SDSS

Project Report

2023

English Version

Versione Italiana

SD2S

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GREETINGS FROM SDSS PRESIDENT

Dear readers,

I am proud and excited to share with you the results of the projects that the Society for the Documentation of Submerged Sites (SDSS) pursued in 2023. Our work tells stories of the sea, of peoples, of wars, of science, and, above all, of passion and dedication.

2023 marked our twenty-third year of projects and expeditions, and the sea continued to surprise us, revealing some of the extraordinary secrets it holds. Exploring it is a privilege so unreal it seems like a dream.

An essential part of our mission is to document what we see and bring it to the surface virtually, making it accessible to all. We believe this knowledge can nurture respect, compassion, and a desire to protect the sea and all of its wonders. Shipwrecks and submerged archaeological sites give us unique opportunities to tell the dramatic and profound stories they represent. In a divided world, these stories can sow seeds of empathy, unity, respect for different perspectives. They aid us in comprehending not only ourselves, but each other - and inspire us to improve .

Not everything we see underwater pleases us; for example, some of the historical and natural sites we visit are covered by lost nets. Every year we find new ones and every year we record the damage they have caused by destroying and uprooting wreck structures or marring the seabed. The day when these sites will be protected as memorials and natural sanctuaries seem distant, but we are convinced that our activities can be the first steps toward this goal.

2023 was an exceptional year for the Society. Thanks to our expertise in photogrammetry, we were able to tackle ambitious goals, accurately modeling large sunken ships, aircraft, and archaeological sites.. The introduction of new equipment allowed us to offer immersive experiences to the public, using virtual reality to bring the underwater world to life at the surface like never before. Furthermore, the campaign on the remarkable site of the Battle of the Egadi Islands led to the discovery of an exceptional collection of artifacts, of great interest to archaeological research, and saw us coordinate and sponsor the creation of a first triage facility for the recovered artifacts at the Museo ex Stabilimento Florio in Favignana.

In addition to the established friendships and fruitful collaborations with the Sicilian Sea Superintendence, the RPM Nautical Foundation, the Municipality of Favignana, the Museo ex Stabilimento Florio, the DPAA, the DAN, and the Ghost Diving e Healthy Seas organizations, other important and promising collaborations have been added, and the SDSS team has been enriched with new members and capabilities.

As we compile this newsletter, a substantial team from SDSS is engaged in completing a website dedicated to the Battle of the Mediterranean Convoys of the Second World War, produced in collaboration with the Museo del Mare ex Arsenale di Palermo, which will be published in a few weeks. Other teams are finalizing the scientific reports of the 2023 campaigns on the site of the Battle of the Egadi Islands and on the submerged site of Punta Gadir, off the coast of the island of Pantelleria, while planning and preparations for the 2024 expedition season are already underway.

We would like to thank everyone who contributed to the success of the SDSS Project in 2023, including our valuable sponsors, donors, partners, volunteers, and collaborators. Your dedication and commitment inspire us to continue working for the safeguarding of our marine heritage and its dissemination to the public.

The journey continues, and we look forward to sharing with you new discoveries and exciting adventures in the coming year. Keep dreaming with us!

With gratitude and determination,,

Mario Arena
President SDSS

The Society for the Documentation of Submerged Sites

EXPLORATION AND DOCUMENTATION OF EXTRAORDINARY SUBMERGED SITES

SDSS is an international non-profit association founded in 1999.
Our mission is the study, research, enhancement, dissemination, and protection of the submerged historical, cultural, biological, and environmental heritage.

Our main activity consists of documenting, using various systems and methodologies, submerged sites such as historical wrecks, archaeological sites, unique underwater habitats and sites of environmental concern, in collaboration with researchers and institutions.

SDSS teams of volunteers include technical divers, documentarians, and explorers capable of operating efficiently and safely beyond the limits normally considered for scientific diving.

In the depth range between 50 and 150 meters beneath the sea surface, SDSS documentation capabilities offer a unique opportunity for scientists and institutions to conduct detailed surveys and other scientific operations in these largely unexplored environments.

2023 PROJECTS

In 2023, SDSS was engaged in projects and missions across various sites in the Mediterranean for over five months.

2023 in numbers

5 Months of expeditions	**81** Days of diving operations	**507** Man-dives
431 Hours of bottom time	**50** Days of decompression	**80** Meters average depth
49 Divers		**11** Nationalities

SDSS SPONSORS and DONATIONS

The SDSS APS is a non-profit organization that is supported through self-financing, sponsorships, public contributions, and donations from companies and individuals who wish to support our projects. Donations to SDSS can be tax-deductible and partially deducted. Even small donations contribute to making our projects, expeditions, and productions possible.
You can contribute to our mission in several ways:

- Purchasing pay-per-view material packages and extra materials of wrecks on the website www.storiasommersa.org.
- Making a free donation through our website by clicking on “donate” - https://www.paypal.com/donate/?hosted_button_id=C9ZJL46HFKSX4 or by contacting us directly.
- Linking your company’s brand to our activities through a sponsorship agreement and sharing our mission. You can contact us by writing to info@sdss.blue.

We look forward to your support.

Sponsors of the 2023 campaigns

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The Wrecks of the Battle of the Convoys

LAMPEDUSA (Sicily)
Historical Period: World War II

Objectives 2023:

- Documentation of wrecks associated with the battle of the Mediterranean convoys located in the area through video, photos, photogrammetry, and 360°-3D video.
- Removal of lost nets..

CAMPAIGN DURATION: 45 days // June - July 2023
CAMPAIGN DIRECTOR: M. Arena
TEAM: LRDG (Long Range Diving Group)
DIVERS: M. Arena, S. Gualtieri, P. Labò, A. Ferrandi, D. Dal Molin, C. De Seta, S. Del Curto, R. Mazza, M. Giaretta, P. Brandt P. Van Erp, B. Oortwijn, D. Remmers, H. Van Oeveren, N. Vardakas
VESSEL COMMANDER AND SURFACE SUPPORT: M. Brischetto


Stella Del Curto

The Battle of the Mediterranean Convoys was fought during the Second World War between the Axis naval and air forces and those of the Commonwealth and Allies, taking place in the Central Mediterranean. The battle lasted for three years and was characterized by the Allies' efforts to disrupt the large flow of convoyed merchant ships escorted by military units carrying supplies between Italy, Libya, and Tunisia to Axis troops engaged in the North African campaign.
A few major battles also arose from the Axis forces' efforts to counter Allied convoys laden with supplies sent periodically to support the resistance and wartime operations in Malta, which was under siege.
Hundreds of ships loaded with war supplies sank during this period; combat and sinkings resulted in the deaths of tens of thousands of men.

Among the objectives of this project is to enhance the exceptional submerged historical heritage and make it accessible to the wider public to promote understanding and protection. The allure of submerged wrecks is also utilized as a means to bring to public memory a part of our recent history and to commemorate the events and thousands of victims from many nation.

The bow of the unidentified ship found in 2023 at 41 meters of depth.

Derk Remmers

Stella Del Curto

Since 2006 SDSS has been conducting annual exploration campaigns in the Central Mediterranean in search of wrecks from the Battle of the Convoys, based on the island of Lampedusa. During the 16 campaigns conducted in this area so far, 41 naval wrecks have been located, 32 of which sank during the battle..

Upon locating a wreck, SDSS divers engage in its exploration and documentation in various forms. This includes assessing its pollutant cargoes and biology, as well as capturing photographs, videos, photogrammetry, and reports on the overall state of preservation of the wreck. They also document the cargo carried, the presence of objects and artifacts of particular historical or symbolic interest, the presence of explosives and hydrocarbons, and the danger of collapses.

The SDSS team includes some excellent underwater photographers who each year strive to bring captivating images of wrecks to the public. The stunning images featured on these pages were captured by photographers Stella Del Curto, Derk Remmers, Kees Beemster Leverenz, Claudio Provenzani, and Stefano Gualtieri.

In the photo above: German half-track artillery tractors of the type Sd. Kfz 11, lined up in one of the cargo holds of the steamship VELOCE.

The 2022 and 2023 campaigns lasted 45 days each, during which various SDSS teams rotated in operations. Both expeditions were based on the island of Lampedusa, from where offshore excursions were launched towards the convoy routes, lasting several days. These excursions were conducted aboard the fishing vessel GIOEL, a sturdy 11-meter wooden fishing boat commanded by Mario Brischetto, one of the most experienced sailors and deep-sea fishermen in the entire Mediterranean and an indispensable guide for excursions in these waters.

The main objective of the operations in these two years was to create photogrammetry and 360°-3D footage of some of the wrecks, and the results obtained were extraordinary. Photogrammetry was completed for the following wrecks:

The steamship **CAFFARO**, of 6,000 tons, was documented with 25,000 photographs. 360°-3D video sequences were also captured inside cargo holds #1 and #2, the only ones currently accessible, documenting their cargo consisting of trucks, cars, and half-tracked vehicles. The difficult access to cargo hold #2 and its surprising contents was discovered during this expedition by one of the exploration teams (D. Dal Molin, A. Ferrandi), who also visited the lower level of cargo hold #1 for the first time, also filled with German military vehicles. The CAFFARO sank on September 12, 1941, after shooting down three of the attacking aircraft, hit by explosive and incendiary bombs that caused the apocalyptic explosion of the 900 tons of explosives it was carrying.

The steamship **ADANA**, of 4,000 tons, was documented with over 17,000 photographs. Similarly, suggestive sequences were recorded with a 360°-3D camera. The ADANA was part of convoy TARIGO, consisting of 5 ships escorted by 3 destroyers, which was surprised on the night of April 14, 1941, and completely destroyed by a force of four British destroyers, resulting in the loss of over 700 men. One of the British destroyer also sank in the fierce battle, where radar once again proved to be a decisive weapon in nighttime combat.

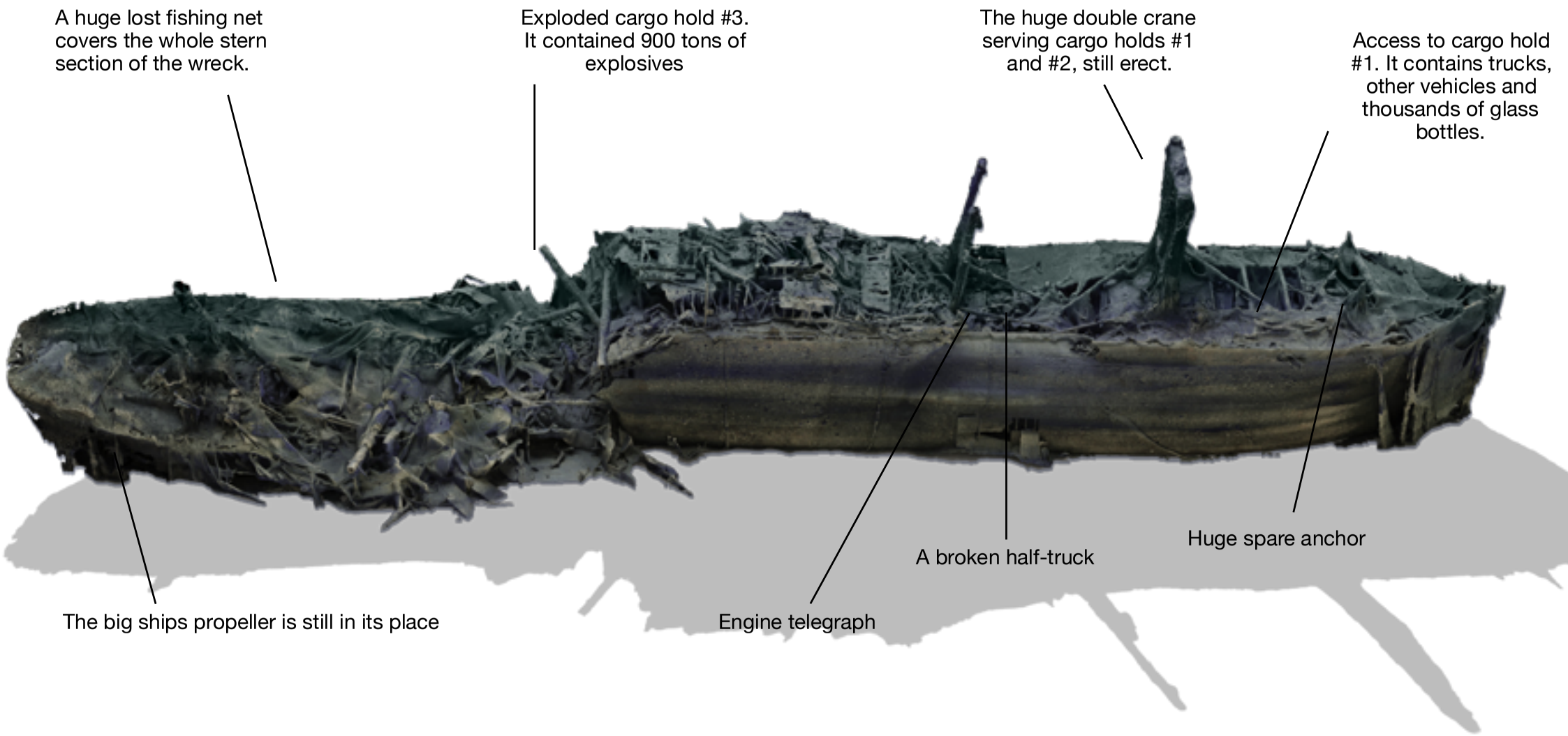
The torpedo ship **LUPO**, of 1,100 tons, was documented with over 11,000 photographs for the creation of its three-dimensional model. The LUPO was caught off guard and sunk within minutes on the night of December 2, 1942, by a force of 4 British destroyers while providing assistance to the survivors of the steamship VELOCE, which was sinking after being hit by torpedo bombers the previous evening. Of the 135 crew members of the LUPO, only 29 survived. The wreck is an Italian Navy war cemetery.

The light bomber **Martin Baltimore No. 699,** from the 69th Squadron of the Royal Air Force, based in Malta, was documented with 3,500 photographs, which, processed with Metashape software, resulted in its three-dimensional model. The aircraft was shot down by a German fighter on June 15, 1942.

The steamship **VELOCE** was a large freighter of 5,500 tons, and completing its model required a whopping 34,000 photographs. The VELOCE was carrying important war supplies at a particularly critical moment in the Desert War when General Rommel's armies were retreating in the desert, pursued by the British 8th Army after the defeat suffered in the great battle of El Alamein. Its holds contain pieces of artillery, dozens of vehicles, half- tracked vehicles, and a number of German tanks. Tens of thousands of photographs of the ship's huge holds were taken in an attempt to create three-dimensional models of the interiors as well. This attempt is still ongoing and will continue in the next campaigns. Meanwhile, the holds and their spectacular cargo have been documented with 360°-3D footage, allowing for virtual dives inside the wreck. The VELOCE is an extraordinary wreck and a war cemetery. 69 people, including the captain, lost their lives in its sinking.

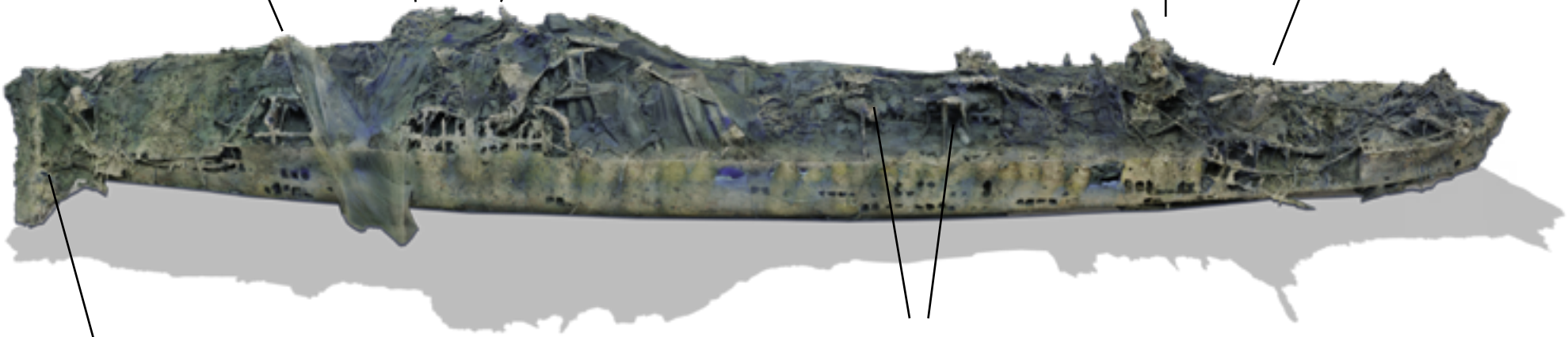
The steamship **EGADI**: was the ship that had been providing postal and passenger service between Sicily and all the islands

pir. CAFFARO


A huge lost fishing net covers the whole stern section of the wreck.
Exploded cargo hold #3. It contained 900 tons of explosives
The huge double crane serving cargo holds #1 and #2, still erect.
Access to cargo hold #1. It contains trucks, other vehicles and thousands of glass bottles.
Huge spare anchor
A broken half-truck
Engine telegraph
The big ships propeller is still in its place

RN LUPO

Italian Royal Navy Torpedo Boat. Silver Medal of Military Valor
Spica class, Airone series. O.L. 81,42. m. W. 7,92 m. Crew: 135
Sunk on December 2, 1942 near Kerkennah shallows, Central Mediterranean



of its southern archipelagos since 1929. It was sunk by torpedo bombers on the night of August 31, 1941, causing the deaths of 44 people, including crew and passengers.
Its spectacular wreck lies at a depth of 76 meters 22 miles off Lampedusa, and creating its model required approximately 11,000 photographs.

The French submarine **NARVAL**: was the first naval unit to establish the Free French Navy after France's surrender in June 1940.
The NARVAL did not return from its third war mission. Its sinking was probably due to a mine strike and perhaps the subsequent explosion of some of its own torpedoes, resulting in the loss of its entire crew of 50 men.
The NARVAL was awarded the Legion of Honor of the French Republic, and its wreck, lying 60 miles off Lampedusa at a depth of 40 meters, is a war cemetery. Photogram-

The cargo holds of the ADANA contain thousands of artillery shells (above) and at least 50 large aircraft bombs, both explosive and high-explosive (below left and right).
Photo: Stella Del Curto

The bow of the SS EGADI in 76 meters of depth.

Photo: Keith Kreitner

metry of the NARVAL was carried out with over 8,000 photographs. Some lost nets were removed from the wreck, and a plaque was placed in memory of the crew.

Two new wrecks were located during the 2022 campaign and one in 2023. These are three merchant ships, at least two of which are laden with war materials, and at the time of this publication, none of the three ships has been identified. **The first to be found** is a small merchant ship of around 1,000 gross tons, broken into two sections, 70 miles west of Lampedusa, on a seabed of 65 meters. It was carrying fuel in barrels, some machinery that we still cannot understand, and hundreds of German metal cans. These cans marked a significant difference in terms of reliability and robustness during the desert war.

The big propeller of the ADANA, at a depth of 62 meters .
Photo: Stella Del Curto

A SDSS team poses before heading out to sea to install the plaque in memory of the fallen crew of the submarine NARVAL. Some nets were removed from the wreck, revealing additional details underneath. The photogrammetry of the NARVAL required about 8,000 photographs.

The second wreck, found about 50 miles west of Lampedusa on a seabed of 120 meters, is a merchant ship of about 2,000 gross tons, with 4 holds and a central superstructure. Its hull is broken on the right side just after the superstructure towards the bow, which, in its final part, ends buried in the sediment of the seabed. Inside its holds, spare parts for airplanes were documented, including at least seven engines that aviation experts identified, based on our footage, as follows:

- 1 x Pratt & Whitney, mod. R-1690, 9-cylinder radial;
- 3 x Junkers, model Jumo 211-12, 12-cylinder inverted V at 60°;
- 2 x Daimler-Benz AG, model DB 601, 12-cylinder inverted V at 60°.

In addition to Italian-made fuel barrels.

The third wreck is that of a merchant ship of about 2,000 gross tons that rests on its right side at a depth of 40 meters, 25 miles southwest of Lampedusa. The wreck is heavily covered with nets, some of which were removed during an action carried out in collaboration with a team from the Ghost Diving foundation, which we report on in more detail in a dedicated section below.

During the 2022 campaign, we hosted a crew sent by the **production company DocLab**, led by the renowned director and underwater cameraman Roberto Rinaldi, who shared our adventures at sea for 10 days to create a trailer that includes spectacular underwater footage. The trailer is intended to gauge the interest of the broadcast market in a production dedicated to the wrecks of the battle of Mediterranean convoys and our

exploration and documentation work.
During the campaigns, several tens of hours of high-definition video and spectacular photographs were also taken, particularly by underwater photographers Stella del Curto, Derk Remmers, Stefano Gualtieri, and Kees Beemster Leverenz.

Photo: Roberto Rinaldi and Mario Arena during a break between dives.

SS. VELOCE

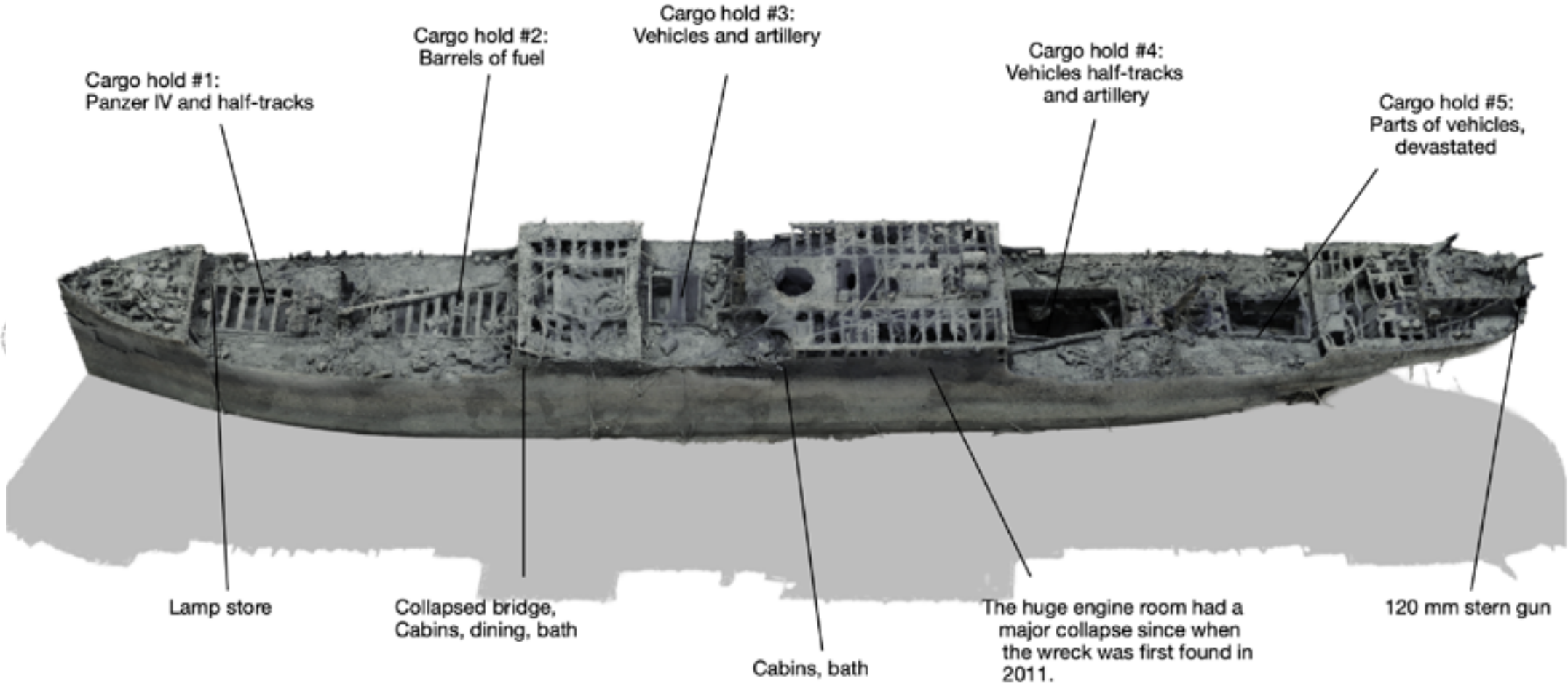


Foto: un'immagine presa dalla fotogrammetria del VELOCE. Il modello tridimensionale sarà disponibile sul sito www.storiasommersa.org. Fotografi: M.Arena, S.Gualtieri, K.B. Leverenz, M. Giaretta, P. Brandt. Elaborazione: S. Gualtieri, K.B. Leverenz, P. Brandt.

During the 2022 and 2023 expeditions, a total of 16 offshore excursions were carried out, each lasting an average of two days, totaling 35 days of diving operations. Over 300 dives were conducted on 14 different wrecks, at depths ranging from 34 to 120 meters. Three new wrecks were discovered, unseen since the day of their sinking. Photogrammetry was performed on five ships, one submarine, and an aircraft, in addition to capturing dozens of hours of high-definition footage and hundreds of artistic photographs.

The SDSS divers who participated in the 2022 and 2023 expeditions were:
M. Arena, S. Gualtieri, P. Labò, C. De Seta, D. Dal Molin, A. Ferrandi, S. Del Curto, R. Mazza, R. Picciol, C. Guidetti, F. De Gado, A. Scaccianoce, P. Brandt, K.B. Leverenz, M. Giaretta, K. Kreitner, E. Salaj.

The spectacular wreck of the Martin Baltimor n°669 of the 69th RAF Squadron based in Malta, in 87 meters of depth in the waters of Linosa Island.

Photo: Stefano Gualtieri

SDSS and Ghost Diving - Healthy Seas

The first two weeks of operations in 2023 on Lampedusa were carried out jointly with a team of divers from the organization Ghost Diving, supported by sister organization Healthy Seas, both foundations committed to cleaning up the ocean and especially recovering lost fishing nets. Our collaboration with both organizations has been ongoing for several years now, with actions to remove nets from wrecks and seabeds, yielding increasingly positive results. During the joint diving operations of SDSS and Ghost Diving in the 2023 campaign, nets were removed from the wrecks of the steamship ADANA, the torpedo ship LUPO, and from a previously unvisited wreck located by the team during one of the offshore excursions.

This wreck is believed to be a merchant ship of about 2,000 tons, lying at a depth of 41 meters on its right side about 25 miles off the coast of Lampedusa. The ship has not yet been identified, but its sinking is believed to date back to World War II and the events of the Battle of the Convoys.

During their long stay on the seabed, lost nets continue to cause unnecessary slaughter of marine life by trapping them and. contribute to marine pollution with their synthetic filaments and plastic parts. Moreover, when a net gets entangled on a wreck, the fishing boat tries to free it by attempting to tear it from the structures it's caught on, pulling with full engine power and in every

A large trawl net recovered during the 2323 operations

direction. This action often leads to the collapse or removal of wreck structures. For example, comparing video documentation filmed. on the wreck of the steamship ADANA several years ago with what was observed and documented in 2023, it was found that the stern cannon of the ship has been removed from its mount and that the superstructure of the bridge is now completely collapsed.Similarly, on the wreck of the torpedo ship LUPO, one of the two torpedo launchers has been completely torn off and is now overturned and partially covered by a net. Both wrecks are important historical heritage sites and war cemeteries.

Pascal van Erp, Founder of Ghost Diving and Deputy Director of Healthy Seas, prepares for a dive to remove a fishing net.

Despite the damage it causes - starting from the excessive catches that increasingly impoverish the sea - fishing is a primary economic activity, vital for the livelihoods of tens of thousands of families in all coastal countries of the Mediterranean.Finding sustainable solutions to mitigate its collateral damage is therefore not simple. Perhaps historic wrecks should be protected with a fishing ban, and their positions made pu-

Below: One of the large nets recovered during the 2023 mission in Lampedusa has finally surfaced. Although a significant portion of the work has been completed, hoisting the net onto the boat is an operation that also presents its challenges.

Photo: Derk Remmers

blic and included in cartography, helping to prevent at least some accidental entanglements. Certainly, awareness- raising actions and ocean clean-up efforts like those undertaken by Ghost Diving and Healthy Seas are important steps towards gaining awareness of the problem.

During this part of the expedition, a team of documentary filmmakers and journalists shot various sequences for the production of a documentary dedicated to the joint activities of Ghost Diving and SDSS in the high seas of the Mediterranean.

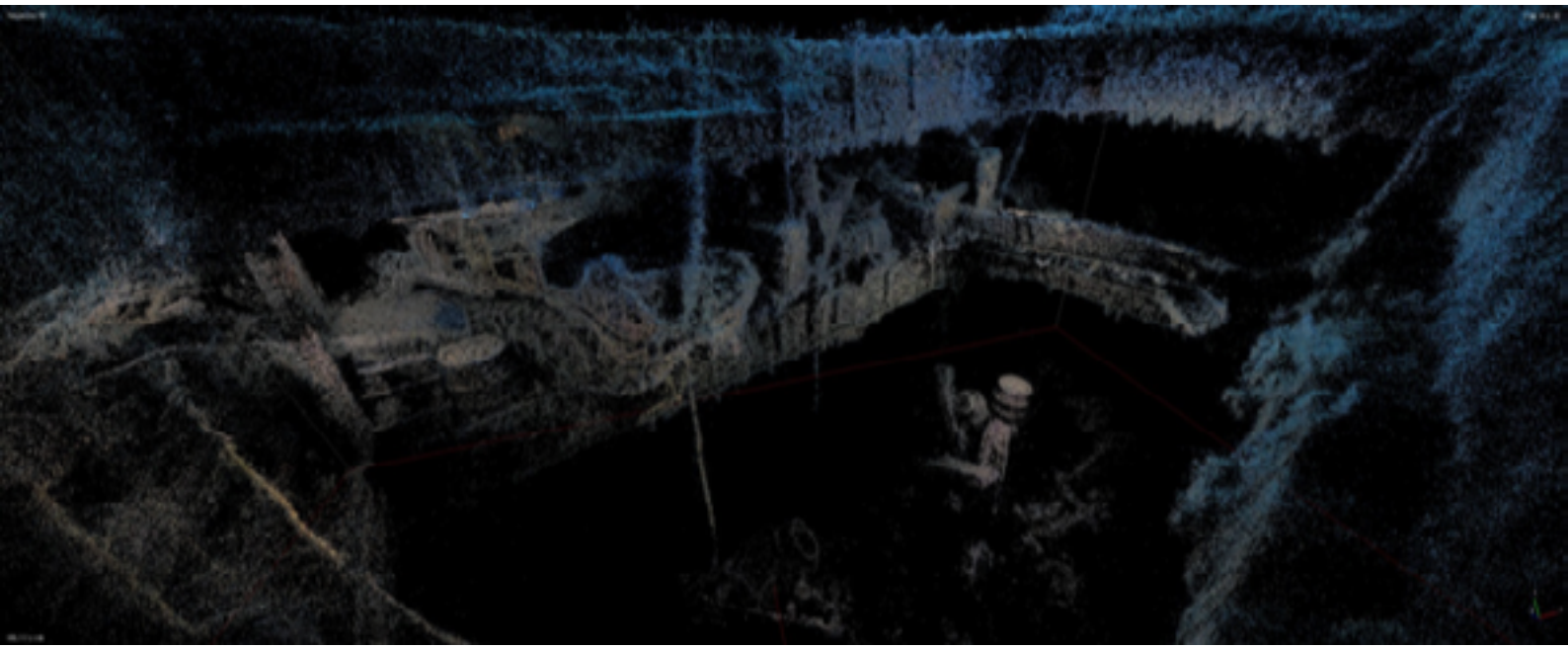
The Ghost Diving team consisted of:
P. van Erp; B. Oortwijn; H. Van Oeveren, D. Remmers, N. Vardakas.

GHOST DIVING
global mission

Below: A large number of lift bags are attached at various points along the lost net and inflated with air. This allows the net to begin its ascent towards the surface, held back only at points where it remains entangled. Divers cut the entanglement points, allowing the net to rise and be recovered.

Photo: Derk Remmers

Underwater Photogrammetry in High-Def



Photogrammetry is a highly attractive and cost- effective technique for documenting and surveying wrecks and archaeological sites. Once a three- dimensional model is obtained, it becomes possible to take various measurements, assess the features and damages incurred in battle or during the time on the seabed, monitor its evolution and transformations over the years, and provide an evocative and effective way to represent the object to the public, appreciating its forms and real condition. However, conducting photogrammetry of large underwater objects, such as a sunken ship or vast seabed areas, presents significant challenges. Underwater, visibility is limited to a few meters, light is absorbed by the water, everything appears with a blue hue, and colors only appear when the object is artificially illuminated with projectors. Consequently, to achieve satisfactory results, the object must be photographed from a very close distance, like one or two meters, necessitating a large number of high-definition photographs to ensure all surfaces are adequately covered. For ships, this translates into thousands or tens of thousands of photographs. If any surface is inadvertently

missed during the photography process, the model may have holes, or the software may fail to process a model, requiring a return to the site to take additional photographs to fill in the missing data. Sometimes this means traveling hundreds of kilometers by car and/or many hours of navigation on the open sea. The amount of data produced then needs to be processed by various software before arriving at the final result, a process that takes several weeks for each model and includes manual steps, often requiring the development and use of customized scripts.

Given these challenges, the attractive prospect of carrying out photogrammetry of large wrecks seemed almost impossible, to the point that several of us were quite skeptical about the feasibility of this endeavor. Encouraging us were notably the results obtained by Professor Timmy Gambin's team at the University of Malta, published on the beautiful website underwatermalta.org, as well as those obtained by the "Presence in the Past" project presented on thethistlegormproject.com.

Encouraged by these works, we decided to give it a serious try and engaged one of the best underwater photogrammetry experts, GUE instructor Kees Beemster Leverenz. During numerous sessions in the winter of 2021, Kees trained 12 SDSS team members in the challenges of underwater photogrammetry, proving himself worthy of his reputation and continuing to provide consultations even after the end of the training. Kees actually became passionate about the project and became a member of the SDSS team, actively participating in various documentation and exploration campaigns and making a significant contribution to solving the processing and rendering issues of the models. Further valuable assistance came from Peter Brandt, an SDSS team diver who has been grappling with the challenges of underwater photogrammetry of large objects for several years and has developed his special shooting system consisting of nine GoPro cameras mounted on a special bracket around an underwater scooter, which is particularly useful in the internal environments of wrecks, as well as scripts and solutions for rendering large objects.

Peter has been participating in SDSS expeditions for years. Several team members then began to seriously pursue this capability, equipping themselves with the necessary equipment and embarking on an equally necessary path of trials, experiments, and errors. Today, the team has six trained and equipped photographers to produce the necessary material for obtaining the models and two powerful PCs dedicated to their processing.

Coordinating the SDSS photogrammetry operations is Stefano Gualtieri, a computer engineer and vice president of the Society. With more than satisfactory results achieved in obtaining photogrammetry of wreck structures, we are now engaged in the challenge of obtaining and representing the modeling of the internal environments of wrecks.

Stefano Gualtieri

Kees Beemster Leverenz

Peter Brandt

Virtually Immersed

Capt. Mario Brischetto, a professional fisherman and our guide in the deep waters of the Central Mediterranean for years, descends underwater for the first time onto one of the wrecks he has been fishing around since he was a child.

Virtually binging to the surface the treasures we find or visit on the seabed and making them available to everyone is a fundamental part of our mission. We aim to do this in the best way possible, and our radar is always on the lookout for new systems and technologies for underwater documentation. We try to equip ourselves as they become available and as soon as we can afford the investment.

This year, we acquired a special camera for 360° stereo recording, namely the Insta Pro, along with its new underwater housing specially designed by one of our supporters and regular suppliers, **EasyDive.**

Stefano Gualtieri took the bull by the horns right away, perfecting the system for its transport underwater, studying the camera and accessory settings, and solving the problems that arose for its use in dynamic dives at high depths. The results are amazing: 360° stereo videos are an exceptional documentation system, capable of offering the viewer immersive experiences, virtually taking them diving on-site to explore the holds of sunken ships or alongside divers engaged in archaeological operations and the robots assisting them, monitoring the progress of the dives. We have recorded several hours of footage, documenting sites of unique charm, such as the holds of VELOCE, ADANA, and CAFFARO with their loads of vintage military vehicles, artillery pieces, bombs, and ammunition, or our excavation

operations on American bombers and archaeological activities on the Egadi battle site.

We have also tested the effect of these videos by putting the headset on a large number of people, both divers and non-divers, including archaeologists, fishermen, mayors and councilors, cleaning staff, journalists, bartenders, plumbers, professors, retirees, students, restorers, maintenance workers, commanders, models, doctors, and nurses. The comments always start with a *WOW!* before continuing with expressions of joy, excitement, and disbelief. More than encouraging!
Technically, we cannot yet say that we have reached the finishing line. We need to find the right collaborations for aspects such as post-production and video editing and refine some aspects of shooting, such as lighting strategies for scenes in different situations. However, we are more than motivated to continue learning and perfecting this amazing documentation system. As cumbersome as it is - the camera remains attached to a pole about two meters long that must be wielded through holds, corridors, and ghost nets. This magic lantern is now an integral part of our diving arsenal.

storiasommersa.org

Many of the materials produced during the most recent documentation campaigns of shipwrecks in the Central Mediterranean will be published on a website specifically dedicated to the wrecks of the Battle of the Mediterranean Convoys, www.storiasommersa.org, created by SDSS in collaboration with the Museum of the Sea in Palermo and the Superintendent of the Sea of the Sicilian Region. The website is also funded by the Ministry of Culture through the European financing program "Culture and Development" ERDF 2014-2020.

storiasommersa.org will be available online starting from May 2024 with the publication of material related to a first group of seven wrecks. Much of the published material will be freely accessible, but through the website, it will also be possible to support our project of documenting the wrecks of the Battle of the Convoys through donations or by purchasing "reserved" materials such as photogrammetric models and full dive videos available in the "store" section of the website.

SDSS is a non-profit organization, and all proceeds from the website will be exclusively used to continue the project!

The website will continue to be updated and enriched with materials produced in upcoming campaigns, starting from the one planned for the summer of 2024, where we plan to create photogrammetry and other documentary materials on new wrecks.

Support the project!

Above: Peter Brandt in action with his special system for the photogrammetry of internal environments. The system is based on nine action cameras and eight video lights assembled with a custom mount around a scooter.
Photo: Keith Kreitner

Below: German Opel Blitz 3-tons trucks lined up inside a cargo hold of the SS CAFFARO.
Photo: Derk Remmers.

Above: SDSS explorer Keith Kreitner launches a drone from the boat to document the life on the high seas of the Central Mediterranean.

Below: “Encounters on the high seas: our GIOEL approaches four Tunisian shrimp fishing boats to negotiate the purchase of a special dinner.”

SDSS divers explore a cargo hold of the unidentified wreck at a depth of 120 meters .

Photo: Kees Beemster Leverenz

Above: Excursions along convoy routes typically involve three nights at sea or in open water. Given the confined spaces of the GIOEL, divers sleep in sleeping bags under the stars. But you wouldn't believe those stars!

Below: A striking image of the wreck located at a depth of 120 meters. Its identification has not yet been made: identifying a wreck is not always simple and often requires dedicated efforts and ... time. However, it is an Italian or German ship sunk during the convoy battles.

Battle of the Egadi Survey 2023

EGADI Islands (Sicily)

Historical period: 1st Punic War - 3rd century BC

Objectives for 2023:

- Archaeological investigation of the area surrounding ram number 23
- Support for RPM - RV HERCULES operations

CAMPAIGN DURATION: 30 days // August 2023
AVERAGE DEPTH: 85 meters
TEAM: "The 4 Cats" - Operation Director: M. Arena
DIVERS: M. Arena, S. Gualtieri, C. Rosa, C. De Seta, L. Marroni
SURFACE VESSEL AND SUPPORT: N. Crespi (Captain), B. Oortwijn, M. Popesso, J. Vernet
SCIENTIFIC TEAM: J. Vernet, M. Davis
SCIENTIFIC DIRECTION: Sicilian Sea Superintendence: F. Maurici, R. La Rocca

The Battle of the Aegates was fought on March 10, 241 BC, between the naval fleets of **Rome and Carthage.** Over **500 ships and 100,000 warriors** clashed off the coast of the island of Levanzo in what is remembered as one of the largest and most violent naval battles in history. The decisive Roman victory forced the Carthaginians to surrender and brought an end to the First Punic War after 23 years of fierce fighting.

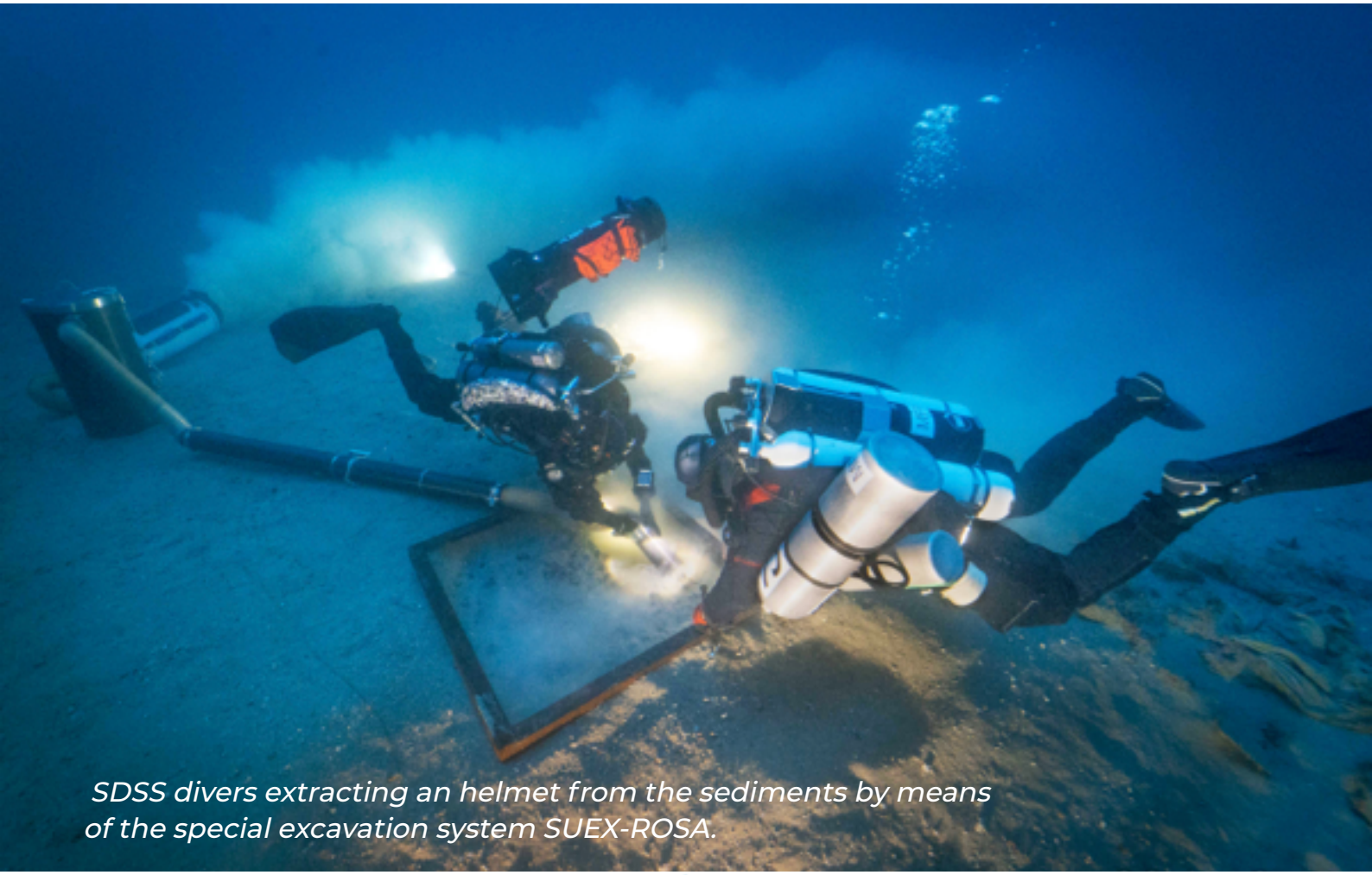
The archaeological site of the Battle of the Aegates, the vast field of relics and debris it generated, was discovered in 2010 by the **RPM Nautical Foundation** after three years of research conducted with electronic equipment aboard the research vessel HERCULES, thanks to the studies and insights of the renowned Sicilian archaeologist Sebastiano Tusa, who tragically passed away in 2019 and was then the director of the research project. It is the only ancient naval battlefield that has been found to date, one of the most important and significant archaeological sites discovered in this millennium, and it is yielding a large body of artifacts of enormous interest to archaeology. For seven years, the SDSS has been participating in archaeological investigations at the site of the battle with its teams of technical divers who descend daily to the seabed of the site to carry out a variety of archaeological operations during month-long annual campaigns.

Photos above and below: Two images of ram number 23 as found on the seabed of the battle. Photo by S. Gualtieri.

The 2023 campaign extended throughout the month of August. Once again, operations were conducted in collaboration with the **RPM Nautical Foundation** and the research vessel **RV HERCULES**, under the coordination and scientific direction of the **Superintendent of the Sea of the Region of Sicily.**

The operational base for the SDSS diving team was set up in some premises within the magnificent complex of the Museo ex Stabilimento Florio "la Tonnara", on the island of Favignana. Within the complex, facilities were arranged for blending and charging breathing mixtures, storing cylinders and equipment, planning operations, processing data, setting up a photographic laboratory, recharging electronic equipment, and a field kitchen, while the boat used by the divers, a 10.20-meter inflatable boat, was housed in the marina of the complex.

Most of the diving operations in 2023 focused on the concentration of artifacts conventionally referred to as **"Area 23"** as it was found near warship ram #23. This concentration of artifacts is likely the imprint, or what remains after over 2200 years, of a ship sunken during the battle and is the third area of this type identified by SDSS divers in the vast battlefield, following the areas conventionally named "Professor Line Area (PLA)" investigated between 2019 and 2020 and "Helmet Square Area (HSA)" investigated in 2021-2022. Area 23 is located at a depth of 85 meters, in open sea, a few miles off the island of Levanzo.
The first findings in this area date back to the last dives of the 2022 campaign when, inspecting the area surrounding war ram 23 in preparation for its recovery, divers began to detect numerous signals of the presence of metallic objects buried under the sediment of the seabed.



SDSS divers extracting an helmet from the sediments by means of the special excavation system SUEX-ROSA.

Already in 2022 numerous artifacts were recovered from this area, including 19 bronze coins, eight silver coins, two almost intact helmets, some bronze cheek pieces, and other objects.
The 2023 operations began with the preparation of a grid on the seabed measuring 40 x 40 meters, divided into 100 sectors of 4 x 4 meters each, to cover the concentration area of artifacts. The survey grid was built to facilitate the systematic inspection of the area, the recording of the positions of the artifacts, and the creation of photogrammetry. The grid was constructed using nylon lines secured to metal stakes driven into the seabed at measured intervals, and each of the 100 sectors was marked with a plastic plaque bearing an alphanumeric identifier, from A1 to M 10 (the letters "J," "K," and "I" were not used).

Three green metal poles, each one meter long, named J, T, and G, were then installed on the seabed at convenient points within the grid. The position of each of the three poles was determined through triangulation with the other two poles and with warship ram #23, whose geographic coordinates were recorded by the USBL installed on the HERCULES vessel's ROV. J, T, and G were then used as reference points to determine the positions of each of the artifacts found in the area.

During various dives, the divers systematically inspected 82 of the 100 sectors using a metal detector, identifying metallic artifacts and tagging them with identification tags. The artifacts were then unearthed by hand or with the portable excavator SUEX-ROSA, and their position was recorded using measuring tape and compass relative to one or more of the reference points J, T, and G. Photogrammetry of the area was carried out using two Sony alpha 7 III cameras, totaling 15,000 photographs in five dedicated dives. For reasons that we still do not understand, one of the sets of photographs cannot be aligned by the software used for photogrammetry (Metashape Pro), and at the moment, the model represents only 72 of the 100 squares. The work will need to be completed in the next campaign.

Area 23 has yielded an important body of over 200 artifacts, including 27 cheek pieces, 138 copper alloy coins of various types, eight silver coins, 13 helmets, a sword, and some spearheads in the form of iron concretions. For the first time, objects such as the buckle of a breastplate, parts of a bronze vessel, remains of a copper alloy brazier, and a set of shipboard tools have been found and are currently being studied by archaeologists.
Meanwhile, the team from the RPM Nautical Foundation has inspected dozens of targets identified by the side-scan sonar mounted on the AUV in the area of the battlefield debris field of the Battle of the Aegates, leading to the discovery of two additional bronze naval rams: ram #26 during the summer of 2022, and ram #27 during the 2023 campaign. On a day of coordinated operations, SDSS divers harnessed the two rams to allow the Hercules vessel to recover them on the surface. After recovery, on a day dedicated to meeting with local authorities, the media, and the museum's audience, the two rams were brought ashore to the desalination center set up by SDSS at the Museum Ex- Stabilimento Florio.

Photos in the following two pages:

Stages of preparation: *SDSS divers Cristiano Rosa and Ben Oortwijn transfer the survey data onto the field map of Area23.*

Following page: SDSS divers Caterina De Seta and Stefano Gualtieri spool pre-measured ropes onto reels for the construction of the survey grid.

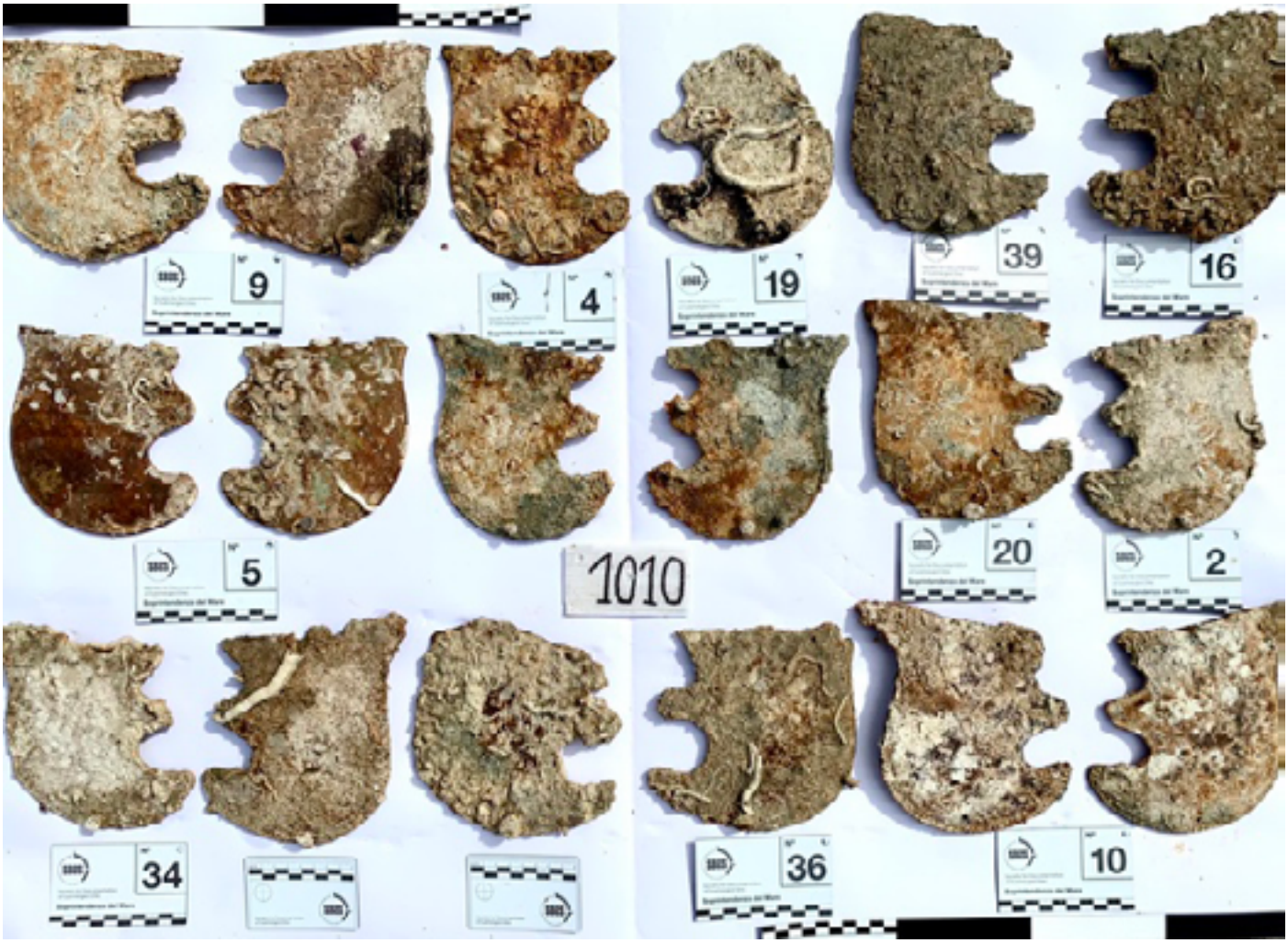

SD2S
BATTLE OF EGADI 2023
10 9 8 7 6 5 4 3 2
E
D
C
B
A
#23

Helmets

On the battlefield debris field of the Battle of the Aegates, around 50 helmets have been found to date in various states of preservation, ranging from intact helmets (about 15% of the artifacts) to only the preserved lower circumference (about 20% of the artifacts). The helmets are all variants of the “Montefortino” type, made of copper alloy and characterized by a semi-spherical or conical dome, a pinecone knob at the apex, and a rear neck guard that protrudes perpendicular or inclined to the dome. The helmets were decorated with features such as a cord with a rope motif and various types of engraved motifs or lines on the lower part of the dome. A number of bronze decorations applied to the top knob of the helmet have also been found, which, in addition to embellishing the object, were probably used to attach a mane or other decorations. Two cheek pieces were attached to the helmet using hinges of different styles and craftsmanship, as well as

Top photo: One of the Montefortino helmets found in Area23.

Photo below: Laura Marroni after a dive at the helm of the boat. Photo: Elke Riedl



Above: The collection of cheek guards gathered from Helmet Square Area.

Beside: A Montefortino helmet just recovered from Area23.

Photo Elke Riedl

supports for the retention buckles. The Montefortino helmet is presumed to have been used by all the armies that took part in the battle, namely the Romans, Carthaginians, and allies on both sides, and in some cases, they bear engraved letters or symbols that probably identified the owner. The discovery of these artifacts in a unique context and with a certain date offers archaeologists a unique opportunity for a better understanding of the types of helmets and their construction characteristics.

Coins

To date, 138 coins have been found in Area 23, sometimes isolated, sometimes in groups of 3, 4, 5, and up to 39 coins in the same spot. The origin of the coins found sheds light on the international nature of the First Punic War and on a connected and open Mediterranean: in fact, although the majority of the coins found are Carthaginian, the collection includes coins from various places in the Mediterranean, including a number of large Roman, Syracusan, Egyptian, and coins from the cities of Velia and Neapolis. Whether the coins were the assets of soldiers or sailors from opposing sides who fell on the same ship while fighting each other, or the booty collected by soldiers before their fate was sealed, or something else entirely, can only be a matter of speculation.

The collection also offers a window into the social and economic history of the time: during the First Punic War, the Roman Republic used heavy bronze coins whose value literally corresponded to the weight of the bronze they were made of, while at the same time other societies such as Carthage and the Greek cities produced artistic coins, struck on a die, and represented a value, rather than having an intrinsic one. The coins, like the majority of artifacts from the battlefield, have yet to undergo in-depth study by archaeologists.

From the top:
Silver coin from Velia;
Silver coin from Neapolis;
Bronze coin from Carthage

Below: Roman bronze Quadrans and Triens

Weapons

As in other concentration areas of artifacts investigated previously, a number of weapons have been found, including swords, spearheads, and arrowheads. These weapons were made of iron which, over centuries of immersion, has completely decomposed, transforming into a concretion that preserves the imprint of the original object inside. These concretions must therefore undergo diagnostic investigations such as tomography or X-rays to obtain an image of the original object.

Next to: SDSS diver Cristiano Rosa admires a broadsword recovered from Area23.

Bottom left: Spearheads appear under X-ray.

Bottom right: A sword undergoes axial tomography. An ideal but challenging diagnosis to obtain.

The experimental artifacts stabilization laboratory and the conference

On land, the activities for conserving the recovered artifacts continued through their storage in static freshwater baths. This process, carried out by the scientific members of SDSS, is a preliminary step for the atmospheric stabilization of the objects and will enable the desalination and conservation treatments by the restorers of the Soprintendenza del Mare della Regione Sicilia.

During the campaign, SDSS also curated and sponsored the setup of an experimental post- excavation laboratory, open to the museum's public and active for the duration of the research campaign. The initiative was overseen by SDSS archaeometrist Justine Vernet and Professor Emeritus Eugenio Caponnetti, involving a team of restorers who conducted activities such as removing marine encrustations and cleaning some artifacts. Visitors at the Ex-Stabilimento Florio had the opportunity to observe and learn about the recently recovered artifacts and

Above: Justine Vernet and Mark Davis cataloging a group of newly recovered coins.

Below: The field laboratory and SDSS volunteer restorers.

the treatments they undergo immediately after recovery, following thousands of years on the seabed. This innovative format commenced with a public opening conference where archaeologists and conservators discussed the developments in archaeological research at the Battle of the Egadi site and in Sicilian territory, along with the challenges related to the stabilization, restoration, and conservation of ancient artifacts from the sea.

Beside: Professor William Murrey, one of the world's leading experts on ancient warships, documents the recently recovered rostrum #26.

Below: Justine Vernet late in the evening and after a day at sea, still hard at work cataloging a newly recovered helmet.

Members of the “4 Gatti” SDSS team in the 2023 campaign of investigations on the site of the Battle of the Egadi: J. Vernet, S. Gualtieri, L. Marroni, C. Rosa, C. De Seta, N. Crespi, M. Arena.

SDSS diver and boat Captain Niccolò Crespi

Above: SDSS Diver Caterina De Seta operates the filling station at our facility in Favignana.

Below: Soprintendente del Mare and SDSS friend prof. Ferdinando Maurici enjoys a day at sea with us every time his challenging agenda allows.

Press Review

The Battle of the Egadi on Ansa.it

The Battle of the Egadi on Regione Sicilia website

The Battle of the Egadi on LaTr3

The Battle of the Egadi on ilSicilia.it

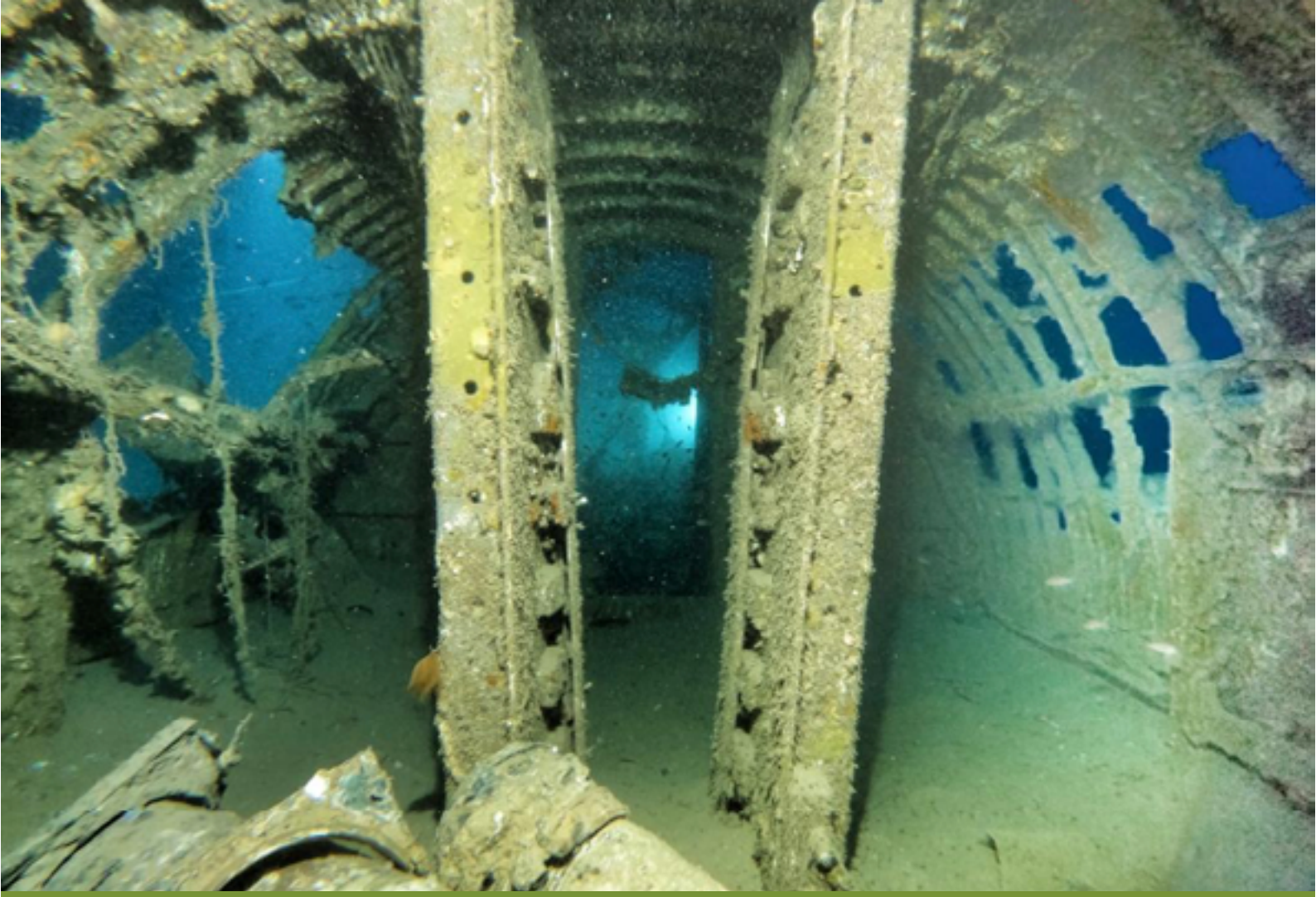
The Battle of the Egadi on Heritage Daily

The Battle of the Egadi on Arkeonews

The Battle of the Egadi on Suex

The Battle of the Egadi on Ilmoderatore

Below: SDSS divers M. Arena, C. De Seta and S. Gualtieri walking back to the base at the museum after a long day at sea. The intense daily routine continues with disassembling and then preparing the equipment for the next day, offloading the collected data, and planning activities for the following day of diving at the site.



Investigative activities conducted by the SDSS in partnership with the US Defense POW/MIA Accounting Agency (DPAA)

Sicilian Coast
Historical Period: World War II

Objectives 2023:

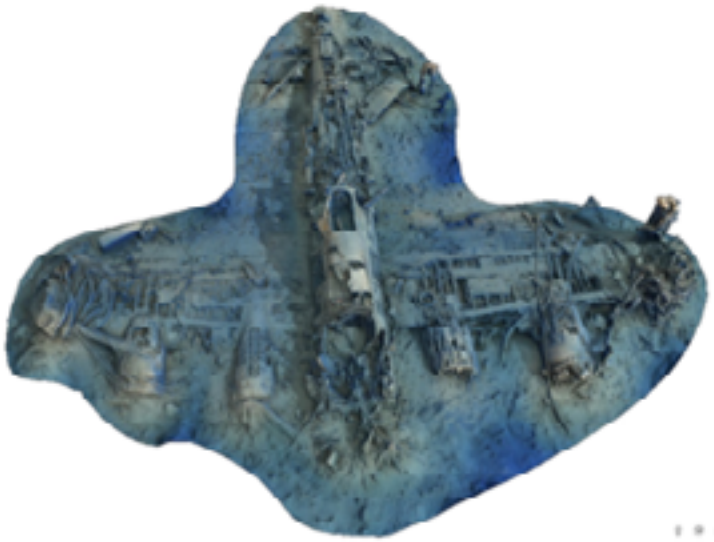
- Investigation of the wreck of a sunken B17

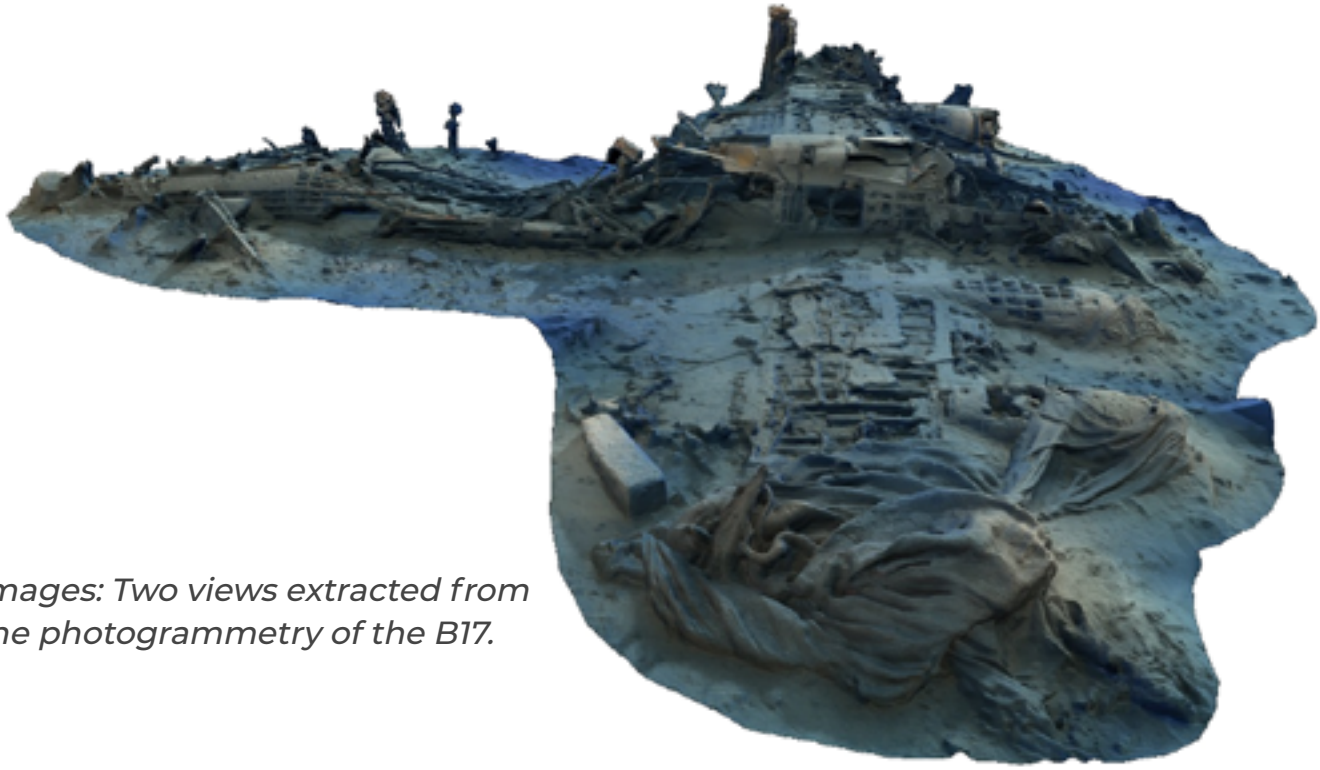
CAMPAIGN DURATION: 21 days // September 2023
AVERAGE DEPTH: 76 meters
TEAM: "The Family" - Operation Director: M. Arena
DIVERS: M. Arena, S. Gualtieri, C. Rosa, N. Crespi, C. De Seta, F. Portella, G. Lieu, F. Khalaf
SURFACE VESSEL AND SUPPORT: M. Popesso, M. Piazza, A. Zille
IN PARTNERSHIP WITH RPM-RV HERCULES: J. Goold
SCIENTIFIC TEAM: D. Ruff, R. Hendren, A. Mazza
IN COLLABORATION WITH Soprintendenza del Mare Regione Sicilia: F. Maurici, C. Di Franco

The SDSS participated in two projects in collaboration with the Defense POW/MIA Accounting Agency (DPAA) and the M. Jackson Foundation for the Advancement of Military Medicine, Inc. (HJF) of the United States Department of Defense. The two projects involved the investigation of two aircraft shot down during World War II in the Mediterranean Sea. The purpose of these missions was to verify the presence of remains of the crew members of the two aircraft lost in action, and the results are currently under evaluation by DPAA personnel.

The first site was the wreckage of a B-17 bomber shot down in 1943 lying at a depth of 76 meters off the coast of Sicily. The operation lasted for three weeks in September and was conducted in collaboration with the RPM Nautical Foundation, represented by the research vessel RV HERCULES, and the Soprintendenza del Mare of the Sicilian Region. SDSS divers conducted a total of 101 dives at the site to carry out the operations.

The SDSS team consisted of:
Divers: M. Arena, S. Gualtieri, N. Crespi, C. Rosa, C. De Seta, F. Portella, G. Lieu, F. Khalaf.
Support and safety: M. Popesso, M. Piazza, A. Zille.





Images: Two views extracted from the photogrammetry of the B17.

Vis Island - Croatia
Historical Period: World War II

Objectives 2023:

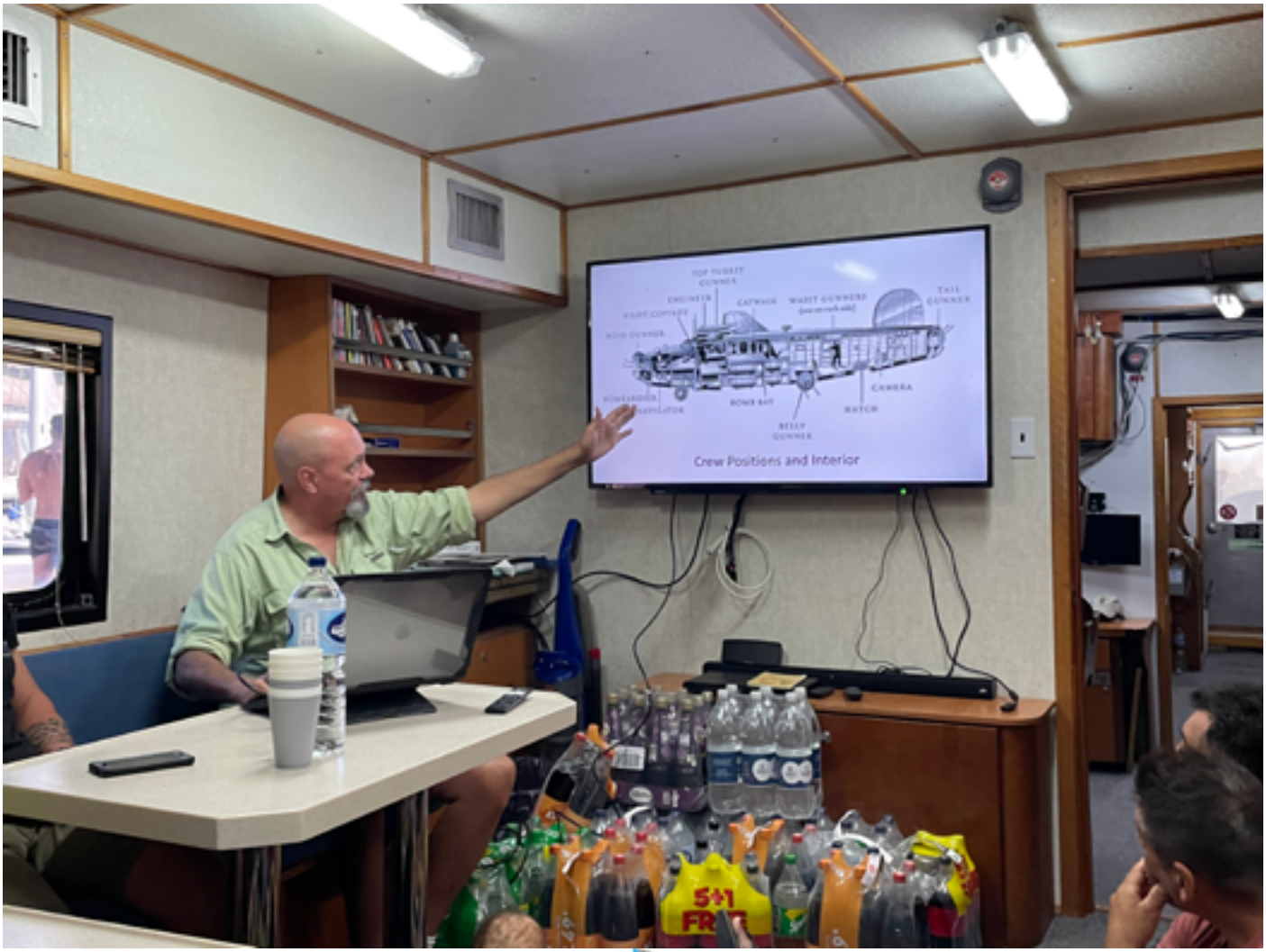
- Investigation of the wreck of a sunken B24

CAMPAIGN DURATION: 21 days // October 2023
AVERAGE DEPTH: 91 metri
TEAM: “La famiglia” - Operation Director: M. Arena
DIVERS: M. Arena, S. Gualtieri, N. Crespi, F. Portella, G. Lieu, F. Khalaf, A. Farnesi, F. De Gado, G. Blackmore, J. Hui, P. Labò.
SURFACE VESSEL AND SUPPORT: A. Mrakovic, D.C,. Manta Diving - Komisa
IN PARTNERSHIP WITH RPM-RV HERCULES: J. Goold
SCIENTIFIC TEAM: R. Hendren, K. Lent.
IN COLLABORATION WITH: Department of Archeology University Split: T. Katunaric

A second mission of the same type took place in October in the waters of the Island of Vis, Croatia, on the wreckage of a B-24 bomber ditched and sunk in 1944. The three-week mission was conducted in collaboration with the RPM Nautical Foundation and the Department of Archaeology at the University of Split. SDSS divers conducted a variety of investigations at the site during 132 dives on the wreck at a depth of 91 meters.
Divers: M. Arena, S. Gualtieri, N. Crespi, F. Portella, G. Lieu, F. Khalaf, A. Farnesi, F. De Gado, G. Blackmore, J. Hui, P. Labò.

Above: Image from the photogrammetry of the B-24.

Below: Archaeologist Richard Hendren instructs the team of divers at the beginning of operations aboard the HERCULES.



“The Family” SDSS after a dive on the B17 off the Sicilian coast.

SDSS divers F. Portella and A. Farnesi prepare for a dive to 91 meters on the B24 wreck.

Submarine Amm. Millo - P.ta Stilo - Calabria - Italy
Historical Period: World War II

Goals 2023:

- Photogrammetry of the wreck

CAMPAIGN DURATION: 3 days // May and December 2023
AVERAGE DEPTH: 72 meters
DIVERS: M. Arena, S. Gualtieri, P. Labò, F. De Gado, M. Giaretta, L. Marroni
BOAT AND SURFACE SUPPORT: Diving Center Megale Hellas, Roccella Jonica

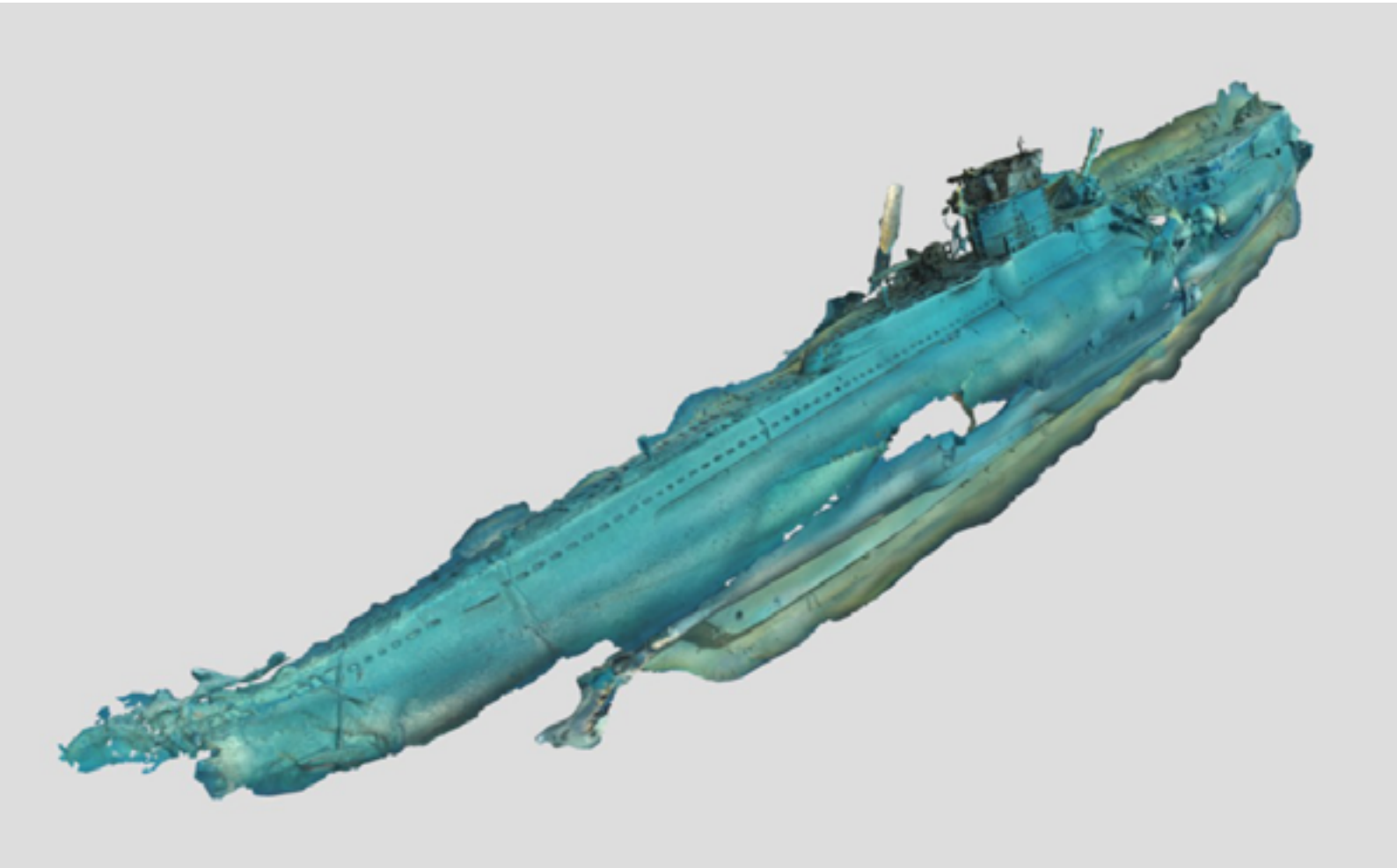
The AMMIRAGLIO MILLO was a large oceanic submarine of the Ammiragli class of the Italian Royal Navy. It was 88 meters long, eight meters wide, armed with 14 torpedo tubes (eight at the bow and six at the stern), two 100 mm cannons, and four 13.2 mm machine guns. Launched in August 1940, after the war had already begun, due to its large size, it was initially used in four missions to transport urgent supplies to Libya.
On March 14, 1942, while returning to Taranto from an ambush mission in the waters south of Malta, the Millo was hit by two of the four torpedoes launched at it by the British submarine ULTIMATUM and sank, taking with it 56 men from its crew, including the commander. There were 15 survivors. Its wreck was found by the Calabrian diver Paolo Palladino lying on its right side at a depth of 72 meters off Punta Stilo.
Due to its role in transporting urgent supplies to Libya, used together with other submarines in particularly critical phases of the convoy battle, when British pressure was such as to almost completely prevent the passage of surface ships, we decided to document it with photogrammetry and to include its history on the website **storiasommersa.org**, dedicated to the wrecks of the Mediterranean convoy battle. It is in this perspective

that a short two-day mission was organized in May 2023, with the participation of five photographers from the SDSS. The wreck of MILLO proved to be difficult to document due to both the very poor visibility that often characterizes the site, and the position of the wreck, tilted over 45° on its left side, which hides and makes it difficult to photograph part of its hull. The approximately 15,000 photos taken during the mission, to which another 3,500 photos taken during a subsequent dive in December 2023 were added, have proven to be still insufficient to fully cover the wreck and to create its three-dimensional model. However, we plan to return to the site in 2024 to complete the documentation of this important and evocative wreck.

The wreck of the submarine MILLO is a war cemetery of the Italian Navy.

Opening photo: The team of photographers from the May '23 mission: P. Labò, M. Giaretta, F. De Gado, S. Gualtieri, M. Arena.

Below: Partial photogrammetry of the wreck.



SDSS and DAN EUROPE RESEARCH

Diving Physiology
Historical Period: XXI century

Goals 2023:

- Collecting physiological parameters before and after deep dives

CAMPAIGN DURATION: 16 days // September and October 2023
AVERAGE DEPTH: 83 meters
OPERATIONAL SUPPORT: RV HERCULES - RPM Nautical Foundation
DIVERS: Various SDSS teams totaling 18 divers
DAN FIELD SCIENTIFIC TEAM: Massimiliano Pieri, Riccardo Pelliccia

Our collaboration with the DAN Europe Research Foundation has been ongoing for many years with increasingly ambitious projects in the field of underwater physiology. DAN Europe is one of the few organizations today capable of investing resources in research on the physiology of underwater immersion, and our dedicated team of divers, our exploration and documentation projects, and the particular exposure and decompression profiles that often characterize them offer an important opportunity for research in this field. It is within this established framework that in September and October 2023, a team of researchers from DAN Europe, led by Massimo Pieri, followed our projects in Sicily and Croatia to collect data and physiological parameters before and after our dives as part of an important study conducted in collaboration with other researchers and scientific institutions, which seeks to further explore the relationship between cardiac physiological data and venous gas bubbles produced following a dive.

During the 2022-2023 seasons, SDSS activities enabled the collection of physiological data from 98 deep rebreather dives on multiple days of consecutive dives. Data was collected from 22 dives at 76 meters in

Above: SDSS divers A. Farnesi, N. Crespi e P. Labò completed the pre-dive checks are ready to jump in the water.

Below: SDSS divers during the monitoring of physiological parameters after a dive.

2022 and 26 dives at 76 meters and 50 dives at 91 meters in 2023. Monitoring included electrocardiogram, heart rate, respiratory rate, body position in space, precordial Doppler, and four-chamber cardiac ultrasound. A total of:

- 24 hours of electrocardiogram with heart and respiratory rate;
- 124 precordial Doppler measurements;
- 130 cardiac ultrasounds;
- Two hours of heart rate, respiratory rate, and R to R time.

Additional data collection is planned for the 2024 season, while research publication is expected in 2025.

Project BCTHubs Link

https://bcthubs.eu/

Dan Europe Research Link
https://www.daneurope.org/en/diving-medical-research

Above: Max Pieri, head of field-research at DAN Europe, performs an echocardiogram on an SDSS diver after a dive.

Below: After a long dive, C. Rosa wears a bioT-shirt for monitoring physiological parameters aboard the HERCULES.

Pantelleria Survey 2023
Punta GADIR

PANTELLERIA Island (Sicily)
Historical Period: III century B.C.

Goals 2023:

- Archaeological Documentation of the Scattering of Amphorae in front of Punta Gadir

CAMPAIGN DURATION: 6 days // October 2023
AVERAGE DEPTH: 100 meters
TEAM: "BBX" - Operation Director: C. Provenzani
DIVERS: C. Provenzani, E. Romano, A. D'Ambrosi, M. Sabatini, S. Carletti, M. Adami, G. Cireddu
SURFACE SUPPORT: E. Famularo, M. Buonomo - Diving Center X, Pantelleria
Scientific Supervision: S. Emma
SCIENTIFIC DIRECTION: Regional Sicilian Sea Authority: F. Maurici, R. La Rocca, S. Emma

PANTELLERIA - Gadir

2,200 years ago, during the First Punic War period, the island of Pantelleria was the stage for events that are not mentioned in any historical source that has reached us. However, the seabeds around the island are revealing important clues from that distant past. Since 2001, four archaeological sites have been discovered on the seabed between the coves of Gadir and Tramontana, a stretch of sea just over a mile long. The four sites are characterized by Carthaginian amphorae of the same types and from the same period, including numerous specimens of the Ramon Torres 5.3.1 type, a rather rare amphora produced within a restricted time frame corresponding to the First Punic War period. Some archaeologists hypothesize that these amphorae were intended for transporting supplies for the troops. In one of the sites, in 2011, a hoard composed of about 4,000 Carthaginian bronze coins was found, all of the same type (except one), depicting a female head on one side and a horse protome on the other. The fact that there is a significant quantity of coins all of the same type leads archaeologists to believe that they were intended for "institutional payment" rather than for commerce. The type of artifacts, along with other elements, leads archaeologists to consider the hypothesis that what was found in this stretch of coast may constitute the remains of a Carthaginian convoy intercepted and destroyed while transporting military supplies for troops in Sicily and coins intended for the payment of soldiers and mercenaries. How fascinating!

It is interesting to note that SDSS divers are also finding numerous coins of the same type at the site of the Battle of the Egadi Islands.

> *"The sturdy torpedo shaped Carthaginian amphorae of the Ramon Torres 5.3.1.2 type were commonly produced in numerous centers under the Carthaginian control, production which took place for a short period of time corresponding to that of the First Punic War, 264-241 BC. It is suggestive to link the production of these capacious amphora with the urgent need to supply the troops engaged in overseas war operations. Up to date the content they carried is unknown.*
>
> Babette Betchold, archaeologist.

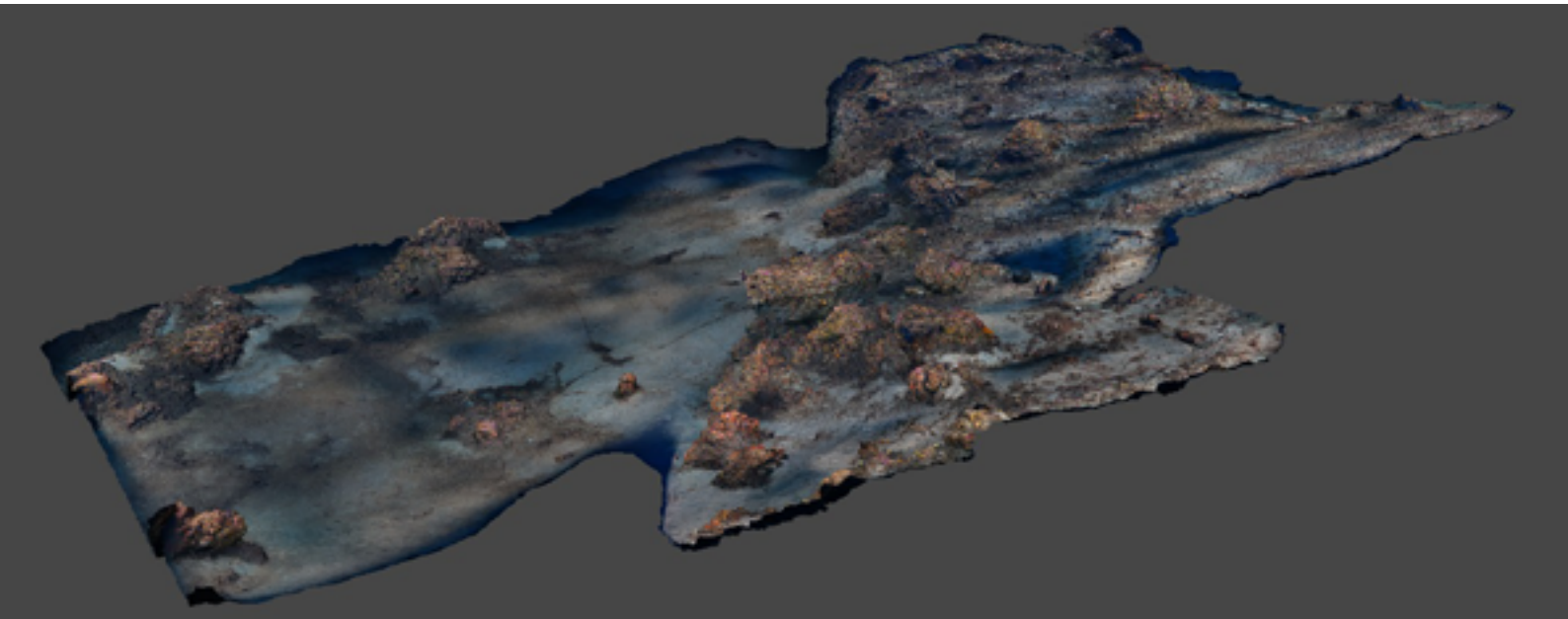
After the initial discovery in 2001 by a team from the SDSS of a dispersion of amphorae at 80 meters depth in the seabeds of Punta Tracino, over the years a series of other discoveries and investigations have followed on this stretch of coast, carried out by the SDSS and other groups, always under the direction of the Soprintendenza del Mare, including the staff of the Cala Levante diving center, the archaeological consortia Arcus and Ares, and the Global Underwater Explorers, which in 2014 conducted an investigation operation with divers and submarines exploring the area down to 250 meters depth. After a few years of inactivity, archaeological investigation campaigns resumed starting from 2021.

Recent Developments in the Investigations

In 2021, the SDSS conducted a survey and documentation campaign on the sites of Punta Tracino and Cala Levante, lasting two weeks, during which the two areas were documented using extensive photogrammetry of the sites and other means for georeferencing artifacts such as the USBL technology of the BluePrint ARTEMIS system, mounted on SUEX underwater scooters (https://www.youtube.com/watch?v=-Ls-zIZfEusY). During this campaign, another 60 coins of the same type as those found previously, bronze nails of various lengths, and around sixty lead rings that were probably part of the sailing equipment of a ship were found.

In 2022, SDSS operations focused on the cala Gadir site, where in 2011 a dispersion of around a hundred amphorae scattered in an area of about 100x40 meters was already discovered on a sandy terrace between 80 and 100 meters depth. Extending the exploration of the site beyond the edge of the slope that descends from 100 meters

The photogrammetry of the Punta Tracino site. The site is characterized by a dispersion of approximately 70 Carthaginian amphorae, scattered over an area of about 1,500 square meters. The photogrammetry is the result of over 7,000 photographs taken during the 2021 expedition.



same types, arranged in groups along a strip that extends for approximately 370 meters in length and 80-100 meters in width, at depths ranging from 80 to 130 meters. Characterizing this spectacular underwater site, over 300 exposed amphorae were counted, while many others are likely buried under sediments. Divers carried out some video transects and photogrammetry of two portions of this vast area, whose survey presents numerous difficulties due to both the size of the extension (approximately three hectares in total) and the considerable depth of the site.

Operations in 2023

The operations lasted only five days during October 2023 due to weather conditions that delayed the team's arrival on the island. They involved seven deep-sea divers from the SDSS, logistical support from the DIVE X Diving Center in Pantelleria, and the presence of Dr. Salvo Emma, an official from the Soprintendenza del Mare, as supervisor of the activities. All dives were conducted with departure/ arrival from land, without the use of boats.

The objective of the 2023 campaign was to continue the survey and video-photographic documentation of the site and the numerous artifacts that characterize it, with the aim of better understanding this extraordinary archaeological site, which is part of an effort that, given the complexities presented, will take several years to complete.

A total of 14 team dives were carried out for 29 individual dives, with an average duration of five hours each, including 60 minutes of bottom time and approximately four hours of decompression. The first days of work were spent installing reference points and lines on the seabed to allow for a more precise estimation of the extent of the area affected by artifacts and the survey of the

positions of some of them. Then, 42 artifacts were tagged with plastic identification tags, each marked with a number, and each of the tagged artifacts was documented with detailed photographs.
The team of divers then conducted some video transects, using the lines as a guide, at depths of 95, 100, and 105 meters, covering a distance of approximately 200 meters.
From the analysis of the videos and during the labeling phases of the artifacts, it emerged that most of the amphorae are found in groups of three, five, or more elements, spaced tens of meters apart, and that many specimens are partially buried and semi-hidden under the sediment.
A team extended the exploration of the area down to 140 meters depth for a length of approximately 100 meters, noting at least twenty amphorae that had not been seen before and confirming that the dispersion of artifacts continues to depths exceeding 130 meters.

The photographs on these pages illustrate the dispersion of amphorae on the seabed off Punta Gadir. It is a variety of Carthaginian amphora shapes distributed over an area of approximately 370 meters in length by 90 meters in width. The fact that the amphorae are so scattered, rather than in a single cluster, may be due to the fact that they were not carried inside a hold, but rather on the open deck of a ship.

The presence of various shapes of Carthaginian amphorae in a single site offers archaeologists the unique opportunity to refine their knowledge of the manufacturing dates of the different shapes.
The complete survey of this complex site, located at great depth, will require several years of investigation and the use of a variety of documentation techniques.

Photos: Claudio Provenzani.

Previous page: Some of the 4,000 Carthaginian bronze coins found at the Cala Tramontana site. They depict a female head on one side and an equine protome on the other. Coins of the same type are also found at the site of the Battle of the Aegates.

Above on this page: A large lead anchor stock at the Cala Levante site. This site is characterized by various artifacts including Carthaginian amphorae, lead ingots, and a dozen of such anchor stocks.

Below: The striking coastline of Cala Gadir, with its volcanic formations.

Mario Arena provides an overview of the latest archaeological investigations at the site of the Battle of the Aegates to the audience at the Florio Museum.

Dissemination

The dissemination of our activities and discoveries during 2023 has taken place in various forms, including, in addition to this current report, the archaeological campaign report on the site of the Battle of the Aegates, the campaign report on activities carried out at the Punta Gadir site, the creation of the website storiasommersa.org dedicated entirely to the wrecks of the Battle of the Convoys, public engagements at the Florio Museum in the former Florio Tuna Factory in Favignana, as well as communication on social media.

Members of the SDSS have also presented their activities at a number of dedicated conferences and events, including:

"The Battle of the Aegates: from maritime research to musealization" by Prof. E. Caponetti, Soprintendenza del Mare and the Municipality of Favignana, Favignana:
- M. Arena, *"The role of SDSS divers in archaeological investigations at the site of the Battle of the Aegates"*
- J. Vernet, "On-site management of artifacts discovered in underwater context, desalination, and stabilization in air"

International Coastal Forum, Association Assalam, Dakhla, Western Sahara (Morocco):
- L. Marroni, S. Gualtieri: *"The Wrecks of the Battle of Mediterranean Convoys"*

GUE Conference, Global Underwater Explorers, Gainesville, Florida (USA):
- M. Arena: *"The Wrecks of the Battle of Mediterranean Convoys"*

Wreck & Cave Night, GUE NL, Amsterdam (NL):
- M. Arena: *"SDSS exploration and documentation activities"*

War at Sea, Historia e Arqueologia do Conflito and Vintage Aeroclub, Lisbon (Portugal):
- M. Arena, S. Gualtieri: *"The Wrecks of the Battle of Mediterranean Convoys"*

Lega Navale Italiana e Club Subacqueo Trieste, Trieste:
- M. Arena: *"The Battle of the Aegates"*

Photo: SDSS activities on stage in Florida, Morocco, Portugal, the Netherlands and Italy

Meet SDSS Divers...
Your Team of Underwater Explorers


Alberto Ferrandi


Andrea D'Ambrosi


Andrea Farnesi


Andrea Scaccianoce


Ben Oortwijn


Carlo Guidetti


Caterina De Seta

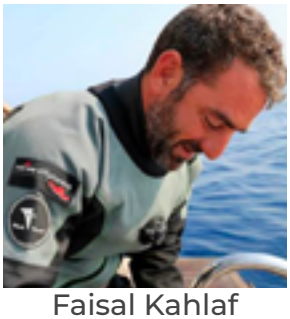

Cristiano Rosa

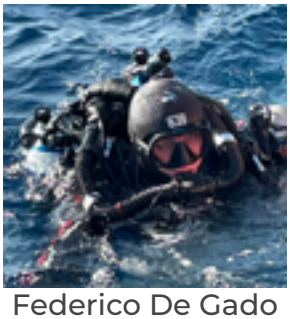

Davide Dal Molin

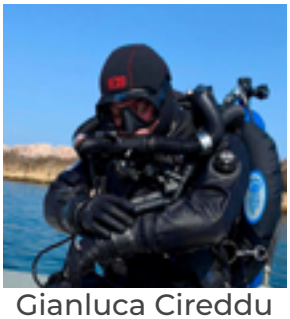

Derk Remmers

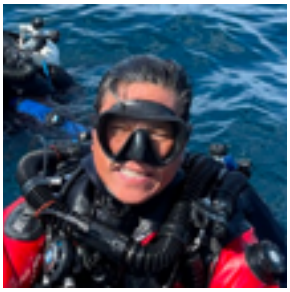

Edo Salaj


Fabio Portella


Faisal Kahlaf


Federico De Gado


Gianluca Cireddu


Gideon Lieu


Hens van Oeveren


Ivan Wagner


Jan Medenwaldt


Jin Hui


Justine Vernet


Kees Beemster Levenz


Keith Kreitner


Laura Marroni


Graham Blackmore


Manuel Piazza


Mattia Popesso


Mario Arena


Elena Romano


Claudio Provenzani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