

The Role of Rescue Services in the Structures of the Maritime Transport Safety Systems in Poland

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ABSTRACT: The paper is based on the activities of the Maritime Search and Rescue Service units in Poland. The information and data contained in the article were obtained through an interview with the rescuers of the Maritime Rescue Coordination Centre in Gdynia. The analysis aims to illustrate the impact of the activities of SAR units in the structures of maritime transport security systems in the Polish SAR zone of responsibility. In addition, the organizational structures and equipment of the rescue units were neatly described. The results of the analysed accidents at sea in terms of presenting similar events in the future are also included in this paper.

1 INTRODUCTION

The Student Special Interest Group of Underwater Research "SeaQuest" operating at Gdynia Maritime University is involved in a wide range of human activity at sea including underwater activities and operation on the water surface, aspects related to the broadly understood maritime transport safety systems and activities of such organizations as the Search and Rescue (SAR) services. The topic of this article is devoted to the role of rescue services in the structures of the maritime transport safety systems in Poland.

Search and Rescue is a state budgetary unit under the authority of the minister responsible for maritime affairs. It was established on 1 January 2002 under the Act on Maritime Safety of 9 November 2000. Since then, the Maritime Search and Rescue Service [18] has performed the obligations set out in two international conventions ratified by Polish States:

- International Convention on Maritime Search and Rescue, drawn up in Hamburg on 27 April 1979 (Journal of Laws 1988, No. 27, item 184), referred to as the "SAR Convention",

- The Convention on the Protection of the Marine Environment of the Baltic Sea Area established in Helsinki on April 9, 1992 (The Helsinki Convention).

The statutory tasks of the "SAR Service" [18] are:

- search and rescue of human life at sea.
- combating threats and pollution of the marine environment.
- performance of other tasks related to maritime safety defined by provisions of separate acts. "SAR Service" including administration of the Polish Maritime Administration Information Platform and maintenance of the Alert Receiving Point in accordance with the International Ship and Port Facility Security Code (ISPS).

The symbol of SAR is the Maltese Cross, derived from the Order of the Knights of Malta, known as the Knights of St. John or Johannites. They are characterized by their courage, bravery and generosity in helping those in need. The isosceles red Maltese Cross has four arms, each with an additional two pyramids, symbolizing the eight blessings from the Lord Jesus' sermon on the mount.

2 METHODOLOGY

The following research methodology was used in the development of this publication: literature and internet review, community interview among Search and Rescue rescuers from the Maritime Rescue Coordinator Centre in Gdynia. Due to the limited nature of this work, this article focuses only on the activities of Polish SAR units in the Polish Search and Rescue Region.

Based on a literature review, the subject of the role of rescue services in the structures of the maritime transport safety systems is not sufficiently developed, therefore as members of The Student Special Interest Group of Underwater Research "SeaQuest" we have taken it upon ourselves to try to spread awareness of the role of rescue services in the structures of the maritime transport safety systems in Poland.

We would like to thank the lifeguards from the Maritime Rescue Coordination Centre in Gdynia for their help in writing this article, for their support, patience and time.

3 ORGANIZATION OF THE SAR SERVICE

3.1 Tasks of the Polish SAR Service

The scope of activities and tasks performed by the SAR service in Poland is regulated by Article 117 of the Safety at Sea Act [14]. The main task of the SAR service is to search for and rescue any person in distress at sea, regardless of the circumstances in which they find themselves. This activity is to be carried out by:

1. maintaining a constant readiness to receive and analyse reports of distress at sea;
2. planning, conducting and coordinating search and rescue operations;
3. maintaining maritime rescue forces and resources in readiness;
4. interacting during search and rescue operations with organizational units:
 - Navy;
 - State Fire Service;
 - Border Guards;
 - Police;
 - Health services;
 - Other units able to provide assistance;
5. Cooperation with other rescue systems operating in the country;
6. Cooperation with relevant services of other countries, in particular during search and rescue operations.

In addition, the SAR service also performs tasks related to maritime safety and combating hazards and pollution at sea, and may perform, as part of rescue operations, maritime rescue activities.

3.2 Polish search and rescue region (SRR)

Article 117 of the Safety at Sea Act [14] further states that: "The boundaries of the area of search and rescue in which the SAR Service performs its tasks and the rules of cooperation in the field of saving lives at sea

with the relevant services of other countries are determined by the agreements concluded with those countries."

The Polish search and rescue region (SRR) [17] responsibility is delimited by the boundaries of the Polish Flight Information Region over the Baltic Sea, delineated by a line connecting the points with the following geographical coordinates:

1. $\phi = 54^{\circ} 27' 28,03''$ N; $\lambda = 019^{\circ} 38' 24,05''$ E – the place where the Polish-Russian state border on the counter meets the shore of the Baltic Sea;
2. $\phi = 54^{\circ} 36' 14,03''$ N; $\lambda = 019^{\circ} 24' 15,02''$ E;
3. $\phi = 55^{\circ} 51' 00,00''$ N; $\lambda = 017^{\circ} 33' 00,00''$ E;
4. $\phi = 54^{\circ} 55' 00,00''$ N; $\lambda = 015^{\circ} 52' 00,00''$ E;
5. $\phi = 54^{\circ} 55' 00,00''$ N; $\lambda = 015^{\circ} 08' 07,00''$ E – from this point an arc of a circle with a radius of 30 km drawn from ARP Rone ($\phi = 55^{\circ} 04' 04''$ N; $\lambda = 014^{\circ} 44' 48''$ E) to the point defined in point 6;
6. $\phi = 54^{\circ} 55' 00,00''$ N; $\lambda = 014^{\circ} 21' 27,00''$ E;
7. $\phi = 54^{\circ} 07' 38,00''$ N; $\lambda = 014^{\circ} 15' 17,00''$ E;
8. $\phi = 54^{\circ} 07' 34,00''$ N; $\lambda = 014^{\circ} 12' 05,00''$ E;
9. $\phi = 53^{\circ} 59' 16,00''$ N; $\lambda = 014^{\circ} 14' 32,00''$ E;
10. $\phi = 53^{\circ} 55' 40,00''$ N; $\lambda = 014^{\circ} 13' 34,00''$ E – Point where the German-Polish state border on land meets the shore of the Baltic Sea.



Figure 1. Illustrative map of the borders of the Polish SRR. Source: Adopted from [17]

In addition to the area delimited above, Polish internal marine waters are included in the coordination of search and rescue operations.

3.3 Search and Rescue Regions bordering the Polish SRR

The Polish SRR [17] is bordered by the areas of search and rescue responsibility of the following countries:

- Federal Republic of Germany;
- Kingdom of Denmark;
- Kingdom of Sweden;
- the Russian Federation.

The general principles of cooperation and collaboration between the States Parties to the SAR Convention in the conduct of search and rescue operations at sea are set out in the SAR Convention in Chapter 3 of the Annex [6].

Pursuant to the SAR Convention, relevant agreements have been signed with neighbouring states for cooperation in search and rescue operations

at sea. The most important arrangements of these agreements [17] are:

- authorizing Rescue Co-ordination Centres to authorize the entry of the Contracting Parties' rescue units into their own territory to search for and rescue survivors;
- authorizing the Rescue Co-ordination Centres of the Contracting Parties to provide each other with all necessary and available assistance;
- use of the SITREP form for communication between Rescue Co-ordination Centres during search and rescue operations.

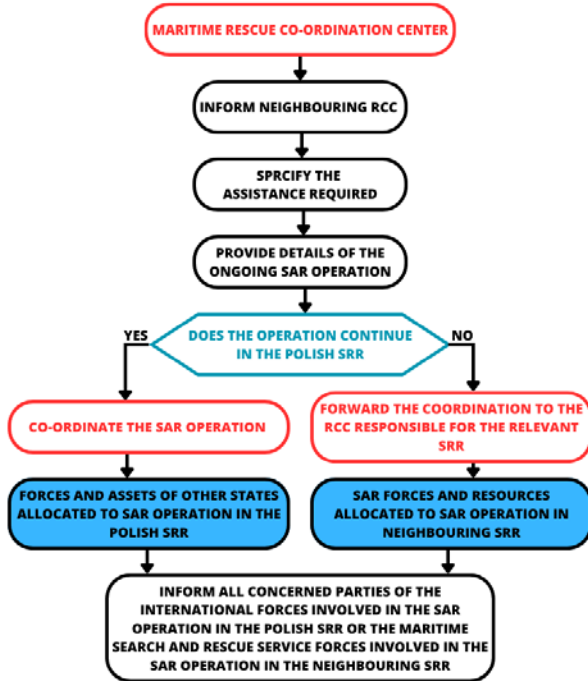


Figure 2. Algorithm presenting activation of international cooperation by Maritime Search and Rescue Service. Source: Adopted from [17]

3.4 Organizational Structure

The SAR Service [13] comprises:

1. Public Department - providing administrative, financial and accounting and legal services, composed of functional organisational units and independent work posts; the public department reports directly to the Director of the SAR Service.
2. Maintenance Department - ensuring adequate preparation, technical efficiency and readiness for rescue operations of marine rescue vessels, coastal rescue stations, special marine anti-pollution vessels and shore-based equipment and storage bases; the maintenance department reports to the deputy director of maintenance department.
3. Operational Department - ensuring planning, conduct and coordination of search and rescue operations and combating pollution of the marine environment, including those related to the function of the reception point for ship security alerts, as well as providing technical support for the control and information system servers for Polish ports; the operational department is subordinated to the deputy director of the operational department.

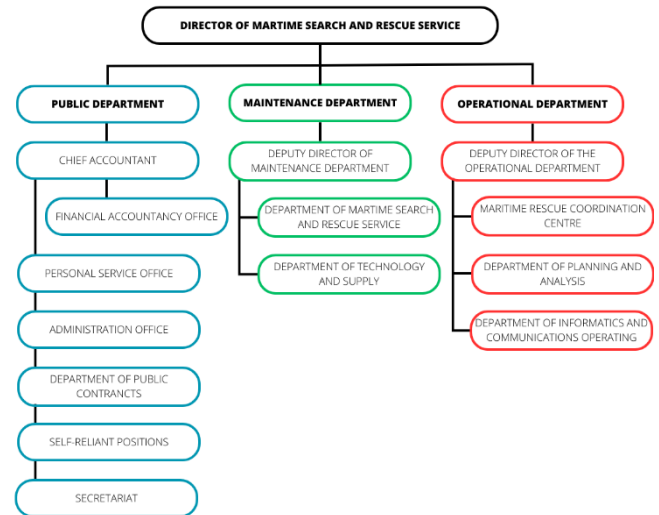


Figure 3. Diagram presenting organizational structure of SAR in Poland. Source: Adopted from [18]

3.5 Polish centres and rescue stations

Figure 4. presents the distribution of Polish SAR stations along the Polish coast, which include:

- Maritime Rescue Co-ordination Centre (MRCC) Gdynia;
- Maritime Rescue Sub-Centre (MRSC) Swinoujscie;
- Coastal Rescue Station (CRS) Trzebiez;
- CRS Dziwnow;
- CRS Kolobrzeg;
- CRS Darlowo;
- CRS Ustka;
- CRS Leba;
- CRS Wladyslawowo;
- CRS Gorki Zachodnie;
- CRS Hel;
- CRS Swibno;
- CRS Sztutowo;
- CRS Tolkmicko;

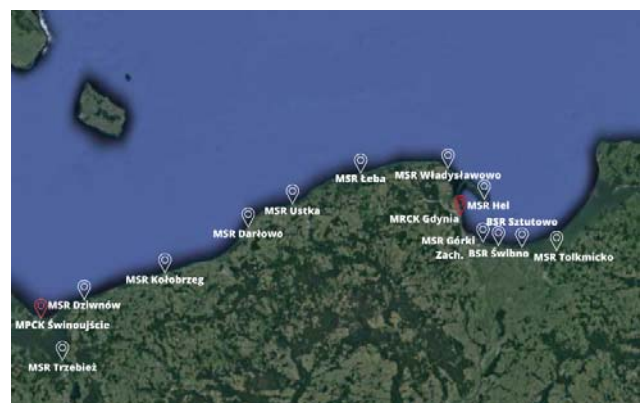


Figure 4. Polish centres and rescue stations. Source: Own study based on [18]

4 FUNCTIONING OF THE SAR UNIT

4.1 Objectives and tasks of the SAR unit

SAR (Search and Rescue) units are organizations whose goal is to provide assistance in the event of a marine emergency or accident. Their main task is to react quickly and effectively to emergency situations

at sea, to protect the safety of people and property, and to prevent possible damage. The main purpose of the SAR unit is to provide assistance in the event of a marine emergency or accident. SAR tasks include [18]:

- Rescuing people in distress at sea,
- Maintaining continuous readiness to receive and analyse notifications of life-threatening situations, as well as incidents of hazards and pollution at sea,
- Collaborating during search and rescue operations and hazard and pollution control with other organizational units,
- Cooperating with other rescue systems operating in the country,
- Cooperating with relevant services of other countries in the implementation of statutory tasks.

4.2 What does a SAR unit consist of?

SAR units consist of various types of rescue units that are designed to conduct rescue operations at sea. Each type of rescue unit has its own unique functions and capabilities that allow for effective rescue operations. Rescue units usually include [18]:

- Rescue ships - these are units equipped with specialized equipment for carrying out rescue operations at sea. They have large operational ranges and are capable of high speeds, so they can reach the scene quickly. Rescue ships are equipped with special communication systems, radar, sonar, as well as water extinguishing agents and equipment for lifting people from the water. An example of such a unit is the SAR-3000 sea rescue vessel.
- Rescue boats - these are smaller units that allow you to quickly reach the scene of the incident and to thoroughly search small sea areas, bays or ports. Rescue boats are usually equipped with outboard motors and specialized equipment to rescue people from the water. An example of a rescue boat is the Gemini Wave-rider 600 type RIB rescue boat.
- Helicopters are aerial units that enable rapid and efficient rescue operations in expansive marine regions. These versatile aircraft are outfitted with advanced radar and communication systems, as well as rescue equipment such as specialized hoists, cable winches, and medical transport systems, among others. One example of such a helicopter is the Mi-14PL/R, a heavy-duty rescue helicopter. Helicopters play a vital role in maritime search and rescue operations, providing rapid response capabilities and the ability to cover vast areas quickly. These aircraft are particularly useful in offshore locations and in situations where conventional rescue vessels may not be able to reach the scene of an emergency in time. Helicopter crews are highly trained professionals, well-versed in the use of specialized equipment and techniques required for successful rescue operations. They work closely with other SAR units, such as coastguard vessels and naval ships, to coordinate search and rescue efforts and ensure that all available resources are utilized effectively. In addition to their crucial role in emergency response, helicopters also play an important role in conducting surveillance and monitoring operations, helping to detect potential hazards and

prevent accidents before they occur. Equipped with state-of-the-art technology and manned by skilled pilots and technicians, these aerial units are a valuable asset to any SAR team operating in marine environments. In conclusion, helicopters are an indispensable component of modern maritime search and rescue operations, providing a vital link between those in distress and the resources needed to affect a successful rescue. Through ongoing training, equipment upgrades, and close coordination with other SAR units, these aircraft continue to enhance the safety and security of those who work and play in and around the world's oceans.

- Divers - specialists who are used to carry out underwater operations in hard-to-reach places such as submerged ships, underwater caves, or other difficult-to-access locations. Divers are equipped with diving gear as well as equipment for conducting rescue operations underwater. According to information provided by Polish Search and Rescue (SAR), due to the rare cases of diving accidents in Poland, they do not have a specially designated group of divers on standby. However, in situations where a diving accident occurs, SAR can rely on the services of the fire brigade, which has specialized equipment for underwater operations. It should be noted, however, that the fire brigade operates only in coastal areas, and in the event of accidents in open sea, SAR must rely on assistance from other units such as the Air Rescue Service or the Navy. All of these rescue units work according to established procedures and as part of the coordination of actions between different SAR units. These units are equipped with specialized equipment and conduct systematic training, which allows for quick and effective actions in rescue situations. It is important to emphasize the crucial role that divers play in ensuring the safety of individuals who engage in underwater activities or those who work in dangerous underwater environments. Despite the relatively low frequency of diving accidents, the consequences of such incidents can be severe, and the need for swift and efficient rescue operations is paramount.

Therefore, it is essential that all SAR units, including those that rely on assistance from other organizations, maintain a high level of readiness and expertise in carrying out underwater rescue operations. This includes not only the acquisition of specialized equipment and regular training but also the development of effective communication and coordination mechanisms between different units, as well as the establishment of clear and efficient protocols for responding to diving accidents. By working together and maintaining a constant state of readiness, SAR units can ensure that they are able to respond quickly and effectively to any emergency situation, thus reducing the risk of injury or loss of life.

4.3 SAR operation costs

SAR operation costs in Poland are highly variable and depend on several factors such as the type of rescue unit involved in the operation, the duration of the

operation, the amount and type of equipment used, transportation costs, and many other factors. Generally, the costs of such operations are very high, and covering them requires multiple sources of funding [18, 20].

In Poland, SAR units are funded from many sources, including the state budget, EU funds, private donations, and funds raised from various charitable actions. However, the majority of financial resources come from the state budget.

Within the state budget, various programs and funds support the activities of SAR units in Poland. The Justice Fund is worth mentioning, as it finances the purchase of equipment and gear for SAR units, as well as training and education for rescuers. Additionally, SAR units in Poland can apply for grants from the European Fisheries Fund, which supports activities related to maritime safety and maritime rescue.

Furthermore, private companies and individuals also engage in financing SAR units in Poland by making donations and organizing various charitable actions. One example of such activities is the "Noble Package for Sailors," which raises funds for maritime rescue purposes every year. It is also worth noting that the activity of SAR units in Poland would not be possible without the involvement of many volunteers who perform their work without remuneration. It is precisely thanks to their work and dedication that SAR units in Poland are able to operate effectively and minimize the costs of their activities.

Table 1. presents the costs associated with the use of Coastal Rescue Stations and various types of rescue vessels for providing rescue assistance.

| Vessel/Coastal Rescue Station | Rate (gross) per hour – PLN |
|-------------------------------|-----------------------------|
| SAR 1500 | 529 / 710* |
| SAR 3000 | 2852 / 3422* |
| R30 | 501 / 601* |
| CZESLAW II | 493 / 591* |
| KAPITAN POINC | 2393 / 2871* |
| Coastal Rescue Station | 683 / 820* |

* means the upper rate of rescue operations in a sea state above 5°.

Source: Adopted from [17]

In summary, the costs of SAR operations in Poland are high, but they can be covered thanks to various sources of funding, primarily from the national budget. In addition, the involvement of volunteers who work without pay and provide an invaluable contribution to the activities of Polish SAR units is of great importance.

4.4 The personnel of a Coastal Rescue Station

In the Polish SAR system, there should be at least one duty rescuer at each maritime rescue station who is responsible for coordinating the station's actions and transmitting alarm information to other rescuers.

4.5 The equipment and gear of a SAR unit

The equipment and gear of a SAR unit should be adapted to the needs and conditions in which the unit

operates, such as weather conditions, type of vessel being rescued, or the individual in need of assistance. The rescue equipment and gear that a SAR unit should have includes [18]:

- Radios and communication equipment, which allow for communication with the SAR coordinator and other rescue units;
- Navigational systems, such as radar, GPS, sonar, and echosounders, which enable the location of the vessel in distress and safe navigation;
- Rescue equipment, such as life rafts, life jackets, rescue boards, life rings, and ropes, which are necessary for conducting a rescue operation;
- Firefighting equipment, such as fire extinguishers, hoses, pumps, and nozzles, which enable the extinguishing of fires on board a vessel;
- Medical equipment, such as first aid kits, defibrillators, medicines, and medical gear, which are necessary for providing medical assistance to casualties.

5 ACTIVITY OF THE MARITIME SEARCH AND RESCUE SERVICE IN POLAND IN 2022

In 2022, the Maritime Search and Rescue Service in Poland took part in a total of 352 rescue operations [18], among which the following stand out:

- Human life-saving operations at sea – 172;
- Medical evacuations – 21;
- Other operations (Rescue Assistance – RA, Emergency Medical Services - EMS) – 50;
- Operations against spillages – 19;
- Investigation operations – 90.

Table 2. Number of SAR operations by type in quarters of the year 2022.

| Type of SAR operation | I quarter | II quarter | III quarter | IV quarter |
|--------------------------------|-----------|------------|-------------|------------|
| Life-saving operations at sea | 15 | 49 | 95 | 13 |
| Medical evacuations | 1 | 4 | 7 | 9 |
| Other operations (RA, EMS) | 6 | 16 | 24 | 4 |
| Operations to combat spillages | 3 | 8 | 6 | 2 |
| Explanatory actions | 6 | 28 | 34 | 22 |

Source: Adopted from [18]

It can be noted in Table. 2 that the highest number of actions carried out takes place in the third quarter of the year, that is the months of July, August and September. In 2022, the Polish SAR Branch assisted a total of 282 people, of whom 139 were rescued who were in life-threatening danger at sea.

Table 3. Number of people rescued by SAR in quarters of the year 2022.

| | I quarter | II quarter | III quarter | IV quarter |
|--|-----------|------------|-------------|------------|
| Number of people assisted - total | 15 | 49 | 95 | 13 |
| Number of people rescued who were in distress at sea | 1 | 4 | 7 | 9 |

Source: Adopted from [18]

The Maritime Search and Rescue Service in Poland has 14 centres and rescue stations. CRS Wladyslawowo and MSR Kolobrzeg are the two locations from which the largest number of actions were conducted.

Table 4. Participation of units in rescue operations - from base locations in quarters of the year 2022.

| Base location | I quarter | II quarter | III quarter | IV quarter |
|---------------------|--------------|---------------|----------------|---------------|
| MRCC Gdynia | 4 | 12 | 6 | 3 |
| MRSC Swinoujscie | 0 | 2 | 11 | 3 |
| CRS Trzebiez | 0 | 7 | 9 | 1 |
| CRS Dziwnow | 2 | 9 | 13 | 2 |
| CRS Kolobrzeg | 6 | 17 | 22 | 8 |
| CRS Darlowo | 1 | 9 | 16 | 4 |
| CRS Ustka | 3 | 12 | 12 | 0 |
| CRS Leba | 3 | 12 | 20 | 1 |
| CRS Wladyslawowo | 1 | 16 | 32 | 8 |
| CRS Gorki Zachodnie | 3 | 9 | 4 | 0 |
| CRS Hel | 1 | 1 | 12 | 4 |
| CRS Swibno | 3 | 6 | 16 | 3 |
| CRS Sztutowo | 2 | 2 | 11 | 0 |
| CRS Tolkmicko | 1 | 1 | 3 | 1 |

Source: Adopted from [18]

6 COURSE OF ACTION

There are five stages of Search and Rescue's participation in actions at sea [18]. The first is the standby stage, which consists of maintaining a 24-hour readiness to receive distress calls and information about existing and likely life-threatening situations at sea by the Maritime Rescue Coordination Centre (MRCC). There are always two lifeguards on duty at the MRCC - an operations officer and an assistant. The second stage is based on the initial action after a life-threatening situation at sea has occurred or is likely to occur. The stage aims to:

- assessing and qualifying the information obtained,
- deploying the appropriate amount of forces and resources to assist in the action,
- gathering additional information,
- alerting the relevant services of other countries,
- where necessary, immediately apply the appropriate actions from the other stages.

The third stage consists of planning the action. The Operational Supervisor on Duty plans the entire process of carrying out the action, which includes a search and rescue plan, including the delivery of casualties to a place of refuge or a place of qualified medical assistance, and a SAR Mission Coordinator (SMC) is appointed. At this stage, the duties of the SMC are taken over by the MRCC Duty Operations Officer. The penultimate - fourth - stage is the execution of the operation. It includes the dispatch of predetermined forces and resources, the appointment of a Coordinator at the scene of the action, the coordination of the SAR action and the informing and further informing of the relevant concerned authorities, institutions, organisations, persons. The final stage is to complete the action, recall the units from the site, restore them to a state of readiness, complete the documentation of the action carried out.

Analysing the report from the search and rescue action in which the container ship Nordic Italia sailing under the Portuguese flag and the cutter Dzi-18 from

Dziwnow took part, we can see that all stages of the action were fulfilled in the right order [19]. Originally, the Maritime Auxiliary Coordination Centre in Swinoujscie was responsible for the action, but the entire command of the action was taken over by the Maritime Rescue Coordination Centre in Gdynia, due to a misunderstanding of the situation. At the outset it was known that the yacht North Italia was involved in the accident, having been raided by a Dzi-18, 13 Nm to the N of Dziwnow. Resources were deployed to standby and prepare to go to sea. After 17 minutes, the SAR action was launched. However, after 21 minutes the action was taken over by MRCC Gdynia. Based on data from the SWIBŻ and Marine Traffic, it was determined that the Nordic Italia was a 158-metre container ship travelling at 17in. The cutter Dzi-18 was rammed by the vessel Nordic Italia. At 6.20 a.m. the m/v Szkwal unmoored and set out to assist the casualties. Support was also called in. Upon arrival, ascertaining details and assisting the injured crew, the decision was taken to evacuate all the cutter's crew and transfer them to the wheel ambulance crew in Dziwnow.

The MRCC receiving a distress call assumes responsibility for the incident until the relevant or other Rescue Coordination Centre takes over. There shall be no unreasonable delays in the commencement of SAR action. Once coordination has been handed over, the MRCC remains on standby to co-operate until confirmed information is received that assistance is no longer required or the action has been completed.

7 THE IMPACT ON THE SAFETY OF THE BALTIC SEA

The Polish SAR operates based on the International Convention on Maritime Search and Rescue (SOLAS) and national regulations, and its task is to provide effective and professional assistance in the event of accidents, disasters, and threats at sea. The fundamental duty of the SAR service is to rescue and recover individuals in distress at sea, irrespective of the situation that led to their peril. The Polish SAR service is equipped with modern and well-trained rescue units that are capable of swiftly responding to any incident in the Baltic Sea. The rescue fleet includes rescue cutters, helicopters, motorboats, inflatable boats, and a team of skilled rescue divers. In 2022, the Maritime Search and Rescue Service (MSPiR) participated in a total of 352 rescue operations, providing assistance to 282 individuals, 139 of whom were rescued from immediate life-threatening situations. Notably, the third quarter of 2022, particularly July, August, and September, saw the highest number of operations conducted. With 14 centres and rescue stations, the Polish SAR service is well-positioned to carry out rescue missions, with the Coastal Rescue Stations in Wladyslawowo and Kolobrzeg undertaking the majority of operations. As a result, this coordinated and well-equipped maritime rescue system plays a vital role in promoting the safety of those who work at sea, as well as tourists and sailors navigating the Baltic Sea waters.

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