

# Autonomous technology for offshore environmental monitoring

## Akvaplan-niva

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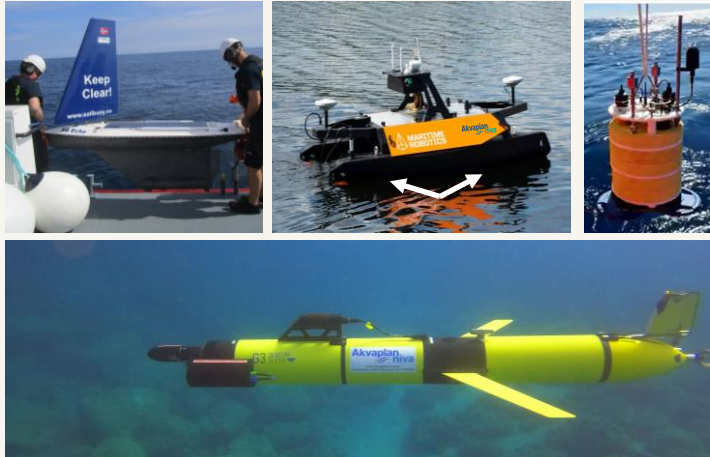
Lionel Camus - [lca@akvaplan.niva.no](mailto:lca@akvaplan.niva.no)

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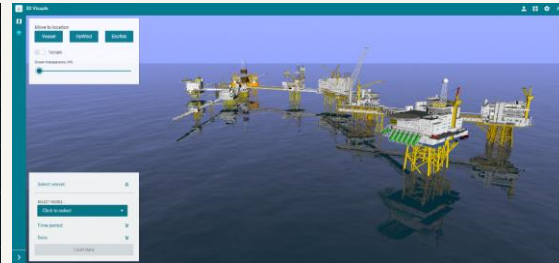


# Approach

## A fleet of autonomous vehicles

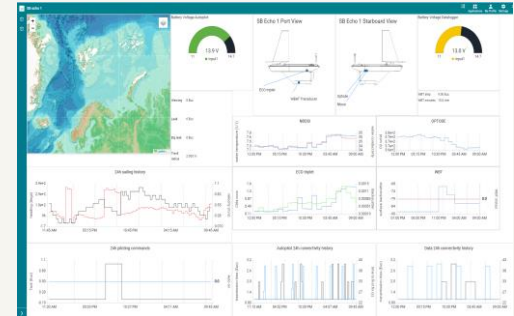


## A data portal: Blue Insight



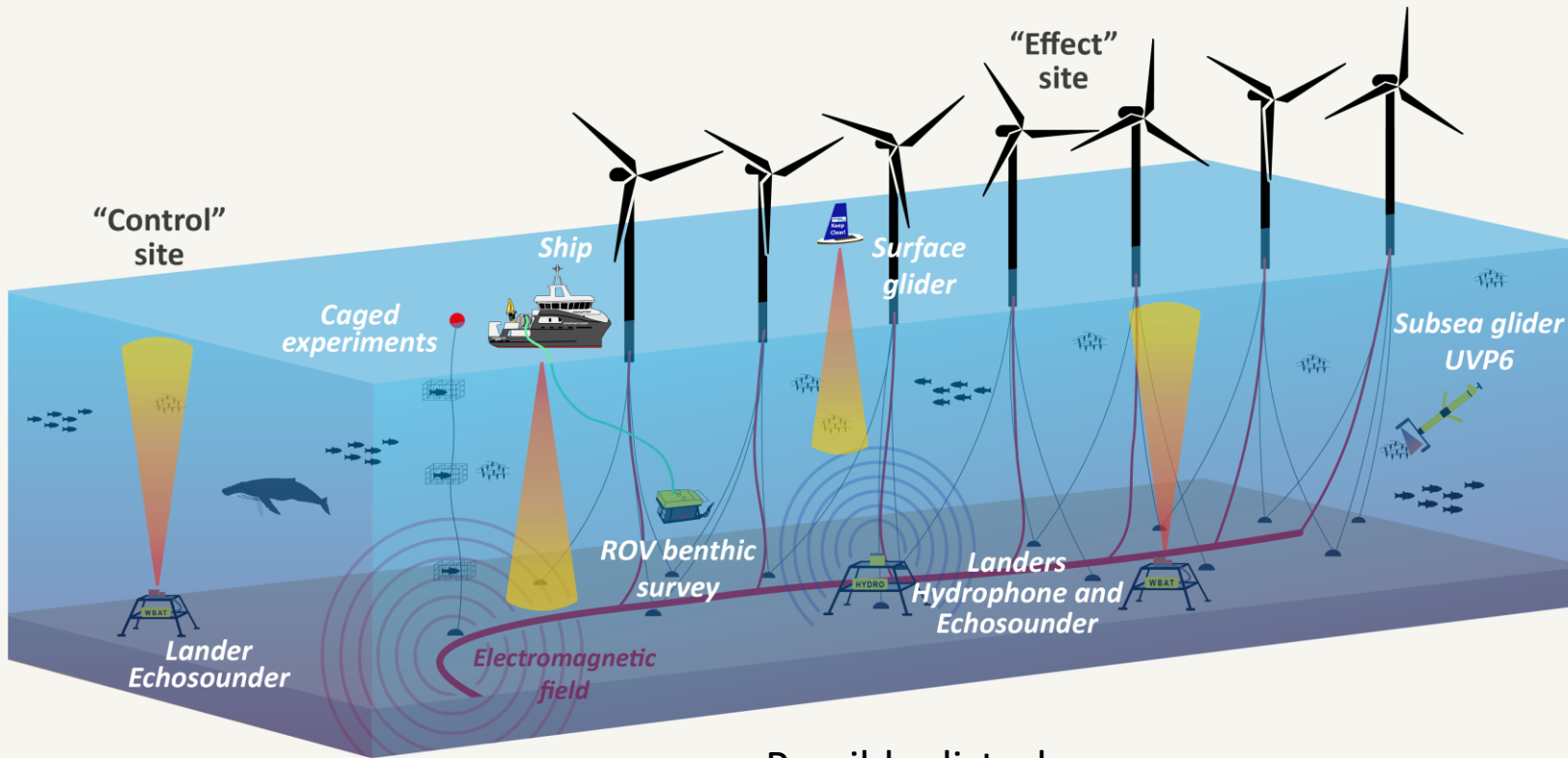
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## Remote Operation Centre



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Changes in currents in the wake of the turbines → Effects on stratification and low trophic levels production



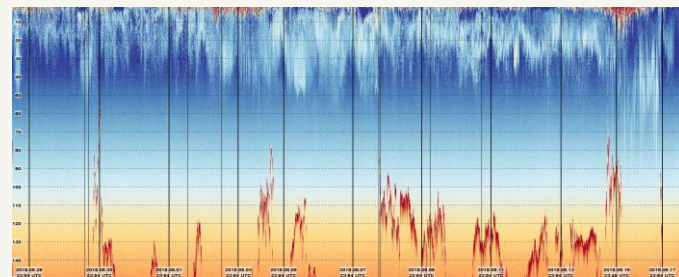
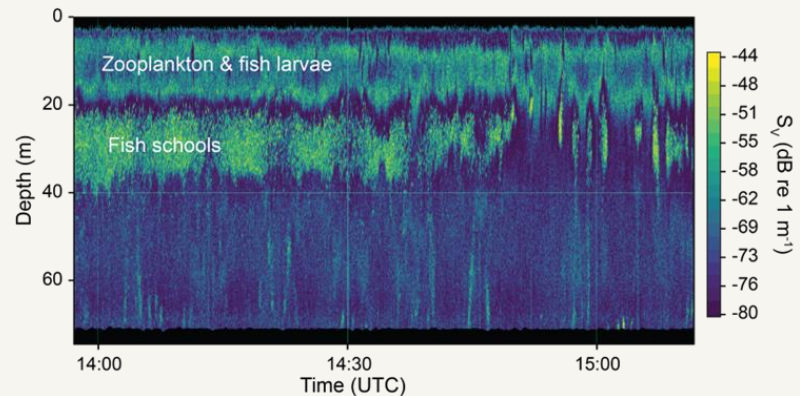
Possible reef-effects (fish and benthos)

Possible disturbances  
(entanglement, sound, EMF...)

# Long term deployment of USV: the Sailbuoy



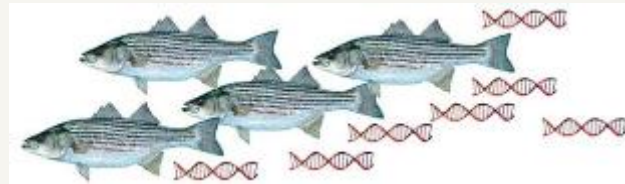
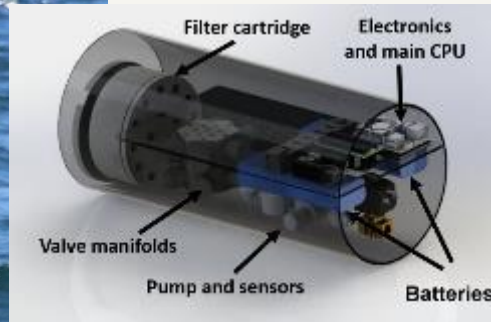
## Biomass in the water column



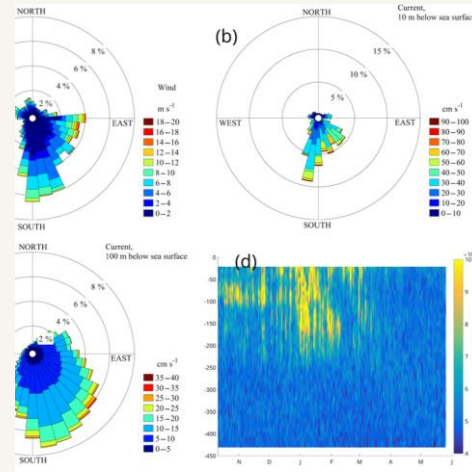
# Biodiversity



DNA sampler















# High frequency ADCP for ocean current across depth

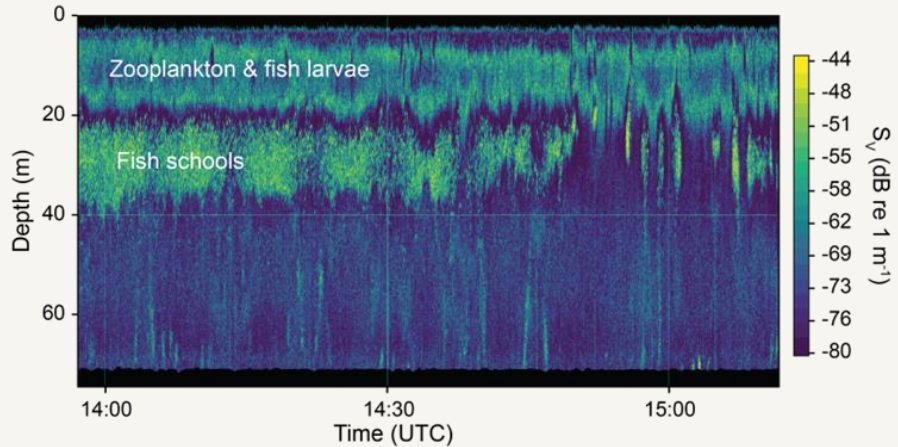


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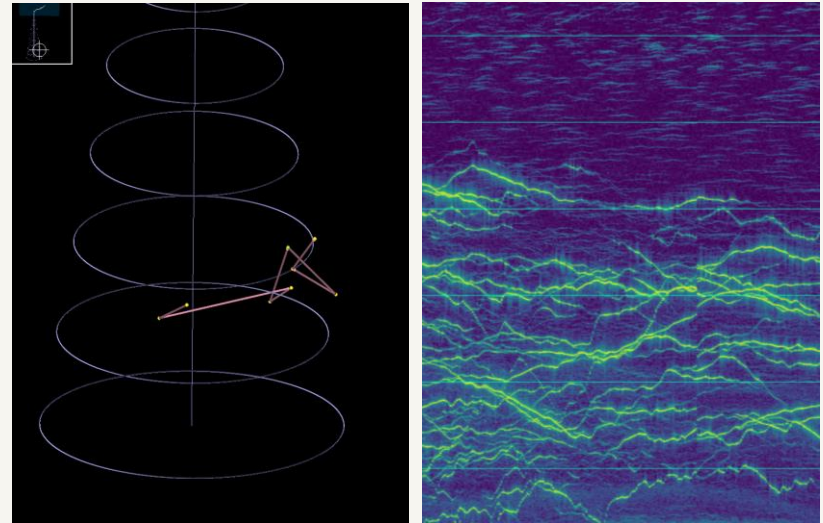
## SailBuoy Ocean Currents: Low-Cost Upper-Layer Ocean Current Measurements

by [Nellie Wullenweber](#) 1,2,3,4  , [Lars R. Hole](#) 4,\*  , [Peygham Ghaffari](#) 5  , [Inger Graves](#) 6  , [Harald Tholo](#) 6   and [Lionel Camus](#) 5  

# A short range USV: the Otter



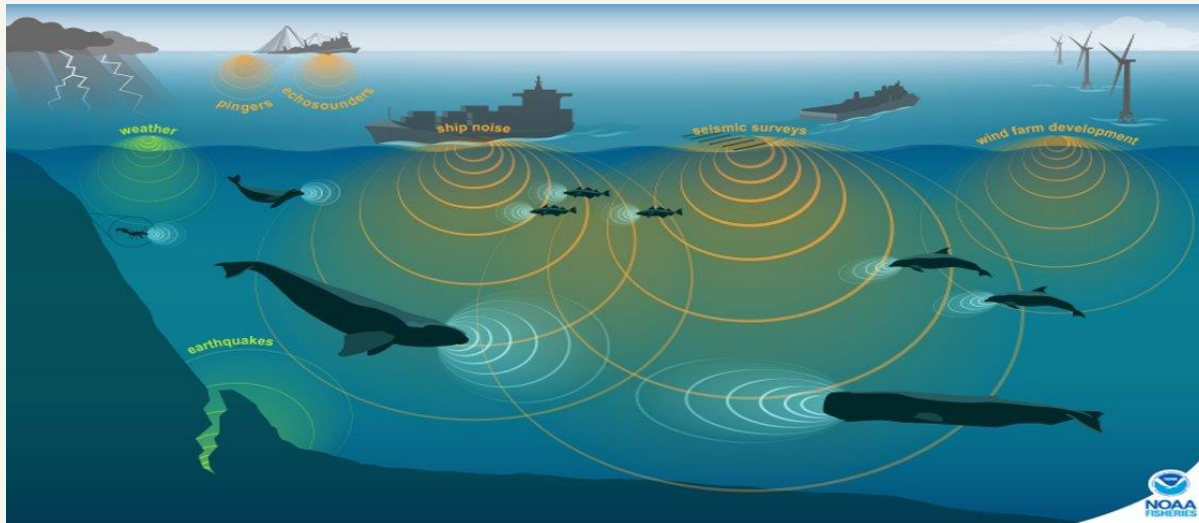
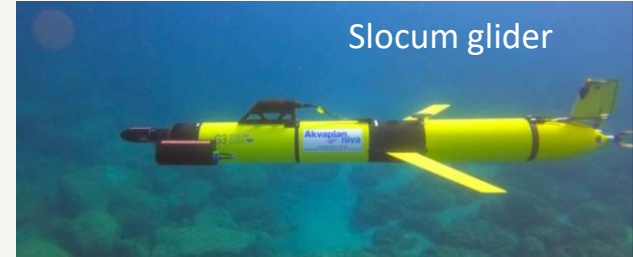
## Individual fish tracking



# Sound monitoring

Biodiversity of marine mammals

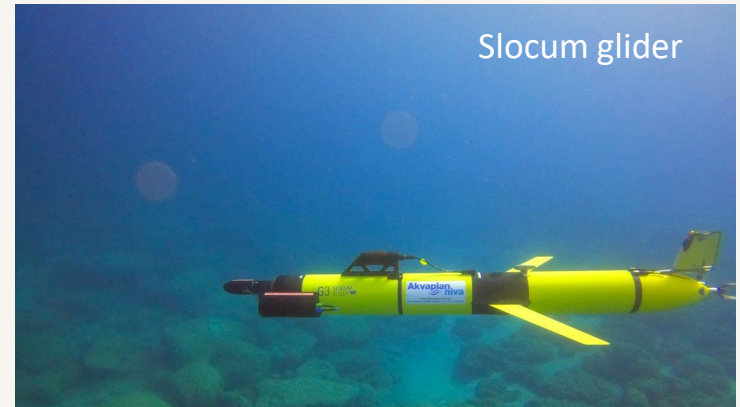
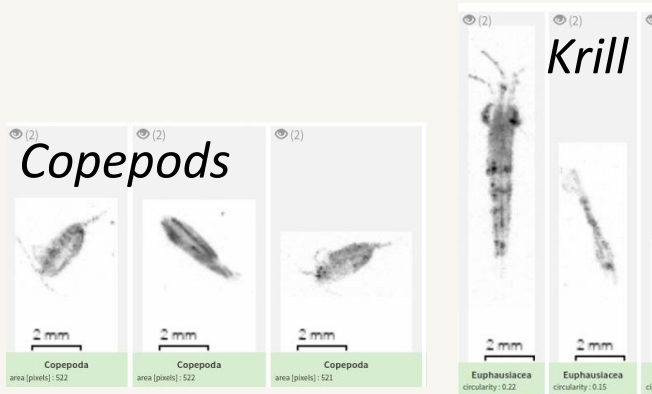
Noise characteristics and intensity from offshore wind operations



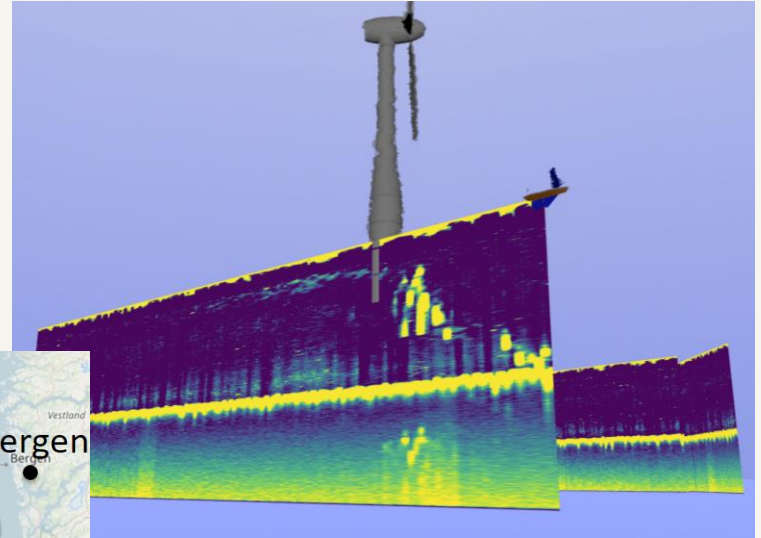
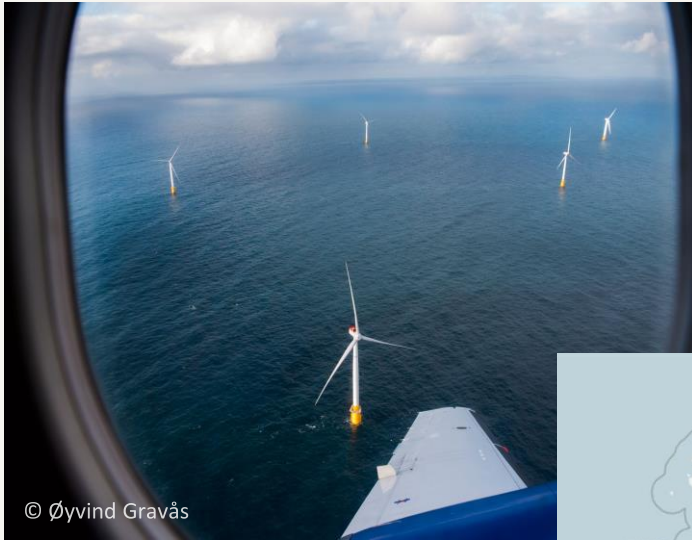


# Plankton identification and abundance

## Optical plankton sensor (UVP6)



# Pelagic ecosystem monitoring at Highwind Scotland

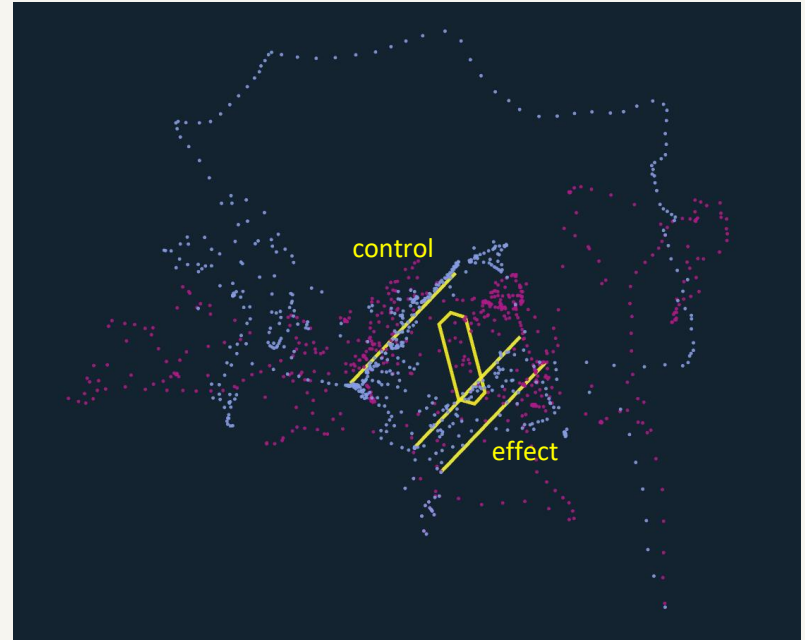


# Hywind OWFs sampling

Hywind Scotland  
distance gradients



Hywind Tampen  
control-effect + distance gradients



analysis



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Echo



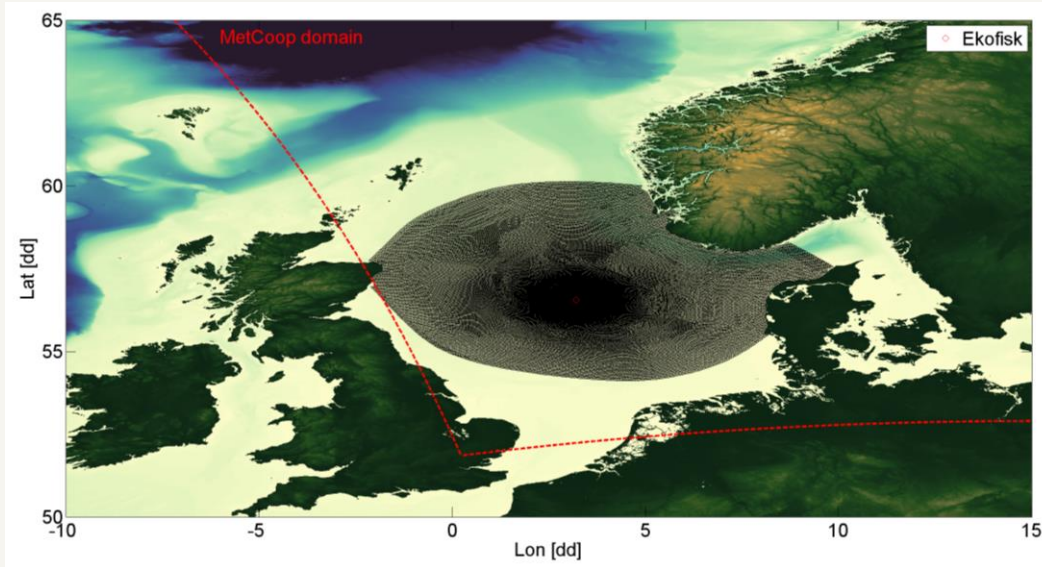
21 to 26/6-21



Harvesting-contextualizing-visualizing

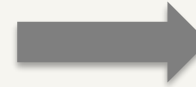
# Connecting models and in situ data collection

High resolution ocean model



Monitoring

Model  
validation



Model  
calibration

## Take home message

- Integrated ecosystem approach
- Oceanography, nutrients, plankton, fish, mammals
- Ecosystem functioning and structure
- Fish behaviour and electromagnetic field
- CO2 free technology, no risk on personnel