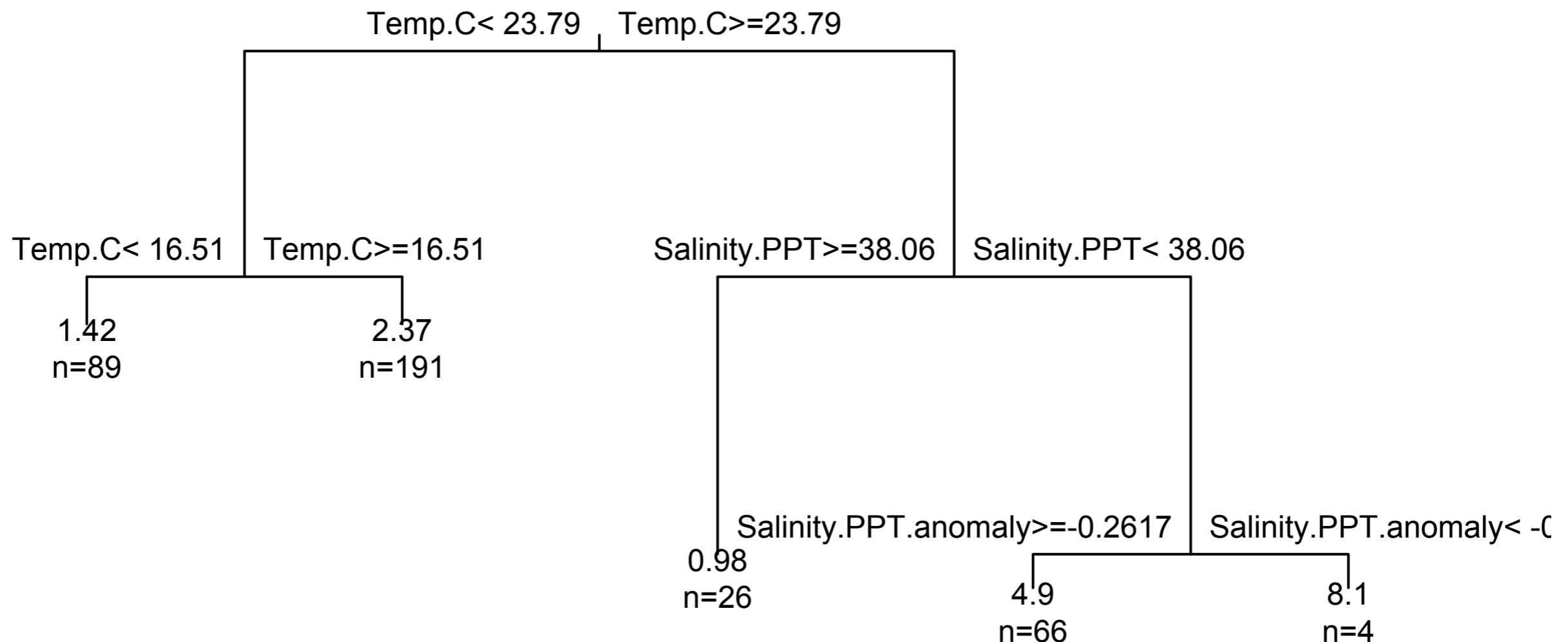
3% of data = 113,000 biological particles, sorted in 38 groups





Environmental correlates

Regression trees: $\log(n+1)$ abundances on variables T, S, fluo, O₂, dens + anomalies



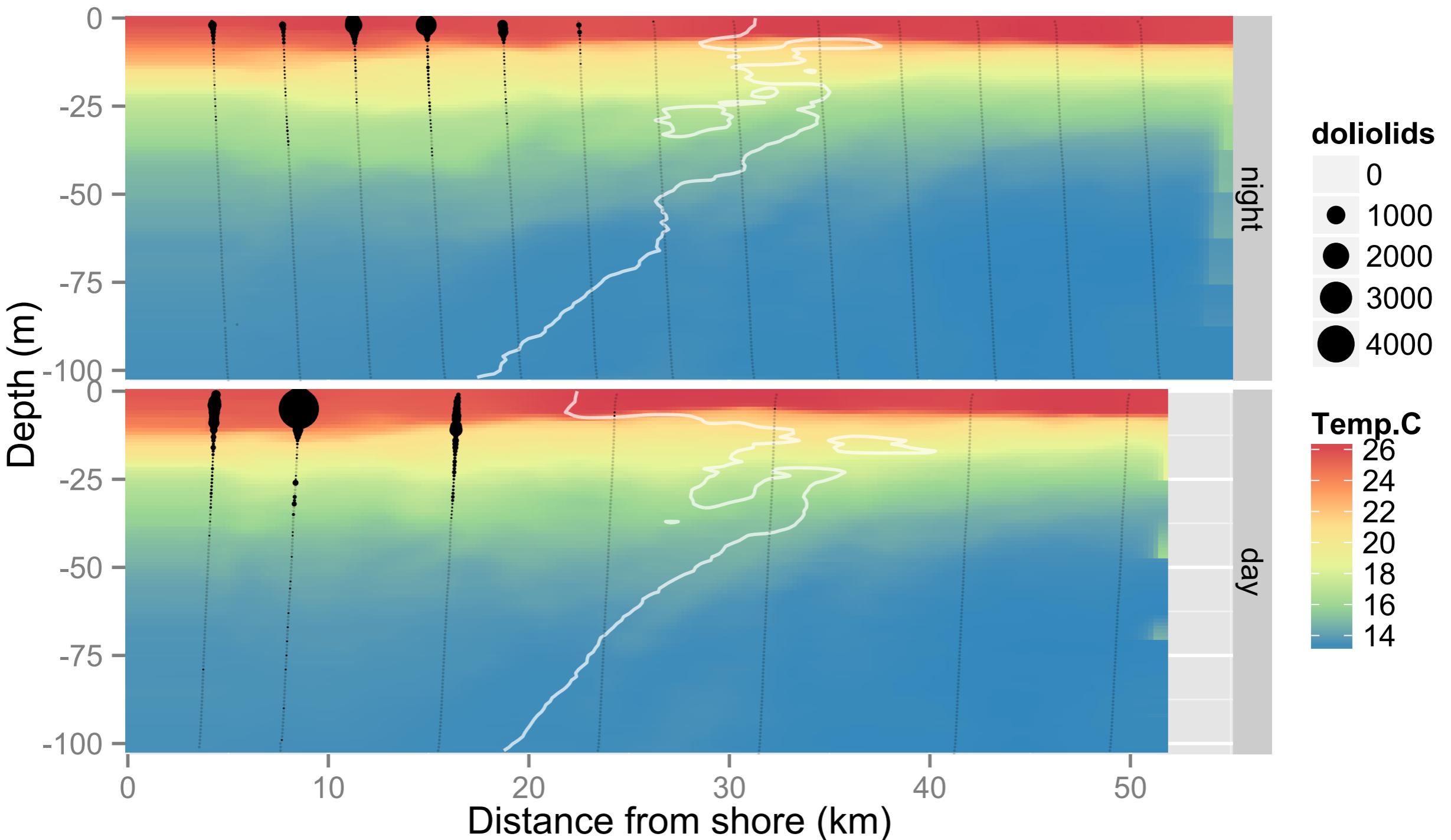
Error : 0.334 CV Error : 0.424 SE : 0.0405

60% variance

Environmental correlates



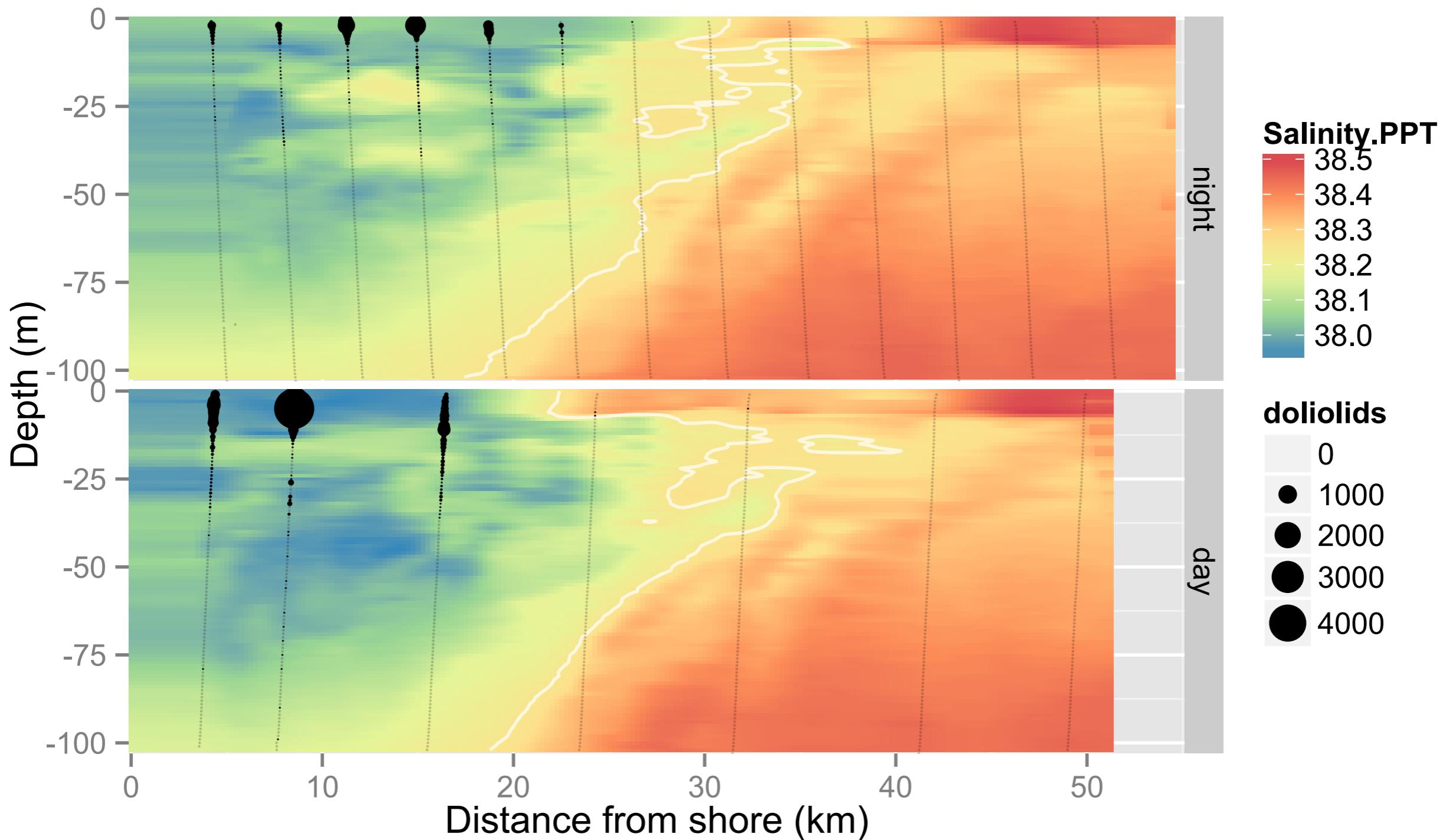
Regression trees: $\log(n+1)$ abundances on variables T, S, fluo, O₂, dens + anomalies



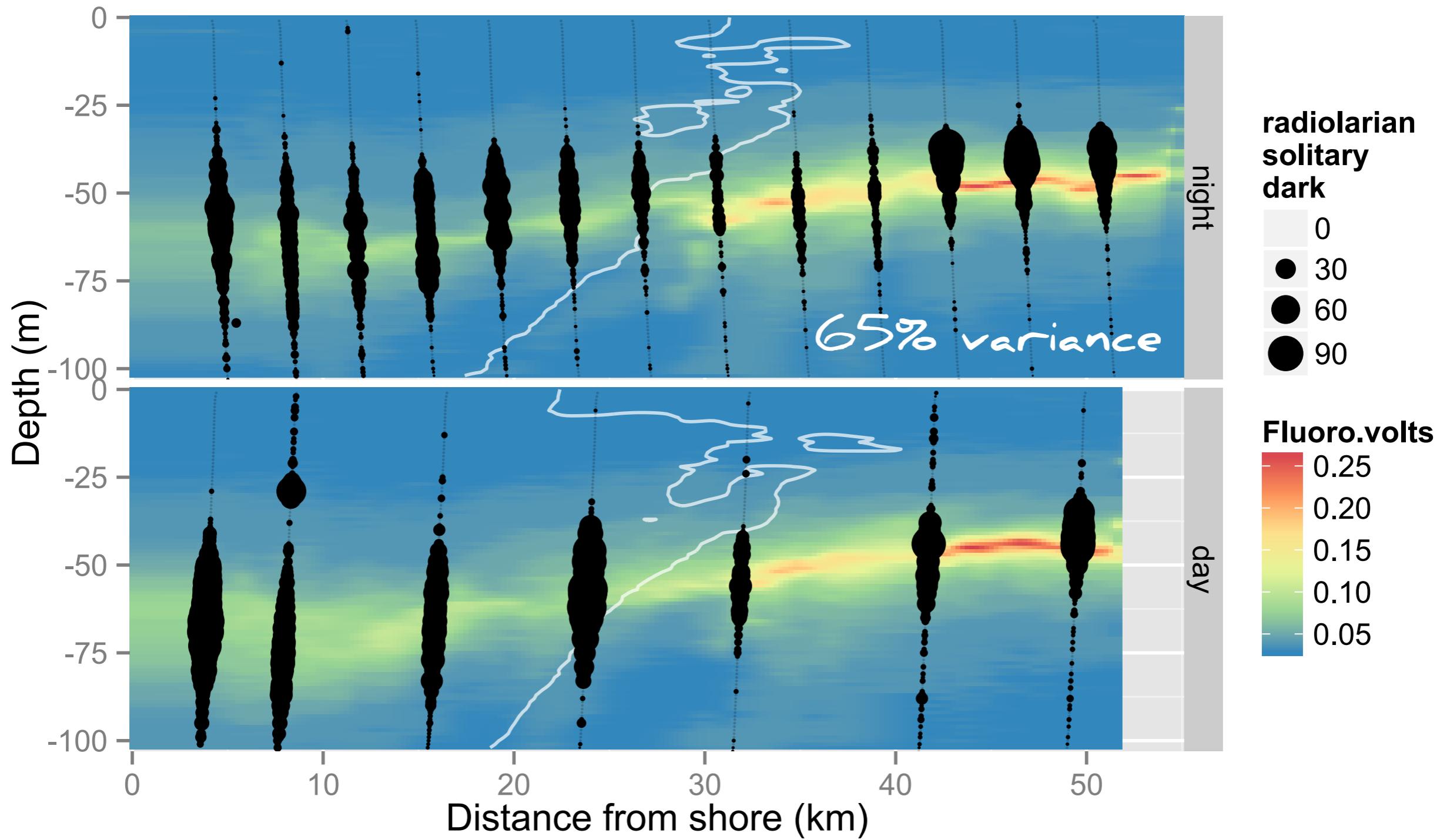
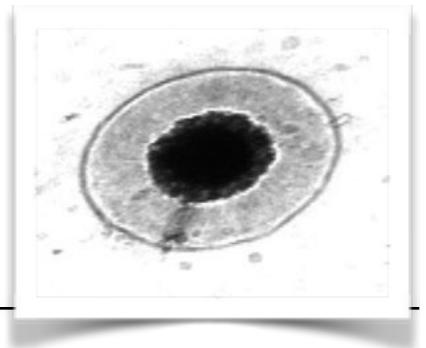
Environmental correlates



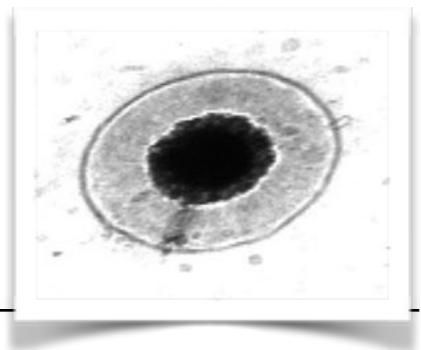
Regression trees: $\log(n+1)$ abundances on variables T, S, fluo, O₂, dens + anomalies



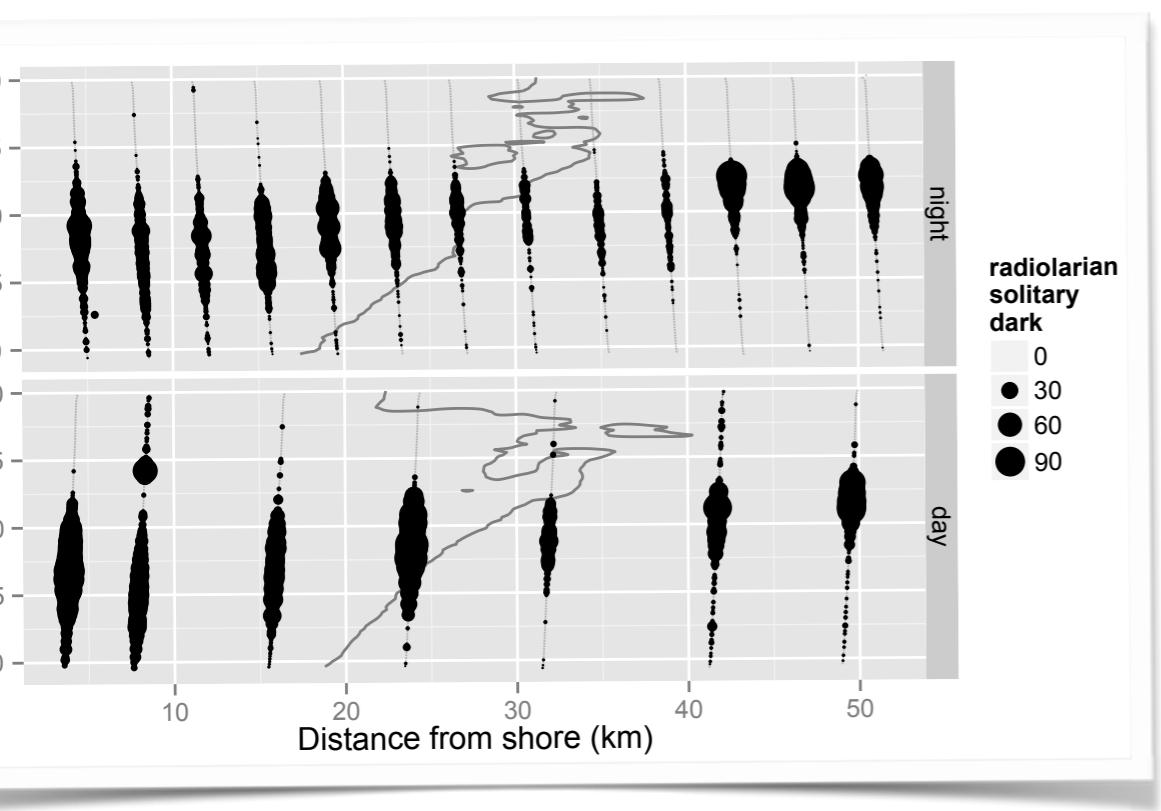
Environmental correlates



Model of distribution



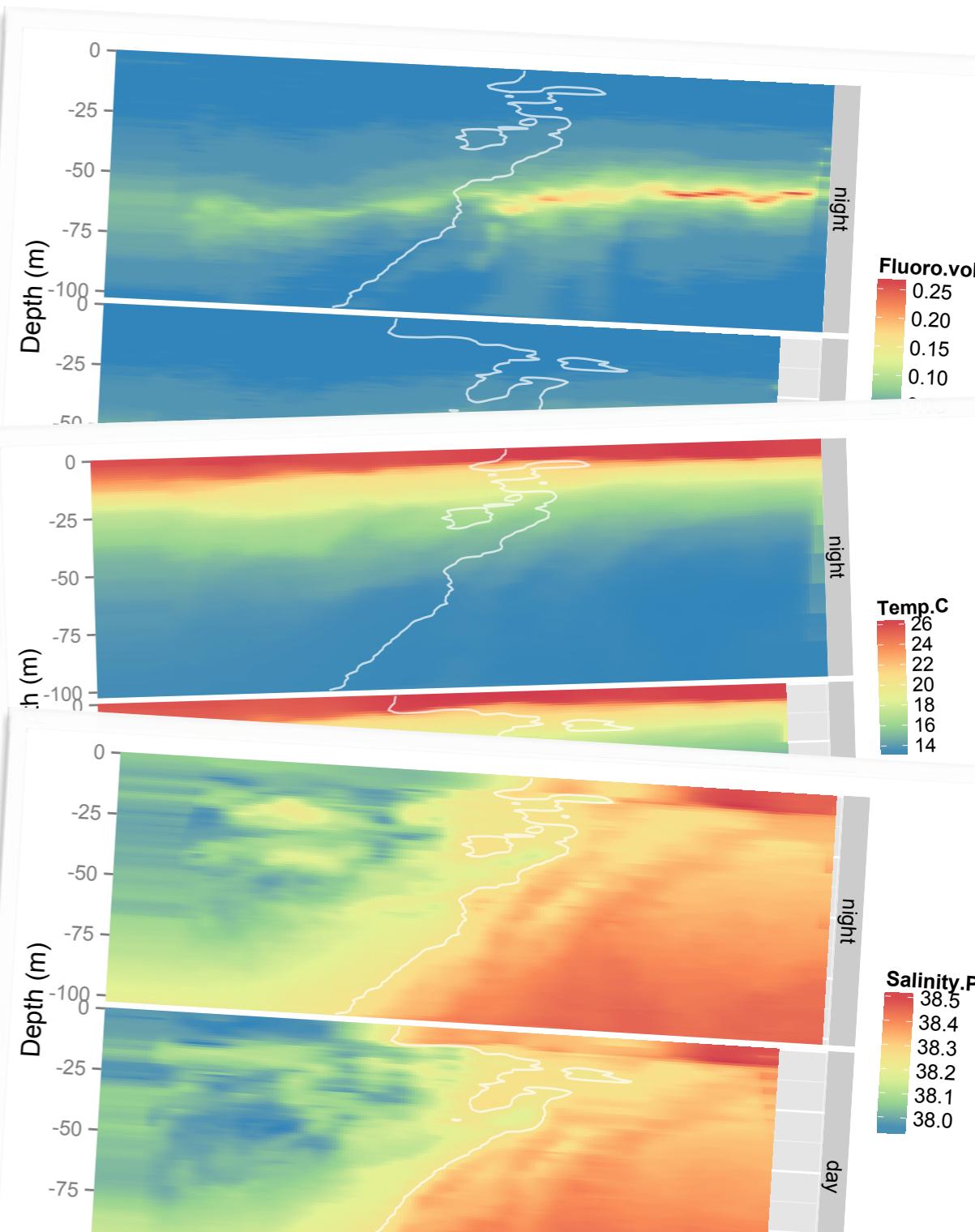
Boosted regression trees: Poisson distributed abundances on variables, CV



25%

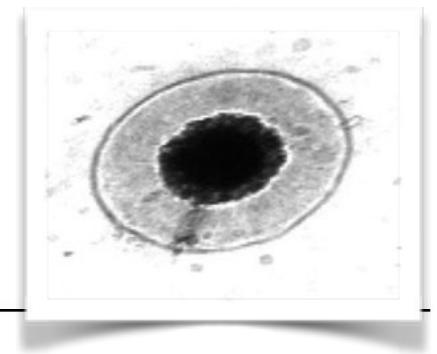
+ 23%

16%

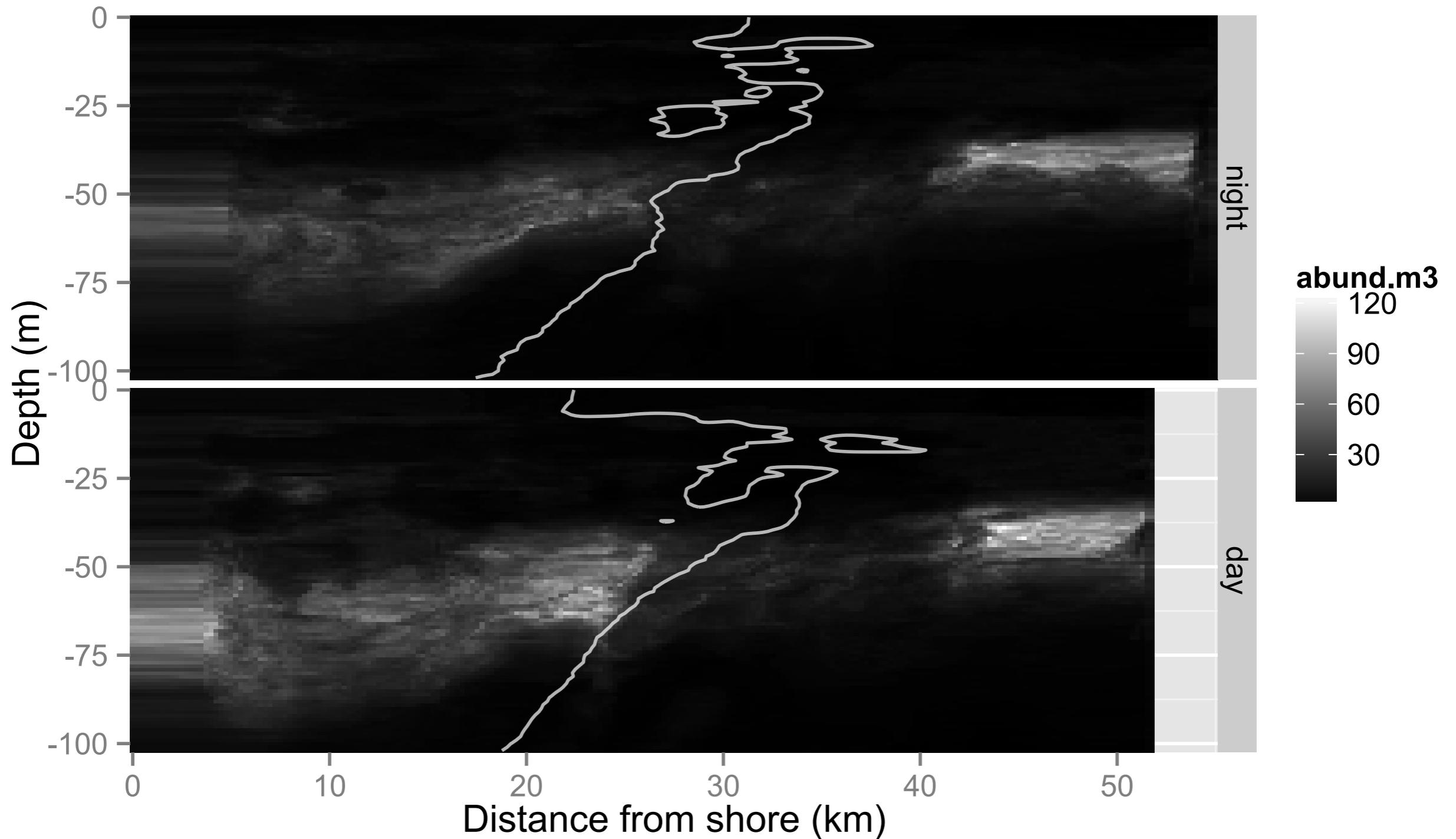


...

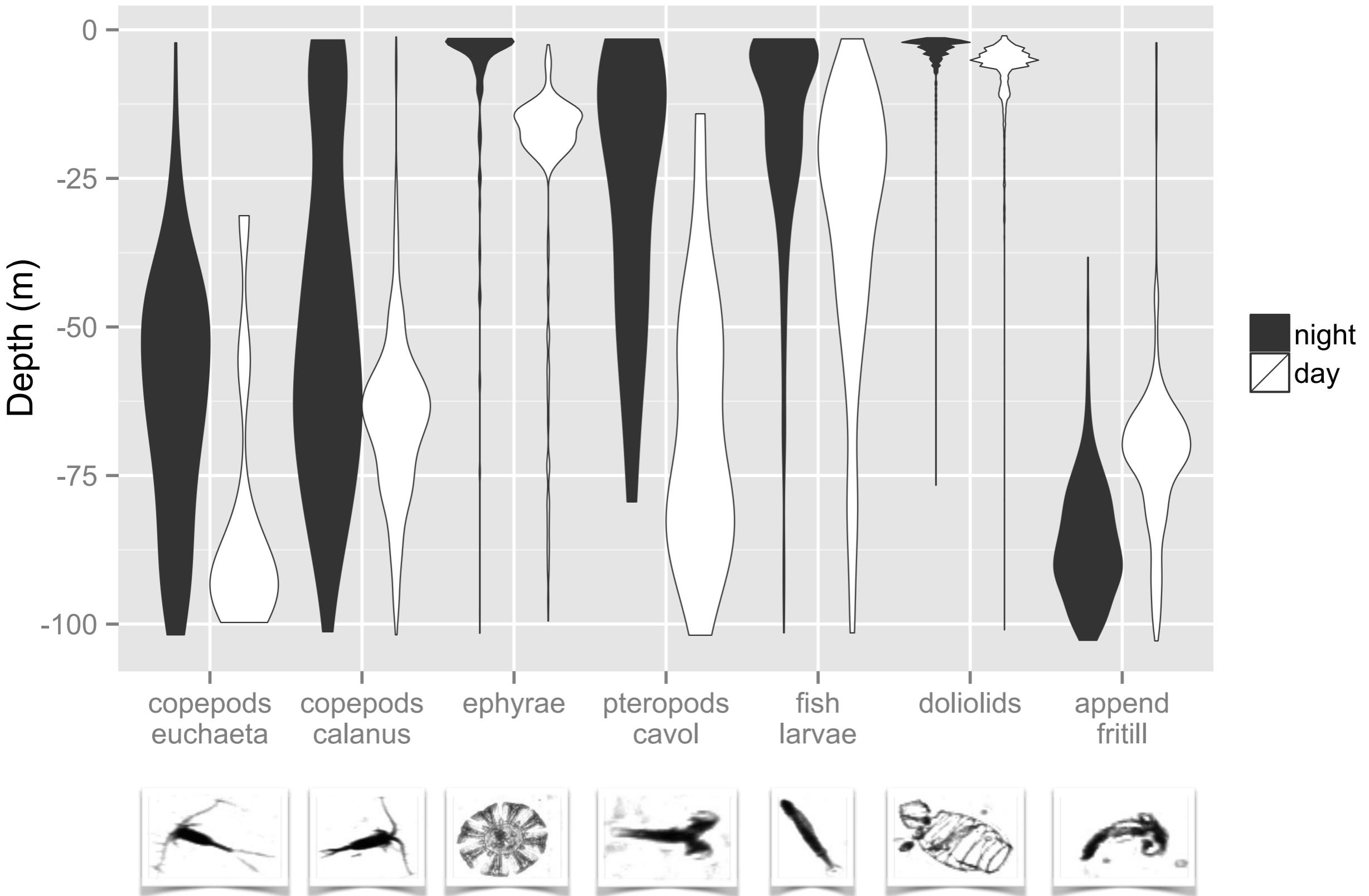
Model of distribution



Boosted regression trees: Poisson distributed abundances on variables, CV



Diel vertical migration



Perspectives

Improvements to image processing and machine learning

Better particle detection

Fully-automated identification

Investigation of
vertical migration on dawn/dusk transects

stability of community among cross-current
transects

advection/diffusion/behaviour between
Lagrangian transects

The image displays three separate browser windows side-by-side, each showing a different tool or dataset related to plankton research:

- Top Window (GitHub Repository):** Shows a GitHub repository named "apeep". The repository contains files like "process.py", "segment.py", "timers.py", and "README.md". A note in "timers.py" says "Make end timer embeddable in log messages". The GitHub URL is "github.com/GitHub, Inc. apeep".
- Middle Window (Plankton Portal):** Shows the "PLANKTON PORTAL" homepage. It features a large image of a plankton cell and navigation links for "Home" and "Science". A text overlay states: "Plankton are a critically important food source."
- Bottom Window (Kaggle Competition):** Shows the "National Data Science Bowl" competition page. It highlights "\$175,000 • 757 teams" and the date "Mon 15 Dec 2014". The competition details include "Dashboard", "Home", "Data", "Make a submission", "Information", "Description", "Evaluation", and "Rules". A sidebar mentions "Competition Details" and "Get the Data". A text overlay at the bottom right states: "Plankton are critically important to o".

Thank you for your attention

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