Preface

This book has been written in memory of those whose lives have been lost to the sea. We name it shortly «The Kerch book».

Seafarers, fishermen and marine researchers know the restless sea waves and the storm gales, the heavy rain and soaking wet humidity, the extreme heat and cold, the fearful collisions, the fires, or the hard to break ice-sheets, when there is nothing romantic about being away from land. In various manuals you can find simple instructions for this most difficult of all environments to survive (the desert, the harsh polar regions and the tropics (among the snakes and deadly diseases) are considered easier). Your ability to stay alive in a marine environment depends upon:

- Your knowledge of and ability to use the available survival equipment;
- Your specialist skills and ability to apply them to cope with the hazards you face;
- Your will to live and ability to keep your head (stay smart).

Undoubtedly, and especially during an accident at sea, all this knowledge, skill and will, listed above, is crucial in the matter of life and death. However, there are better ways to survive in this unsteady world and these lie in precaution and preventative measures. As is well known, the Kerch accident happened because of a heavy storm, lives were lost and gallons of oil leaked into the sea causing an environmental disaster. Of course, storms at sea may be extremely destructive and we cannot prevent them. However, these storms are predictable. All you can do when they are forecast to strike is listen to the early warnings and remove yourself from harm's way. The Kerch storm was forecast well in advance. Therefore, why did the Kerch accident happen, what prevented the people from acting more quickly in looking for a shelter and safe harbour? What did we learn from the Kerch accident? What should we do to avoid other accidents and to prepare well for emergency situations? We have written this book to answer these and similar questions and to communicate our findings to a wider audience.

Whilst drafting this book, we have received many different comments, some of them useful, others less. We have accepted all those comments that were from people who know the sea personally i. e. those whom have worked at sea, whom have risked their lives under difficult conditions and who have known critical situations from their own experience. Being 'out of the sea' and away from danger, comfortably sat in your arm-chair, it is easy to criticize how the 'political sensitivities' of the Kerch accident were handled. This involved talking openly about gaps in legislation and policy, use of old or inappropriate ships, non-qualified staff, commercial interests and illegal ship transportation, lack of capacity to save wild life or to utilise waste products, quality of clean-up operations at sea and on coast, the chronic pollution in the Kerch Strait, and many other important issues. For those who have never worked at sea — we know that it is impossible to picture the despair and fear in an accident or in an emergency if you have never been in at least one storm away from land or in a maritime incident. However, imagine that your child works at sea — what would you do to spare him or her from an accident, have you even ever thought of this possibility? With this book we have aimed at increasing public awareness on issues related to governance of environment protection and human security in the Black Sea region and to advocate for transparency, hence wider public participation and bottom-up control on decision-making, especially during accidents. We have used the 'political sensitivities' to sharpen your attention and to engage as many people as possible to concentrate on issues which would help in practice to better manage the risks at sea, saving human lives and protecting the environment more efficiently through enhancing the safety aspects of shipping.

The book is based on ideas born in the Black Sea Commission[1] and is supported financially by the EC/BSC project MONINFO (http://www.blacksea-commission.org/_projects_MONINFO.asp). In fact, the Kerch accident triggered discussions in the European Parliament about the safety of the Black Sea bearing in mind the plans of the Black Sea states for a several-fold increase in oil transportation and export capacities, the activities (on-going and envisaged) in oil/gas extraction and the new energy projects[2] discussed. The European Parliamentarians mentioned in their Resolu-

[1] The Commission on the Protection of the Black Sea Against Pollution (Black Sea Commission, BSC, www. blacksea-commission. org) is the intergovernmental body established in implementation of the Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention) which was signed in 1992 and later ratified by all Black Sea countries. The basic objective of the Bucharest Convention is to substantiate the general obligation of the Contracting Parties to prevent, reduce and control the pollution in the Black Sea in order to protect and preserve the marine environment and to provide policy and legal frameworks for co-operation and concerted actions to fulfill this obligation. The BSC works in the field of environment safety aspects of shipping under a special Protocol (PROTOCOL ON COOPERATION IN COMBATING POLLUTION OF THE BLACK SEA MARINE ENVIRONMENT BY OIL AND OTHER HARMFUL SUBSTANCES IN EMERGENCY SITUATIONS, http://www.blacksea-commission.org/_convention-protocols.asp#Emergency), Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea (adopted by the Black Sea coastal states in April 2009, http://www.blacksea-commission.org/_bssap2009.asp) and Regional Contingency Plan (http://www.blacksea-commission.org/_table-legal-docs.asp), which substantiates the procedures and obligations of contracting parties during emergency situations.

[2] The strategic importance of the Black Sea region as a production and transmission area for diversification and security of energy supply for the EU is mentioned in an EU parliament resolution of 17th of January 2008, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ: C:2009:041:0064:01: EN: HTML (EU-2008, 2008). The latter calls on the Council and the Commission to urgently consider increasing their practical support for infrastructure projects of strategic importance; reiterates its support for the creation of new infrastructure and viable transport corridors diversifying both suppliers and routes, such as the trans-Caspian/trans-Black Sea energy corridor and the Nabucco, Constanța-Trieste and AMBO pipelines, as well as other planned gas and oil transit projects crossing the Black Sea and the Inogate (Interstate Oil and Gas Transport to Europe) and Traceca (Transport Corridor Europe — Caucasus — Asia) projects connecting the Black Sea and Caspian Sea regions; calls for social and environmental impact assessments to analyse the impact of the construction of such new transit infrastructures. The EU parliament resolution of 13th of December 2007 directly refers to the Kerch accident and calls on the Council and the European Commission to monitor closely the situation.

tion from 13th of December 2007 (http://eur-lex.europa.eu/) the key role that Black Sea regional organisations, in particular the Organisation for Black Sea Economic Cooperation (BSEC), can play in ensuring better management of and cooperation in seafaring on the Black Sea. In 2009 the EC provided substantial financial assistance to the Black Sea region to enable the coastal states to better prevent and respond to operational, accidental and illegal oil pollution. This financial assistance is managed by the BSC, the regional focal point in environment protection, in the frames of the MONINFO project mentioned above. In line with the main goals of the MONINFO project, the Kerch accident was analysed (as an event which happened as a consequence of natural disaster and human mistakes), contributing to clarifying the level of regional preparedness to accidents and efficiency of response to oil spills in the Black Sea region.

We hope this book will be equally interesting to professionals and non-professionals. It is a mixture of scientific and administrative approaches to the retelling and analysis of the events around the Kerch catastrophe of 11th of November 2007.

The ultimate purpose was to learn from the accident, to not let it slip into history without drawing and conveying the lessons learnt in as wide a context as possible. For instance, during the past 50 years, more than 10 accidents on a scale much larger than the Kerch Strait disaster have occurred in the Black Sea and its straits. We are fairly sure that only a few people remember them and about their disastrous effects. The book you hold in your hands is the first one to remind the people in the Black Sea region that accidents still happen too often in the Pontus Euxinus[3], to tell the story of one of them in detail, and to reiterate the need to better understand the sea's hospitality or hostility, to cherish both and use them without conflict and risking human life.

The Balaklava storm in November 1854 is quoted as one of the most disastrous storms that ever happened in the Black Sea and numerous ships of the Turkish-Anglo-French navy were in distress (for more details see Chapter 3 of the book). It has a great similarity with the Kerch storm. Consequent disasters you can better visualize and understand through the numerous photos provided in this book. The authors of the book (you will find their names in the beginning of the different chapters) wrote it with great love and true devotion to the protection of the Black Sea and with the sincere wish to further contribute to the increased security in the region.

The editors and their colleagues spent many months in order to produce a well compiled text and high quality figures and photos. Although conducting an evaluation of a maritime accident can seem like a daunting task, we relished very much the process. The analyses of the Kerch catastrophe highlighted successes and failures; we do believe the insight and clarity gained on the basis of this case-study will become incentives to further improvements of maritime safety in the Black Sea region.

Enjoy reading!
Dr. Violeta Velikova

[3] Pontus Euxinus means 'hospitable sea', the name given by the ancient Greeks to the Black Sea, though initially they called it Pontus Axenos (inhospitable sea).

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Dr. Yuriy Ilyin

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This Kerch book reflects an enormous group effort. We are obliged to the interest encouragement and inspiration of many people who supported us from the very beginning and made this book possible. This most comprehensive compilation of materials available on the Kerch accident appeared thanks not so much to the financial assistance provided for the process, as divided in between the numerous authors and contributors it became a minor incentive. The book was born because many people in the Black Sea region became excited about such a publication, and worked with devotion hard to make it happen. We have been also fortunate to have significant feedback on the drafts from highly qualified specialists, which helped us to improve the book before its finalization.

We have been also fortunate to have significant feedback on the drafts of the book from highly qualified specialists, who helped us to improve the manuscript before its finalization. Officials from Russian Federation and Ukraine Ministries, experts from maritime administrations and other organizations working in the field of management of safety aspects of shipping or environment protection, in general, and more than 80 prominent scientists studying the Black Sea ecosystem have contributed to the Kerch book.

Each chapter has been developed and then more than ten times redrafted with the participation of dozens of experts from different organizations. We would like to acknowledge the contribution of a number of individuals, who participated not only in the writing and revising of the book, but also to provision of materials, organization of cruises for collection of data/information, who commented constructively on the book or helped to illustrate it attractively.

We thankfully value the support of the AzNIIRKH Director Dr. S.Agapov, who provided all the materials of the Institute collected in November 2007–2008 in the Kerch area, where 42 scientists worked hard to summarize the findings of the complex monitoring conducted after the Kerch accident in comparison with previous long-term investigations. Gratitude to Prof. Mikhail Flint (SIO RAS, Deputy Director), Acad. Valeriy Eremeev (IBSS Director), Acad. Vitaliy Ivanov (MHI Director), Mr. Viktor Borulko (UkrSCES Ex. Director), Prof. Evgeny Gubanov (YugNIRO Director), and their scientific and technical staff who organized a number of very important cruises in 2007–2009 to monitor the effect of the Kerch accident and greatly contributed to the post-disaster assessments. We are grateful to Dr. B. Trotsenko (YugNIRO, Kerch) and Dr. A. Boltachev (IBSS, Sevastopol) for sharing with us important reports and publications on the investigations organized by their institutes in the Kerch area — prior and after the accident. Many thanks go to the Directors of the State Oceanographic Institute Mr. Vladymyr Komchatov (Moscow), the Kuban Estuarine Hydrometeorological Station Mr. Alexey Ivanov (Temruk), the Special Center on Hydrometeorology and Environmental Monitoring of the Black and Azov Seas Mr. Oleg Lusak (Sochi) for providing valuable information and raw data from the long-term monitoring of Hydrometorological Services of Russia and Ukraine. The contribution of Mr. Ivan Samsonov and Mr. Akram Nasurov from the Russian «Black Sea-Azov Directorate for Technical Control on the Sea» of Rosprirodnadzor, and of Ms. Natalia Kutaeva from the Federal Agency of Sea and River Transport of the Ministry of Transport of the Russian Federation is kindly acknowledged and highly appreciated. Many thanks to all of you for your valuable support.

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The opinions expressed are those of the authors supported by the editors. Any errors or omissions are responsibility of the editors and should be reported to them accordingly.

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a) Fragment of Radarsat-1 image acquired at 03:45 UTC (© CSA, R&DC «ScanEx», 2007); (top)

b) Fragment of TerraSAR-X image acquired at 03:52 UTC, resolution 3 m (© InfoTerra 2007); (right)

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b) Landsat ETM+ image (20×20 km) 26.06.2008, 08:09 UTC, total slick length was 8 km.

c) Landsat ETM+ image (20×20 km) 12.07.2008, 08:09 UTC, total slick length was 8 km.

d) Envisat ASAR (30×30 km) 18.07.0819:25 UTC (©ESA 2008), total slick length was 20 km.

e) Envisat ASAR image (30×20 km) 16.08.0807:54 UTC (©ESA 2008), showing oil slicks along the route of transportation of the wrecked oil tanker bow part. Oil slick was stretching from the Tuzla Island to the port of Caucasus. Some residual oil films were detected at the accident site.

Fig. 6.4.3. Envisat ASAR acquired on 8 June 2009, at 07:50:44:

1 — oil/wastewater spill from a moving ship on ship route to the Kerch Strait;

2, 3 — oil/wastewater spills from ships at anchorage sites;

4 — algae bloom.

Fig. 7.2.1a. Sulfur concentration (mg/g) of the Kerch Strait bottom sediments in summer 2008.

Fig. 7.2.1b. Sulfur concentration (mg/g) of the Kerch Strait bottom sediments in November 2008.

Fig. 7.2.1c. Sulfur concentration (mg/g) of the Kerch Strait bottom sediments in December 2008.

Fig. 7.2.1d. Sulfur concentration (mg/g) in bottom sediments in December 2008.

Fig. 7.2.2a. The total chlorinated pesticides concentration (ng/l) in the Kerch Strait surface waters on 6–9 December 2007. The station numbers (see also Fig. 6.1.7a) are given at axis x.

Fig. 7.2.2b. PCBs concentrations (ng/l) in the Kerch Strait surface waters on 6–9 December 2007. The station numbers (see also Fig. 6.1.7a) are given at axis x.

Fig. 7.2.2c. Distribution of PCBs (ng/l) in the Kerch Strait surface waters in December 2007 (white) and in March 2008 (grey).

Fig. 7.2.2d. PCBs (ng/g) total concentration per station in the Kerch Strait bottom sediments on 6–9 December 2007.

Fig. 7.2.2e. Various trace metals (μg/g) spatial distribution in the Kerch Strait bottom sediments in March 2007.

Fig. 7.2.2f. Strontium (μg/g) distribution in the Kerch Strait bottom sediments in March 2008.

Fig. 7.2.3a. Average concentration of chlorinated pesticides in the bottom sediments of the Kerch Strait in 2009.

Fig. 7.2.3b. Average concentration of sums DDT and HCH in the bottom sediments of the Kerch Strait in 2009.

Fig. 7.2.3c. Average concentrations of total PCBs in the bottom sediments of the Kerch Strait in 2009.

Fig. 7.2.3d. Trace metals concentration in the surface waters of the Kerch Strait in 2009.

Fig. 7.2.3e. Trace metals concentration in the bottom sediments of the Kerch Strait in 2009.

Fig. 7.2.4a. The PCBs congeners total concentration in the Kerch Strait surface waters in December 2007.

Fig. 7.2.4b. The sampling sites location and distribution of total PCBs (white bars) and total DDTs (grey bars) in the Kerch Strait bottom sediments in December 2009.

Fig. 7.2.4c, d. The ^{137}Cs and ^{90}Sr activities in the Kerch Strait bottom sediments in December 2007.

Fig. 7.3a. The IWP distribution at the surface (left) and in the bottom (right) layers on 31 August 2008.

aFig. 8.1a. Abundance of petroleum oxidizing bacteria in the Kerch Strait water at surface with the Azov and Black Sea adjacent water basins, November–December 2007 (Korpakova I. G., Agapov S. A., 2008).

Fig.8.1b. Abundance of petroleum oxidizing bacteria in the Kerch Strait bottom sediments with the Azov and Black Sea adjacent water basins, November–December 2007 (Korpakova I. G., Agapov S. A., 2008).

Fig. 8.4a. The Cluster and MDS (Multidimensional Scaling) analysis of benthic communities similarities detected at the Kerch Strait stations in December 2007.

Fig. 8.4b. Scheme of the bottom sediments visual diving survey and sample collecting conducted in the Kerch Strait on 13–25 August 2008.

Fig. 8.4c. Scheme of oil expansion resulting from the 11 November 2007 oil spill accident in line with results of the Kerch Strait aerial survey conducted on 11–16 November 2007 (Matishov G. G., 2008). Periods: in green — 11–13 November, in yellow — 14 November, in red — 15 November and in pink — 16 November.

Fig. 8.5a. The bottom ecosystem scheme and the spring visual observation scheme of the storm drains pollution (graded, marked by crosses).

Fig 8.7a. Distribution of 1 year-old golden mullet (th. ind/km^2) in October 2007 in the Sea of Azov (after Korpakova I. G., Agapov S. A., 2008).

ACRONYMS

AMS — Aviation Meteorological Station

AzNIIRKH — Azov Scientific Institute for Fishery, Rostov-on-Don, Russia

BSC — Commission for the Protection of the Black Sea Against Pollution (Black Sea Commission, www.blacksea-commission.org)

BSC PS — Black Sea Commission Permanent Secretariat

BSIMAP — Black Sea Integrated Monitoring Program

ChAD — «Black Sea-Azov Directorate for Technical Control on the Sea» of Rosprirodnadzor, Novorossiysk, Russia

DL — Detection Limit

DSRUTO — Department for Safe and Rescue Measures, and Boat Lifting Underwater Technical Operations, Novorossiysk, Russia

ESAS AG — Environmental Safety Aspects of Shipping Advisory Group of the BSC

HMS — Hydrometeorological Station

IBSS — Institute of Biology of the Southern Seas of National Academy of Sciences of Ukraine (NASU), Sevastopol, Ukraine

IKI RAS — Space Research Institute of Russian Academy of Sciences, Moscow, Russia

EHMSK — Estuarine Hydrometeorological Station «Kuban» (former Kuban Estuarine Station) of the State Department «Krasnodar Center of Hydrometeorological Service» of Roshydromet, Temruk, Russia

MAC — Maximum Allowed Concentration of pollutants in water

MB UHMI — Marine Branch of Ukrainian Hydrometeorological Institute, Sevastopol, Ukraine

MHI — Marine Hydrophysical Institute of National Academy of Sciences of Ukraine (NASU), Sevastopol, Ukraine

MNR — Ministry of Natural Resources of Russian Federation

PC — Permissible Concentration of pollutants in bottom sediments

UkrSCES — Ukrainian Scientific Center of Ecology of the Sea, Ministry of the Environment Protection, Odessa, Ukraine

SCHME BAS — Special Center on Hydrometeorology and Environmental Monitoring of the Black and Azov Seas of North-Caucasian Regional Division of Roshydromet, Sochi, Russia

SIO RAS — P.P. Shirshov Institute of Oceanology of Russian Academy of Sciences, Moscow, Russia

SB SIO RAS — Southern Branch of P.P. Shirshov Institute of Oceanology of Russian Academy of Sciences, Gelendzhik, Russia

SOI — State Oceanographic Institute, Moscow, Russia

SSC RAS — South Scientific Center of Russian Academy of Sciences, Rostov-on-Don, Russia

SST — sea surface temperature

SSS — sea surface salinity

UNEP — United Nations Environment Programme

TACIS — Technical Assistance for the Commonwealth of Independent States, a programme implemented by European Commission

YugNIRO — Southern Scientific Research Institute of Marine Fisheries and Oceanography, Kerch, Ukraine

Table 1. Russian and English Geographical names

Крым	**Crimea**	**Тамань**	**Taman**
Ак-Бурун мыс	Ak-Burun Cape	Азовское море	Azov Sea
Арабатский залив	Arabatskaya Bay	Архипо-Осиповка пос.	Arkhipo-Osipovka village
Аршинцевская коса	Arshintsev Spit	Ахиллеон мыс	Ahilleon Cape
Аршинцево город	Arshintsevo town	Береговой поселок	Beregovoy village
Белый мыс	White Cape	Волна поселок	Volna village
Героевское поселок	Geroevskoe village	Динский залив	Dinsky Bay
Еникале мыс	Enikale Cape	Должанская станица	Doljanskaya tinu village
Жуковка поселок	Zhukovka	Ейск город	Eiysk town
Заветное поселок	Zavetnoe village	Железный Рог мыс	Iron Horn Cape
Змеиный мыс	Snake Cape	Ильич поселок	Ilyich village
Казантип мыс	Cazantip Cape	Кавказ порт	Caucasus port
Казантип бухта	Cazantip Bay	Кучугуры поселок	Cuchuguru village
Камыш-Бурун мыс	Camush-Burun Cape	Панагия мыс	Panagia Cape
Камыш-Бурун бухта	Camush-Burun Bight	Приазовский поселок	Priazovsky village
Капканы поселок	Capkanu village	Приморский поселок	Primorsky village
Каркинитский залив	Karkinitsky Bay	Сенной поселок	Sennoy village
Керчь бухта	Kerch Bight (KB)	Тамань город (станица)	Taman town (village)
Керчь город	Kerch city	Таманский п-ов	Taman Peninsula
Керченский пролив	Kerch Strait (KS)	Таманский залив	Taman Bay
Крым порт	Crimea port	Темрюкский залив	Temruk Bay
Курортное поселок	Curortnoe village	Темрюк порт	Temruk harbour
Малый мыс	Malyi Cape	Тузла остров	Tuzla Island (TI)
Набережное поселок	Nabereznoe village	Тузла коса	Tuzla Spit (TS)
Опасное поселок	Opasnoe village	Тузла мыс	Tuzla Cape
Павловский мыс	Pavlovsky Cape	Цемесская бухта	Cemes Bay
Подмаячный поселок	Podmayachnuy village	Чушка коса	Chushka Spit (ChS)
Сипягино поселок	Sipyagino village		
Такиль мыс	Takil Cape		
Фонарь мыс	Light Cape		
Хрони мыс	Hrony Cape		
Церковная банка	Zerkovnaya bank		
Черное море	Black Sea		

INTRODUCTION

On 10 and 11 November 2007 a strong storm hit the Kerch Strait located between Ukraine in the West and Russia in the East (Fig.1), and linking the Sea of Azov with the Black Sea. Extremely severe conditions totaling 9 hours lasted from 5:00 AM till 2:00 PM on 11 November. Winds exceeding 30 m/sec produced the over 4 meter-high waves in the waters where the depth varied from 7 to 12 meters only.

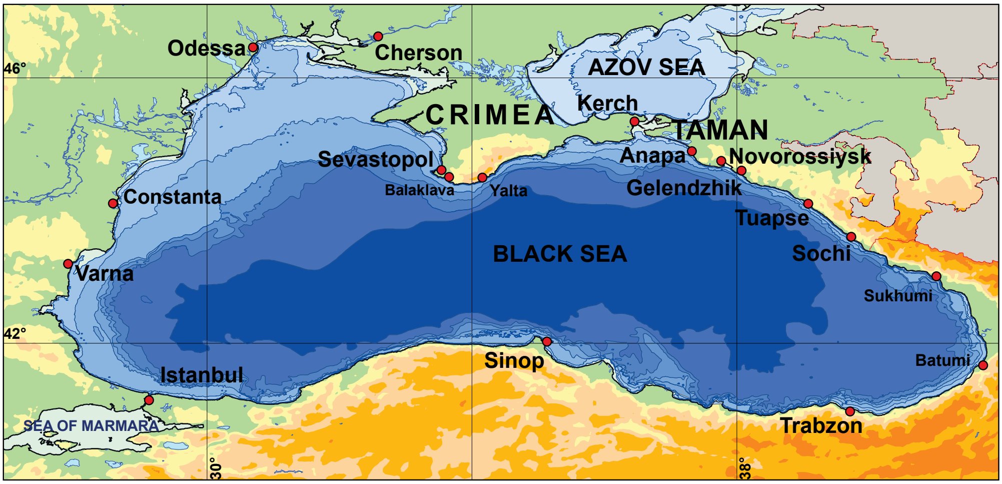

Fig. 1. The Black Sea and main ports

During the storm, 167 boats were on the strait and in its vicinity, while most of them were anchored. No doubt, that the weather conditions experienced by the region at that moment were most unusual and largely unexpected, and, on top of it, a number of vessels had ignored Ukrainian and Russian strong weather warnings and found themselves in the extreme and dangerous sea conditions. Besides, the vessels were mostly poorly equipped[1] for a stormy weather and could not cope with the waves exceeding 2–2.5 meters.

As a result, the gravest mass accident and boat loss for the whole post-Second World War history occurred on the Kerch Strait. Several persons died or went missing despite of the most efficient SAR (Search and Rescue) effort immediately organized.

The vessels that were at the Southern end of the strait within the zone of the raid load-unload regions[2] were caught in an extremely difficult situation. The waves reaching

[1] Note: At the Russian Port Caucasus on the Strait of Kerch, the Taman Handling Complex — a new floating oil-chemical port — was built to handle the petroleum products, sulfur and fertilizers transshipments from small to bigger boats. The small boats were 'river-sea' type, and could not withstand a high-waves sea. Therefore those boats were not supposed to enter the sea. With its shallow water, high winds, lack of natural shelter for the boats and the rapid formation of water spouts possibilities, the Kerch Strait was an unsafe place where accidents were likely to happen. In addition, most of the boats were old, for instance the *Volgoneft-139* tanker was built in 1978, *Nahichevan* — in 1966, *Volnogorsk* — in 1965, and *Kovel* — in 1957.

[2] Transshipment areas (Fig. 2) are located in the in shallow waters of the Kerch Strait Southern part without a natural shelter from storms. When ships lie at anchor in the Southern area of the Kerch Strait, as well as at the berth with the coordinates 45°06'N, 36°33'E, they are positioned about 15 miles away from the place of refuge (the Northern area of the Kerch Strait which is well protected from the Southern waves by the Tuzla Island and Chushka Spit, being considered as the place of refuge). The berths in the Southern area of the Kerch Strait do not provide protection from the waves coming from the hazardous Southern directions especially.

5.4 m height and arriving from the Black Sea were taking tankers and dry-cargo carriers away from their anchors to wash them aground at the Kerch and Taman Peninsulas. In total, thirteen boats[3] suffered an accident as a result of the storm, and of them four dry-cargo carriers and one tanker sank[4] (Fig. 2).

Photo: The storm on 11th of November, 2007, http://englishrussia.com/index.php/2007/11/13/storm-hdr/

Photo: The high waves nearby Novorossiysk on 11th November 2007, by *Alexander Kuznetsov.*

The SAR (search and rescue) operations were unique, dangerous and difficult due to the gale wind up to 35 m/s and heavy waves. Russian and Ukrainian SAR units were engaged in real self-denial operations. Helicopters could not take part in rescuing people due to the stormy weather conditions. Despite of all, 35 crewmembers

[3] Three dry cargo ships sank in the Kerch Strait — *Volnogorsk*, *Nahichevan*, *Kovel* (Russian flag); the *Hach Ismail* sea-going dry cargo ship (Georgian flag, Syrian crew) sunk near Sevastopol and 15 persons went missing. Six vessels stranded — the *Vera Voloshina* dry cargo ship (Ukrainian flag) — near the Sudak village off the Meganom Cape in Crimea, after stranding, the ship's hull broke in two, but the crew did not suffer; the *Ziya Koc* sea-going dry cargo ship (Turkish flag, Turkish crew) and *Captain Ismael* (Georgian flag, Syrian crew) — in Novorossiysk, the *Dika* and *Dimetra* barge vessels (Russian flag) — in the Kerch Strait, the *Sevastopolets-2* ship crane (Russian flag) — South-East of the Kerch Strait; two ships were damaged (the *BT-3754* barge and the *Volgoneft-123* tanker ship with a crack in her hull (Russian flag) — in the Kerch Strait. The *Volgoneft-139* tanker (Russian flag) ship-wrecking in the Kerch Strait is described in more detail in Chapter 4.5

[4] Later, Mr. Valentin Pilipenko, the ex-Captain of the Port of Kerch listed the reasons for the Kerch accident as follow: lack of preparedness of the 'river-sea' boats captains to sail in marine areas, especially at the high-waves sea; lack of experience in using the life-saving equipment; poor communication (none of the vessels in distress could give a signal SOS prescribed by the international documents, attempts to use life rafts and evacuate the sailors were unsuccessful, two of the boats were lost of contact, i. e., *Volnogorsk* and *Nahichevan,* and information about their fate came from nearby vessels. And the last but not least: in pursuit of profit the vessels owners often restricted their captains to act in accordance with legal documents violating by this the established rules.

Photo: Berths and a queue of ships at anchorage in the southern part of the Kerch Strait (Booklet, 2009).

from four ships had been salvaged and hospitalized. Eight people from the sunken vessel *Nahichevan* did not survive — four sailors were found dead on shore two days later, four went missing.

Photo: The *Sevastopolets* floating crane in the Kerch Strait, the *Captain Ismael* dry cargo ship stranded in Novorossiysk, the *Vera Voloshina* cargo ship aground in Crimea and *Ziya Koc* dry cargo ship in Novorossiysk, photo re-drawn from Booklet, 2009, and by *Alexander Kuznetsov*.

The *Vologoneft-139* motor tanker and the *Volnogorsk*, *Nahichevan* and *Kovel* dry-cargo motor vessels anchored in the Kerch Strait were virtually torn apart by the storm. The *Volgoneft-139* boat broke into-two and its bow sank in vicinity of the main ship channel of the Strait at the 10 m depth. The stern section drifted by wind to north and touch the ground at 45º15'5 N and 36º31'8 E. From this tanker leaked about 1300 tons of heavy fuel[5], and it happened approximately five km to the West from the Tuzla Spit (Fig. 2). An immediate attempt to prevent oil from leaking from the wreck by using

[5] Note: The Russian Federation and Ukraine have not adopted officially the Black Sea Regional Contingency Plan, though the Plan was recognized as fully operational during a number of Black Sea regional exercises aimed to enhance the oil spill preparedness and response of the Black Sea coastal states (DELTA Exercises — SULH 2007, RODELTA 2009, see BSC Newsletters N 10 — http://www. blacksea-commission. org/_publ-Newsletter10. asp#1; and N 12 — http://www. blacksea-commission. org/_publ-Newsletter12. asp#a2). Russian Federation plans to adopt the RCP in 2011. Ukraine is not yet ready.

booms appeared to be unsuccessful due to the currents prevailing on the Strait. Shortly afterwards, the spill hit the coasts of Russia and later of Ukraine. Large amounts of heavy fuel oil mixed with algae covered the shore trapping and killing thousands of birds.

The other motor vessels of *Volnogorsk* (loaded with 2437 t of granulated sulfur), *Nahichevan* (2366 t) and *Kovel* (1923 t) did not sink immediately, but drifted towards the coast of Ukraine to the South from the Tuzla Island. It was later reported that the sulfur granulates discharged to the sea floor had been leaked from the *Kovel* motor vessel. The m/v *Volnogorsk* sank at 45º11'6 N and 36º31'8 E at the depth of 11 m. All the crewmembers (8 persons) left on the life raft. The *Neptunia* sea tug (Ukraine flagged) was sent to the life raft. The *Nahichevan* motor vessel sank at 45º12'0 N and 36º33'3 E; *Kovel* sank at 45º09'1 N and 36º26'6 E (Fig. 2).

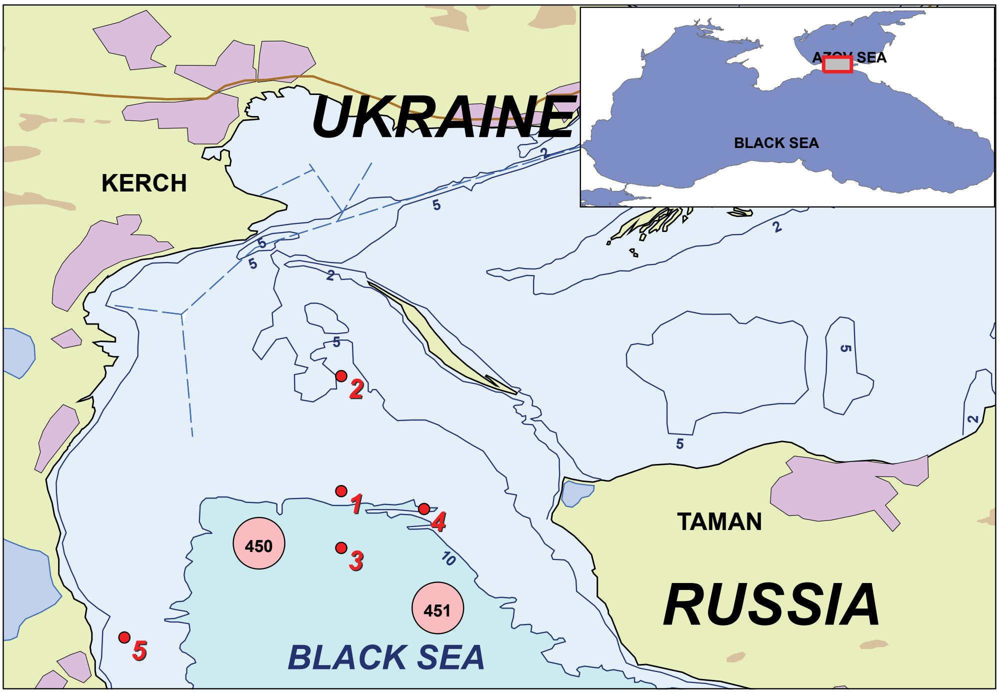

Fig. 2. Map of the areas where the ships sank in the Kerch Strait on 11 November 2007: the *Volgoneft-139* tanker bow (point 1) and stern (point 2; 45º15'5 N and 36º31'8 E), *Volnogorsk* (3; 45º11'6 N and 36º31'8 E), *Nahichevan* (4; 45º12'0 N and 36º33'3 E) and *Kovel* (5; 45º09'1 N and 36º26'6 E). Transshipment areas Nos 450 and 451 are marked in red.

When the Captain of the Kerch Port, Mr. Valentin Pilipenko got informed about the fate of *Volgoneft-139* and *Volgoneft-123*, he immediately decided to evacuate all vessels in distress to the Northern part of the Kerch Strait. In this unique operation, under limited visibility and stormy wind (up to 35 m/s), 47 vessels were successfully navigated to a safer place passing the Strait.

Initially, the Black Sea Regional Contingency Plan (www.blacksea-commission.org) was not activated. Russia and Ukraine did not ask for international assistance to tackle the oil pollution accident and planned to cope with the disaster by means of their own oil spill response reserves. However, many international organizations volunteered to render a help, while many people around the world got truly worried about the potential aftereffects of the Kerch accident and were ready to go to Russia or Ukraine to participate in the wild-life rescue effort and on-coast cleaning operations. As of 17 November 2007, hundreds of workers from the Ukrainian and Russian Ministries of Emergencies, civilian volunteers and representatives of international organizations were involved in the shoreline clean-up and rescue operations.


Photo: November 12, 2007, oil patches on the Tuzla Spit, http://www.flickr.com/photos/.


Photos: A birds stained with fuel oil sits at the shore near Russia's port Caucasus (published by Reuters: Mr. *Alexander Natruskin*), photo of *Igor Golubenkov* (NGO: Saving Taman, http://www.flickr.com/photos/).


Photo: Techniques were used for the clean-up operations on the coast, by *Igor Golubenkov* (NGO: Saving Taman), November 12, 2007, on Tuzla Spit, http://www.flickr.com/photos/.

Regardless of that effort, the accident became considered as an ecological catastrophe, one of the worst in the region and the gravest since the early 1990s (when a tragic accident of the *M/T Nassia* tanker happened on 13 March 1994: see http://www.cedre.fr/). Despite of all the sea and land response operations carried out to halt the oil pollu-

Photo: Military forces and volunteers engaged in clean-up operations on the coast, by *Igor Golubenkov* (NGO: Saving Taman), November 12, 2007, on Tuzla Spit, http://www.flickr.com/photos/.

tion, the expectations emerged that the consequences of the accident would be felt for several years on — environmentally and socio-economically. A number of public institutions and agencies jointly with commercial companies got engaged in determining the damage inflicted on the ecosystems. Their produced figures and numbers were enormous and varied by more than three orders of magnitude to range from tens of millions to hundreds of billion roubles, while Ukraine was initially about to claim billions of USD from Russia in compensation for its sustained damage.

Many central TV and radio channels presenters kept informing the public in their news blocks about the rescue efforts and measures taken to reduce the sustained damage. Newspapers kept reporting conflicting figures and forecasts, and some of them were expecting the oil slick to reach the coasts of other Black Sea states as well by means of the currents.

It became both necessary and apparent to determine as soon as possible potential ways of spreading of the oil and sulfur discharged into the sea, as well as the actual and potential impact of these hazardous substances on the ecosystem conditions in the region of the Strait and adjacent water space both at the time straight after the accident, and for a longer-term period. A number of organizations from different agencies both in Russia and Ukraine in the course of the first several days following the accident had managed to carry out an initial oil-fuel spread assessment. Further on, during 2008–2009 numerous scientific institutes conducted complex observations in the Kerch Strait and adjacent water space of the Black and Azov Seas to assess the state of the environment and impact of the Kerch accident. In carrying out the environmental analyses and economic assessment the EC and UNEP participated as well.

The Kerch accident became the most studied oil spill event in the world — numerous inspection trips on coast and at-sea and more than 60 complex cruises were organized, and millions were spent for the post-disaster needs assessment. Numerous papers, brochures and books were published, and certain are still planned for publication in Russian and Ukrainian. Herewith, we would rather analyze and summarize vast volumes of published and unpublished data, and information materials compiled during more than two years after the accident that have consolidated the view points of different Russian and Ukrainian public and academic authorities, why the Kerch disaster happened, as well as about its impact and lessons learnt.

The present monograph carries information and data about the sequence of events, contingency plans activated for the post-accident response to include the cleanup operations and remediation activities, emergency phase monitoring as well as numerous complex ecological observations carried out afterwards during the period of 14 November 2007—December 2009. As well, it describes meteorological conditions prevalent within duration of the extreme storm, characteristics of the wind waves and sea currents predominant at the time of the accident, pollution-zone parameters received through mathematical simulations jointly with aerial and visual observations, results of the satellite surveys over the surface waters and coasts pollution extent within the accident area, and the operational monitoring data on the land and the sea. Analysis of pollution dynamics in the Kerch Strait and its adjacent sea space for the two years that have passed since the time of the accident (water, bottom sediment and biota in November 2007–December 2009) is presented. A detailed complex assessment of the Kerch catastrophe magnitude and its impact on the coast and marine environment is included also. So far, the monograph remains the most complete compilation of available materials and data collected in the Black Sea region after the accident. How accidental was this disaster, which has had such a negative effect on the recreational image of the northern Black Sea coast? Who is to blame for the wrecks — the traffic controllers, the owner of the ship or the charter party? What is the level of oil spill pollution preparedness and prevention in the Black Sea region? The book answers all these questions and many others.

Summing up their research results, the authors consider the experience received in the course of assessment of an emergency situation produced by the Kerch Strait accident. Also, lessons learnt during and after the Kerch disaster would contribute to enhancing the shipping safety standards, building stronger prevention and preparedness effort in the Black Sea region in case of an oil pollution accident and improve regional cooperation in emergency situations at the sea.