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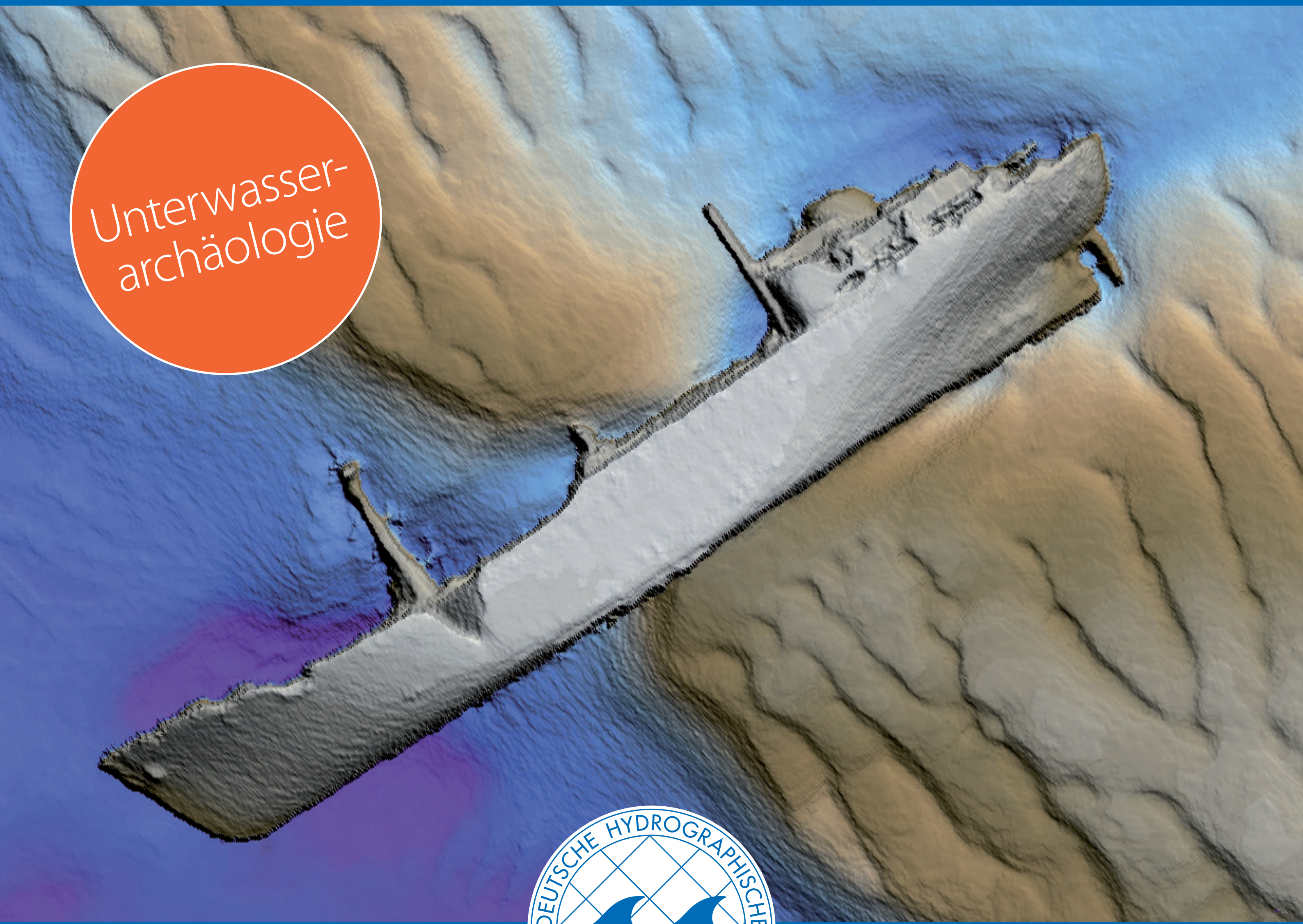

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Discovering wrecks while mapping for infrastructure

An article by STEFFEN WIERS

Discovering wrecks is a common occurrence while surveying for infrastructure projects. In most cases the wrecks are known and only a confirmation of their positions is required. Sometimes things get more interesting, because there is a story to be told about the wreck or due to obvious damages that led to the accident. In some rare instances we discover a previous unknown wreck or a wreck is excavated. This article showcases three examples of wrecks surveyed by Fugro Germany Marine. The *DS Norge,* a steamer that sank in 1871 and was previously unknown. The *MV Høegh Aigrette* that sank close to Dover, UK, with a V-shaped incision in its hull. And the wrecks of the Swedish ship blockade, a deliberate line of wrecks offshore Rügen in the Baltic Sea.

wreck discoveries | underwater archaeology | cable survey | excavation | magnetometer | UNCLOS
Wrackfunde | Unterwasserarchäologie | Kabelvermessung | Ausgrabung | Magnetometer | UNCLOS

Bei Vermessungsarbeiten für Infrastrukturprojekte werden häufig Wracks entdeckt. In den meisten Fällen sind die Wracks bekannt und es ist nur eine Bestätigung ihrer Positionen notwendig. Manchmal wird es jedoch interessanter, weil es eine Geschichte über das Wrack zu erzählen gibt oder weil offensichtliche Schäden zu erkennen sind, die zu dem Unfall geführt haben. In seltenen Fällen entdecken wir ein bisher unbekanntes Wrack oder ein Wrack wird ausgegraben. Dieser Artikel zeigt drei Beispiele für Wracks, die von Fugro Germany Marine vermessen wurden. Die *DS Norge,* ein Dampfer, der 1871 sank und zuvor unbekannt war. Die *MV Høegh Aigrette,* die in der Nähe von Dover, Großbritannien, mit einem V-förmigen Einschnitt im Rumpf sank. Und die Wracks der schwedischen Schiffsblockade, einer absichtlich angelegten Reihe von Wracks vor der Küste Rügens in der Ostsee.

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Introduction

During survey work interesting discoveries are regularly made along the way. For the clients of Fugro Germany Marine (hereafter referred to as Fugro), these discoveries often mean additional work, as wrecks or other archaeological finds need to be avoided or cleared before any infrastructure project can take place. In the case of cables or pipelines a simple rerouting is often sufficient and that's the end of the story. A wreck report is written and is usually submitted to country agencies, like the respective hydrographic services, in case a finding is located inside territorial waters or the exclusive economic zone, and at a minimum reported in a relevant wreck database.

It must be mentioned that there are guidelines and rules in the United Nations Convention on the Law of the Sea (UNCLOS) regarding archaeological and historical finds outside of countries jurisdictions. But while these rules may protect any finds, it is not a mandate for further investigation or salvage.

In any case, wrecks are part of history and often tell interesting stories or even lead to further investigations by archaeologists. Here we present some examples from Fugro's work that instigated further research: the discovery of the wreck of the *DS Norge* in Østergapet offshore Kristiansand, Norway, the wreck of the *MV Høegh Aigrette* in the Strait of Dover, UK/Netherlands, and the discovery of the several wrecks of the Swedish ship blockade offshore Rügen, Germany.

Methodology

During cable route surveys Fugro routinely deploys multibeam echo sounder (MBES), side-scan sonar (SSS), sub-bottom profiler (SBP) and single magnetometer (MAG), all of which can be used to find wrecks. Wrecks exposed on the seafloor are easily mapped using MBES and SSS, producing highly detailed images. SBP and MAG on the other hand mostly indirectly identify wrecks.

MBES is used on all surveys and mounted to the hull of the ship, provides the best position fix. Resolution is dependent on water depth and usually gridding is performed at ~10 % of the water depth. In shallow water, even smaller debris and containers are easily identified and details can be resolved, while in deep water, larger objects are still visible, but details are obscured.

SSS is usually deployed during cable route and marine infrastructure surveys, towed behind the ship at a constant altitude above the seafloor. On hydrographic surveys SSS may be deployed to acquire more data on wrecks. Resolution is dependent on the swath range, speed of tow and sonar frequency, but for typical projects it is between 0.1 and 0.5 m. Since the system is towed close to the seabed, it does not depend on water depth. Positioning accuracy is highly dependent on the towing distance of the SSS fish, with deeper waters needing longer cables and towing distances. Generally, an accuracy of ±2 m is considered acceptable. Correlation with MBES can lead to improved positioning while retaining the SSS's detailed resolution.

SBP is much more limited in finding and identifying wrecks. The system is usually hull-mounted and only a direct path over an object can give a response in the data. Nevertheless, objects can be identified by refraction hyperbolas. Association is more difficult but usually possible if any objects are recorded in relevant databases.

MAG can be a great tool to locate metallic objects and wrecks usually give a very strong response. Positioning is similar to SSS, in the case of magnetometer arrays and close line spacing. Single magnetometers impose an additional restriction since no direct pass over an object is necessary for detection. A wreck can be tens of metres away from the line and still be detected.

In general, a combination of all sensors yields the best results. But in practise MBES and SSS are the sensors most used.

DS Norge

The *DS Norge* was a paddle steamer of the newly founded Bergen Steamship Company, Det Bergenske Dampskibsselskab (DBD). It was built in 1854 by Thomas Wingate & Co in Glasgow and an early acquisition into the growing company. It served the company's Bergen–Hamburg route via Stavanger and Kristiansand.

In early September 1855, the *DS Norge* (Fig. 1), leaving Kristiansand on route to Hamburg, collided with the *DS Bergen,* another steamer of DBD. According to a newspaper article (Fig. 2), visibility was low when the two ships collided near the Oxhoe Lighthouse, although, other sources mention good visibility (Skipet 1988).

Only 15 minutes after the collision, the *DS Norge* sank. The incident is considered to be the first major Norwegian maritime disaster in the age of steamships, in which more than half of the 70 passengers lost their lives. Blame was laid on the captain of the *DS Norge,* who was sentenced to 160 days in prison.

Despite the known location of the collision, the wreck of the *DS Norge* was not located until more than a century later. The *MV Fugro Helmert* was conducting survey operations for a cable across the Skagerrak in 2018 when an unknown wreck

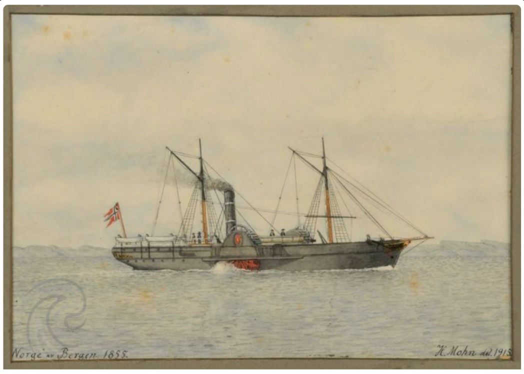
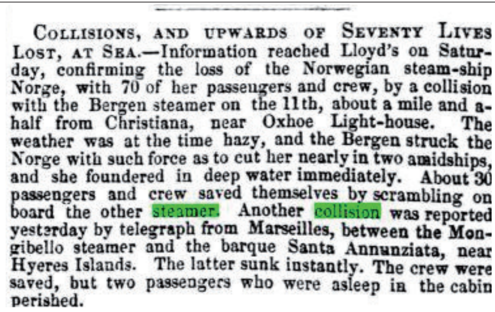


Photo: Norsk maritimt museum

Fig. 1: *DS Norge*

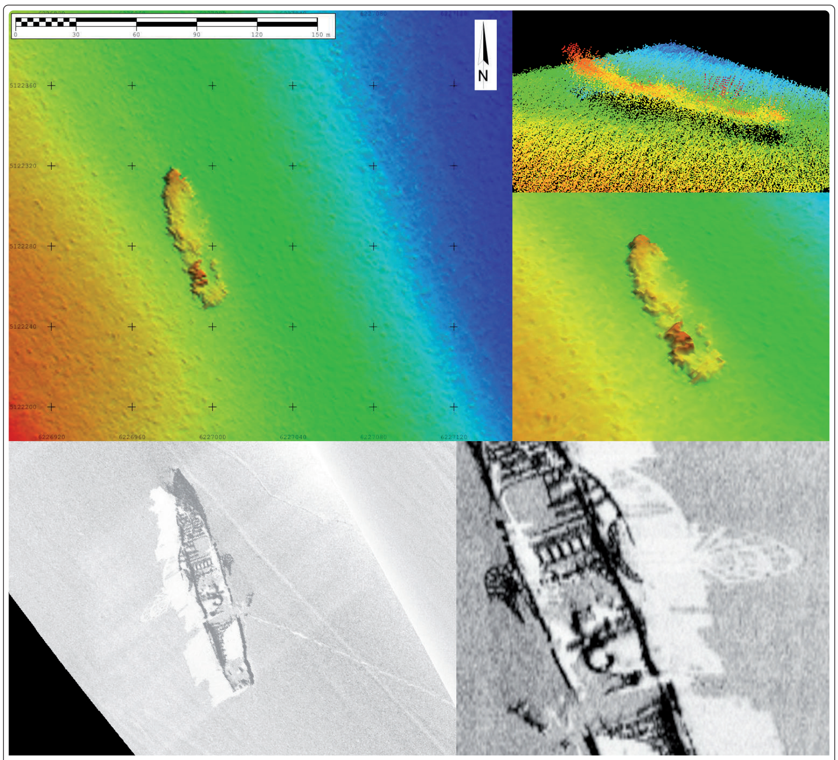


Collisions, and upwards of Seventy Lives Lost, at Sea.—Information reached Lloyd's on Saturday, confirming the loss of the Norwegian steam-ship Norge, with 70 of her passengers and crew, by a collision with the Bergen steamer on the 11th, about a mile and a-half from Christiana, near Oxhoe Light-house. The weather was at the time hazy, and the Bergen struck the Norge with such force as to cut her nearly in two amidships, and she foundered in deep water immediately. About 30 passengers and crew saved themselves by scrambling on board the other steamer. Another collision was reported yesterday by telegraph from Marseilles, between the Mongibello steamer and the barque Santa Annunziata, near Hyeres Islands. The latter sunk instantly. The crew were saved, but two passengers who were asleep in the cabin perished.

Fig. 2: Newspaper article, reporting on the collision of the *DS Norge* and the *DS Bergen*

was discovered. As per usual procedure, a wreck report was issued and forwarded to the Norwegian authorities.

The wreck was found to be in pristine condition, resting in an upright position on the seabed in a water depth of 165 m (Fig. 3). The multibeam



Fugro data

Fig. 3: Multibeam echo sounder and side-scan sonar images of the *DS Norge*

echo sounder shows a clear outline and allowed for a very accurate position fix (Fig. 3). More details can be seen in the multiple side-scan sonar passes (Fig. 3). Parts of the superstructure and paddles are clearly visible, while no obvious signs of the collision itself can be seen.

The Norwegian Maritime Museum concluded that it could be the *DS Norge,* after studying the data provided. In 2019, the museum conducted an ROV dive in cooperation with SubseaX and Saastad ROV, which was live streamed on YouTube, to inspect the wreck (Norwegian Maritime Museum 2020).

MV Høegh Aigrette

Another wreck surveyed by Fugro is that of the *MV Høegh Aigrette* in the English Channel approximately 12 nautical miles east of Ramsgate, UK, near the Goodwin Sands. It sank after a collision with another cargo vessel, the Norwegian freighter *Sunriver* on 25th of November 1967. The general cargo ship was en route from Duala (Cameroon) to Svendborg (Denmark), loading timber and general cargo.

The two ships collided in thick fog and the *MV Høegh Aigrette* sank after about three hours. The loaded logs spread across the English Channel, impeding traffic on the important shipping lane. All crew of the *MV Høegh Aigrette* were rescued and brought ashore at Dover, captured in a short film by Reuters. The *Sunriver* only sustained slight damage.

Fugro surveyed the wreck of the *MV Høegh Aigrette* during an Maritime & Coastguard Agency (MCA) campaign in 2007. The wreck was routinely

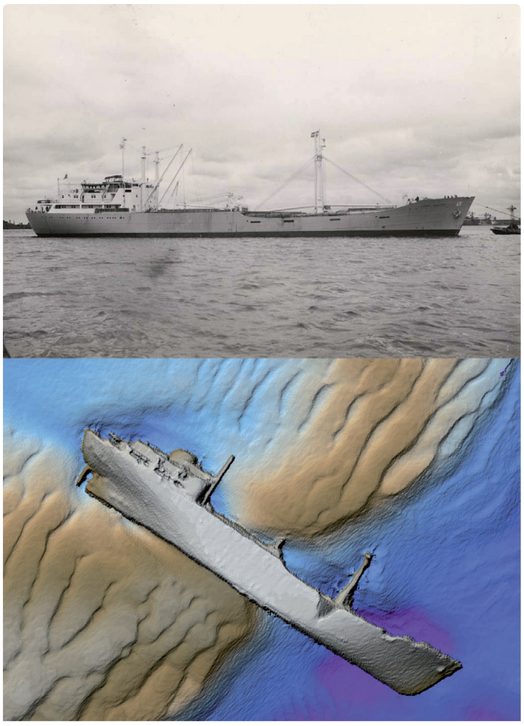


Photo: Hansen Pedersen (Cargo Ship Fo7120A),
MBES data: Courtesy of UK Maritime and Coastguard Agency. Data acquisition, processing and visualisation by Fugro

Fig. 4: Photo (top) and multibeam echo sounder data from the wreck of the *MV Høegh Aigrette*

surveyed with additional lines from all sides, producing high quality data. The maps show a mainly intact wreck lying on its port side (Fig. 4). On the starboard side a V-shaped incision is visible, believed to be the result of the collision with the *Sunriver.*

The wreck lies in a water depth of 35 m with the highest point of the wreck at 23.6 m. The data shows that the wreck lies directly on the sediment with no visible freespan and well defined scours around the wreck, the survey further revealed a debris field around the wreck and scattered remains of fishing nets.

Swedish ship blockade

One of the more spectacular wreck sites was surveyed by Fugro for the Nord Stream 1 pipeline project in the Baltic Sea (Nord Stream 2008). Several wrecks line the eastern entrance of the Greifswalder Bodden (Fig. 5). They are the result from a deliberate barrier that was put in place by Swedish marine forces in 1715 during the Great Northern War (Belasus 2013; Auer 2021).

From 1700 to 1721 a Russian-led coalition contested Swedish supremacy in Northern, Central and Eastern Europe. In 1715, a naval battle took place near the island of Rügen in the Baltic Sea (Fig. 6). A Swedish flotilla tried to defend the island, and with it the access to Swedish Pomerania, against two Danish flotillas. Stralsund, in particular, stood in the way of a full-scale invasion, but the Russian coalition had to conquer the island of Rügen first, to deploy their artillery. And in turn, they had to establish naval supremacy around the island.

In 1715, two fairways existed to enter the Greifswald Bodden from the Baltic Sea. One was between the islands of Ruden and Usedom, the ›Osttief‹, and the other was between Rügen and Ruden, the ›Westtief‹. The Swedish forces, hoping to force the Danish flotillas in reach of their land-based artillery batteries on Rügen, sank 20 smaller ships and fishing boats in both fairways. They loaded the vessels with stones to sink them at a distance of 40 to 60 m (Belasus 2013). Despite the great effort, the Swedish forces lost the battle due to a disgruntled local pilot who showed the Danes a way through the barrier (Belasus 2013).

Forgotten for a long time, the barrier was rediscovered in 1996, allowing archaeologists to investigate 18th century ship-building techniques (Belasus 2013; Auer 2021).

During both Nord Stream pipeline projects, no suitable passage was found to satisfy distance requirements to any of the wrecks. The only option left was to excavate some of the wrecks, lay the pipeline and afterwards putting the wrecks back (Nord Stream 2008; Belasus 2013; Auer 2021).

The excavations for Nord Stream 2 were conducted by Trident Archäologie and some impressive underwater photogrammetry was collected (Sketchfab 2020a, 2020b). The remains of the ship timber can be seen through the ballast stones, used to sink the ship (Trident 2023). Excavation was done in several phases, starting with removal of all stones that cover the wreck, followed by careful disassembly of the remains of the ship (Trident 2023).

Fugro conducted several more surveys in the area for diverse projects, such as power cables and liquefied natural gas (LNG) pipelines over the years where the initial findings from Nord Stream 1 have repeatedly assisted interpretation.

Final remarks

Discovering wrecks is always an exciting event during survey. Even more so, if the wreck is not listed in any database. Although this is rare, Fugro did discover some over the years. If wrecks are listed, commonly more information is available. However, the primary goal is usually to assess the relevance for the (infrastructure) project and not its historical or archaeological value. But while less interesting for infrastructure companies, wrecks can be of high importance for historians and archaeologists. During some projects archaeological assessments are a requirement that can lead to successful co-operations, for example during Nord Stream 1 (Thadeusz 2010). //

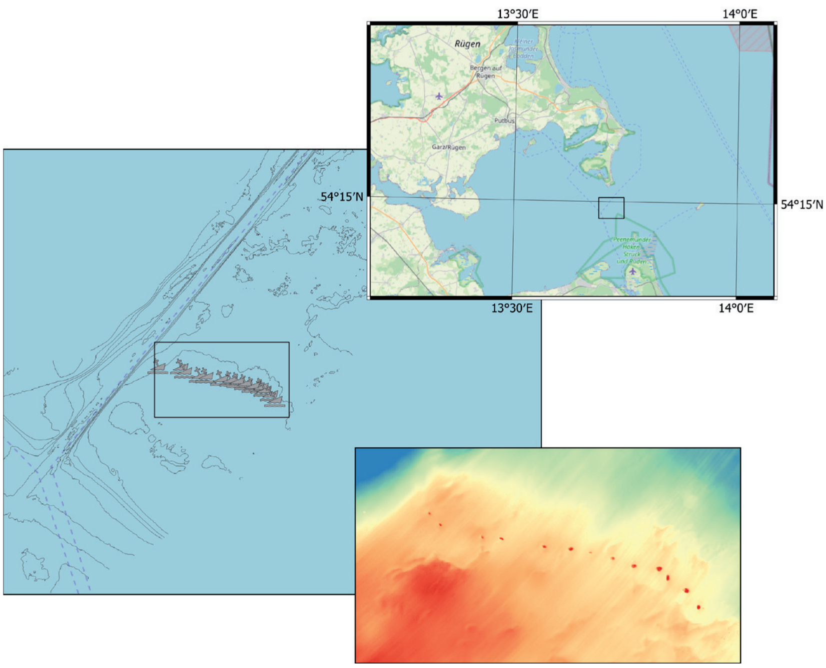


Fig. 5: The Swedish blockade between Rügen and Ruden. Contours are at 1 m interval

Abbildung
Der
See Battaille
Derer
Königl. Dänisch- und Schwedischen Flottillen
Welche im Monat Sept. 1715. zwischen Rüden und Rügen vorgangen, benebst der auff besagter Insul Rügen zwischen den 15. und 16. Nov. geschehenen glücklichen Landung.

Erklärung der Buchstaben.

A. Die Dänische Flottille, welche wegen der auf Rüden liegenden Batterie B. und der Ooster-Tieffe befindlichen Versenckung C. disseits nicht zur Attaque der Schwedischen Schiffe gelangen kunte, deßwegen der Train D. bemeldter Flottille den 18. Sept. Nachts um 12. Uhr bey enrstandenen favorablen Wind, um die Gripswaldische Oie, nach der Wester-Tieffe seegelte, alldar wegen ebenmäßiger Schiff-Versenckung und contrairen Windes biß den 24. sich aretirte, von dannen sich mit der grösten Mühwaltung vermittelst vor ausgeworffener Ancker und Buxirung unter Rügen E. in die Wester-Tieffe gezogen, allwo sie den 25. von denen Schwedischen Schiffen F. um 1. Uhr Nachmittags canoniret, und biß am späten Abend bombardiret worden, denen hingegen die Dänische Prahmen G. (davon der gröste 46. Canons führte, worunter 22. halbe Cartaunen waren) welche den andern Tag als den 26. von Morgen an, biß um Mittag dergestallt auff die Schweden gefeuret, daß selbige genöthiget worden, 5. Schiffe nach Strahlsund zu salviren, die übrigen aber retirirten sich unter der Batterie bey Rüden, da dann die gesamnte Flottille sich in den so genanten Boden durch die Enge der Wester-Tieffe hindurch begeben, und das gantze Fahr-Wasser bey lit. H. H. durchgehends besetzt, daß also hierdurch die Communication von Stralsund und Rüden abgeschnitten, und der Zweck zu einer benöthigten Descente auff Rügen glücklich erhalten worden I. K. welche Landung auch zwischen den 15. und 16. November in der Nacht bey dem Dorffe Strehso folgender Gestalt geschehen: daß der Feind durch unsere Cavallerie welche Mine gemacht, bey Groben zu debarquiren einige Zeit amusiret worden, und da die Infanterie inzwischen nach ersten Ort hingeseegelt, ist der Feind nicht eher daselbst angelanget, als gegen Morgen zwischen 3. und 4. Uhr, da die völlige Infanterie sich bereits postirt und vergraben, auch bereits die Spanischen Reuter vorgesetzet gehabt, ingleichen 6. Esquadrons Preußische und einige Dänische schon am Lande gewesen. Die Schweden ohngefehr 5000. Mann Cavallerie und Infanterie starck unter Anführung ihres Königes sind gleich Anfangs mit grosser Furie auf die Seite allwo die Sächsischen und Dänischen gestanden angefallen, allwo sie auch die Spanischen Reuter übern Hauffen geworffen, und biß ans Retrenchement heran getrungen, da aber diese eine tapffere Gegenwehr gethan, auch mittler Zeit die Preuß. Artillerie unter ihre Cavallerie continuirlich gefeuret und 5. Preuß. Esquadrons auf sie loß gegangen, ist nach einem dreystündigen Gefecht alles bey den Feind in Confusion gerathen und derselbe zur Retirade gezwungen worden. Den Verlust Schwed. Seits rechnet man 600. Tode so auf den Platz blieben, worunter sich der General Bassewitz befindet, ohne Bleßirte und Gefangene, und soll der König von Schweden 2. Blessuren an den lincken Bein bekommen haben, dessen Pferd aber hat man todt vor dem Retrenchement gefunden, 8. Canons und 1. Standart hat man erobert, von unsern Trouppen ist der Obriste von Dörfflingischen Regiment Graf von Truchses blieben. Nach Aussage der Gefangenen haben die Feinde Ordre gehabt, im Fall sie repoußiret würden, sich nach der alten Fähre L. zu retiriren, welches man aber zu verhindern trachten wird. Gleich nach geendeter Action sind schon 150. Deserteurs zu den Unsrigen überkommen, und hat man einen Uberfluß an Fourage und Geträyde auf der Insul gefunden, woraus zu schliessen daß der Feind den Winter über sich zuhalten gemeynet. Mit der Belagerung vor Strahlsund gehets nach Wunsch von statten, da man ein Mittel gefunden, das Wasser aus den Graben so tieff abzuzapffen, daß man in kurtzen die Stadt zur Ubergabe zwingen wird.

Gedruckt 1715. den 23. Novembr.

Fig. 6: Newspaper article from 1715, reporting on the naval battle that took place between Sweden and Denmark

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