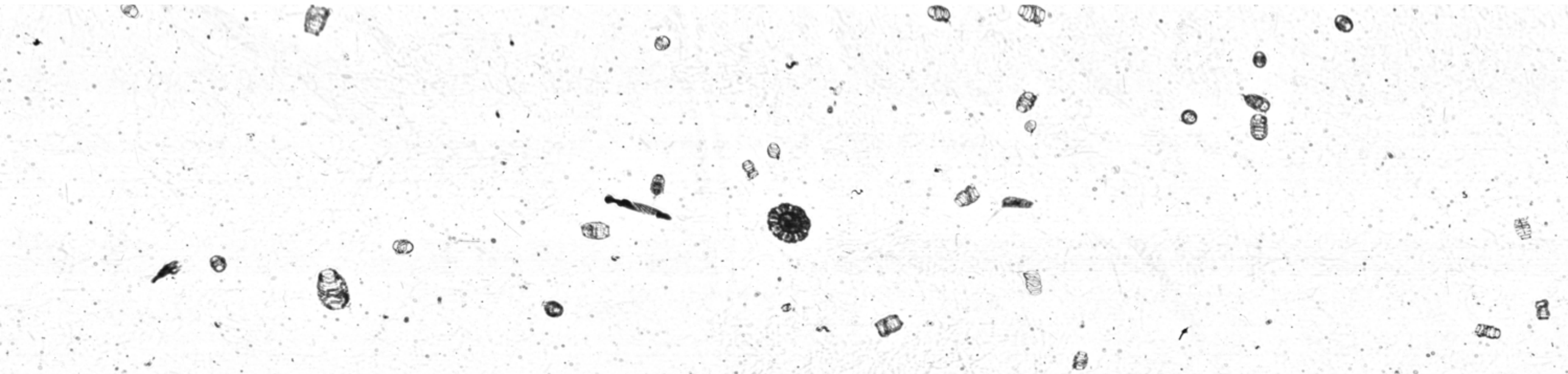
Aquatic Sciences Meeting, Granada, 22-27 Feb. 2015
J-O Irisson, R Faillettaz, JY Luo, CM Guigand, RK Cowen

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

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decoupling environment-organisms

low spatio-temporal resolution

One
~~The~~ solution:

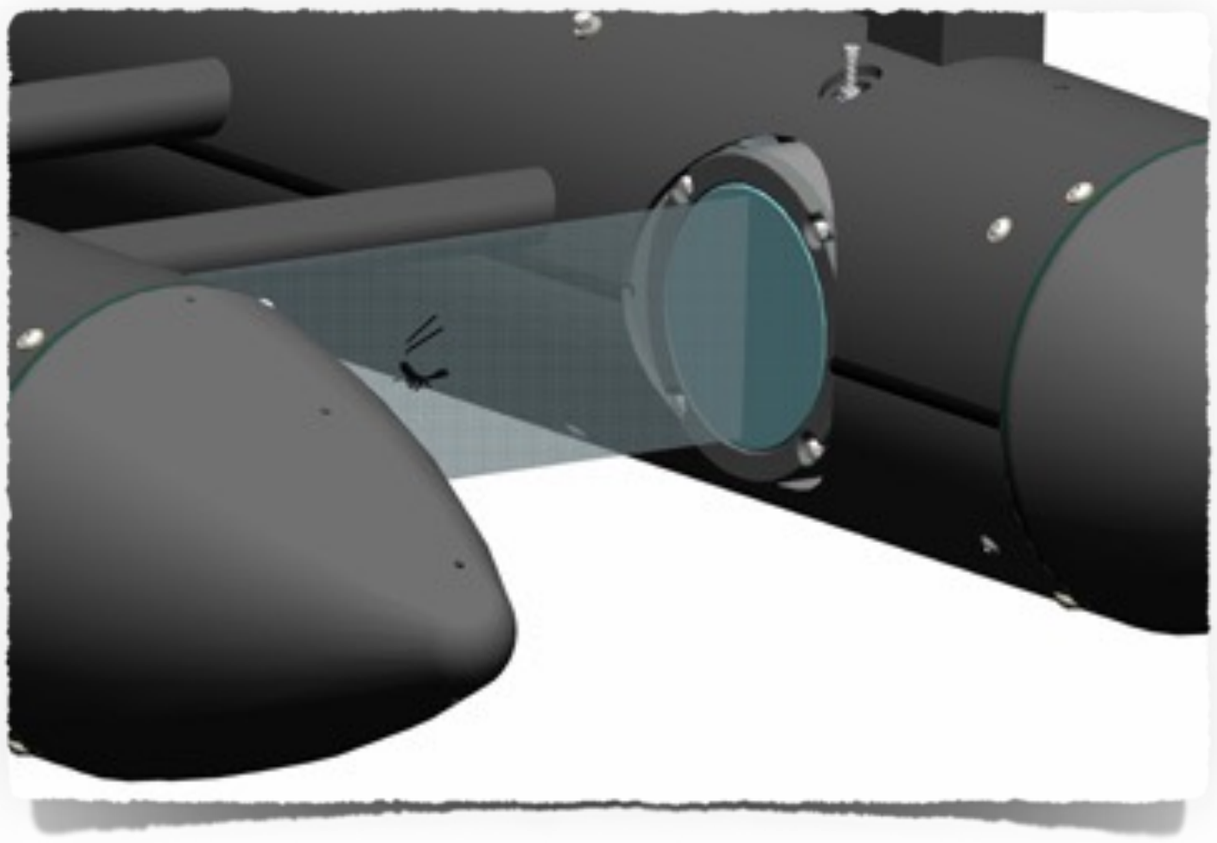
high-frequency simultaneous sampling through high resolution imaging

In Situ Ichthyoplankton Imaging System (ISIIS)

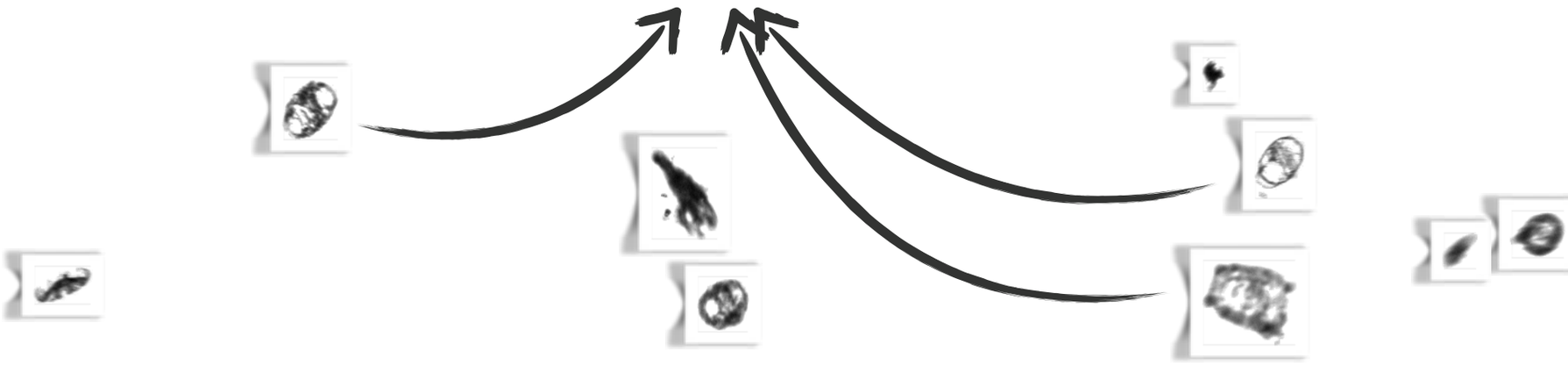
CTD
Fluorometer
Oxygen
ADCP

BellaMare

UNIVERSITY OF MIAMI
ROSENSTIEL
SCHOOL of MARINE &
ATMOSPHERIC SCIENCE



Computer-assisted identification



Scientific questions

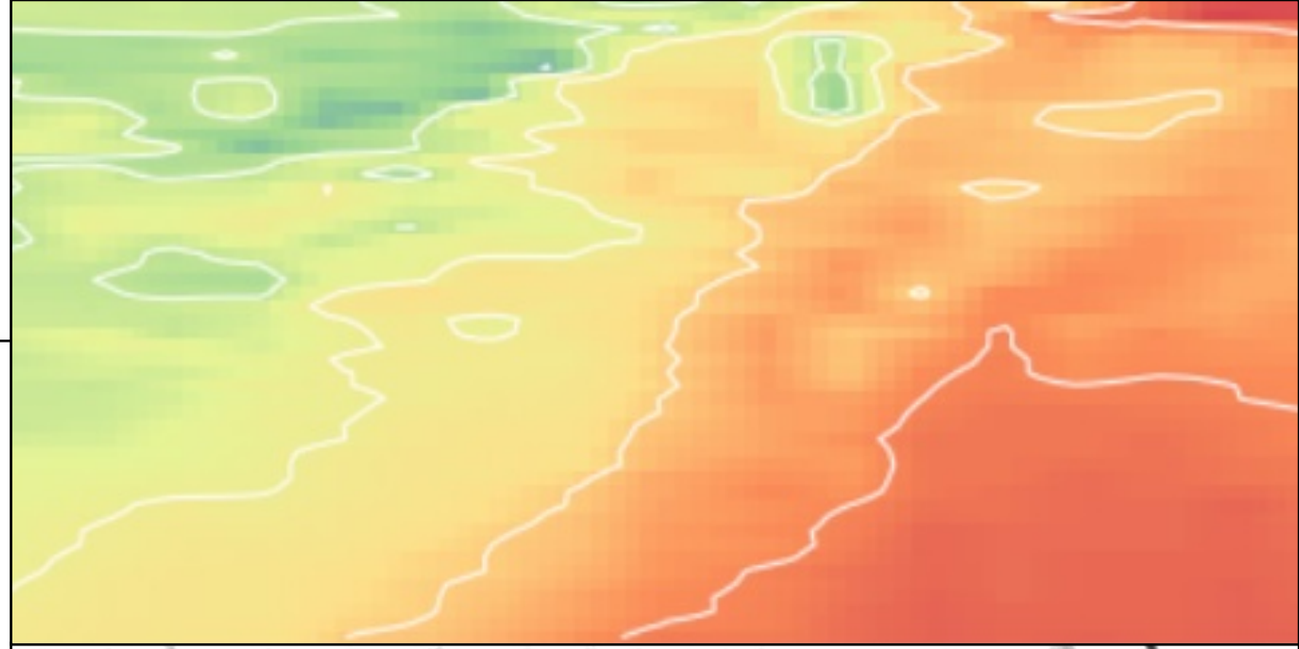
cm-scale, ~10Hz data resolution

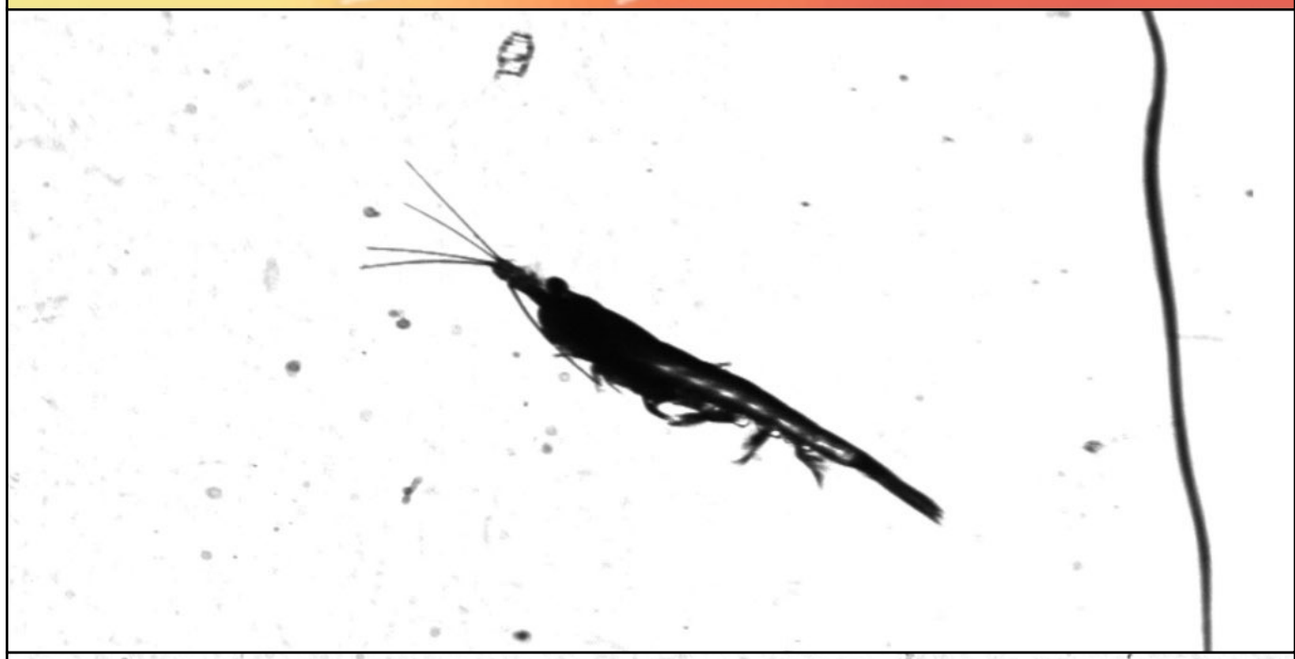
Bio-physical interactions (including very small scale)

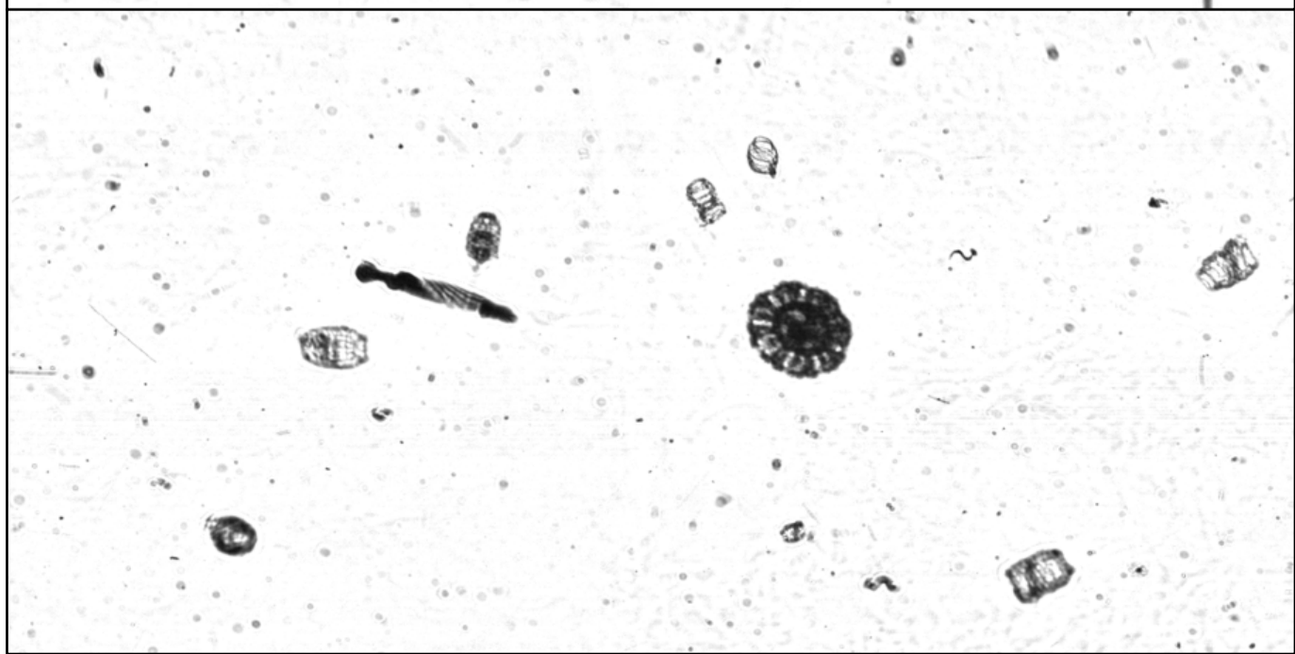
Thin plankton layers

Co-occurrence (predation, cooperation)

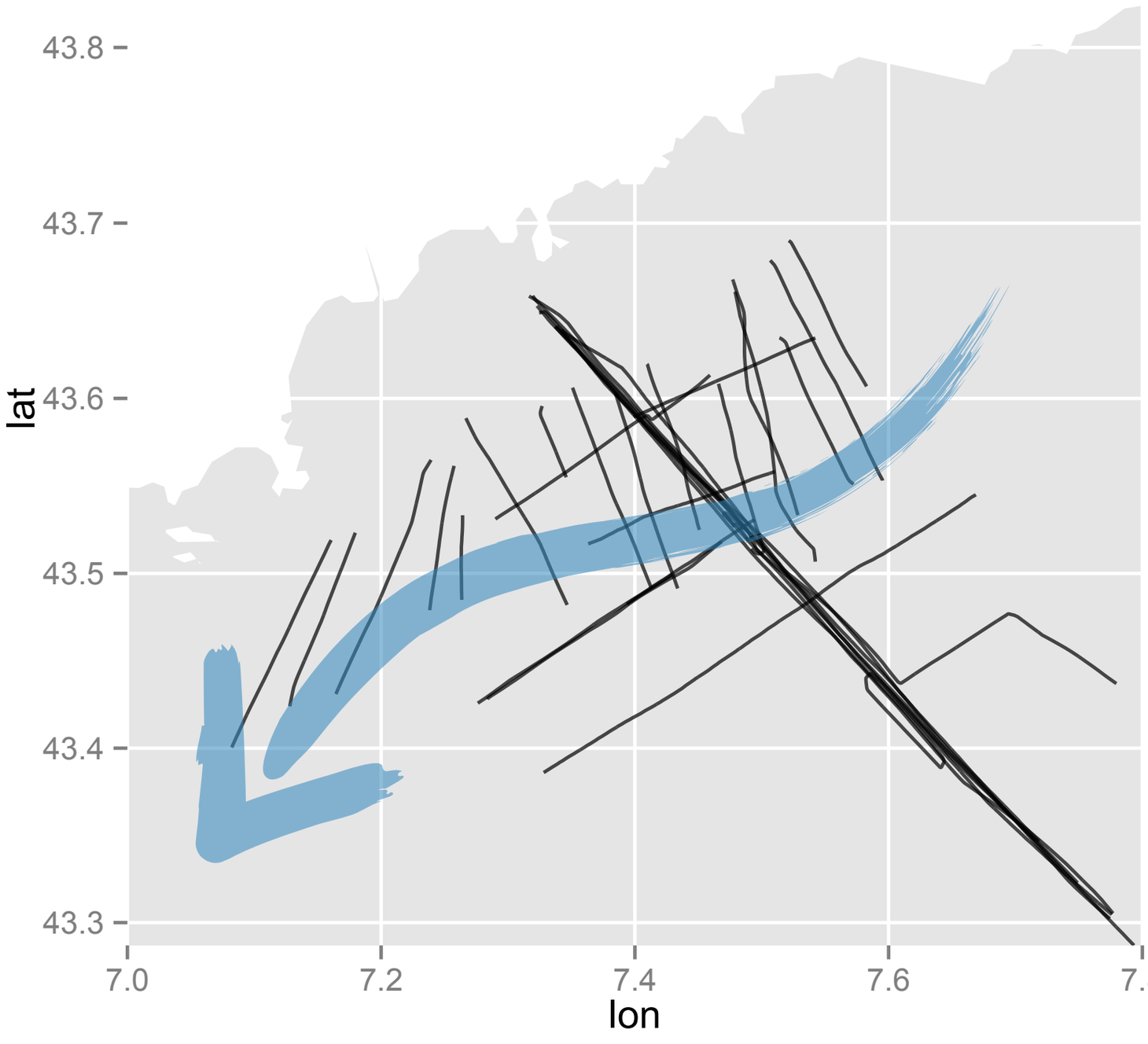
etc.







Sampling strategy



Describe a mesoscale front

Cross-front transects

day or night

Along-front transects

dawn or dusk

Lagrangian transects

48h

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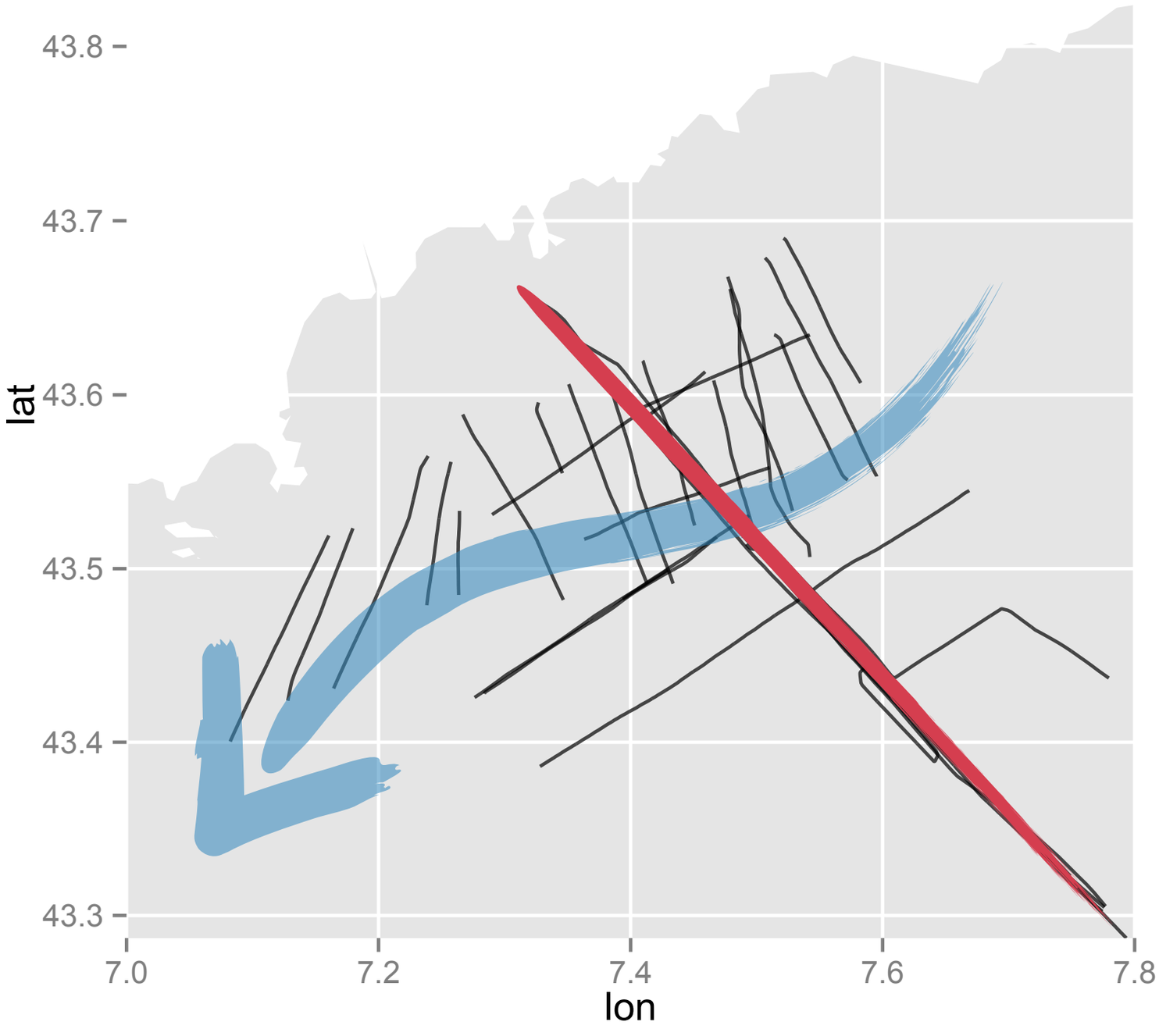

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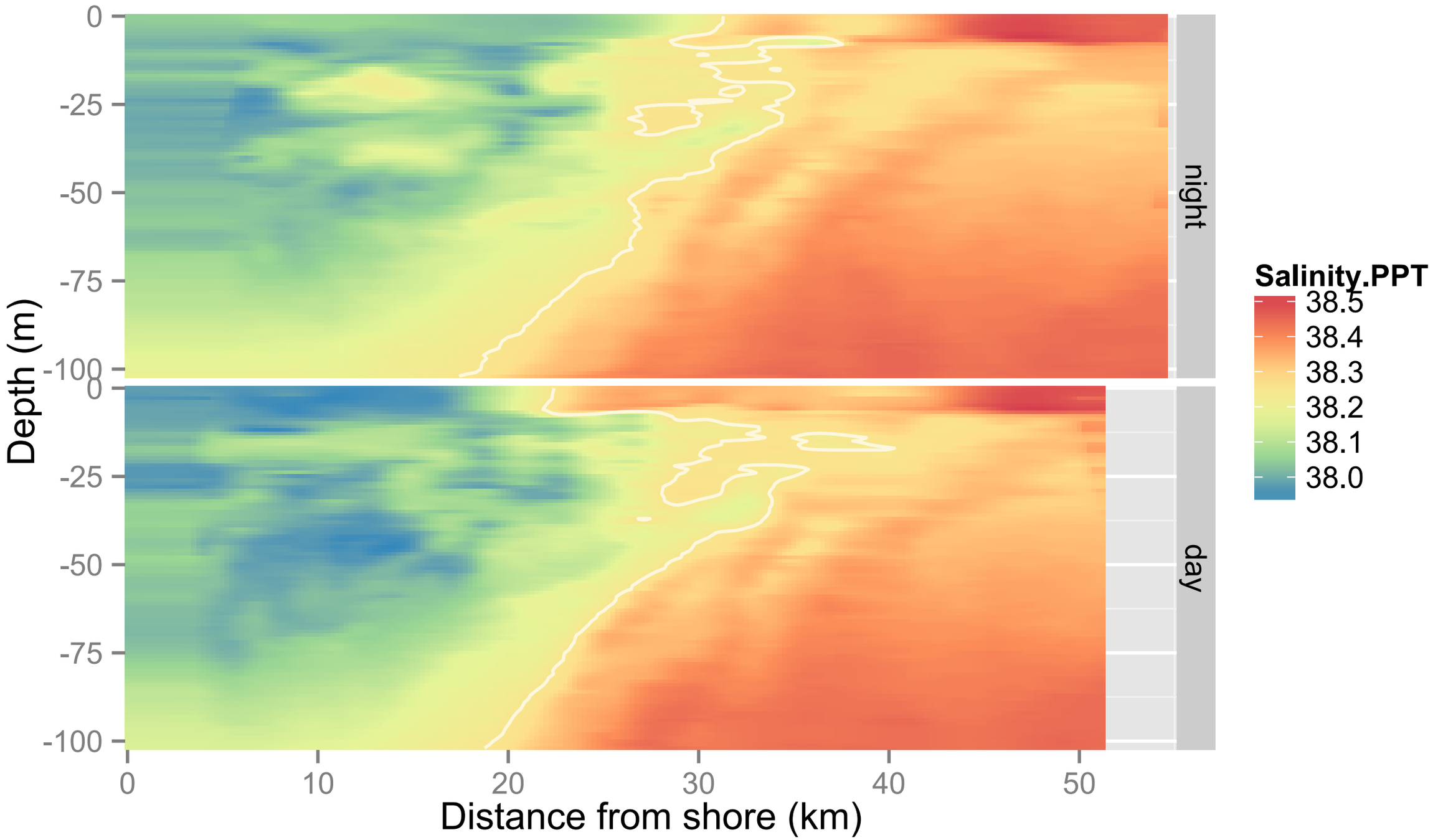

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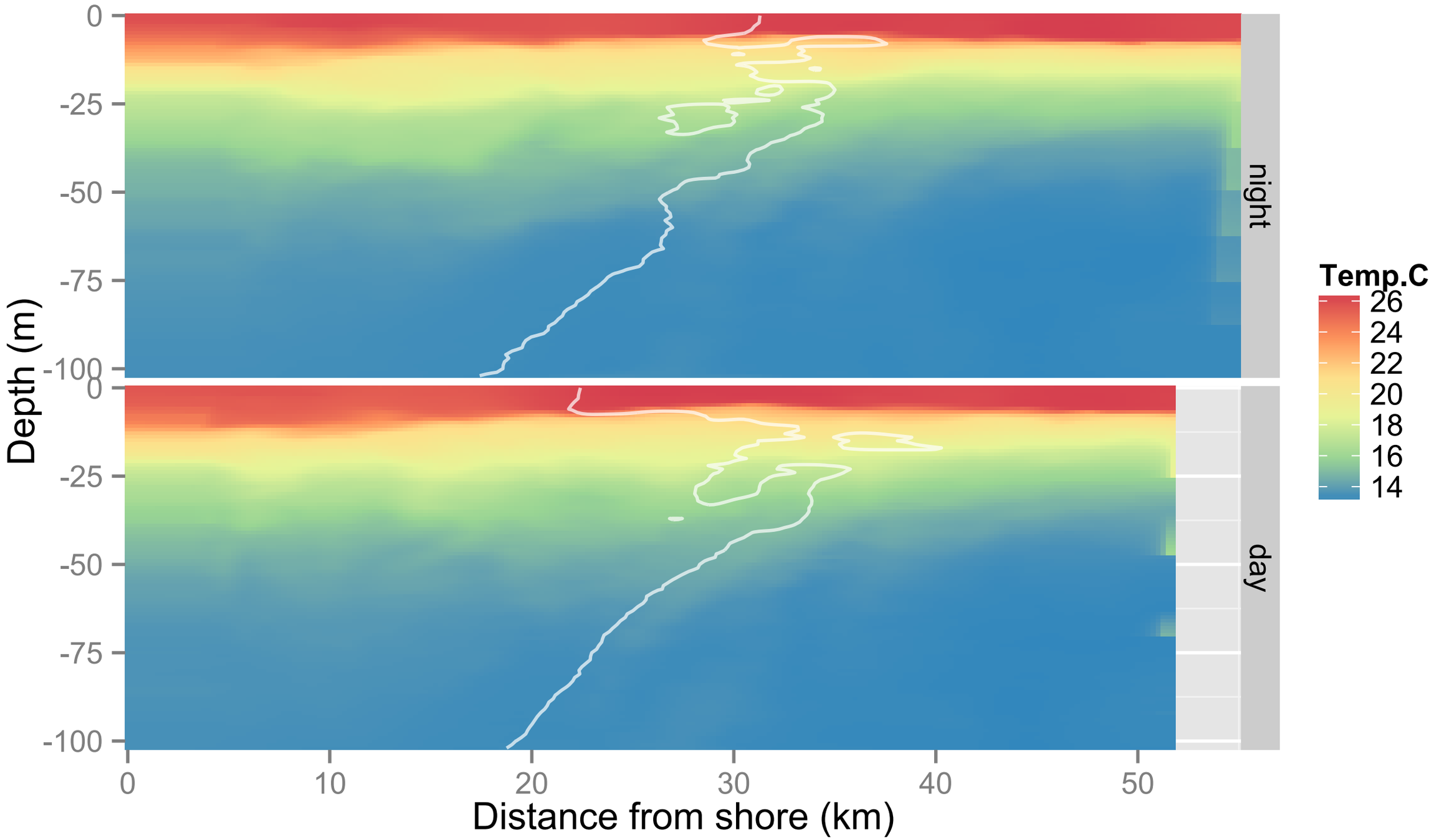

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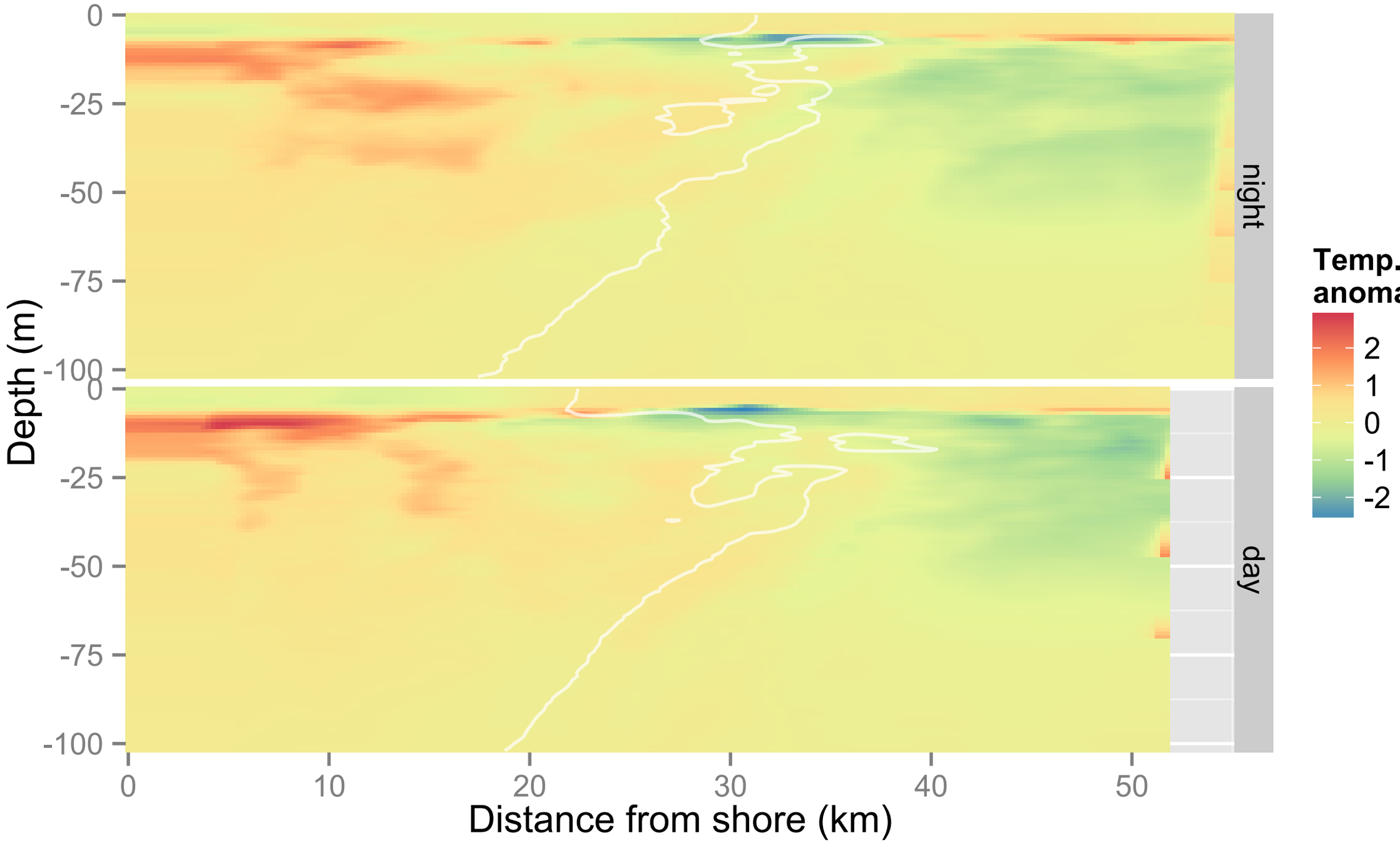

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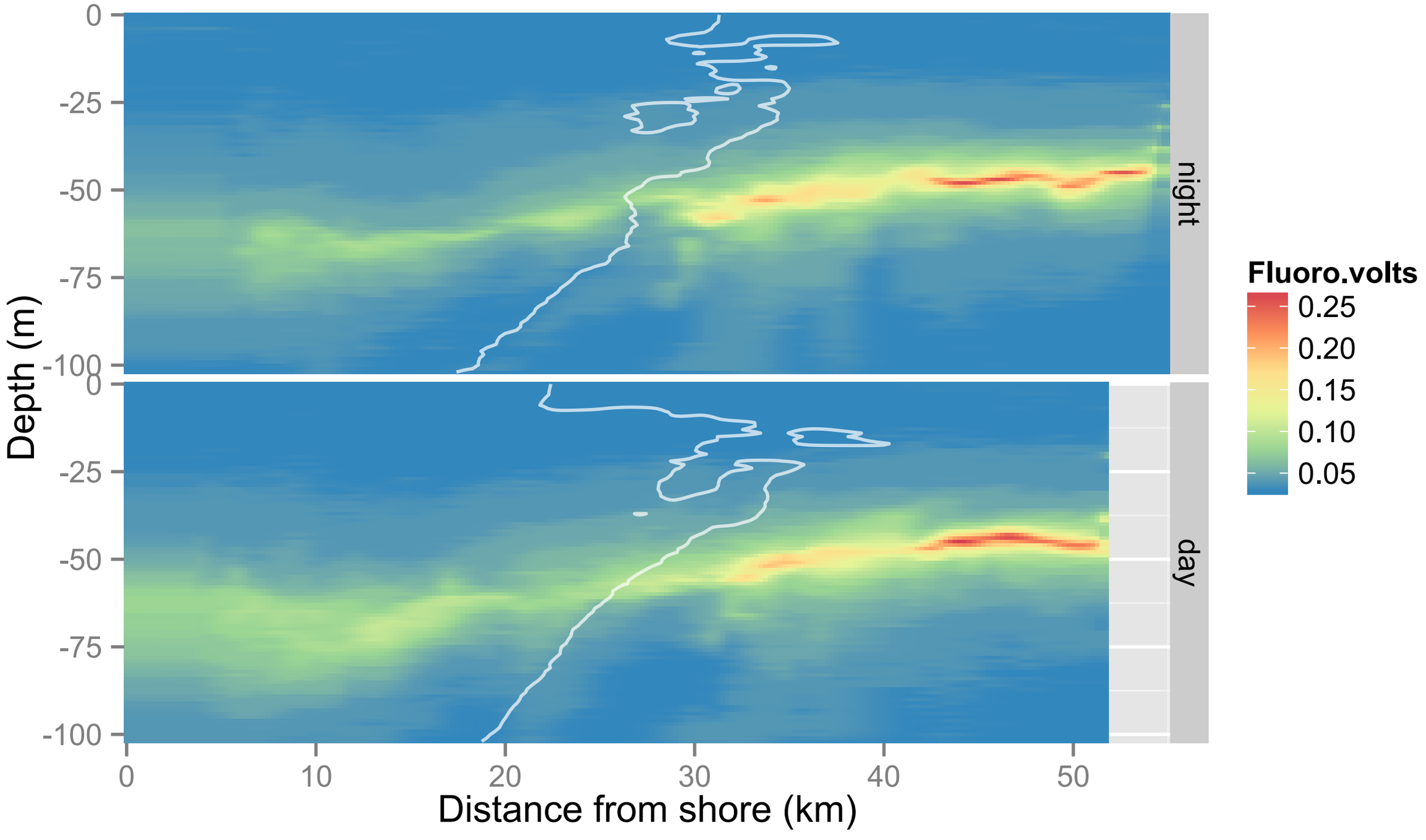
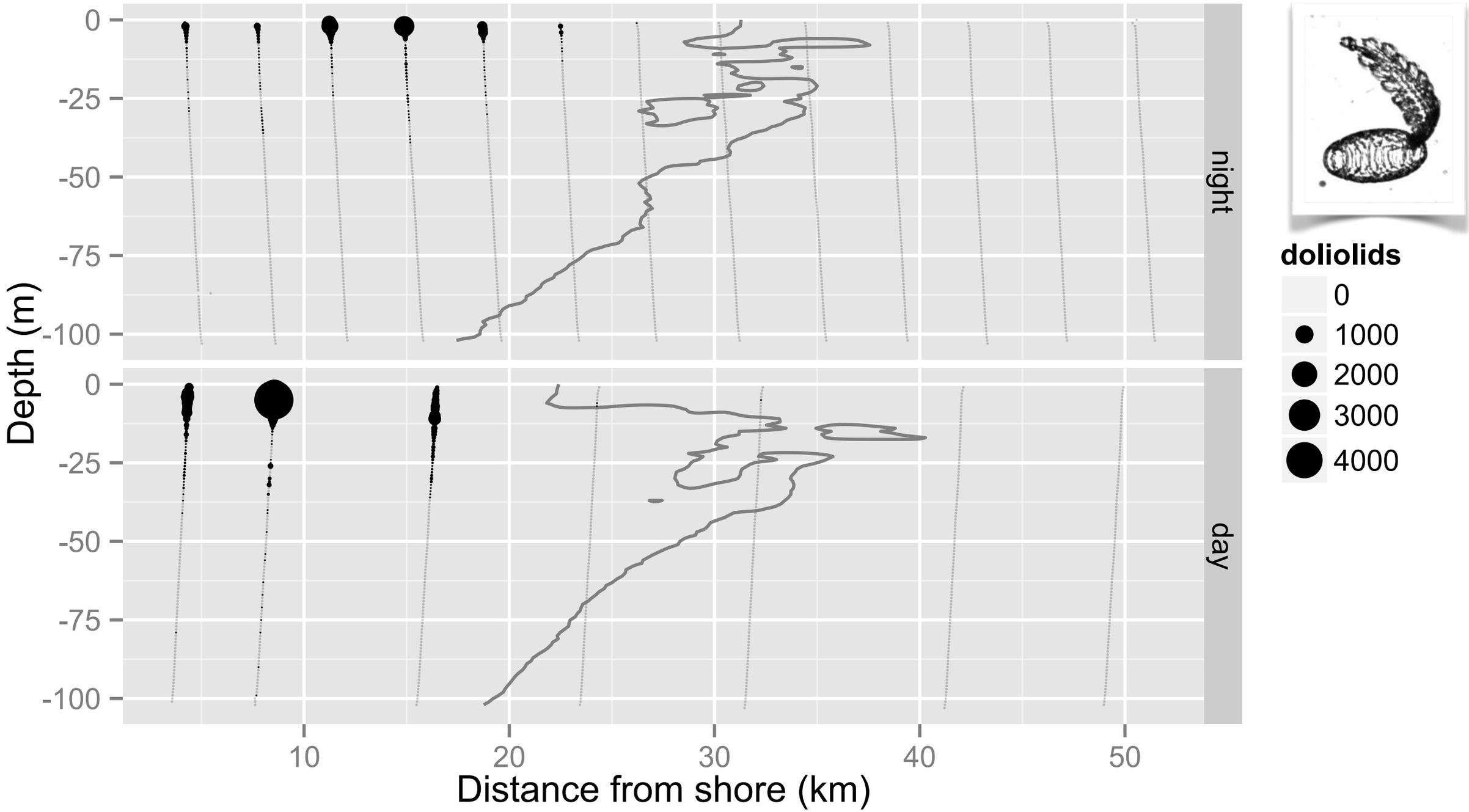


Spatial distribution

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



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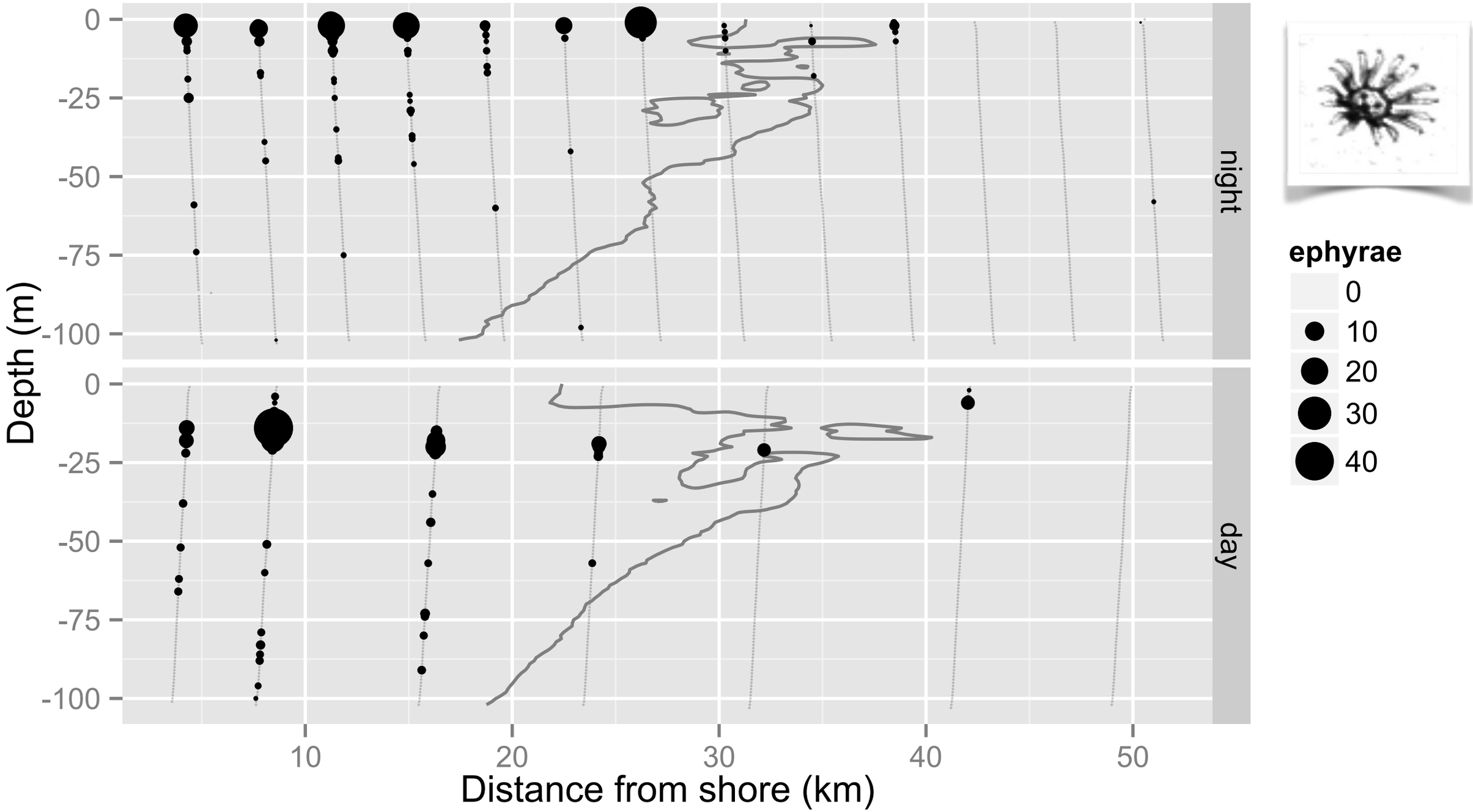

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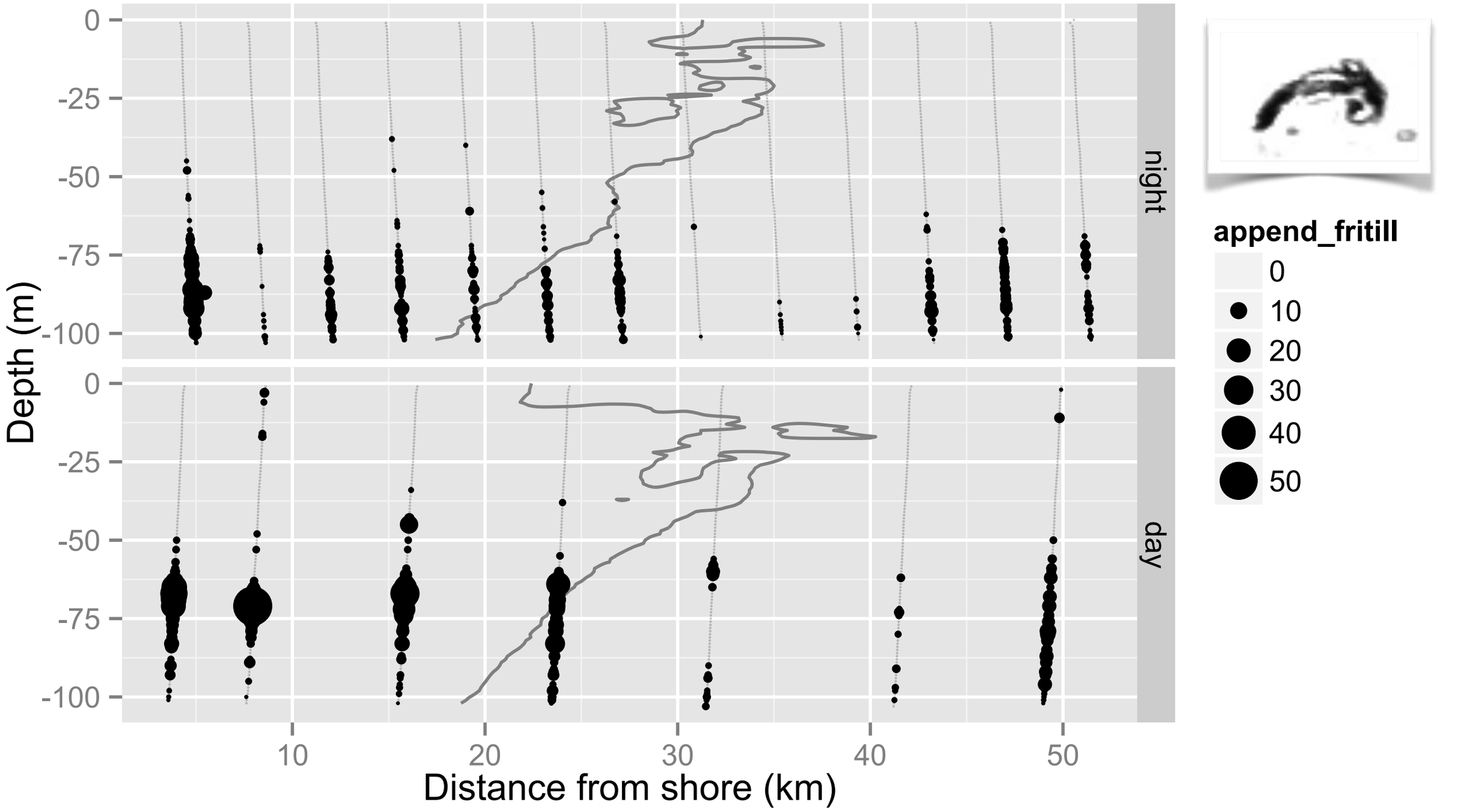
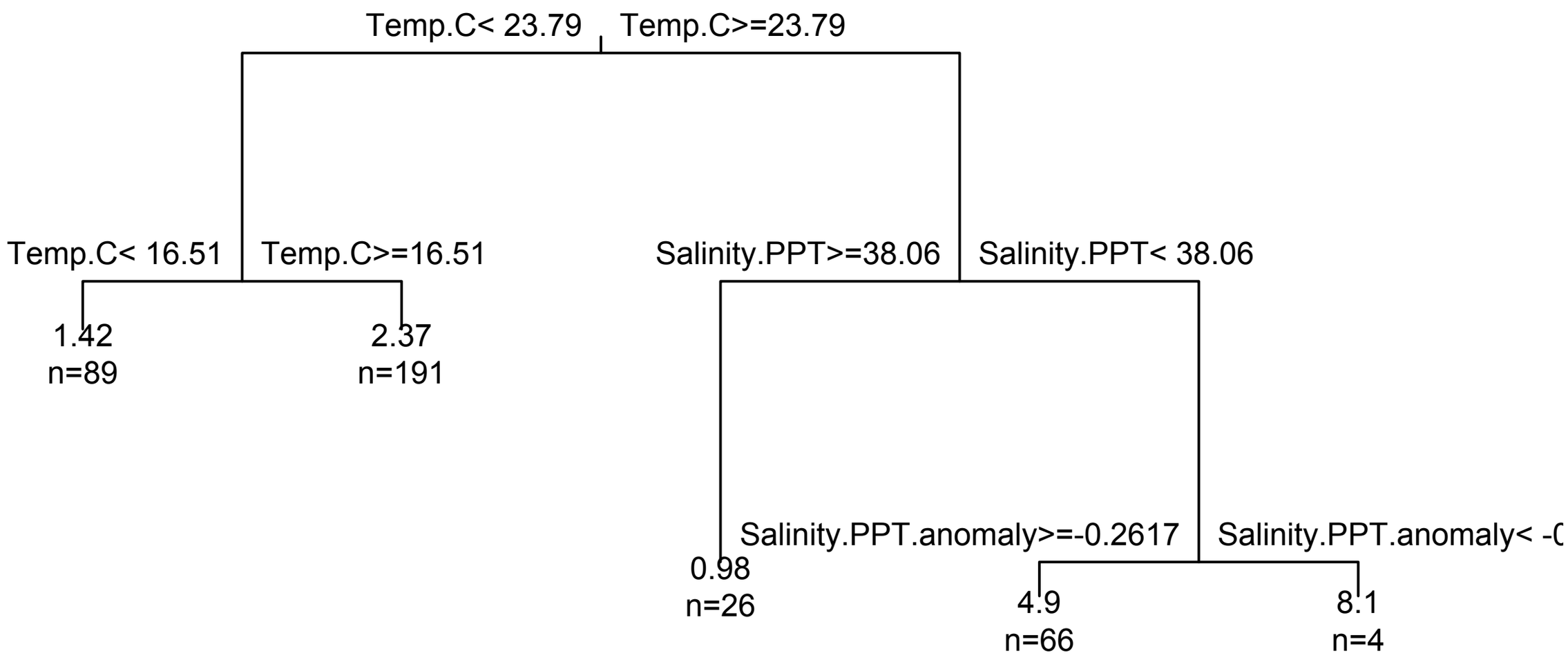


Environmental correlates

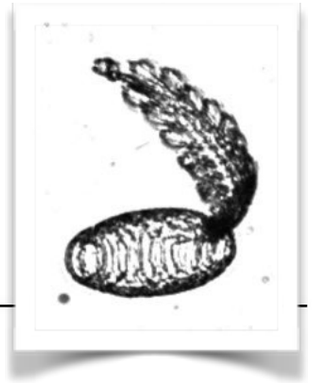
Regression trees: log(n+1) abundances on variables T, S, fluo, O2, dens + anomalies



Error : 0.334 CV Error : 0.424 SE : 0.0405

60% variance

Environmental correlates



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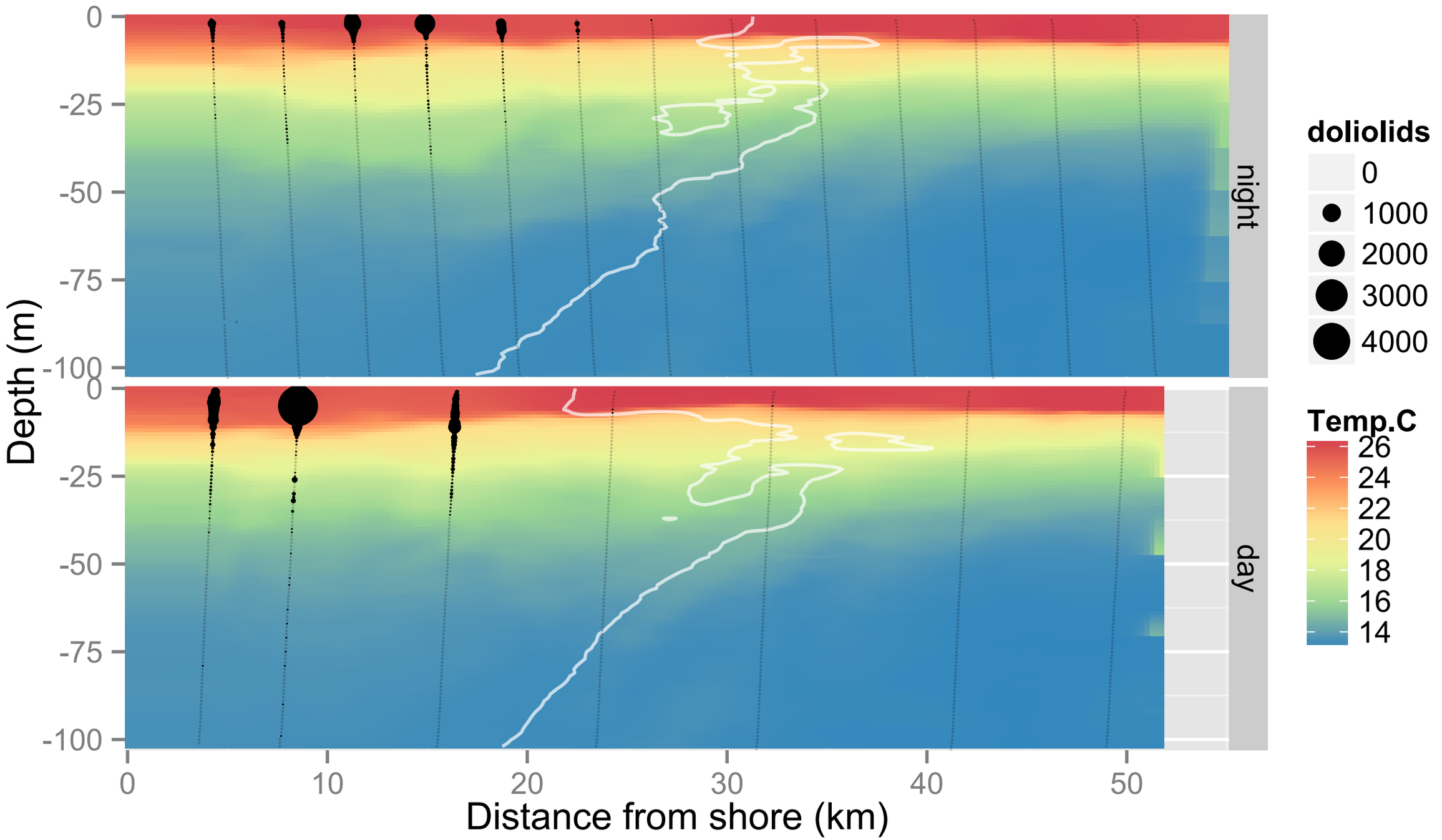

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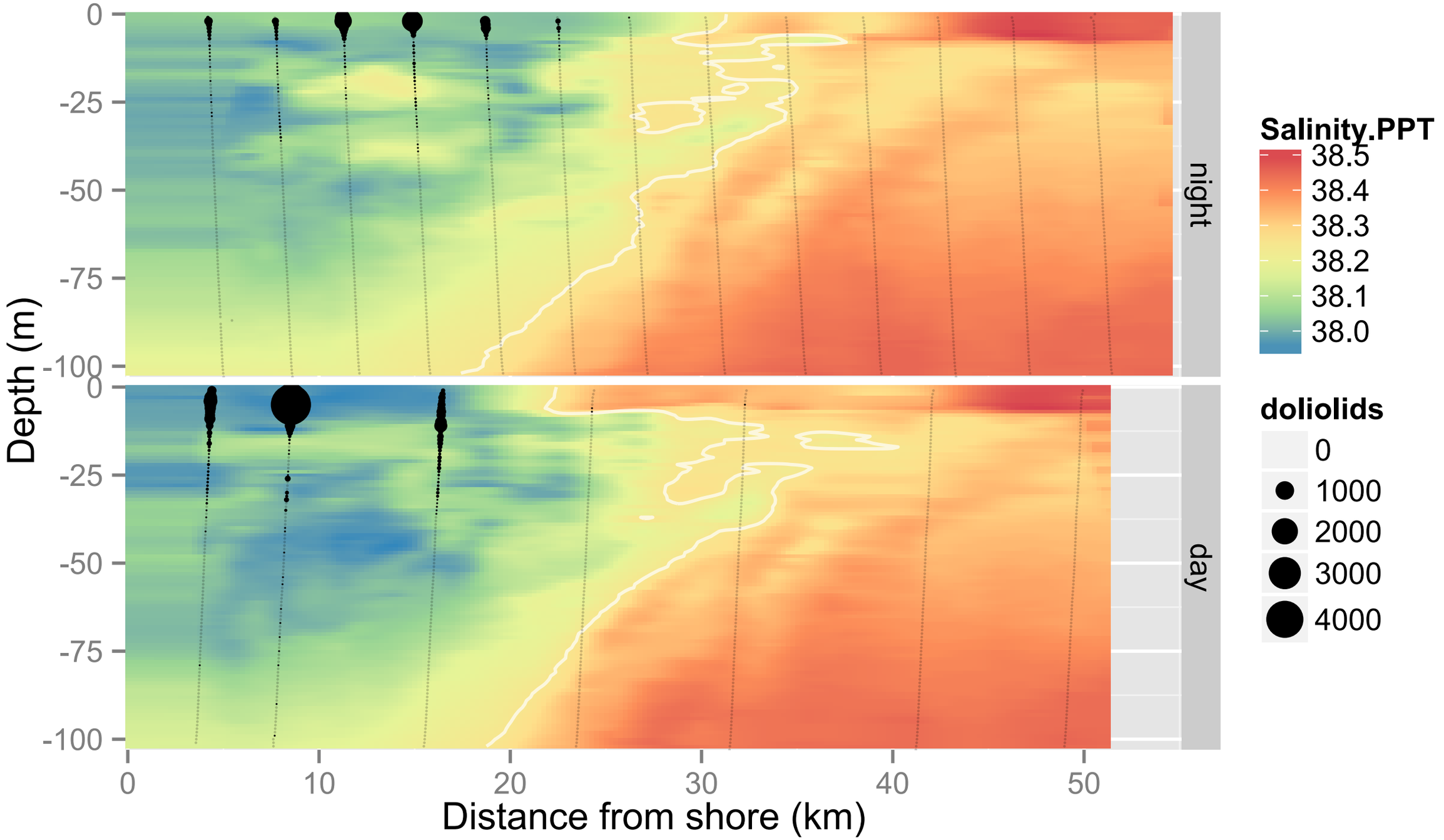

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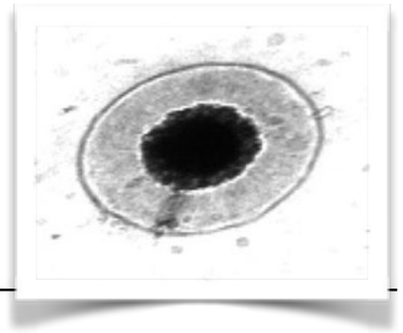
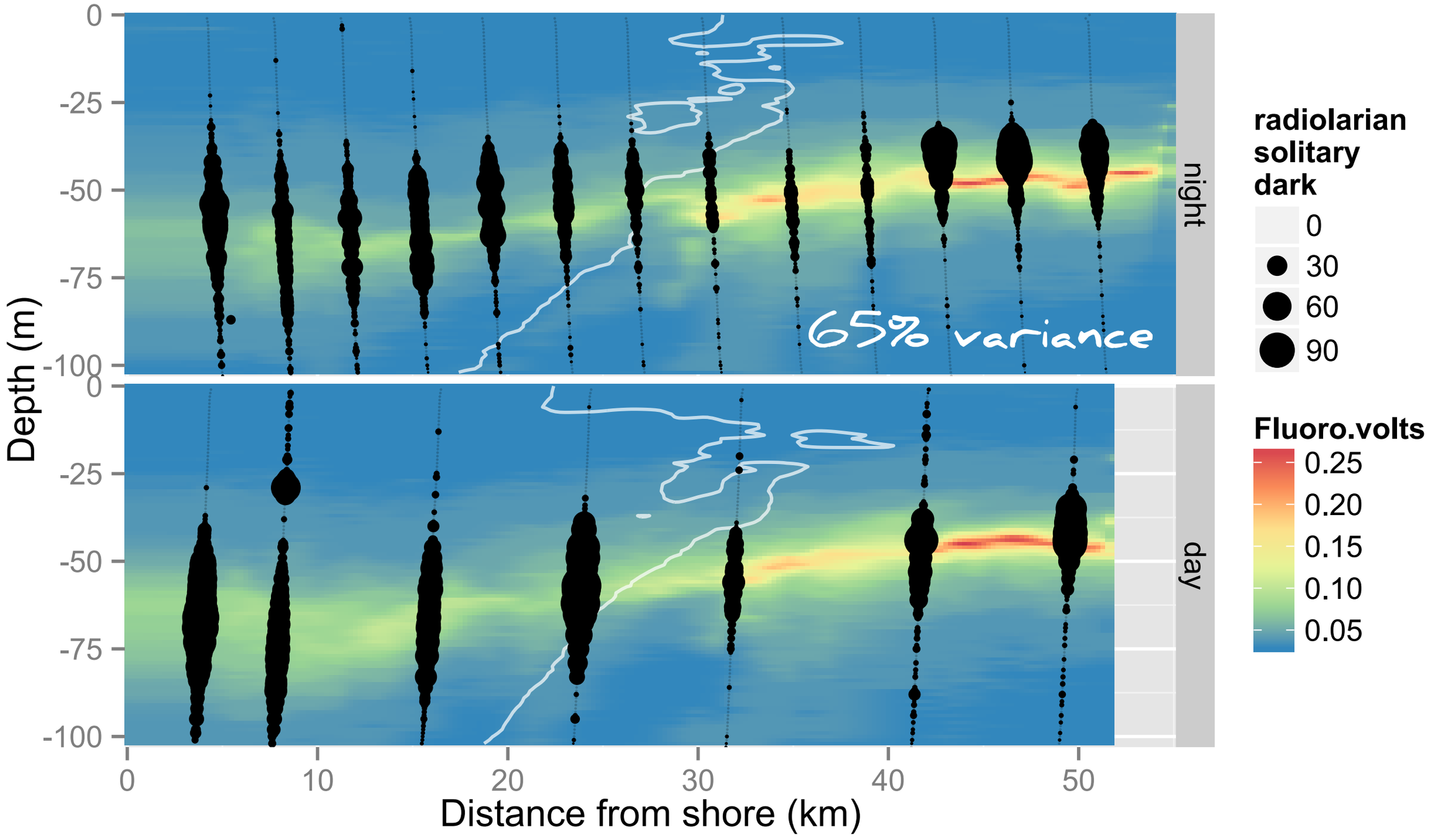
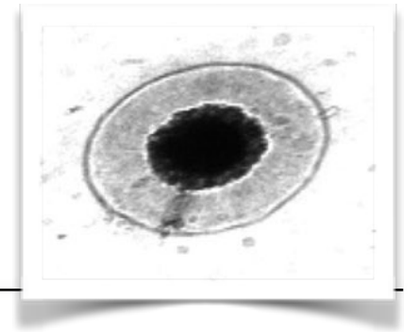
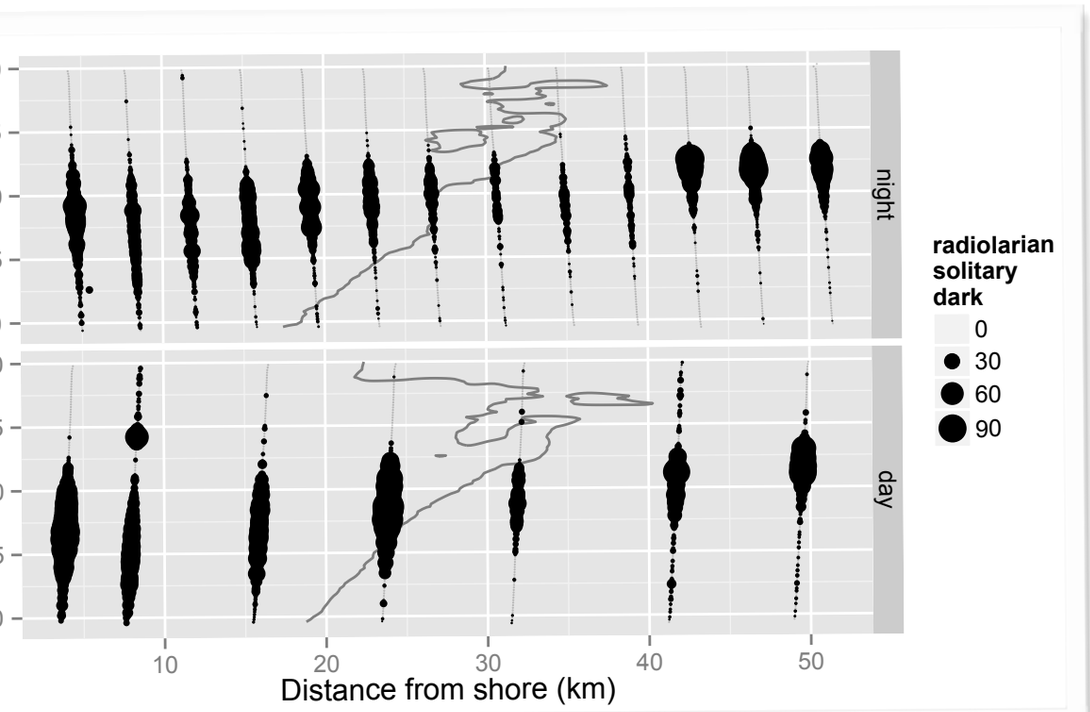




Model of distribution



Boosted regression trees: Poisson distributed abundances on variables, CV

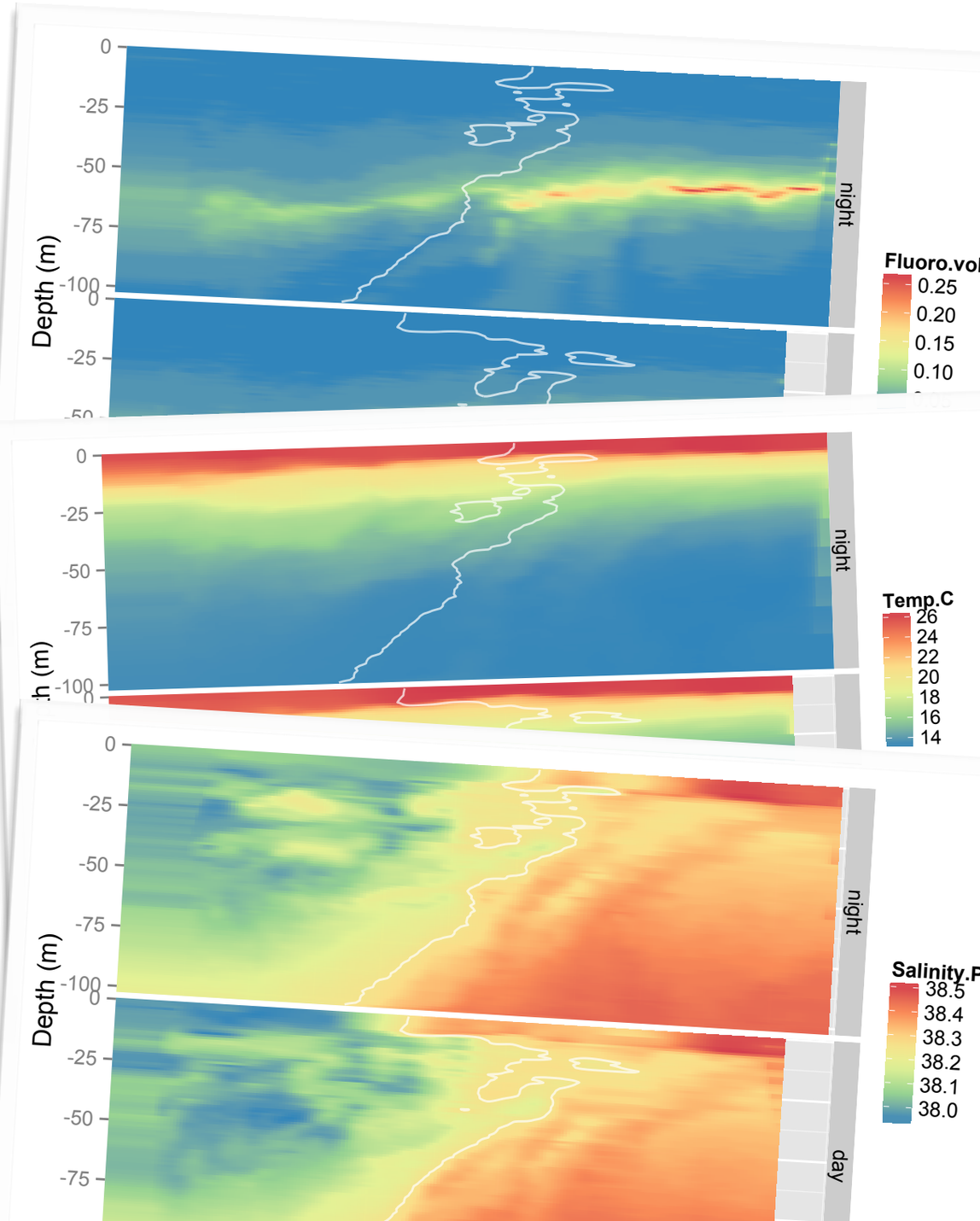


25%

+ 23%

16%

...



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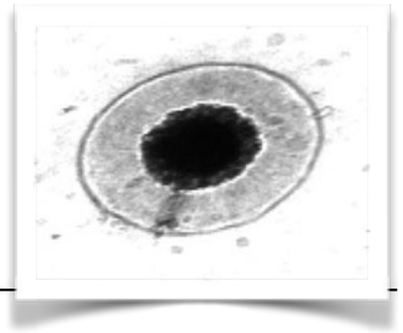

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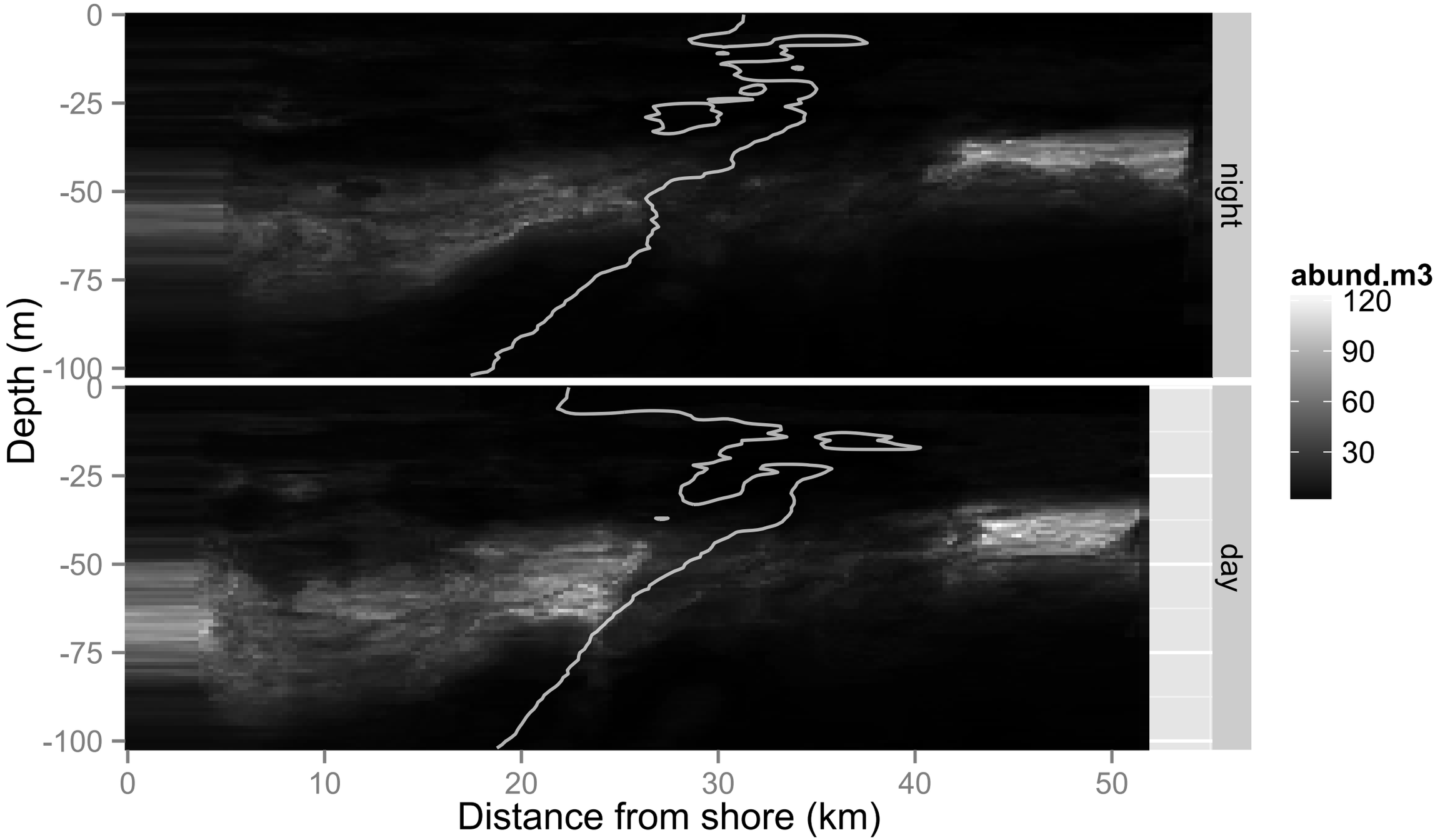
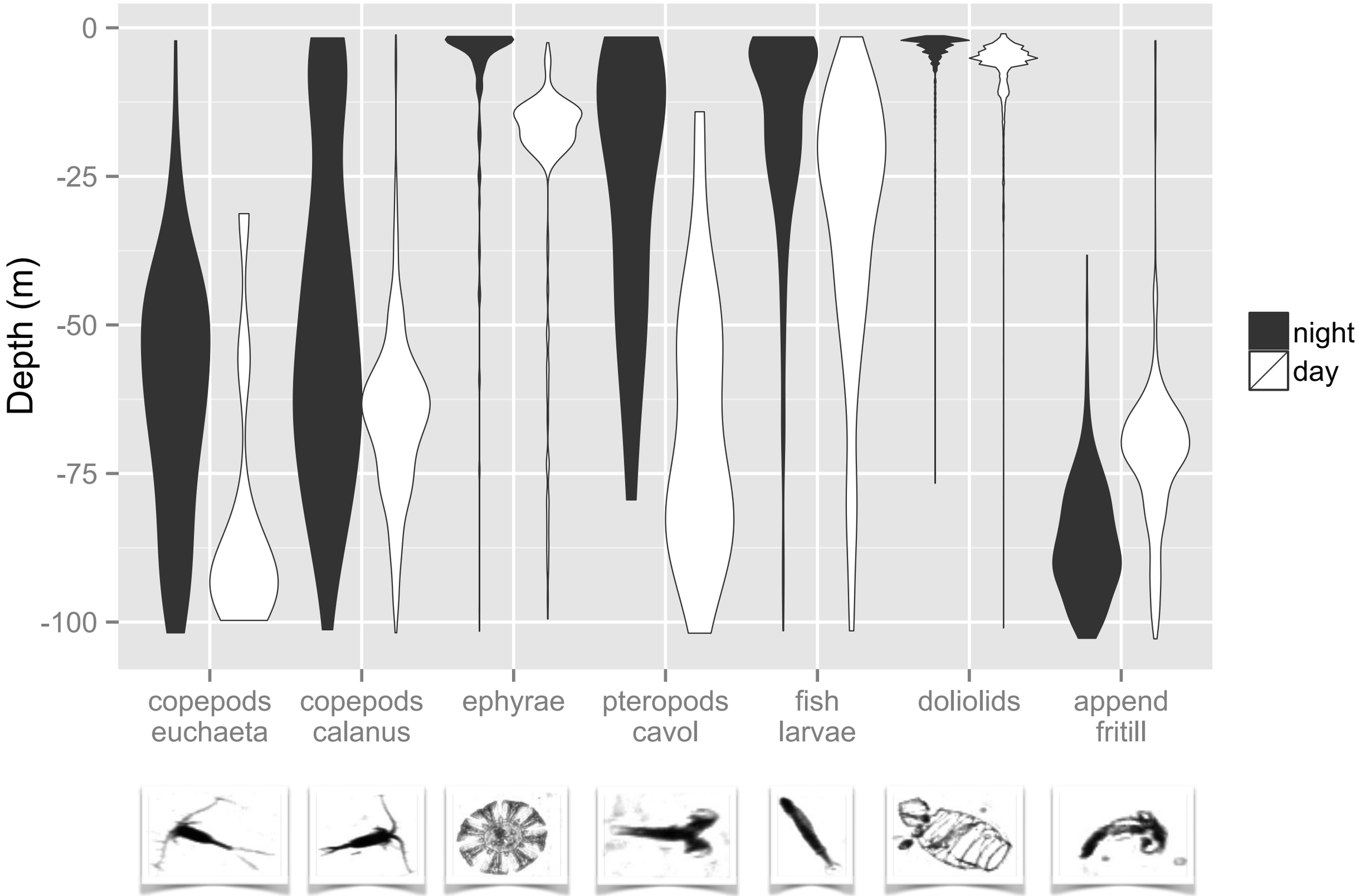


Diel vertical migration



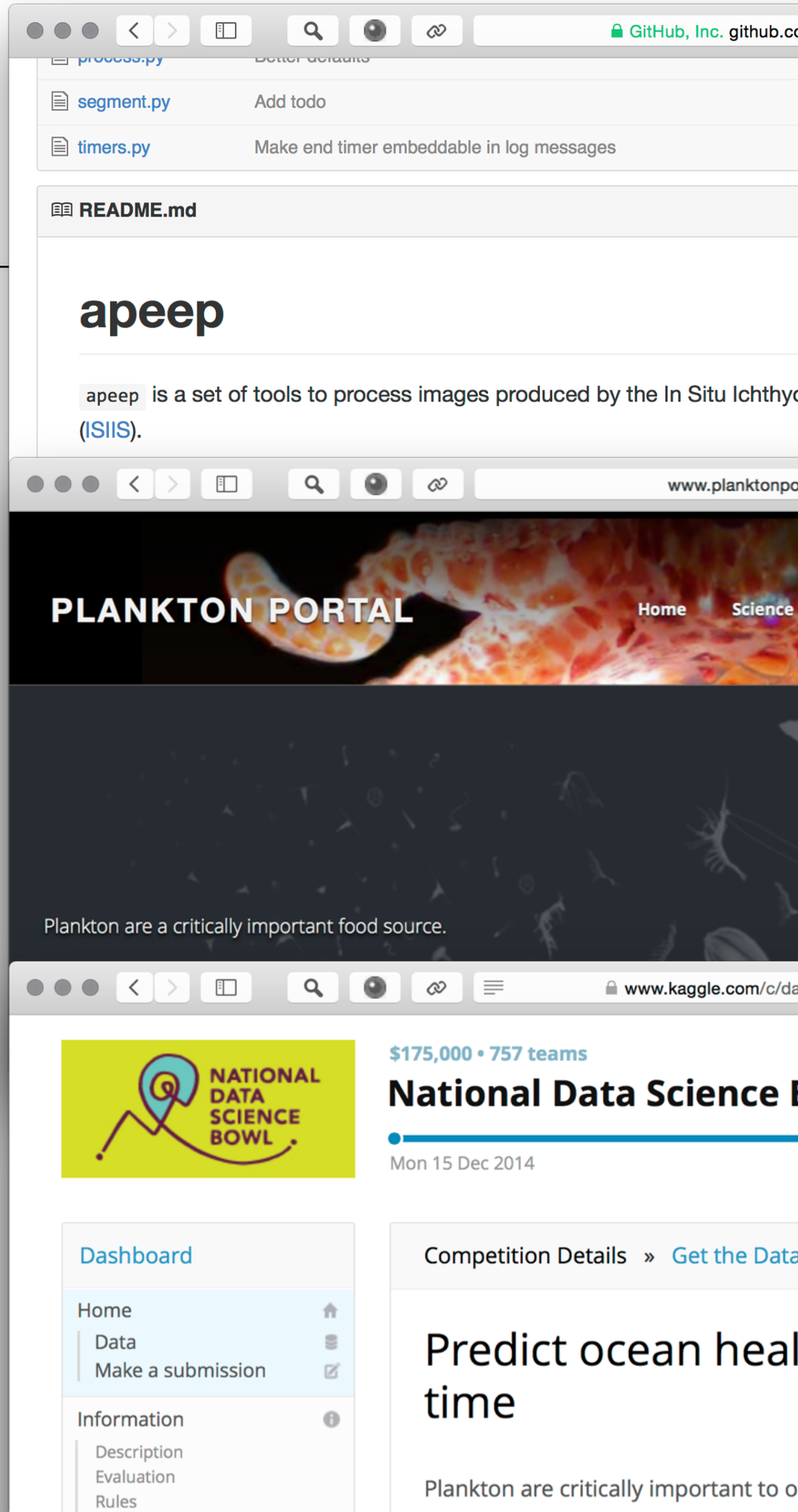
Perspectives

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



Thank you for your attention

Co-authors:

J-O Irisson
R Faillettaz
JY Luo
CM Guigand
RK Cowen

Contributors

A Maupetit
F ferrando
M Picheral