

# Kelp Detection using Remote Sensing Technology

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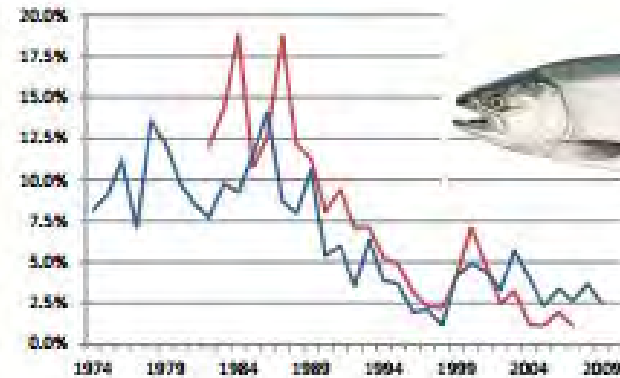


# Salish Sea

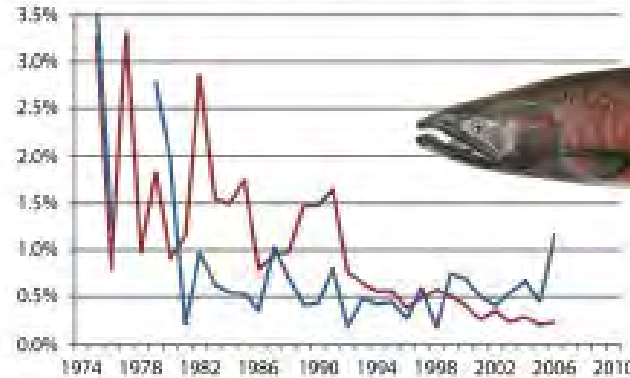


# Context of our research

Kelp = Important habitat for juvenile salmon

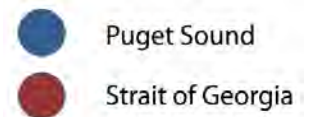


Coho



Chinook

Marine survival rates

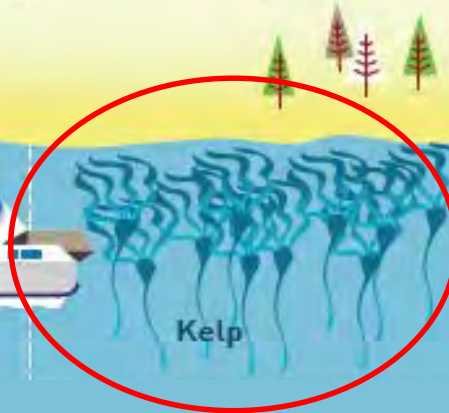
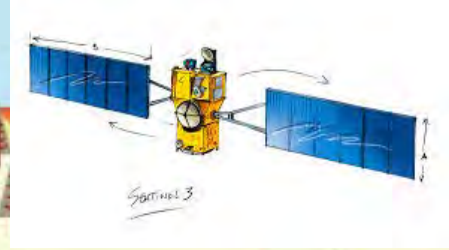


1. **Satellites** (*MODIS, VIIRS, Sentinel-3; WV, SPOT, etc*)

2. **Ferries**

3. **Research Vessels**

4. **Citizens**



Water Samples

Net Haul

CTD

Camera

Forage Fish

Spring

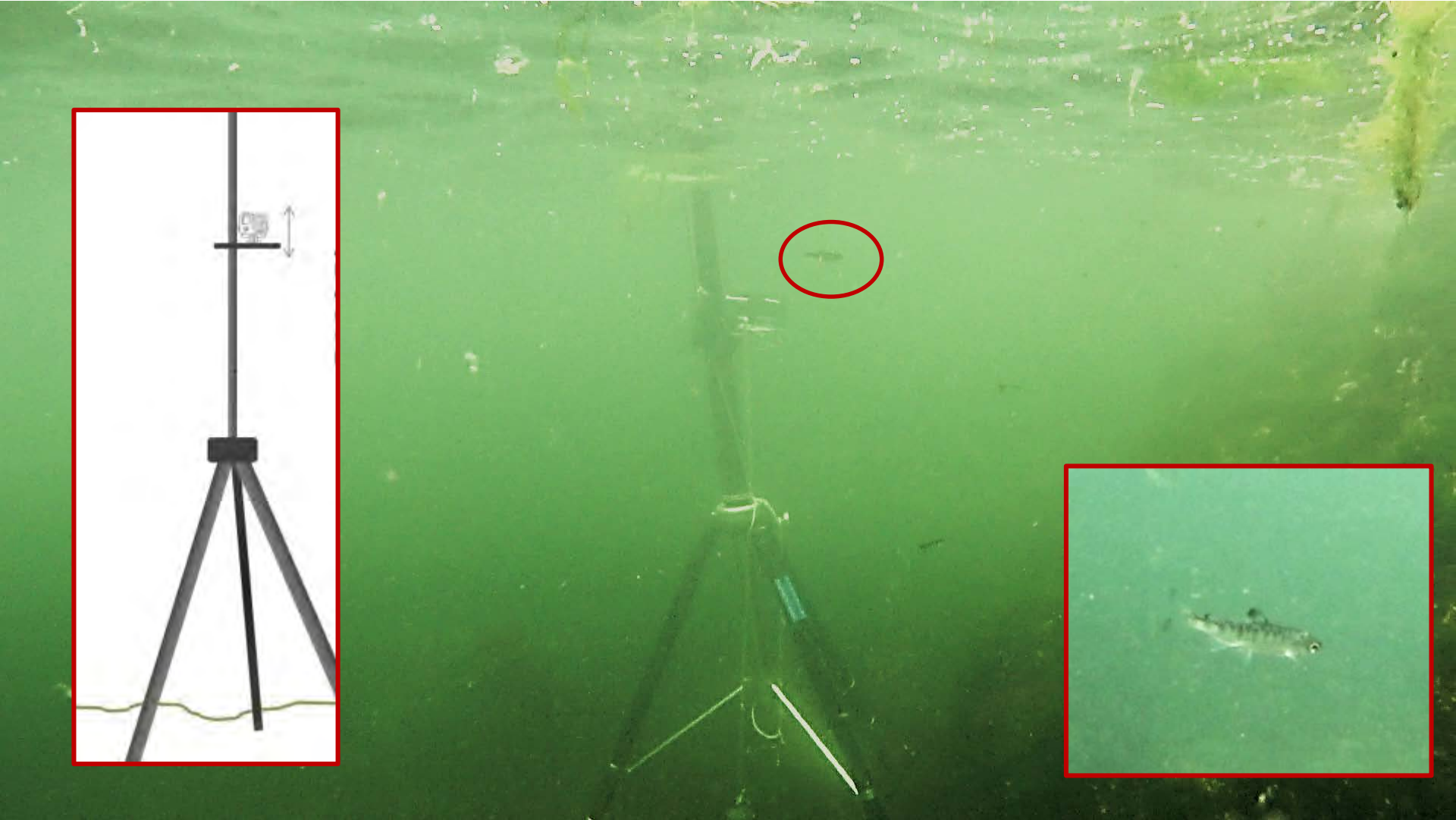
Ichthyoplankton

Zooplankton

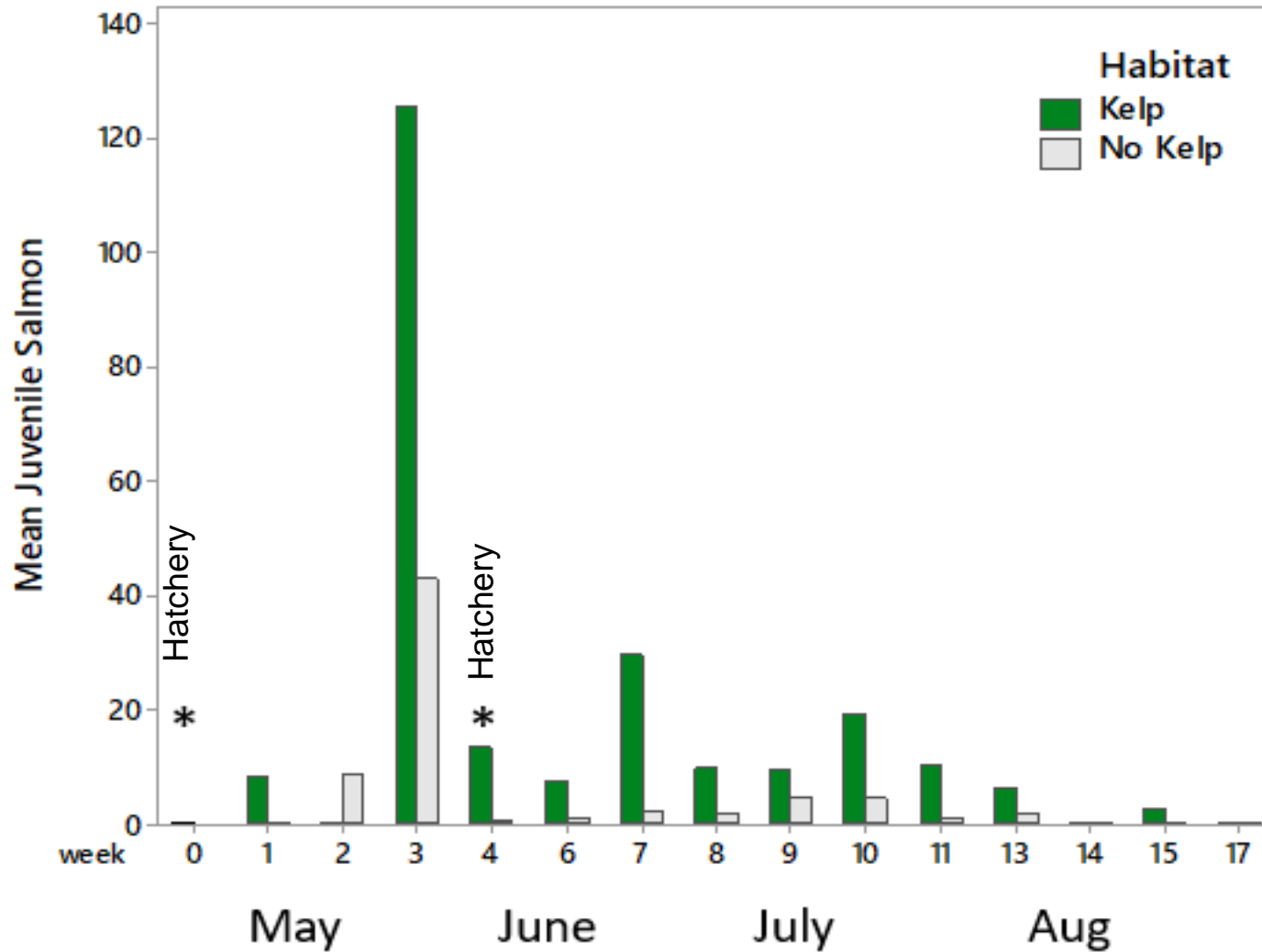
Phytoplankton



# Juvenile salmon



# Snorkel survey: 2017



# Kelp detection with satellites

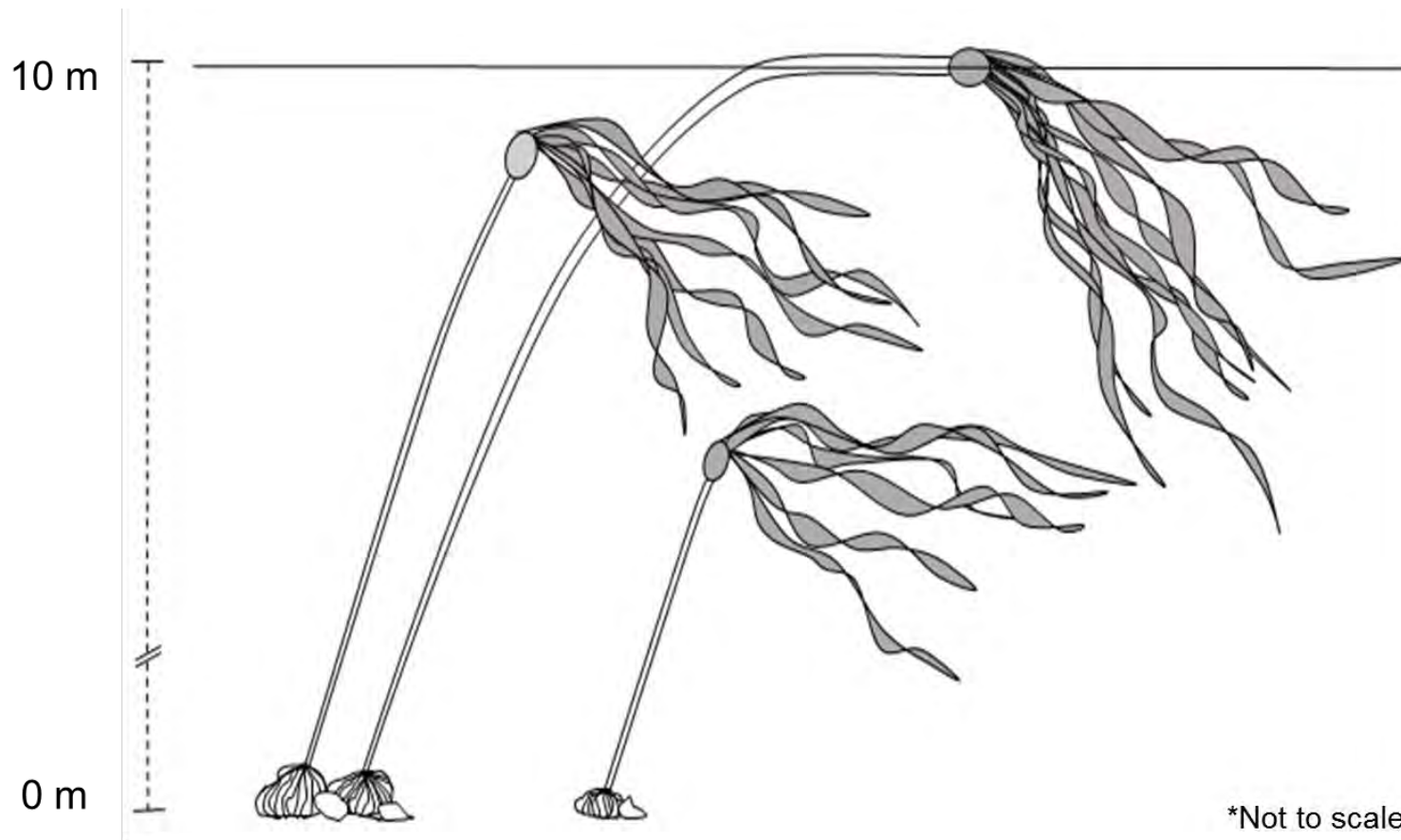
Depends of:

1. Structure of kelp
2. Satellite characteristics
3. Environmental characteristics



# Kelp Detection - satellites

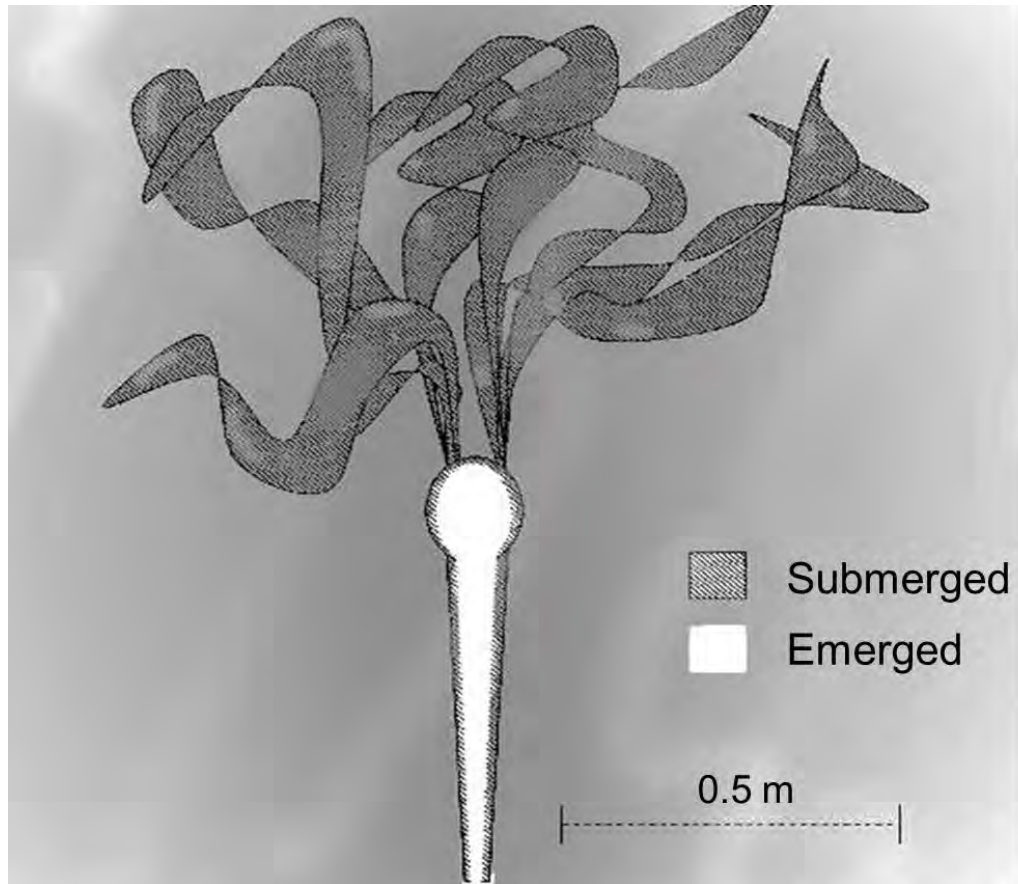
- **Bull kelp canopy cross-section**





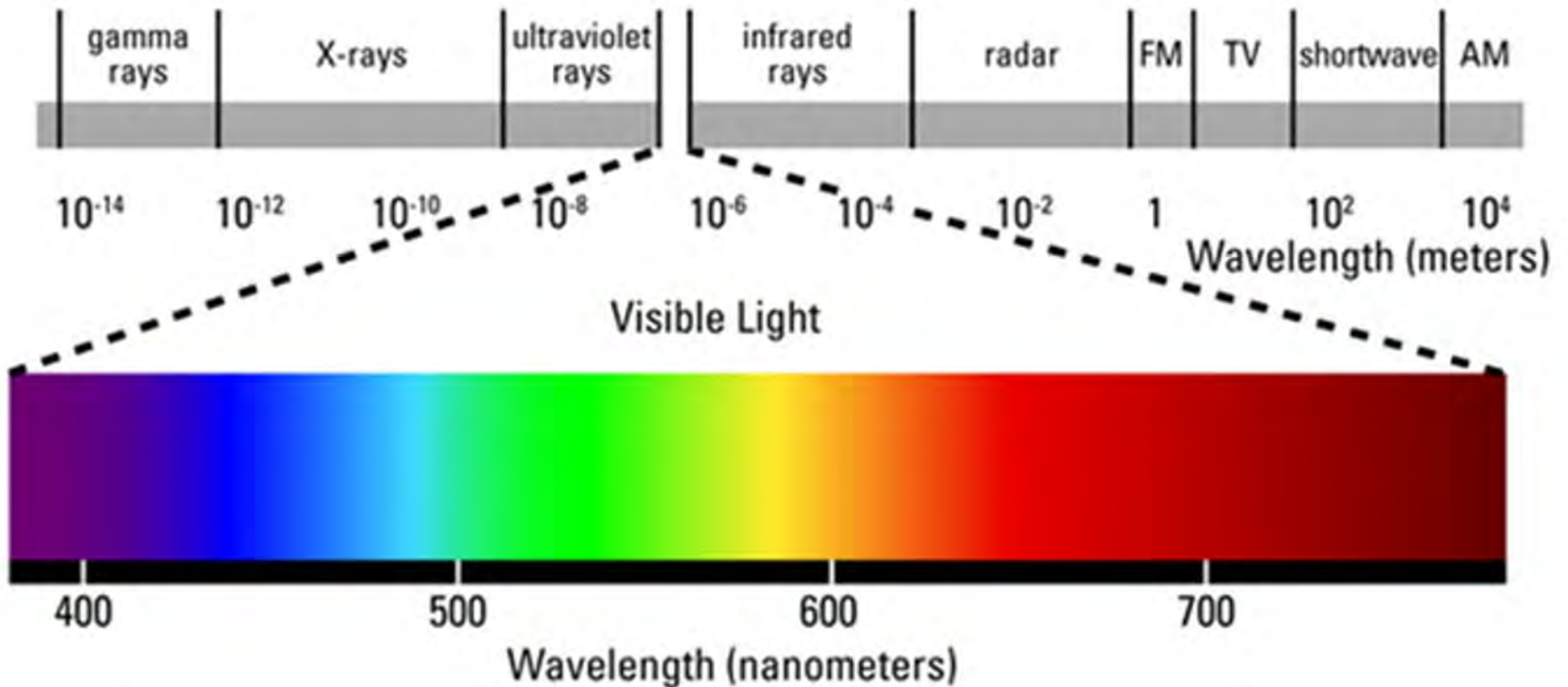
# Kelp Detection - satellites

- **Bull kelp canopy – aerial view**



# Kelp Detection - satellites

- **Measured signal: Electromagnetic radiation**

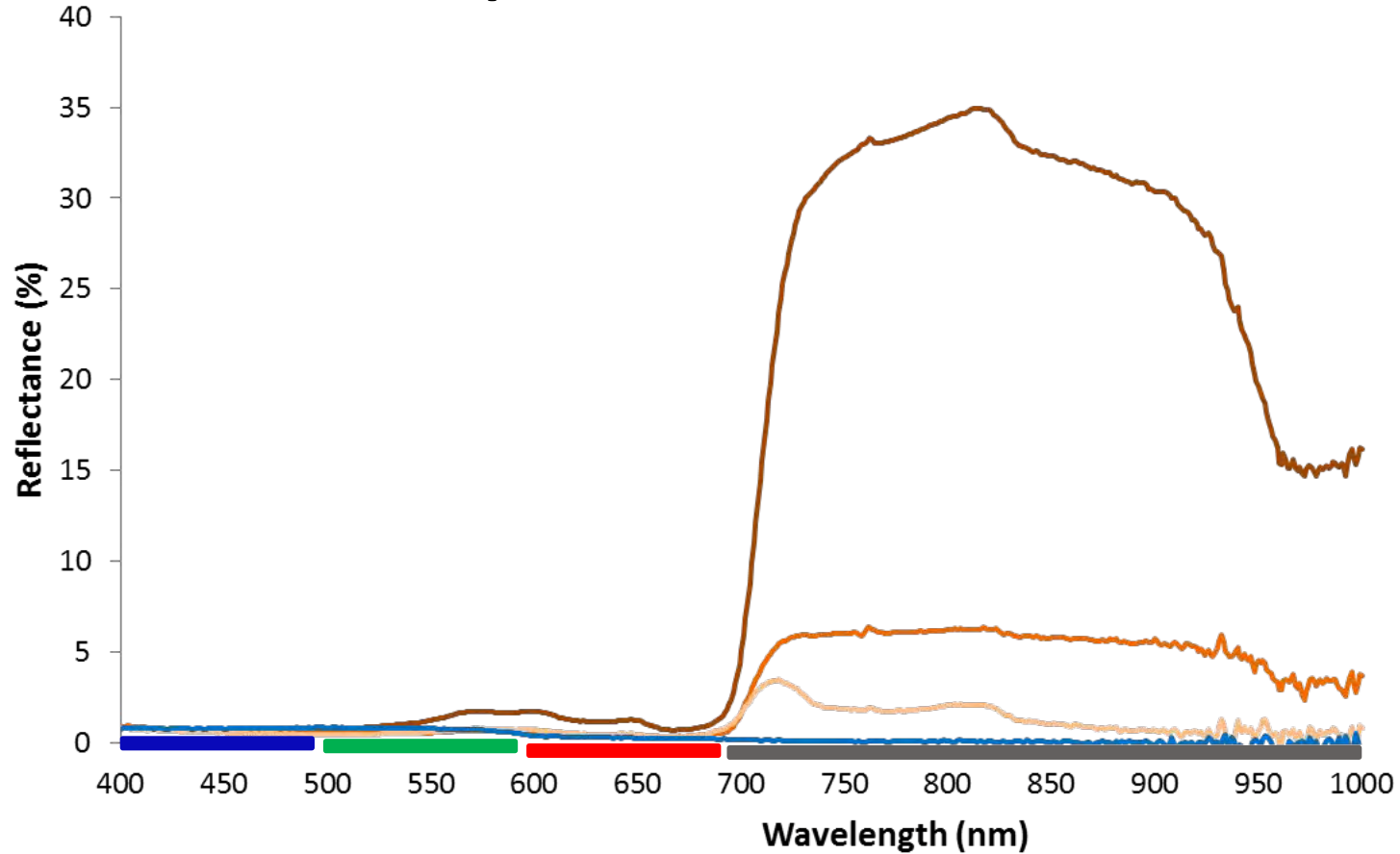


# Kelp Detection - satellites

- Measuring light reflectance



# Kelp Bed Reflectance



— Dense kelp



— Sparse kelp

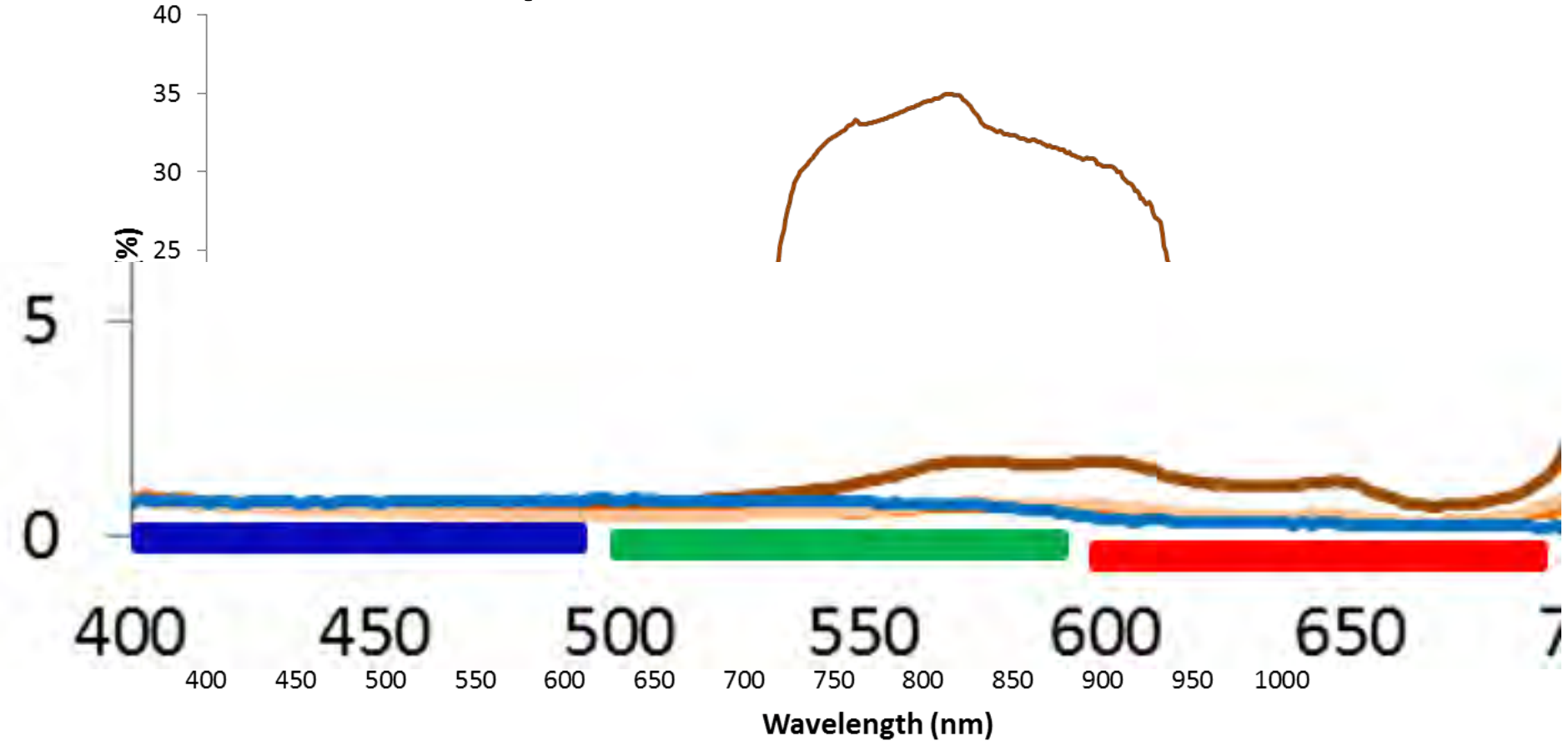


— Submerged kelp



— Water

# Kelp Bed Reflectance



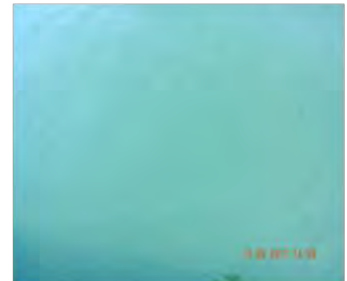
— Dense kelp



— Sparse kelp

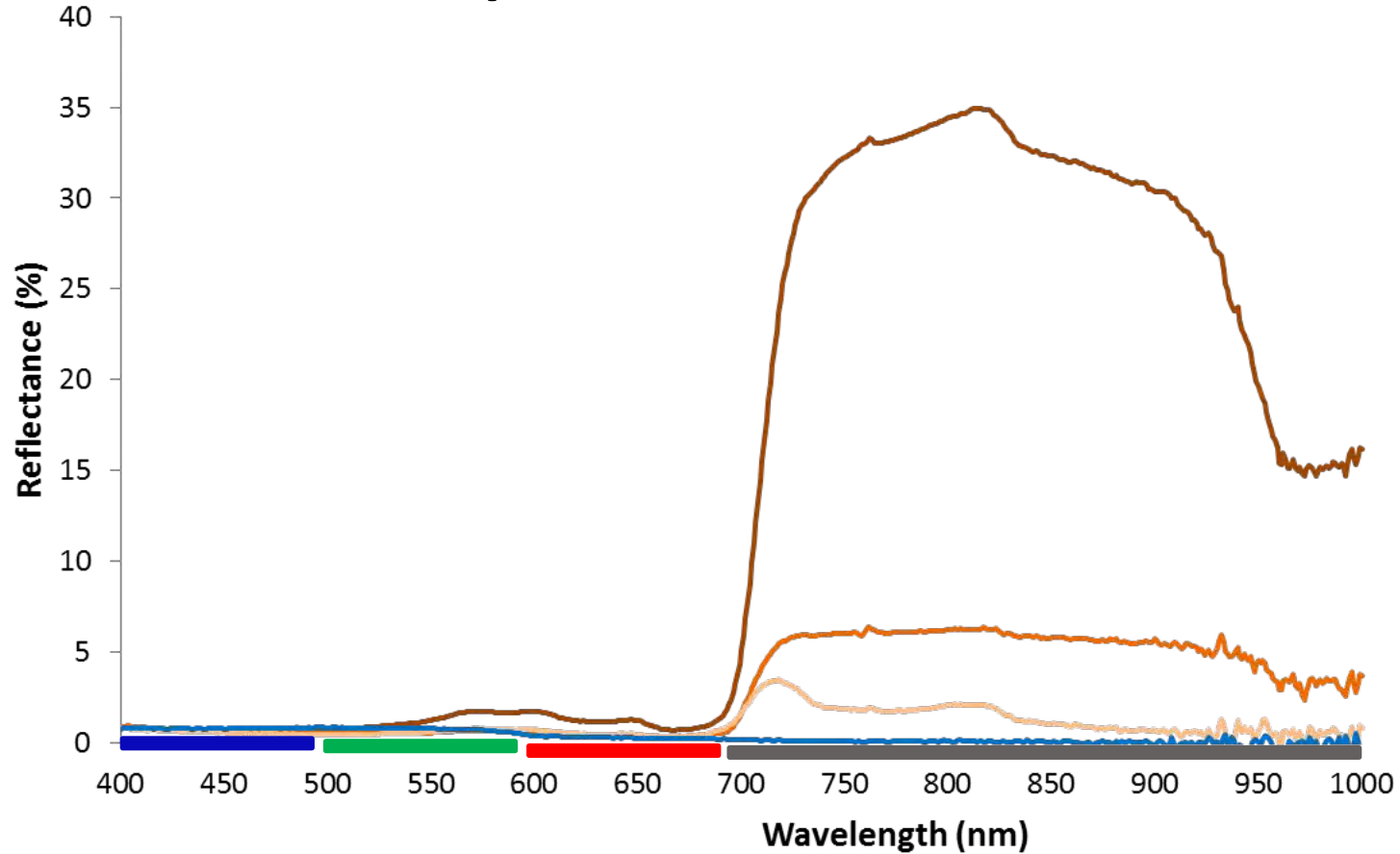


— Submerged kelp



— Water

# Kelp Bed Reflectance



— Dense kelp



— Sparse kelp



— Submerged kelp

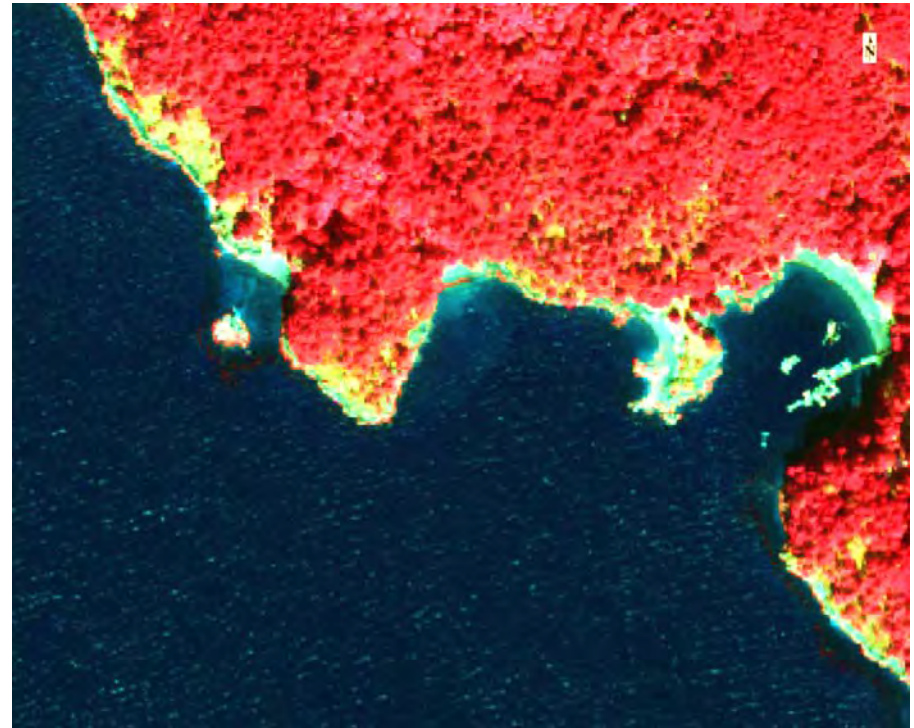


— Water

# WorldView -3



**True colour: B G R**



**False colour: G R IR**

# Improving resolution



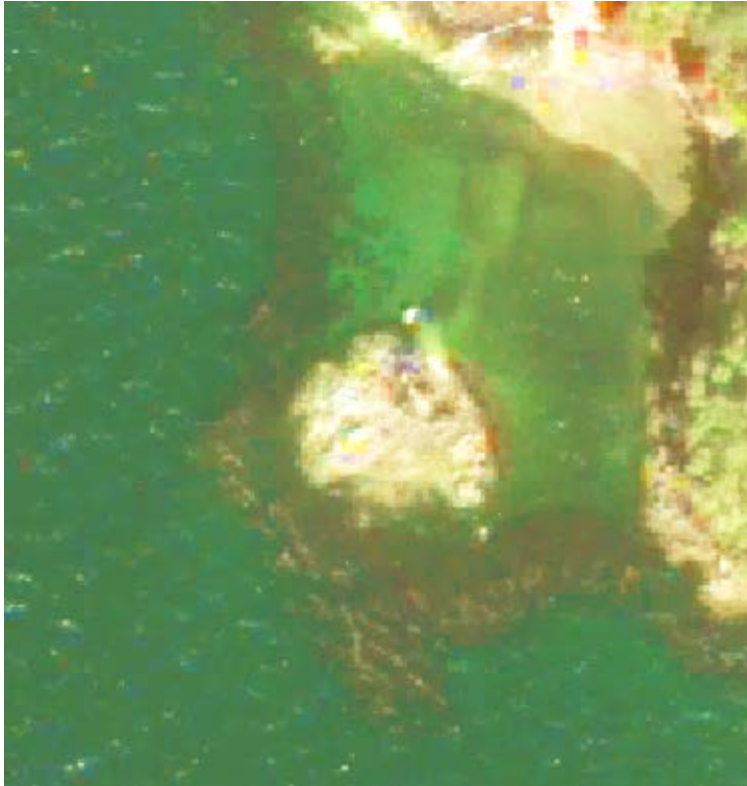
**2m Resolution**



**Pansharpend 0.5m**

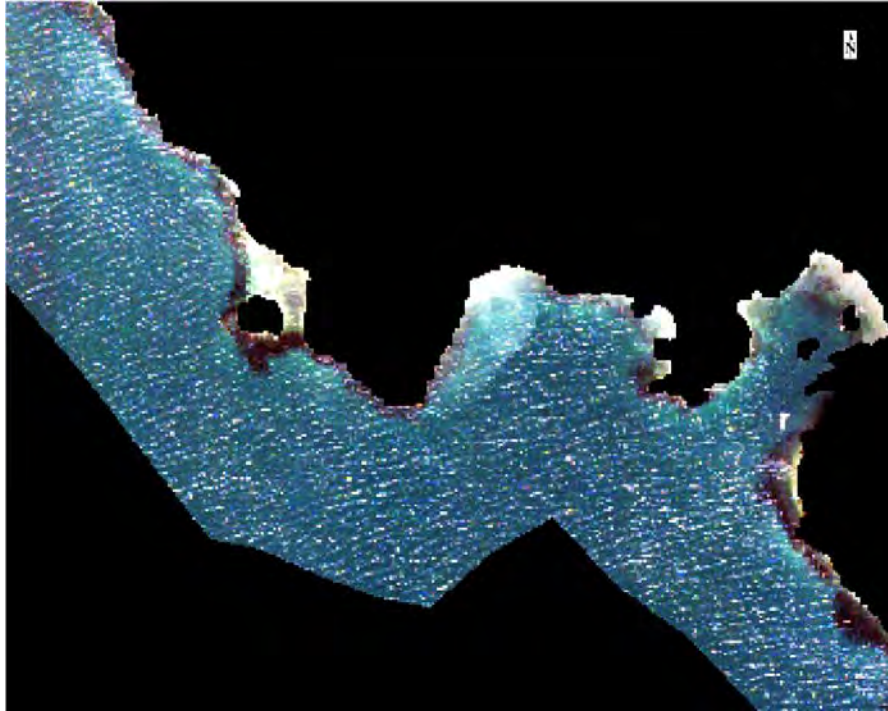


# Improving resolution

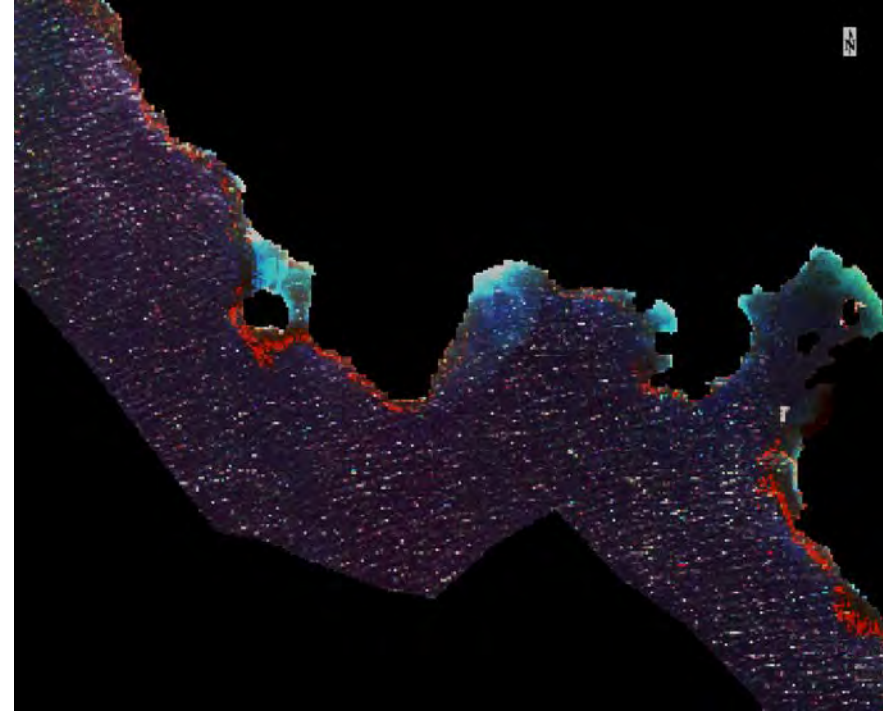


**Pansharpned 0.5m**

# Remove land and deep waters

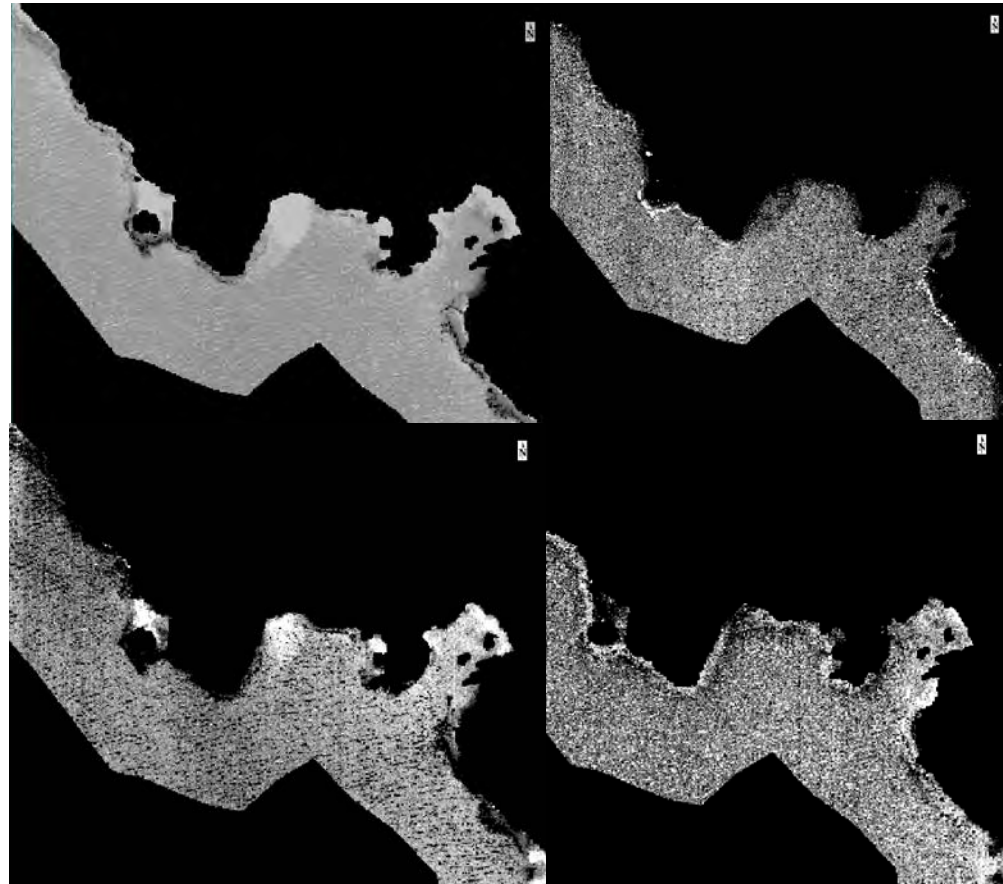
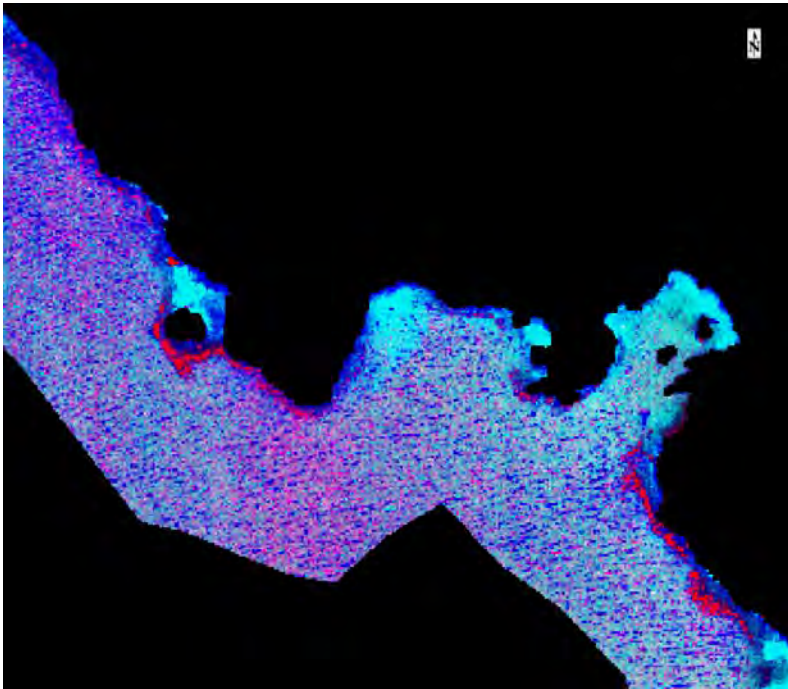


**True colour: B G R**

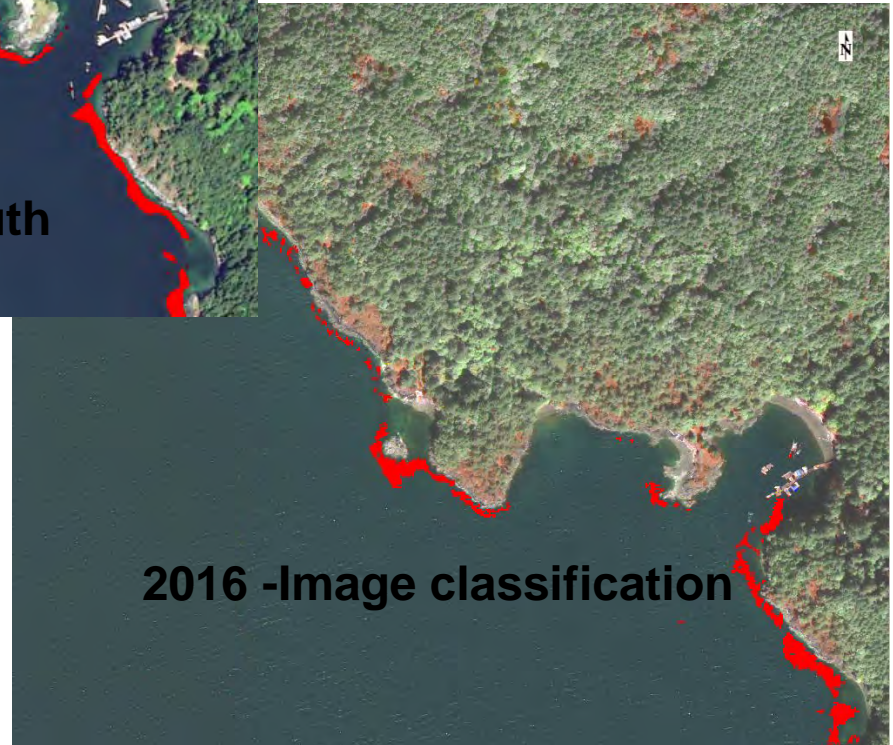
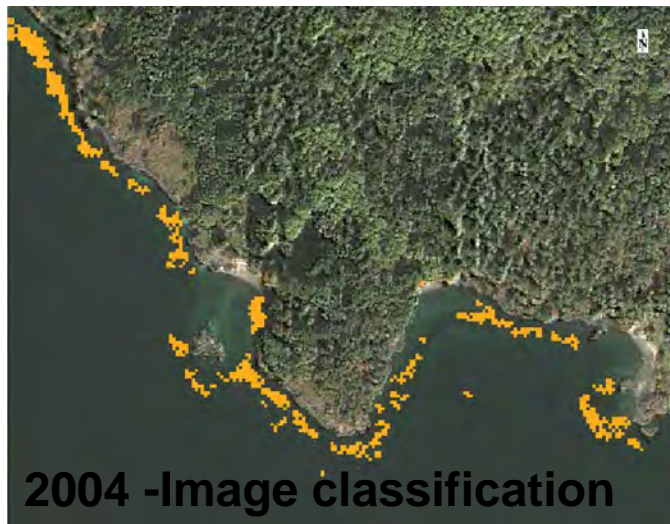


**False colour: G R IR**

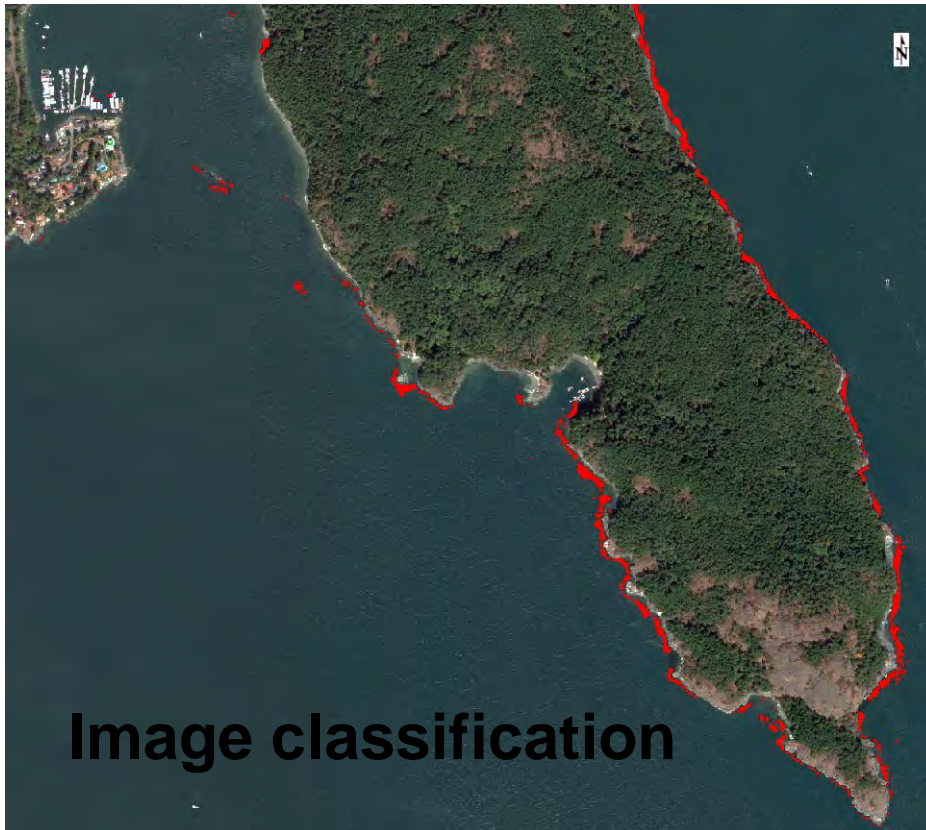
# Image manipulation: PCA



# Classification Results 2016

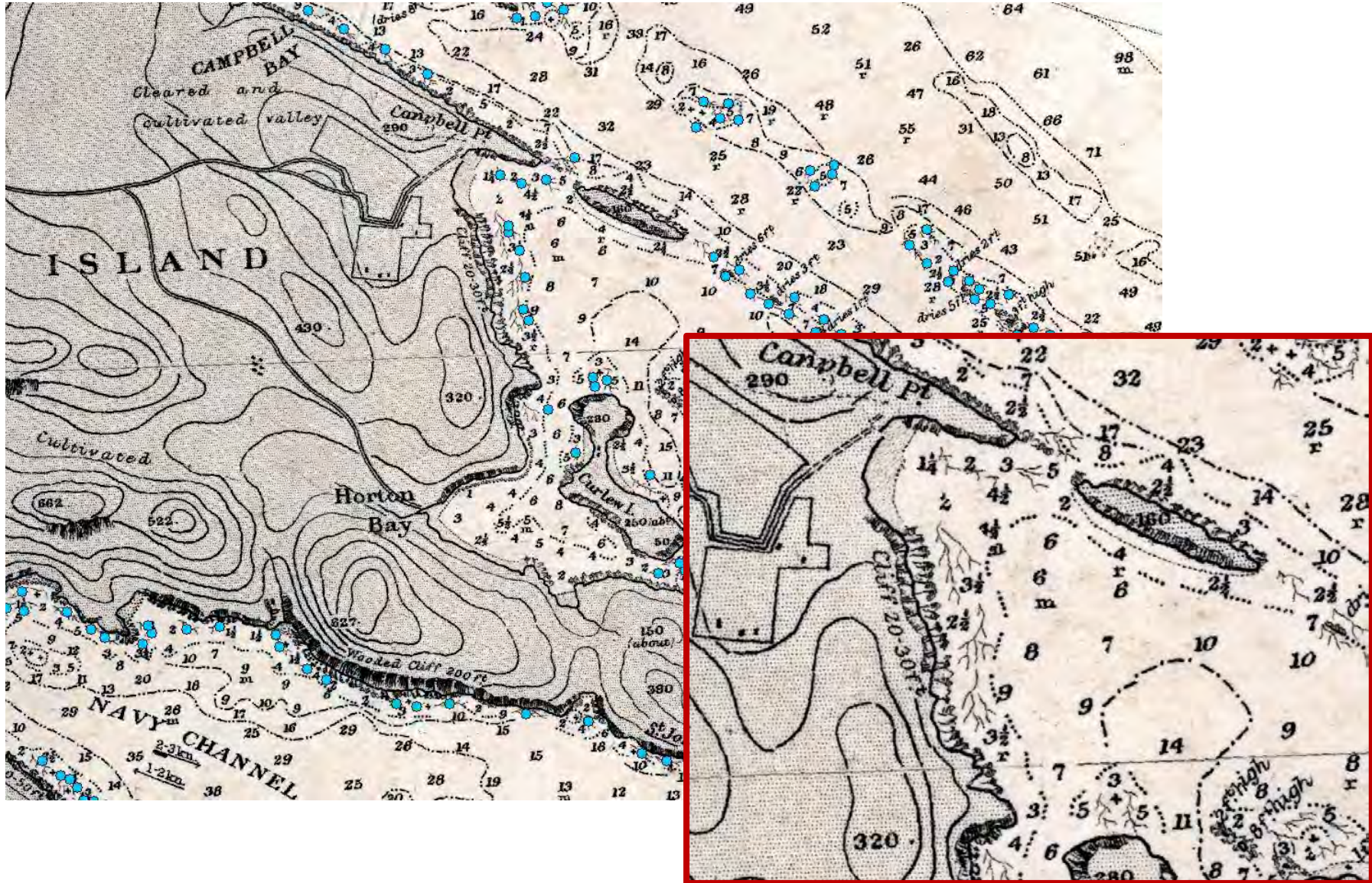


# Classification Results 2016



# Baseline?

## British (1905): Blue

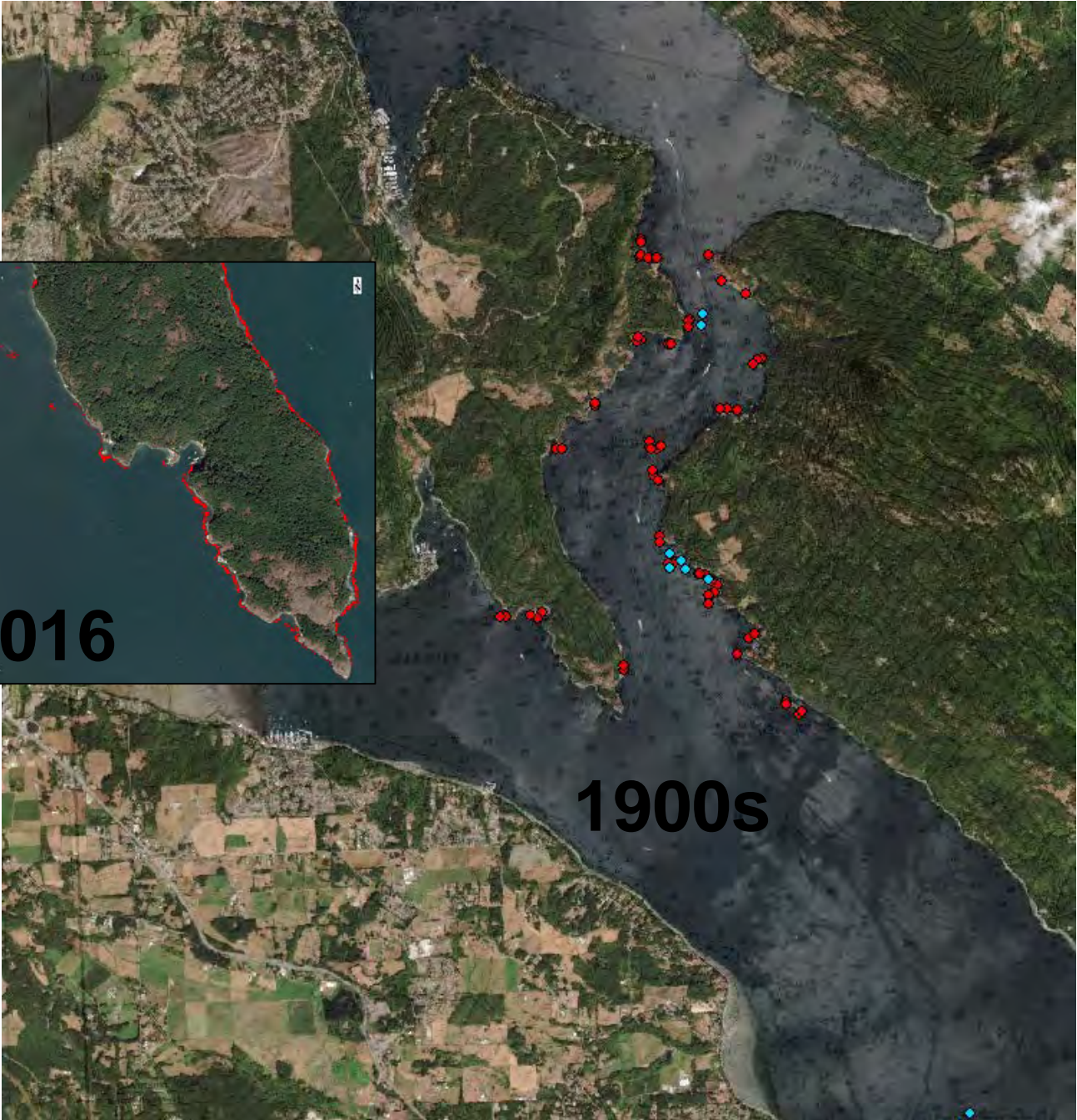


# Baseline?

British (1905): Blue

Canadian (1930): Red









Thank you  
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