

Research into the practical management of underwater cultural heritage at The National Museum of Denmark

The National Museum of Denmark

David Gregory

デンマーク国立博物館は水中文化遺産の保存処理と展示に関し長い歴史を誇る。近年、国際法 (UNESCO・ICOMOS) やヨーロッパ圏の条約 (ヴァレッタ条約) などにより、より有効 (確実な) 遺跡の現地保存の方法に関する調査が開始されている。

これらの条約の主張の概要を下記に述べる:

- 水中文化遺産の保護は現地保存を第一オプションとする
- 発掘よりも非破壊調査, 非破壊探査, サンプルングを推薦する

国立博物館ではこれらの主張に沿って総括的, プロセス化を図った研究が過去20年におよび進められている。水中文化遺産のマネージメントは5つの要素 (プロセス) に分けて考えることができる。

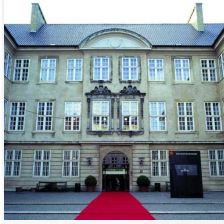
1. 水中にどのようなモノ (遺物・遺跡) が存在しているのか?
遺跡が存在するエリアを特定するための想定モデリング
2. 遺物・遺跡の特定
探査機器 (手法) の開発とマッピングによる遺跡分布の把握
3. 遺物・遺跡の保存状況の確認
遺跡が浸食など環境から悪影響をうけているか。どのようなプロセスが悪影響を及ぼしているかの特定とその原因の解明。遺跡・遺物はそれらのプロセスによりどの程度の浸食を受けているのか?
4. どのようにして遺跡・遺物を保護できるのか? (発掘・現地保存・埋め戻しなどの判断)
遺跡が失われる前に発掘をし記録を残すことが優先されるのか? 発掘・引き揚げた後の保存処理・現地での埋め戻し, 別の場所での埋め戻しなど。
5. どのように遺跡をモニタリングし現地保存できるか?
現地保存は遺跡保護に対する特効薬ではない。遺跡を見ることができないから何もしなくてもよいわけではない。遺跡の永続的な保護にはモニタリングが重要である。

国立博物館は, これらの方法をすべて適応する義務はないが, デンマーク国内の他の5つの博物館と協力をし, 国内の水中文化遺産の保護を行う。

また, 博物館はこれらの諸問題の解決に向けた国際協力研究も手掛けている。特に EU 加盟国間での研究プロジェクトでは Moss Project (<http://moss.nba.fi/eng/whatis moss.html>) や Wreck Protect (www.wreckprotect.eu) などがあり, 現在国立博物館が中心となり進めている SASMAP (www.sasmap.eu) でこれまでの調査の総括を図る予定である。



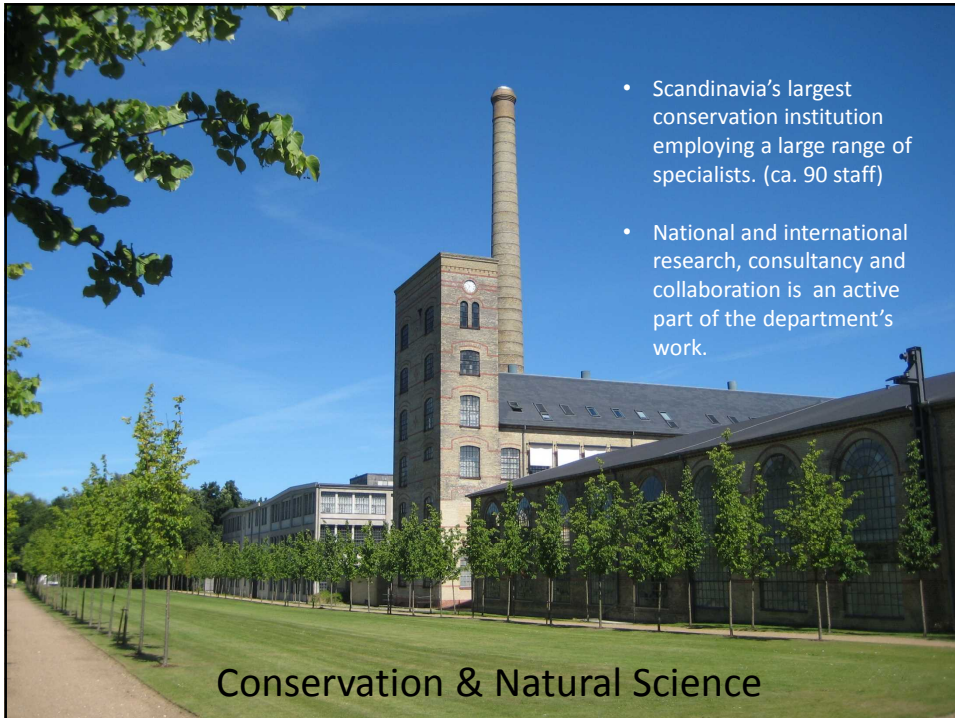
The National Museum of Denmark



Research into in situ preservation of underwater cultural heritage

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Department of Conservation & Natural Science



- Scandinavia's largest conservation institution employing a large range of specialists. (ca. 90 staff)
- National and international research, consultancy and collaboration is an active part of the department's work.

Conservation & Natural Science

Activities concerning Maritime Archaeology

Research based:

- **In situ preservation** of underwater archaeological sites
- **Conservation** of waterlogged artefacts
- **Exhibition** of Ship finds

Long history conserving & exhibiting Ships & Boats



Hjortspring Boat
Excavated 1921-1922
Ca. 300 BC



Ladby Ship
Excavated 1935 – 1936
Ca. 10th Century

Viking Ship Museum, Roskilde



Skuldelev Ships

Site drained
Excavated 1962-65
Documented & conserved 1965-69



Conservation Methods



Mainly PEG impregnation
& Freeze drying



Novel Exhibition techniques



The ship on exhibition 2013-2014



Berlin
4 mnd.
180.000 visitors



In situ Preservation & Re-burial of Ships

- Vejby, & Kollerup Cogs excavated in 1978 (44 tons wood)



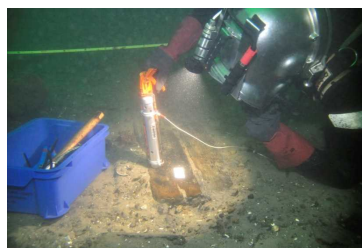
On land

Amager Strandpark wreck (2009)



- Reburial of finds following documentation
- In porous sandy soils
- Below the ground water table (waterlogged)

Underwater



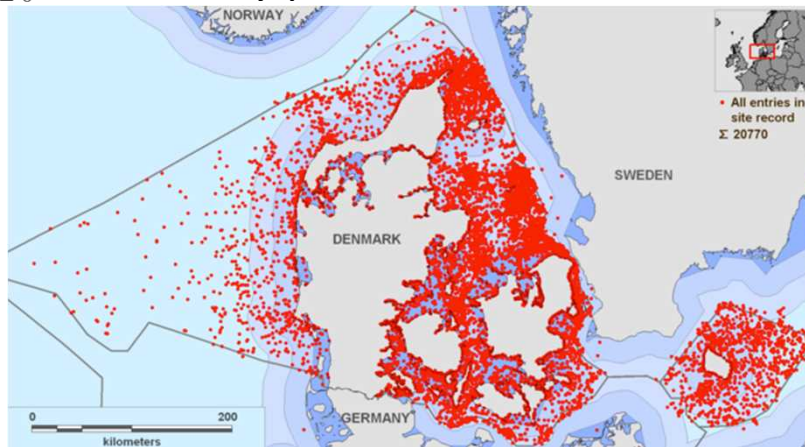
- Assessment of the environment (currents & sediment)
- Wood Assessment
- Recommendations for in situ preservation

Femern Belt Connection



Nationalmuseet
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Why preserve sites in situ?



Kulturstyrelsen (2013)

“On the seabed there are ca. 20,000 shipwrecks which have sunk over the centuries and there are also ca. 20,000 submerged settlement sites lying around the present day coastline and out to a depth of 30 – 40 metres.” (Kulturarv en værdifuld ressource for kommunernes udvikling, s.60)



Nationalmuseet
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Why preserve sites in situ?

Juridical:

International Conventions:

ICOMOS Charter (1996)

Valetta Treaty (1992)

UNESCO Convention (2001)

- “The preservation of underwater cultural heritage *in situ* should be considered as a first option.”
- “Non- destructive techniques, non-intrusive survey and sampling should be encouraged in preference to excavation.”



Challenges with in situ preservation

Valetta Treaty (European Law):

Identification of the heritage and measures for protection

- Article 3 §1b

b. to ensure that archaeological excavations and prospecting are undertaken in a scientific manner and provided that:

- **non-destructive methods of investigation are applied wherever possible;**
- **the elements of the archaeological heritage are not uncovered or left exposed during or after excavation without provision being made for their proper preservation, conservation and management;**

Article 4

Each Party undertakes to implement measures for the **physical protection of the archaeological heritage**, making provision, as circumstances demand:

- for the acquisition or protection by other appropriate means by the authorities of areas intended to constitute archaeological reserves;
- for the conservation and maintenance of the archaeological heritage, preferably in situ;**
- for appropriate storage places for archaeological remains which have been removed from their original location.



Challenges with in situ preservation ii

Integrated conservation of the archaeological heritage

Article 5

Each Party undertakes:

to seek to reconcile and combine the respective requirements of archaeology and development plans by ensuring that archaeologists participate:

in planning policies designed to ensure well-balanced strategies for the protection, conservation and enhancement of sites of archaeological interest;

to make provision, when elements of the archaeological heritage have been found during development work, for their conservation *in situ* when feasible;

What's missing?

- No Guidelines or accepted standards for how to carry out in situ preservation / re-burial
 - Site Assessment
 - Material science (state of preservation? Deterioration processes?)
 - Appropriate methodologies
 - Monitoring of sites
- No expectations for what is an expected / acceptable "life" of in situ management – 50, 100 years...forever?
- Financing for carrying out in situ preservation / stabilisation can be obtained but difficult to obtain funding for monitoring: "Out of sight out of mind"
- Difficulties receiving funds for protection of material from research excavations

The National Museum's Approach

Know your enemy: Threats to archaeological sites

- A process based approach to understanding the site environment and what effects this has had and **will have** on the archaeological materials contained within a site if they are left in situ.

Requirements for In Situ Preservation

- Knowledge of the extent of a site both **on** and **in** the seabed
- mapping
- Knowledge of the deterioration processes of materials
Physical
Biological
Chemical
- Knowledge of the state of preservation of materials
- Knowledge of the site environment

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Requirements for In Situ Preservation

Only by knowing your enemies can you defeat them

- Stabilisation / Mitigation strategies
- Monitoring of sites



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Deterioration processes on marine sites



Open Seawater

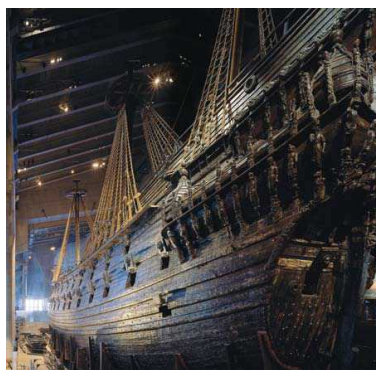
- *Physical*
Scour due to effects of currents
- *Biological*
Activity of wood borers
(Microorganisms: fungi & bacteria)

Seabed

- *Biological*
Anaerobic microbial decay of materials
- *Chemical*
Corrosion

Prioritisation by understanding the environment

The burial / site environment dictates what we find preserved



The *Vasa* (1628)



Darsse Cog (ca 1200)

**What materials are present and what deterioration processes will affect them ?
Provide Heritage Agencies with measurable / quantitative data for prioritising**

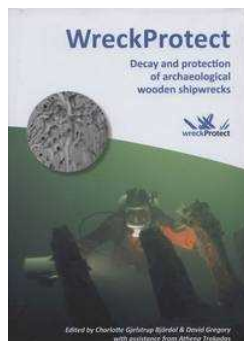
European Funding

- Offers opportunities for necessary interdisciplinary and international research between a range of companies and institutions
- Opportunity to effect policy – project requirements often have to show how results will benefit European policy
- Significant resources (80 billion Euros for European research between 2014 – 2020. **Sadly not all on Cultural Heritage** ☹)
- Japan can be an associated partner in many projects

Recent Research Projects



<http://moss.nba.fi/eng/whatis moss.html>
(2001-2004)



www.wreckprotect.eu
(2009 – 2011)



SASMAP. Development of Tools and Techniques to Survey, Assess, Stabilise, Monitor and Preserve Underwater Archaeological Sites.

www.sasmap.eu
(2012 – 2015)



Opportunity for Museum, Universities, Governmental agencies to work together

11 partners (DK, UK, SE, DE, SE, GR, IT) and 4 small companies involved

Remote sensing specialists, geologists, marine geochemists, archaeologists, conservators, wood scientists

Scientific themes of the project

Down scaling

WP1 Geological models to predict location of sites

WP2 Remote surveying techniques to map istes on and in the seabed

Upscaling

WP 3 Assessing the **burial environment** and **deterioration** of **organic archaeological** materials

WP 4 **Assessment** of the **state of preservation** of **waterlogged archaeological wood**

WP 5 **Tools** and **techniques** to **raise waterlogged organic archaeological artefacts**

WP 6 **In situ stabilisation** of underwater archaeological sites

Outputs of the project

New tools and techniques:

- Surveying methods (satellite imagery to measure bathymetry on coastal and shallow sites)
- Surveying tools 3D sub bottom profiler for mapping what lies beneath the seabed)
- Sampling and characterising the environment (dataloggers to measure in open seawater and in the seabed plus sediment sampling)
- Non destructively assessing state of preservation of wood in situ
- Tools and techniques for raising fragile organic archaeological artefacts
- Tools for preserving archaeological sites in situ (artificial seagrass)

Non invasive and non destructive assessment

Guidelines

Two guidelines to be produced based on the results

1. Surveying and location of archaeological sites
2. Preserving sites in situ



Thank you for the invitation and your attention

招待状とご清聴ありがとうございました