

Slide	Speech
1	<p>Dear Mrs Busse and Mr Oelerich, Dear delegates, dear Mr Stempel, Thank you for the possibility to speak here today on behalf of the German National Academy of Sciences and its independent group of experts on underwater heritage.</p>
2	<p>My name is Hauke Jöns. I am the scientific director of the Lower Saxony Institute of Historic Coastal research. In the next 10 minutes, my colleague Mike Belasus from the University of Copenhagen and I would like to present some scientific conclusions on the fact that the Baltic Sea is not only an important ecosystem forming the habitat for thousands of different species, but also a unique archive of the environmental and humankind history. So far, this archive has been only partly opened and investigated (Fig. 4).</p>
3	<p>The Baltic Sea environment offers extraordinary preservation conditions for organic materials such as wood, bone and even vegetable fibres, seeds and pollen. In the waterlogged and low oxygen sediments they are safe from degradation, therefore they may survive for thousands of years, whereas under dry conditions they would have decayed in a few years.</p> <p>You can see here the image of a of a prehistoric paddle on which you can recognize very fine drawings (Fig. 1) and another image of a fish knife with a handle of hazel wood and lime bast (Fig. 2). These world wide unique findings indicate coastal settlements (Fig. 3), which became inundated due to the postglacial sea level rise, thus forming sea level index-points.</p> <p>The marine environment has also preserved numerous sunken ships that are not only of special importance for the understanding of technical developments but offer a wealth of preserved data on human life in the past and their interaction with the environment.</p>

	<p>For illustration, you can see one of the Viking age Boats from the Roskilde Fjord in the upper picture (Fig. 5), and in the following picture a uniquely preserved 16th century ship found only last year in Swedish waters (Fig. 6).</p>
4	<p>The archaeological remains from each site are time capsules. Together, they create a complex puzzle that allows a piece-by-piece reconstruction of parts of our unwritten history in the Baltic Sea region.</p> <p>An impressive example are the remains of well-preserved fish traps that were investigated 12 m below sea level in the southern Swedish Hanö Bay (Fig. 7). They enable not only the reconstruction of the fishing strategy of prehistoric communities around 8000 BC but also the local sea level change and shoreline displacement on the long term.</p> <p>The remains of ships bear important information on technical and economic developments but also data on living conditions, past environments or social changes. Well-preserved examples as this recently discovered vessel (Fig. 8) are human micro habitats and contain evidence of every aspect of human life and its interaction with the environment of a very short period in time.</p>
5	<p>We would like to underline that the data from archaeological investigations in the Baltic Sea is not important just for historical studies. It also provides new knowledge about topics of strong significance in our recent political debates, especially climate and sea level change, biodiversity and human migration.</p> <p>In this image, you can see the regression and transgression processes in the Baltic Sea during the last 9000 years (Fig. 9). The arrow points to the Wismar Bay in Germany. Complex studies of numerous archaeological sites on the seabed within the SINCOS-project enable a detailed reconstruction of the Wismar Bay rising in the last 8000 years, mirroring the local climate and sea level change (Fig. 10). Together with the IPCC data they form also the base for the creation of future scenarios of regional coastal retreat to be expected until 2100 (Fig. 11).</p>
6	<p>But Archaeology can also provide valuable insights into historic biodiversity and environmental change of the Baltic Sea region. Remains of fish (historical population of Cod, Fig. 15), mammals (Fig. 12), insects and plants, living and growing at the coast and</p>

	<p>beyond were used by past societies or ship-communities for food, construction, merchandise or became part of the archaeological context as parasites or „stowaways“. Archaeological discoveries can even prove under what climatical conditions the trees grew that became inundated due to postglacial sea level rise or that were used for ship-building (Fig. 13 & 14).</p>
<p>7</p>	<p>For the topic of the history of human migration, the findings of human remains from prehistoric times are of particular importance. You can see here a around 7000 years old grave from Tybrind Vig in Denmark (Fig. 16). It was investigated 3 m below recent sea level. Graves like this form the base for ancient DNA analyses, enabling piece by piece the reconstruction of human migration in a long-term perspective.</p> <p>In addition, data from shipwrecks allow us to reconstruct trading routes and the use and even exhaustion of resources like fish or timber for instance. Such information also sheds light on early connections between people across the sea and gives evidence for the transport of goods, knowledge, ideas, diseases and epidemics, as well as alien species (Fig. 17). The latter is still a much discussed problem today.</p>
<p>8</p>	<p>Even if the relics of past life on the shore or on board of ships have been conserved for long periods on the seabed, nowadays their preservation is threatened by various factors (Fig. 18).</p> <p>On the one side, there are the geological and biological factors such as strong currents on the sea floors or the expansion of wood boring species such as <i>Teredo navalis</i>.</p> <p>However, on the other side, the economic pressure to the Baltic environment has grown enormously during the last decades. With that, the threat to our archaeological heritage has increased as well. Fishing as well as sand and gravel mining are usually connected to the disturbance of the sea floor and the possible destruction of archaeological evidence. Plundering of shipwreck sites has never been so easy as today, due to the availability of many site coordinates on the internet. In addition, progress in diving technology facilitates the access to the submerged world.</p>

<p>9</p>	<p>Strong threats to the environment are caused also by hazardous substances to be found especially in wrecks from the two world wars (Fig. 22). Iron corrosion cannot be stopped and will ultimately lead to the collapse of ships hulls. Therefore, archaeological documenting of the submerged objects and their removal by specialized teams that can localize pollutants like fuels, oils, heavy metals and ammunition and other, can be instrumental.</p> <p>A permanent growing threat to the archaeological sites derives also from pollution with nutrients, especially those used in agriculture (Fig. 19 & 20). These excess other nutrients, such as nitrogen or phosphorus, that stimulate algal growth and cause the well-known retreat or death of the eelgrass vegetation, as you can see at Strande near Kiel (Germany) (Fig. 21). Because the roots of the eelgrass do also protect archaeological remains from erosion, this natural protection is lost at more and more spots. The sites are simply washed away.</p>
<p>10</p>	<p>So, how can we improve this situation? The map on the left side was created during the Baltic Rim Project and shows the areas of already known or expected archaeological sites (Fig. 23). The map on the right shows planned wind farms as an example for further possible use of the Baltic Sea (Fig. 24). This indicates that it is utterly necessary to integrate the archaeological heritage in all planning processes, before and not after they start. The marine cultural heritage should be considered as part of the marine environment. As such, it should as a matter of routine be consistently integrated into marine spatial planning, above and under sea level.</p>
<p>11</p>	<p>We would like to close with a positive example. During the environmental assessment process for the Fehmarn Belt tunnel (Fig. 27), archaeological investigations became completely integrated into the planning process. In addition, the archaeologists got access to several sediment cores (Fig. 26), that were taken to investigate the underground in the area of the route. The analyses ended with new data about the regional environmental changes in the Fehmarn area from the Yoldia- to the Ancyclus-phase (between 7500 and 6500 BC) (Fig. 25).</p>

12	<p>In conclusion, our recommendation is to integrate archaeological expertise into the design of strategies for the protection and development of the Baltic Sea marine environment.</p> <p>A comprehensive state of the research, wider results of the exchange in the scientific and professional community, as well as several options for interventions are available in the recently published statement of the German National Academy of Sciences Leopoldina “Traces under water”.</p> <p>Thank you for your attention and we are here to answer additional questions</p>
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