

ORIGINAL PAPER

ORYGINALNY ARTYKUŁ NAUKOWY

**RESCUE CARRIED OUT IN WATER AREAS BY FIREFIGHTING UNITS  
IN POLAND IN THE YEARS 2020-2022**

**RATOWNICTWO NA OBSZARACH WODNYCH REALIZOWANE PRZEZ  
JEDNOSTKI OCHRONY PRZECIWPÓŻAROWEJ  
W POLSCE W LATACH 2020-2022**

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### Summary

**Background.** The aim of the work was the analysis of the interventions of firefighting units in water areas in the years 2020-2022 in Poland taking into account the victims and the risks to the health of the rescuers.

**Material and methods.** The paper uses the data originating from the Decision Support System of the State Fire Service (SFS), which have been made available by the Bureau of Operational Planning and the Commander-in-Chief's Bureau. The analyzed material spans three years: 2020, 2021 and 2022. The digital data from the Decision Support System were recorded in accordance with the guidelines of the National General Command of the SFS.

**Results.** According to the SFS's records, in the years 2020-2022 rescue services intervened 1.77 mln times, including 17,938 in water areas. The interventions of firefighters in water areas

constituted approx. 1% of all interventions carried out in the investigated years. Among all the interventions in water areas in the years 2020-2022, 1,029 were operations under water and under ice.

**Conclusions.** The most operations in water areas take place in coastal voivodeships, and those with lakelands that are attractive in the holiday period. In order for the operations to be effective, it is important for services and entities specialized in rescue in water areas to cooperate with each other. Water rescue also means risk to the rescuers who are involved in accidents during rescue operations each year. The statistics of drownings in the last decade have a downward trend, which may be related to greater social awareness, but also to the development of water rescue.

**Keywords:** firefighting units, water rescue, firefighters, health risks, Poland

### Streszczenie

**Wprowadzenie.** Celem pracy była analiza interwencji jednostek ochrony przeciwpożarowej na obszarach wodnych w latach 2020-2022 w Polsce z uwzględnieniem osób poszkodowanych, oraz zagrożeń zdrowotnych funkcjonariuszy.

**Materiał i metody.** W pracy wykorzystano dane pochodzące z Systemu Wspomagania Decyzji Państwowej Straży Pożarnej (PSP), które udostępniło Biuro Planowania Operacyjnego, oraz Biuro Komendanta Głównego. Materiał poddany analizie obejmuje trzy lata: 2020, 2021, 2022. Dane cyfrowe z Systemu Wspomagania Decyzji były ewidencjonowane zgodnie z wytycznymi Komendy Głównej PSP.

**Wyniki.** Według ewidencji PSP w latach 2020-2022 podmioty ratownicze interweniowały 1,77 mln razy, w tym na obszarach wodnych 17938. Interwencje strażaków na obszarach wodnych stanowiły ok. 1 % wszystkich interwencji zrealizowanych w obserwowanych latach. Wśród

wszystkich interwencji na obszarach wodnych w latach 2020-2022, 1029 dotyczyło działań podwodnych i pod lodowych.

**Wnioski.** Najwięcej działań w obszarach wodnych występuje w województwach nadmorskich, oraz tych z pojezierzami atrakcyjnymi w okresie wakacyjnym. Istotne jest współdziałanie służb i podmiotów specjalizujących się w ratownictwie na obszarach wodnych, aby działania były skuteczne. Ratownictwo wodne to również ryzyko dla ratowników, którzy każdego roku ulegają wypadkom podczas działań ratowniczych. Statystyki utonięć w ostatniej dekadzie mają tendencję spadkową, co może mieć związek z większą świadomością społeczeństwa, ale i z rozwojem ratownictwa wodnego.

**Słowa kluczowe:** jednostki ochrony przeciwpożarowej, ratownictwo wodne, strażacy, zagrożenia zdrowotne, Polska

## Introduction

Water rescue is one of the many areas of specialization of firefighting units belonging to the National Firefighting and Rescue System (NFRS) in Poland. The system consists of the State Fire Service (SFS), appointed by the act of 1991, and other uniformed services:

- the volunteer fire service,
- the company fire service,
- the airport fire service.

These entities complement each other, since the catalogue of the performed duties and their dynamics are vast. The duties of the NFRS include two groups of threats: fighting designated fires and local threats [1].

The broad meaning of “rescue in water areas” includes operations related to deluge, local floods, operations on water, on ice, under water and under ice. The duties in water areas

are difficult, dangerous and requiring knowledge about the rescue equipment and techniques. Before commencing operations in water, each firefighter-rescuer must be aware of the threat and be certain that the actions will be performed safely, on the basis of the best knowledge and the experience gained largely during trainings and drills. This primarily concerns firefighters from these regions of Poland where the number of real operations is lower [2].

For many years, the SFS has had specialized rescue groups of various specializations functioning in a continuous mode, classified as: technical, water diving, high-altitude, search and rescue as well as chemical and ecological rescue, and since 2021, emergency medical services are also provided in the area of a voivodeship ad hoc, for the needs of rescue operations, drills and trainings (the intervention mode) [3].

Water rescue means operations necessary to reduce or eliminate direct threats in water areas (waterbodies, watercourses or artificial reservoirs). Rescue operations include reaching and providing access to the people at risk or to the victims, evacuating the victims outside the danger zone (the water area), evacuating animals and performing medical rescue operations [4].

The scope of operations in water rescue is divided into the following levels of operational readiness:

- basic – provided by all units of the SFS, and the firefighting units from outside the SFS. They include units of the volunteer fire services and other rescue services declaring operational readiness;
- specialized – provided by specialized groups of water and dive rescue (SGWDRs), as well as other suitably equipped entities with trained personnel, declaring operational readiness all year round. The levels of operational readiness depend on the number of trained rescuers in a given entity, and on the specialized equipment.

The specialized level of inland water rescue may also be provided by entities not associated with the NFRS, e.g. the volunteer water rescue service, associations, or the maritime

search and rescue service in offshore areas. Over 500 rescue and firefighting units function at the SFS, with over 4,738 further volunteer fire service units also included in the NFRS (as of the end of 2021). There are also several functional SGWDRs in every voivodeship, in order to make the time of reaching the location of an incident and taking specialized actions as short as possible. The location of the groups in voivodeships is presented in Table 1 [5].

**Table 1.** Location of SGRWNs in Poland [6]

Voivodeship	Number of SGWDRs	Location: cities
Lower Silesian	3	Wrocław, Legnica, Jelenia Góra
Kuyavian-Pomeranian	2	Bydgoszcz, Włocławek
Lublin	1	Lublin
Lubuskie	2	Gorzów Wielkopolski, Zielona Góra
Łódź	3	Łódź, Piotrków Trybunalski, Sieradz
Lesser Poland	2	Kraków, Tarnów
Masovian	5	Warszawa, Płock, Sokołów Podlaski, Radom, Maków Mazowiecki
Opole	3	Opole, Nysa, Kędzierzyn-Koźle
Subcarpathian	3	Tarnobrzeg, Sanok, Przemyśl
Podlaskie	4	Augustów, Łomża, Suwałki, Grajewo
Pomeranian	3	Gdańsk, Ustka, Kościerzyna
Silesian	1	Bytom
Świętokrzyskie	1	Kielce
Warmian-Masurian	7	Giżycko, Olsztyn, Bartoszyce, Elbląg, Ostróda, Mrągowo, Węgorzewo
Greater Poland	4	Poznań, Kościan, Konin, Piła
West Pomeranian	2	Szczecin, Koszalin

In the Warmian-Masurian Voivodeship, which has the most popular and touristically appealing lakes, there are as many as 7 SGWDRs, which is due to the number of tourists who visit this voivodeship each year. As declared by Statistics Poland, in 2020 the region was visited by 872 thousand people, with 936 thousand in 2021 (including approximately 5% of foreign tourists) [7].

The SGWDRs perform tasks which can be divided into 3 main areas.

1. Area I – the basic level – operations on the surface:
  - identification of threats,
  - saving the drowning,
  - flood control actions,
  - actions on frozen waterbodies,
  - actions in rapidly flowing waters,
  - training other units with respect to water rescue as part of professional improvement;
2. Area II – the specialized scope – operations beneath the water surface:
  - unblocking locks and culverts,
  - saving people from under the water surface,
  - saving people from under the surface of ice,
  - saving people trapped in sunken vehicles or boats,
  - recovery of sunken vehicles or boats constituting an environmental threat;
3. Area III – humanitarian operations:
  - recovery of dead bodies [8].

Dispatchment to operations in water areas proceeds in accordance with the dispatchment procedures, analogically to other specializations of the SFS. During an incident, those holding proper supervisory positions dispatch brigades from the rescue and firefighting units of the SFS, or units which have declared the ability to perform rescue operations in water areas in their operational readiness [9].

A separate scope of operations related to rescue in water areas involves ice rescue, related to the freezing of waterbodies in the winter period. This subtype of actions in water

areas is particularly difficult, as it features all the threats characteristic of water rescue, along with air and water temperatures favoring faster occurrence of hypothermia [10,11].

The aim of this work was an analysis of the interventions of firefighting units in water areas in the years 2020–2022, taking into account the victims and the risks to the health of the rescuers.

## **Material and methods**

The paper uses the data originating from the Decision Support System of the SFS, which have been made available by the Bureau of Operational Planning and the Commander-in-Chief's Bureau. They are publicly available data in the form of:

- annual Information Bulletins of the State Fire Service for the years 2020-2022 [12-14],
- data on the website of the General Command of SFS: [www.gov.pl/kgpsp](http://www.gov.pl/kgpsp) [15].

The analyzed material spans three years: 2020, 2021 and 2022. The digital data from the Decision Support System are recorded in accordance with the guidelines of the National General Command of the SFS [16].

The database has been prepared in Microsoft Excel by means of the MS Office 2016 suite for Windows 10. The quantitative data are described in the following form: the sum (n), the percentage % of a specific factor, the mean (Mean), and the standard deviation (SD).

The analysis is fully anonymous for the described cases and the services participating in the investigated operations. The analysis complies with the principles of the GDPR and the Declaration of Helsinki; therefore, an opinion of a bioethical commission has not been requested.



### *Limitations*

The acquired data have a quantitative nature. On their basis, it is impossible to describe and analyze the data describing the victims in detail (age, gender), or the detailed nature of an incident. Reports prepared by the supervisors of rescue operations after the end of each rescue and firefighting operation are not available for analyzing. An incident card is prepared by authorized persons after a completed intervention; the authors had no access to this documentation. Information regarding the victims, cooperation with medical services during the described operations, further medical procedures, the cause of an incident or operations resulting in the deaths of the victims would constitute an added value to the analysis.

### **Results**

According to the SFS's records, in the years 2020-2022 rescue services intervened 1.77 mln times, and detailed characteristics are presented in Table 2.

**Table 2.** Characteristics of all incidents handled by firefighting units in the years 2020-2022

<b>Year</b>	<b>Fires</b>	<b>Local threats</b>	<b>False alarms</b>	<b>All interventions</b>
<b>2020</b>	128,754	413,865	40,634	583,253
<b>2021</b>	106,466	428,041	45,208	579,715
<b>2022</b>	135,965	424,958	47,895	608,818
<b>Total</b>	371,185	1,266,864	133,737	1,771,786
<b>Mean</b>	123,700	422,200	44,500	-
<b>SD</b>	15,300	7,400	3,600	-

Source: own elaboration based on collected data.

The data of the Decision Support System included detailed data taking into account the type of rescue and firefighting operations, the type of the equipment used, and the area of operations. The operations collected from the databases are related to water rescue in terms of:

- the location of the operations – the results are presented in Table 3,
- the equipment used in the operations – the results are presented in Table 4.

According to the data in Tables 2 and 3, the interventions of firefighters in water areas constituted approx. 1% of all carried out in the investigated years, including approx. 1.4% in the local threats category, having considered the number of fire incidents.

**Table 3.** General characteristics of the locations of rescue operations related to water rescue in the years 2020-2022

<b>Year</b>	<b>In water areas</b>	<b>Under water and ice</b>
<b>2020</b>	5,258	348
<b>2021</b>	5,426	343
<b>2022</b>	7,254	338
<b>Total</b>	17,938	1,029

Source: own elaboration based on collected data.

The number of rescue operations in water areas, including operations under water and ice, amounted to 18.9 thousand, which accounts for 1.49% of all interventions in the MZ category.

**Table 4.** General characteristics of the equipment used for water rescue in the years 2020-2022

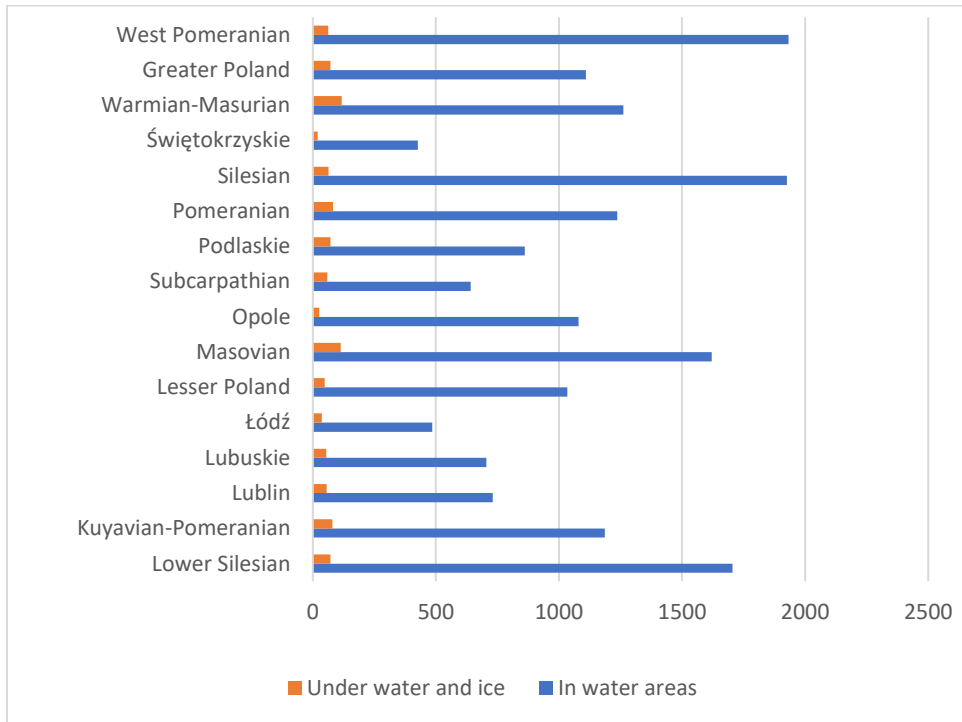
<b>Year</b>	<b>Equipment used for diving</b>	<b>* Special vehicles: water rescue</b>	<b>** Floating equipment</b>
<b>2020</b>	438	3,167	3,155
<b>2021</b>	367	2,632	3,599
<b>2022</b>	395	2,179	5,327
<b>Total</b>	1,200	7,978	12,081

Notes: \* special vehicles – equipment: diving gear, flotation clothing, lifebuoys, throwing strops, rescue bridges, buoys, buoyancy equipment, a set for implementing the procedures of qualified first aid lighting equipment, sonars and floating equipment, as well as ice rescue equipment; \*\* floating equipment – rowing boats, motorboats with propellers, canoes and other floating equipment unrelated to the SGRWNs, e.g. floating pumps.

Source: own elaboration based on collected data.

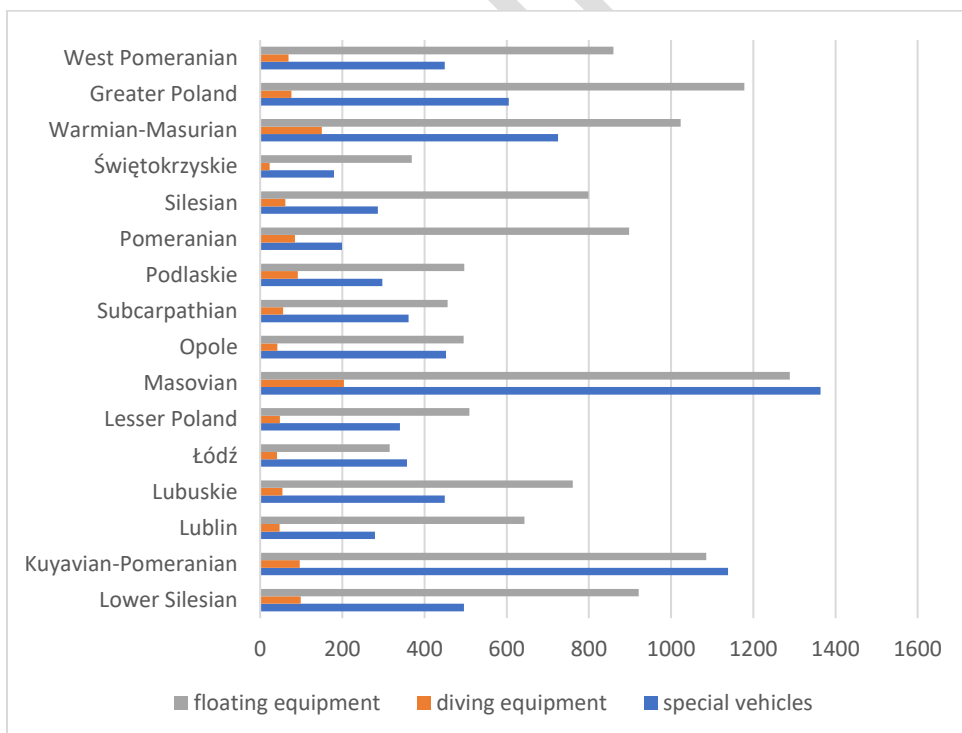
Means of water transport have been used for rescue operations, e.g. searching for missing persons, illuminating the area of operations, transporting specialized equipment, or evacuating people from flood risk areas.

The data of the Decision Support System enabled an analysis for individual voivodeships. Graphical data are presented in Figures 1 and 2.



**Figure 1.** Water rescue per voivodeship – the location

Source: own elaboration based on collected data.



**Figure 2.** Water rescue per voivodeship – the equipment used

Source: own elaboration based on collected data.

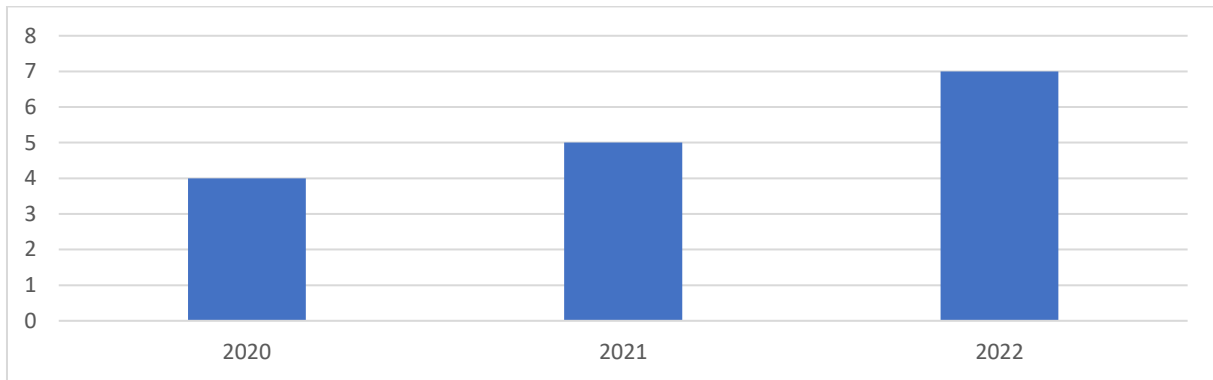
According to the Statistics Poland, the population of Poland in the investigated years was 38.2 mln. The numbers of inhabitants per voivodeship, and the numbers of operations in water areas per 1000 inhabitants are presented in Table 5.

**Table 5.** Firefighter interventions in voivodeships per 1000 inhabitants of a voivodeship [17]

<b>Voivodeship</b>	<b>Number of inhabitants – an average for 3 analyzed years (mln)</b>	<b>Interventions per 1000 inhabitants</b>
Lower Silesian	2,896	0.61
Kuyavian-Pomeranian	2,050	0.61
Lublin	2,080	0.37
Lubuskie	1,001	0.75
Łódź	2,429	0.21
Lesser Poland	3,417	0.31
Masovian	5,542	0.31
Opole	0,969	1.14
Subcarpathian	2,111	0.33
Podlaskie	1,166	0.79
Pomeranian	2,349	0.56
Silesian	4,461	0.44
Świętokrzyskie	1,215	0.36
Warmian-Masurian	1,404	0.98
Greater Poland	3,498	0.33
West Pomeranian	1,678	1.18

The number of rescuers in each voivodeship also depends on the number of inhabitants (Statistics Poland data from Table 5). The statistical value of the employment index of the SFS firefighters in a shift-based service (24-hour service) per each 1,000 inhabitants of a voivodeship in the consecutive years of the analysis was similar and averaged 0.64. The index for all the firefighters in Poland (a shift-based system and an 8-hour system) averages 0.79, and it is variable [17].

In each of the analyzed years, there was a small number of situations hazardous to the firefighters' health during water and dive rescue. The data pertain to the SFS workers only. The results are depicted in Figure 3.

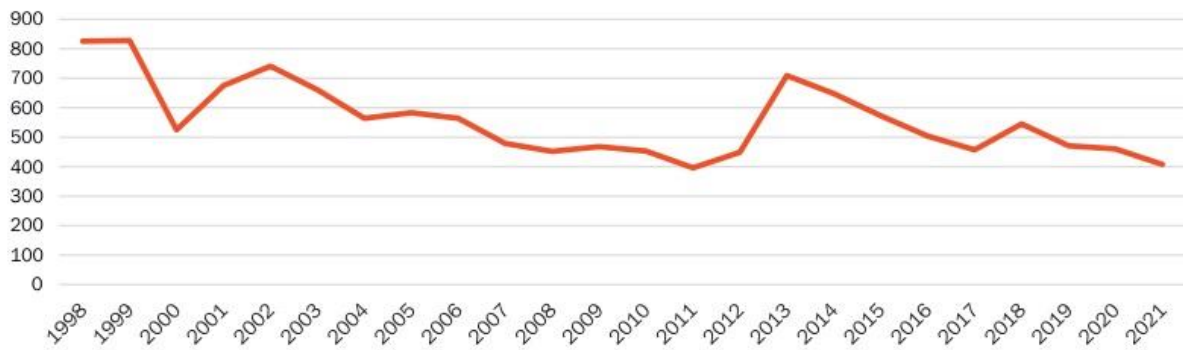


**Figure 3.** Number of situations hazardous to the firefighters' health during water and dive rescue

Source: own elaboration based on collected data.

## Discussion

The necessity to maintain and develop the SGWDRs and other entities handling rescue in water areas is supported by the numbers of drownings in Poland, as presented in Figure 4.



**Figure 4.** The number of human drownings in Polish waterbodies in the years 1998-2021 [18]

The data acquired in the authors' own analysis show the number of people successfully saved during operations in water areas in the recent years. It may be concluded that the numbers presented in Figure 3 could have been higher if not for the efficient dispatching and specialized assistance of entities handling water rescue both in the NFRS and other services.

The acquired data divided among voivodeships do not correlate with the population of a given voivodeship. The number of firefighter interventions in water areas could have been affected by other factors: the location (e.g. coastal voivodeships or voivodeships with lakelands popular in the summer period), the overall number of watercourses and their availability.

Rescue operations in water areas mean fighting against time and the risk of drowning. However, it should be noted that water is a serious threat also to the rescuers. Drownings are also recorded among professional divers and water rescuers. Examples include a 2021 incident from the Lower-Silesian voivodeship, when professional instructor firefighters drowned during diving exercises, and a diver's accident during the search for a person in 2023 [19,20].

In order to minimize the number of victims of accidents in water areas, it is crucial to properly equip rescue services, provide both specialized training in accordance with the area of the specialized group as well as medical training, so as to implement the qualified first aid

procedures in accordance with the Principles of Organizing Medical Rescue in the NFRS after reaching the victim [4,21].

In order to ensure safety in water areas, it is important that entities performing duties related to this specialization cooperate with each other. The volunteer water rescue service is a formation which has considerable water rescue resources at its disposal, and it is the leading organization in this field of rescue. Volunteer water rescue service units are used in emergency situations (flood control), prevention (trainings, swimming lessons for the adolescents) and protection of bathing waters in the holiday period. Cooperation between the volunteer water rescue service and the SFS has been functioning for many years, formalized on the basis of the 2006 agreement. The following years saw the decentralization of water rescue of the volunteer water rescue service in Poland. This scope of rescue services may be provided by entities authorized by the Minister of Internal Affairs and Administration [22-24].

Water rescue handled by the firefighting units and the cooperating entities in inland waters is supplemented by the search and rescue service in offshore waters. Due to Poland's long shoreline, high popularity among tourists, and the intensely used waterway, it should be added that this water rescue area is of high importance. Offshore interventions are not taken into account in the statistics of the General Command of the SFS, but a considerable number of Polish citizens use Polish marine waters. Search and rescue at sea as well as fighting threats and contaminations of the marine environment are among the duties of the search and rescue service [25].

## **Conclusions**

The most operations in water areas take place in coastal voivodeships, and those with lakelands that are attractive in the holiday period. In order for the operations to be effective, it



is important for services and entities specialized in rescue in water areas to cooperate with each other. Water rescue also means risk to the rescuers who are involved in accidents during rescue operations each year. The statistics of drownings in the last decade have a downward trend, which may be related to greater social awareness, but also to the development of water rescue.

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