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Multibeam Mapping in the Search for Remains of the Viking-age Trading Center “Birka” in Lake Mälaren, South Central Sweden

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	BC					AD											
	500	400	300	200	100	100	200	300	400	500	600	700	800	900	1000	1100	
Norway	The Early Iron Age					The Roman Iron Age					The Late Iron Age						
											Migration Period		Merovingian Period			Viking Period	
Sweden	The Early Iron Age					The Roman Iron Age					The Late Iron Age						
											Migration Period		Vendel Period			Viking Period	
Denmark	The Early Iron Age					The Roman Iron Age					The Germanic Iron Age						
											Migration Period		Later Germanic Iron Age			Viking Period	

All three countries use the Roman Iron Age for the time period up to 400 AD. Then there are differences:

Norway: The Late Iron Age: The Migration Period 400-570/600, the Merovingian Period 570/600-800 and the Viking Age 800-1050.

Sweden: The Late Iron Age (400-1050) includes the Migration Period 400-550, The Vendel period 550-750 and **the Viking Age 750-1050**.

Denmark: The Germanic Iron Age 400 AD – 750/800 AD. This period is divided into the 'Early Germanic Iron Age' or the Migration Period 400 – 550, The Later Germanic Iron Age' 550-750. Then follows the Viking Age 750/800-1050.



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Birka on Björkö Island (eng. Birch Island)

1. Björkö is located in Lake Mälaren, West of Stockholm
2. Mälaren is the third largest lake in Sweden, 1 120 km²
3. Birka was a Viking-age trading center on Björkö established sometime after 750 A.D.
4. Birka was inhabited until the end of the 10th century
5. Birka became one of the first Christian congregations in Sweden
6. Mälaren was during the Viking time a part of the Baltic Sea, it became a lake due to isostatic rebound at about 1000 A.D. This means a perfect setting for a protected harbor with access to the World Ocean through the Baltic Sea

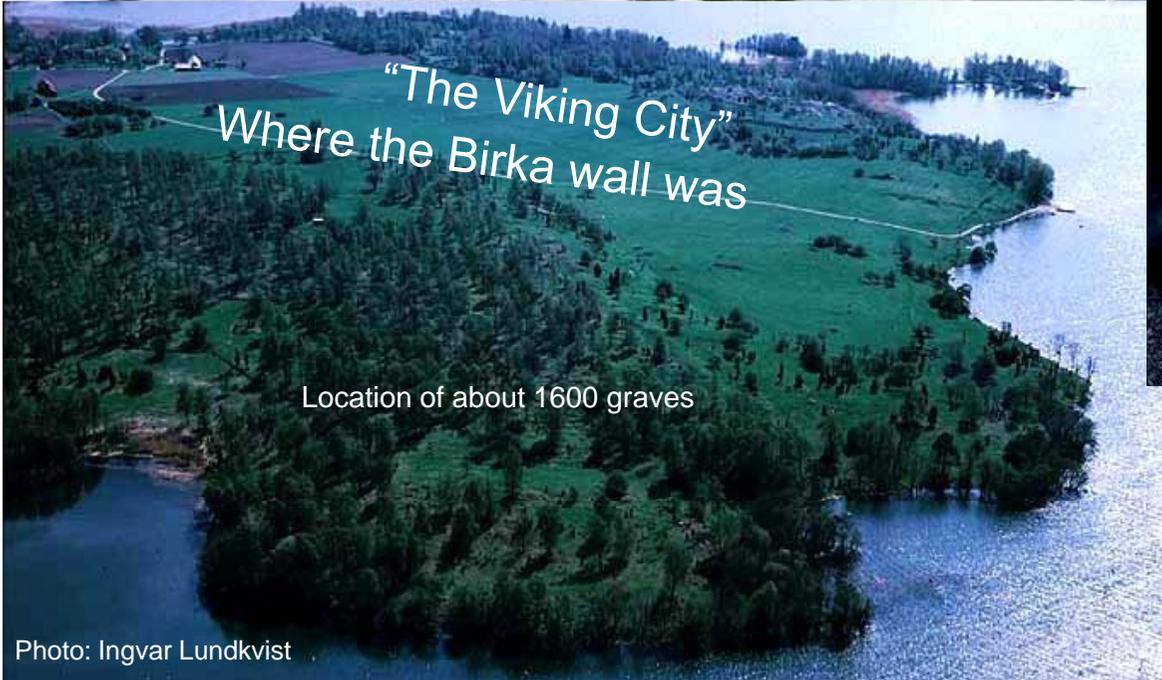




Photo: Martin Jakobsson



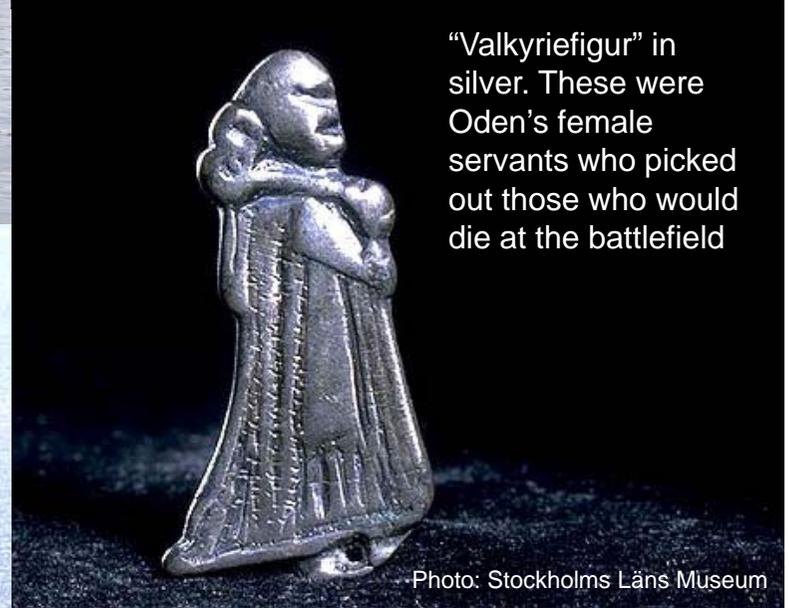
Photo: Stockholms Läns Museum



“The Viking City”
Where the Birka wall was

Location of about 1600 graves

Photo: Ingvar Lundkvist



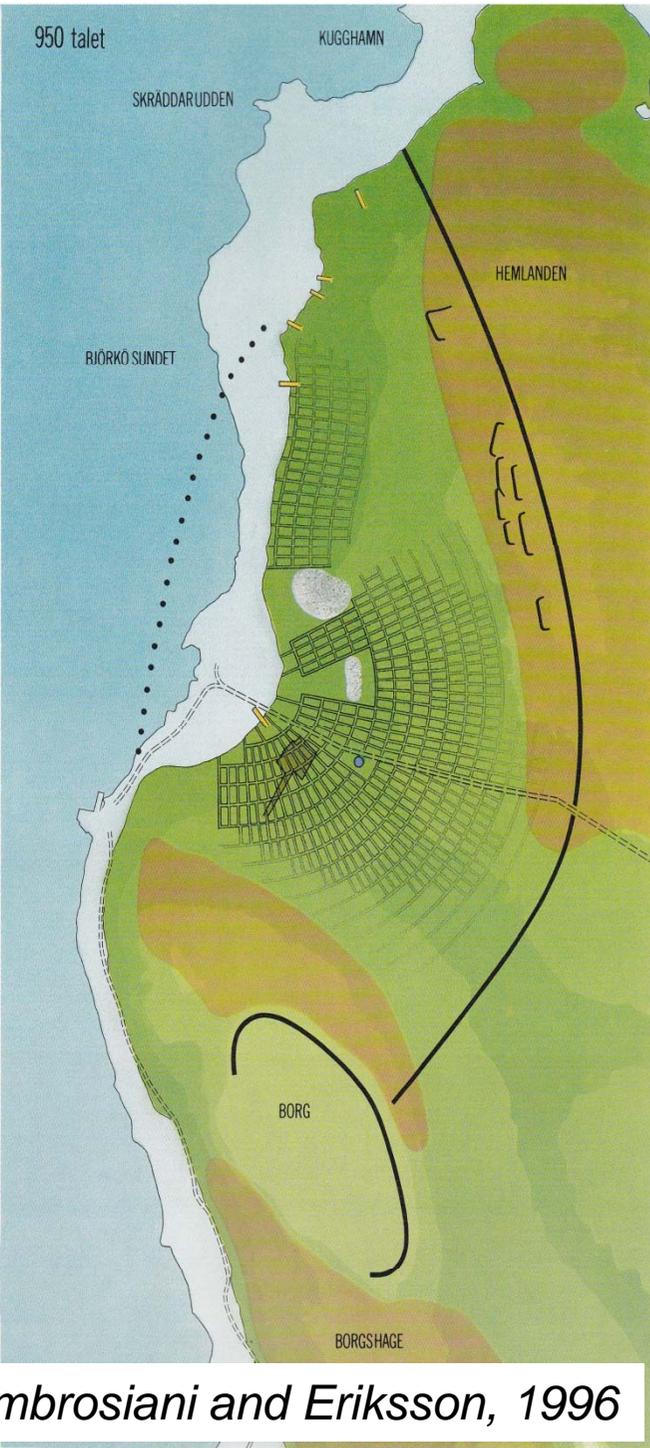
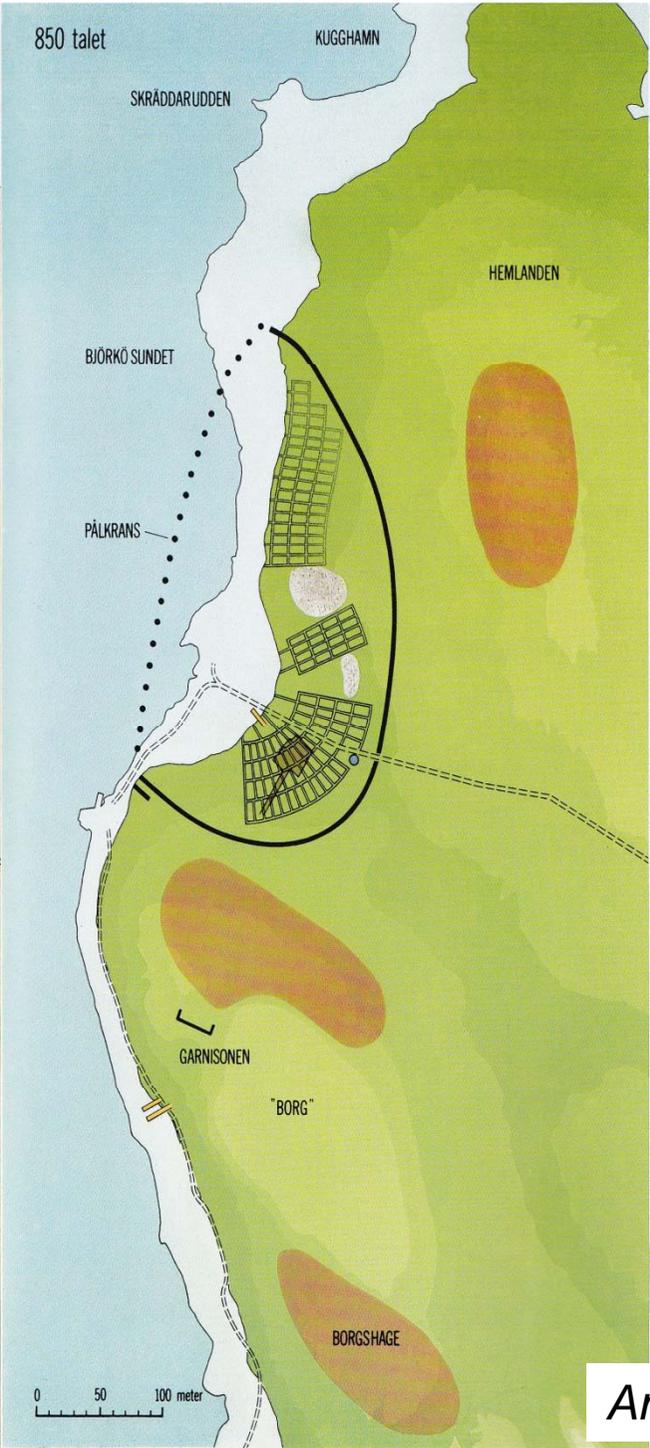
“Valkyriefigur” in silver. These were Oden’s female servants who picked out those who would die at the battlefield

Photo: Stockholms Läns Museum

Glass cup found at Birka



Photo: SHM



Ambrosiani and Eriksson, 1996

What do we like to find?

→ • Small Viking-boats used locally

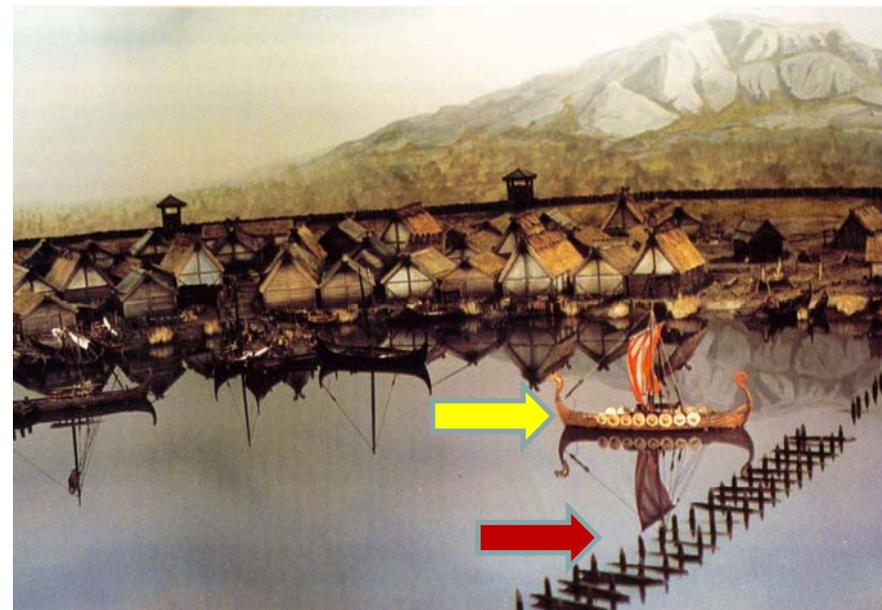
→ • Large Viking-ships (a dream!)

→ • More remains of the pole protection establishment

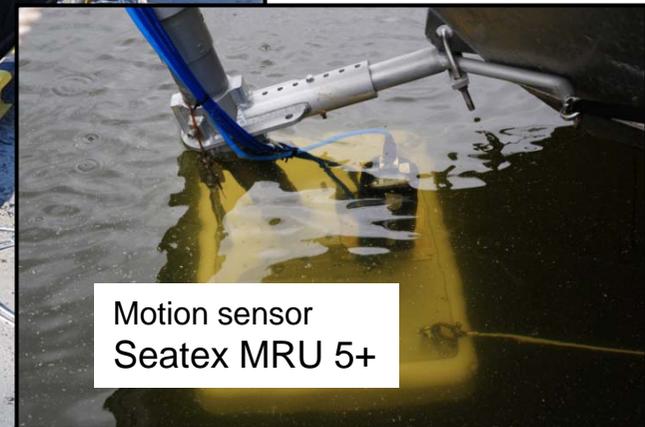


Reconstruction. Photo Holger Ellgaard

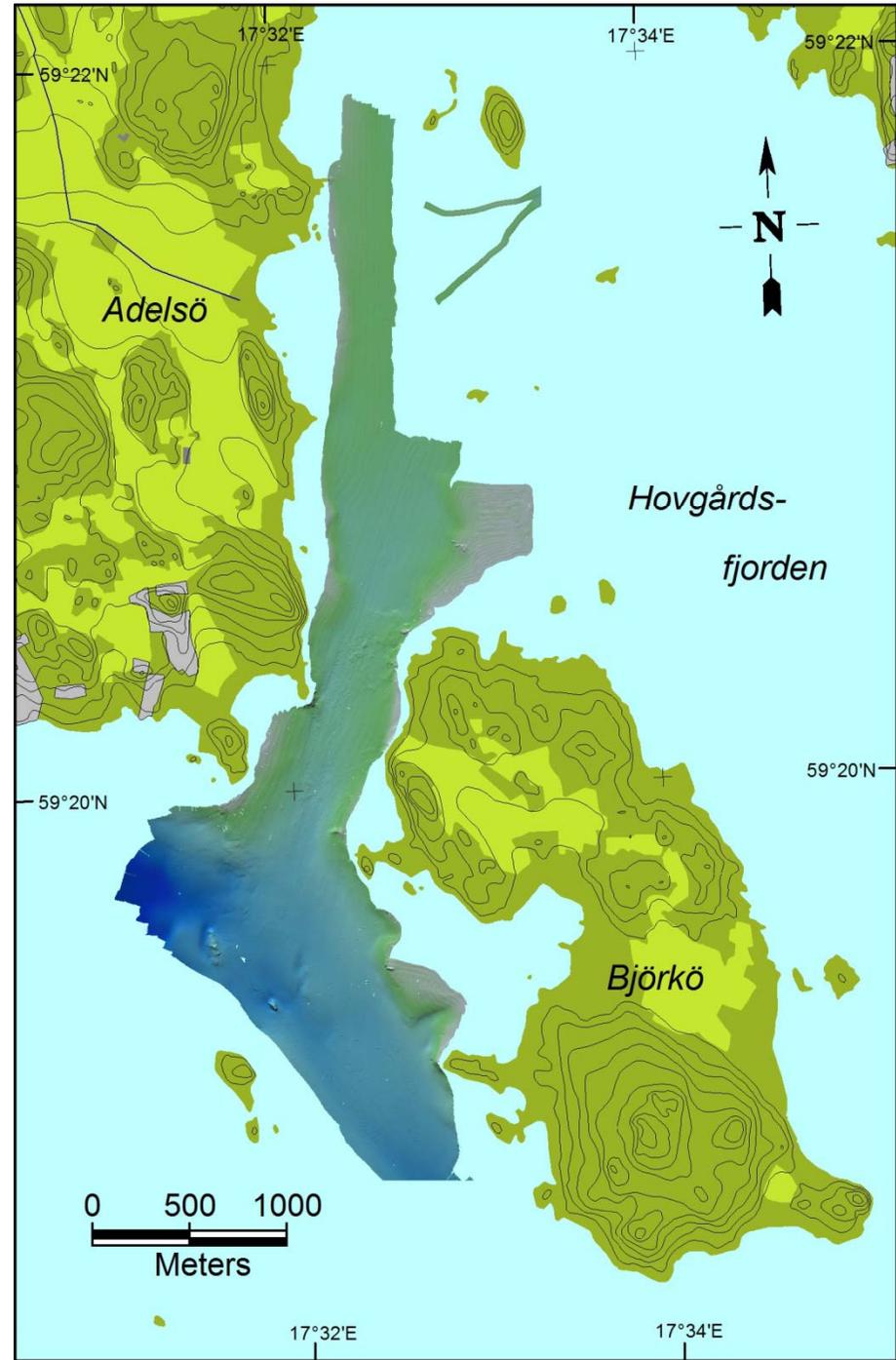
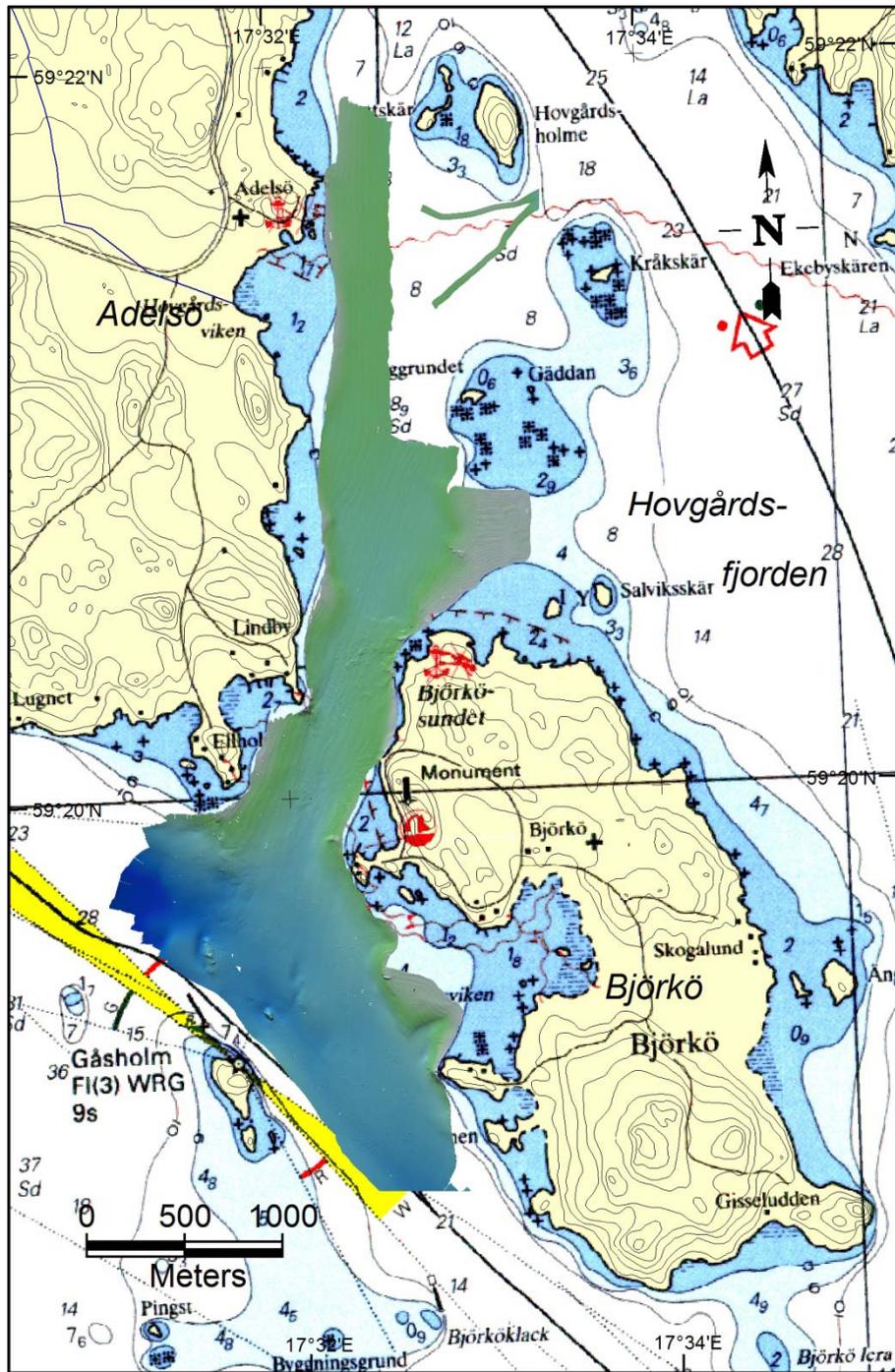
No ships have been found!!

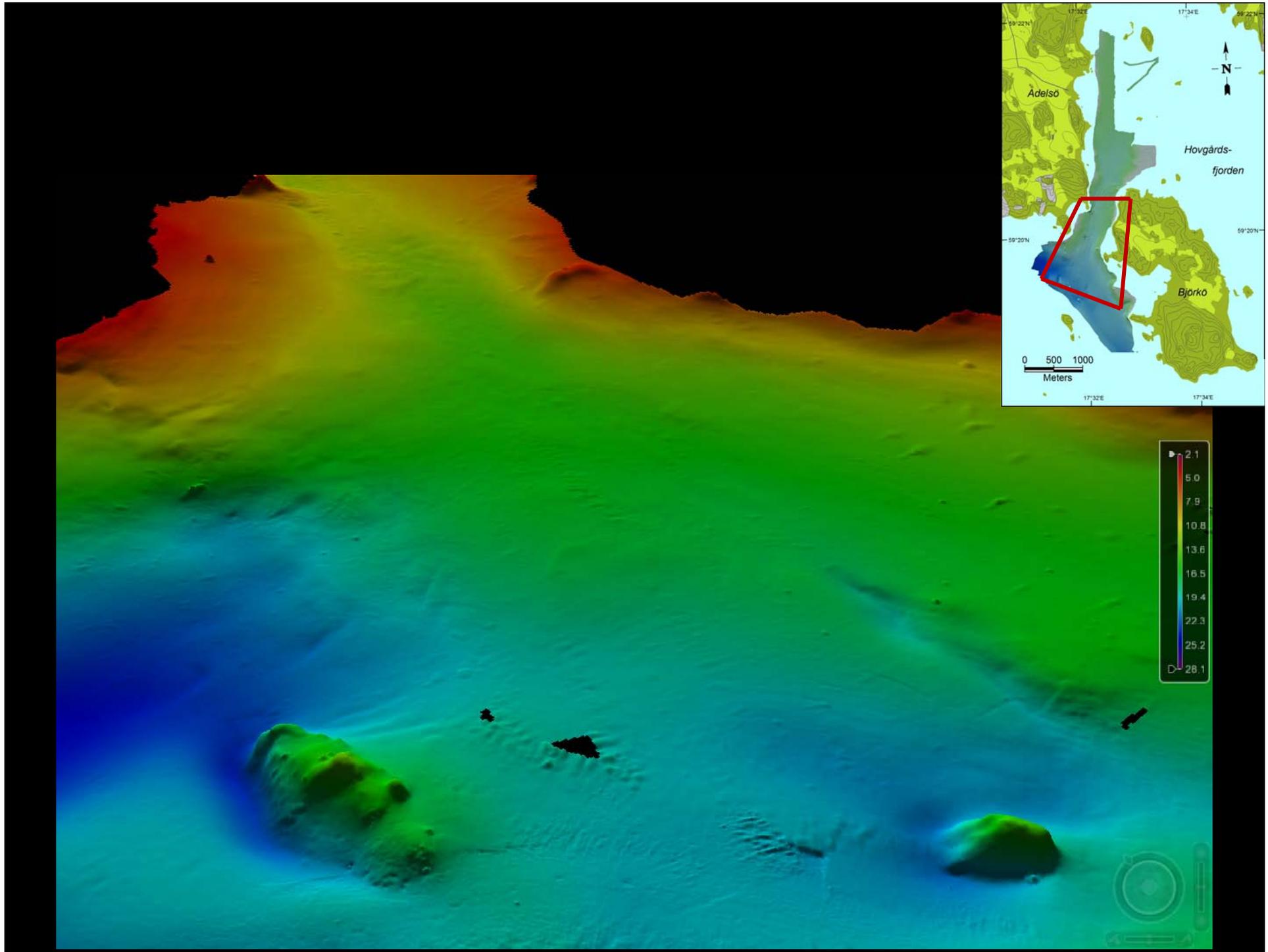


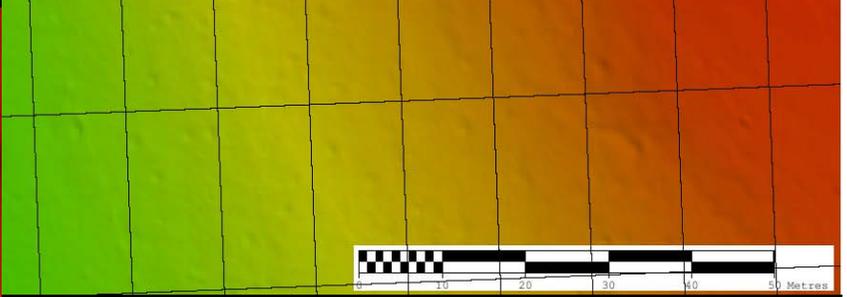
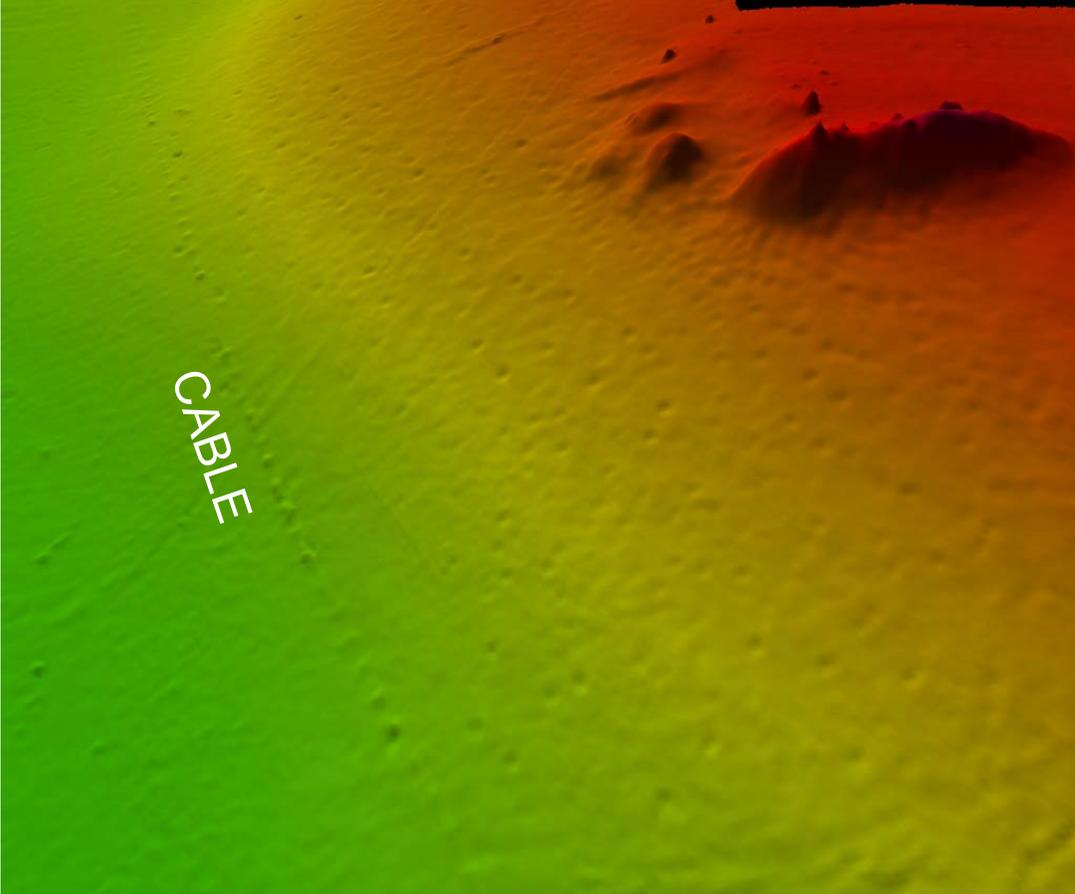
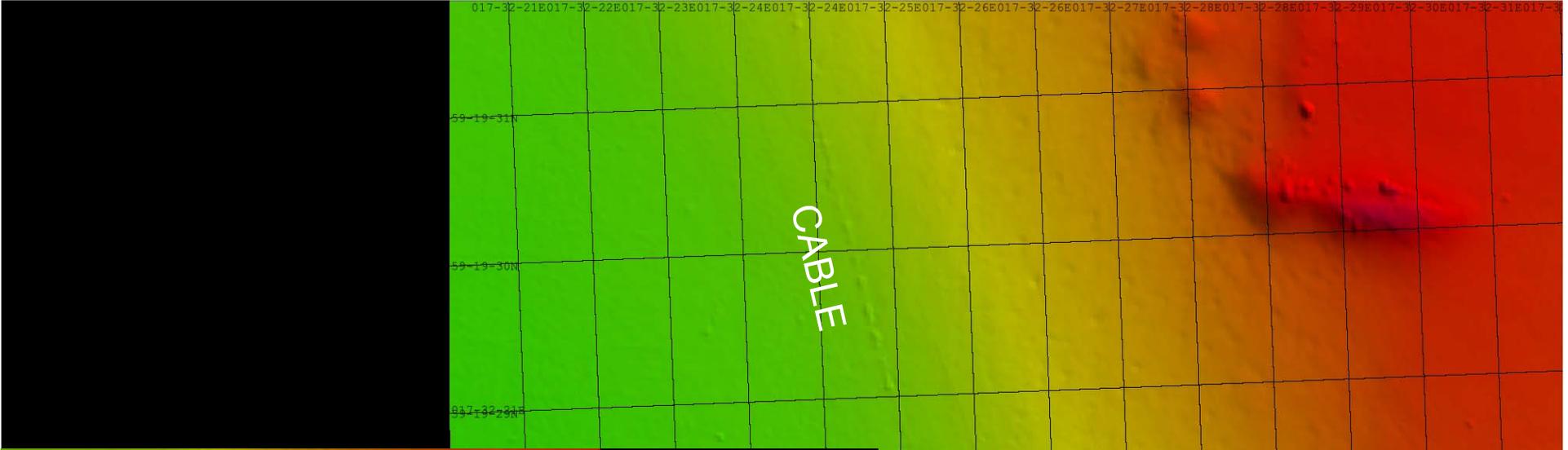
Geophysical mapping, May 2011



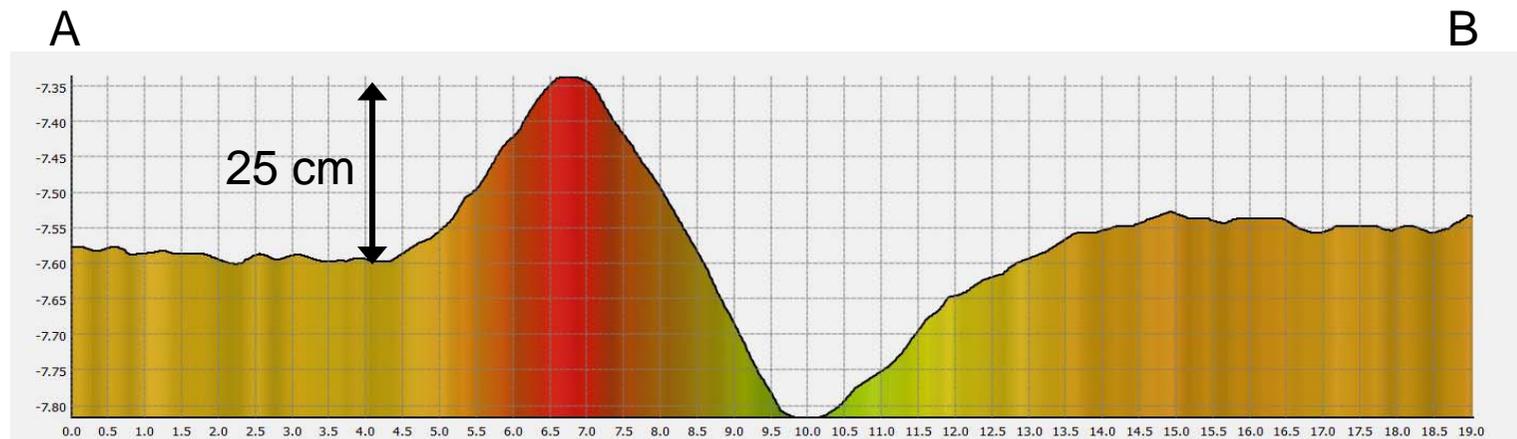
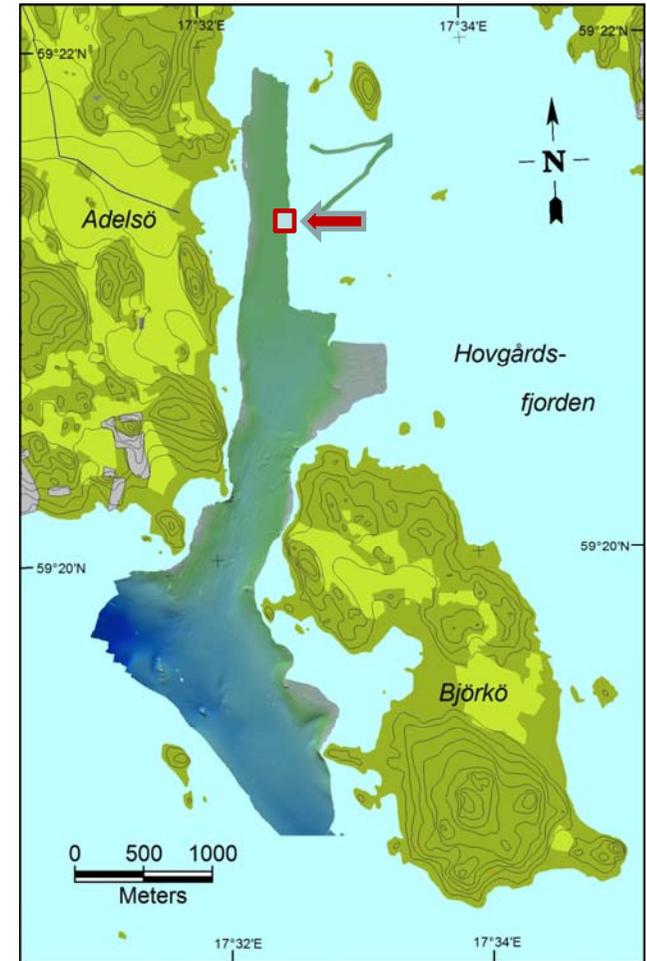
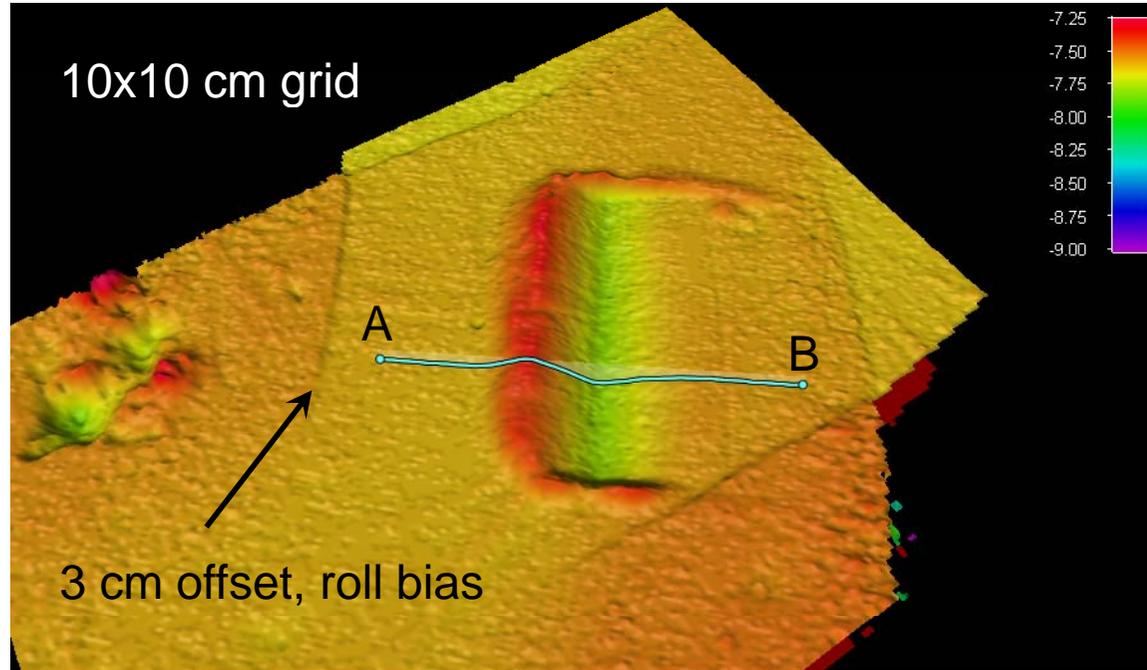
- Kongsberg EM2040, 200-400 kHz, mapping in max 500 m water depth with decimeter to cm resolution
- Meridata subbottom profiler, 28 kHz
- EdgeTech TD272 Sidescan sonar, 500 kHz

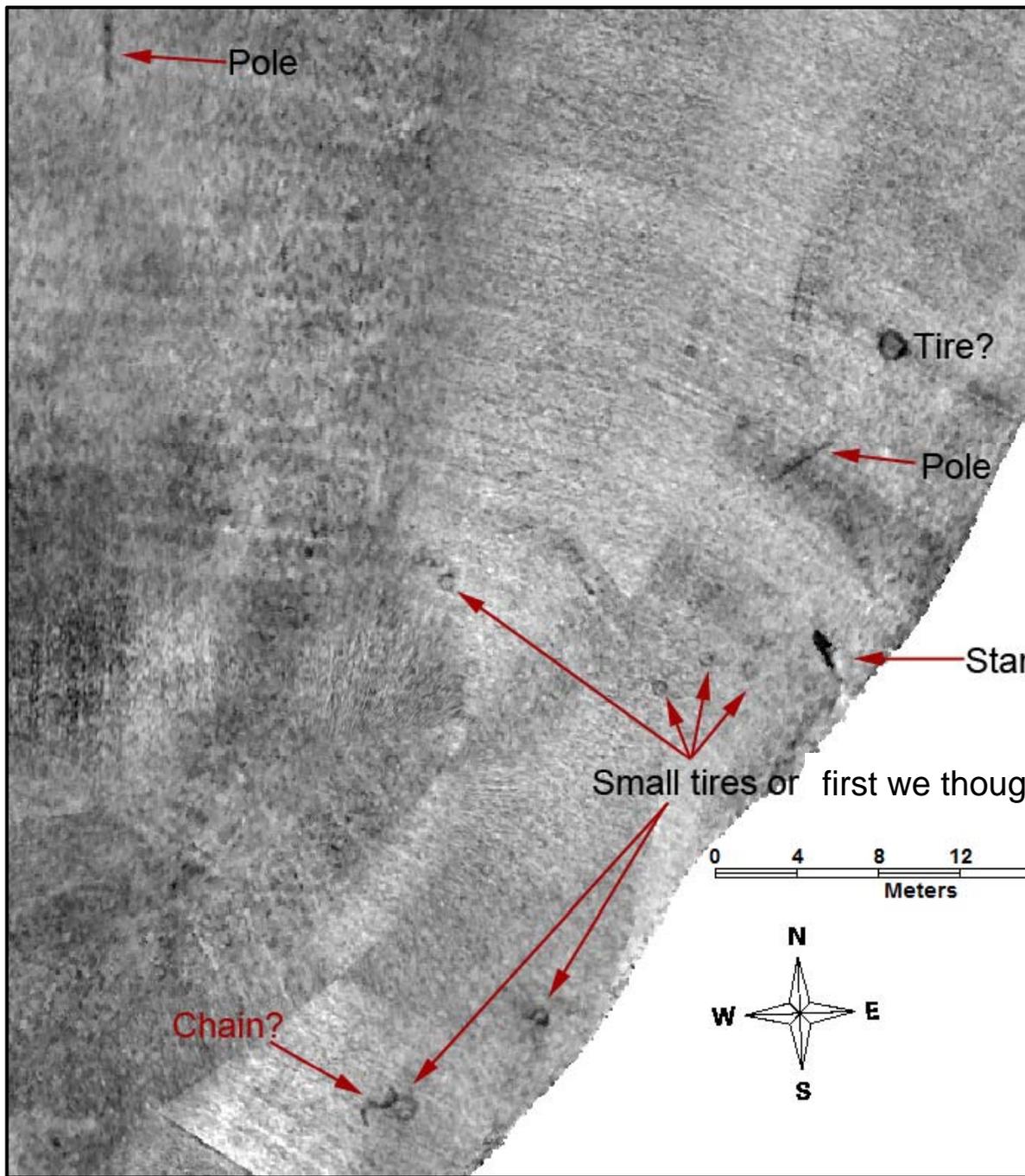






A tipped over ship or entrance to mystic underwater housing?





Pole

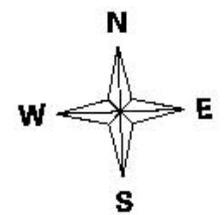
Tire?

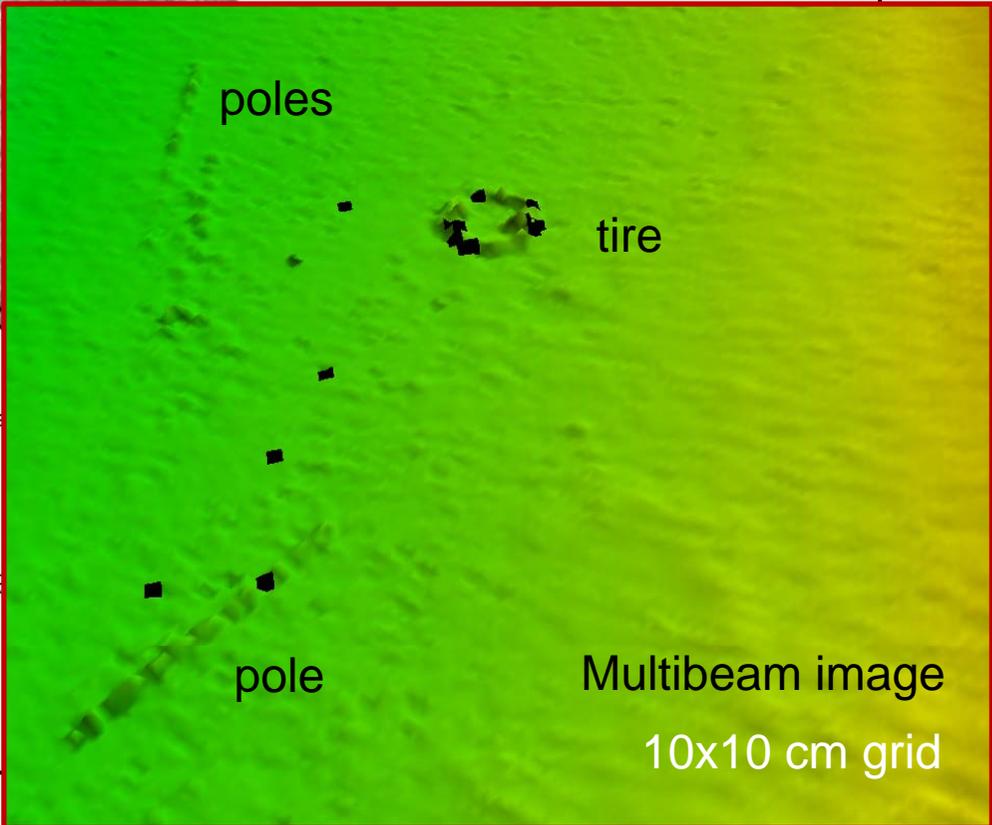
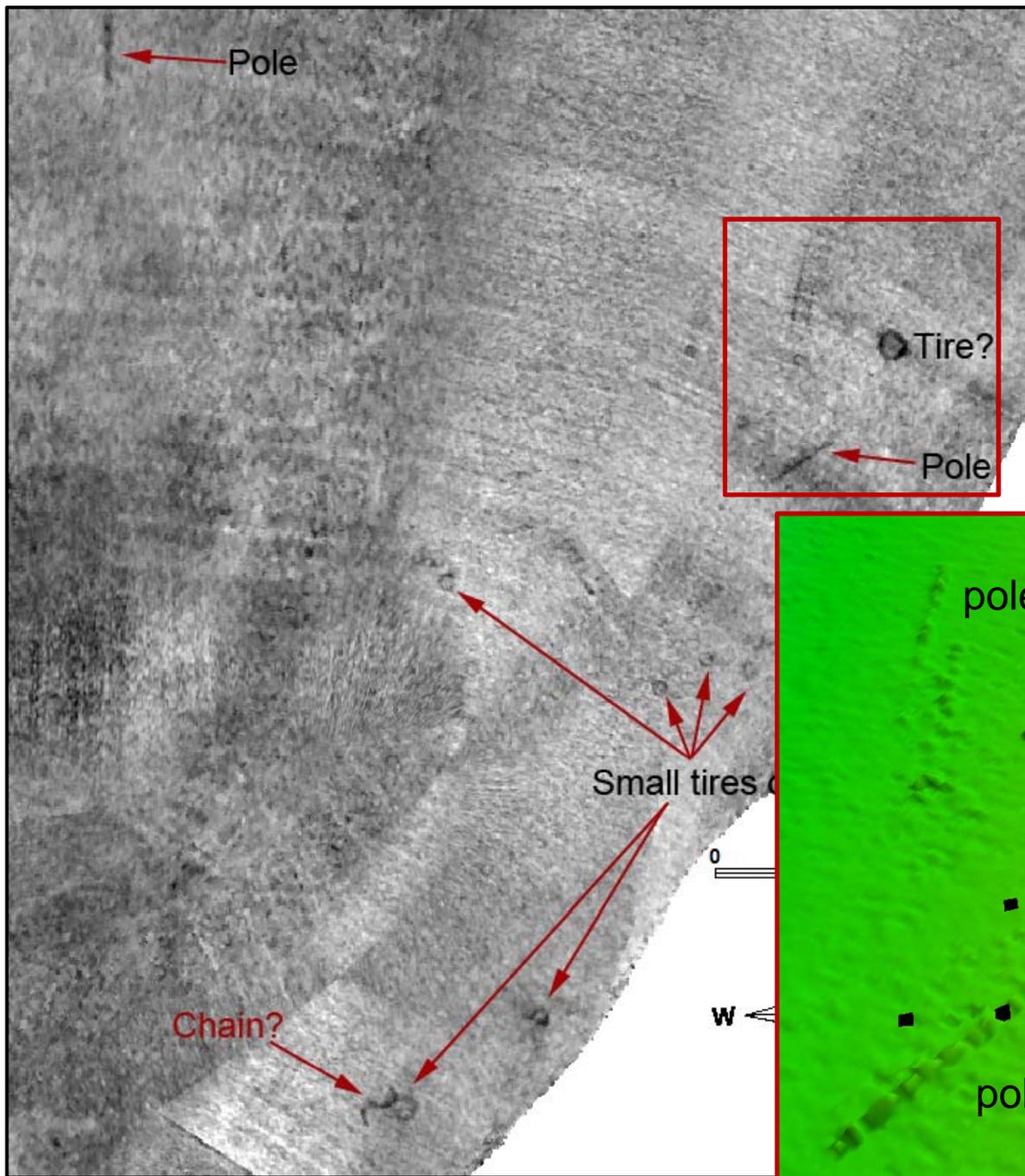
Pole

Standing pole

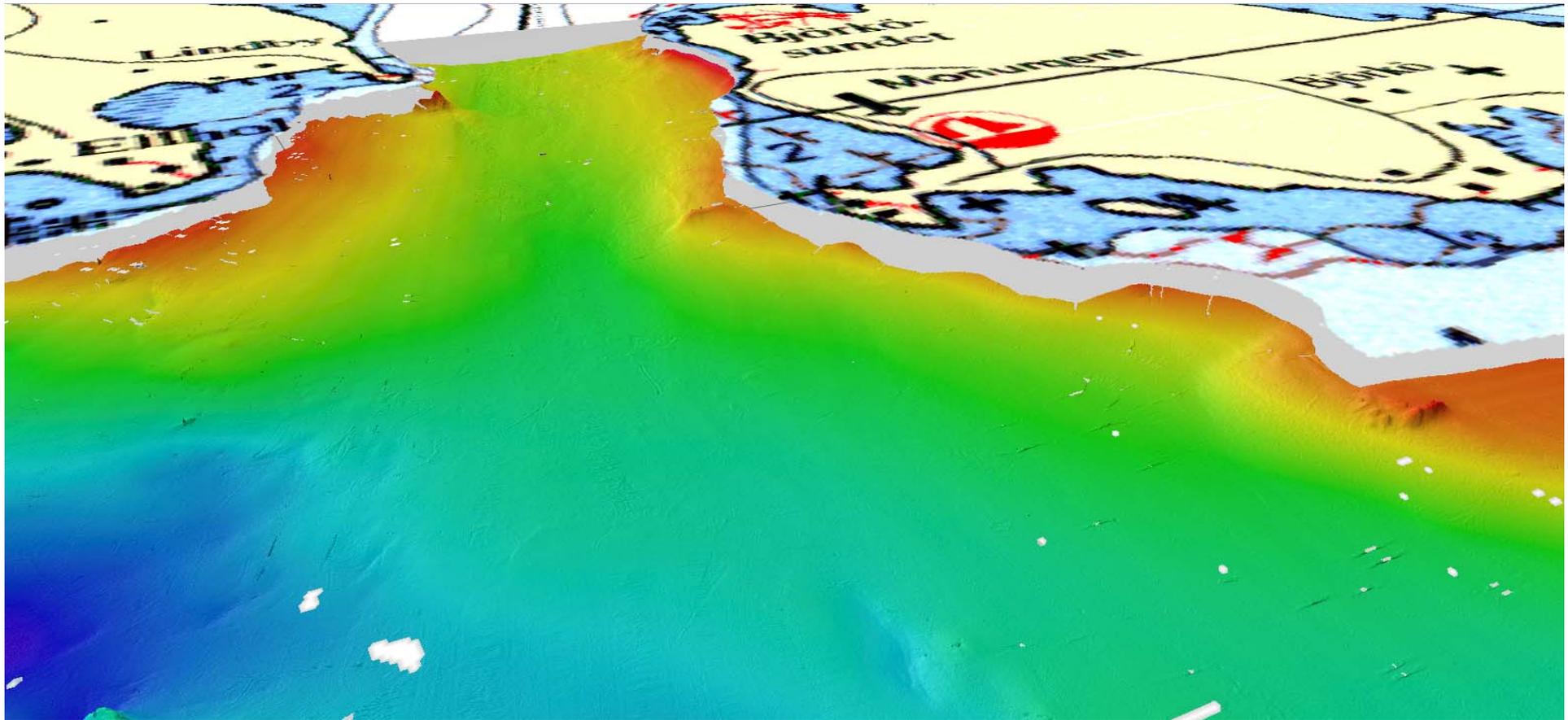
Small tires or first we thought these were poles

Chain?

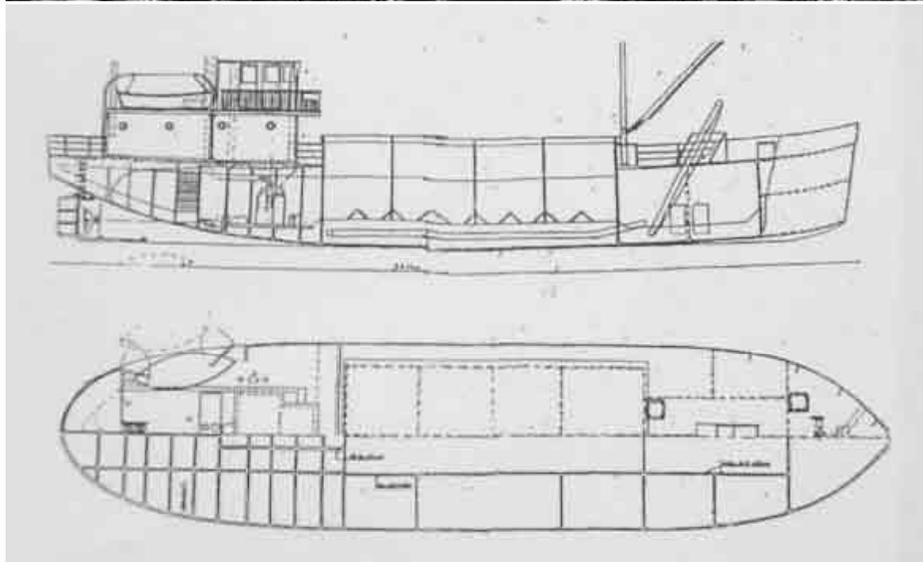
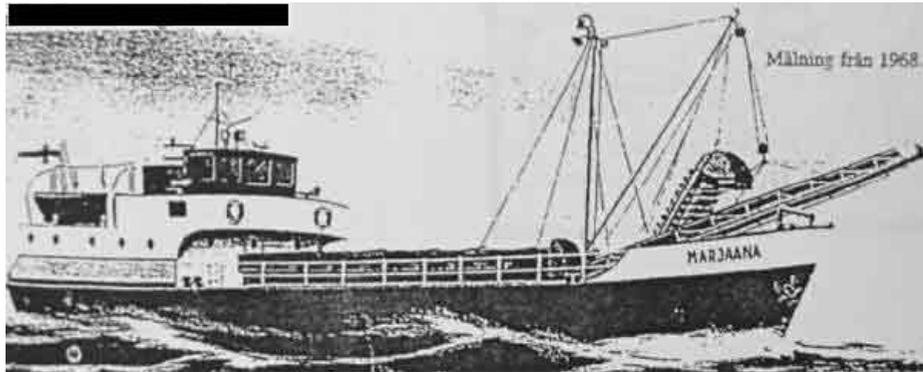




To be further analyzed.....



Bonus survey



Sister ship "Rospiggen"

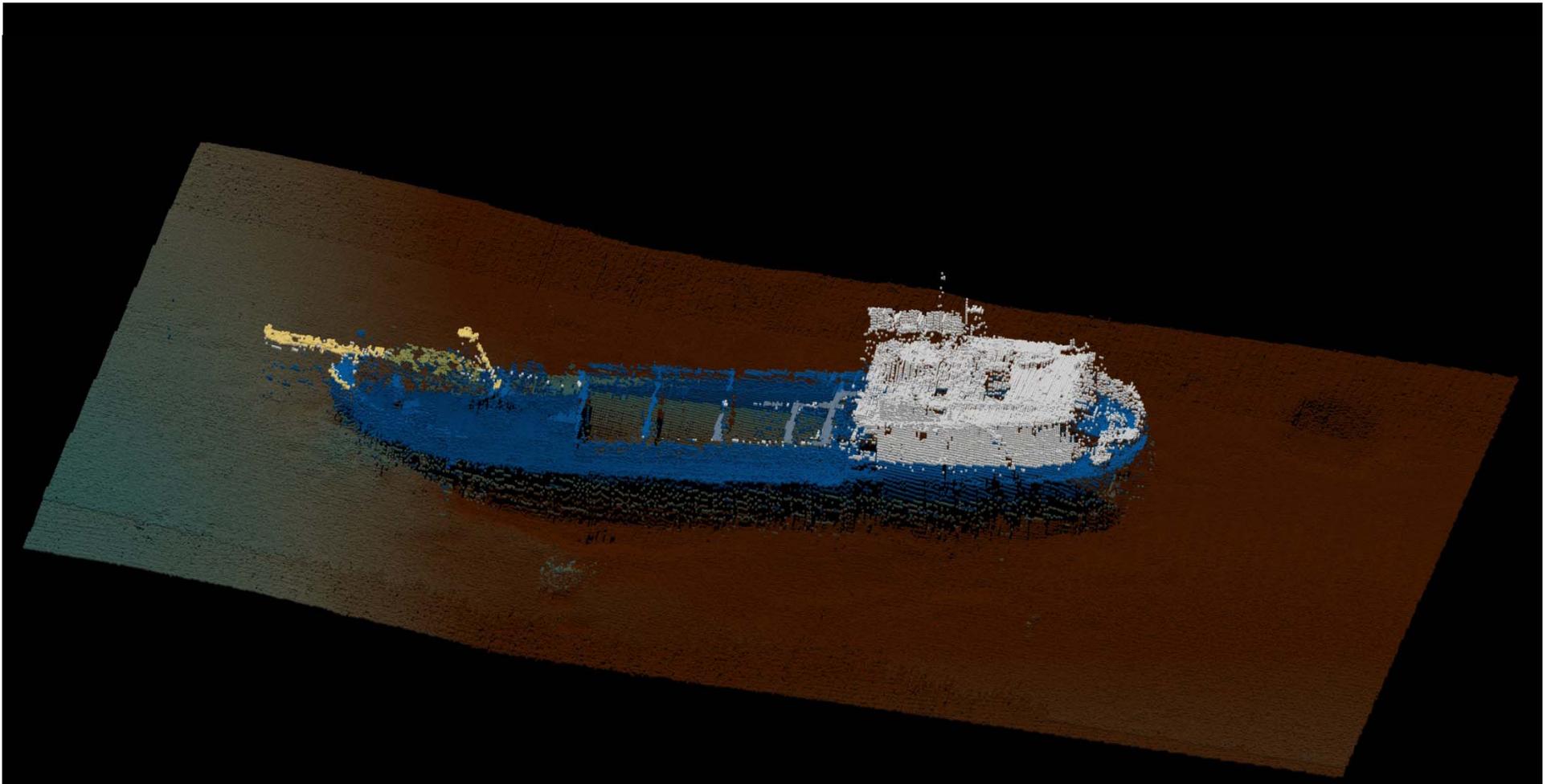
Specifications

Length: 33.76

Width: 7.66 m

Sunk: 1969-04-04

- *M/S Marjaana* was built for Underås Sandtag AB in 1944 and was first called *Underås Sandtag II*. The ship was used to carry sand to be used for concrete.
- The ship was sold in 1965 and renamed to *M/S Marjaana*. She continued to carry sand for Underås AB in Mälaren.
- *M/S Marjaana* sunk 1969 after a collision with a hard ice edge on the side of the lead just before Easter.
- All onboard survived except for the ship dog who went back to his cabin to get away from the commotion.



Sister ship Rospiggen

Resolution Addition to our
Antarctic Mapping Activities
Swedish Icebreaker Oden



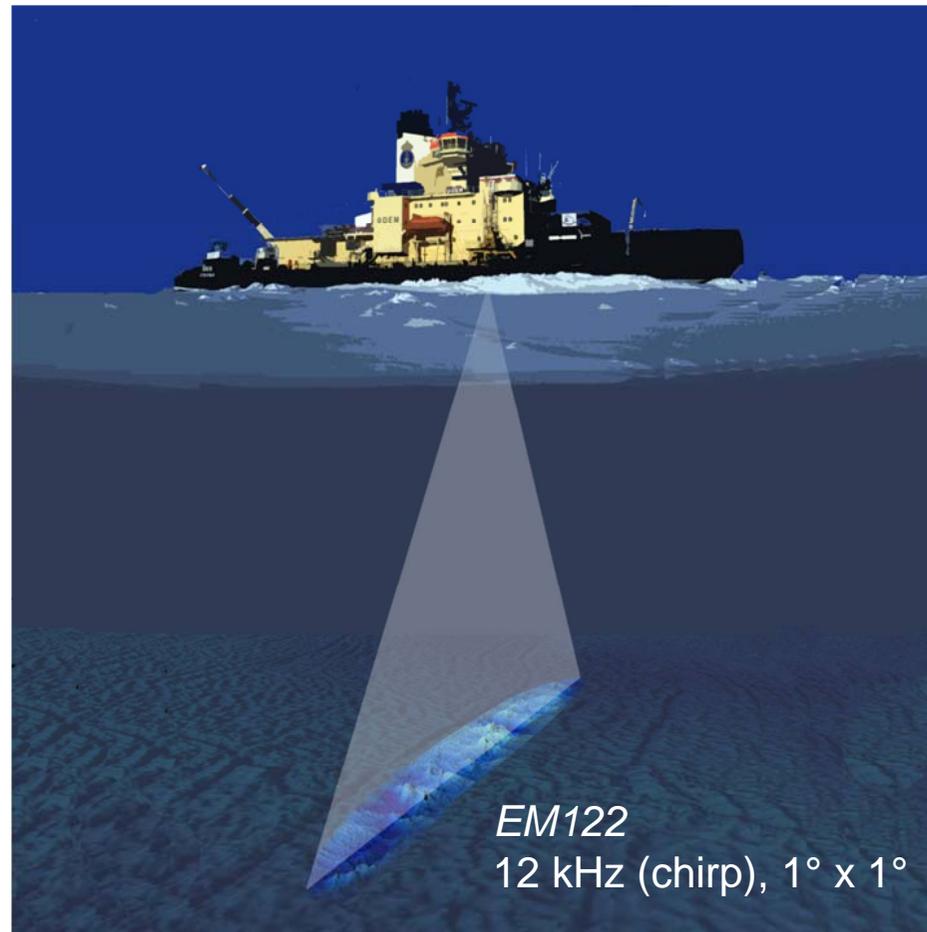
Stockholm University multibeam systems

Oden: Kongsberg EM122

Portable: Kongsberg EM2040

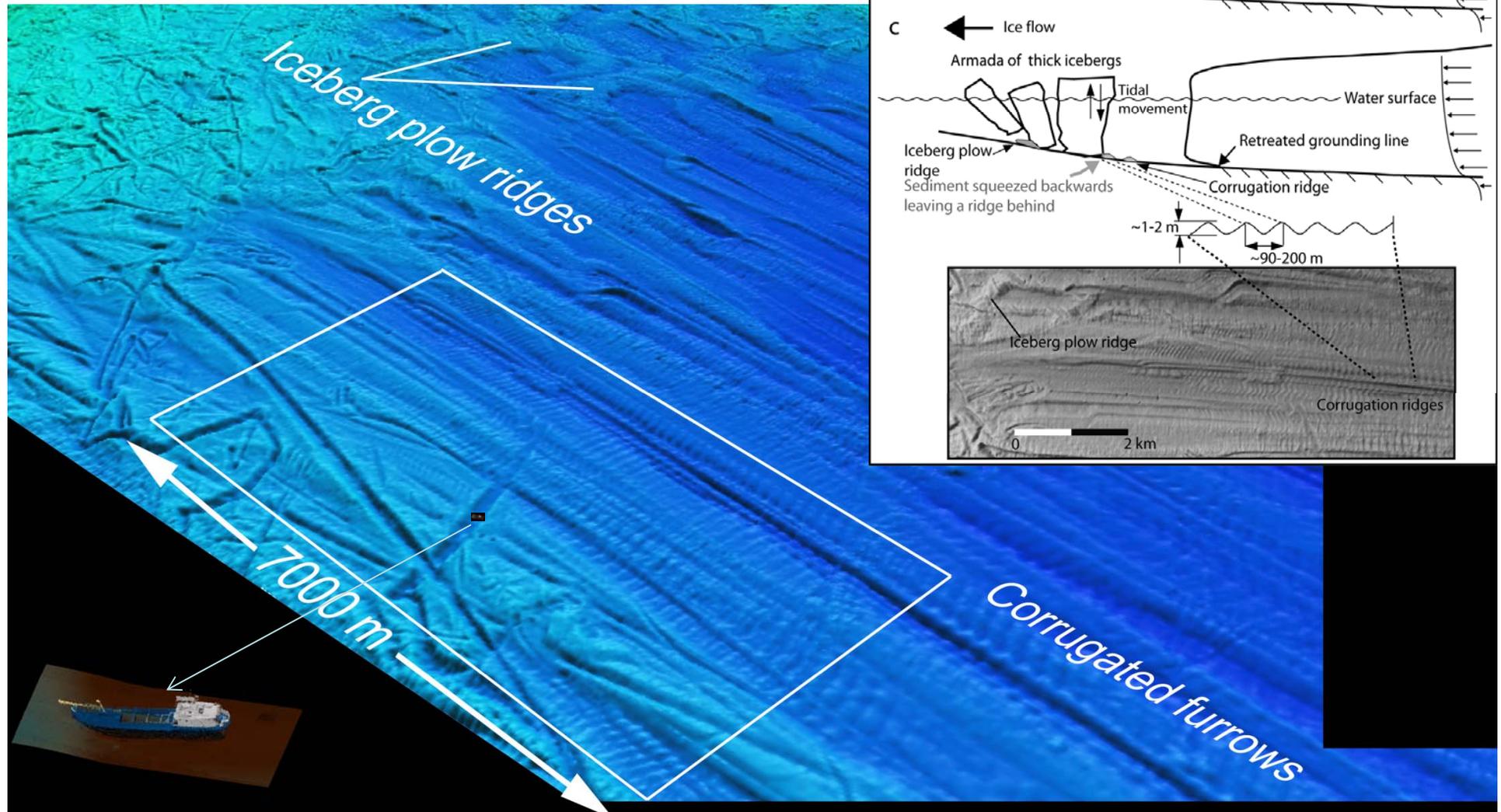


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Knut and Alice Walleberg Foundation; Swedish Research Council; Swedish Maritime Administration



What will higher resolution give us next!

Jakobsson, M., Anderson, J.B., et al., 2011. Geological record of Ice Shelf Breakup and Grounding Line Retreat, Pine Island Bay, West Antarctica. *Geology*.



Swedish Arctic Ocean Investigation of Climate-Cryosphere-Carbon Interactions – The SWE-C3 Program –

Two Leg Expedition 2014

