DOCTRINAL CONSIDERATIONS ABOUT THE SEABED WARFARE

Professor Lucian Valeriu SCIPANOV, PhD

Naval Forces Department, Command and Staff Faculty,
"Carol I" National Defence University, Bucharest

Marian-Vasile SAVA, BEng

Romanian Naval Forces

The present paperwork provides an intrinsic examination of the seabed environment and intends to identify the opportunity to integrate the seabed warfare concept into the naval doctrine. The objective of this endeavour is to determine the place of seabed warfare in the doctrine. In addition to the clarification, some amendments to the Romanian naval doctrine are suggested in order to improve the doctrinal content regarding underwater warfare and seabed security. To that end, it is conducted a comparative analysis between different naval allied doctrines, some leading global technology corporations, and non-governmental organizations. The result of the research should support the development of a robust naval doctrine, adapted to technological advances and the tactics of using modern weapons specific to seabed warfare. Moreover, upgrading the content of a maritime security strategy, which would contain measures in critical areas such as submarine communications, energy exploitation and the use of underwater vehicles, represents a direction to follow, especially in the conditions of multi-domain actions that have effects on the maritime environment.

Keywords: seabed warfare; naval doctrine; maritime control; underwater operations; underwater critical infrastructure;

INTRODUCTION

In the framework of maritime security, this paperwork provides an intrinsic examination of the seabed environment and intends to identify the opportunity to integrate the *seabed warfare* concept into the Romanian Navy doctrine.

The underwater dimension is becoming increasingly competitive, contested, and to some extent congested, and represents a distinct challenge not only for Navies but indeed for the combination of military and civilian, public and private entities that contribute to pursuing any country's economic and strategic interests.

This scientific approach is based on the premise – previously launched by the authors, in a specialized publication – that *"the security of the seabed is a component of maritime security that requires a more detailed control of the underwater environment"* (Scipanov, Sava, 2024). A perspective of controlling the seabed has been considered through active and passive measures, both in the military and civil domain, through the participation of the entrepreneurial environment and ecological organizations, in order to safely exploit the maritime infrastructure, mainly civilian and military critical infrastructure.

The first objective of this endeavour is to determine the place of seabed warfare in the present doctrine. This aspect is strengthened by a comparative analysis of some doctrinal approaches from the perspective of some international actors, active in the maritime field. The arguments presented will support the place and role of seabed warfare in a national doctrine approach that will be able to open opportunities for the development of capabilities in the naval field.

The second objective is to provide some amendments to the Romanian naval doctrine to improve the doctrinal content regarding underwater warfare and seabed security. To effectively integrate

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seabed warfare into naval doctrine, three directions of action in the Romanian Navy are proposed. The analysis will allow the identification of some particularities from a tactical perspective, thus ensuring content elements regarding their significance and some implementation possibilities.

The result of the research should support the development of a robust naval doctrine, adapted to technological advances and the tactics of using modern weapons specific to seabed warfare. It is envisioned to take into account the military field contribution to maritime security as well as the participation of civil institutions, governmental and non-governmental organizations, specialized companies, and ecological associations in this endeavour. Thus, the field of seabed security will be able to complete the component spectrum of the maritime security cluster.

INTEGRATION OF THE SEABED WARFARE INTO THE DOCTRINE

In this chapter, certain amendments will be presented in order to improve the doctrinal content by identifying the importance of the *seabed warfare* from an operational and tactical planning perspective. We start from the premise that the direction of action for the modern Romanian naval forces in strengthening maritime security, implicitly the submarine environment, will also be found in the structural model of a maritime security strategy for the Black Sea (Scipanov, 2020, pp. 68-97), in line with the construct of comprehensive strategies. To effectively integrate *seabed warfare* into our doctrine, certain Romanian Navy contributions will be identified in this section and organized into three distinct functions. Additionally, tactical insights for each function will be provided, ensuring a comprehensive understanding of their implementation and significance. This structured approach will not only streamline the integration process, but also offer the directions to enhance naval capabilities by addressing the unique challenges and opportunities associated with *seabed warfare*. Through this method, the Navy will be better ready to harness the full

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potential of seabed operations, ensuring robust defence and control in this critical domain.

To ensure that the Romanian Navy can achieve its maritime control objectives, it is necessary to establish a classification system for *seabed warfare* operations and a corresponding operational framework. These operations include all activities performed by the Navy or on its behalf, involving the seabed, whether conducted from, to, or directly on it.

Seabed warfare operations support the freedom of information, access, and action for our naval forces, as well as the protection of our critical infrastructure, and maybe the most important aspect is that the *seabed warfare* is a crucial piece of the broader maritime control. These operations involve the implementation, deployment, and utilization of fixed, semi-fixed, or mobile underwater capabilities that can operate towards, from, and on the seabed, either independently or within a network. They ensure the freedom of action for our Navy, protect our submarine installations (including submarine communication cables), and safeguard our national interests related to the exploration and exploitation of mineral and energy resources. Additionally, these operations can pose a credible threat to any potential enemy forces that might target our national interests.

Considering the diverse, evolving, and potentially dual nature of underwater operations, seabed warfare activities are encompassed within a broader strategy of maritime area control. They are crucial to our national ambition to maintain our capacity for early warning, action, and contribution to national resilience.

A comparative analysis of specialized studies and different approaches of other *seabed warfare* doctrines is compulsory to complete the research objectives. The result will give an image of the interested actors in maritime security when they promote, achieve, or develop *seabed warfare*.

For example, the focus of the UK seabed warfare doctrine goes towards the seabed cables (Brooke, 2023). UK *seabed warfare* broadly refers to undersea warfare in which the seabed is the focus. Undersea warfare is not a new concept, but it is also a concern since submarines

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have long played a vital role in the Royal Navy's history. What is new, or at least becoming more widely discussed in public, is the growing threat to critical infrastructure on the seabed and the resulting risk to national security. *Seabed warfare* is no longer a futuristic scenario, but a contemporary form of conflict in the era of increasing geopolitical, global, and regional competition. As the ability to manoeuvre, map, and operate at greater depths increases, critical maritime infrastructure along the seabed resembles the exposed underbelly of national security in a new age of undersea warfare. The *seabed warfare* can thus be characterized as an interim phase between an era of maritime competition and security contestation.

The US defined *seabed warfare* as *"operations that involve undersea networks and systems capable of operating on the seabed, interacting with seabed systems, and taking actions against other systems"* (Carr et al., 2018, p. XX and p. 9).

Seabed warfare utilizes seabed capabilities or systems that interact with seabed infrastructures to perform missions such as underwater warfare, submarines, mine countermeasures, surface warfare, military deception etc.

An interesting approach to seabed is that of the Italian Navy (Marina Militare Italiana – MMI) that sees it as the *"fifth physical operational domain, beside air, land, maritime and space"* (Calcagno, Marrone, 2023, p. 7). From the Italian Navy perspective, the underwater dimension, including the seabed area, is now seen as the new, challenging and physical operational maritime domain. The Navy acknowledges that *"operating underwater requires renewed attention, a novel doctrinal approach, as well as peculiar skills and technological solutions, especially considering that the use of UUVs has pushed the boundaries in terms of how deep navies as well as private actors can operate"* (Ib.).

As regards the French doctrine approach, a preoccupation concerning seabed warfare can be noted and can be underlined in France's ability to guarantee meeting its ambitions in the seabed domain. French naval doctrine defines a classification of seabed warfare

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operations and establishes the framework for seabed operations. *"These operations encompass all the activities conducted by the French Ministry for the Armed Forces, or for its benefit, from, to and on the seabed (...). Seabed warfare operations include implementing, deploying, and utilizing fixed or mobile underwater capabilities able to operate towards, from, and on the seabed, either independently or in a network"* (Seabed Warfare Strategy, 2012, p. 38). In other words, these seabed operations contribute to freedom of movement, protecting critical underwater infrastructure and promoting seabed security.

The People's Liberation Army (PLA) Navy focuses on detection and early warning of underwater enemies. They are planning to build a so-called *"The Great Underwater Wall"* which is a network of stationary sensors on the ocean seabed that listen for enemy submarines and Anti-Surface Warfare efforts (Carr et al., ib., pp. 2-3). This is another indicator that underlines the concerns of the main global and regional actors in the maritime field regarding the coverage of seabed security through measures to guarantee maritime security, in general, and economic security, in particular.

Similarly, defence companies focus on developing unmanned underwater vehicles and advanced sensors. Kongsberg[1] considers that autonomous platform has proven itself superior to all others in this domain (https://www.kongsberg.com/maritime/about-us/news-and-media/blog-stories/seabed-warfare/). Moreover, there are companies focused on underwater sensors and detection of submarine threats (https://www.sercel.com/en/market/defense/submarine-warfare).

SAAB[2] is a company that pays a lot of attention to the submarine field and especially to the seabed domain. In recent years, dependence on subsea infrastructure has increased on a global scale. There has been a focus on subsea cables, which are vital for the global economy and for communications. *Seabed warfare* therefore involves a major

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[1] Kongsberg – *"a leading global technology corporation delivering mission-critical solutions with extreme performance for customers that operate under extremely challenging conditions"*, https://www.kongsberg.com/who-we-are/ (A.N.).
[2] Sweden company, serve the global market with world-leading products, services and solutions from military defence to civil security, https://www.saab.com/. (A.N.).

risk of sabotage to subsea infrastructure. Many countries are investing in their own deep-water capacity to respond to current and future threats, known as *seabed warfare*. Remotely operated underwater systems are generally used for payload transportation, observation, surveillance, and mine-clearing (https://www.saab.com/markets/norway/editorial-articles/seabed-warfare).

This increase is also due to rising demand for stealth seabed warfare systems and the growing use of AUVs for deep sea warfare. *"There is a real and present threat out there today"* (Lade, 2022). Technological development determines the adaptation of operating systems on the seabed, the underwater environment being a dimension that should not be omitted.

Some international actors' actions are causing concerns at the level of seabed security. For example, it can be stated that Russia is *"the most capable nation to conduct seabed operations today"* (Ib.). It is possible to observe the concern regarding the effects that the uncontrolled or unsupervised actions of some international actors possessing combat capabilities on the seabed can produce. The lack of reaction is not a proper attitude to the threat to the seabed security. *"They do seabed operations, and that's a range of things. They can lay sensors, they can interdict other people's infrastructure, they can survey, they can do the whole gambit of what you might want to do on the seabed. So, there is a real and present threat out there today"*, underline Chris Lade, too (Salerno-Garthwaite, 2022). If specialists in the field mention these aspects, it requires great attention to be given to the field of seabed security. It confirms the purpose of our approach to highlight the importance of the analysed domain.

Sercel[3] participates in the design and manufacturing of detection and measurement systems for submarines and marine drones. Undersea warfare consists of operations conducted to establish battlespace dominance in the underwater environment. The *undersea*

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[3] Sercel is part of Viridien Group. Sercel is the world's leading designer and manufacturer of high-tech solutions for subsurface exploration, https://www.sercel.com/en. (A.N.).

warfare market is characterized by the reduction in noise levels of modern submarines, as well as the widening and shifting of conflicts to shallow areas. It necessitates the development of more advanced sensors and detection systems to ensure state sovereignty (https://www.sercel.com/en/market/defense/submarine-warfare).

Sercel is an example of a company concerned with the development of underwater capabilities, for the exploitation of underwater resources. It also contributes to monitoring underwater activities, being an important actor in the field of innovation. The presence of underwater technology on the market highlights the need to promote the underwater field and draws attention to the inherent development of seabed warfare as well as to the navies concern to develop capabilities in the field.

Considering the example of other states and the increased importance of the underwater domain, Romanian Navy should consider to give attention to this subject. For an effective maritime security, we propose some amendments to the Romanian naval doctrine. Our proposal is to introduce the concept of *seabed warfare* and to organize it around three main functions:

- *gain seabed expertise;*
- *conduct seabed surveillance;*
- *execute seabed operations.*

To achieve the outlined objectives, we will elaborate on each of the three previously mentioned functions. This analysis will provide a clear framework for understanding how each function contributes to *seabed warfare* goals. Breaking down these functions and exploring their roles, operational mechanisms, and tactical applications, valuable insights will be presented into their importance and interconnectivity. This approach will ensure that we not only meet but also exceed the proposed objectives, paving the way for a robust and effective implementation of our vision in a future maritime security for the Black Sea (Scipanov, 2020).

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Gain seabed expertise

This function must enable the measurement, characterization, and analysis of the seabed and underwater environment physical properties. This function could include:

- Hydrographic and oceanographic missions involve the comprehensive collection, analysis, and storage of critical data, including bathymetric surveys and gravimetric measurements, essential for the safe navigation of underwater vehicles and the autonomous operations of naval forces. These missions also utilize magnetometry in order to identify magnetic anomalies and characterize the seabed, which is vital for managing acoustic sensors at ultra-low and very-low frequencies. Additionally, they assess velocity profiles, ambient noise levels, and environmental transparency (Metrick, Weinberger, 2016, p. 42). Depending on the level of confidentiality required or the permissiveness of the data collection environment, these operations can be executed using sovereign military resources, through collaborations with NATO/EU allies, or with trusted partners. This type of operation can be carried out by specialized structures in the field of maritime and fluvial hydrography using MUVs and ROVs or other sensors launched from specialized platforms.

- Mine warfare sounding survey missions are conducted to ensure a comprehensive understanding of the seabed. These data collection operations enhance the effectiveness of mine warfare strategies during both peacetime and crises, supporting deterrence, safeguarding critical infrastructure, and enabling the intervention of air-maritime forces.

- Special rapid environmental assessment missions in disputed areas aim to discreetly penetrate underwater into the depths of an enemy's territory. The goal is to collect crucial geographical, hydrographical, oceanographic, and meteorological information needed to plan special naval actions or amphibious operations in strategic ports or areas. These missions seek to obtain

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a detailed understanding of environmental data in non-permissive environments, including the underwater volume and coastal zone. Usually, such operations are performed by special operation forces launched from submarines or using MUVs, depending on the complexity.

Conduct seabed surveillance

This type of operation can be described as passive activity because only fixed or mobile sensors are used. Seabed operations related to seabed surveillance (Ib., p. 19) include:

- Monitoring the seabed environment and critical submarine infrastructure (communication cables, natural gas platforms etc.) within our maritime area of interest (territorial waters and EEZ) and in any area or theatre of operations.

- Observing the submarine environment from the seabed by deploying and utilizing underwater detection systems like seabed sensor nets to secure the operational area and support the navy ops or early warning.

- This type of surveillance can be considered to be attributed to the specialized electronic warfare and observation structures by implementing a seabed surveillance network (Scipanov, Nistor, 2019). In this manner, the Recognized Maritime Pictures (RMP) will be complete.

Execute seabed operations

The range of activities linked with the seabed operation function encompasses:

- Searches and inquiries conducted to resolve potential uncertainties, identify threats, and, if needed, prepare for underwater interventions. To bolster surveillance efforts, targeted investigations must be feasible upon initial detection or indication of a threat, preceding any force using operations.

- Intervention to neutralize devices that may jeopardize the operational freedom of our naval forces or critical infrastructure.

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- Search and recovery operations targeting sensitive objects containing vital information, such as missile debris or flight recorder black boxes or even human lives.
- Naval presence in the underwater domain; this mission is carried out mainly by submarines; it is enough for the enemy to know that the submarine is not in the port.

This force using operations can be achieved only by modern equipment such as sonars, surface and underwater drones or modern platforms such as Anti-Surface Warfare – ASW ships, submarines, torpedoes etc.

To achieve the performance to conduct all the above-mentioned three functions, the Romanian Naval Forces have to follow a large procurement programme. Examples of modern equipment that the Navy should consider to acquire in order to complete all three functions previously mentioned, can be: hydrographic maritime drones that can carry multiple sensors for underwater research and surveillance, mine warfare systems with the ability to detect, classify, localize, identify and neutralize drifting mines, midget submarines that can infiltrate into the enemy area of interest and collect data, medium size diesel-electric submarines for intel ops and attack potential enemies, and (semi) fixed seabed surveillance sensors.

As the significance of the seabed grows, there is a question about its role within the multi-domain environment. Although the seabed is not a distinct compartment or domain on its own, it does present a novel arena for potential conflict, necessitating vigilant monitoring and specialized doctrine. To effectively addresses the seabed warfare, it is imperative to identify both present and future threats to our national interests and the operational freedom of our armed forces. Specifically, the Romanian Navy and the affiliated intelligence directorates will play pivotal roles in detecting and identifying potentially hostile activities, comprehending the intentions of our adversaries, and attributing responsibility for such actions.

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CONCLUSIONS

Incorporating the *seabed warfare* subject into the broader naval forces' doctrine goes beyond just recognizing and describing the operations that were outlined earlier. It necessitates crafting a distinct body of doctrine, delineating the framework, principles, and instruments essential for naval operations. This doctrine must be adapted to ongoing technological advancements, addressing critical areas like submarine communications, energy exploitation, underwater vehicle utilization, and so on. By comparative analysis, we have identified the different approaches to seabed doctrine. Most of them are concentrated around critical infrastructure protection and implementing underwater surveillance systems.

Acknowledging the experience of other states and the concern of some companies specialized in the submarine industry, and not only, regarding the importance of the underwater field, the Romanian Navy should consider introducing the concept of *seabed warfare* into its doctrine.

The three main functions presented:
- gain seabed expertise;
- conduct seabed surveillance;
- execute seabed operations,

are just some of the directives that must be adopted by the Navy in the future.

Technological advances in unmanned underwater vehicles and especially recent breakthroughs in autonomous underwater vehicles have helped to keep the seabed safe. On the other hand, technological developments have reopened the race to gain a degree of control of the seabed, making underwater critical infrastructure such as oil and gas platforms, telecommunications cables, and oil and gas pipelines more vulnerable to disruption, sabotage, linear or hybrid military action.

The Romanian Navy and other civil and military institutional actors must support the implementation of maritime security management

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measures to cover the security of the seabed through active and passive measures. The military capabilities will be able to create the appropriate security framework for the safe exploitation of the underwater infrastructure, and the directly interested companies will be able to offer effective physical protection, complementary to general security.

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