

## *“Hydrographic surveying using high resolution satellite images”*

*TS 5I – Hydrographic Surveying in Practice.*

*Commission 4*

*Frida Andersson*

*Swedish Maritime Administration*

### **Agenda**

- Reasons for SMA co-operation
- Issues
- Area of investigation
- Satellite data / Nautical Charts
- Results
- Aerial photographs as an alternative
- Conclusion – Goals



## The project

- Swedish Maritime Administration (SMA), Vattenfall Power Consultant AB, The Swedish Armed Forces (FM)
- Dr. Petra Philipson, remote sensing consultant
- Project started in January 2007
- Financed by the Swedish National Space Board

## Reasons for SMA co-operation

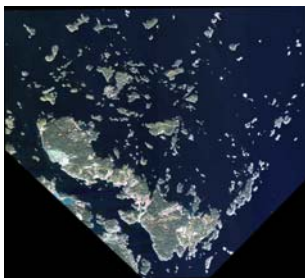
- Improve the Nautical Chart Database in shallow water
- Update information in harbours



## Issues

1. Can this type of imagery be used to map small islets and rocks?
2. Is it possible to locate and estimate depth of rocks located under the surface?
3. To what extent can lights and beacons be identified in the images and is the geometric accuracy enough?
4. Is it possible to map the shoreline automatically by using the satellite images?

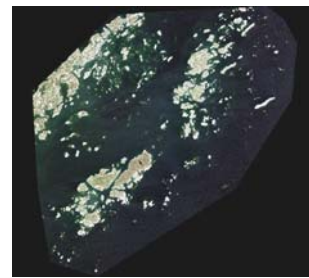
## Area of investigation





County of  
Östergötland, east of  
Arkö-Gränsö



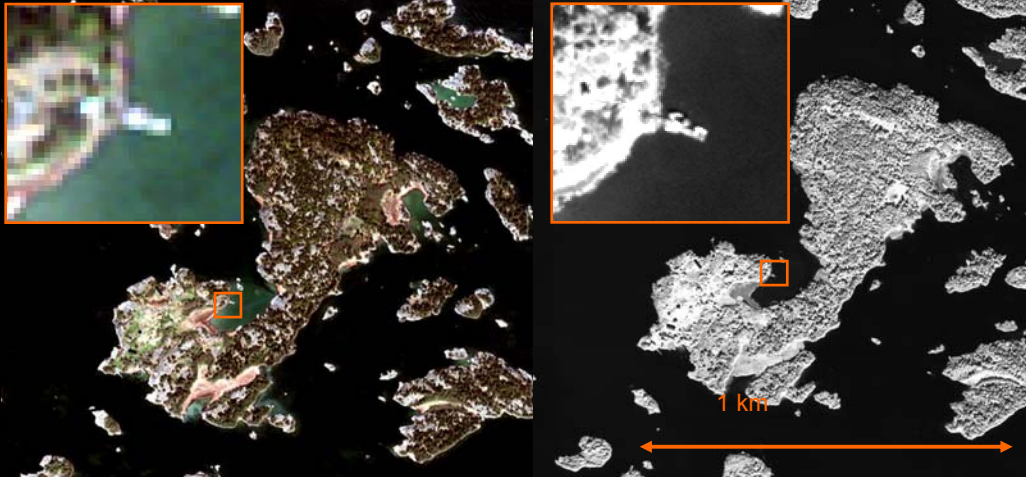
Order: 25\$ km<sup>2</sup>  
Archive: 20\$ km<sup>2</sup>



Archipelago southeast  
of Stockholm, Nämndö




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## Satellite data




QuickBird, 2.4 m
 QuickBird, 0.6 m

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## Nautical Charts



SMA 1:50 000, SMA 1:25 000, Hydrographica 1:10 000

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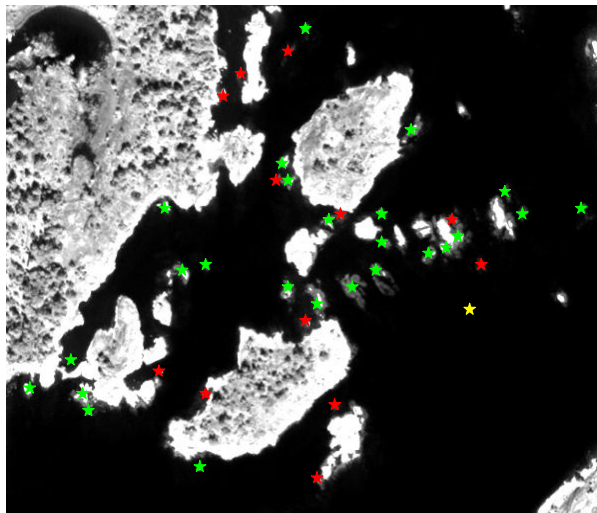
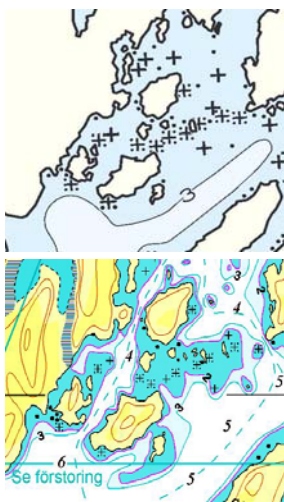




## Image analysis

- Are there rocks and islets in the image that do not exist in the nautical charts?
- Are there rocks and islets in the nautical charts that do not appear in the image?
- Is it mainly very small islets and rocks that are missing in one or the other of the base materials?

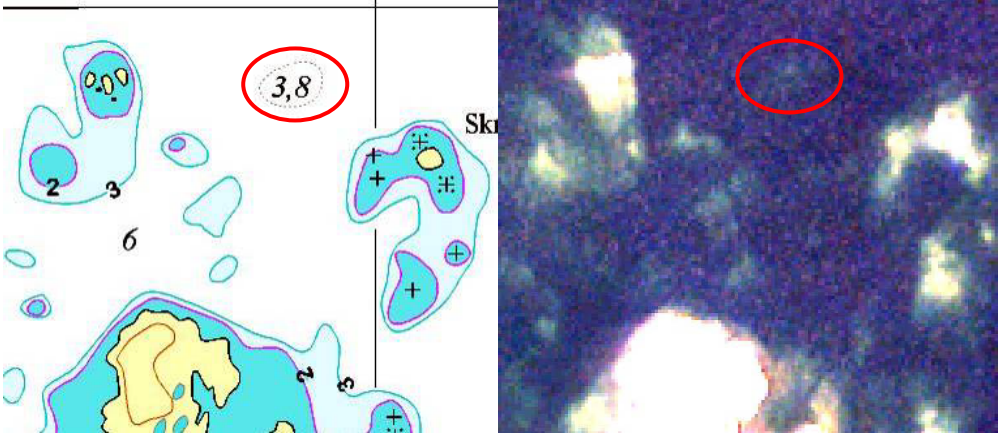


## Result: islets, rocks, subsurface rocks






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### Result: depth estimation

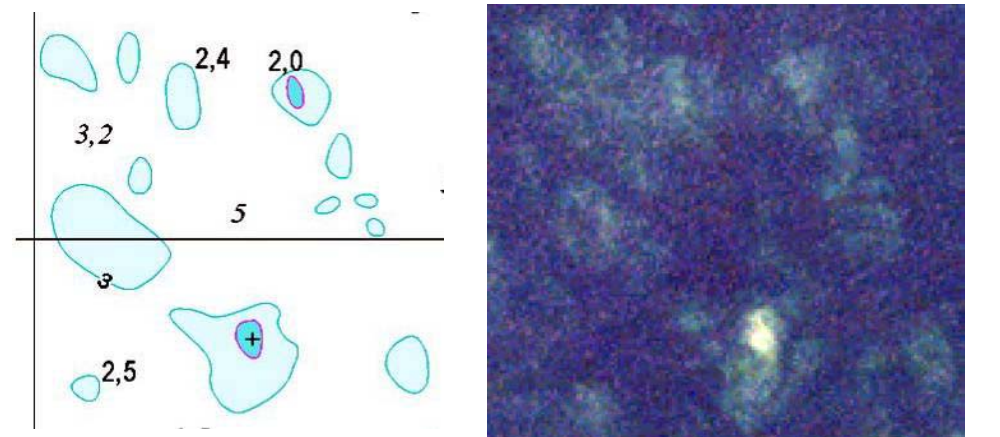


The slide displays a bathymetric chart on the left and a corresponding depth estimation image on the right. The bathymetric chart shows depth contours with values 2, 3, 6, and 3,8. A red circle highlights the 3,8 contour. The depth estimation image shows a dark blue background with bright yellow and white spots, and a red circle highlights a specific bright spot.

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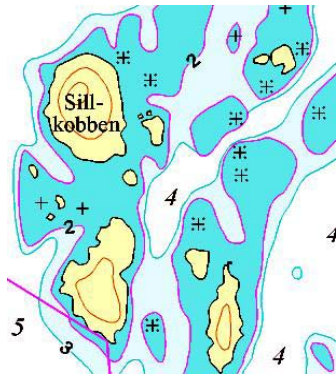
### Result: depth estimation



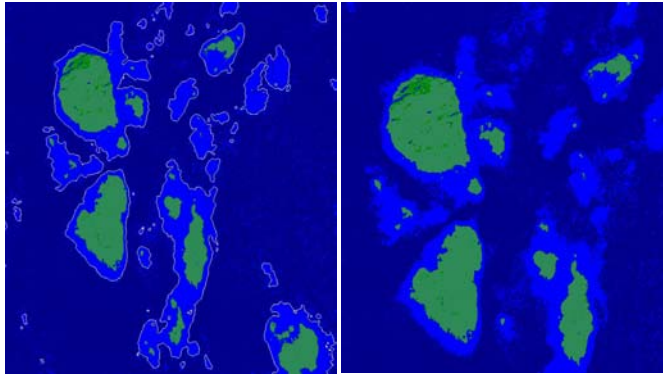
The slide displays a bathymetric chart on the left and a corresponding depth estimation image on the right. The bathymetric chart shows depth contours with values 2,4, 2,0, 3,2, 5, 3, and 2,5. The depth estimation image shows a dark blue background with bright yellow and white spots.

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## Result: depth estimation



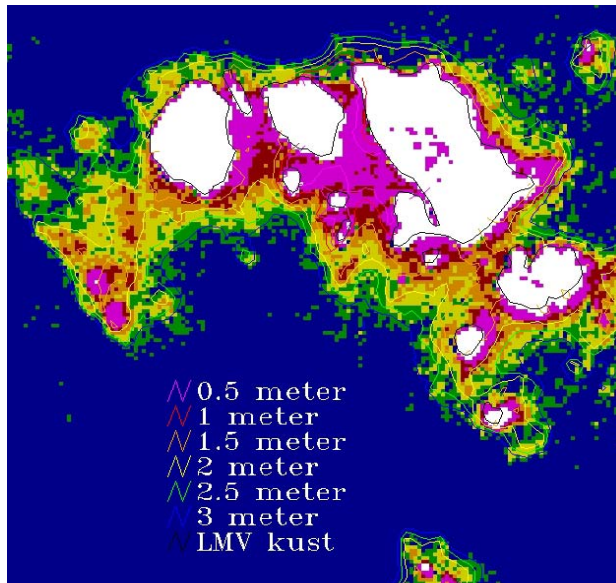
Hydrographica



HR-QB

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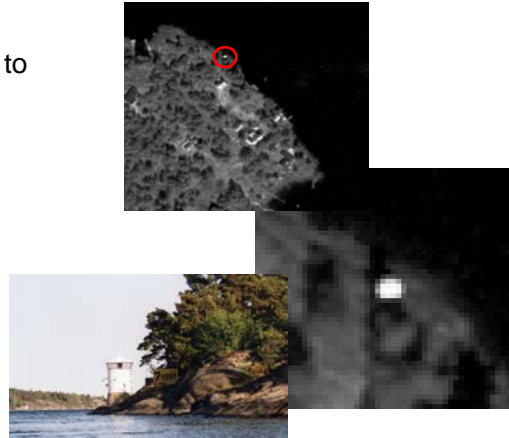
The islands "Femöringarna" in white and derived depths intervals. The displayed vectors correspond to the laser data.



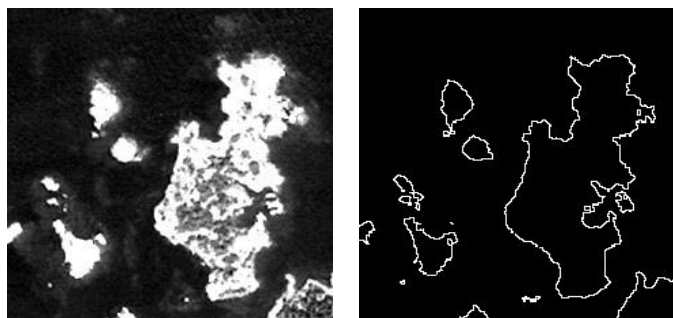
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## Result: navigational marks

- Lights and one beacon.
- Smaller marks are not possible to identify.



## Result: NSL – national shoreline





## Aerial photographs as an alternative

- 0.5 m, pan
- 2.5 m multispectral
- Every third year
- Raw data



## Conclusion

- *The preliminary results show a potential to use high resolution satellite data for mapping of maritime objects.*

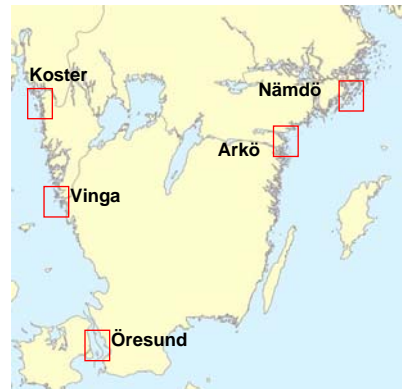
## Goal 2008-2009

- Investigate if the information collection process could be automated.
- A more exhaustive analysis regarding the possibility to estimate depth.
- Develop a strategy to include the satellite derived data in the nautical database at the SMA.



## Additional investigation areas - 2009

- Three locations at the Swedish west coast
- Clear water – increases the depth penetration possibilities
- Sweden's first marine national park



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Thank you!