THE TURKISH STRAITS

MARITIME SAFETY,

LEGAL AND ENVIRONMENTAL ASPECTS

Edited by
Nilüfer ORAL and Bayram ÖZTÜRK

TURKISH MARINE RESEARCH FOUNDATION

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FOREWORD

This year marks the seventieth anniversary of the Montreux Convention Regarding the Straits, signed the 20th of July, 1936. The Montreux Convention is a historically important treaty for a number of reasons, but one that has become less known with the passage of seven decades is that the Montreux Treaty was an expression of the young Turkish Republic's adherence to the *rule of law* and international comity, at a time when other states did. And it is because of Turkish respect for the rule of law and international comity, its careful implementation of the Treaty, that the Montreux Convention has maintained its credibility as one of the oldest continuing international agreements and its importance for maintaining regional stability, even during the most challenging times.

Nonetheless, since 1936 international shipping throughout the world has grown, and likewise the Turkish Straits witnessed annual traffic increase from 4500 vessels a year to nearly 55,000 vessels a year. This increase in traffic brought greater risk of accidents, and by the 1980s the rate of collisions in the Straits had reached alarming levels. Turkey, as the sole coastal and sovereign State for the Straits had an obligation to its own citizens as well to international shipping to take measures to provide for safety of navigation and protection of the marine environment. Within the letter and spirit of the Montreux Convention, respecting the rule of law and international comity, and with the support of the International Maritime Organization, Turkey succeeded in taking a number of measures that have greatly contributed to reducing the number of collisions and accidents in these vital waterways for international commerce.

The Turkish Straits have been and continue to be one of the most important waterways in the world. For centuries it has served as the economic lifeline for the Black Sea region and has been the soul of Istanbul, a UNESCO cultural heritage city. This book provides the reader with an overview of the central issues of importance for the Straits: environmental, navigational, historical and legal subjects have been addressed by the top experts in their respective fields. This book was specially prepared for the historic occasion of the first meeting of the IMO Maritime Safety Committee meeting outside of London. It is a great honor for Turkey that the IMO, representing 166 governments, selected Istanbul, a city connecting two continents, as the venue for the 82 nd MSC meeting, and a personal honor to write the foreword to this important book on a very important waterway.

H. E. Binali YILDIRIM

Minister of Transportation and Communication

LEGAL ASPECTS

THE HISTORY OF REGULATIONS REGARDING PASSAGE RIGHTS THROUGH THE STRAIT OF ISTANBUL DURING THE OTTOMAN EMPIRE ERA

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Historically, empires that exercised control over the Turkish Straits eventually sought dominance over the Black Sea. This included the Byzantine and Ottoman Empires, both having accomplished this. For example, the main aim of the Ottoman Sultan, Yıldırım Bayezid, in constructing the Gelibolu Dockyard in 1390 was to take control of the Strait of Istanbul (Bosphorus) and the Strait of Çanakkale (Dardanelles), and thus keep the sea routes leading to Istanbul and the Black Sea under his dominance. In order to fulfill his ambition he introduced a system of ship inspection for ships seeking passage through the Istanbul Strait, denying permission of passage when he deemed it to be appropriate. Furthermore, Beyazid's intention to conquer Istanbul was demonstrated by his decision to construct the Anatolian Fortification (Anadolu Hisarı). Less than a century later, Mehmed the Conqueror would construct the Rumeli Fortification (Rumeli Hisarı) as a prelude to his historical conquest of Istanbul. This was to give the Ottomans dominance over both sides of the Istanbul Strait. After the conquest of Istanbul, they then directed their attention towards the Black Sea. From then on, the right of passage through the Istanbul Strait was to be subject to the permission of the Ottoman Empire. Nonetheless, as the colonies of Venice and Genoa still existed at the time, vessels flying their respective flags were allowed passage into the Black Sea through the Istanbul Strait for a period of time; but once the Ottoman Empire succeeded in subjecting all of the Black Sea under its control following the capture of Kili and Akkirman (1484) during the reign of Bayezid II, the Ottoman Empire prohibited the passage of all foreign flagged vessels into the Black Sea. Consequently, completely isolated from foreign trade during the XVI th Century, the Black Sea became an inland sea and preserved this status until the signing of the Küçük Kaynarca Treaty in 1774. (1)

At the beginning of the XVIII th Century the Ottomans refused passage rights to all foreign flagged vessels through the Istanbul Strait into the Black Sea, including merchant vessels, thereby preventing any foreign power access to the sea. Thus, as explained in the letter which was written in the name of Sultan Mustafa II, but sent after his deposition by his successor Ahmed III (2):

The Black Sea is under the sole control and authority of no other country but myself and my agreement is such that not even one small boat shall be allowed to pass on to the Black Sea.

The passage regime of ships through the Istanbul Strait during the period of the Ottoman Empire can divided into four different periods:

The first period encompasses the time from the conquest of Istanbul in 1543 to the mid- XVI th century when the Black Sea was completely under Ottoman control and when foreign flagged ships were prohibited access into the sea.

The second period encompasses the time starting from the mid –XVI th century to the end of XVIII th Century when the Black Sea had the status of an inland Ottoman sea.

The third period encompasses the time following the signing of the Küçük Kaynarca Treaty in 1774, when Russian merchant vessels were granted permission to navigate in the Black Sea. During the early 1800s, other European States would also obtain similar rights.

In the fourth period, following the Crimean War, the Istanbul Strait maintained an international status that also applied to warships.

Each of the aforementioned periods was characterized with their own special procedures and conditions for passage.

The procedures and conditions for passage as applied during the first period started with Mehmed the Conqueror restoring the Anatolian Fortification (Anadolu Hisarı) and the construction of the Rumeli Fortification built directly across from the former during the conquest of Istanbul (1453). At that time many Italian city-states led by Venice and Genoa were using the Istanbul Strait and were trading along the Black Sea coast. However, once both coasts of the Istanbul Strait fell under the control of the Ottomans, as a condition of passage all non-Ottoman flagged vessels would have to first obtain a document called *izn-i sefine*. They were also required to lower their sails during passage, submit their cargo to inspection and pay a tax of 300 *akce selamiyye*. (3)

İzni sefine was a voyage permission given to ships that sought passage through the Dardanelles and the Bosphorus, similar to an order of passage (*yol hükmü*) and a passage license (*mürur tezkiresi*) given for highways. Starting from the mid XVI th century, including Venetian and Genoan ships, passage into the Black Sea was forbidden to all countries. (4).

The second period refers to the procedures and conditions that applied between the XVI th Century until the last quarter of the XVIII th Century when the Black Sea was an inland sea. The regulations were divided into two different categories: regulations that applied to Ottoman merchants traveling within the Ottoman territory, and regulations that applied when merchants traveled to Russian territory after Russia had captured ports along the Black Sea coast.

During the period when the Black Sea coast was completely under Ottoman control, in general, Ottoman merchants traveled to the Black Sea to obtain food and cereals. The main region where cereals were obtained in the Black Sea was the Danube basin and the hinterlands of the Rumeli and Anatolian coasts. This much needed cereal was transported to Istanbul by sea through the Istanbul Strait. In general, the sea merchants who traveled to the Black Sea can be divided into two groups: One was the *Kapan* merchant who transported the wheat needed in Istanbul and who worked under contract with the State, and the other one was the *entrepreneurial* merchant who worked independently.

Those ships that contracted with the Government to transport wheat from the Black Sea to Unkapanı (Istanbul), especially from parts of the Danube and its surroundings, were called *Unkapanı kapan-ı dakik* ships. These ships were different from the other ships and enjoyed more privileges than the others as they were given priority to ship their goods. So that they would not be kept waiting on their return, a list of these ships, as confirmed by the kapan, was given to *Kavak Ustası* who was on duty at the Anadolu Kavağı as the customs officer for the Istanbul Strait. Furthermore, these privileged ships were also allowed to carry a sign showing that they were a Kapan ship. For example in 1755, a total of one-hundred and twenty ships belonging to fifty-six merchants were allocated to transport wheat and barley from the Black Sea coast to Istanbul. The total tonnage was 7000 kile on average, which was equal to one hundred and seventy-five (175) tons. The independent merchants were also subject to the same regulations. For example, they had to fulfill certain conditions in order to pass through the Istanbul Strait. They were required to designate the port of shipment, the tonnage of their ship, the type and quantity of the cereals they were going to transport and, also guarantee that they would bring their goods directly to Istanbul and provide proof of a guarantor to confirm this. After preparing these documents they would go to the *kapan naibi* and he would submit the case to the *Kadi* (Judge) of Istanbul. After confirming the application, the Kadi of Istanbul would send it to the *Divan-ı Hümayun* (Ottoman Government) where a *firman* (decree) would be prepared addressing the kadis and other officers of the ports of shipment. At the port of shipment, the type and quantity of the cereals would be endorsed and confirmed on the back of the firman. On its way back to Istanbul, when the ship would pass by the fortifications in the Istanbul Strait, it would be stopped and inspected to ensure that all documents were in order and then an officer would accompany the ship to prevent it from going somewhere other than Unkapanı in Istanbul.

Towards the end of the XVIII th Century, when Russia captured the northern coasts of the Black Sea, the idea of doing free trade in that region was appreciated by the Ottoman merchants, especially by the Ottoman Greeks living on the islands in the Aegean Sea, who would volunteer for this work. What played the main role was the Russian desire to have trade conducted in their ports and to attract the Greeks in order to take control of them. The ship owners, who were interested in sea trade in the Ottoman Empire and wanted to trade with Russia, were required to obtain permission and submit to the conditions established by treaties in order to pass through the Istanbul Straits and sail to other foreign territories. These documents were called *İzn-i sefine* and exist today as a notebook series in the Prime Ministry Ottoman Archives. These documents, which included permissions of passage given to Muslim and non-Muslim Ottoman subjects, are very valuable for showing the condition of Ottoman sea transportation. From these izn-i sefine firmans, it is possible to learn the name and nationality of the captains, the type of ship, the number of the crew, whether they were Muslim or non-Muslim, the type of goods transported, the port from where they took these goods and their destination. The firmans, which granted passage rights the Black Sea, show that they were given for travel to Russian ports throughout the Black Sea.

Russia captured the fort of Azak in 1739, Taygan in 1769, and established the port cities of Kerson in 1778 and Odessa in 1794. After having invaded Crimea in 1783 Russia took possession of some important port cities in the northern coast of the Black Sea (6).

Permission to pass through the Istanbul Strait into the Black Sea for Ottoman ships flying the Ottoman flag was also subject to certain rules. Generally, the captain of the private ship chartered by the merchant – who was usually Russian or of another nationality- would submit a letter of request to the *Divan-ı Hümayun* (the Government office responsible for writing the agreements and firmans) asking for permission for passage. After the application for passage was found to be acceptable a passport would be issued from the Russian Embassy in Istanbul, recording the names of the captain and the crew. After these procedures were completed, under the supervision of the Istanbul customs controller, the crew was required to act as a guarantor for each other, and the captain for all, that they would return. The captain in turn had to find for himself a reliable guarantor who resided in Istanbul. The İzn-i sefine firman for passage was given to the captain upon the confirmation by the customs head officer that all necessary procedures had been completed. These firmans were addressed to the Istanbul customs chief officer, to the port chief officer (*liman nazırı*) who was responsible for the control of ships at Anadolu Kavağı, known as *Bahr-ı Siyah Kavağı* at the time, and to Kavak Ustası. When the ship arrived at Kavak, it was checked by the chief officer and the Kavak Ustası to make sure that there were no export – restricted goods or people other than the crew that had been recorded on the passport. These firmans were valid for one-time only and would have to be returned upon the ship's return, and be sent to the *Divan-ı Hümayun Kalemi* at the Sublime Porte.

In addition, the concern that its non-Muslim subjects would remain in Russia prompted the Ottoman Empire to introduce new conditions for the crew of merchant ships. Thus, as of 1794, the guaranty given by the captain was not sufficient by itself for crew members living on the Aegean Islands. In addition, they were required to bring a letter of bail sealed and written in Greek by the local communal leaders (*Kocabaşıs*) of the islands where they resided.

The duration for the completion of the procedures to obtain permission for the passage of ships differed. Where it was initially possible to obtain these documents within four to five days, eventually the conditions became more onerous with time and required more than fifteen days, which in turn led to complaints. Ships sailing to the Black Sea were required to return within three months at the latest. The procedures, which the ships were subject to on their return from the Black Sea, were also applied in accordance with the firmans. A customs officer would inspect the captain's passport in accordance with the firman granting permission of passage to determine if there was anyone missing from the crew. The ship would be released if the entire crew was present. The customs head officer would record this information related to the return and the date of return of the ship on the back of the passport, along with his signature, and then send the firman to the Divan-I Hümayun where it was to be kept. Should anyone have an accident during the voyage or, either the captain or the crew were to die, or the ship returned with fewer crew for any other reason, an investigation would be conducted and information taken from the guarantors.

Between the years 1781-1846, a total of 2420 Muslim merchant ships passed through the Istanbul Strait under these conditions for Russian ports in the Black Sea, and another 1764 non-Muslim merchant ships amounting to a total of 4184 Ottoman ships that sailed to Russian ports (7). However, it should be kept in mind that during the Ottoman-Russian wars all trade had completely stopped and as a result ships were not allowed to pass from the Istanbul Strait to the Black Sea, even for trading purposes. Taking this fact into consideration, we see that non-Muslims were banned from trading activities during the Ottoman-Russian wars between the years 1787-1792, 1806-1812, and during the Greek rebellion between the years 1821-1826. Although this restriction was later lifted, the State encouraged Muslim merchants rather than the Greek people, to sail to the Black Sea, which in turn resulted in an increase in the number of the Muslim merchants. Even though the State did not appreciate the employment of foreign people on Muslim ships, because of the lack of qualified Muslims, which allegedly caused delays and accidents, eventually non-Muslim guides, captains, sailors and boatmen were allowed to work as crew on Muslim merchant ships (8).

In giving merchants permission to go to Russia, the Ottoman Empire gave utmost importance to two points: First, was to prevent the export of banned goods such as, olive oil, soap, coffee, sulphur. The second, and the more important one, was to prevent non-Muslim subjects from remaining in Russia. During this period Russia did not have an adequate supply of qualified crew to sail its vessels. During the war that lasted from 1768 to 1774, Russia tried to attract non-Muslim Ottoman subjects who lived on the Aegean islands. Within a short period of time, the Greek residents of these islands made up the majority of the officers and privates in the Russian navy. In response, the Ottoman authorities made passage through the Istanbul Straits more difficult.

After the Küçük Kaynarca treaty was signed, Russia obtained the right of navigation in the Black Sea for its own ships; this procedure was applied to other countries as well. Thence, the third period of regulations for the passage through the Istanbul Strait began.

During this period, Russian merchants engaged in trade in the Black Sea in two ways: Beginning in 1743 and until the Küçük Kaynarca Treaty dated 1774; they could trade only by engaging Ottoman flagged ships. However, after 1774 they were allowed to navigate through the Istanbul Strait on Russian flagged ships. (9)

Among the Ottoman-Russian treaties signed during the XVIII th Century, the Küçük Kaynarca Treaty was the one to bring to an end the status of the Black Sea as a Turkish lake and make the Istanbul Strait an international matter of discussion. Subsequently, Austria, in 1783, France and England, in 1802, and later other small European countries gained the right of passage through the Istanbul Strait, allowing for direct trade with Russia.

Shortly after the Russians gained the right to trade on their own ships, as provided by article 11 of the Küçük Kaynarca Treaty, they then wanted to sailing rights in the Black Sea. These ships were allowed to sail into the Black Sea through the Istanbul Strait only after being inspected at the Rumeli Fortification (Rumeli Hisarı) to control for any banned export goods. But Russia wanted all of its ships to pass and made demands that their warships be disguised as unarmed commercial ships during the 1768-1774 war. However, the Ottomans refused this demand, which became a harsh point of discussion between the Russian ambassador and the Ottoman statesmen. In the end, Ottoman statesmen replied to the Russian ambassador by posing the question;

"If we take off a few cannons from the ships in our dockyard and send them loaded with merchandise to the ports of other countries can we claim the we were faithful to the agreement?" The Ottomans further advised that they could not fulfill the Russian request. Thence, the Aynalıkavak Tenkihnamesi (1779) and trade agreement (1783) were signed to make new trade arrangements with new conditions. Accordingly, the large Russian commercial ships could have a capacity of 16,000 kile (25 tons), and smaller ones could have a capacity of 100 kile (25 tons). They would be required to pay selamiyye tax of 300 akce to pass through the Istanbul Straits (10). Despite all these agreements, it was not easy for Russia, in practice, to pass through the Istanbul Straits and trade independently in the Black Sea. In particular, disputes about the goods transported had been an obstacle for the passage of the ships from time to time. Ottoman statesmen were not willing to allow the crops needed in Istanbul to be transported to other countries. According to agreements concluded, goods were allowed to be transported by Russia to other countries only if there was no need for them in the Ottoman Empire.

Thus, a total of 445 Russian trade ships had passed through the Istanbul Strait into the Black Sea between 1774 and 1787. Yet, when war erupted between the Ottoman Empire and Russia, trade ceased and the Ottomans prohibited the passage of all foreign ships through the Istanbul Strait. For example, trade completely stopped during the wars in the years between 1787-1792 and 1806-1812. Furthermore, after the wars ended the status quo was not to remain the same as before the war. The Greek rebellion which took place at the beginning of 1821 had affected trade and for that reason, passage into the Black Sea and the Mediterranean Sea was more strictly controlled. Some of the measures included reserving a room in the Kurşunlu Mahzen dockyard and appointing officers to strictly monitor the comings and going of ships. With the assistance of these officers foreign trade ships were inspected including their overall number, type, and ports of arrival and the destination of the goods they transported. Furthermore, they were inspected as to whether they carried any runaway subjects aboard and any banned export goods.

After Russia, Austria, France and England obtained the right of passage into the Black sea, other smaller European countries together with Spain, Sicily, Holland, Sweden and Prussia also applied to the Ottoman Administration (Babıali) to obtain similar rights of passage. Even though they were granted passage rights they were subject to special conditions, making it difficult to obtain permission (11). Among the conditions imposed on these countries was the requirement that they sell their goods at face value in Istanbul, if such goods were needed by the residents of Istanbul. Furthermore, their ships would be subject to inspection at the dockyard and they would not be allowed passage through the Istanbul Straits if banned export goods were found on board.

Free passage for all countries through the straits was made possible with the Edirne Peace Treaty, and thus, the Black Sea, which had been a "Turkish lake" and then a Russian-Ottoman Sea, gained international status (12).

The first time that the passage of war ships through the Straits came into question in treaties was when Russia offered assistance to the Ottoman Empire upon the French invasion of Egypt. However, the Ottoman Empire permitted Russian war ships passage rights through the Istanbul Straits only during the war. This right of passage of Russian war ships was only peculiar to the period of war. (13). When war broke out between the Ottoman Empire and Russia in 1806, this time England offered assistance and an agreement was concluded in Kal'a-i Sultaniye in 1809. According to this agreement, if France attacked Ottoman territory the British armada was entitled to protect the Ottoman coast up to the Black Sea (14). However, the British armada could only pass the Canakkale Strait and proceed only to the entrance of Istanbul.

The events that resulted from the Greek rebellion in 1821, events provoked by Britain, France, and Russia, and which turned against the Ottoman Empire, in the end resulted with the signing of the Edirne Treaty. According to Article 7 of the Treaty, the Black Sea was to be open to navigation to the merchant ships of all countries, which meant that the Istanbul Strait would also be open to navigation for the merchant ships of all countries (15).

The rebellion by the Ottoman governor who controlled Egypt, Mehmet Ali Pasha, pushed the Ottoman Empire into closer relations with Russia. The signing of the Hünkar İskelesi Treaty (1833) granted Russian ships passage rights through the Straits, including a requirement for the closure of the Straits to the ships of all countries in the case of war (16). However, this agreement did not last long. Britain and France strongly opposed such an agreement and consequently, upon the rebellion of the governor of Egypt again, western countries interfered in order to get closer to the Ottoman Empire and thwart the influence of Russia on the Ottoman Government. As a result of this, the question of the Straits became part of international principles of law. According to the London Treaty of 1841, the Straits were to be kept closed to the war ships of all the countries in times of peace, allowing the passage only small war ships of allied countries but only with the permission of a special firmans. With this agreement the Straits became not simply a question between the Ottoman Empire and Russia but a matter concerning of the Great Powers. (17).

Consequently, Britain and France took part in the war between the Ottoman Empire and Russia, which started in 1853, and by sending their armada to the Black Sea they supported the Ottoman Empire. According to the treaty, which was signed after the Crimea war, in Paris in 1856, regulations about the Straits were accepted and the principle of an objective legal regime for the Black Sea was introduced. Thus, the Black Sea was to be open to merchant ships but closed to war ships. Moreover, the Ottoman Government and Russia were prohibited from having dockyards or navies in the Black Sea (18). This was later changed with the London agreement in 1871 wherein Russia was given the right to keep a navy in the Black Sea, and the war ships of allied countries were allowed to use the Straits in times of peace (19).

The legal status of the Turkish Straits and the Black Sea status remained as provided by the 1871 Treaty of London until World War I.

FOOTNOTES

1. See İdris Bostan, "Rusya'nın Karadeniz'de Ticarete Başlaması ve Osmanlı İmparatorluğu 1700-1787" (Russia starting trade in the Black sea and the Ottoman Empire 1700-1787), *Belleten*, 225, Ankara 1995, p.353-394; İdris Bostan, İzn-i Sefine Defterleri ve Karadeniz'de Rusya ile Ticaret Yapan Devlet-i Aliyye Tüccarları 1780-1846" (Note-books of İzn-i Sefine and merchants of the Great Empire who were trading with Russia) Türklük Araştırmaları Dergisi (Turkish Research Magazine), 6 , Istanbul 1991, p.21-49.
2. Prime Minister's Office Ottoman Archives, Name-i Hümayun Defterleri, nr.6, p.10, 37.
3. Thus a Venician ship carrying cereals to Istanbul was sunk on 25th November 1452 because it had not obeyed the rules. Halil Inalcik. "The Question of the Closing of the Black Sea under the Ottomans", *Arkheion Pontou*, Athens 1979, p.82.
4. Inalcik, ibid, p.108-110.
5. For more detailed information on obtaining the cereal which made up the basis of the iaşe of Istanbul, see. Lutfi Güçer, "XVIII. yüzyıl Ortalarında Istanbul'un iaşesi için Lüzumlu Hububatın Temini Meselesi" (Question of Obtaining the Necessary Cereals for the residents of Istanbul in the mids of XVIII Century), *İktisat Fakültesi Mecmuası*, XI, İstanbul 1949-950, 397-416.

6. Bostan, *İzn-i Sefine*, p.22-27.

7. There are many original examples of such izn-i sefine firmans in the Prime-minister's Office Ottoman Archives. For more information *see* Bostan, *İzn-i Sefine*, p.27-33.

8. Bostan, *İzn-i Sefine*, p.35-37. There is information at Hatt-ı Hümayun. nr. 240001, 240001-A that the the merchants had guides in their ships.

9. For more information on the period when Russia started trading in the Black Sea *see* Bostan, Rusya'nın Karadeniz'de Ticarete Başlaması" (Russia Starting Trade in the Black Sea), p.354-360.

10. The Aynalıkavak Tenkihnamesi is in the Prime Minister's Office Ottoman Archives, Düvel-i Ecnebiye (Foreign World), nr.83, Bab-ı Asafi, Divan-ı Hümayun, Düvel-i Ecnebiye, file no. 15/18 and Texts of the Trade Agreements in 1783, Düvel-i Ecnebiye, nr. 83, p.175-190. For more information, *see* Bostan, *Rusya'nın Karadeniz'de Ticarete Başlaması* (Russia Starting Trade in the Black Sea), p.358-360.

11. For more detailed information on the small European countries starting trade in the Black Sea and under what conditions they were allowed to pass across the straits, *see* Kemal Beydilli, "Karadeniz'in Kapalılığı karşısında Avrupa Küçük Devletleri ve Miri Ticaret Teşebbüsü", *Belleten*, 214, Ankara 1991, p.687-755.

12. Cemal Tukin, *Osmanlı İmparatorluğu Devrinde Boğazlar Meselesi* (Question of the Straits during the Ottoman Empire Times), İstanbul 1947, p.131.

13. For the reasons of that relation *see* Tukin, *Boğazlar Meselesi* (Question of the Straits), p.65-107.

14. Tukin, *Boğazlar Meselesi* (Question of the Straits), p.108-125.

15. Tukin, *Boğazlar Meselesi* (Question of the Straits), p.1128-131.

16. Enver Ziya Karal, *Osmanlı Tarihi* (Ottoman History), Ankara 1970,c. V, p.134-139

17. Karal, *ibid*, p.208-209.

18. Karal, *ibid*, p.244.

19. Tukin, *Boğazlar Meselesi* (Question of the Straits), p.287-305.

THE MONTREUX CONVENTION,
THE TURKISH STRAITS AND THE BLACK SEA

Ali KURUMAHMUT
Lawyer, Retired Naval Commander

The Turkish Straits, when considered within the historical context of international law that prevailed in 1936, together with their geographic position, physical formation and *sui generis* characteristics, do not form an *international* strait system. The Strait of Istanbul, the Sea of Marmara and the Strait of Çanakkale are considered to be, under relevant international conventions, a single navigational route that connects two open seas, namely the Aegean and the Black Seas. To sail between these two seas requires navigating 164-nautical miles through the Straits of Istanbul and Çanakkale, both of which individually qualify as national straits, and the Marmara Sea, which is an internal sea of Turkey.

While in 1938, a total of some 4.500 ships passed through the Strait of Istanbul transporting a total cargo of approximately 7.500.000 tons, by 2005, the number of ships navigating through the Straits increased to 54.794; and of these, 10.027 carried hazardous cargo; the total figure of such cargo amounting to 143.567.196 metric tons. Today, an average of twenty-seven ships carrying hazardous cargo pass through the Strait of Istanbul each day. Likewise, of the 49.077 ships that passed through the Strait of Çanakkale in 2005, approximately 18 percent of the cargo carried was hazardous. On average, twenty-four ships pass each day through the Strait of Çanakkale.[1] Although the physical structure, the geomorphologic and hydrological nature, and the meteorological conditions of the Turkish Straits have remained unchanged, the total number of ships passing through the Straits has increased twelve times during the past seventy years.

Throughout the years, there have been many serious accidents in the Turkish Straits, particularly within the Strait of Istanbul and its approaches, resulting in serious marine and environmental pollution. Such accidents have caused loss of life and bodily injury, damage to historic waterside mansions and cultural property, serious ecological damage to underwater

[1] The Republic of Turkey, Prime Ministry Undersecretariat of Maritime Affairs, *Official document*, dated May 23, 2006, registration number B.02.1.DNM-0.06.02.02-162-05/8410.

resources and marine life, and disruption of maritime traffic. The various super tanker accidents that have caused ecological catastrophes in different parts of the world also pose a potential threat to the Turkish Straits, but with the added risk of creating social chaos.

The general passage regime through international straits is basically built on the principle of freedom of navigation. The first important case concerning the passage through straits that form part of the coastal state's territorial sea and is used for international navigation, which connects two high seas, was decided by the International Court of Justice in the *Corfu Channel Case*. The Court, in this case, held that warships had the right to pass through straits used for international navigation in time of peace without the prior permission of the coastal state, provided that the passage was innocent.[2] This principle, which was accepted as a customary rule of international law by the Court, was later adopted by the Geneva Convention on the Territorial Sea and Contiguous Zone of 1958 ("Geneva Convention"). According to this Convention, the regime of innocent passage applied without distinction in both the territorial sea and in straits used in international navigation, Furthermore, no distinction was between commercial vessels and warships, except that the right of innocent passage through straits used for international navigation, unlike other parts of the territorial sea, could not be suspended by the coastal state.[3]

The 1982 United Nations Convention on the Law of the Sea ("LOSC"), however, adopted different rules from the Geneva Convention with respect to the rights of passage through straits used in international navigation. According to the LOSC, the transit passage regime became the general rule for straits used in international navigation. The LOSC created two divergent rules for two different types of international straits. In the first instance, straits connecting one part of the high seas, or exclusive economic zone, with another part of the high seas, or exclusive economic zone, are subject to the *transit regime* with one exception. This exception is the where the strait is formed by an island of a State bordering the strait and its mainland, in which case the transit passage does not apply if there exists seaward of the island a route through the high seas or through an exclusive economic zone of similar convenience.[4] The second instance is the application of innocent passage regime in straits connecting the territorial sea of a coastal state and a part of high sea or another state's exclusive economic zone.[5]

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[2] International Court of Justice Reports of Judgements Advisory Options an Orders, 1949, page 28-29.
[3] Article 16/4.
[4] Article 38/1, 45/1.a.
[5] Article 45/1.b.

Those straits whose legal status have not been determined by a special agreement, in accordance with article 35 (c) and are used for international navigation are subject to the transit regime, when they are part of territorial sea of the coastal state or states. Transit passage rights include navigation on the surface, submerged navigation, as well as the right to over flight. In other words, contrary to the *navigation-on-the-surface* requirement in innocent passage, transiting submarines and other submerged vessels may navigate underwater. Moreover, aircraft have the right to transit passage.

The fundamental principle of free and continuous conduct of international maritime transportation in straits used for international navigation has further limited the rights of coastal states, even more than the restrictions on the rights of coastal states in application of innocent passage rights in their respective territorial seas. A coastal state may suspend or stop the navigation of a vessel to prevent a non-innocent passage over its territorial sea, in accordance with the rules of the LOSC, or it may take certain measures provided by its domestic legislation. However, coastal states do not have the right to suspend or stop transit passage.

The 1923 Lausanne Convention on the Straits, which regulated navigation between the Black Sea and the Aegean and Mediterranean Seas, and provided for the legal status of the Black Sea, has provided for freedom of navigation both at sea and air. Although the regime of Lausanne did not envision any restriction on passage through straits, it did set forth certain limitations on warships concerning their tonnage in the Black Sea. Because the Lausanne Convention on the Straits called for the demilitarization of the Straits zone and no military deployment was permitted therein, the sovereign rights of Turkey were, at the time, restricted over the Turkish Straits. Turkey had been deprived of the right to take measures for its defense and security, and furthermore there were serious gaps left regarding Russian security in the Black Sea.[6]

Today, the 1936 Montreux Convention on the Regime of the Straits regulates the legal status of Turkish Straits and of the Black Sea. It was signed between the former USSR, the former Yugoslavia, Romania, Bulgaria, Turkey, Greece, France, the United Kingdom, and Japan on July 20, 1936, and entered into force on November 9, 1936. The seven-decade old Convention is the longest lasting accord since the 165 years period of the 1841 Convention on the Straits, which marked the first time the Turkish Straits was regulated by a multilateral convention. The Montreux Convention on the Regime of the Straits has been open for accession to all states that have signed

Lausanne Peace Treaty of 1923. While Italy made use of this right and acceded to the Convention on May 2, 1938, Japan gave notification on September 8, 1951 to the effect that it has renounced all rights and obligations it possessed as a state party to the Convention. Following the dissolution of the former USSR and Yugoslavia, and after the Russian Federation and Ukraine became parties to the Convention, the current list of states parties to the Convention includes Turkey, the Russian Federation, Ukraine, Romania, Bulgaria, Greece, Italy, France and the United Kingdom.

The Montreux Convention on the Regime of the Straits brought and end to the restrictions imposed by the Lausanne Convention, and reconfirmed the sovereign rights of Turkey. The Convention, furthermore, imposed class and tonnage limitations for warships that would navigate through Straits in time of peace, and called for notification prior to passage. While the Convention has provided for restrictions on the class, tonnage, and duration of stay for warships of non-Black Sea states in the Black Sea, it does not allow any access for the submarines or aircraft carrier of non-littoral states. Likewise, it does not allow for the passage of aircraft carriers of the Black Seas states, however, the Convention does permit the navigation of their submarines in exceptional circumstances and on the condition that they navigate on the surface during daytime and are not escorted by another vessel. Turkey has retained the right to determine and regulate the passage through the Straits at its own discretion in time of war when Turkey is belligerent or when Turkey considers itself to be threatened with imminent danger of war. In this case, Turkey may close the Straits to the warships of all states, or it may allow the passage of warships of certain states only. In time of war when Turkey is neutral, the Straits are to be closed to the warships of all belligerent states. Those provisions of the Convention concerning the time of the war when Turkey is neutral and when it is belligerent were applied during World War II. The principle of the freedom of navigation has been fundamentally restricted by the Montreux regime as far as warships and aircraft are concerned.

The Montreux Convention on the Regime of the Straits, which regulates navigation through a sea zone consisting of two national straits and an internal water, harmonizes the powers of Turkey as the sovereign state in the Straits on the one hand, and establishes rights and obligations for Turkey, the littoral states of the Black Sea and all other user states on the other hand. Hence, the

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[6] Doğu Ergil, Boğazlar Üzerinde Bitmeyen Kavga (1923-1976)-The Endless Argue on the Straits, İstanbul 1978, page 107-108.

Convention is both a legal and a political document. The powers of Turkey constitute the rule, whereas limitations to these powers are exceptions within the framework of this Convention.

As one of the most important accords of the twentieth century and having been in force for seventy years, the Montreux Convention on the Regime of the Straits has made significant contributions to the NATO defense in the Mediterranean Sea throughout the cold war era. The former USSR, taking into account the increase of the upper limit of non-Black Sea naval forces to a total of 45.000 tons at any given time, and considering the naval forces that Turkey may have as a NATO member, was able to keep its Black Sea force at the level of 105.000 tons, which was a limited figure vis-à-vis the Mediterranean Sea. Moreover, the Soviet Union was able to send submarines and surface vessels that could be classified as aircraft carrier to the Mediterranean only within the limits set forth in the Montreux Convention and subject to the principle of transparency.

Within the limitations of the Montreux Convention and according to the data on tonnage as of January 1, 2006, non-Black Sea states may maintain up to a maximum total naval force of 43.500 tons, consisting of light surface vessels, minor war vessels and auxiliary vessels in the Black Sea. Any individual non-Black Sea state may keep a total of 29.000 tons of naval force which is two thirds of the aforementioned figure, and the presence of such force in the Black Sea may not exceed twenty-one days. It seems evident that, with such a limited force, a non-littoral state that may have political and military designs regarding the Black Sea would not be able to carry out its objectives.

For any non-littoral state wanting to maintain a naval force in the Black Sea without any limitations on class, tonnage or duration of stay, and which wants to exercise the rights and freedoms of the high seas in the Black Sea, the Montreux Convention remains as an impediment. Although any one of the state parties to the Convention has possessed the option to terminate it since November 9, 1956, none of them has so far started such a process. Furthermore, any one of the state parties may propose an amendment to one or more provisions of the Convention at the end of every five-year period starting with its entry into force. So far, this process has not been initiated either.

The Montreux Convention on the Regime of the Straits remains as a fundamental instrument for maintaining the security of the Turkish Strait as well as the Black Sea as a whole. Should the Convention be terminated and no new convention agreed upon, this could create a situation of instability and uncertainty effecting Turkey, the littoral states of the Black Sea and user states. In this case, Turkey, as the sole state having sovereignty over the Turkish Straits, would continue to retain the law enforcement and jurisdictional powers, the power to require that the passage be innocent, and the power to regulate the passage itself. Turkey would be able to regulate the modalities of the passage and transportation within the framework of the general principles contained in Article 23 of Lausanne Peace Treaty and Article 1 of the Montreux Convention on Straits. However, regulation of the high seas area of the Black Sea would fall outside the scope Turkey's jurisdiction.

THE TURKISH STRAITS AND THE IMO: A BRIEF HISTORY

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INTRODUCTION

One of the more challenging issues to find itself on the agenda of the International Maritime Organization was in relation to safety of navigation and protection of the marine environment of the Turkish Straits. This matter remained on the Maritime Safety Committee ("MSC") agenda for a number of years. Although at times challenging, the IMO succeeded in adopting measures that in tandem with the other measures undertaken by the Turkish Government have proven to promote safety of navigation and protection of the marine environment of the Turkish Straits.

The Turkish Straits, comprised of the Istanbul Strait, Çanakkale Strait and the Marmara Sea, constitute the sole link between the Black Sea and the Mediterranean Sea. The Turkish Straits form a commercially vital and strategic sea route for commercial shipping, and one that, unfortunately, has had a history of serious maritime accidents. It was in response to the increase in shipping traffic and maritime accidents that prompted Turkey to adopt new safety of navigation measures, including implementing a new traffic separation scheme in accordance with Rule 10 of COLREG. In doing, although not required to under international law, in 1993 the Turkish Government decided to submit the traffic separation scheme for the Turkish Straits for adoption to the IMO. Although, this action was commended by much of the international shipping community, it also inadvertently, set off a debate that was to occupy the MSC agenda for some years. The process was long and at times controversial, however, at the end the IMO and Turkey were able to succeed in establishing a new set of rules for passage through the Turkish Straits, which over time have proven to be effective in enhancing safety of navigation and protection of the marine environment.

* In memory of Capt. Gunduz Aybay, my teacher.

TURKISH STRAITS MARITIME REGULATIONS AND THE IMO RULES AND RECOMMENDATIONS

The need for more effective regulations of vessel passage through the Turkish Straits dates back to a 1968 report published by the Merchant Marine Academy Association that presented a detailed study of the traffic problem together with recommendations.[1] The tragic and devastating 1979 *Independenta/Shipbroker* tanker accident raised public awareness of the risks brought by shipping and dangerous cargo to the Turkish Straits. It sparked a debate which lasted for many years on the need to improve the safety of the Turkish Straits.[2]

In 1987, the Association of Turkish Ocean Going Masters prepared and submitted a report and proposal for the creation of a traffic separation scheme in the Turkish Straits to the Turkish Ministry of Transportation. In 1990, a Commission was established to conduct a detailed study of the matter of safety of navigation through the Straits. The Commission concluded that a traffic separation scheme was necessary to ensure the safety of the Straits as well as the bordering coastal area together with new regulations to replace the 1982 Istanbul Port Regulations, which were based on Rule 9 of the Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREG). The Commission drafted the Regulations, which were ultimately adopted by the government and enacted as the 1994 Maritime Regulations for the Turkish Straits.[3]

At the same time, a decision was taken by the Turkish government to submit the proposed traffic separation scheme (TSS) for adoption to the International Maritime Organization (IMO). On March 26, 1993, Turkey presented an information paper to the Sixty-second Maritime Safety Committee (MSC) on the existing maritime traffic problems in the Turkish Straits and a plan to introduce a TSS in the Turkish Straits in an effort to increase safety of navigation and protect the marine environment. Turkey also advised of its intention to enact new maritime Regulations.[4] Almost one year to the day Turkey had presented MSC 62/INF.10, the *Nassia/Shipbroker* accident

[1] Gunduz Aybay, "On the Power of Turkey to Regulate Free Passage Through the Straits," *New Problems New Solutions*, 53.
[2] *The Review of Environment and Woodlands Protection Society of Turkey* devoted a special volume in 1980 to the safety hazards in the Bosphorus and also of tanker fires (January 1980, vol. 3). See also the special issue on the Bosphorus, 14 *The Review of Environment and Woodlands Protection Society of Turkey* (October 1982).
[3] The Regulations went into effect on July 1, 1994.
[4] MSC 62/INF.10.

shook Istanbul.[5] It was an alarm bell for the urgent need for a new traffic management system in the Straits.

The IMO was quick to respond and at MSC 63 adopted the Turkish TSS and Associated *Rules and Recommendation on Navigation through the Straits of Istanbul, the Strait of Çanakkale and the Marmara Sea*, which were to go into force on November 24, 1994,[6] subject to confirmation by the Nineteenth General Assembly meeting (SN/Circ.166).[7]

NATIONAL REGULATIONS VS. IMO RULES AND RECOMMENDATIONS

Some member Governments of the IMO raised questions regarding certain provisions of the newly adopted *1994 Turkish Maritime Regulations for the Turkish Straits* ("Turkish Straits Regulations"). Although Turkey had not submitted the Turkish Straits Regulations to the IMO the latter found itself as a forum for what was often a political and legal debate. Turkey had intended only to present the traffic separation scheme created by the 1994 Regulations for approval and adoption by the IMO issue. However, the controversy began when Turkey, for the purpose of developing a set of additional navigational rules for the TSS, at the request of NAV 39, presented its Rules of Navigation.[8] These Rules were taken directly from the draft national Turkish Straits Maritime Regulation. Although the Turkish national Regulations were never in their entirety submitted to the attention of the IMO, nonetheless, the national Regulations found themselves to be the focus of debate. Nevertheless, following a lengthy discussion, the MSC 63 Working Group agreed to a set of draft Rules and Recommendations, which eventually were adopted as the IMO Rules and Recommendations.[9]

The MSC eventually adopted, and the Nineteenth Assembly confirmed, the Turkish Straits TSS and Routeing system together with a set of Rules and Recommendations.[10]

Despite adoption of the TSS and the Associated Rules and Recommendations by the MSC and confirmation by the Nineteenth General Assembly,[11] the Turkish Straits continued to be on the IMO agenda for another five years. This was partly, if not primarily, the result of *paragraph 5* of

[5] On March 13, 1994.
[6] The national Turkish Maritime Regulations went into effect on July 1, 1994.
[7] MSC 63/WP.5/Add.1; MSC 63/WP.17.
[8] IMO Doc. MSC 63/7/2. The Rules were taken directly from the national Regulations.
[9] IMO Doc. MSC 63WP 11.
[10] Routeing Measures Other than Traffic Separation Schemes Rules and Recommendations on Navigation Through the Strait of Istanbul, the Strait of Çanakkale and the Sea of Marmara, IMO Doc. SN/Circ. 166 and A.19/827.

Resolution A.827 adopted by the Nineteenth Assembly. While confirming the MSC adopted Turkish TSS, the Resolution also requested the MSC to

> *review, based on submissions from Governments, the operation of the Rules and Recommendations set out in Annex . . . and the conditions in the Straits of Istanbul, Strait of Canakkale and the Marmara Sea, to consider, as appropriate, any suggestions for changes in the said Rules and Recommendations*.[12]

The request for a report opened the door to further discussions, primarily revolving around what was for Turkey the highly controversial and unacceptable *NAV 43 Draft Report on the Turkish Straits* prepared by the Working Group on Ships Routeing and Related Matter[13] NAV 43 proved to be a watershed for the Turkish Straits at IMO. The draft NAV 43 Report included recommendations that the suspension of traffic be employed only in exceptional circumstances, such as in cases of *force majeure*, when visibility was below .05 miles or emergency situations, whereas the 1994 were far more detailed.[14] It is clear that the Turkish Regulations were far more detailed and much more likely to reduce the risk of an accident than the conditions proposed for the draft NAV 43 Report.

The NAV 43 Report also included a recommendation to replace Rule 10 (the TSS) with Rule 9 (Right-side passage). Yet, Turkey had adopted Rule 10 because Rule 9 had proven ineffective in preventing accidents. The recommendation that perhaps most raised the ire of the Turkish

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[11] Res.19.A/ 827.

[12] The Turkish delegation objected to this paragraph, which has not been included in the draft Rules and Recommendations, accepted by consensus by NAV 40. Turkey also objected that the IMO was creating a permanent oversight mission in the Turkish Straits. In fact, at the following MSC 67, the Russian delegation proposed the creation of an international commission to oversee the operation of the Rules and Recommendations in the Turkish Straits (IMO Doc. MSC 67/7/12).

[13] The NAV 43 Draft Report (NAV 34 WP. 1), included recommended amendments to the existing TSS in the Turkish Straits as well as to the Rules and Recommendations. The Draft report was based on papers prepared by Turkey (NAV 43 INF.5 and 6), Russia (Nav 43/3/1), Bulgaria (NAV 43 INF.8), and the OCIMF MSC 67/7/12.

[14] Turkish Regulations provided for the temporary suspension of traffic under a variety of circumstances: such as during construction work, extinguishing fire, drilling, scientific and sports activity search and rescue operations, prevention and removal of marine pollution, and pursuit of criminal and accidents (article 24); for the passage of large vessels or vessels carrying hazardous cargo when visibility was 1 nm or less, for all vessels 100 m or greater when visibility was 0.5, and for all vessels when 0.5 or less (article 41.); for large vessels, deep draft vessels, or vessels carrying hazardous cargo traveling at 10 nm when the current force was 4 nm or more (articles 40 and 50); and regardless of traveling speed for large vessels and deep draft vessels when current force was 6 nm or more (articles 41 and 51). Article 42 also prohibited two large vessels carrying hazardous cargo from navigating the Strait of Istanbul at the same time. Article 52 prohibited two large vessels carrying hazardous cargo from navigating in opposite directions in the Straits of Çanakkale and imposed a minimum distance of 20 nm for vessels traveling in the same direction.

Delegations was the proposal that an international group of experts be sent to the Turkish Straits to study and analyze traffic movement.

RULE 9 vs. RULE 10

By the time of MSC 70, discussions on a new draft report were primarily concerned with replacing Rule 10 with Rule 9 of COLREG. Russia presented a paper arguing for the replacement of the existing Rule 10 with Rule 9 and also complained that suspension of traffic in the Straits had been frequent and costly.[15] Bulgaria presented a paper arguing for the application of Rule 9.[16] The common argument they presented against Rule 10 was that it caused frequent suspension of traffic. Turkey in turn presented a number of papers, which included information on its intention to accede to the CLC and FUND Conventions as amended by the 1992 Protocol,[17] an update on the establishment of VTS in the Turkish Straits,[18] and a lengthy explanation for application of Rule 10.[19] The Turkish paper explained in detail how application of Rule 9 would increase the likelihood of two vessels colliding in the narrow bends of the Straits. Furthermore, in the four years that had passed since MSC 63, statistics showed a significant decrease in maritime accidents in the Straits. Turkey used this as evidence that Rule 10 was successful and why its continued application was necessary.

The Turkish Straits matter seemed destined to a perpetual stalemate with each camp firmly entrenched in its demands. But MSC 71 brought about a dramatic change in events. It began with the submission by IFSMA,[20] IAIN,[21] and IMPA[22] of a paper recommending that the practice of suspending two-way traffic continue but that Rule 9 replace Rule 10. The Paper recognized that traffic incidents in the Straits had decreased significantly, but surmised that rather than the TSS, the suspension of two-way traffic had contributed to the noted decrease.[23] The paper also recognized that Turkey's stated intent to establish a modern VTS system would also further promote safety in the Turkish Straits. Turkey submitted a paper in which it outlined reasons for temporary suspension

[15] IMO Doc. MSC 70/11/11.
[16] IMO Doc. MSC 70/11/13.
[17] IMO Doc. 70/INF.21.
[18] IMO Doc. 70/INF.22.
[19] IMO Doc. 70/INF.20 and IMO Doc. 70/11/16 (response to Bulgarian paper).
[20] International Federation of Shipmasters' Association.
[21] International Association of Institutes of Navigation.
[22] International Maritime Pilots' Association.
[23] IMO Doc. 71/22/8.

of traffic and for maintaining the TSS. The paper concluded that the *present ships routeing system in the Turkish Straits, as a whole, works well and has significantly enhanced safety of navigation*.[24]

The U.S. delegation in turn proposed that the Working Group finalize the draft report but placing the emphasis on "safety" and that an analysis of the *pros and cons* of the IFSMA, IAIN, and IMPA paper and the Turkish paper be made. Perhaps weary from six years of entertaining the matter of the Turkish Straits on his agenda, the Chairman of the MSC, taking heed of the statement of Joe Angelo, the head of the U.S. delegation, said that ". . . since 1994, we believe that discussions that have taken place in this committee have focused on everything but the safety issues of navigation through the Turkish Straits." With the approval of the MSC, he then went ahead and instructed the Working Group to examine the *pros and cons* of the application of Rule 9 and Rule 10 "taking into account the level of safety and protection of the marine environment which (had) been achieved under the existing IMO-adopted system. . . ." These terms were further narrowed to taking into account "the human element" thereby excluding all other factors, including economic and, of course, legal and political.

In light of the significant reduction of maritime accidents in the Turkish Straits since the implementation of the national Regulations and the IMO-adopted TSS and Associated Rules and Recommendations in 1994, a majority of the Working Group made amongst other things the following conclusion:

(1) Suspension of the two-way traffic was necessary within the context of the present routing system to prevent large ships from meeting in the narrow, winding part of the Straits of Istanbul and the Strait of Çanakkale;
(2) Vessels not taking advantage of available pilotage should;
(3) Vessels not particiapting in TÜBRAP should be more strongly encourage to; and
(4) Turkey should be encouraged in its efforts to implement a modern VTS.

Furthermore, a majority of the Working Group also noted that:[25]
(5) The existing IMO adopted routing system had been effective;

[24] IMO Doc. MSC 71/22/9.
[25] Russia, Greece, Bulgaria, Ukraine, and Greek-Cyprus noted their reservations.

(6) After extensive technical discussions, the working group had not reached any conclusion that any change would make a clear and definitive contribution to safety of navigation in the Straits; and lastly,

(7) No changes could be made without the consent of Turkey, who had no intention of adopting any changes.

The Working Group recommended that there was no need for further discussion and, thus, no need for a new Report and recommended that the subject matter of the Turkish Straits be discontinued. This recommendation was adopted by MSC 71 and confirmed by the Twenty-first Assembly.[26]

RECENT DEVELOPMENTS IN THE TURKISH STRAITS

The 1994/1998 Turkish Straits Maritime Traffic Scheme Regulations were adopted for one reason and that was to enhance safety of navigations, protection of live, property and the marine environment.[27] The TSS was an important part of the effort to meet these objectives. However, it was not in and of itself enough to provide optimal safety of navigation. One of the results of the IMO – Turkish Straits process was the recommendation to Turkey to establish a state-of-the-art vessel traffic information system for the Turkish Straits. Turkey undertook to do so and in 2004 a multi-million dollar technologically sophisticated VTS system went into operation.

The Turkish Straits VTS system operates in accordance with IALA standards and user guidelines. The current system is advisory and not mandatory. However, given the limited geomorphology of the Turkish Straits and the risks, most ships do participate in it. One of the issues for Turkey is whether to make participation in the VTS mandatory by ships navigating the Turkish Straits, and of so, whether Turkey should submit the matter to the IMO, as it did for the TSS. According to SOLAS coastal States may make VTS participation mandatory in their territorial sea and while not required to submit such mandatory system to the IMO approval are required in the planning and implementation to, *whenever possible*, follow the guidelines developed by the Organization (SOLAS V, Rule 12.3). The downside to presenting a system for mandatory VTS participation is the potential to initiate a new round of debates over the Turkish Straits. On the

[26] During the Twenty-first Assembly, Turkey was for the first time elected to category "C" of the IMO Council.

other hand, one of the primary benefits that accrued to Turkey notwithstanding years of debate in the IMO was the international approval and thus compliance with the rules of passage through the Turkish Straits for safety of navigation and protection of the marine environment.

Without question, as a result of the IMO adopted TSS and associated measures, the 1998 Turkish Straits Regulations, and the TURKISH Straits VTS, there has been a significant improvement in safety of navigation and protection of the marine environment. Given the significant increase in transport of dangerous and hazardous cargoes over the past decade, safety has taken on even greater urgency. Nevertheless, the Turkish Straits continue to be risky for shipping and maritime incidents have demonstrated that despite the myriad of precautions adopted, accidents or near incidents cannot be prevented. A near disaster that occurred on 21 February 2006 is a vivid illustration of this reality: a tanker 243 meters in length laden with 86 000 tonnes of fuel oil was navigating through the Istanbul Strait at a speed of 12 nm when the rudder locked. Within a matter of minutes the tanker swept by the swift currents of the strait would have plowed into the 18^{th} Century Dolmabahçe Palace but for the quick action of the pilot who by dropping anchor succeeded in stopping the tanker within a mere 200 meters from the Palace quay.

CONCLUSION

The experience of the Turkish Straits in the IMO has over time demonstrated the importance of the IMO and of international cooperation in promoting safety of navigation and protection of the marine environment. The fact that the MSC has chosen Istanbul as the location of its first historic meeting outside of London is a testament to the success of the efforts of all parties.

THE ROLE OF PORT STATE CONTROL AND THE STRAITS[1]

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INTRODUCTION TO PORT STATE CONTROL

Port State Control is the control of foreign flagged ships in national ports. As stated in nearly all the literature about port state control, in an ideal world port state control would not be necessary. Since the control systems used by the other partners in the shipping world have proven ineffective in eradicating all substandard vessels from the seas, port state control stays in practice. However, port state control is not, and can never be a substitute for the proper exercise of flag state responsibility. The primary responsibility to safeguard against substandard ships lies with the flag states. It is when flag states fail to meet their commitments that the port state comes into play.

When one reads the literature about the port state control, one comes across statements to the effect that port state control is the last safety net and in an ideal world the port state control would not be necessary.

So how would the system work in an ideal world?

International conventions have been created and developed on the basis of the safety of the ships being regulated by the flag states. The International Maritime Organization (IMO), a specialized agency of the United Nations, started to develop international treaties and other legislation concerning the safety and marine pollution prevention in the 1950s in order to develop international standards which would replace the multiplicity of national legislation which then existed. IMO has produced a mass of legislation over the years and majority of countries are

[1] This article is an updated and revised version of the paper presented at “The Impact of Caspian Oil and Gas Development on Turkey and Challenges Facing the Turkish Straits” conference held by İstanbul Bilgi University Maritime Law Research Center and the Department of International Relations in İstanbul on 9 November 2001.

members of these conventions If majority of the countries are members of these conventions, why is it still possible to find shipowners or manning agents who force seafarers to risk their health and lives at sea, or find ships which are unsafe and do not comply with the required technical conditions under the international conventions? Or why are there so many crew members who do not know what to do in case of an emergency?

Shipping is not failing in ratifying new conventions and international community is not failing in adopting necessary legislation; but shipping is failing in the application and enforcement of international legislation, especially the ones on safety, pollution and crew welfare. As a general rule the implementation of international conventions is the responsibility of the states that ratified them. Governments ratifying the international instruments are obliged to incorporate the provisions into their national legislation. However, in practice enforcement of international conventions raises many problems. They may take a long time to be incorporated into the national legal system of each state. The coming into force of a convention does not necessarily mean its effective enforcement.

For a considerable period of time, the shipping community relied on the flag states to provide overall control. This has been very difficult to achieve especially with the advent of flags of convenience. Flag states also have gradually relied upon more and more on classification societies to regulate and control the standards laid down by the IMO. However, the control mechanisms applied by the flag state and classification societies have proven be not good enough to remove the all-substandard vessels form the industry.

The clear example of failure of this system can be seen in the *San Marco* case.[2] This case is the illustration of the deficiencies in the international safety net. The *San Marco* then known as the MV Soral was a 1968 built panamax dry bulk carrier. It was owned by a succession of one ship brass plate companies. In March 1991 it was sold to a company named Sea Management for $3.2 million. The vessel traded as San Marco under the ownership of another brass plate company, Shipping of Nicosia, Cyprus. In May 1993, it was detained by the Canadian Coast Guard (CCG) for serious structural, fire fighting and life saving defects. Following this incident the vessel's P&I club withdrew the cover. As the owner would not do the immediate repairs its classification society, Bureau Veritas (BV), withdrew class after an inspection.

[2] "Holes in the System" January 1994 *Seatrade Review*, pp. 6-7 cited in Steyn Theuns, "Port State Control: The Buck Stops Here-Does It, Should It, Can It?" http://www.anu.edu.au/law/pub/icl/portstat/PORTSTATECONTROL.html

In May 1993 the vessel had been inspected by an Hellenic Register of Shipping (HRS) surveyor for a class transfer from BV and found to be in “good condition and well-maintained”. The vessel was issued with clean class certificates, without any repair recommendations. She had the BV certificates valid until 1995 and no recommendations. Towards the end of June, the same year, the CCG allowed the *San Marco* to depart from Vancouver under tow at the request of the shipowner. However, although the HRS issued a clean class certificate and the vessel had BV certificates valid to 1995 the CCG did only allow the vessel to be towed unmanned. The CCG had no legal power to compel the owner to do repairs locally. Soon after leaving Canadian waters the tow to *San Marco* was cut and a crew put on board by a helicopter. From then on, the vessel continued to trade, unrepaired with clean HRS certificates. Obviously, if the Canadian port state control had the legal power to demand repairs before departure, the vessel would have been prevented from trading in a dangerously unseaworthy condition. As this was not the case the *San Marco* managed to slip through the safety net.

In November 1993, while she was 150-200 miles off the South African coast on a voyage from Morocco to Indonesia, she lost some 14x7 metres of shell plating from both sides of her No.1 hold and all 5000 tons of cargo in that hold. The ship was put into Cape Town as a port of refuge and quickly detained by the Department of Transport. As it was not possible to continue trading her without spending substantial amount of money on repairs, the vessel was subsequently sold for scrap at a public auction.

As illustrated in the *San Marco* case, shipowners, classification societies, insurers, flag state administrators have failed to do their job properly. If all parties concerned acted responsibly and prudently, port state control would not be necessary. The control mechanisms applied by the flag states and classification societies have proven not to be sufficient in eliminating all substandard vessels from the industry.

Six years after the *San Marco* case, the *Erika* incident yet again forced a radical re-assessment of the industry’s safety net.

THE *ERIKA*

The *Erika* incident which took place in December 1999 prompted a huge legislation overhaul. During the early morning of 12 December 1999 the Maltese registered tanker *Erika* broke in two in gale force winds in the Bay of Biscay approximately 60 miles of Brittany Coast. The tanker was carrying 31,000 tonnes of heavy fuel oil.

In analysing the reasons for the *Erika*'s disastrous loss, many factors such as flag, class, age, and charterer came into play. The *Erika* reflected the polyglot nature of the tanker industry. The charterer was French, the owner Italian, the crew Indian, and the flag Maltese. However, the *Erika* was not the only incident where so many nationalities were involved in the management of a vessel. There have been many oil pollution incidents where the vessels were registered under a flags of convenience country, polluted various sea resources but none of them had the same attraction. But the *Erika* was different from many previous incidents as it carried the required certificates, was under class and had been inspected by port states, flag states and industry inspectors on several occasions. The vessel slipped through the whole series of safety nets.

At the time of her sinking all of the *Erika*'s class and statutory certificates were valid. She was classed with RINA (Registro Italiano Navale), a full member of International Association of Classification Societies (IACS). The ship was under the management of an Italian company, which was also ISM certified by RINA. Between 1991 and 1999 she was inspected 16 times by the port state control inspectors and twice by the flag states control inspectors. This figure does not include the vetting inspections undertaken by the oil majors, or the surveys carried out by the classification societies. Several oil companies chartered the *Erika* throughout the 1990s. The inspectors of Texaco, Exxon's subsidiary Standard Marine, Repsol and Shell approved her as a fit vessel to carry their cargoes. The vessel was also approved by TotalFina whose cargo she was carrying when she sank. In December 1999, the *Erika* had the approval of most of the major oil companies which carry out vetting inspections prior to accepting a tanker.

Similar to *Erika* incident, only one and half years later the effectiveness of the safety net came under discussion again with the loss of the *Prestige* and subsequent oil spill.

THE MEMORANDUM OF UNDERSTANDINGS (MOUS)

HISTORICAL OUTLOOK

The origins of port state control lie in the memorandum of understanding between eight North Sea States signed in Hague in 1978. The background of this memorandum is that in 1976 a maritime session of the International Labour Conference adopted the Merchant Shipping (Minimum Standards) Convention, more commonly known as ILO Convention No. 147. This Convention aimed to inspect vessels that entered the ports of member states. On March 2 1978 the Hague Memorandum was signed by the maritime authorities of eight countries[3] which decided that this Convention deserved a proper follow up. The aim of the memorandum was to surveillance the seagoing ships generally in order to ensure that requirements stated under the ILO Convention No. 147, as well as in other Conventions, were met. Just as the Hague Memorandum was about to come into effect, in March 1978 *Amoco Cadiz* incident happened. This incident caused a strong political and public demand in Europe for much more stringent regulations with regard to the safety of shipping. Following these developments, the ministers responsible for maritime safety of 13 European countries, together with the representatives of the Commission of the European Communities, IMO and the International Labour Organization (ILO) met in Paris in December 1980. They agreed that the elimination of substandard shipping would be best achieved by co-ordination of port states and based on the provisions of a number of widely accepted international maritime conventions, the so called relevant instruments. At a second ministerial conference, again in Paris, in January 1982, the present Paris MOU on Port State Control was adopted and signed by the maritime authorities of 14 states.

Although the Paris Memorandum of Understanding on Port State Control (Paris MOU) -the earliest regional agreement of this kind- was signed in 1982, maritime authorities of most states already had specific powers to exercise port state control under the conventions to which they became parties. These include the International Convention for the Safety of Life at Sea (SOLAS);[4] the International Convention on Load Lines 1966 (LL 66); the International Convention for the

[3] These countries were Belgium, Denmark, France, Germany FR, the Netherlands, Norway, Sweden and the United Kingdom.

[4] It was recognised by the drafters of the 1929 SOLAS Convention that a flag state could not constantly monitor every ship in its fleet wherever it sails in the world. Therefore, the states were given power to inspect a vessel's

Prevention of Pollution From Ships, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) and the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW 1978). Therefore, the powers used by Port State Control Officers (PSCOs) are not new; it is the willingness to use these powers and the coordinated application of port state control which are new. However, it has to be kept in mind that a port state can only apply those conventions which have entered into force, and which it has implemented for its own ships. Ships that fly the flag of a state which is not a party to that convention or below convention size would not be exempt from inspection because the principle of *no more favourable treatment* would be applied.

The Paris MOU has been in operation since July 1982. With this memorandum, for the first time, a regular and systematic control of ships was exercised by a regional group of port states which are parties to the relevant Conventions. The Paris MOU is the model upon which other regions of the world base their agreements on port state control. Since its entry into force the number of states in the Paris MOU has grown. This has mainly been due to the increase in the number of member states of the EU.

THE RULES THAT GOVERN PORT STATE CONTROL ACTIVITIES

In November 1995, IMO adopted resolution A.787 (19)-Procedures for Port State Control. The resolution was amended in 1999 by resolution A.882 (21) The amendments include the incorporation of additional guidelines for PSC related to the ISM Code and for port State control under the 1969 Tonnage Convention, provisions on suspension of inspections, procedures for the rectification of deficiencies and release, updating of reporting formats and of the list of certificates and documents to be checked during inspections. Considering the latest developments in the shipping world following the recent incidents and the 11th of September, there is no doubt that IMO guidelines on port State control will be amended in the future again.

The rules are published by IMO as a booklet with the title of "Procedures for Port State Control".[5]

The procedures are not mandatory and only offer guidance to port states.

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documentation. If there were clear grounds for suspecting that the condition of the ship did not meet the Convention standards, then an inspection of the ship could be carried out.

[5] IMO, *Procedures for Port State Control* (IMO, 1997). New edition published in 2001.

BASIC PRINCIPLES

The intention of port state control is not to enforce on foreign merchant shipping any requirement which goes beyond convention requirements. In other words, the MOUs do not extend the scope of port state control beyond the international convention requirements.

- The prime responsibility for compliance with the requirements laid down in the international maritime conventions lies with the shipowner/operator. The responsibility for ensuring that compliance remains with the flag State.
- Each maritime authority gives effect to the provisions of the relevant MOUs.
- Each authority has to ensure that foreign merchant ships visiting its ports comply with the standards laid down in the relevant conventions and all amendments thereto in force. In this context, a participating maritime authority regards a ship flying the flag of another member State as a foreign ship too.
- The MOUs provide for a total number of inspections, expressed in terms of a percentage, that each of the states party to the relevant MOU shall conduct.
- IMO and ILO conventions provide the basis for inspections under the MOUs.
- All possible efforts are made to avoid unduly detaining or delaying a ship.
- In principle, there will be no discrimination as to flag.
- Inspections are generally unannounced.
- In general ships will not be inspected within six months of a previous inspection in a MOU port, unless there are "clear grounds"[6] for inspection. This frequency of inspection does not apply to ships selected for mandatory inspection or expanded mandatory inspection. These vessels may be inspected whenever the authorities may deem it appropriate.

INTERNATIONAL INSTRUMENTS

The MOUs invoke international instruments that are legally binding for States which are parties to these instruments. They do not set any new standards. They basically aim to make sure

[6] Clear grounds for inspection is established when there is evidence that the ship, its equipment, or its crew does not correspond substantially with the requirements of the relevant Convention, or that the master or crew members are not familiar with essential shipboard procedures relating to the safety of ships or the prevention of pollution.

that all ships operating in the region meet the internationally agreed standards. Only internationally accepted conventions shall be enforced during the port state control inspections.

WHO BOARDS A SHIP TO CARRY OUT PORT STATE CONTROL?

Port state control is carried out by a Port State Control Officer (PSCO). The PSCO's powers derive solely from the sovereign State which employs him and is subject to the national laws of the jurisdiction in which he is operating. The PSCO should be an experienced person qualified as a flag state surveyor and able to communicate with the master and key crew members in English. However, the PSCO need not have sailed as master or chief engineer or have had any seagoing experience. *In principle*, he should not have any commercial interest in the port, the ship or be employed by or on behalf of a classification society.

All PSCOs carry an identity card issued by their maritime authorities as evidence of the authority to carry out inspections. Inspections may be carried out by a single PSCO or a team of PSCOs depending to some extent on the size and type of ship and the resources available on any particular day.

THE INSPECTION PROCESS

The port states authorities set overall percentage *inspection rates* to ensure that a minimum number of ships are inspected. They use *targeting factors* to focus inspection effort on those ships most likely to be substandard. Ships of a certain age and type are specifically selected for the purpose of conducting *expanded inspections*. *Concentrated inspection campaigns* are conducted to check on special matters or areas of concern.

Certain selection criteria such as the ship's flag, age and type, are believed to directly influence how well a ship is likely to be operated and in what condition a ship is likely to be found. To help PSCOs to rank priority ships, the Paris MOU has developed a computerised targeting formula as part of its database system. This formula resulted in a target factor (TF) for each individual ship. By allocating points to each criteria a scoring system is employed and a ship is assigned a targeting factor. The target factor value of each ship is calculated in the central Paris MOU PSC database (SIRENAC) on the basis of ship's profile and inspection history.

In general the inspection should be limited to check of ship's certificates unless there are clear grounds for believing that the condition of the ship does not substantially reflect those certificates. In the past, this has been interpreted to mean that the inspection should stop once the PSCO has been shown a set of valid certificates. Experience continues to show that valid certificates are no guarantee of compliance with the conventions. Control on compliance with on board operational requirements may be included in the control procedures, particularly if the PSCO has reason to believe that the crew demonstrates insufficient proficiency in that area.

Guidelines on what to inspect are available in IMO Guidelines on port state control procedures (Res. A.882 (21)), in the Paris MOU's Manual for Surveyors and in the Annexes to the EC Directive on port state control. Although these documents serve as a consistent reference point ultimately professional judgment is used in selecting areas for attention.

The regional PSC MOU members from time to time agree to carry out special inspection campaigns for a period of generally 3 months. Within such campaigns special attention is laid on certain details during the regular inspections held on board.

DETENTION

A PSCO may impose the following courses of action on a ship:

a) Rectification of deficiencies prior to departure;
b) Rectification of deficiencies in the next port, under specific conditions;
c) Rectification of (minor) deficiencies (only) within 14 days;
d) Detention of the ship.

Following an inspection the PSCO has to decide which action has to be taken to correct the deficiencies found and the time within which the corrections are to be made. If the deficiencies found are serious the PSCO has to decide whether he should prevent the ship from sailing until they are rectified.

The role of a PSCO, in deciding on the detention of a ship, is very delicate. The decision to detain a vessel is based on the professional judgment of the PSCO. If deficiencies are revealed on a PSCO inspection, which are “clearly hazardous to safety, health or to the environment” the PSCO must ensure that those deficiencies are removed before the vessel is allowed to sail. The authority may, in practice will, detain the vessel in order to ensure that deficiencies are rectified. Despite the guidelines provided to assist a PSCO to make that judgement there is a subjective element in a PSCO’s judgement that deficiencies are so clearly hazardous to warrant a detention.

A PSCO may detain a vessel if there is one deficiency of such serious nature that it warrants the vessel’s detention; or if there is a combination of deficiencies which may not warrant detention if viewed individually but when viewed together with other deficiencies, they are seriously sufficient to warrant a vessel’s detention.

The Paris MOU gives a list of defects which may constitute grounds for detention. This is only a guide and it should not be seen as the definitive list of detainable items. However, the detainable deficiencies in the area of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarerers 1978 (STCW 78) are the only grounds for detention under the Convention. The decision to detain requires the PSCO’s professional judgment that is why the knowledge, experience, integrity and independence of PSCO are particularly important.

The non-exhaustive list of examples of deficiencies provided by the Paris MOU is as follows:

- Lack of valid certificates;
- SOLAS Convention deficiencies;
- International Bulk Cargo Code deficiencies;
- International Gas Carrier Code deficiencies;
- Load Line Convention Deficiencies;
- MARPOL Convention, Annex I deficiencies;
- MARPOL Convention, Annex II deficiencies;
- MARPOL Convention, Annex V deficiencies;
- Standards of Training, Certification and Watchkeeping Convention-STCW-deficiencies
- ILO Convention deficiencies.

Under each category, there is a list of specific deficiencies. When a PSCO decides on the detention of a ship, he will immediately inform the master accordingly and advise him to seek assistance and to arrange remedial action in order not to delay the ship. Following a detention the PSCO officer is required to inform the flag state and the classification society (if it has issued statutory certificates) without delay. This notification includes the PSCO’s report of inspection.

A detained ship will only be released once the PSCO is satisfied that the deficiencies found have been properly rectified. In cases where some repairs cannot be carried out in the port of detention, the PSCO may allow the ship to proceed to a repair yard as long as adequate temporary repairs are made and it is safe for the ship to make the voyage. If the vessel does not comply with the conditions of the release, it will be liable and refused to access to all Paris MOU ports. In order to lift the ban, the vessel needs to be re-inspected to confirm that the ship complies with the conventions.

In exceptional circumstances, where the overall conditions of a ship, its equipment or the working conditions of the crew are found to be obviously substandard, the PSCO may suspend an inspection. In such a case the port state should notify the flag state of the suspension without delay. The suspension would continue until the deficiencies identified by the PSCO have been rectified, as instructed.

INSPECTION CHARGES

The port state should not charge the ship for any general inspection. However, charges can be expected if the ship invites a port state to undertake inspection, or if the ship is detained and the PSCO has to return to the vessel for a re-inspection. That’s why it is important that the ship should ensure that all deficiencies are properly rectified before asking for a re-inspection. It is also possible that there may be charges if there are overriding factors.

APPEAL AGAINST DETENTION

In case of a ship arrest the claimant needs to satisfy various legal tests before a hearing in the local courts. In case of an appeal the courts usually hear any appeal made by a shipowner who is suffering substantial losses from the arrest. Unlike the arrest of a ship, a PSC detention order can be issued at the sole discretion of a PSCO, without prior consideration of the merits by a judge. An unduly detained ship will be entitled to compensation and can appeal against the detention if the detained ship can prove the wrongful detention.

Under different jurisdictions, there are limited rights of appeal against a port state detention order. However, appeal against a detention order takes quite a long time and does not stop the process of detention. That is why it is not possible to obtain the release of a detained vessel by simply getting a letter of guarantee from a P&I club.

THE PARIS MOU REVIEW PANEL

If an owner or operator misses the deadlines under the national appeal procedures but still wishes to appeal, or to use the review procedures as well as, and as an alternative to, the appeal procedures, he may now seek redress by the review panel procedure.

In order to use the review procedure the application has to be made to the flag State (or classification society, if applicable) to act on behalf of the owner. An owner can not submit a case for review directly. The owner is not a party in the review, only the flag State or, if relevant, the classification society.

THE USA PORT STATE CONTROL

The United States does not take part in any of the regional agreements on port state control. It undertakes control measures on a unilateral basis. On May 1, 1994 the US Coast Guard introduced its revised port state control initiative. The primary objective of this program is to identify high risk foreign merchant ships based on the performance records of their owners, operators, classification societies and flag states; and to systematically target ships for boarding.

In the USA there is no agreement or memorandum of understanding which is specifically dedicated to port state control. Therefore it is not possible to have a conclusive list of conventions enforced by the US Coast Guard under the port state control program. The US exercises its port state control authority through the US Coast Guard's long standing foreign vessel boarding program, now referred to as Port State Control Program. The programme has been expanded twice, to incorporate enforcement of the STCW Convention and the ISM Code.

Following the 11th of September tragedy, in November 2002 the US passed a domestic law called the Maritime Transportation Security Act (MTSA) 2002 and the new International Ship and

Port Facility Act (ISPS Code) adopted by IMO in December 2002. Vessels not complying with ISPS and MTSA can be denied entry, detained or expelled from US ports.

The Coast Guard will enforce applicable requirements of the ISPS Code and the maritime security arrangements authorized by MTSA for all foreign vessels subject to SOLAS and all foreign commercial vessels greater than 100 gt that enter US ports.

The Ship Arrival Notification System (SANS) and the National Vessel Movement Center (NVMC) were set up after September 11 2001 to centralize the USCG notice of arrival (NOA) process for ships entering US ports. NOA was increased to 96 hours and in addition to the previously required arrival and hazardous cargo information, information on the ships; crew and non-crew is required. Vessels are also now required to submit their charterer information as part of their 96 hour advanced NOA.

RECENT DEVELOPMENTS ON PORT STATE CONTROL

The Paris MOU has been amended several times to accommodate new safety and marine environment requirements arising from the IMO and other developments. Many of these modifications were made to bring the Paris MOU in line with the EC Directive on Port State Control.

The major changes were introduced following the *Erika* incident. Under these amendments, the following new provisions have been introduced, starting from July 22 2003:

- Expanded inspection for older oil tankers, chemical and gas carriers, bulk carriers and passenger ships will be mandatory after 12 months from the last expanded inspection.
- In order to target high risk ships, a ship with a “target factor” greater than 50 will be inspected after one month from the last inspection in the Paris MOU.
- Banning rules are extended. A ship registered with a flag on the blacklist will be refused to access to ports in the Paris MOU region:
    - after the second detention in three years if it is in the “very high risk” or “high risk” category on the blacklist;
    - after the third detention in two years if it is in a “lower risk” category on the blacklist.

- Detentions from January 22 2002 count towards a ban and in order to lift the ban the flag State and, where appropriate, the class must certify that the ship complies with the required standards. The ship must also complete an expanded inspection at the owners' expense.
- The charterer of ship carrying liquid or solid bulk cargoes will be recorded by port state control inspectors. This information has to be made available on board by the shipowners.
- If a ship is required to carry a functioning voyage data recorder (VDR), and it is found not to be functioning properly, the ship may be detained.

Following the adoption of the International Ship and Port Facility (ISPS) Code by the IMO in 2002 and the requirements to obtain International Ship Security Certificate (ISSC) by July 2004, a harmonized action plan to inspect all ships subject to the Code started on 1 July 2004.

Aspects considered by port State control officers (PSCO) conducting inspections include:

- whether there is a valid ISSC on board;
- control of access to the vessel;
- control of access to the sensitive areas if the ship;
- that the ship is operating at the same (or higher) security level as the port facility;
- that records are held of at least 10 ship-to-port or ship-to-ship interfaces;
- that security drills and exercises have been carried out at required intervals, taking into account of crew changes;
- whether master and ship's personnel appear to be familiar with essential ship security procedures;
- whether key members of the ship's personnel are able to communicate effectively;
- if a subsequent interim ISSC has been issued to avoid full compliance with ISPS;
- that the ship identification number is permanently marked in a visible place.

If after July 1 2004 deficiencies are recorded against any of these items, action may be taken by the PSCO and the competent security authority.

Certain measures were also taken by the IMO following the *Erika* and *Prestige* incidents:

- compensation limits for oil pollution disasters were raised;
- mandatory ship reporting systems, traffic separation and routeing systems were introduced;
- agreement was made on the single hull tanker phase out;
- "new guidelines on places of refuge for ships in need of assistance" were adopted;
- The new International Ship and Port Facility (ISPS) Code was adopted by the IMO in 2002.

REVIEW OF PORT STATE CONTROL

Port state control has been an active component of the shipping world for a considerable time. The regional agreements on port state control have been strengthened in existing areas and continue to expand into new areas. It is becoming nearly impossible for a shipowner to identify one or two ports where the ships could trade without concern about a port state inspection or a fear of detention.

Why should the shipowners worry about port state control so much?

Shipping has two distinctive features;

- It is international; and
- It involves serious amounts of money.

Therefore whenever we need to resolve a shipping problem we have to keep in mind these two features. Let's take flags of convenience as an example. The practice of shifting maritime activity from one flag to another and registering vessels in states with more convenient laws and or policies is not new. The reasons for registering a ship under a flags of convenience country vary from one owner to another. But the most common motivation has always been of economic advantage. The choice of flag relates to investment and to cost/revenue considerations. Therefore, it is not possible for a shipowner to choose a flag without considering fiscal advantages. There is a positive economic incentive in not complying with international minimum standards and the competitive advantages which the substandard operator gains are sizeable. The maritime companies also consider the political and commercial aspects of the problem whether there are any trading restrictions due to the vessel’s flag or whether there are any political risks associated with the flag state.

Shipowners always need to keep port state control in mind for their trade as failing to comply with port state control requirements may be hugely costly and may stop the vessel to be able to trade with certain ports for a considerable period of time;

- The main principle of MOUs is name and shame. Once a vessel is detained it will be on the list of detained ships available on the web site of the relevant MOU. In the past some vessels have tried to avoid inspections and consequent sanctions by change of name. However, as every single vessel is registered with a unique IMO identification number, such means of escape have not been successful.
- Concentrated inspection campaigns need to be considered as well. These campaigns normally last a period of 3 months and focus on a specific area of the ship.
- Under the Paris MOU ships may be refused to access to any port in the region of the memorandum if they jump a detention or fail to indicate at an indicated repair yard. Following the *Erika* and *Prestige* incidents it is more difficult for a vessel to sail around the European ports without complying with the port state control requirements.
- With the entry into force of the ISM Code there will be no exemption from enforcement of the provisions of the Code against vessels entering the ports of the parties to the relevant MOUs. In fact, European port states are now required, as a matter of European law to check for compliance of both the ISM and STCW conventions and if appropriate, detain a vessel for breach of either of those two conventions even if non-certification is the only deficiency. The state may allow the vessel to sail in order to avoid the port congestion, but is required to notify the other flag and member states accordingly. In such cases other member states will refuse right of entry to its ports until compliance is complete to the satisfaction of the original detainee state.
- Expanded inspections became mandatory for oil tankers, chemical and gas carriers, bulk carriers and passenger ships will be mandatory after 12 months from the last expanded inspection. These ships may also be subject to inspection between the two expanded inspections.

- Banning rules are extended. A ship registered with a flag on the blacklist will be refused to access to ports in the Paris MOU region and detentions from January 22 2002 count towards a ban as well.

It is not only the shipowners who need to worry about the port state control. The charterers have to keep in mind port state control as well.

In one case[7] a bulk carrier was chartered to load a grain cargo. The receivers had tight time requirements. If the loading and discharge didn't run smoothly, they had to shut down their processing plant and incur substantial losses. The chartered vessel arrived at the loading port on time and loaded the cargo without delay however, during the loading the ship was subjected to a port state control inspection. The inspectors found several defects with the ships lifesaving equipment and the vessel was detained until these defects had been corrected this resulted in a 3 day delay. As a consequence the receivers of cargo suffered a financial loss of some $ 200,000 with little chance of making recovery.

One of the easiest checks a charterer can make on a prospective vessel is checking the individual ships' port state control detention history. Such a study should be done with the port state control detention history for all vessels under the same management and/or ownership. Such data provides extremely valuable information on maintenance standards and work practices of a vessel and her owner. However, one has to keep in mind the differences in port state control practices and evaluate this data with an experienced person in order to make sure that a good ship and her owner are not unreasonably penalised for minor defects to a vessel. A detention or improvement order could be evidence of an unseaworthy ship. Despite the fact that the seaworthiness of a vessel is a matter of fact and the presence of a certificate or otherwise is only evidential, not conclusive, Article 2(9) of the EC Directive refers to a ship under detention as "unseaworthy"'. It is possible that the cargo claimants will look at the ship's history of port state control inspections more closely in order to prove the unseaworthiness of a vessel.

Is the port state control a perfect system to eliminate substandard ships? Like any other system where human beings are involved port state control system can be abused.

Some of the problems experienced with port state control practice are:

[7] Case example given by Capt. Jonathan Stoneley "A Charterer's Perception of Port State Control" Port State Control: Managing Safety and Quality in Shipping, 2&3 December 1998, London.

- Port state control is taking an even increasing role in policing the world's fleets, and owners are facing increasing threat of port state control inspections. But unfortunately, port state control does not have a uniform application in all these areas, sometimes not even within the same region of the MOU. As the number of MOUs increases, so the number of countries entitled to PSC inspection increases. This creates more risk of varied standards of inspectors and inspections. Therefore, even the establishment of an internationally uniform standard of competence of inspectors will not necessarily provide a solution; as such a standard could again be subject to different interpretations.
- There are basically two systems of port state control. One is the regional agreements; the other is the US port state control. Within the regional agreements, the Paris MOU is becoming the most strict port state control system. There are two reasons for such a practice: Firstly, Paris MOU has the financial means. Secondly, Paris MOU member states are the European Union countries. European Union is very keen on improving maritime safety standards especially following the *Erika* and *Prestige* incidents. The US Port State Control system has been a notable exception with tighter standards than the regional agreements. This general practice encourages the unsafe vessels to trade other parts of the world where port state control can be avoided.
- Port state control can not be applied in all parts of the world as it needs to be. For instance, South Africa is situated on a particularly busy corner of the world's major sea routes, the weather conditions are frequently dreadful and many casualties occur but port state control is never as effective as a European port due to insufficient funds and lack of trained personnel.
- Port state control can easily be used as a political tool in order to demonstrate that certain flag states are not performing their tasks as well as they should. If a ship is trades into its home ports and any deficiencies are found or detentions occurred during these home port inspections these do not take place in port state control figures as these controls are flag state control rather than port state control.
- Port state control has a large subjective element in it. It is possible for a port state control inspector to treat a deficiency as requiring detention or to be corrected before departure depending on his professional judgement and possibly the general policy of the country or ports towards port state control or the flag of the ship concerned.

- It is possible to ask for compensation for an unduly detained ship, but the process is long, costly and does not lift the detention order. Therefore, instead of going through the legal process the shipowners prefer to sort out the problem in a more practical way.

CAN PORT STATE CONTROL BE APPLIED IN THE STRAITS?

Turkish Straits means the passage from the Black Sea, through the Istanbul Strait (Bosphorus), the Sea of Marmara, and the Canakkale Strait (Dardanelles) into the Aegean Sea. It is the only sea route out of the Black Sea and as such the only sea route through which Russian and Caspian exports can reach the Mediterranean.

Although a number of pipeline projects bypassing the Straits have been constructed or are being planned, Bosphorus is still the preferred transport route for exporters. At present, roughly 1.7 million barrels of oil per day (bpd) is moved through the Bosphorus. Considering the increases in Russian and Caspian exports, by 2010 another 2-3 million bpd would be added to this amount. According to the International Energy Agency (IEA) estimations the Straits has a maximum capacity of 1.8 million bpd.

In addition to oil traffic, 1.5 million people commute from one side of the Bosphorus to the other each day, which makes it the one of the busiest waterways in the world. Therefore, protection of the Bosphorus from oil spills and collisions is necessary both for Turkish people and the international oil transporters.

As it has been pointed out, following the *Erika* incident it appears unlikely that any prudent charterer would have sent *Erika* and her particularly polluting cargo to USA under current OPA (US Oil Pollution Act) punitive legislation and port state control regime. Thus one can suspect that the average age of tankers used to carry American imports of crude oil & products is lower and their seaworthiness is higher than that of their counterparts calling at the ports of EU. Could a 25 year old river-type vessel go to any of the European ports? The answer would be definitely no, but such a vessel manages to come to a Turkish port. The Russian tanker *Volgoneft 248,* which broke in two off the port of Ambarli in the Marmara Sea near Istanbul at the end of 1999.

The *Volgoneft 248* was classed by the Russian river register and statutory survey was carried by the Russian Maritime Register of Shipping. She was officially limited to sailing between March and November, in wave heights below 2.5 m. As she was outside the scope of restrictions, her documents were no longer valid. The vessel loaded Heavy Fuel Oil in Bourgas, Bulgaria.

Flag state; Russia

Port States; Bulgaria, Turkey

Port State Control Agreements in Force in the Region at the Time of the Incident:

Turkey-Mediterranean MOU signed on 11 July 1997

Turkey and Bulgaria are members of Black Sea MOU but this MOU is signed after the incident.

In the *Volgoneft 248* case, the flag state failed to do the flag state control. At the time of the incident, the Black Sea MOU was not effective in Bulgaria, the first port state. This leaves the second port state Turkey to do port state control. As the definition of port state control clearly indicates, it is not possible to use port state control unless the vessel is voluntarily in a foreign country's port. Therefore, it is not possible for Turkey to use port state control on the vessels passing through the Straits. However, it is possible to coordinate the port state control in the region more effectively. For instance, under the Caribbean port state control there is a code of safety for Caribbean ships. During the development of the Caribbean MOU it was recognized that the majority of substandard ships operating in the region were less than 500 gross tons and there was no detailed international standard for this class of ships as they were mainly outside the ambit of the international conventions. Consequently, the guidelines provided for inspections to be carried out on the Caribbean cargo ships below 500 gross tons. Ships of traditional built were supplemented by a Code of Safety for Caribbean Cargo Ships (CCSS Code). This decision has been taken on the basis of the vessels sailing in the region. The practice of port state control shows that the member states in a regional MOU can bring into force tighter controls for the vessels in that region. In order to increase the effectiveness of port state control in the region, the EU and the Paris MOU are constantly monitoring the port state control regime and propose corrective actions. The same principle can be applied for port state control practice in Turkey.

If port state control is here to stay and Turkish vessels are subject to port state control wherever they go in the world, why don't we make the best use of the system?

Despite the fact that Turkey won't have a right to have port state control on the vessels passing through Straits it can make the best use of this tool by making sure that vessels visiting a port in the Black Sea or Mediterranean MOU region go through port state control. Therefore, full exchange of information between regional areas should exist so that the port, where the ship will be visiting, has the maximum amount of information before the ship calls. This will also eliminate repeated inspection.

In Europe the *Erika* and *Prestige* incidents are used to improve the safety standards in the ports of the region. Turkey should use the *Volgoneft 248* and the other incidents before and after that, to improve port state control in the region and use it more effectively.

MARITIME SAFETY ASPECTS

GENERAL DIRECTORATE OF COASTAL SAFETY AND SALVAGE ADMINISTRATION

Salih ORAKÇI

Director General of the Turkish General Directorate of Coastal Safety and Salvage Administration

The General Directorate of Coastal Safety and Salvage Administration ("GDCSSA") has the task of protecting the marine environment and enhancing safety of navigation. It was established in 1997 as a General Directorate [by the Turkish Republic resolution of Cabinet Decision in 12.05.1997] and is a state-owned organization directly under the Ministry of Transport.

The Administration's core competences are:

- Search and rescue services
- Salvage and towage services
- Aids to navigation services (lighthouses, buoys, dGPS, RDF, ...)
- Marine communication services
- Turkish Straits Vessel Traffic Services ("TSVTS")

Let's have a look at these services briefly;

Search and Rescue Services:

According to the Search and Rescue ("SAR") Coordination of Turkey, the Marine Rescue Coordination Center ("MRCC"), located in Ankara and under the authority of the Undersecretariat for Maritime Affairs, is responsible for the SAR coordination and, the Turkish Coast Guard is responsible for marine rescue operations. The GDCSSA has a special agreement with the Turkish Coast Guard for search and rescue services within the area of the Turkish Straits to provide assistance, if needed. Both bodies, the Coast Guard and the GDCSSA have enjoyed close cooperative relations in providing rescue services in the Turkish Straits.

The GDCSSA is well organized in the Turkish Straits having fifteen well equipped rescue stations (eight of them are boat stations and seven of them are shore-based rescue stations).

Professional rescue teams keep watch at the stations for twenty-four hours a day and seven days a week. The GDCSSA is also a member of the International Lifeboat Federation (“ILF”).

During a SAR operation, if it is impossible to reach the vicinity of vessels by sea or air due to severe weather conditions, shore-based rescue services are performed to provide assistance to grounded vessels from land –based vehicles that send lines using rockets for whip and breeches buoy equipment, when the causality occurs at the north entrance of the Istanbul Strait.

Life- saving operations that are provided from offshore are performed by ten high speed rescue boats (30 knots), which have the capability of self righting and self floating, three SAR boats (12 knots) and five RHIBs (35-40 knots).

Salvage and Towage Services:

Salvage and towage services are provided by well trained and experienced staff on a global basis. We are one of the twenty-nine world-wide members of the International Salvage Union (“ISU”).

The GDCSSA has met the need for the services of tugs, underwater works, salvage & towage with 2 conventional salvage vessels, four Fi-Fi class-1 tugs, 11 firefighting tugs and various types of service boats which total some 25 vessels. Also, there is a project to add another 2 Fi-Fi Class-2 tugs in the near future.

The towed structures vary from floating dry docks, rigs, damaged vessels, barges, drigging equipments etc. The GDCSSA also has environmental protection equipment to use in case of oil spills. The protection of our coastline and seas is vitally important to the well being of marine resources and local communities. The GDCSSA has the capability of responding to marine oil spills during salvage operations or, in case of any emergency situation, to respond to oil spills employing 2800 m barriers, 4 sea slugs and 2 skimmers.

The GDCSSA has been given a State monopoly in providing these services in the Turkish Straits. In case of any emergency situation such as, drifting, sinking, or grounding, the GDCSSA stands ready and willing to assist 7/24, vessels and cargo, provide salvage, protection of the marine environment and wreck removal in the Turkish Straits.

Aids to Navigational Services:

The GDCSSA, which is qualified as an Aid to Navigation ("AtoN") authority, provides AtoN services as one of our main tasks and is performed consistently in order to improve the safety of navigation for all mariners.

Currently, 507 AtoN equipment have been operating continuously along 8333 kilometers of beautiful and scenic Turkish coastal area.

The GDCSSA, which is a member of the IALA, has been constantly inspecting its quality of services to meet and maintain ISO 9001-2000 standards. Also, the GDCSSA attaches full importance to the concept of people working at sea. The GDCSSA keeps up with the latest technological improvements and renders service with many beacons and dGPS stations in the Turkish Straits.

Marine Communications:

"Turk Radio" having an old history was incorporated into the GDCSSA in 02.07.2004. This arrangement has contributed to the safety of navigation by conducting marine communication services as a monopoly. Turk Radio undertakes not only to provide marine communication, messages for the safety of navigation, marine meteorological and sanitary broadcasts and distress safety communication but also acts as Navtex coordinator and accounting authority for marine communications.

Turk Radio began broadcasting in Turkish as of 01.01.2005 in accordance with the International Maritime Organisation (IMO) recommendation. These Turkish Navtex broadcasts are accessible from the GDCSSA web page (www.coastalsafety.gov.tr). After the signing of the protocol with the General Directorate of Meteorology in July 2000, national/international meteorological information is also being broadcast on the VHF-HF telephone and telex band. Further operations to provide radio services (Meteorology- routine communication) via HF- mail are still in progress.

The description of activities provided by Turk Radio is provided below:

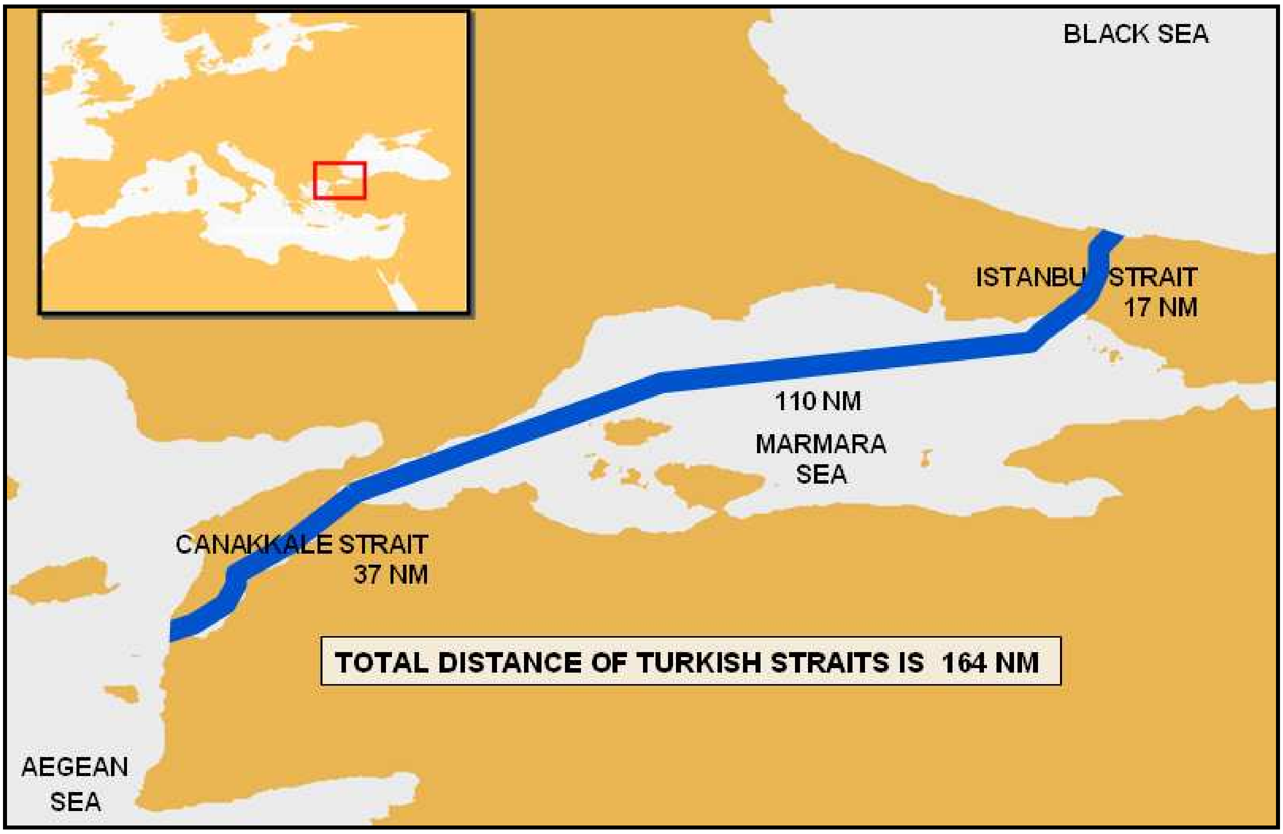
DESCRIPTION OF ACTIVITY	2003	2004	2005
Distress and Safety Message	58	42	60
Meteorological Broadcast	6.852	6.840	5.040
Navtex Broadcast	8.049	8.948	19.940
Baseless Distress and Safety Message	45	39	38

THE TURKISH STRAITS

For centuries, the Turkish Straits been known as a difficult waterway to navigate for vessels, as well serving as a strategically and commercially important waterway for maritime transport. In addition to its geopolitical and strategic importance, as the only waterway between the Black Sea and Mediterranean Sea, the Turkish Straits are also a highly congested route for international maritime traffic.

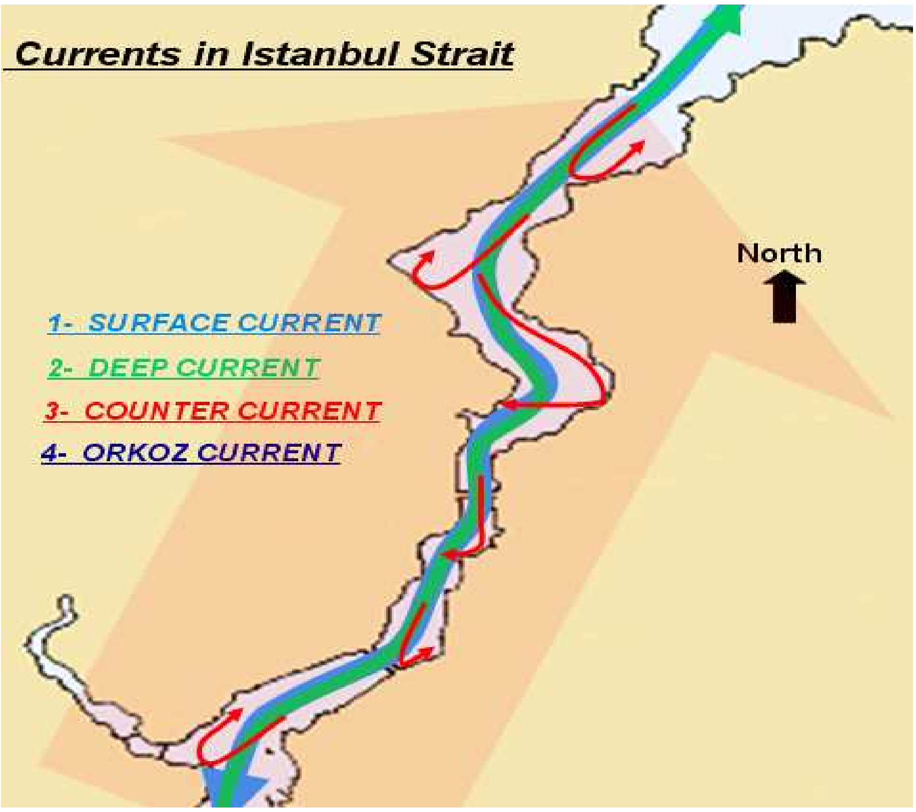
The Turkish Straits consist of the Istanbul Strait (17 nm in length), the vessel-navigating area of the Marmara Sea (110 nm in length) and the Çanakkale Strait (37 nm in length). The total length of the Turkish Straits is 164 nm and it is open to international maritime vessel traffic under the control and regulation of the Turkish Government.

Istanbul, which according to Napoleon:” If the world were a single state, its capital would definitely be Istanbul” and, La Martine who said “there, God and human, nature and art have came together to create the most astonishing view the human eye could ever imagine,” has been declared as a "World Heritage City" by UNESCO. The shoreline of Istanbul is densely populated and vessels often pass within just meters of houses, schools and historical places. Beyond the historical importance of the Turkish Straits there is another important point that should be emphasized and that is that every day the residents of Istanbul use the Istanbul Strait as an integral part of their daily lives. Boats and car ferries cross it approximately 2500 times every day carrying an estimated two million people between two continents.



Although so many people are carried across the Strait every day, there are important risks and difficulties. One of these risks is the width of the strait. The narrowest bend of the Istanbul Strait is located between Aşiyan and Kandilli where the Strait measure a mere 698 meters, The Aşiyan and Kandilli bend requires a course alteration of 45 degrees and is only one of twelve sharp bends in the Istanbul Strait. The Yeniköy bend is another difficult area in the Istanbul Strait where the course alteration is 80 degrees. Another danger for the navigation is the current speed, which can reach up to 7-8 knots.

The Straits are further characterized with four different types of currents. The Black Sea is nearly 30cm higher than the Aegean Sea which creates a surface current direction that generally moves from north to south and can reach up to 7-8 knots. But due to the low sea water density of the Black Sea a second deep current flows from south to north. In addition, there are local counter currents and the orkoz current which is caused by strong southerly winds, all of which make navigation in Turkish Straits difficult.



Over the years the Turkish Straits have been the victim of many accidents that have endangered both the lives of crew, the population of as well as caused serious damage to the marine environment. In 1963 a woman was actually killed in her bed after a vessel rammed into her bedroom.

Some of the most serious accidents involved tankers carrying oil through the Strait of Istanbul. The most catastrophic of these accidents occurred in 1979 when the M/V *Evriali* collided with M/T *Independenta,* the latter fully laden with oil. The collision resulted in the tenth most serious oil spill in the world as a total of 95.000 tons of crude oil spilled and burned into the Strait. Forty-three crew members lost their lives. In 1994 a similar collision took place again in the Istanbul Strait between the M/T *Nassia* and the M/V *Ship Broker* resulting in a spill of 20.000 tons and twenty-nine crew members lost their lives.

After these serious accidents, Turkey established a traffic separation scheme for the Turkish Straits ("TSS") and the IMO adopted the Associated Rules and Recommendations (resolution A.827(19)) which have been applied successfully since 1994. Since this implementation the number of accidents has decreased significantly demonstrating the effectiveness of the system.

1979 M/T Independenta – M/V Evriali

1994 M/T Nassia – M/V Ship Broker

TURKISH STRAITS VESSEL TRAFFIC SERVICE

The Turkish Straits Vessel Traffic Service ("TSVTS") began operations for the Istanbul and Çanakkale Straits on 30 December 2003. The competent authority of the TSVTS is the Minister of Transportation. The TSVTS Authority is the General Director of Coastal Safety and Salvage Administration, who is appointed by the Turkish Government.

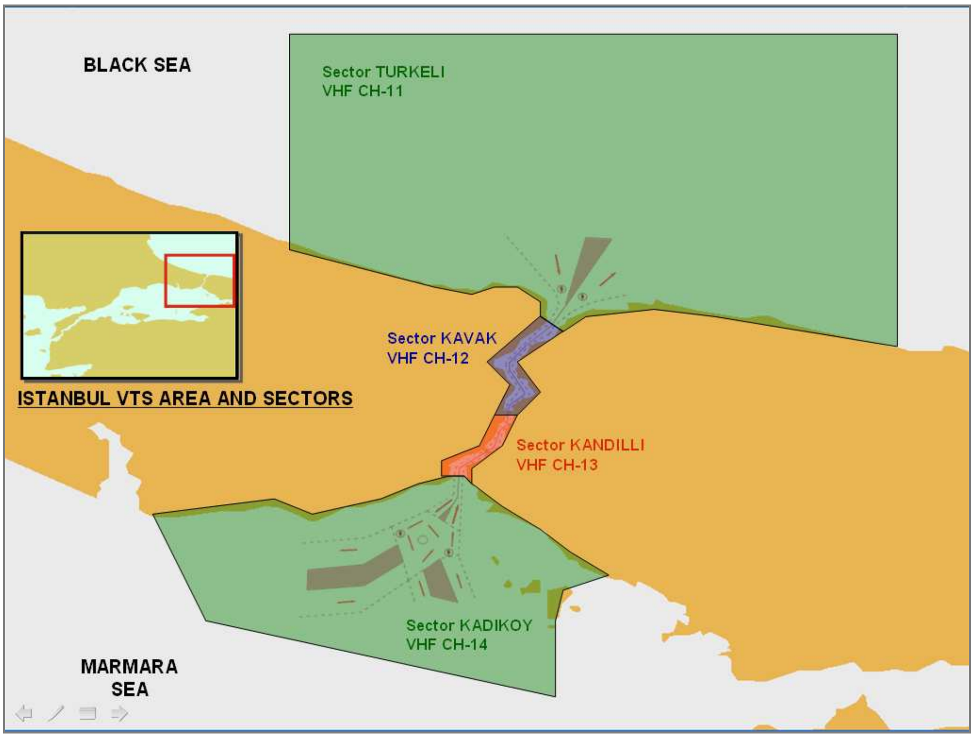
The TSVTS does not simply enhance the safety of navigation but it also serves an important function in coordinating emergency teams in case of an emergency. The TSVTS also makes risk assessments by using information received from vessels, tugs, SAR, and medical boats etc. It also issues warnings to other vessels and strives to prevent or minimize the risk of an accident or of an unexpected situation from taking place.

The following important point also needs to be emphasized:

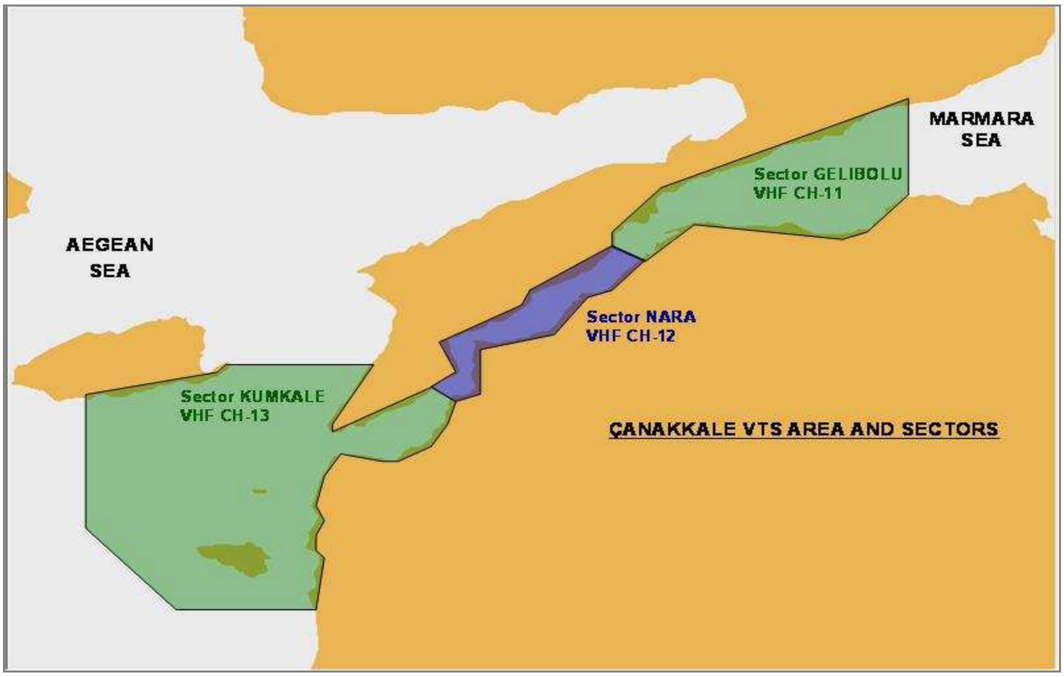
"Taking into consideration the fact that the ultimate decision relating to safety of navigation is given by the Master, any information, warning, instruction or recommendation given by the VTS does not in any way affect the responsibility of managing the vessel, the professional ability and knowledge of the Master."

There are currently two VTS areas in Turkish Straits:

The above picture shows the delineated VTS areas which for Istanbul is 55 nm in length and for Çanakkale is 78 nm in length. The vessel -navigating -area in the Marmara Sea is 71 nm in length and will join the system after three more remote sensor sites are established by the end of 2007.



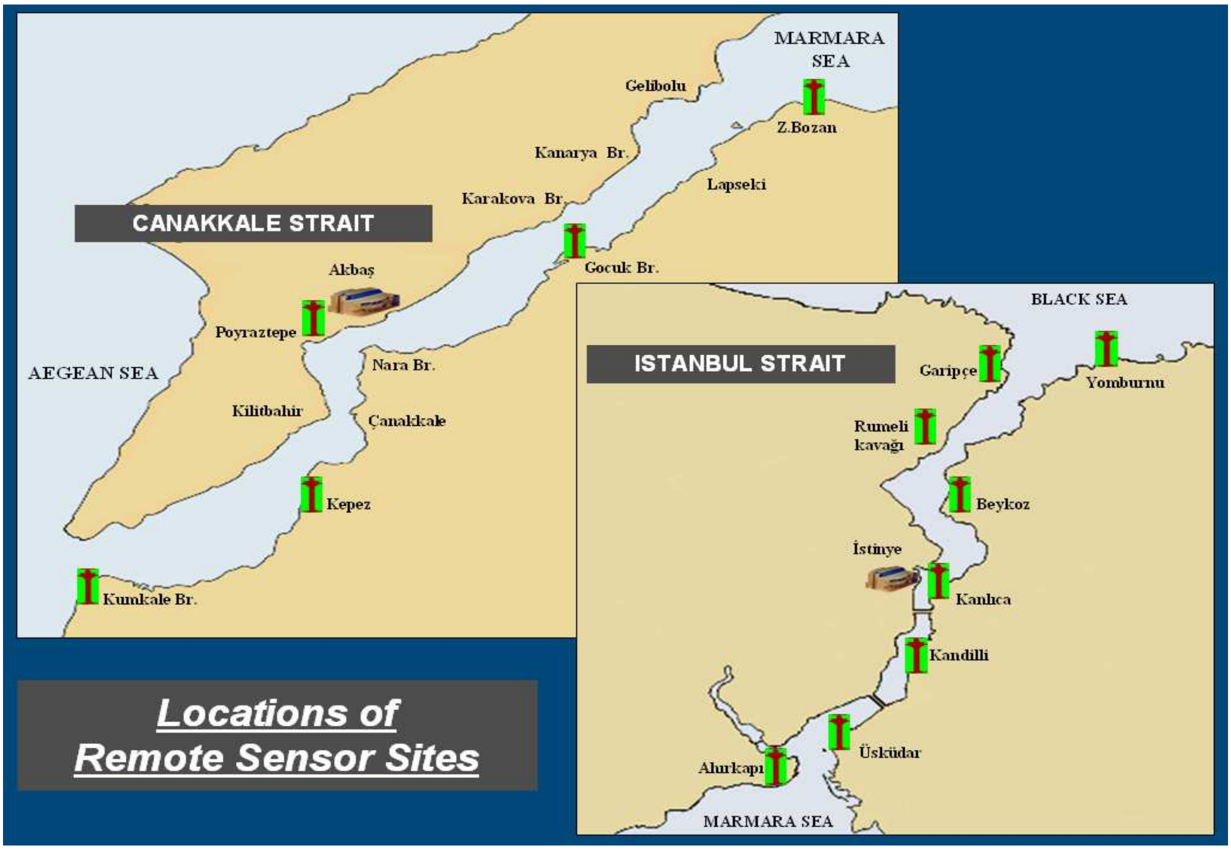
The Istanbul VTS area is divided into four sectors: Türkeli, Kavak, Kandilli, and Kadıköy. Each sector is controlled by an operator. Different VHF channels are used for each sector. Furthermore, all sector operators should have a commanding influence over their respective sector.



The Çanakkale VTS area is divided into three sectors. The names of the sector from north to south are the Gelibolu, Nara and Kumkale sectors. Similar to Istanbul, each sector is controlled by a different operator with a different VHF channel.

In regard to the technical specifications of the system;

The collection of information on marine environment and vessel traffic in the TSVTS areas involves a combination of sensors. Information on the vessel traffic situation is obtained by sensors and these sensors are located on remote sensor sites (RSS). There are a total of thirteen RSS made up of eight sensors for the Istanbul Strait and five for the Çanakkale Strait.



The entire TSVTS area is covered by microwave radars and CCTV equipped on these sites and three of them are equipped with VHF at both Straits. Six AIS base stations have been established in the Turkish Straits. Furthermore, there are fifty pieces of portable pilot units with AIS transponders that are being used by pilots enabling them to have the whole traffic image for vessel passages.

The main components of the system are: x-band microwave radars, closed circuit TV cameras, Doppler current sensors, surface water measurement sensors, salinity and temperature profilers, automatic weather stations, dGPS reference stations, VHF direction finder stations, VHF / MF / HF / Inmarsat -C communication equipments, record and replay units and Automatic Identification System base stations.

The TSVTS render three kinds of services:

Information service is a service for providing information about maritime traffic, the position of vessels in relation with other vessels, intended movements of other vessels, notices to mariners, meteorological information and any other information deemed to be necessary by the VTS Operators.

Navigational assistance is a service for providing information in order to ensure the safe navigation of vessels experiencing difficulties due to navigational equipment failure or bad weather.

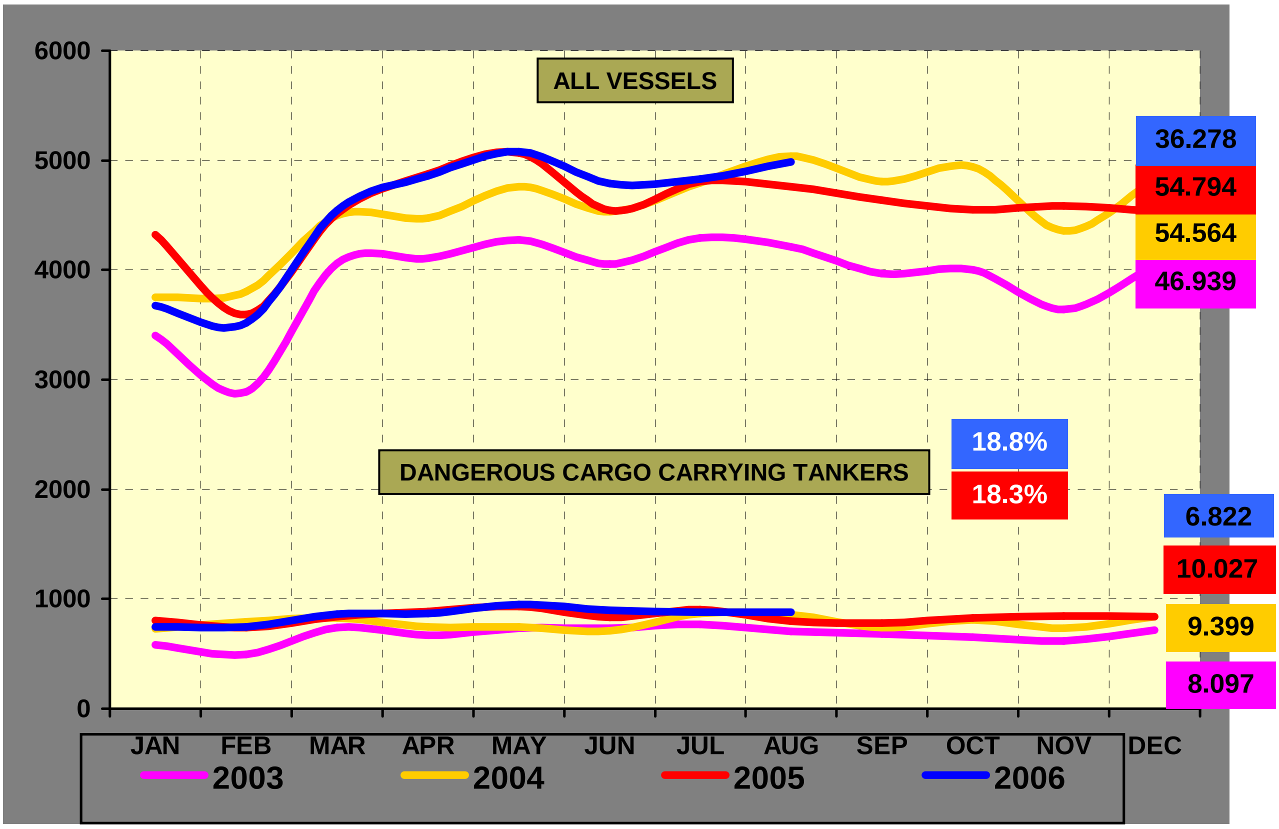
Traffic organization service is a service for providing operational information before vessels enter the Straits to assist vessel traffic organization in accordance with the Turkish Straits Maritime Traffic Regulations.

The recruitment and training of VTS operators are based upon the criteria established by the IMO Guidelines and applicable IALA model courses. The minimum acceptance standard to become a VTS operator in the TSVTS requires holding a master mariner certificate and, in addition, all candidate Operators are trained for six weeks. Operators also have flexibility to use all components of the console. All sensors on the RSS can be controlled remotely by operators. Furthermore, all movements and communications of vessels within the Turkish Straits are automatically recorded by data recorder units without any interruption.

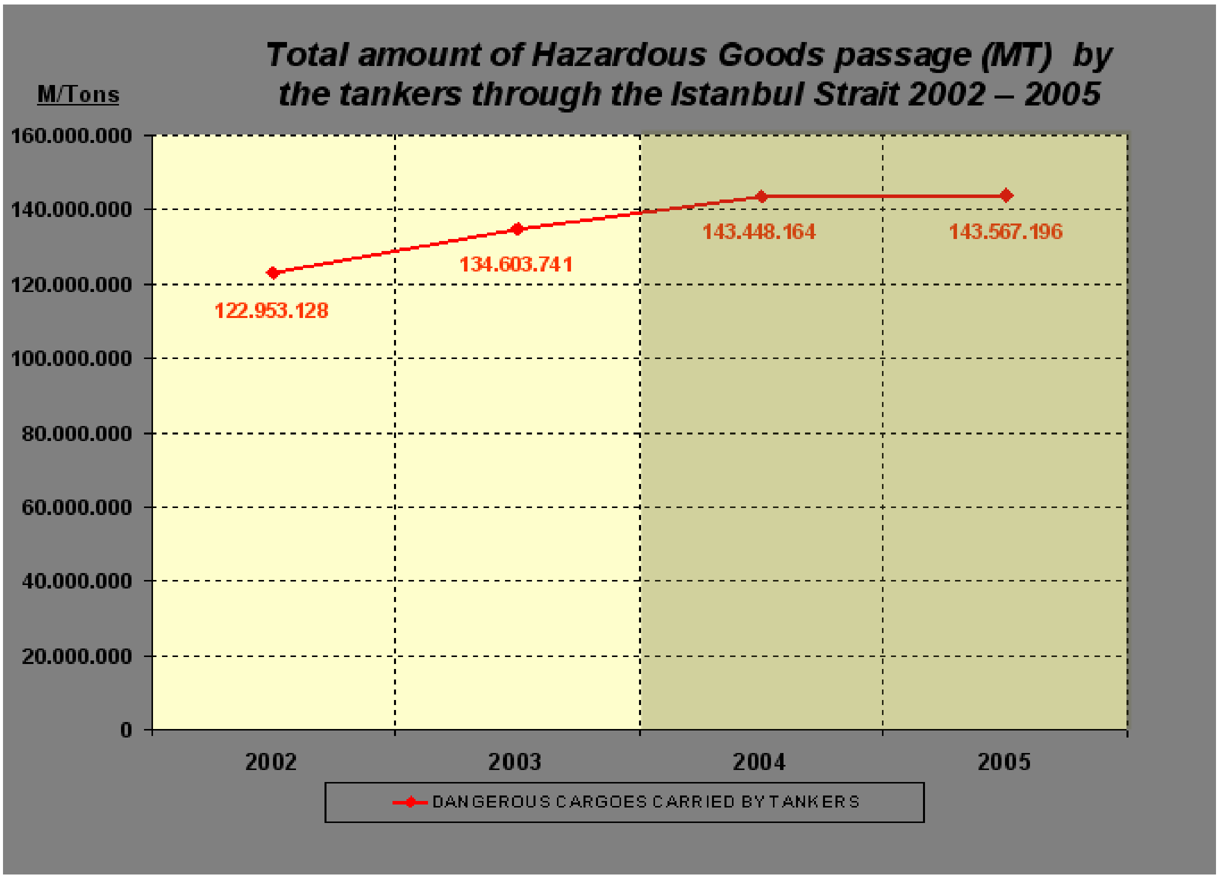
The main purpose of the TSVTS is to improve the safety of navigation and to protect the marine environment in the VTS Area by proper and effective monitoring, strategic planning and good interaction with vessels. Importance is also given to efficiency of vessel traffic flow through the Turkish Straits.

In addition, the TSVTS, provides important services for security measures in accordance with the IMO adopted International Ship and Port Security Code ("ISPS") was adopted by the IMO, and for search and rescue operations. The TSVTS is the first contact point in the case of any emergency in the VTS area and it distributes all related information to the concerned organizations. Furthermore, the VHF channel 06 is used to provide communication during emergency situations.

Finally, the following statistical data summarizes the operation of TSVTS:



These statistics show the total number of vessels and the total number of vessels carrying dangerous cargo that passed through Istanbul Strait during the years of 2003-2004-2005 and the first nine months of 2006. There has been an average increase of 16 percent since 2003. The improvement of vessel traffic flow efficiency has been almost the same in the Çanakkale Strait. One of the most important reasons for this improvement can be attributed to the efficient and proper traffic organization provided by the VTS, which began providing these services at the end of 2003. According to these statistics, almost 19 percent of these vessels carry dangerous cargo. The statistics for the number of vessels in 2004-2005, show that although we use the latest and highest technology and well trained and experienced personnel in VTS, there were not any significant changes at the number of vessels. That means that the Strait has reached to the peak level for traffic volume.



The amount of dangerous goods that passed through the Istanbul Strait in 2004, 2005 and the first nine months of 2006 were for each period nearly 143.5 mtons, of which 95 percent was crude oil and petroleum product. The amount in 2002 was nearly 123 mtons of dangerous goods.

In addition to the VTS, the use of a pilot during passage provides another important means for enhancing the safety of navigation. Although engaging a pilot in the Turkish Straits is strongly recommended by IMO resolution A.827(19) the percentage of vessels engaging a pilot is only 45 percent in total for all vessels in Istanbul Strait in 2005 of which only 35.4 percent was comprised non-stopover vessels. Likewise the proportion of vessels using an escort tug for the non-stopover vessels was also merely 1.8 percent. Clearly, 1.8 percent is a negligible figure. Bearing in mind that the risk of an accident decreases considerably for those vessels engaging a pilot, it is strongly expected and recommended for all vessels intending to use the Turkish Straits to engage a pilot and use an escort tug.

Even taking all of the above-mentioned safety precautions, once cannot say that the risk of an accident in the Turkish Straits would be completely removed. The aim is to minimize all possible risks by taking the measures mentioned above. One of the greatest problems that vessels face arises from the use of unqualified crew and staff as well as the lack of adequate technical maintenance of vessels. In 2005 there were a total of 85 engine, 18 rudder, 13 gyros and 22 other navigational equipment failures totaling a significant 138 failure incidences that have occurred in the Istanbul Strait. If we consider the fact that twenty-five of these vessels were tankers and five were passenger ships, it is not difficult to estimate the risk scenario.

On this issue, in addition to coastal States, flag States and especially port States have an important role to play. The Turkish Administration takes all the necessary measures to minimize the risk of any accident / incident however, all other parties concerned and especially masters should also fulfill their obligations as required by international/ national law, rules, recommendations and good seamanship. Unfortunately, many important international conventions for the safety of navigation and protection of the marine environments such as, SOLAS, COLREG, MARPOL 73/78 and STCW came into effect only after some important accidents such as the TITANIC, TORREY CANYON, ERIKA, BRAER, and NASSIA.

There are many important key factors to minimize navigational risks in Turkish Straits. One of the most important of these is to engage a pilot and another is to use an escort tug.

Now, I would like to pose the following question to all:

"Are we going to wait for another ***disaster*** *instead of using tug boats and engaging a pilot?"*

TURKISH STRAITS:
DIFFICULTIES AND THE IMPORTANCE OF PILOTAGE

Cahit İSTİKBAL

Turkish Straits Pilot, Vice-President, International Maritime Pilots' Association (IMPA)

INTRODUCTION

The term "Turkish Straits" describes the Strait of Istanbul, Strait of Çanakkale and areas of the Sea of Marmara. For purposes of maritime transportation; it describes the passageway within the traffic separation scheme from the Black Sea extending to the Aegean Sea. This article aims to give an overview of the pilotage services in general, and then will touch upon the difficulties of navigation in the Turkish Straits and the importance of pilotage as a maritime safety tool to eliminate the risks created by these difficulties.

THE ROLE OF MARITIME PILOTS

The maritime pilot's role is to assist the Master of a vessel during the ship's passage to and from a berth in a given pilotage area, by providing local knowledge of navigational and operational matters combined with specialist ship-handling experience.[1]

The pilot is entirely familiar with the special regulatory requirements and unique conditions that exist in his specific pilotage area, and with which the Master of the vessel cannot be expected to be fully conversant. The pilot is wholly familiar with all the local factors that might affect the navigation of the ship. These may include strong tidal flows, recent shoaling, ferry activities, dredging operations and other hazards.

The maritime pilot also provides an essential communications link with the port authorities, maritime traffic services (VTS), tugboats, boatmen and other ships.

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[1] European Maritime Pilots' Association (EMPA) web site www.empa-pilots.org

Maritime pilots not only supply pilotage to ships; but also provide a public service by contributing to the overall safety of maritime traffic and by ensuring the protection of the environment.

Maritime pilots are one of the main elements for providing *maritime safety* in *high risk* marine environments." Unlike the VTS system, which is positioned on-shore, pilots are positioned right on the target, carrying out their duty on the bridge of the ship, just at the very heart of operations.

The basic advantage of a pilot *being onboard* of the ship is that a pilot feels the ship, her interaction with the sea; he/she has eye-to-eye contact with the ships' navigational team, and sees the capabilities and possible incapability of the ship. These, in the author's opinion, are what make a maritime pilot different from any other element in a high-risk marine environment.[2]

PILOTAGE SERVICES IN TURKEY

Pilotage is compulsory at Turkish ports for all Turkish flag vessels over 1000 GT and for all foreign flag vessels over 500 GT. Principally, the following types of pilotage organizations currently provide pilotage services in Turkey:

1- Public companies
2- Private companies
    a. Companies owned by a cooperative body of pilots (Only one example)
    b. Companies owned by businessmen
3- Public ports
4- Private ports

Pilotage is governed by two regulations:

1- Regulation on Competencies of Pilots (1997)
2- Regulation on Pilotage and Towage Organizations (1998)

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[2] Istikbal,C; "Pilot, Ship and VTS", IMPA Web Site
http://www.internationalpilots.org/haberdetay_articles.asp?kategori_no=36&id=87

Pilots' certification is given by the Undersecretariat of Maritime Affairs, which is part of the Ministry of Transport. Pilots are supervised by the Port Authority. Pilotage is compulsory for vessels exceeding 500 GT. This does not apply to domestic ferries, and national war and administrative vessels[3]

During the 1990s, as a result of complaints brought against pilotage services provided by public companies the Maritime Undersecretariat decided to take some steps to address these problems. Initially, the Maritime Undersecretariat modified some of the port regulations in order to give opportunities to private enterprises to provide pilotage services in those areas falling outside of the monopoly zones of public administrations.[4]

In Turkey, the pilotage system works well; however, there are some challenges that continue to exist. Due to the complexity of the system, the unique philosophy of pilotage is only being partially achieved throughout pilotage areas. Furthermore, in some parts of the system where pilots are employed by ports open to free competition, pilots might experience difficulty in refusing pilotage service that they might assess to be unsafe, despite the IMO Resolution A.960 that provides that "[t]*he pilot should have the right to refuse pilotage when the ship to be piloted poses a danger to the safety of navigation or to the environment."*

During the privatization process of Turkish ports, pilotage services were also included in the privatisation package. In fact, pilotage services needed to be excluded from the privatization package in order to regulate these services as a service independent from the port. Unfortunately, this was not the case in Turkey in the privatization process of many ports.

Turkey has been successful in privatization process; but its difficult to say the same for the Pilotage services within it. The author holds high expectations that a fully regulated, unified pilotage system will take place in the near future in Turkey. In order to achieve that, the author offers two suggested options:

1- Establishing the Turkish Pilotage Federation that consists of local bodies which provide pilotage services; or

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[3] Prof. Dr. Osman Kamil SAG; "*The importance of training and certification of maritime pilots*" Presentation paper for the IMPA 2004 Istanbul Congress.
[4] Capt.Aykut EROL; *"Importance of the pilotage services"* articles published on various maritime magazines..

2- Establishing the Turkish Chamber of Pilots which sets the operational procedures of the pilotage profession and which guarantees that nation-wide services retain the same philosophy and understanding in pilotage.

In either option, the Turkish Straits Pilotage Services should be included in the system in order to maintain unification.

A BRIEF LOOK AT THE HISTORY OF THE TURKISH STRAITS

Apollonius of Rhodes, in the third century BC, described a "Pilot" in his book *The Argonautica* as a "skillful helmsman." Furthermore, the pilotage to which he referred took place in the Strait of Istanbul (The Bosporus). The Legendary hero Jason led his Argonauts through the Bosporus to reach Colchis, in search of the "Golden Fleece". This journey has been dated back to 1200-1300 BC. Passing through the Bosporus was one of the biggest challenges on the route to Colchis. The following paragraph is from the book "Argonautica":

"…*with a favoring wind they steered through the eddying Bosporus. There, a wave like a steep mountain rose up in front as though rushing upon them, almost reached up to the clouds; would you say that they could escape grim death, for in its fury it hangs over the middle of the ship, like a cloud, yet it sinks away into calm when it meets with a skilful pilot."*

This skillful pilot, who steered the Argo safely through the Bosporus was Tiphys, who may also have been the first known pilot in the Bosporus.

What was the reason behind that Jason sailed from Greece to Georgia and fight with the perils of the Straits? We should seek an economic reason; and it is not far away. At the time, gold was produced in Georgia, and it was represented in the legend as the "Golden Fleece."

Another strategic reason for gaining control over the Straits was the Trojan Wars. Troy was located in a strategic place controlling the Straits. Ancient Greeks thought it was necessary to capture this city in order to control the trade to the Black Sea countries. The beautiful Helen is seen as the reason of the Trojan Wars, as seen in the recent film "Troy"; but the main reason was far beyond this. The main reason was to gain control of these strategically important waterways. It was only after the fall of Troy that the Greeks were able to control and colonize the Black Sea coast.

There is another legend about the Straits dating back to ancient times having to do with the name "Bosporus" itself. "Bosporus" means "cow's passage" and according to the legend, the beautiful Io passed through this passageway when running to avoid a fly when her lover, the "boss" of Olympus, "Zeus" converted her into a cow in order to prove to his jealous wife, Hera, that she was not his lover.

Apart from legends, throughout written history, the Turkish Straits region has been an important playground for world powers since the beginning of history.

For centuries, the Strait of Istanbul has served as a strategically vital waterway to and from the Black Sea. In 513 B.C., the Persian emperor Darius built a bridge of ships across the strait to lead his army into Greece.

Throughout history many forts and palaces were built along the coast of the Straits, as testimony to the strategic value of these most difficult waterways. In 1453, the Ottomans conquered Istanbul, dramatically changing the role and significance of the Straits as a commercial passageway connecting east and west.

Ottoman control over the Straits lasted for centuries, however, its strength fluctuating according to the Empire's strength and power. In 1833, the Treaty of *Hünkar Iskelesi* was signed between the Ottoman Empire and Russia, which granted free passage to Russian warships through the Straits "in case of need".

The Treaty of London (1840) and the Straits Convention (1841) followed. These were the first international instruments to regulate passage through the Straits. Then Ottomans lost total control over the Straits under the 1918 Mondros Armistice. According to this armistice, Turkish Forces were to be demobilized immediately and Allied forces were to occupy strategic points along the Turkish Straits.

The Treaty of Sèvres, which was signed in 1920, entrusted the responsibility to administer the rules of passage through Straits to an International Straits Commission. But, the success of the Turkish revolt, under leadership of Mustafa Kemal, prevented the ratification of the Sèvres Treaty.

The 1923 Lausanne Convention followed the success of the Turkish Independence War under the command of Mustafa Kemal (Ataturk). The most significant aspect of the Lausanne Convention was that warships would be no longer prohibited from entering the Turkish Straits.

Today, the traffic in the Turkish Straits is regulated according to the rules set forth by the Montreux Treaty, which was signed in 1936. Article 1 of this convention provides that the parties "*recognize and affirm the principle of freedom of transit and navigation in the Straits*" while Article 2 states that " *during peacetime, merchant vessels of all states have complete freedom of navigation in the Straits, whether it be day or night*" and leaves the pilotage and towage "*optional*"

A legal analysis of the Turkish Straits necessarily begins with the 1936 Montreux Convention, but does not stop there. Local practice and the 1994/1998 Maritime Regulations are also a part of the existing regime.[5]

From the pilotage aspect, Article 2 of 1936 Montreux Convention established the rule that " *pilotage and towage remains optional*" It is a certain rule, however, the issue is not that simple. The 1994/1998 Turkish Straits Regulations strongly recommends to all ships to use a pilot[6]. The IMO issued Rules and Recommendations further supported the Turkish Regulations by *strongly advising* ships to use a pilot when transiting the Turkish Straits.[7] Despite the existence of Article 2 of the Montreux Convention, all other supporting legislative documents regards pilotage as a tool to be used in order to carry out a "safe a prudent seamanship" while passing through the Turkish Straits. Accident statistics and analyses also support this statement. Therefore, ships that do not use pilot for passage through these most difficult waterways could have no valid ground to verify this situation after a serious accident.

On the other hand, Article 2 of Montreux Convention applies only to the ships engaged in non-stopover passage through the Turkish Straits. Turkey has the authority to establish compulsory pilotage regime for ships which are bound for ports and piers or anchorages within the Turkish Straits area. Therefore, pilotage for ships bound for a Turkish port within the Straits is compulsory and this constitutes 40 percent of all ships passing through the Turkish Straits.

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[5] Nilufer ORAL; "*The legal regime of the Turkish Straits*"; Presentation paper for the IMPA 2004 Istanbul Congress.
[6] Article 27; Maritime Traffic Regulations for The Turkish Straits and the Marmara Region; 1998
[7] IMO Resolution A.827(19), 1995

PERILS OF THE STRAITS AND THE IMPORTANCE OF PILOTAGE

Today's larger and more powerful ships, which cannot even be compared to the smaller vessels of Jason's time, still appear to need the help of *Tiphys* to pass safely through these waterways.

Within the Turkish Straits system, particularly the Strait of Istanbul, which forms a winding and quite narrow geographical structure 18 nautical miles (31 Km.) in length and 700 meters at the narrowest points in width, there are numerous bends including one that require 12 course alterations for passing vessels. Some of these alterations are very sharp, in some instances more than 80 degrees.

From the meteorological aspect, the Strait of Istanbul is heavily influenced by strong northern winds, rain and intensive fog particularly during spring and autumn seasons. Furthermore, weather conditions can change rapidly so that a ship beginning its passage in cloudy weather can all of a sudden find herself inside a thick fog with zero visibility.

This happened to me once as I was piloting a tanker from the north to south. At the beginning visibility was fine but as the ship rounded the Yeniköy bend, which is still near the entrance of the Strait of Istanbul, we faced a thick fog making the fore mast of the tanker invisible, which was indeed extremely dangerous. Being familiar with the Straits, I was able to pass through it safely but I do not even want to imagine a captain by himself in a similar situation, without a pilot, carrying thousands of tonnes of oil.

As is known, the dynamic factors of surface and subsurface currents are different. The main factor for subsurface currents is the difference of density between the Black Sea and the Aegean Sea, while the main factor of the surface current is the difference of water levels between these two seas. Surface currents, which can increase up to 6-8 knots in speed, are one of the most important handicaps for navigation through the Straits. This is because the danger created by surface currents is twofold greater. Vessels navigating with the current lose the ability to steer as they can only actually make 2-4 knots through the water. On a winding road we all know the importance of steerage. Who would want to drive around a 80 degree curve with poor steering capability? This is the case for ships turning the Yeniköy bend in the Istanbul Strait.

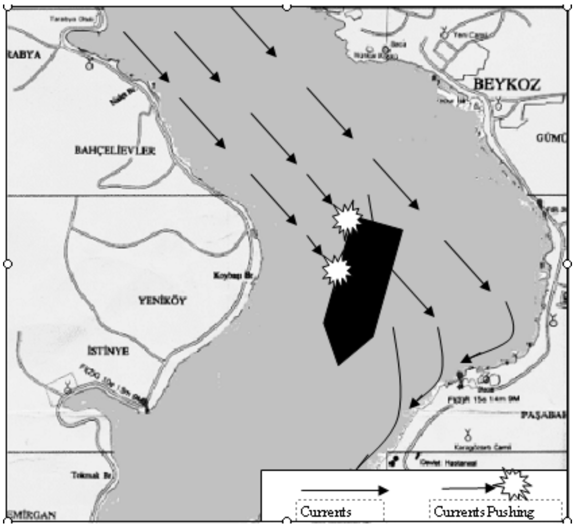

Figure 1- Sharp bends (Yeniköy) In the Strait of Istanbul and effect of current.

The second danger emerges when a vessel must turn around a bend and across currents. In such a case, the current literally pushes the fore of the vessel and makes it very difficult for her to turn in the desired direction. For instance, a large vessel carrying explosive cargo caught in such a cross current may find herself in someone's living room.

Human error is generally accounted for 85 percent of accidents at sea. Therefore taking on a pilot for the passage has proven successful to reduce the risk of an incident in the Turkish Straits. Unfortunately, only 40 percent of vessels (average of Istanbul and Çanakkale) passing through the Turkish Straits take a pilot and yet, statistics show that 92,8 percent of the vessels involved in accidents in the Straits had not employed a pilot. In any case, it should not be forgotten that although safety measures reduce the risks of navigating through the Turkish Straits such risks they would never be fully eliminated. A fisherman has been quoted as saying after the Sea Empress incident: “What they talked about was that they were 99.9 percent that there wouldn’t be a major spill, but we got the 0.1%”.

Passage through the Straits, particularly in Istanbul becomes even more dangerous due to increasingly busy local traffic with an average of 2000-2500 daily crossings by boats transporting citizens’ back and forth between the two coasts of the city. Pleasure boats used in the Strait, for tourist and entertainment purposes, further increase the amount of local traffic especially in summer seasons. Boat movements are also increased by the swarms of fishing boats.

All of these perils listed above demonstrate that navigating through the Turkish Straits require the following:

1- Utmost navigational knowledge with particular attention to navigation in narrow channels (harmonized with local experience);

2- Prudent seamanship and manoeuvring skills (harmonized with local experience);

3- Familiarity with the geographical, oceanographic and meteorological characteristics of the Straits;

4- Fluency in local language and knowledge of the routes, attitudes and manoeuvring characteristics of local vessels and traffic;

5- Good cooperation with VTS, knowledge in what-to-do in emergency situations; and

6- Good bridge team management.

Who can appropriately provide necessary services for all of the items listed above? Certainly, the answer is the "Pilot." Pilotage has traditionally been the best viable means to minimize the risks in a high-risk marine environment and the Turkish Straits is no exception.

MAJOR ACCIDENTS IN THE TURKISH STRAITS

Some of the major accidents that have occurred in the Turkish Straits before the passage of Regulations are as follows:

- **M/T Independenta:** Romanian flagged tanker *Independenta* collided with the Greek flagged freighter M/V *Evriyali*, on 15 November 1979. Almost all of the Romanian tanker crew lost their lives (only 3 out of 46 survived). The collision caused a fire and the tanker's wreck remained grounded affecting the area for some years.

- Ammoniac loaded Panama flagged tanker M/T *Blue Star*, collided with the Turkish Crude Oil Carrier M/T *Gaziantep*, which was at anchor, on 28 October 1988. Huge quantities of ammoniac cargo polluted the environment. As was in the case of the 1994 *Nassia* accident, it was by sheer luck that the wind was blowing seaward and not landward. It would have been disastrous otherwise.

- M/T *Nassia* collided with bulk carrier M/V *Shipbroker*, both Southern Cyprus flagged vessels, on 13 March 1994. Twenty-nine officers and crewmembers of both ships lost their lives, including the master of Shipbroker. The ship burned totally. The fire on the tanker Nassia, which was fully loaded with crude oil, caused damage to the Strait and the marine environment. Approximately 20.000 tonnes of crude oil, a considerable part of Nassia's cargo, caused severe pollution, and a fire, which lasted four days, five hours and forty minutes, all of which resulted in the suspension of traffic in the Strait for several days. Once again Istanbul was lucky because the winds were not blowing towards the land but seaward.

There were not any major accidents or spills after the implementation of 1994/1998 Turkish Straits Regulations. However, one should take this fact with caution recalling that was a fifteen-year of interval between last two major accidents in the Turkish Straits: the *Independenta* in 1979 and the *Nassia* in 1994. Therefore, by not having an accident before 2009 would only be consistent with previous margins. But on the other hand, apart from major accidents, the overall volume of accidents indicate that there has been a sharp drop in the number of accidents since the implementation of 1994/1998 Regulations.

PILOTAGE IN THE TURKISH STRAITS

Pilotage services in the Turkish Straits are provided by *Turkish Maritime Incorporated*. This is a public public-owned company. The company is subject to privatization and almost all of the assets have been privatized except for pilotage and towage services in the Turkish Straits. Turkish Maritime Incorporated employs one hundred and forty pilots in order to provide the pilotage services. Services provided from two pilot stations in the Strait of Istanbul and two pilot stations at the Strait of Canakkale. Pilot stations located at the entrances of each Strait and at the either side. There is one additional pilot station dedicated to the Port of Istanbul for housing the harbour pilots.

Turkish Maritime Incorporated acts not only as a pilotage and towage service provider for the Turkish Straits, but also as a practical school and pool of experience for pilotage in Turkey. In May 2006, this company organized the first refreshment courses in Turkish pilotage history for its own pilots and received the “Golden Anchor” award from a high level jury of experts.

STRAIT OF ISTANBUL				STRAIT OF ÇANAKKALE			
YEARS	**Total Passages**	**With pilot**	**%**	**YEARS**	**Total Passages**	**With pilot**	**%**
1995	46954	17772	37,8	**1995**	35459	8292	23,4
1996	49952	20317	40,6	**1996**	36198	10307	28,4
1997	50942	19752	38,7	**1997**	36543	11047	30,2
1998	49304	18881	38,3	**1998**	38777	11448	29,5
1999	47906	18424	38,4	**1999**	40582	10002	24,6
2000	48078	19209	39,9	**2000**	41561	11130	26,7
2001	42637	17767	41,6	**2001**	39249	10703	27,3
2002	47283	19905	42,1	**2002**	42669	12164	28,5
2003	46939	21175	45,1	**2003**	42648	13020	20,5
2004	54564	22318	40,9	**2004**	48021	14404	29,7
2005	54794	24449	45	**2005**	49077	15661	32
2006(First 9 months)	40988	19913	49	**2006(First 9 months)**	36609	12605	34,4

Table 1. Use of pilotage services in the Turkish Straits (Data provided by Turkish Straits VTS)

Table 1 shows the use of pilots in both the Istanbul and Çanakkale Straits. Vessels passing through the Çanakkale Strait use approximately 15 percent fewer pilots than the vessels passing through the Strait of Istanbul.

A long-term accident analysis carried out on a total of 608 accidents occurred between 1982-2003 in the Strait of Istanbul demonstrate that human error is 22,5 percent responsible of the accidents.[8] The other reasons are respectively: adverse weather conditions (14%) technical failure (12, 2%), strong currents (4, 8%), fire (1, 3%) sabotage, (1, 2%) geographical and topographic conditions (0,3%), and others (0,7%). In the 246 cases the reasons for the accidents remain unknown. In analyzing the causation of accidents taking into account unknown causes; with the

[8] Dr. Nur Jale ECE; "*Analysis of the maritime accidents in the Turkish Straits*", 2006; P. 183

exception of technical failures such as, fire and sabotage, approximately 84 percent of all accidents between the years 1982 - 2003 can be linked to human error.

When accidents are analysed from the pilotage perspective, it can be clearly seen that pilotage eliminates the human error factor in accidents. Of the total 608 accidents that happened in the Strait of Istanbul between 1982-2003, 564 ships did not have pilot on board (92,8%) and 44 ships did have a pilot on board (7,2%)[9].

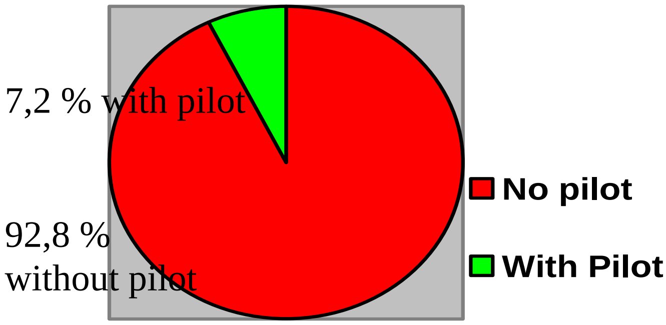

Figure 2: Results of analysis of 608 accidents in the Strait of Istanbul between 1982-2003.

VESSEL TRAFFIC SERVICES IN THE TURKISH STRAITS AND NEED FOR COOPERATION

The idea of a VTS for the Turkish Straits dates back to the 1980's, and was first put on the national agenda by the Turkish Pilots. As has been the case in pilotage history almost everywhere, pilots and pilot stations used to have the responsibility of performing many of the functions of a VTS. But, due to the low percentage of pilot use in the Turkish Straits during this period, as well as the absence of modern equipment, this aspect of the service could hardly have been called as being efficient.

The 1994 Nassia accident was a milestone for the Straits triggering the urgent implementation of the 1994 Turkish Straits Regulations together with Traffic Separation Scheme, which had been prepared well in advance. The Traffic Separation Scheme was approved by IMO on Turkey's request in May 1994, together with "Rules and Recommendations" the latter recognizing the right of Turkish authorities to suspend one-way or two-way traffic in order to

[9] Dr. Nur Jale ECE; "*Analysis of the maritime accidents in the Turkish Straits*", 2006; P. 192

provide for safe passage in cases of “large ship” passage. Implementation of these “Rules and recommendations” and the “Turkish Straits Regulations” in parallel, led to a great improvement in safety performance as reflected by the dramatic decrease in the number of accidents. However, nothing is free.

As a result of these safety precautions, the number of ships at the entrances waiting for passage increased causing complaints from Black Sea States such as Bulgaria, Russia and glag States such as Greece and Cyprus. These States voiced their complaints at the IMO in 1997. However, without going into detail, the IMO came to the conclusion, in 1999, that the IMO Rules and Recommendations had resulted in an increase in safety of navigation in the Turkish Straits. In addition, the IMO recommended the establishment of a modern VTS. This encouraged the already-existing efforts of Turkey in this regard and Turkey pressed the button for the establishment of a modern VTS. In October 1999, the Turkish government announced that Lockheed Martin was the winner of the VTS tender.

All operators of the Turkish Straits VTS are Master Mariners and have at least two years of Command experience. They have been trained in accordance to the IALA model course V-103/1 for “Basic Training” and model course V-103/3, which provides for “On the Job Training.” They have obtained their VTS Operator certificates after having successfully passed the final examination. However, the role of the pilots within this framework has not been clarified. A senior pilot at the VTS centre acting as a coordinator between pilots and the VTS operators would be to the benefit of more efficient services. That would further prevent the conflicts which might occur occasionally between the providers of both services.

The most important aspect of a VTS is in serving as a dynamic information source. Every ship has her own information resources: Radar, ECDIS, VHF, various navigational publications, pilot books, guides to port entrances etc. In addition to their advantages, each of these resources also shares the same weak point: they can not be expected to be updated at the very last moment. VTS constitutes a dynamic source in the responsible area, and is the most updated and dynamic source of information. This information may include the position and type of other ships in the area, meteorological or hydrological outlook, any malfunction of the navigational aids such as lights, light buoys etc. By the implementation of AIS system, all of these dynamic information and warnings will be available to all ships in a certain area and that will eliminate the voice communications burden on both sides. We can say that in the near future VTS systems will almost be "silent" contrary to the actual conditions of today.

VTS system has been revolutionary in many aspects; however, there are certain limitations for a VTS in such narrow waterways. First of all, as mentioned right above, The Turkish Straits, especially the Strait of Istanbul, are very narrow waterways. The width of an appropriate traffic lane measures only half a cable- less than 100 metres in certain areas. In another words; when something goes wrong with a ship, it takes only seconds for her to violate borders of the separation scheme and end with a collision, grounding or hitting the coast. Therefore, assessing the situation from a position ashore- even with the most modern monitoring tools- would possibly be misleading. On the other hand, pressing the ships to remain precisely within the borders of an appropriate traffic lane which is -as mentioned above- only half a cable at certain areas got the risk of being agitative for the decision makers on the ship's bridge and could give more harm than good. That's where the VTS services should be careful; because the situation has the risk of being counter-productive in the efforts of providing more efficient safety environment within the Straits.

Taking into account the time-lag in VTS system operations and also taking into account the main rule that ships should be commanded from the navigation bridge; VTS and pilotage services need to be done in close cooperation.

Apart from the concerns stated above, the VTS has brought revolutionary changes to the Straits. The overall traffic is now being audio-visually monitored and recorded at the VTS stations. Ships are being tracked from the Black Sea entrance to the Aegean Sea exit-or vice versa. In today's world, security concerns also increased to the level of safety concerns; and no doubt that a VTS is a tool to improve the security margins in the Turkish Straits.

CONCLUSION

The Turkish Straits, as Admiral Efthimios Mitropoulos stated during the IMPA 2004 Istanbul Congress, "are the spiritual home of pilotage.[10]" Since the beginning, passage through these most perilous waters needed the assistance of a local pilot as a helping hand. This was not only because the narrowness and curved structure of the Straits, but also because of the current system, the speed of which might reach up to 6-7 knots (3-4 knots of current speed accepted as the normal everyday force in the Turkish Straits), and due to the curved structure of the straits, currents create eddies and counter currents in the area of the sharp bends. Today, as the human element still remains as the key factor in the process of decision making on the ship's bridge, pilotage continues to remain a compelling need for a safe passage through the Turkish Straits. The long term accidents statistics supports this statement. 92,8 percent of accidents in the Turkish Straits involved vessels with no pilot on board.

Due to the international legal regime, a pilotage regime which is compulsory for all ships cannot be established in the Turkish Straits. Turkey has the authority to establish such a regime for vessels bound for Marmara ports. Such vessels represent 40 percent of all traffic. Despite such challenges the ratio of ships using pilot are steadily increasing. The most recent statistics indicate that 49 percent of all passing ships used a pilot in the Strait of Istanbul; this is a 10 percent increase from the previous year.

Today, the Straits are safer compared to the pre-1994 era. The International Maritime Organization has a great share in this. There were various discussions at the IMO since the first implementation of Turkish Straits TSS and attached IMO Rules and Recommendations in 1994[11]. Pilotage has been "strongly recommended" by IMO on several occasions. I hope that in the near future 100 percent of ships will use the services of a qualified pilot when passing through the Turkish Straits.

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[10] Efthimios Mitropoulos; Keynote Speech; IMPA 2004 Istanbul Congress; http://www.imo.org/Newsroom/mainframe.asp?topic_id=847&doc_id=3740
[11] IMO Assembly Resolution A.827(19).

ANALYSIS OF MARINE CASUALTIES IN THE STRAIT OF ISTANBUL

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INTRODUCTION

The Strait of Istanbul is a narrow channel that links the Black Sea to the Sea of Marmara. Geographical conditions and navigational constraints of the Strait, i.e. narrowness, deep, currents and bad weather conditions constitute the main parameters contributing to marine casualties in the Strait of Istanbul.

The Montreux Convention of 1936 Regarding the Legal Regime of the Turkish Straits established freedom of passage and navigation with certain formalities for merchant vessels of any flag and with any kind of cargo, by day and by night (1).

With the express purpose to enhance safety of navigation, Turkey introduced a traffic separation scheme in the Turkish Straits Region, the Strait of Istanbul inclusive, in full compliance with Rule 10 of COLREG '72. The new scheme has been in use since 01 July 1994. In additions, Turkey recently installed a Vessel Traffic Management and Information System (VTMIS) (1).

The Strait of Istanbul is one of the most congested waterways in the world. In 2003 there were a total of 49 939 vessels, in 2004 a total of 54 564 vessels, and in 2005 a total of 54 794 vessels navigating the Strait annually. In 2005, an average of 150 vessels navigated the Strait on a daily basis.

A scientific study entitled *"The Accident Analysis of the Strait of Istanbul from The Points of Safety Navigation and Environment And Evaluation of Innocent Passage"* was recently conducted (2). This study found that geographical conditions and navigational constraints of the Strait, i.e. narrowness, deep, currents and bad weather conditions, constituted the main factors contributing to marine casualties in the Strait of Istanbul. The study also examined other navigational constraints in the Strait of Istanbul such as, geography, meterology, hydrography, oceanography, economic, strategic features, legal issues, maritime traffic, casualties and casualty statistics, current safety measurements were examined. The casualties examined included those that occurred during the "*right-side passage scheme*" period between the years 1982-2003, near misses between the years 1994-2003,and the period between 1994-2003 when the "*Traffic Separation Scheme*" (TSS), in full compliance with Rule 10 of COLREG 72, was introduced; and lastly, the year 2004 during which use of the "*Vessel Traffic Management and Information System*" (VTMIS) began operation employing statistical methodology such as, frequency distribution, χ^2 analysis, dicriminant analysis, clustering analysis and regression analysis. A general evaluation was conducted together with proposing further required measurements to ensure safety navigation and environment.

HISTORICAL CASUALTY RATES

The casualty rates were applied to vessels and tankers serving world oil markets that passed through the Strait of Istanbul. The casualty data for the Strait of Istanbul was acquired from the Turkish Office of the Prime Ministry, Undersecretariat for Maritime Affairs, the Turkish Pilotage Association, Turkish Maritime Research Foundation, Lloyd's Maritime Information Service's traffic incident database, a PhD thesis and scientific articles on this matter. The data included the vessel name and type, vessel flag and tonnage, type of accident, place of accident, year, date and time of occurrence.

During the 1948-2003 period there was a total of 594 marine casualties in the Strait and 447 marine casualties during the 1982-2003 period when the "*right side passage scheme*" was implemented.

The historical data included the years 1982- 2003. The vessel casualty data base, containing 608 records (each collision was taken into consideration as two accidents in the analysis) was recorded involving collisions, strandings, groundings, fires and explosions, founderings, contacts and others. The vessels included all reported accidents involving commercial vessels such as general cargo, dry bulk, container, Ro-Ros, tankers, tugboats, passenger vessels, recreational vessels, fishing vessels and others.

THE RESULTS OF CASUALTY ANALYSIS

The results and evaluations of casualty analysis are as follows:

Most of the marine casualties that occurred in the Strait of Istanbul were during the months of January (13.0%), February (12.8%) and March (12.0%). The least number of casualties occurred in April (5.1%) and in September (5.1%) between the years 1982-2003 during the "*right-side passage scheme*" period.

While the "near - misses" in the Strait of Istanbul occurred the most during the months of June (12.4%), April and then in July (11.7 %), the risks of casualties in the Strait occurred the least in March (5.1%).

However, in 2004 when the VTMIS was introduced in the Strait of Istanbul, casualties occurred the most in February and March (18.8%) and then in September and December (12.5%); no casualties occurred in April, May or October. The reason for the lack of casualties during these months may be a result of the VTMIS taking on an active role in the Strait.

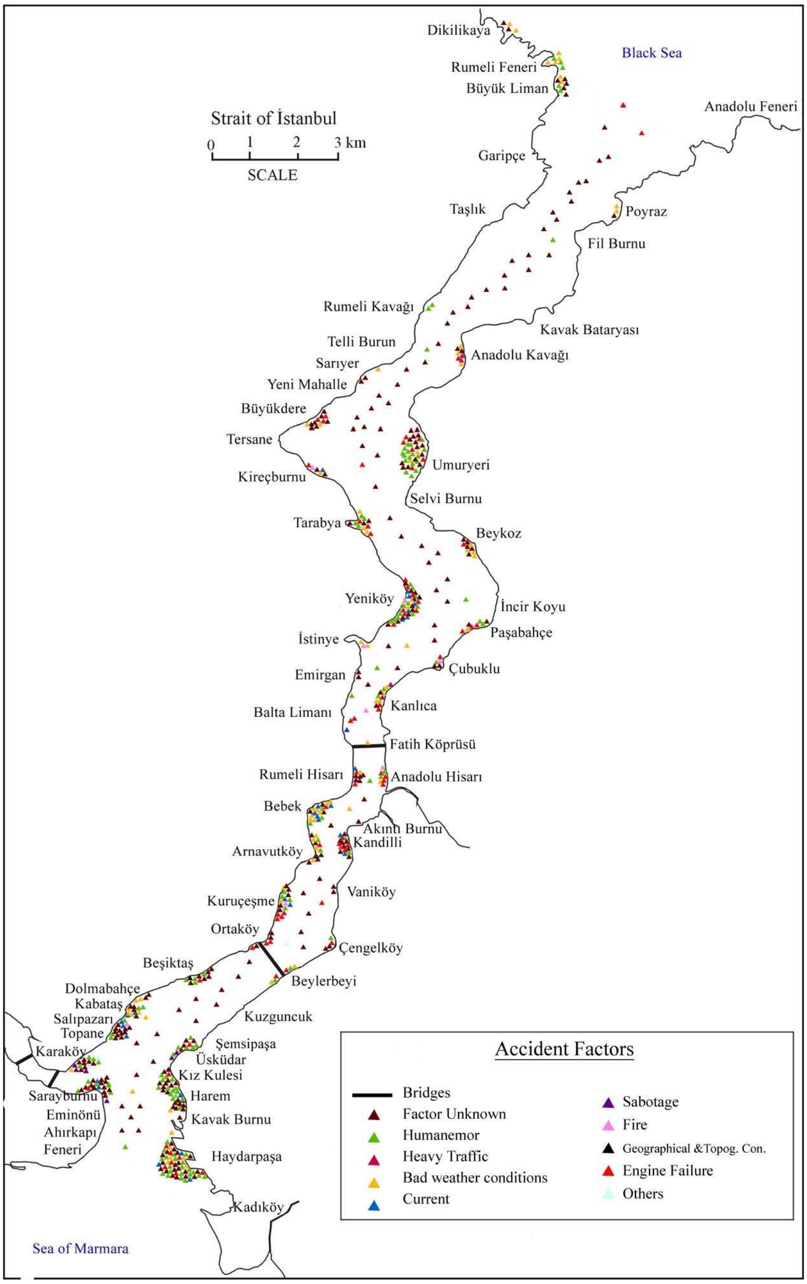
Casualties occurred the most in the months of January and February in the first zone (Salıpazarı, Kızkulesi, Haydarpaşa, Üsküdar, Kabataş, Harem, Karaköy, Dolmabahçe, Beşiktaş, Beylerbeyi, Ortaköy, Sarayburnu, Çengelköy ve Eminönü) and in the Second Zone (Rumeli Hisarı, Kandilli, Yeniköy (Çakarı), Akıntı Burnu, Kanlıca, Arnavutköy, Bebek, Balta Limanı, Anadoluhisarı, Vaniköy, Emirgan, Paşabahçe, Çubuklu, Kuruçeşme, İstinye, Fatih Köprüsü).

Casualties occurred the most in the Strait of Istanbul between the hours 04:00 and 08:00 (12.5%) and then between 08:00 and 12:00 (12.2 %). The fewest casualties occurred between the hours 16:00 and 20:00 (10.0%) in 1982-2003. The reason for the higher number of casualties occurring between the hours 04:00 and 08:00 can be attributed to human error resulting from sleeplessness, professional weariness and fatigue.

While near misses in the Strait of Istanbul occurred the most between the hours of 12.00-16:00 (14.6%) and then between the hours of 16:00-20:00 (13.9%), the risk of casualty in the Strait of Istanbul occurred the least between the hours of 04:00-08:00 (6.6%). The reason why the risk of casualty occurred the most between the hours of 12:00-16:00 can be attributed to local traffic density.

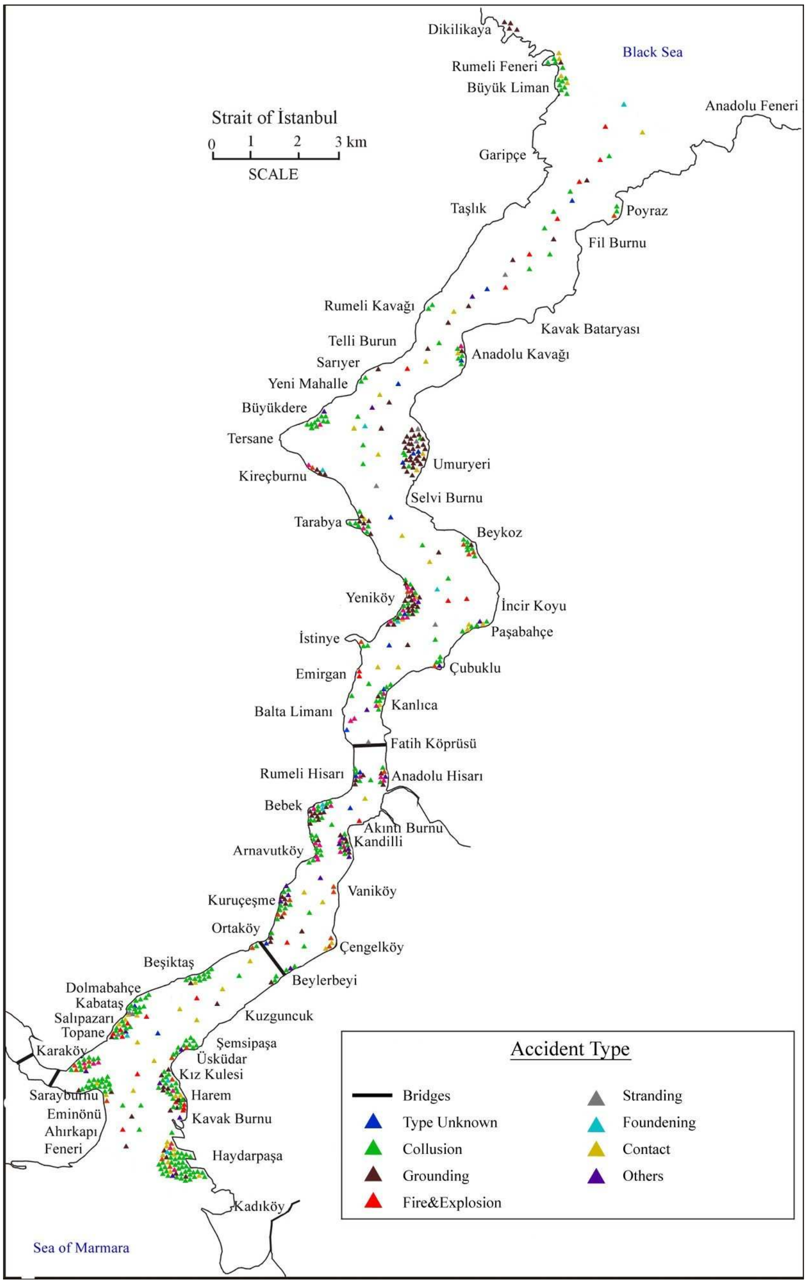
In 2004, casualties in the Strait of Istanbul occurred the most between the hours of 04:00-08:00 (87.5%). The cause can be attributed to human error caused by sleeplessness, professional weariness, and fatigue.

Accidents in the Straits of Istanbul according to the *type* of accidents during the period between the years 1982-2003 has been shown below in Map 1.



According to the results of the analyses conducted between the years 1982-2003 human error was the major cause of casualties in the Strait of Istanbul. Other causes included bad-weather conditions (14%), breakdowns (12.2%), currents (4.8%), fire (1.3), geographical and topographical conditions (0.3%) and other causes.

Accidents in the Straits of Istanbul according to the *cause* of the accidents during the period between the years 1982-2003 has been shown below in Map 2.



Based on the data over a twenty-one year period from 1982 to 2003, a total of 45,6 % of the casualties were collisions, 20,4 % were groundings, 7,9 % fires or explosions, 7,2 % were strandings, 2,3 % were foundered, 9,0 % were due to contact and, 4,6 % were due to other causes.

According to the results of the analyses conducted for the years between 1994-2003 near misses on the Strait of Istanbul occurred the most because of geographical and topographical conditions (99,3%), and bad-weather conditions (0.7%).

In 2004, a total of 15 casualties, the causes of which are unknown, occurred in the Strait of Istanbul. However, one casualty (6.3%) occurred because of a breakdown.

The major cause of near misses was because of geographical and topographical conditions, and human error.

A casualty analysis concerning navigational errors that was conducted in Japan for the seven year period between 1985- 1997 showed that 84.9% of 8,996 casualties was due to human error (e.g. not conforming to COLREG, bad maneuvers and incapability of crew). Human error derives from such incidences such as the person responsible from managing the vessel technically misconceives the lighthouse, and misreads values of depth, angle and distance (3). The causes of casualties included insufficiency of technical knowledge, mental disease, and failure to follow rules, fatigue, sleeplessness, professional fatigue, lack of education and so on.

Collisions are mostly caused by human error. Collisions may appear in any place, at any time, day and night, in narrow passages, in good weather or limited visibility conditions, along coastal area and in the open sea.

Most of the casualties that occurred between the years 1982-2003 in the Strait of Istanbul were predominantly caused by human error (22.5%), as stated above. However, according to a discriminate analysis carried out in the study, 16.8% of the 137 casualties, which appear as "*human error*" in the accident records (in real classification), were estimated correctly. Therefore, it was estimated that had the casualty reports concluded for those incidents that occurred between the years 1982-2003 in the Strait of Istanbul been reported correctly, the rate of human error would have been even higher.

In 2004, when the VTMIS was introduced in the Strait of Istanbul, a total of 15 casualties occurred, the causes which were undetermined. This fact shows that reports of accidents should be examined and prepared carefully.

During the period between the years 1982-2003 cargo vessels (general cargo, dry bulk, refrigerator, container and Ro-Ro) (43.4%) were involved in most of the casualties in the Strait of Istanbul, other vessels (sand coaster, cable vessels, floating restaurant, navy etc.) (1.0%) were involved in near misses.

Although cargo vessels (general cargo, dry bulk, refrigerator, container and Ro-Ro) (63.5%) were involved in near misses in the Strait of Istanbul the most, passenger vessels (passenger vessel and boat, sea bus and ferryboat) (0.7%) were involved in near misses the least.

While in 2004 cargo vessels (general cargo, dry bulk, refrigerator, container and Ro-Ro) (75.0%) were involved the most in casualties in the Strait of Istanbul, smaller boats (vat + yacht + tug boat + boat + training and research ships) (0.7%) were involved in casualties the least.

Although between 1982-2003 vessels of 1-10000 GRT (85.4%) were involved the most in casualties in the Strait of Istanbul, vessels of 25 001 and above GRT (4.8%) were involved in casualties the least.

Despite the fact that between the years 1994-2003 the vessels of 1-10000 GRT (72.3%) were involved in near misses in the Strait of Istanbul the most, vessels of 25001 and above GRT (9.5%) were involved in near misses the least.

While in 2004 vessels of 1-10 000 GRT (81.3%) were involved in casualties in the Strait of Istanbul the most, those vessels of 25 001 and above GRT were involved in casualties the least.

In conclusion, the period between 1982-2003, that is before and after the regulations were introduced, and the period between 1994-2003 when the VTS was introduced, vessels 1-10000 GRT were involved in the near misses the most. These vessels should be encouraged to employ a maritime pilot.

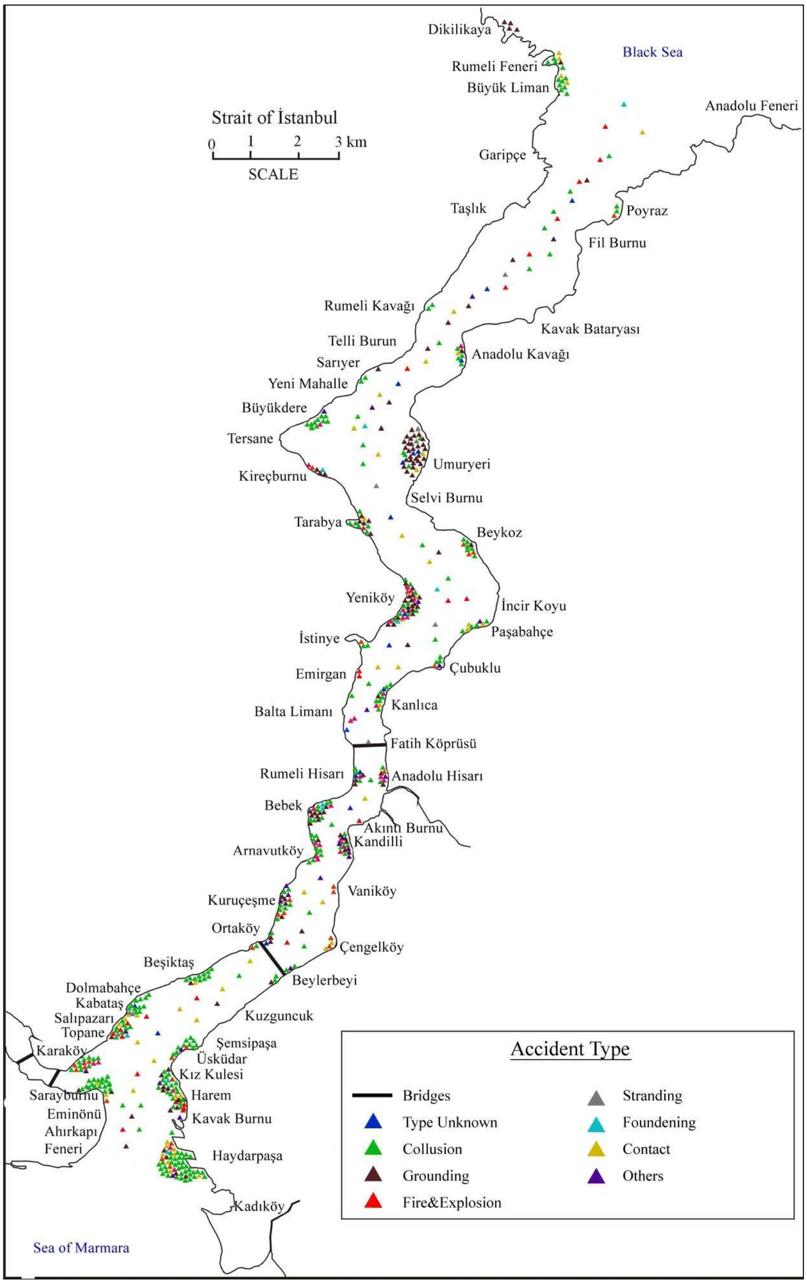
Between the years 1982-2003 Turkish flagged vessels (51.3%) were involved in most of the casualties in the Strait of Istanbul; American and Antigua flagged vessels (4.8%) had the least number of casualties.

European states flagged ships (33.6%) were involved in casualties the most, followed by Asian and European Continent flagged vessels (26.3%), and then Turkish, Russian and Turkish Republics flagged vessels (13.9%) were involved in casualties. American and Antigua flagged vessels (12.4) were involved in casualties the least.

In 2004, Russian and Turkish Republics flagged vessels (37.5%) were involved in casualties in the Strait of Istanbul the most even though European, American and Antigua flagged vessels (12.5) were involved in casualties the least.

In 2004, when the VTMIS was established, Russian and Turkish Republics flagged cargo vessels were involved in casualties the most. These vessels stated should be encouraged more to employ a maritime pilot.

Accidents in the Strait of Istanbul between the years 1982-2003 according to the *location* of the accidents is shown below in Map 3.



It should be recalled that between 1982-1993 most of the casualties in the Strait of Istanbul occurred in the First Zone (Salıpazarı, Kızkulesi, Haydarpaşa, Üsküdar, Kabataş, Harem, Karaköy, Dolmabahçe, Beşiktaş, Beylerbeyi, Ortaköy, Sarayburnu, Çengelköy ve Eminönü) (33.4%) and then in the Second Zone (Rumeli Hisarı, Kandilli, Yeniköy (Çakarı), Akıntı Burnu, Kanlıca, Arnavutköy, Bebek, Balta Limanı, Anadoluhisarı, Vaniköy, Emirgan, Paşabahçe, Çubuklu, Kuruçeşme, İstinye, Fatih Köprüsü) (27.6%) and in the Third Region (Büyükdere, Anadolu Kavağı, Umuryeri, Kireç Burnu, Dikilikaya, Tarabya, Beykoz, Yenimahalle Ağzı, Sarıyer, Kavak Burnu, Rumeli Kavağı, Selvi Burnu and Sütlüce) (16.9%) in order. However, the casualtys in the Strait of Istanbul occurred least in the Fourth Zone (Rumeli Feneri, Istanbul Boğazı and Karadeniz entrance) (7.6%).

In the first and second zones, where most of the casualties occurred between 1982-1994 and 1994-2003, more safety measures should be taken.

Between 1994-2003 most of the near-misses that took place in the Strait of Istanbul, in order of frequency, occurred mostly in the second zone (27.0%), then in the third zone (24.1%) followed by the first zone (20.4%) and, last and least in the fourth zone (10.2%).

In 2004, most of the casualties that took place in the Strait of Istanbul, in order of frequency, were in the second zone (18.8%), the third and the fourth zone (12.5%). However, in the first zone, no casualty occurred.

In conclusion, *most of the casualties in the Strait of Istanbul between the years 1982-2003 and after the regulations were implemented (1994-2003), occurred in the first zone. However, the near misses between the years 1994-2003 and before the regulations were implemented, and most of the casualties in 2004 when the VTMIS was established occurred in the second zone.* There was no traffic density in anticipation of 1982.

However, between 1992-2003, as the traffic density and tonnage of the ships increased in the Strait of Istanbul so did the number of near misses. The second zone is the narrowest zone, therefore precautions that eliminate the factors causing casualties, such as navigational aids, escort tugs and VTS pilotage services, should be taken.

The chi square (χ^2) test was used for the years 1982-1994 and 1994-2003 in order to compare casualties from 1994 when the Straits regulations began to be implemented until the period between 1994-2003 when casualties occurred and; from 1982 when the right-side passage navigation system was adopted, until 1982-1994 when the regulations were implemented. Variables, which have a relationship in both analyses, are stated as follows:

- Casualty years and casualty type;
- Casualty place and vessel's type;
- Casualty months, casualty type and casualty place;
- Casualty hours, casualty place and casualty reason;

- Casualty place and casualty years; casualty months, casualty hours, casualty type, casualty reason, vessel's type and flag;
- Casualty reason and casualty hours; casualty type, casualty place and the situation of whether the vessel appoint maritime pilot;
- Vessel type and years; casualty type, casualty place, vessel's flag and tonnage and the situation of whether the vessel appoint maritime pilot;
- Vessel's tonnage and casualty's type, vessel's type and flag, dead toll and losses and the situation of whether the vessel appoint maritime pilot;
- Vessel's flag and casualty type, casualty place, vessel's type and tonnage;
- The situation of whether the vessel engaged maritime pilot and cause of casualty, vessel' type and tonnage.

Chi square (x2) test was made for the purpose of determining common variables that affects casualties between the near misses and the casualties in the Strait of Istanbul between the years 1994-2003.

There is a relationship among the casualty type, vessel type and casualty location in the casualty incidences that occurred in the Strait of Istanbul before and after the regulations began to be implemented. Necessary precautions should be taken in the first and the second zones where most of the accidents occurred. Furthermore, cargo vessels, which were the cause of most of the accidents, should be encouraged to engage a maritime pilot.

There is a relationship among casualty hours, casualty location and casualty cause in both periods stated. Moreover there was a conflict 43 (16.0%) in the first zone between the hours 20:00-24:00 when most of the casualties occurred in the Strait of Istanbul between the years 1994-2003.

There is a statistical connection among vessel type, vessel tonnage, and the situation of whether the vessel should engage a maritime pilot and vessel flag before and after the regulations began to be implemented. Cargo vessels and vessels (1-10 000 GRT) which cause most of the casualties before and after the regulations began to be implemented, should be encouraged to appoint maritime pilot in order to reduce casualties in the Strait of Istanbul.

In both analyses, variables show a statistical relationship between casualties and near-misses that occurred in the Strait of Istanbul between the years 1994-2003, which is pointed out in the following Comparative Statement in respect of casualties given in SUPP- 20:

-Casualty years and casualty type;
- Casualty place and vessel type;
- Vessel type and years, casualty place vessel tonnage;
- Vessel type and tonnage.

In 2004, when the VTMIS was introduced the variables, which have statistical relationship between them:

- Months and casualty cause
- Months and casualty hours
- Casualty hours and vessel tonnages
- Casualty hours and vessel types
- Vessel flags and casualty causes
- Vessel flags and vessel types
- Casualty types and hour
- Casualty types and vessel tonnage
- Casualty types and vessel's flags

Among the casualties, the reason why collisions occurred the most was because of the limited control and maneuverability ability of the shipmasters in the near-miss areas.

Required measurements should be taken in order to prevent the type of collisions that occurred the most between 1982-1994 and 1994-2003, before and after the regulations began to be applied. Measurements such as Vehicle Traffic Service (VTS) and the ship's obeying rules are taken in order to diminish human error such as professional weariness and fatigue. Furthermore, navigation equipments such as GPS, ECDIS (Electronic Chart Display and Information System) should be diversified, and upper bridge navigation equipment should be reflected by seaman better.

In 2004, when the VTS was established, there were many incidences of vessels strandings (75.0%). The reason for this may be due to oceanographic and hydrographic conditions. According to multi dimensional scale analysis, there is a close relationship between the situation of whether the vessel has employed a maritime pilot and the casualty location, the dead and the injured, the loss, the vessel's flag and tonnage; and between the vessel's type and flag, which were the involved in casualties in the Strait of Istanbul.

According to the results of the multiple regression analysis, independent variables such as hydrographical (currents), meteorological parameters (dominant wind (north-north-east and others), storm, rain, snow and fog, ships tonnages play great role in casualties in the Strait of Istanbul. *It is suggested that a marine pilot be employed during bad weather conditions, high current speed and for the passage of the vessels with high tonnage.*

The results of analysis show that the rate of not employing a maritime pilot was 92,8% in casualties and 7.2% for vessels that did employ a maritime pilot involved in casualties in the Strait of Istanbul between the years 1982-2003.

The rate of employing a maritime pilot was 10.3% in vessels involved in the casualties in the Strait of Istanbul between the years 1982, when the right side passage system was introduced, until 1994 when the regulations were adopted.

The rate of employing a maritime pilot on ships involved in accidents from 1994, when the regulations were adopted, until 2003, was 3,4%.

The rate of employing maritime pilots has decreased from 1994 when the regulations were implemented.

According to the results this analysis of accidents, the decrease in the number of accidents from 1994, when the Strait of Istanbul regulations were adopted, shows that *the application of the regulations decreased the rate of the accidents. However, during this same period, the rate of near misses increased. (13).*

There has been a decrease in the number of accidents in the Strait of Istanbul in 2004 when the VTS began operation compared to 2003. This shows that the VTS prevents accidents (2).

CONCLUSION AND EVALUATION

When environmental factors are taken into consideration, the Strait of Istanbul possesses unique ecological features including serving as a biological corridor for marine life and a variety of flora and fauna, as well as a habitat for some thirty-three marine species that are in danger of extinction. The Straits also possess valuable historical and cultural qualities. Istanbul which has been included as forming part of the common heritage of humanity with its 3000 years of history by the Convention on the Protection of Cultural and Natural Heritage of the World by UNESCO and was included in the list of “100 historical protected areas with equal significance in the Mediterranean” by the 1985 Genoa Declaration. However, this city with over 11 million residents remains at risk from possible ship accidents.

The traffic in the Strait of Istanbul has exceeded the limits for safe passage; moreover the traffic in this area, especially the tanker traffic, is expected to increase. The growing *number* of ships carrying dangerous cargo and the *amount* of the dangerous cargo has become a serious threat to safety of navigation as well as human and environmental safety. Accidents, which may occur in the Strait of Istanbul, especially from tanker traffic, could create acute situations for the area, including the closure of the Strait of Istanbul to traffic. This would negatively affect all countries making use of the Strait of Istanbul especially the Black Sea region countries.

According to the results of a study based on a simulation of ship traffic in the Strait of Istanbul, the transport of Caspian oil to world markets through the Straits will casue further increase in traffic density, and likewise, the waiting period, adding to the greater probability of accidents (4).

It is of great significance for Istanbul, the safety of its residents, safety of cargo and of the marine and surrounding environment, to take the needed precautions for improving navigation so as to decrease the number of casualties in the Strait of Istanbul. Necessary measures include the reporting system and pilotage services, escort tug services, reduction of human errors, finding alternative ways for transporting dangerous cargo, management of vessel traffic, providing environmental safety, communication equipment, better investigation of casualties and preparation of reports, declaring the Strait of Istanbul as Particularly Sensitive Sea Area (PSSA), the mapping of ship wrecks, further legislation and legal regulations; and furthermore, the immediate provision of risk management.

According to the risk assessment done for the Torres Strait, which was declared to be a PSSA by the IMO, employing maritime pilots for every ship engaged in passage through the area has resulted in a decrease in collisions by 30% and strandings by 32%. For this reason, a similar PSSA for the Straits of Istanbul should be analyzed in detail.

The Strait of Istanbul serves as a biological corridor for thirty-three different marine species and as a passage for dolphins that were included in the list of protected wild life during the 8th conference of Convention on Migratory Species of United Nations environment program (UNEP/CMS) held in Nairobi (22). The risk of a casualty in this area may be reduced by greater employment of maritime pilots and other measures such as escort services and other navigation aids.

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ENVIRONMENTAL ASPECTS

INVASIVE SPECIES OF THE TURKISH STRAITS

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ABSTRACT

The Turkish Straits System, because of its hydrological peculiarities, is a unique ecosystem that is located between the Black Sea and Mediterranean Sea. This area is also one of the busiest waterways in the world. There are twelve exotic species found in the Turkish Straits system. These are *Codium fragile, Mnemiopsis leidyi*, *Beroë cucumis, Rapana venosa, Scapharca inaequivalvis, Mya arenaria, Teredo navalis, Panaeus japonicus, Callinectes sapidus, Asterias rubens, Mugil so-iuy* and *Gambusia affinis*. Among them the *R. venosa* has been commercially important and the *M. leidyi* has been the most destructive species for the native ecosystem.

Key words: *Turkish Straits, distribution, invasive species, ballast water, intentional introduction*

INTRODUCTION

The Turkish Straits System, including the Istanbul Strait (Bosphorus), Marmara Sea and Canakkale Strait (Dardanelles), lies between the latitudes 40°00’ and 41°10’N and the longitudes 26°15’and 29°55’E (Fig. 1). The surface area of the Marmara Sea is 11,500 km^2 and the volume is 3,378 km^3. The length of the coastline is 927 km. This sea is surrounded by Anatolia and Trace regions in Turkey. It is one of the busiest water ways in terms of shipping activities between the Mediterranean and Black Sea basins and around 50,000 ships pass every year (Ozturk *et al*. 2001).

The Turkish Straits, due to its geographical and hydrological characteristics, represents a peculiar ecosystem as a transitional zone between the Mediterranean and the Black Sea. As such, it constitutes a barrier, a corridor or an acclimatization zone for living organisms (Ozturk & Ozturk

1996). The Marmara Sea serves as a barrier because it limits the distribution of warm water and high saline species of Mediterranean origin or the cold water and low saline species of the Black Sea. On the other hand, the Marmara Sea, located between the Mediterranean and Black Seas, is a very important biological corridor for many migratory species of fish, birds and marine mammals. As an acclimatizaion zone, some Mediterranean species adjust to the new environment of the Black Sea slowly, or the Black Sea species to the Aegean Sea.

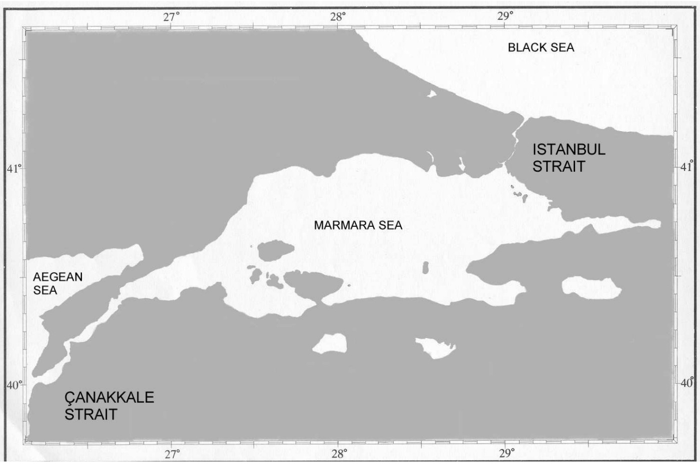

Figure 1. The Turkish Straits System

HYDROLOGICAL PROPERTIES OF THE STRAITS

The Turkish Straits consist of two layers of water of either Black Sea or Mediterranean origin, separated by a transitional layer of 8-10 meters. As a result, the hydrography of the Marmara Sea is dominated by the conditions of the adjacent basins. The Black Sea water enters the Marmara Sea through the Istanbul Strait as an upper flow of 15-20 m and exits from the Canakkale Strait. Likewise, the Aegean water enters through the Canakkale Strait as a lower layer flow, and exits to the Black Sea with the Istanbul Strait underflow. The upper layer has a volume of 230 km^3 and its average renewal time is 4-5 months. The lower layer has a volume of 3,378 km^3 and its average renewal time is 6-7 years (Besiktepe *et al.* 2000). Life in the upper layer is nourished primarily by the brakish waters of the Black Sea (Tugrul & Salihoglu 2000).

The temperature of the surface water of the Marmara Sea, which is under the influence of the Black Sea, is of a range between 4 to 24 ºC. The salinity varies between 10 and 18 ‰. Deeper water shows pronounced changes in salinity and temperature. The salinity at 20 m depth rises to 30 ‰ and at 40-50 m depth to 37 ‰.

The temperature of the surface water of the Çanakkale Strait is 6 to 26 ºC and the salinity 24 to 36 ‰. In deeper water, at 70 m depth, the temperature ranges from 14 to 17 ºC. The salinity at a depth of 30 m rises to 37.5 ‰ and beyond it reaches to 39 ‰ (Kocatas *et al*. 1993).

BIOINVASION BY INVASIVE SPECIES AND ECOLOGICAL AND ECONOMICAL CONSEQUENCES

Invasive fauna and flora of the Marmara Sea have been introduced in two different ways: these are by ship, in ballast water, or on ship hulls, e.g. *Mnemiopsis leidyi*, and man-made introduction, e.g. *Gambusia affinis* and *Mugil so-iuy*.

Lessepsian species, which exist in the Aegean and Mediterranean Seas, have not yet been observed in the Marmara Sea, which serves as a barrier against these species. On the other hand, non-native species introduced from the Black Sea, use the Marmara Sea as a corridor or an acclimatization zone into the Aegean and Mediterranean Seas.

Invasive species found in the Marmara Sea are described below.

Algae

Codium fragile (Suringar, 1867)

The origin is the Pacific Ocean and was probably introduced accidentally during the Second World War (Mojetta & Ghisotti 1996). This species now distributed throughout the Marmara Sea coast.

Ctenophores

Mnemiopsis leidyi (Agassiz, 1865)

The origin is the North Atlantic Ocean. It was possibly introduced by ballast water. This species first penetrated into the Black Sea and then was transported via surface currents into the Marmara, Aegean and Mediterranean Seas.

It was first recorded in the Marmara Sea by Artuz (1991). In October 1992, an extremely vigorous outbreak was recorded in the Marmara Sea (GESAMP 1997). The abundance of *M. leidyi* was recorded as 4.3 kg/m^2 near the Istanbul Strait and 9.7 kg/m^2 near the Canakkale Strait, mostly in 10-30 m deep water (Shiganova *et al.* 1995). In 1999, at 16 m depth in the Istanbul Strait, the maximum biomass 2 kg m^{-3} was recorded (Ozturk 1999). This species was also reported from the Turkish coast of the Aegean and Mediterranean Seas (Kideys & Niermann 1994).

M. leidyi is a euryhaline organism tolerating a wide range of salinity of 4-75 ‰ (Burrel & Van Engel 1976). The fresh water reservoir of Istanbul was invaded by this species causing serious economic loss due to damage of pipelines (Ozturk *et al.* 2001).

Since the *M. leidyi* is a voracious predator of the fodder zooplankton, it resulted in the decline of zooplanktons. Carcasses of this ctenophore, which sank in massive quantities to the sea bottom, caused anoxia. They also became entangled with fishing nets causing substantial damage.

As a result, there was a decline in the pelagic fish stocks in the Marmara Sea as pelagic fish feed mainly on copepods and clodecerans, which are also foraged by *M. leidyi*. Furthermore, *M.leidyi* feeds on fish eggs and larvae, seriously affecting economically important fish, such as *Scomber scombrus, Sarda sarda, Sprattus sprattus, Engraulis encrasicholus,* which use the Marmara Sea as spawning grounds. The decline of the fish stocks and economic loss of fisheries was estimated as 400,000 USD for Turkey alone. (Ozturk & Ozturk 2000).

Beroë cucumis (Fabricus, 1780)

The origin is the circumpolar sea. It is found in abundance in the North Sea and the Pacific coast of North America. A possible way of its introduction was by ballast water. Density of this ctenophore in the Marmara Sea during summer months was 10-160 ind./m^3. The majority were adults, 5-6 cm in length in the coasts of the Prince Islands at the depth of 10-15 m (Ozturk 1999). It is known to be one of the predators of the *M. leidyi* (Burrel & Van Engel 1976).

Molluscs

Rapana venosa (Crosse, 1861)

The origin is Sea of Japan and its possible way of introduction was by ballast water and eggs attached to ship hulls sailing into the Black Sea. *R. venosa* penetrated to the Marmara Sea in the 1960s and is also found in the Aegean Sea.

The *R. venosa* feeds mainly on mussels and oysters in rocky substrata. In the Marmara Sea it is quite abundant at 5-25 m depth with a maximum density of 15-20 ind./m^2. In 1965, the total distribution area of the *R. venosa* was only 8 km^2, however, by 1980 this increased to 170 km^2

(Ozturk 1999). Due to its high population density along the Marmara coast, where oyster and mussel fishing has been commercially important, these bivalves were almost exterminated.

In 1982, a Turkish fisherman discovered the commercial importance of this species and was exported to Japan for the first time. Since then, it has been overexploited and now, for the protection of the stocks in the Black Sea and Marmara Sea, according to Fisheries Law No. 1380, this species can be fished for only eight months during the year. This species was very beneficial for the Turkish fisheries economy providing an estimated two million USD of annual profit from export activities and employing approximately 6,000 persons directly or indirectly. Yearly production was 4,000 t in 1997 (DIE 1998).

This gastropod is harvested by diving and by dredging. The dredging method is very harmful to benthic ecosystem as it is not a selective method such as diving.

Scapharca inaequivalvis (Bruguiere, 1789)

Its probable origin is the Pacific Ocean. A possible way of introduction was by ballast water. This species was observed in the Marmara Sea for the first time in 1989. It distributes to the Istanbul Strait and Prince Islands (Ozturk & Ozturk 1996). This species is well adapted to the eutrophic water of the Straits and inhabits coastal waters up to 45 m depth. Its density reached approximately 60 ind./m^2 in 1999 (Ozturk 1999).

Mya arenaria (Linne, 1758)

The origin is the North Sea or the Atlantic coast of North America. It was possibly introduced by ballast water. This species is found mainly in the sandy and muddy shallow bottoms of the Istanbul Strait and the entrance to the Black Sea. It is a dominant bivalve species in many parts of the Istanbul Strait with a population that has reached 1300 ind./m^2. Around the Prince Islands, the average biomass was 1 kg/m^2 in 1999 (Ozturk 1999). This bivalve is consumed by sturgeon, turbot, gobby and mullet. Adults are consumed by the *R. venosa*. It has no commercial importance.

Teredo navalis (Linne, 1758)

Its probable origin is the Atlantic Ocean. There are two possible ways of its introduction; by sea currents at the stage of pelagic larvae and, in floating wood (tree branches, wooden hull, etc.) as adult organisms. This species has been found in the Marmara Sea and along the Istanbul Strait shores since the 1950s. The *T. navalis* is a boring organism and it uses wood as a habitat and as food.

Crustaceans

Panaeus japonicus (Bate, 1888)

This prawn is of an Indo–Pacific origin species and was intentionally introduced into the Marmara Sea in the late 1960s from the Iskenderun Bay on the Turkish coast of the Mediterranean Sea (M. Demir, pers. comm.). However, its population did not increase as much as was expected.

Callinectes sapidus (Rathbun, 1896)

The origin is the Atlantic coast of North America, from Cape Cod to Florida and the Gulf of Mexico. The possible ways of its introduction into the Marmara Sea was by ballast water and as ships hull fouling. This species was found in the Marmara Sea in 1974 (Froglia *et al*. 1998).

Echinoderms

Asterias rubens Linnaeus, 1758

This species was reported by Albayrak (1996) from the Istanbul Strait and Marmara Sea. It is a macrobenthic species and feeds on mussels and oysters. It can be considered as a shipping-mediated invasion. A special monitoring study is needed to assess the impact on the molluscs and other species.

Fish

Mugil so-iuy (Basilewsky, 1855)

It originated from the Amu Darya River Basin. It reached the Turkish Black Sea coast from the Sea of Azov, migrated westward, reaching the Marmara Sea, then continued to the coast of the Aegean Sea. This species potentially has commercial importance. The yearly catch of this species is 15 t in the Marmara Sea and 10 t in the northern Aegean Sea (DIE 1998).

Gambusia affinis (Baird & Girard, 1854)

The origin is the North American wetlands. It was intentionally introduced for the first time by the Ottoman army to control mosquito populations in the Amik Lake on the Mediterranean coast and its wetlands. It then was introduced to other wetlands throughout Anatolia by Turkish authorities to combat malaria (Geldiay & Balik 1988). Distribution of the species is found in the wetlands of the Marmara Sea, the lagoons of Buyuk and Kucuk Cekmece. *G. affinis* is an euryhaline species.

CONCLUSION

As the Turkish Straits serve as a link between the Mediterranean and Black Seas, we can find invasive species originally introduced into either of these two seas. However, for certain species, the Istanbul Strait serves as a barrier to limit the species' distribution, while, for others, it serves as a corridor to enlarge species' distribution.

Compared to the Black Sea, the Marmara Sea has fewer exotic species, i.e. the Black Sea has twenty-six species (Zaitsev & Mamaev 1997), or thirty (Zaitsev & Öztürk 2001), while the Turkish Straits System has twelve species (this study). This can be explained by two reasons. One of them is that biotic and abiotic factors are different in the Black Sea than in the Marmara Sea, i.e. the higher temperature and salinity of the latter. Another is the gap in historical records of invasive species and scientific studies of the Marmara Sea and the Black Sea. Nevertheless, more detailed investigations and monitoring studies are needed.

Interestingly, some species have turned out to be highly valuable as resource, such as the *R. venosa*. The *M. so-iuy* also has commercial potential without damaging the native ecosystem. Whereas, by contrast, some species, such as the *M. leidyi*, have turned out to be extremely harmful for the native fauna and flora, resulting in huge economic losses.

Shipping volume is expected to grow with the increasing production of Central Asian oil where proven oil resources are six billions tons, and reserves are estimated to be between 40 to 120 billion tons. All of this oil will be shipped via the Turkish Straits (Ozturk 2002). This, in turn, may cause great risks for the Turkish Straits and the Black Sea due to heavy shipping activities. Other transport routes for invasive species are the Danube River and the Volga-Don Canal. Since river shipping is one of the growing sectors of the Black Sea region, hull fouling species may spread to the Black Sea and then to the Marmara and Aegean Seas by surface currents. Not only sessile species but also mobile and fouling organisms are transported on the surface inside vessels, e.g. tank fouling and fouling in ship's cooling circuits.

Another factor that should be taken into account is the impact of global warming to the distribution or dispersion of invasive species. We assume that the increase in sea water temperature may influence the movement of some invasive species from south to north.

As is already known, the uncontrolled discharge of ballast water and sediments from ships has led to the transfer of harmful aquatic organisms and pathogens, causing damage to the marine environment, human health, property and resources. We know that several states have taken joint or unilateral actions for the purpose of preventing, minimizing and ultimately eliminating the risk of introduction of harmful aquatic organisms and pathogens through ships entering their ports or territorial waters. Turkey also should take all necessary actions to prevent the introduction of all kinds of harmful aquatic species, mostly in the Turkish Straits system particularly because of its position as a biological corridor linking the Black Sea and Mediterranean Sea.

In 2003, the IMO adopted the *International Convention for the Control and Management of Ship's Ballast Waters and Sediments*. This convention has not yet entered into force. This convention, however, is one of the international instruments for combating invasive species and Turkey should sign and ratify it soon for the sake of protection of its own seas.

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FISHING IN THE ISTANBUL STRAIT (BOSPHORUS)

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ABSTRACT

The Istanbul Strait is traditionally a rich fishing ground as it is a migratory passage for many pelagic fish. There are small-scale artisanal fisheries and large-scale industrial fisheries in the Istanbul Strait. The artisanal fisheries are carried out with pots, dredges, trap nets, beach seine nets, liftnets, lines, gill and trammel nets, and diving, whereas the industrial fisheries are carried out with purse seines only. These fishing activities face problems such as increasing sea traffic, oil spill, urbanization, lack of modernization, overfishing and invasion of exotic species. The artisanal fisheries in the Istanbul Strait should be protected from the point of view of sustainable fisheries.

INTRODUCTION

The Istanbul Strait (the Bosphorus) is one of the world's busiest waterways. However, it is also traditionally important as a rich fishing ground for the Istanbul fishermen, due to the biological peculiarity of the strait. The Turkish Straits System, including the Istanbul Strait, Marmara Sea, and Çanakkale Strait, connects the Black Sea and the Mediterranean Sea. It serves as a biological corridor between these two seas, that is, marine animals also use this strait for migration (ÖZTÜRK and ÖZTÜRK, 1996). Pelagic fish like bluefish and bonito enter the Black Sea from the Mediterranean through this strait in spring, and travel back to the Mediterranean in autumn (KOSSWIG, 1953). Therefore, the fishermen use this strait as a 'natural trap' to catch these pelagic fish. Some species like horse mackerel and silverside are year-round habitants of the Istanbul Strait.

In this paper, we describe the importance of the Istanbul Strait from the aspect of the fisheries.

FISHING PORTS AND COOPERATIVES

There are 17 fishing ports and 13 fisheries cooperatives are located in the Istanbul Strait (Fig. 1). Fourteen ports are located to the north of the Fatih Sultan Mehmet Bridge over the Istanbul Strait. This is because the area to the south of this bridge is always crowded with heavy marine traffic and not permitted for fisheries by law.

These cooperatives have total 5294 members. In 2002 total number of registered fishing boats is 225 in Istanbul region. Among these, 53.6 % are from the Istanbul Strait. The total number of fishing boats in the Istanbul Strait was 1206 in 2002, decreased to 996 (17 %) in 2006, probably due to the depletion of the fish stocks and heavy shipping traffic. Among 996 fishing boats, 735 were artisanal, 177 purse seine - trawlers, 61 only purse seiners and 23 only trawlers.

TYPES OF FISHING IN THE ISTANBUL STRAIT

The types of fishing in the Istanbul Strait are, in general, divided into two: artisanal and industrial. Small-scale artisanal fishing is still carried out with pots, dredges, trap nets (dalian), beach seine nets, liftnets, lines, gill nets, trammel nets, and diving. Large-scale industrial fishing is operated with purse seines, as trawling is forbidden in the Strait.

DEVEDJIAN (1926) described the fishing activities in the Istanbul Strait back in 1915. He mentioned that in that time sturgeons, bluefin tuna, swordfish, and turbot were common in the Strait. Besides, lobster, spiny lobster, shrimp, and oyster were caught. These species disappeared due to various reasons, but the most important ones are pollution and loss of habitats. He also described all of the below fishing methods, except diving, which are still used today.

Pots : Pots are special basket- or cage-like traps to catch shore rockling in the Strait. The shore rockling is favored by Jewish people due to their religious reason. The pot fishing has been carried out in Anadoluhisarı, Yeniköy, Bebek, and Emirgan. There are no more than 10 fishermen using the pots to fish nowadays.

Dredges: Dredges are used to catch mussels at the sea bottom. In the Istanbul Strait, it is allowed only in the north of the line connecting Yeniköy Ferry Port and Paşabahçe Lighthouse due to the heavy traffic in the region south of that line. It is also forbidden between 1 May and 1 September.

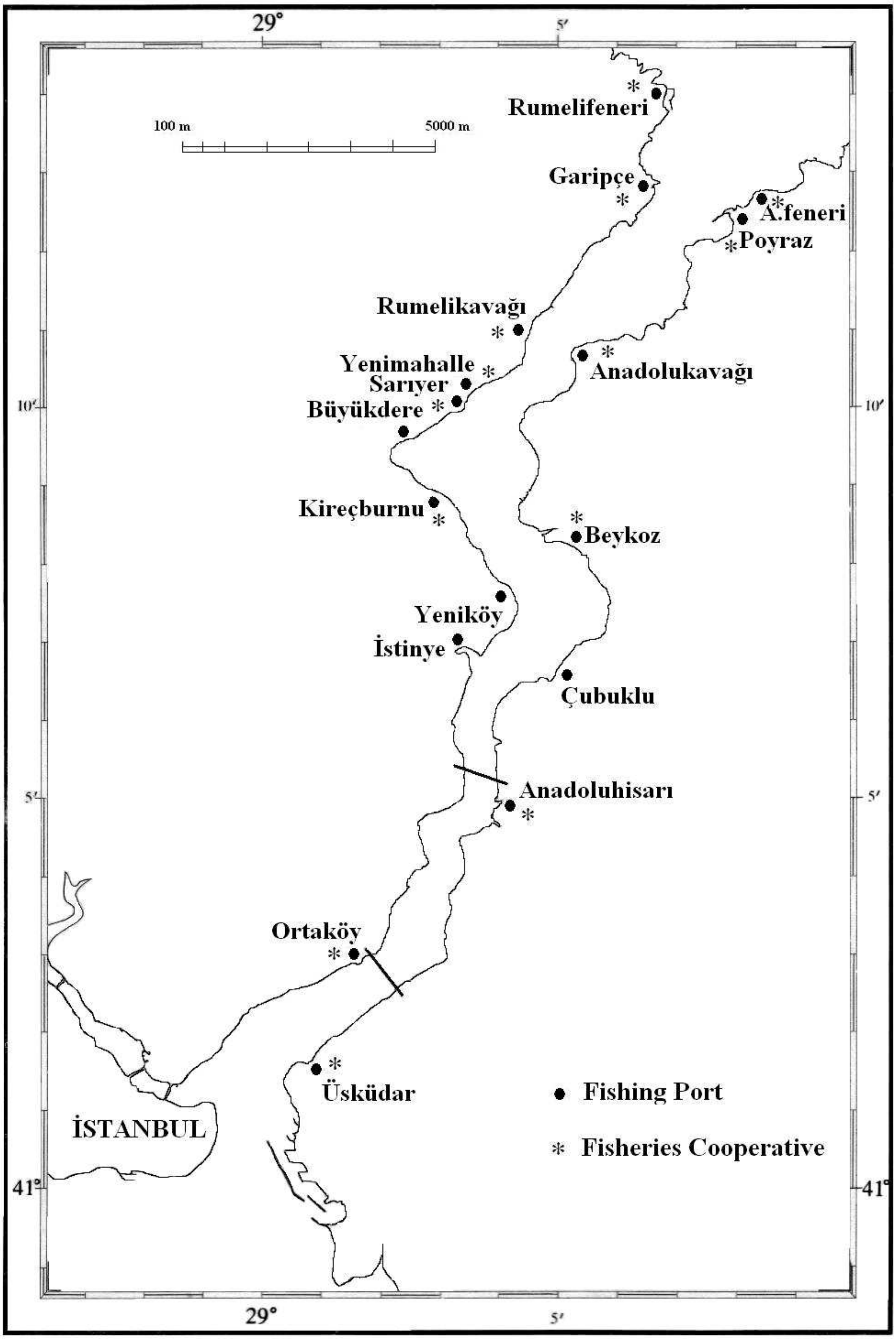

Figure 1. Fishing ports and fisheries cooperatives in the Istanbul Strait.

There are 24 dredge boats registered in the Istanbul Strait. Each of them does eight to ten dredges one day, catching 240 – 450 kg of mussels. Boats are 6.5-11.1 m in length, 2.4-3.3 m in width, with 16-56 HP. Dredges are 1.1-1.2 m in length and in width, the opening is 35-50 cm. Dredges are made of two bags; the mesh size of the inner bag is 10 mm and that of the outer bag is 5 cm. There are usually four to six persons working on a boat. In Rumelikavağı, where most of the catch lands, there are about 400 people shelling mussels.

This fishing method is very harmful for the benthic ecosystem.

Trap nets: Trap nets are called “dalyan” in Turkish and sometimes this word is used as “dalian” in other languages. According to DEVEDJIAN (1926), there used to be 52 trap nets in the Istanbul Strait only. There remain, however, only three trap nets at present: Bağlaraltı, Filburnu and Beykoz. Bülbül Sokağı dalian in Sariyer is not set anymore.

KARAKULAK (2000) summarized the characteristics of the trap nets in and around the Istanbul Strait as follows. These nets are active only through summer, April-July. The nets are set parallel to the shoreline, about 100m in length and 20-40 m in maximum width. Although this is a passive way to catch fish, the location of the nets has been selected after their long experience, so that they catch surprisingly wide variety of fish species. Those are silverside, horse mackerel, bluefish, bonito, anchovy, mullet, garfish, pilchard, sprat, chub mackerel, two-banded bream, annular bream, picarel, corb, surmullet, striped mullet, scorpion fish, grey mullet and gobby. Among these, silverside, picarel, horse mackerel, grey mullet and bluefish are the basic commercial species caught by the trap nets. There are between 10 and 25 fishermen working at one trap net.

Beach seine nets: Beach seine nets are called “manyat” in Turkish and there are 12 boats, 9-14 m in length, fishing with this type of nets in the Istanbul Strait. Due to the characteristic of the technique, the sea bottom has to be smooth. In the Strait, therefore, their fishing grounds are limited to Sarıyer, Kireçburnu, Yeniköy, Paşabahçe, Kozaltı, Çubuklu, Küçüksu plajı, Anadoluhisarı, Bebek, Arnavutköy, Vaniköy, Çengelköy, Ortaköy, Beşiktaş, and Kabataş .

They used to catch turbots, sole, and gurnards, but they are scarce and hardly seen in the Strait now. Therefore they mainly catch other bottom fish, such as red and striped mullets, and scorpion fish, but also garfish and horse mackerel. They operate 3-4 times a day between November and May. This fishing method is forbidden between 1 May and 30 September. There are usually three to four people working on a boat.

Liftnets : The liftnets are used to catch fish when fish is seen above the nets fixed to the shore. The nets are hung from the metal frames, either rectangular (4 x 8 m) or circle (1.5-2 m in diameter). There remain six liftnets in Tarabya, Arnavutköy, Yeniköy, Kandilli, Kanlıca, and Anodoluhisarı (Fig. 5). The fishermen catch mainly silverside and horse mackerel between March and June.

Lines : Vertical hand lines are used to catch pelagic fish, like bluefish, bonito, and horse mackerel. The size and number of the hooks depend on the target fish species. There are about 635 small fishing boats with lines and nets, registered in the Istanbul Strait. There are usually two people working on a boat. Smaller boats (less than 6 m) generally use lines, while the bigger boats use nets. They use, however, lines or nets according to the circumstance.

Gill nets and trammel nets : They mainly catch migratory pelagic fish, such as bluefish, bonito, and garfish, during spring and autumn, and horse mackerel, red and striped mullets all year round. The length of the net is 180 m and the depth is 5 m, mesh size 17-36 mm. The nets are left in the water perpendicular to the coast in the evening and hauled in the morning. There are usually two to three fishermen on each boat.

Diving: Sea snail, *Rapana thomasiana* (= *R.venosa*), are caught by surface-supply divers from Beykoz, Poyraz, and Sarıyer. This sea snail was brought into the Black Sea by ships from the Sea of Japan and successfully invaded the Black Sea and subsequently the Turkish Straits System. This is not consumed domestically, but exported to Japan and Korea. There are 6 boats working for this fishing.

Purse seines: Purse seining is one of the most effective ways to catch pelagic fish nowadays. Purse seining is the only industrial fishing permitted in the Istanbul Strait. According to the Fisheries Law (MINISTRY OF AGRICULTURE AND RURAL AFFAIRS, 2002), it is permitted in the area north of the line connecting the Yeniköy Ferry Port and Paşabahce Lighthouse. It is forbidden between 1 May and 1 September. They catch commercial pelagic fish, such as horse mackerel, bluefish, bonito, anchovy, chub mackerel, and sprat.

There are 64 purse seine boats registered in the Istanbul Strait for 2002 fishing season: 2 in Beşiktaş, 7 in Beykoz, 8 in Eminönü, 45 in Sariyer and 32 in Üsküdar. These boats are 10.2-62 m in length. Most of these boats usually work outside the Istanbul Strait, but fish in the Strait when they find a big catch there during the migratory season. There are also 199 purse seine - trawl boats, 9.3 – 46.5 m in length, registered at the same time, but they work mostly outside the Istanbul Strait. There are usually 8-15 people working on a boat.

PROBLEMS RELATED TO THE FISHING ACTIVITY IN THE ISTANBUL STRAIT

The fishing activity in the Istanbul Strait faces several problems as follows.

Traffic: There are about 50,000 ships passing through the Strait every year. There are also numerous ferries and small passenger boats travel through and across the strait for commuters every day. This heavy marine traffic affects the fishing activity in the strait. Trap nets and dredges already decreased greatly simply because they cannot operate due to the traffic. The Fisheries Law (MINISTRY OF AGRCULTURE AND RURAL AFFAIRS, 2002) itself forbids any fishing activity when vessels are present in the Istanbul Strait. According to TUMPA (2002) and İSTİKBAL (unpublished data), during 1982-2001, there were only 13 accidents involving fishing boats in the Istanbul Strait (Table 1).   This means there is less than one accident happening in the strait annually. This figure is not very high, but it should be noted that some accidents occur due the dense presence of fishing boats. There can be more of such accidents if the traffic in the strait increases.

Table 1. Sea accidents related to the fishing activities in the Istanbul Strait, 1982-2001.

No	Name of vessels (type)*	Date	Position	Type of accident	Remarks
1	Toroslar(T), unknown (F)	18/4/1983	Kızkulesi	Collision	Fishing boat sank
2	Büyük Şaban Reis (C), Zulfikar (F)	16/11/1984	Rumelifeneri	Collision	Caused by the presence of fishing boats, damaged nets.
3	Pelikan	3/1/1985	Kabataş	Collision	Collided fishing nets.
4	Stanislay Kosper (C)	7/2/1985	Kabataş	Collision	Caused by the presence of fishing boats, damaged nets.
5	Nikolay Semiplatinsic	8/4/1985	Haydarpaşa	Collision	Caused by the presence of fishing boats, damaged nets.
6	Enis Köse (B), unknown (F)	10/8/1985	Kızkulesi	Collision	Fishing boat sank.

7	Akkoç (C), unknown (F)	30/6/1986	Anadolukavağı	Collision	Caused by the presence of fishing boats.
8	Nusret Atasoy (C), unknown (F)	30/6/1986	Kanlıca	Collision	Caused by the presence of fishing boats.
9	Bilgilibiraderler (C), unknown (F)	17/11/1988	Büyükliman	Collision	Damaged nets.
10	Aries Erre (T), Kocadere (LF)	6/12/1988	Haydarpaşa	Collision	Damaged nets.
11	Salih Ünlü (C), unknown (F)	11/10/1997	Yeni Mahalle	Collision	Fishing boat damaged.
12	Uluç Ali Reis (SB), Ertan (F)	24/2/1998	Kabataş	Collision	Fishing boat sank.
13	Hayday-5 (C), unknown (F)	26/9/1998	Umuryeri	Collision	Caused by the presence of fishing boats, fishing boat sank.

* B: bulk carrier, C: cargo ship, F: fishing boat, LF: local ferryboat, SB: sea bus, T: tanker.

Oil spill: Many aquatic organisms died due to the tanker accidents, such as that of Independenta in 1979 and Nassia in 1994. BAYKUT *et al*. (1985) mentioned that there was a mass mortality of commercial fish, such as bluefish, grey mullet, and sea bream after the Independenta accident. Besides, the fishermen could not work for many days and the fish caught were tinted with oil. The Nassia accident resulted in an economic loss of about $400,000, estimated by MACALISTER ELLIOTT AND PARTNERS (1994). The sediments of the Strait were long contaminated with oil (GÜVEN *et al*., 1996). Small oil spills from the engines may not affect as much as the above accidents, but as the number of passing boats increases, that may become unnegligible.

Urbanization: As the population of Istanbul increases, more people live and more industries are developed on the shores of the Istanbul Strait, thus the domestic and industrial wastewater increases. This has brought the habitat loss to some of the marine organisms of the Strait, which include mussels, oysters, lobsters, etc (ÖZTÜRK and ÖZTÜRK, 1996; TOPALOĞLU and KIHARA, 1993).

Lack of modernization: The artisanal fisheries described above have been carried out in the same way for more than 100 years. There are some modernizations or technology which can be applied to these traditional fisheries. An example is the modification of the trap nets so that the fish entering the trap shall not escape from the net. For some reason, the artisanal fishermen are not eager to change their traditional methods. This attitude is favorable from the viewpoint of sustainable fisheries, however, can be economically disadvantageous.

Overfishing: Overfishing is one of the major problems in the Istanbul Strait. Since most of the commercial species are migratory species, not only the overfishing in the Istanbul Strait, but also that in the Marmara Sea and the Black Sea affect the fisheries in the Strait. Commercial species like mackerel, bluefin tuna, and swordfish, almost completely disappeared from the area. Other migratory species, such as bonito and bluefish, greatly decreased. Stocks of some non-migratory species, such as sturgeons, also declined due to the overfishing.

CONCLUSION

A total of 2160 people work directly as fishermen in the Istanbul Strait. Besides, there are thousands of people working in the fishing industry, as shelling mussels, buying and selling fish, processing fish, working at seafood restaurants, etc. The fishing activity in the Istanbul Strait is a source of livelihood for these people, although the fishermen are sometimes engaged in other activities, such as renting their boats for a recreational purpose during summer when most the fishing is forbidden.

Unfortunately, we do not have data of total revenue by the fishing activities. Considering the above number of people engaged in the fisheries, however, we can assume that the economical importance of the fishing activities in the Istanbul Strait is not negligible. We should not forget as well that the fish has a high nutritional value and available for ordinary citizens, particularly during the peak migration season for many pelagic fish, when the price of the fish is reasonably low. Heavy marine traffic and large tankers are observed in the most important fishing grounds within the Istanbul Strait. They are obstacles for the fishing activities of both large-scale purse seiners and artisanal fishing.

Artisanal fisheries are decreasing all over the world and so are in the Istanbul Strait. However, these types of fishing are so-called sustainable or responsible fisheries, which allow us to fish for a long time without damaging stocks, as marine resources are limited and have to be utilized wisely. This concept has been increasingly important and this is why the artisanal fisheries in the Istanbul Strait have to be protected.

Although the Strait is a busy waterway, which holds an extremely high economic importance, it is also for the local people, including the fishermen. They have a historical right to fish in the strait and that right should not be neglected.

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THE TURKISH STRAITS:
SOME CONSIDERATIONS, THREATS AND FUTURE

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ABSTRACT

The Turkish Straits System (TSS) includes the Straits of Istanbul (Bosphorus), Canakkale (Dardanelles) and the Marmara Sea. All are connected to the Black Sea and the Mediterranean Sea. It is one of the busiest waterways in terms of shipping activities between the Mediterranean and Black Sea basins; around 55,000 ships pass every year.

The main ship originated incidents are oil spillage. Accidents related to shipping in the TSS are examined under four categories. They are collision, grounding, fire and strandin; each of these has direct effect on the marine ecosystem.

The ship traffic has increased during the past decade (1996-2005), as well as the hazardous cargo transported through the TSS. As the quantity of traffic has increased, accidents in the TSS have become more common. There are more pilots taken on board in 2005 than in 1996, but this increase does not match the above increase in the traffic in the TSS. The heavy traffic through the TSS undoubtedly presents substantial risks to the local environment. If statistics of the number of vessels passing through the straits are considered in relation to the physical characteristics of the straits, it is clear that the probability of a serious environmental catastrophe occurring in or around Istanbul is very high. Pollution mitigation measures should be taken in the TSS at both national and international levels.

1. INTRODUCTION

The Turkish Strait System (TSS; Fig.1) is a 278-km-long and 75-km-wide inland sea between the Mediterranean and Black Seas. The surface area is approximately 11,350 square kilometers and it has a volume of 3,380 km^3. The TSS, including the Straits of Istanbul (Bosphorus), Canakkale (Dardanelles) and the Marmara Sea, is situated between 40º00’ and 41º10’N and 26º15’ and 29º55’E. The length of the coastline is 927 km. This area is surrounded by the Anatolia and Trace regions in Turkey. It is one of the busiest waterways in terms of shipping activities between the Mediterranean and Black Sea basins; around 55,000 ships pass in 2005.

The discovery of the oil resources in the Caspian Sea and central Asia will increase the traffic in the Strait.

The TSS plays a significant role in the protection of the biodiversity of both the Mediterranean and Black Sea basins due to its ecological peculiarities.

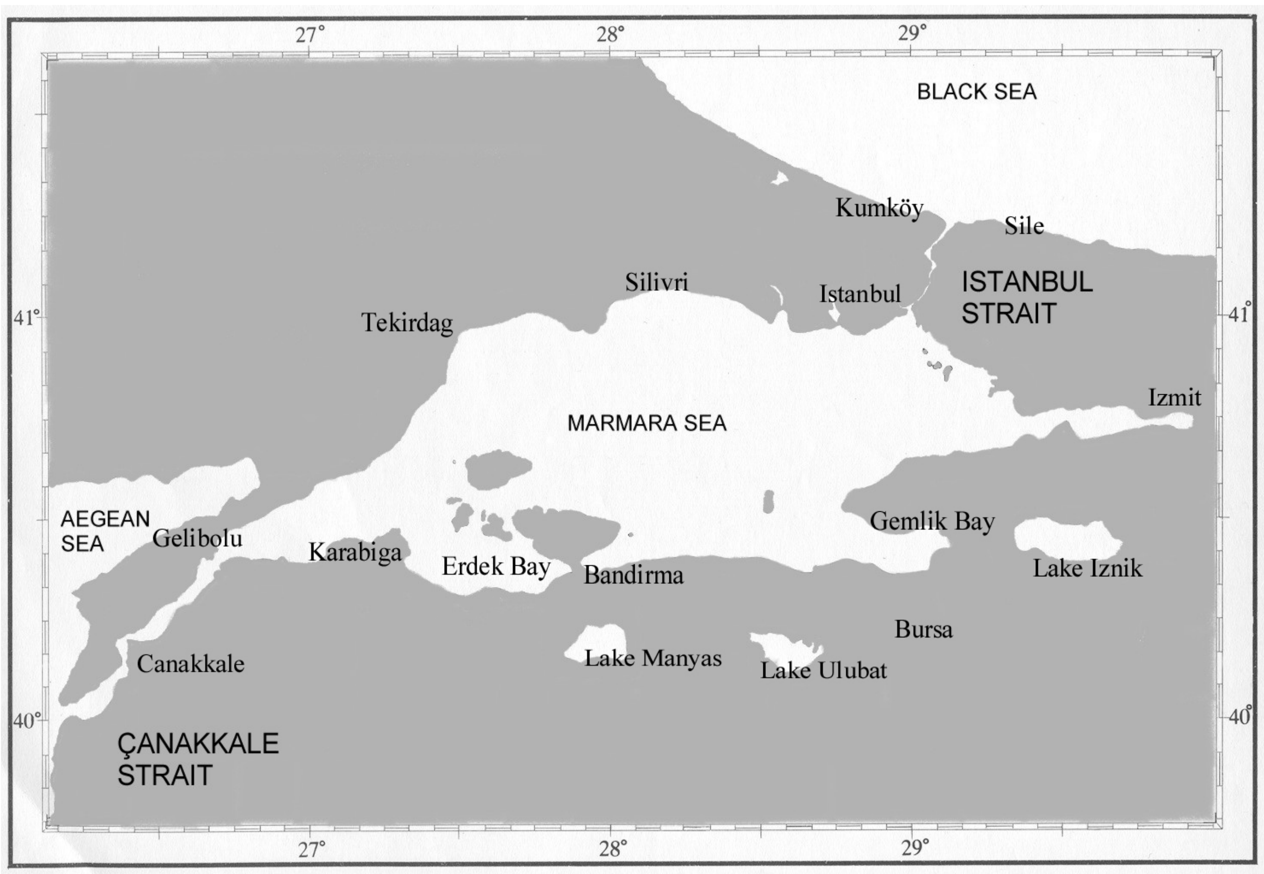

Figure 1. The Turkish Straits System.

2. HYDROGRAPHICAL PROPERTIES OF THE TURKISH STRAITS SYSTEM

The Marmara Sea is made up of two layers of water of either Black Sea or Mediterranean Sea origin, separated by a transitional layer of 8-10 m. Therefore; the hydrography of the Marmara Sea is dominated by the conditions of the adjacent basins. The Black Sea water enters the Marmara Sea through the Istanbul Strait as an upper current of 15-20 m depth and exits through the Canakkale Strait. Likewise the Aegean water enters through the Canakkale Strait in a deeper layer flow, and enters the Black Sea with the Istanbul Strait underflow. The main surface current is a slope current – the primary cause being the level of the Black Sea, which is higher than that of the Sea of Marmara by about 0.4 m – due to excessive flow of water into the Black Sea, discharged by the rivers. The upper layer has a volume of 230 km^3 and an average renewal time of 4-5 months. The deeper layer has a volume of 3,378 km^3 and an average renewal time of 6-7 years (Beşiktepe *et al*. 2000). Life in the upper layer is nourished primarily by brackish water of the Black Sea (Tuğrul & Salihoğlu 2000).

The temperature of the surface water of the Marmara Sea, which is under the influence of the Black Sea, ranges from 4 to 24 ºC. The salinity varies between 10 and 18 PSU. Deeper water shows pronounced changes in salinity and temperature. The salinity rises to 30 PSU at 20 m depth and 37 PSU at 40-50 m depth. The temperature of the surface water of the Çanakkale Strait ranges from 6 to 26 ºC and the salinity 24 to 36 PSU. In deeper water, at 70 m depth, the temperature ranges from 14 to 17 ºC. The salinity at a depth of 30 m rises to 37.5 PSU and below it to 39 PSU (Kocataş *et al*. 1993).

3. BIOLOGICAL CHARACTERISTICS OF THE TURKISH STRAITS SYSTEM

Due to the geographical and hydrographical characteristics of the TSS, it represents a peculiar ecosystem, as it is a transitional zone between the Mediterranean and the Black Sea. As such, it constitutes a barrier, a corridor or an acclimatization zone for living organisms (Öztürk & Öztürk, 1996).

The TSS serves as a barrier because it limits the distribution of both warm water marine species of Mediterranean origin and cold water, low saline species of the Black Sea (Öztürk, 2002). It acts as a barrier between the Aegean and Marmara Seas and between the Marmara and Black Seas. For example, the distribution of the Mediterranean endemic seagrass, *Posidonia oceanica*, is limited by the Canakkale Strait. The TSS is also a major barrier for invertebrates, as cephalopods and horn corals are not found in the Black Sea.

On the other hand, the TSS is the most important biological corridor for many species of migratory fish, birds and marine mammals between the Mediterranean and Black Sea (Öztürk, 2002).

Corridors preserve ecosystem structure, function and connectivity by linking core areas (e.g. feeding, breeding, nursery and wintering grounds) and “stepping stones” between core areas. They are essential for many birds, mammals and sea turtles, as well as for many fishes, and invertebrates. Migratory species obviously rely on corridors, but it is less obvious that many species that are not migratory, and may even be completely sessile for the most obvious parts of their life cycle, depend on marine dispersion for colonization and completing their life cycle. Different types of corridor can be characterized by their purpose, like migration, commuting or dispersal corridors (Pickaver, 2002).

The TSS is a biological corridor serving for the penetration of Atlantic-Mediterranean fishes to the Black Sea. In general, this migration originates from the Mediterranean and Aegean Sea in spring and returns to the Marmara and Aegean Sea in autumn. Dolphins and sea birds enter the TSS following these migratory fish (Öztürk & Öztürk, 1996).

The TSS also allows Mediterranean species of phytoplankton and zooplankton penetrate into the Black Sea with the Istanbul Strait underflow.

The third characteristic of the TSS is the role as an acclimatization zone, which allows some Mediterranean species adjust slowly to the new environment of the Black Sea, or the Black Sea species to the Aegean Sea (Öztürk, 2002). Among 1785 zoobenthic species in the Black Sea, 150 species of Mediterranean origin are exclusively found in the limited area near the mouth of the Istanbul Strait. This implies that these 150 species expanded their distribution to the Black Sea through the straits where they were acclimatized gradually to the environmental conditions of the Black Sea (Bacescu *et al*., 1971; Caspers, 1968).

4. SHIPPING ACCIDENTS, OIL SPILLS AND ENVIRONMENTAL IMPACTS

Shipping accidents in the TSS are examined under four categories: collisions, groundings, fire and stranding. Each category has a distinct effect on the marine ecosystem. Collisions are the dominant type of accidents in the area. They are caused by poor visibility and strong currents, which result in navigation failure. One of the biggest disasters occurred in 1979 in the Marmara Sea at the entrance to the Istanbul Strait; the Greek cargo ship Evriyali (10,000 tons dwt) was in collision with the Romanian oil tanker Independenta (165,000 tons dwt) which was carrying 94,000 tons of Libyan crude oil. It caused heavy air and sea pollution in the Istanbul area and the Marmara Sea. The maximum accumulation of particles in the air during the fire reached 1,000 mg/m^3; this was at least four times greater than the permissible limit set for human health. Heavy oil contamination formed on the surface of the sea and on the shores of the Marmara and Istanbul Strait. It was estimated that 30,000 tons of crude oil was burned, the remaining 64,000 tons was spilled into the sea (Baykut *et al*. 1985). Because of the rapid evaporation of the light components, the crude oil quickly sank to the bottom of the sea in an area approximately 5.5 km in diameter. The thick coating of tar was estimated at 46g/m^2. In this area only nine benthos species survived, the mortality rate was estimated at 96% (Baykut *et al*. 1985).

In 1994, the Nassia incident severely affected the marine environment when 20,000 tons of oil was discharged into the Black Sea, the Istanbul Strait and the Marmara Sea. All the coastline, bays and beaches were covered in thick oil and pitch. After this incident oil levels in the tissues of mussel, *Mytilus galloprovincialis* in the Istanbul Strait were as high as 250µg/g dry weight (Guven *et al*.1995). At least 1,500 seabirds were reported to have died after being coated with oil, but the overall total was probably much higher. Marine mammals were also affected and stranded during this incident. 8 harbour porpoises (*Phocoena phocoena),* 2 common dolphins (*Delphinus delphis)* and 2 bottlenose dolphins (*Tursiops truncatus*) stranded.

The second type of accidents in the Istanbul Strait is the grounding of ships due to failure in maneuvering in the narrow straits, strong currents and mechanical problems. Groundings are particularly dangerous for the benthic organisms such as mussel beds and vulnerable sea grass meadows in local coastal areas. A more recent accident occurred in 1999 when the Volganeft-248 oil tanker broke in two during bad weather and sank close to Istanbul in the Marmara Sea. Some

1,200 tons of fuel oil were dispersed along a 5-kilometer stretch of coastline. The oil also entered a wetland lagoon and the freshwater reservoir of the city of Istanbul. The ecological damage from this accident was 90% mortality of marine life. Among the losses were algae species: velvet horns, *Codium tormentosum, Codium barbata, Codium crinata* and sea lettuce, *Ulva lactuca*; starfish, *Astropecten* spp. and spiny starfish *Marthesterias* sp.; mussel, *M. galloprovincialis,* oyster, *Ostrea edulis,* razor shell, *Solen ensis*, limpets, *Patella vulgata, g*reen shrimp, *Crangon crangon,* pink prawn, *Paneaus* sp.; fish species such as rock gobby, *Gobius niger,* common sole*, Solea solea, g*rey mullet*, Mugil cephalus,* and *g*urnard*, Trigla lucerna*. There were also over 3,000 gulls and cormorants found dead.

The most recent incident was the Russian oil tanker Gottia that collided to the Emirgan harbour wall spilling 22 tons of oil into the Istanbul Strait and exterminated all mussel beds there (Güven, 2002).

In 2003, Georgian ship Svyatov Pantaleymon caused oil spill in the northern part of the Black Sea and 150 ton oil was spilled. More than 200 seagulls and cormorants were dead. The fishing ground of up to 2 nmiles off shore was also contaminated with oil. Mussel beds and sole, flounder and turbot spawning grounds were also adversely affected from the oil spill.

5. SHIPPING ACTIVITIES

The total navigational distance from one end to other in the TSS is approximately 300 km. For a commercial vessel traveling at an average speed it takes approximately 16-18 hours. From the navigational safety point of view there are some serious difficulties in the region due to various factors. Physical characteristics of the area is one of those factors such as hydrological and oceanographic specifications; sharp turns, narrow points, and unstable surface currents. Traffic condition is also one of the important factors affecting the safety of navigation in the area (Ustaoğlu & Poyraz, 2002).

From 1996 to 2005, the average annual increase rate in the number of vessels passing through the TSS was 1.31% for the Istanbul Strait and 3.79% for the Çanakkale Strait. The number of vessels passing through the Istanbul Strait (54,794) in 2005 was 1.09 times higher than the number of those (49,952) in 1996. The number of vessels passing through the Çanakkale Strait (49,077) in 2005 was 1.38 times higher than the number of those (35,487) in 1996 (Table 1).

From 1996 to 2005, the average annual increase rate in the amount of dangerous cargo carried through the TSS was 10.33% for the Istanbul Strait and 7.42% for the Çanakkale Strait. The amount of dangerous cargo carried through the Istanbul Strait (143,567,196) in 2005 was 2.38 times higher than that (60,118,953) in 1996. The amount of dangerous cargo carried through the Çanakkale Strait (148,951,376) in 2005 was 1.86 times higher than that (79,810,052) in 1996 (Figure 1, Table 2-3).

Table 1. Development of shipping traffic in the Straits of Istanbul and Çanakkale (1995-2005).

	Number of Vessels passed	
Year	**Istanbul Strait**	**Çanakkale Strait**
1995	46954	35460
1996	49952	35487
1997	50942	36543
1998	49304	38777
1999	47906	40582
2000	48079	41561
2001	42637	39249
2002	47283	42669
2003	46939	42648
2004	54564	48421
2005	54794	49077
Yearly Average	**49032**	**40952**

Table 2. Statistical figures regarding amount of hazardous cargo (million tons carried through the Strait of Istanbul.

Year	Number of tankers carrying hazardous cargo	Amount of hazardous cargo (million tons)	Monthly average	Daily average
1996	4248	60,118,953	5,009,912	164,709
1997	4303	63,017,194	5,251,432	172,649
1998	5142	68,573,523	5,714,460	190,482
1999	5504	81,515,453	6,792,954	233,330
2000	6093	91,045,040	7,587,087	249,438
2001	6516	100,768,977	8,397,415	276,079
2002	7427	122,953,338	10,246,112	336,858
2003	8107	134,603,741	11,216,978	368,777
2004	9399	143,448,164	11,954,014	398,467
2005	10027	143,567,196	11,963,933	393,335

Table 3. Statistical figures regarding amount of hazardous cargo (million tons) carried through the Strait of Canakkale.

Year	Number of tankers carrying hazardous cargo	Amount of hazardous cargo (million tons)	Monthly average	Daily average
1996	5658	79,810,052	6,650,838	218,658
1997	6043	80,485,711	6,707,143	220,509
1998	6546	81,974,831	6,831,236	224,589
1999	7266	95,932,049	7,994,337	262,827
2000	7529	102,570,327	8,547,527	281,015
2001	7064	109,625,682	9,135,474	304,516
2002	7637	130,866,598	10,905,549	358,538
2003	8114	145,154,920	12,096,243	397,685
2004	9016	139,203,656	11,600,305	386,677
2005	8813	148,951,376	12,412,615	408,086

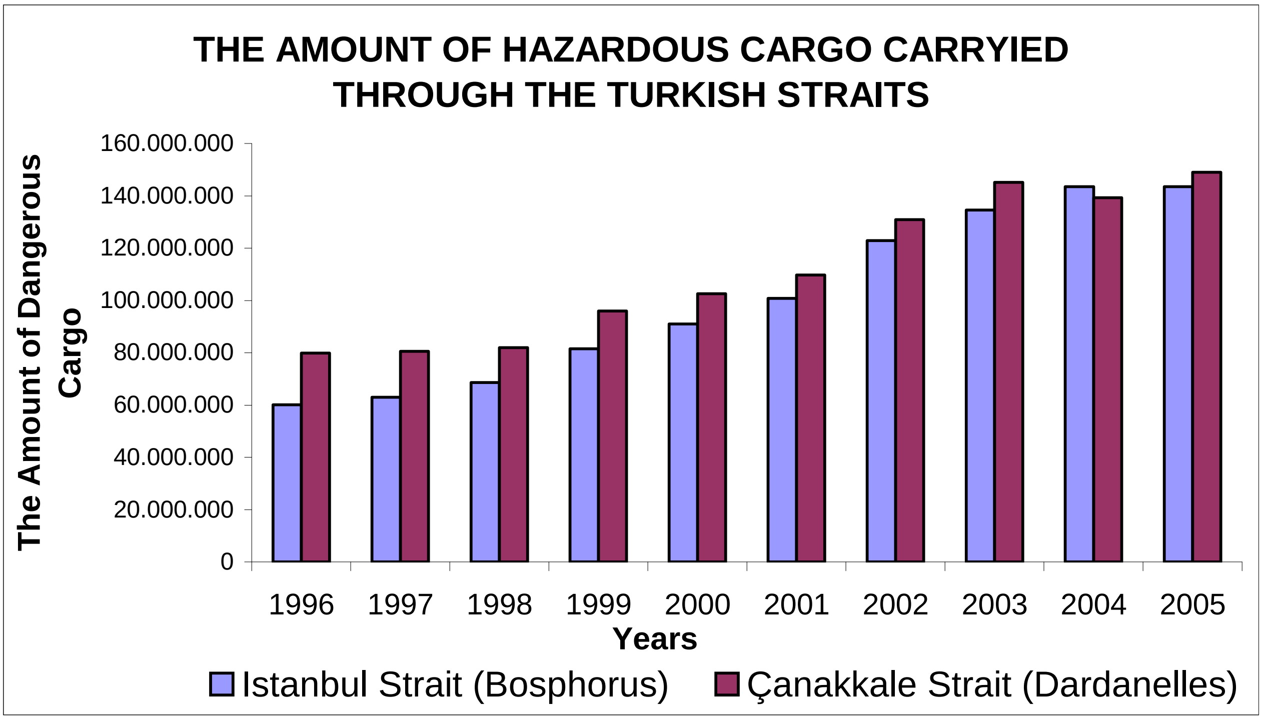

Figure 1. The amount of hazardous cargo carried through the TSS between the years of 1996- 2005.

From 1996 to 2005, the average annual increase rate in the number of vessels carrying dangerous cargo in the TSS was 7.7% (10.14% for the Istanbul Strait and 5.2% for the Çanakkale Strait). The number of vessels carrying dangerous cargo in the Istanbul Strait (10,027) in 2005 was 2.36 times higher than the number of those (4,248) in 1996. The number of vessels carrying dangerous cargo in the Çanakkale Strait (8,813) in 2005 was 1.55 times higher than the number of those (5,658) in 1996 (Figure 2, Table 4).

Table 4. Statistical figures regarding tanker traffic in the Istanbul & Çanakkale Straits.

	Istanbul Strait			**Çanakkale Strait**		
Year	**Tankers total**	**Monthly average**	**Daily average**	**Tankers total**	**Monthly average**	**Daily average**
1996	4248	354	12	5658	471	16
1997	4303	359	12	6043	504	17
1998	5142	429	14	6546	546	18
1999	5504	479	16	7266	605	20
2000	6093	507	17	7529	627	21
2001	6516	543	18	7064	588	19
2002	7427	619	20	7637	636	21
2003	8107	675	23	8114	676	22
2004	9399	783	26	9016	751	25
2005	10027	836	28	8813	734	24

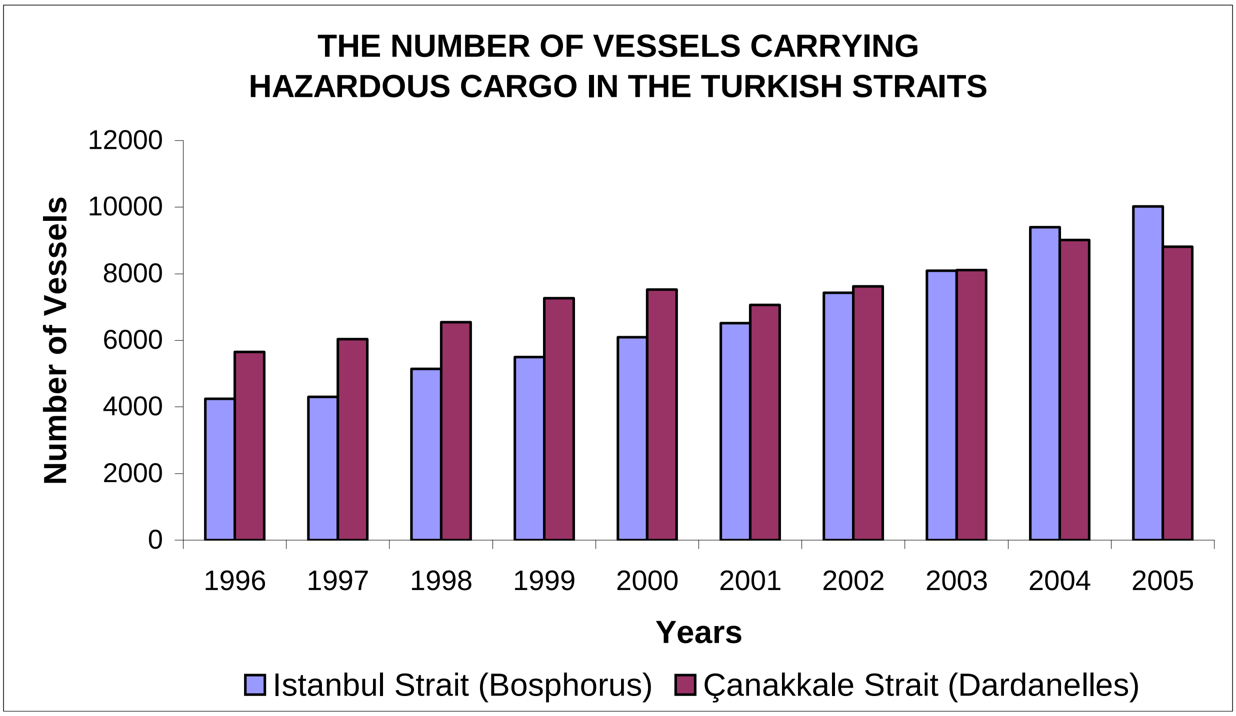

Figure 2. The number of vessels carrying hazardous cargo in the TSS between the years of 1996-2005.

From 1996 to 2005, the average annual increase rate in the number of accidents in the TSS was 26.14% (36.97% for the Istanbul Strait and 40.14% for the Çanakkale Strait). The number of accidents in the TSS (42 in the Istanbul Strait and 20 in the Çanakkale Strait) in 2005 was 3.65 times higher than the number of those (7 in the Istanbul Strait and 10 in the Çanakkale Strait) in 1996. The number of accidents in the Istanbul Strait (42) in 2005 was 6 times higher than the number of those (7) in 1996. The number of accidents in the Çanakkale Strait (20) in 2005 was 2 times higher than the number of those (10) in 1996 (Figure 3, Table 5).

Table 5. Shipping accidents occurred in the Straits of Istanbul and Çanakkale (1995-2005).

	Number of accidents	
Year	**Istanbul Strait**	**Çanakkale Strait**
1995	4	12
1996	7	10
1997	11	5
1998	20	7
1999	9	7
2000	9	8
2001	20	9
2002	13	9
2003	13	4
2004	26	4
2005	42	20

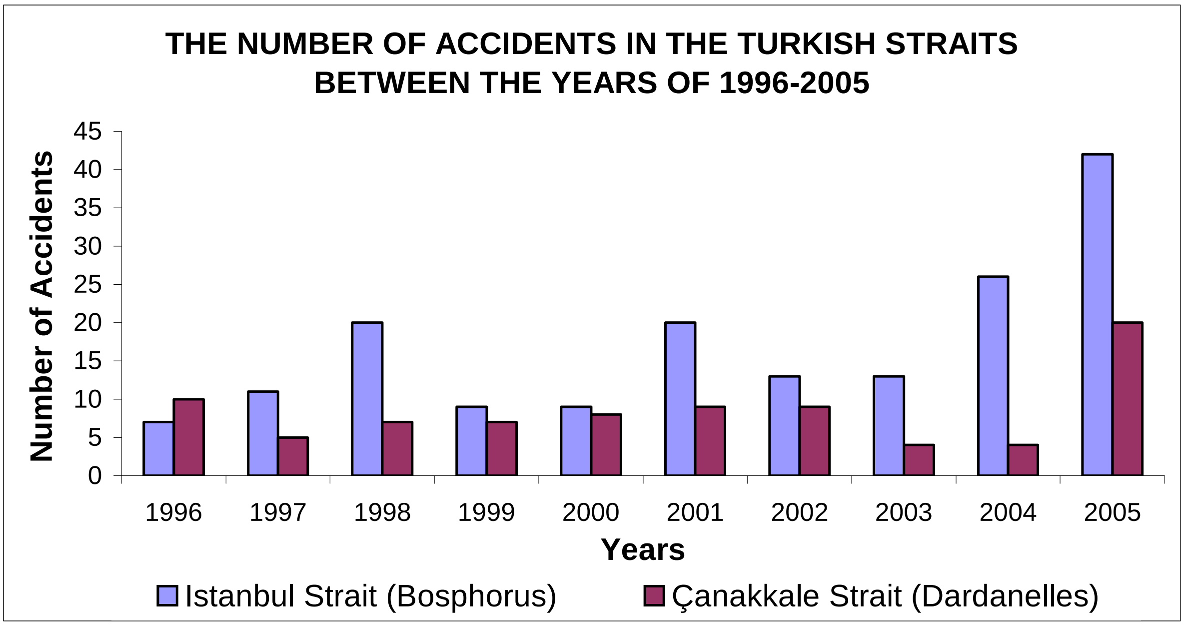

Figure 3. The number of accidents in the TSS between the years of 1996-2005.

From 1996 to 2005, the average annual increase rate in the number of transit passing vessels through the TSS was 62.3% (56.6% for the Istanbul Strait and 68% for the Çanakkale Strait) and that in the number of vessels visiting ports in the TSS was 37.7%. The percentage of the number of transit passing vessels through the TSS rose from 57% in 1996 to 66% in 2005 and that of the number of vessels visiting ports in the TSS decreased from 43% in 1996 to 34% in 2005. The average annual increase rate in the number of transit passing vessels through the TSS was 4.3% for the Istanbul Strait and 4.6% for the Çanakkale Strait. The number of transit passing vessels through the Istanbul Strait (34,111) in 2005 was 1.44 times higher than the number of those (23,761) in 1996. The percentage of the number of transit passing vessels through the Istanbul Strait rose from 48% in 1996 to 62% in 2005. The number of transit passing vessels through the Çanakkale Strait (34,387) in 2005 was 1.46 times higher than the number of those (23,554) in 1996. The percentage of the number of transit passing vessels through the Çanakkale Strait rose from 66% in 1996 to 70% in 2005 (Figure 4,5).

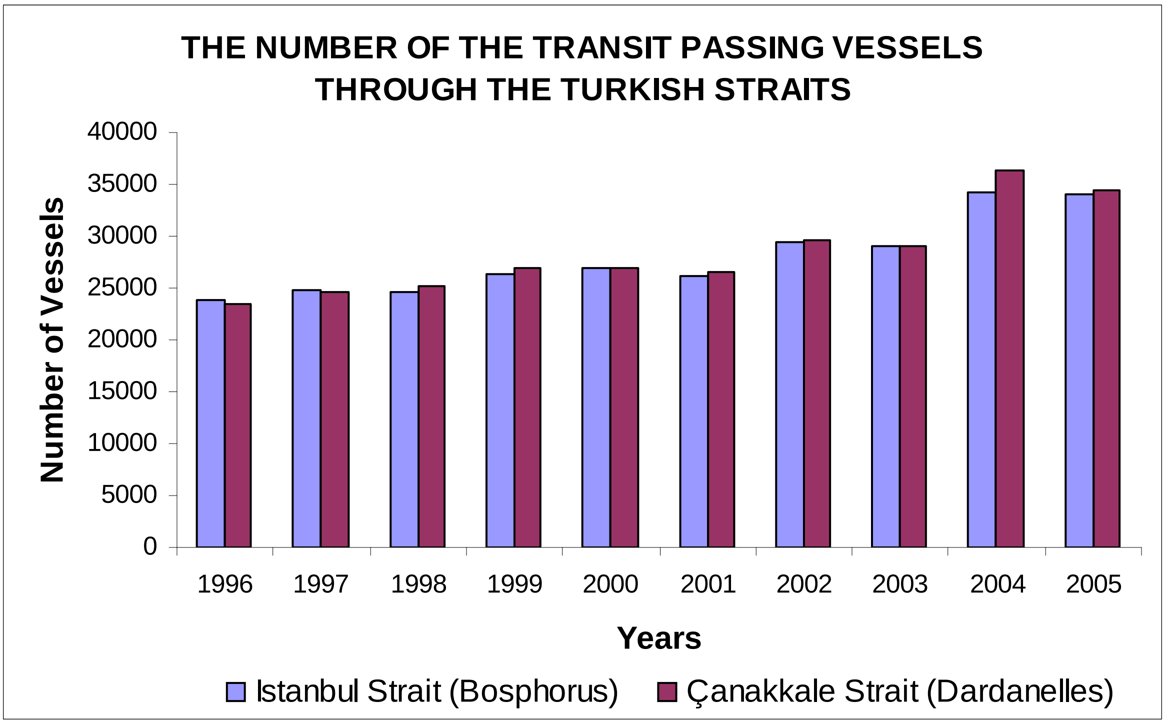

Figure 4. The number of transit passing vessels through the TSS between the years of 1996- 2005.

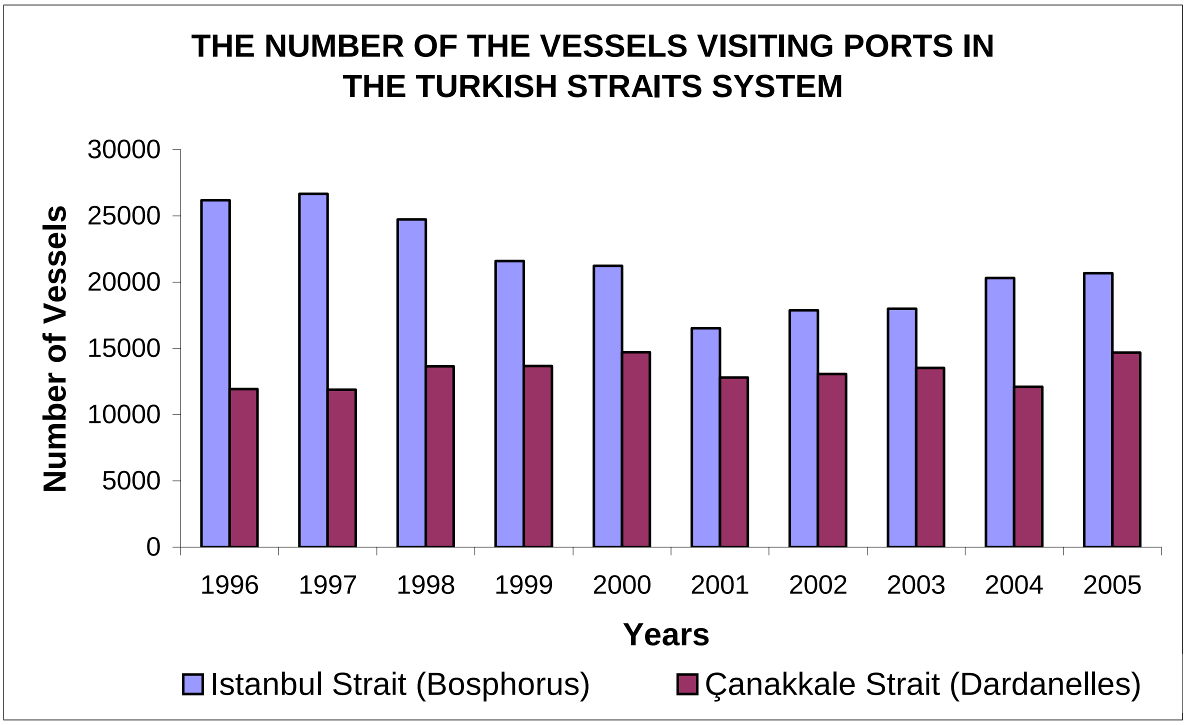

Figure 5. The number of the vessels visiting ports in the TSS between the years of 1996- 2005.

From 1996 to 2005, the average annual percentage of the number of the vessels taking pilot while passing through the TSS was 35% (41% for Istanbul Strait and 29% for Çanakkale Strait). The percentage of the number of vessels taking pilot while passing through the TSS rose from 34.5% in 1996 to 38.3% in 2005. The average annual percent increase in the number of vessels taking pilot while passing through the TSS was 2.3% for Istanbul Strait and 5.3% for Çanakkale Strait. The number of vessels taking pilot while passing through the Istanbul Strait (24,494) in 2005 was 1.2 times higher than the number of those (20,317) in 1996. The percentage of the number of vessels taking pilot while passing through the Istanbul Strait rose from 40.7% in 1996 to 44.7% in 2005. The number of vessels taking pilot while passing through the Çanakkale Strait (15,661) in 2005 was 1.6 times higher than the number of those (10,081) in 1996. The percentage of the number of vessels taking pilot while passing through the Çanakkale Strait rose from 28.4% in 1996 to 31.9% in 2005 (Figures 6 and 7).

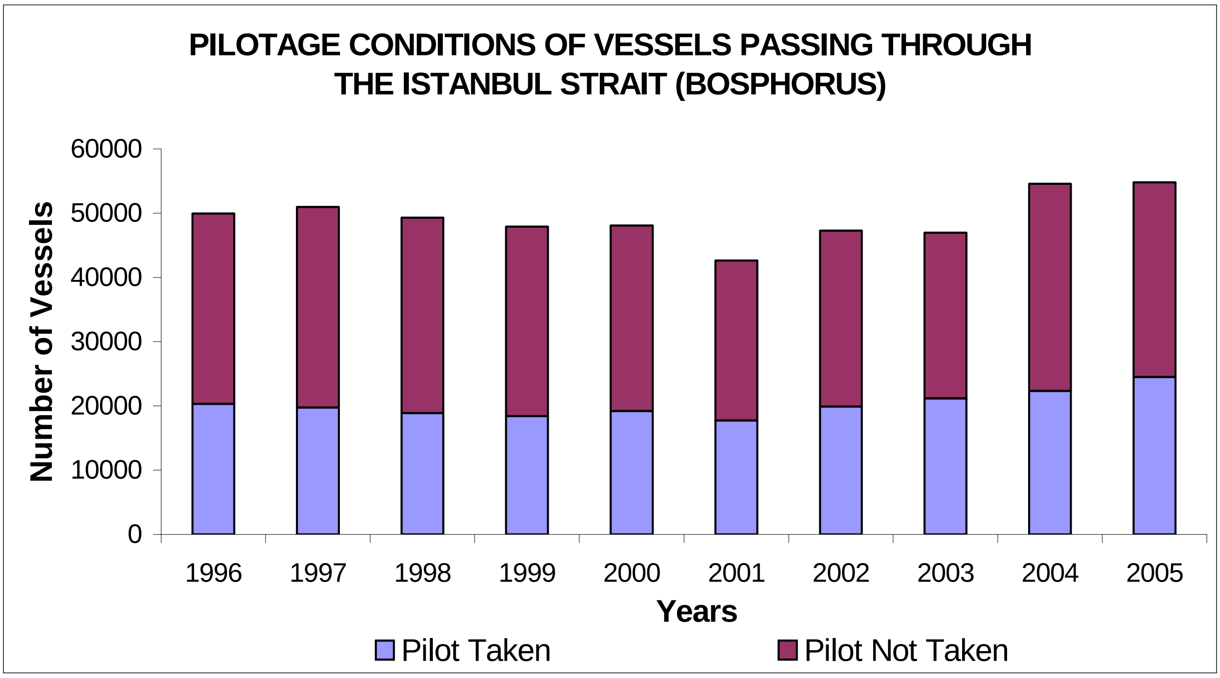

Figure 6. The pilotage conditions of the vessels passing through the Istanbul Strait between the years of 1995- 2005.

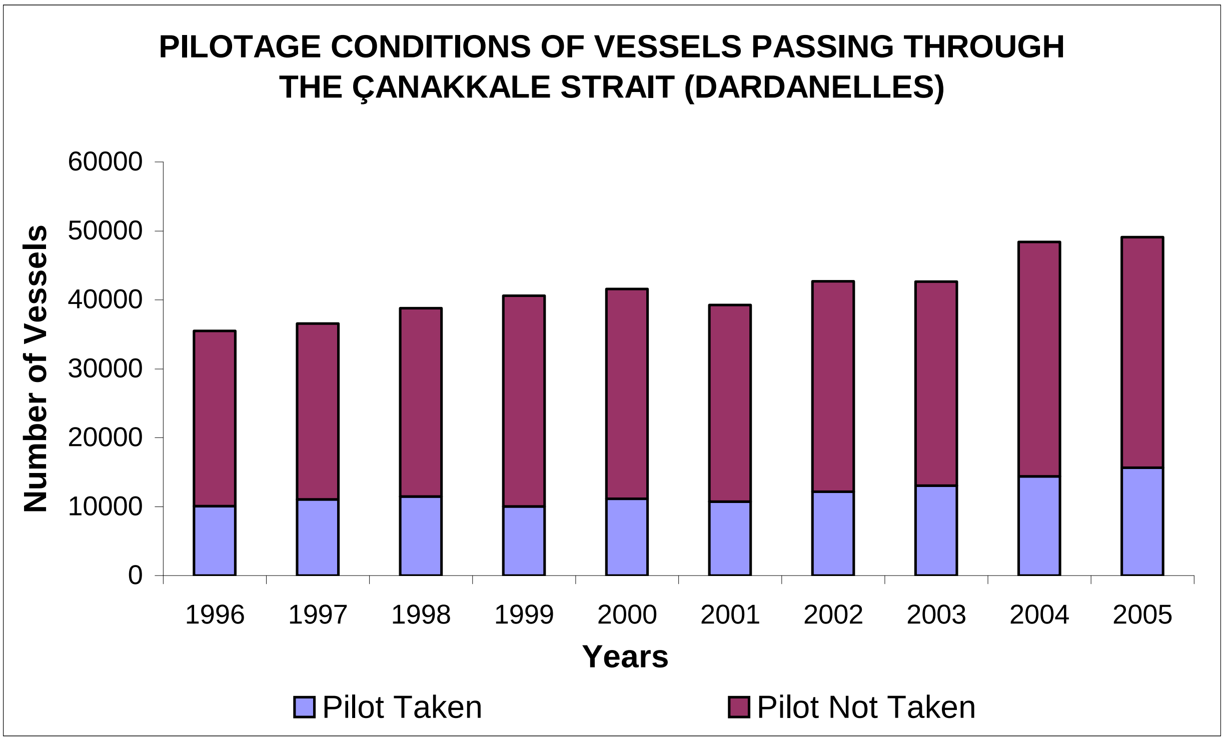

Figure 7. The pilotage conditions of the vessels passing through the Çanakkale Strait between the years of 1995- 2005.

Comparison of the shipping traffic of the main canals of the world shows clearly the high density of the traffic through the Istanbul Strait (Akten, 2003) (Table 6).

Through the Malacca Straits, over 100,000 oil and cargo vessels traversed it each year, carrying 3,23 million barrels of crude oil each day. Shipping accidents occurred more frequently, recently, which is attributed to heavy traffic in the Malacca Straits with shallow, narrow channels and shoals (Eng *et al*., 2000).

According to the Queensland Transport and the Great Barrier Reef Marine Park Authority (2000), there are over 10,000 vessel movements along the Queensland coast every year and approximately 2,500 ships transit the inner route between the Torres Strait and Cairns each year, which equates to about 7 ships per day. According to the 2001 Australian census, the Australian Bureau of Statistics (ABS), the population of the Torres Strait Islands was 8,089.

Table 6. The Istanbul Strait and the main canals of the world (1999-2000) (Akten, 2003).

Canal	Annual Shipping Traffic
Panama Canal	12,755
Suez Canal	13,552
Kiel Canal	23,945
Istanbul Strait	48,000

The Strait of Istanbul faces dense shipping transits. Mean of yearly figures covering the traffic separation scheme period, 1994-2002, in particular, indicates that on a daily basis 132 vessels (or nearly 6 vessels an hour) navigate the Strait. When the local but “intra-strait” traffic is taken into account, almost another 2,000 crossings a day (or roughly 85 crossings an hour) must be added to the figure. Therefore it is not exaggreating to say that any time in any day nearly 100 “floating bodies” use the strait either crossing or proceeding up or down (Akten, 2004).

6. CONCLUSION

We reviewed the sensitivity of the biodiversity of the TSS as well as the current situation of the ship traffic there. Almost all statistics show that the ship traffic has been more intense in the past decade (1996-2005). We also examined the ecological disasters as a result of ship originated pollution and conclude the ecosystem is hard to recover once it is damaged.

The TSS is the only navigational link between the Black Sea and the Mediterranean. The newly-developed oil and natural gas resources of the Caspian Region and the surrounding countries have transformed this important link into a main energy hub. This fact has inevitably increased the risk of a catastrophic accident and consequent oil spill, especially in the Istanbul Strait. The issue is alarming not only in view of environmental hazards, but also for its influence on the world energy market. Therefore, in case of an accident, efforts should be made to contain the spilled oil so that damage is minimized (Örs & Yılmaz, 2003).

Oil spills and the increasing number of ships passing through the TSS is a serious threat to marine biodiversity, not only in the TSS but also in the Black Sea and the Mediterranean Sea. They are also a threat to humans – 11 million habitants of Istanbul.

Any perturbation of the ship traffic is likely to have a major effect on the Turkish economy since the Istanbul metropolitan area generates 22% of the Turkish GNP and has a growth rate of

63%. Any oil spill phenomenon that might be accompanied by large-scale fires and explosions can have disastrous consequences not only in terms of human life and environment but also for Turkish and regional economies. This might even trigger a chain of events affecting the world economy considering the size of the traffic volume (Örs & Yılmaz, 2003). Unlike the case of other commercial goods, there exist cheaper and safer ways of transferring large quantities of oil and gas from one part of the globe to another (Örs & Yılmaz, 2004b). The enormously increasing maritime traffic density alarms the development of environmental management tools for pollution prevention, prediction, and risk assessment (Örs & Yılmaz, 2004a).

Pollution sources should be mitigated by national and international efforts with the help of the relevant conventions such as MARPOL 73-78. Oil spill response and management plans should be implemented for the entire TSS coast. OPRS convention and relevant instrument should be adopted and implemented for all vessels to protect marine biodiversity in the TSS.

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OIL POLLUTION IN THE BLACK SEA AND TURKISH STRAITS

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1. INTRODUCTION

The Black Sea is 1200 km long and 615 km wide. It has a maximum depth of 1270 m. and the northwestern part of the shelf is less than 200 m. in depth. Its surface area is 420.000 km^2, volume 537.000 km^3, salinity 18 to 19 ‰ at the surface and 22.5 ‰ at the 2000 m depth. The upper water masses are about 23.195 km^3 (50.2%), deep water masses 248.390 km^3 (45.4%). The minimum depth of the H_2S zone is 60-80 m; 90 percent of the Black Sea water volume is anoxic. It is linked with the Mediterranean Sea through the Istanbul Strait, the Sea of Marmara and the Çanakkale Strait.

The Turkish Straits is comprised of the Istanbul Strait, Sea of Marmara and the Çanakkale Strait. The water exchange between the Black Sea and Mediterranean Sea takes place through these straits.

The Istanbul Strait is 31 km long, 1.6 km wide on average and 0.7 km at the narrowest point, the maximum depth being 110 m.

The Çanakkale Strait is 60 km long, 1.2 km across at the narrowest and 6.5 km at the widest points, the maximum depth being 102 m. The Istanbul Strait and the Çanakkale Strait are separated by the Sea of Marmara (300 km).

The Sea of Marmara has a surface area of 11.550 km^2, the volume is 3378 km^3. Its maximum length (Gelibolu- İzmit) is 276 km, maximum width is 76 km and has a maximum depth of 1268 m. The length of the coastline is 927 km.

The speed of the upper layer current is 0.5-4.8 knots in the Istanbul Strait, 1.5-4 knots in the Çanakkale Strait and 0.1 knot in the Sea of Marmara (1).

2. POLLUTION SURVEY

An important problem of the Black Sea is oil pollution. It is an important contaminant in seawater. There are several sources of petroleum hydrocarbons that are introduced into marine environment as spills from tanker accidents, tanker washings, water ballasting, shipping transport, ship operations, storage, oil terminals and refinery etc. All these processes were increase the oil pollution at sea water. The other sources pollution of the Black Sea are land based pollutants in sewage discharged by river flow to it especially, the Danube, Dniester Don, Kuban, Southern Bug, Inguri, Eya, Rion, Çoruh, Kızılırmak, Yeşilırmak, Sakarya, Filyos, Bartın, Devrekani rivers. Over 160 rivers flow from the territory of Turkey into the Black Sea and the total annual run is 44.44 km^3, the Sakarya 4.54, Kızılırmak 5.94, Çoruh 6.6, Yeşilırmak 4.89 km^3

Many papers were published on oil pollution of the Black Sea. A comprehensive account was published by Polikarpov (4) on the pollution of the Black Sea. GEF* (Global Environment Facility) also published various books (Black Sea Environment series) on the Black Sea. According to Fashchuk (5) about 410.000 tons/year of oil product are brought into the Black Sea with river flow. Miranov estimated in 1993 that 70000 tons of oil annually was discharged into the Black Sea. Land based sources brought by rivers, the amount of oil and oil products were 206.000 tons (3). According to other contributions, 90000 tons oil product per year has flowed into the Black Sea (6), in 1980-1989 an average of 80.000 tons of oil products annually entered the Black Sea. Shipping caused the input of another 12.000 tons/year of petroleum into the Black Sea. Oil that entered the Black Sea with river flow was 32–40% from shipping and 5–10% as a result of oil spills caused by ship accidents and pipeline damage. Approximately 1500-2000 tons/year of petroleum hydrocarbon flowed into the Black Sea from the waste water of coastal industries, 30% from Odessa, 30% from Batumi, 20% from Sevastopol, 15% from Krasnodar territory and, 15% from the southern coast of Crimea (7). The Caspian Sea receives 86% of petroleum hydrocarbons (8). Oil pollution in the region of Istanbul, Odessa and Sochi causes alarm. The pollution level near the coasts of the Krasnodar region is due to the spew of the wastewater and trade wastes from the localities, the ports activity, and the transport of pollutants by the Black Sea currents from the shore of Turkey and Georgia (9).

* This organization settles in Istanbul, Turkey, but the books published by GEF imply unfortunately many lacking on the article printed in international and national journal by Turkish researcher.

The amount of hydrocarbon on the shores and open sea of the Black Sea was 0.05 -1.0 mg/L and in the bottom water was 10-100 times higher than in the water. General amount of polyaromatic compounds on the Black Sea surface water was 0.62 μg/L (10).

Oil concentration levels in the Novorossiysk – Gelendzhik area, (eastern Black Sea) during spring and the beginning of summer was 0.13 mg/L oil and polycyclic aromatic hydrocarbons > 1.00 μg/L (11).

During the spring and summer periods in the NW Black Sea the local concentration of oil products in the water can exceed MAC (Maximum Allowable Concentration) as much as 10-19 times (12)

It was calculated that petroleum product reserve in the film phase reaches the Black Sea, on the average 2.8-120 tons and its maximal value exceeds 600 tons (13).

In this article for the comparison of the oil pollution in sea water and sediment the limit values were 0.13 μg/L and 10 μg/g respectively (14a, b, 15).

2.1 Bulgaria

In the sea water of the Varna Bay the oil concentration level varied 0.21-0.31 mg/L in 1990-1991. The mean concentration of the total hydrocarbon found in Bulgaria coastal sea water ranged from 0.07-0.13 mg/L. Seasonal variability of concentration was found high in the summer months (17, 18). In the sediment of Varna Bay the maximum oil content was 1.60 μg/g (16) and in Varna Port 5.8 mg/g (17).

2.2. Romania

Land – based sources of petroleum hydrocarbon in the Danube River is a major source of oil pollution for the Black Sea. Approximately 110 thousand tons of petroleum is annually transported to the Black Sea by Danube waters (9).

The pollution level of the Romanian Black Sea coastal zone was 10.5 -1038.1 µg/L in sea water. The oil pollution level in Mamaia 39-276 µg/L surface water was 10.5-394 µg/L at 10 m and in Constanta Nord –Varna Veche 91-1029 µg/L surface water was49.3-183.9 µg/L at 10m in 1997. In Danube estuary 10.5-2716 µg/L, Vadue, Sinoe, Mamaia 4-10200, Constanta Nord -Varna Veche 0-7391 µg/L at surface water and 0 -2388 µg/L at 10m (19).

The highest concentration of oil in sea water and sediment are found in the vicinity of River Danube. In 1995 the oil pollution level of Danube sediment was found to be 66-1750 µg/g (Rompe Equiv.) (20).

2.3. Ukraine

The Sevastopol Bay contains over 21 tons of oil hydrocarbon in the bottom sediment (21).Miranov found that in 1993 Sevastopol deposit oil amount was 20000 tons (see ref. 4).Oil concentration of Sevastopol region in 1990 has an oil hydrocarbon level of up to 540 µg/L. In Yalta region in 1991 up to 180 µg/L (4).

The Concentration of oil in sediment of Ukraine was found to be 2.1- 310 mg/g (22). In 1995 the oil pollution in sediment was 0.6-320 µg/g (Chrysene Equiv.), 3.2-1750 µg/g (Rompe Equiv.) (20).

In the bottom sediment of Odessa, Sevastopol and Kerch the pollution level was 0.947-9.0 mg/g (12), 90mg/g and 7.0 mg/g (dry weight) (23) while Kerchensky Straits this value was 0.022-0.050 mg/g (24).

2.4 Russia

The pollution of Novorossiysk – Gelendzhik sea water during the months of spring and the beginning of summer was up to 0.13 mg/L (11) In 1995 the oil level in Russian coastal waters was

16-530 µg/L (Chrysene Equiv.), 52-680 µg/L (Rompe Equiv.)(20).

Anapa, Novorossiysk, Gelendzhik, Tuapse and Sochi the average content of PAHs during the 1980-1993 periods varied as 0.04-032 mg/L. The highest concentration was noted during 1980-1992 in the region of Tuapse. During this period Novorossiysk, Tuapse and Sochi were highly polluted with PAHs. Anapa 0.04-013 mg/L, Novorossiysk 0.22-0.9 mg/L, Tuapse 0.09-0.32 mg/L , Gelendzhik 0.09-012 mg/L , Sochi 0.12-0.13 mg/L. In 1994-1995 the pollution level in Krasnodar was < 0.05 - 0.06 mg/L. In 1980-1994 the Azov Sea content of PHCs in the mouth of the Don was 0.07-038 mg/L (9).

Concentration of oil found in sediments in Russia was 7-170 mg/g (22).

2.5 Georgia

As indicated above in the most stable regions of oil film accumulation in the Black Sea in 1981-1990 in Novorossiysk to Tuapse and from Sochi to Batumi. The oil pollution in Batumi coastal area was 150 µg/g (13).

2.6 Turkey

Oil transportation is one of the problems for the Black Sea basin and especially for the Istanbul Strait. The present problem faced by the Turkish Straits is the sharp increase of oil transportation by tankers. Turkish authorities are committed to reduce the risk of a serious oil spill in the highly sensitive Turkish Straits (25).

Tanker / ships accident occurred in Turkish Strait are listed in Table 1:

Table 1. The main tanker accidents occured in Istanbul Strait and Sea of Marmara (26, 27).

Date	**Vessel name and flag**	**Accident area**	**Accident type and oil spilt**
14.12.1960	World Harmony(Greek) v. Peter Zoranic (yugoslavia)	Kanlıca	Collision and fire: 18000 tons oil spilled
15.09.1964	Norborn(Norwegian) v. wreck of Peter Zoranic	Kanlıca	Contact: fire and oil spilled
01.03.1966	Lutsk(USSR) v.Kransky Oktiabr (USSR)	Kızkulesi	Collision and fire: 1850 tons oil spilled
15.11.1979	Independentia (Romania) v.Evriali (Greek)	Haydarpaşa	94.000 ton oil spilled
09.11.1980	Nordic Faith(British) v.Stavanda (Greek)	-	Collision and fire
25.03.1990	Jambur(Iraqi) v. Da Tung Shan(Chinese)	Sarıyer	Collision : 2600 tons oil spilled
13.03.1994	Nassia (Philippines)v. Shipbroker (Philippines)	Rumeli feneri çakarı	Collision and fire : 20.000 tons oil spilled
01.03.1996	Lutsk (USSR) . Kransky Oktiabr (USSR)	-	Collision and fire : 1850 tons oil spilled
13.02.1997	TPAO tanker burned	Tuzla Bay	214.3 tons spilled
30.12.1999	Volganeft (Russian)	Ahırkapı	Sank: 1200 tons oil spilled
07.10.2002	Gotia (Greek)	Bebek	Collision and stranding : 22 tons oil spilled

v : wreck

Primary factors responsible for oil pollution in the Istanbul Strait are not only the tanker accident/traffic but also industrial pollution from the countries surrounding the Black Sea, and urban sewage.

Many papers were published on oil pollution for the coastal area of Turkey (28-44). The samples collected from the stations were analyzed by UVF and GC/MS.

The oil pollution monitoring conducted for the Black Sea Turkish coastal area and Turkish Straits in 1994 – 2006 (still in progress) and which is still being supported by the institutions listed below:

1.İSKİ (Istanbul Water and Sewerage Administration) project in 1997-2006 (continued)*

1.1. In the Black Sea (vicinity of entrance of Istanbul Strait), monthly at 1 stations, trimesterly 3 stations

1.2. In Istanbul Strait, monthly at 9 stations,

1.3. In Sea of Marmara, northern coastal area trimesterly 13 at stations

2. *Ministry of Environment and Forestry, Republic of Turkey (TBK),* In west part of the Black Sea Turkish coast (From İğneada to Istanbul Strait entrance) at 12 stations, six month interval

3. *Ministry of Environment and Forestry, Republic of Turkey (TRK),* From İğneada toHopa At 70 stations for sea water and 67 station for sediment, six month interval

4. The sample was specially taken during the expedition of Memphis (Sampling Programme at the Sea of Marmara on Behalf of the Memphis Project, Grantmij. Nederland BV. Environmental Master Plan and Investment Strategy for the Marmara Sea Basin, Turkey. European Investment Bank and Turkish Ministry of Environment and Forestry)

The Sampling stations are shown in Fig 1-4

The oil concentration of sea water and sediment are presented in Table 1-9 and in Table 10-12 respectively. The oil level represents the maximum concentration of the oil pollution found from sea water (μg/L) and sediment (μg/g). Abbreviation: (S): surface, (D): Depth, first number: indicated oil pollution level, year in parenthesis.

*Include 67 parameter

1. SEA WATER

I. Project of İSKİ

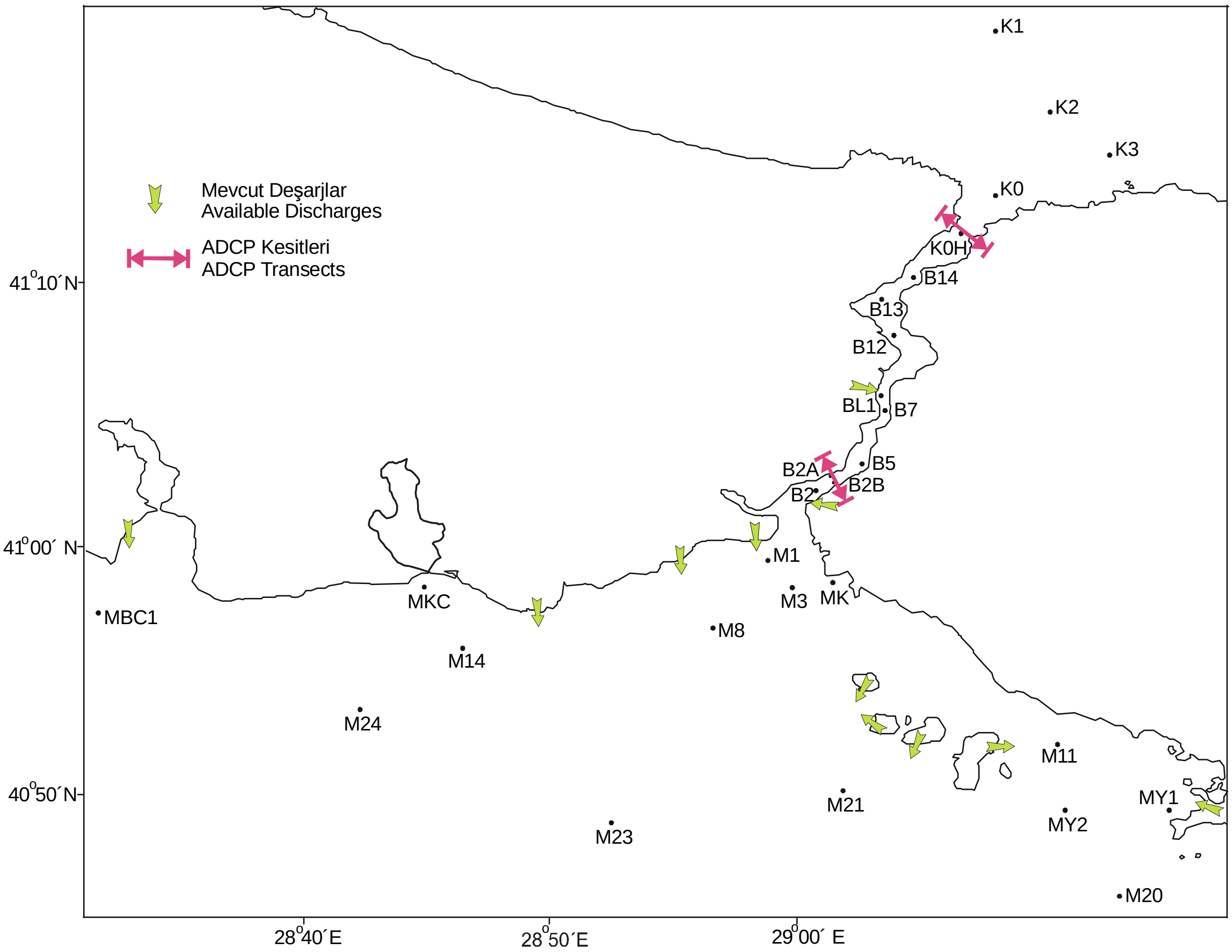

Figure 1. The sampling stations in İski project

1.1. The Black Sea

Table 1. Oil pollution level in sea water

Stations	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
K1 (S)	25.0	0.33	16.1	35.1	6.4	5.0	28.5	47.8	52.6	85.7	80.4
K1 (D)		28.1	3.3	29.8	64.8	5.0	85.0	6.7	108.9	87.0	302.0
K2 (S)				9.8	44.5	97.7	209.2	20.9	109.0	130.1	66.5
K2 (D)				16.5	22.1	7.4	42.8	53.0	140.0	92.4	72.7
K3 (S)		44.6	1.9	126.9	15.7	25.0	37.3	6.6	33.7	74.1	78.5
K3 (D)		17.4	3.7	3.1	5.8	5.8	7.7	24.8	35.0	87.2	542.1

1.2. Istanbul Strait

Table 2. Oil pollution level in sea water

Stations	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
K0(S)	40	43.1	9.4	13.4	10.2	11.8	34.9	255.2	108.3	282.9	316.6
K0(D)		34.5	8.5	10.1	19.2	14.0	10.7	125.0	173.9	3173.7	66.5
K0A(S)				253.1	26.5	72.0	44.5	161.7	84.9	94.6	161.2
K0A(10m)				8.5	26.9	50.2	69.3	148.5	401.8	11.8	80.9
K0B(S)				39.2	16.1	32.0	45.5	114.1	87.0	160.8	89.3
KOB(10m)				37.9	110.6	49.9	47.9	100.3	84.0	149.1	98.8
B13(S)		44.0	18.2	52.8	10.0	64.5	48.9	166.4	56.3	70.5	100.7
B13(D)	53	22.3	56.7	25.9	35.7	31.8	58.7	199.7	382.5	87.5	222.3
B7(S)	55.0	46.0	9.8			68.7	21.1	210.1	81.7	120.44	103.4
B7(D)		31.0	7.0			91.8	29.8	160.5	103.6	83.7	118.5
B2(S)	35	66.8	45.3	15.7	20.7	11.0	20.8	205.4	1223	75.9	68.0
B2(D)		47.0	9.3	25.2	31.7	68.8	73.7	152.3	84.2	83.25	116.5
Kız K.(S)						439.4	752.9	110.1	1183.0	85.7	205.5
Kız K.(D)						35.5	24.7	105.6	180.0	183.5	85.6

Kız K. East
(S) 221.71, (10m) 236.35
Kız K. West
(S) 247.77, (10m) 356.61

1.3. Sea of Marmara

Table 3. Oil pollution level in sea water

Years	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
MY1(S)				16.0	141.5	49.7	74.2	490.3	300.1	89.3	111.2
MY1(D)				37.3	19.1	18.4	54.5	124.0	183.0	88.0	101.0
MY2(S)						31.9	44.6	451.6	99.2	54.0	846.0
MY2(D)						33.0	29.7	132.7	325.3	54.1	231.4
MBC(S)				6.0	16.9	59.8	42.6	120.0	88.3	684.3	135.6
MBC(D)				7.0	30.1	319.6	319.0	132.2	74.0	91.8	136.7
MKC(S)							23.7	343.2	189.9	270.4	210.9
MKC(D)							50.8	132.7	216.0	89.6	356.0
M3(S)		13.0	6.7	3.7	11.0	6.6	9.3	5.9	94.6	60.6	68.1
M3(D)		13.0	1.3	17.4	31.7	28.3	318.9	5.4	113.7	64.1	56.6
M8(S)		66.3	4.7	2.9	21.9	17.0	7.2	2.9	321.3	67.0	68.36
M8(D)		7.1	5.1	12.4	19.8	4.5	6.7	95.1	86.8	70.7	83.5
M11(S)		10.0	26.7	3.7	17.8	7.5	136.5	16.7	32.9	78.9	84.6
M11(D)		18.9	8.1		9.2	32.7	24.3	9.4	88.1	79.6	69.4
M14(S)		51.0	4.3	4.2	26.0	8.7	18.9	18.8	150.1	106.5	60.9
M14(D)		42.0	7.3	2.1	21.5	5.0	8.8	26.3	150.1	27.5	59.9
M20(S)		6.5	35.0	4.2	7.3	17.6	33.5	3.2	66.8	45.8	71.1
M20(D)		13.3	11.3	2.3	21.5	7.2	7.2	73.4	81.8	104.8	97.5
M23(S)	20.0	5.0	5.6	5.7	23.7	6.6	12.9	6.6	61.6	60.5	107.8
M23(D)		13.0	6.6	2.1	10.1	6.6	383.4	116.8	84.8	42.2	76.7
MK(S)							198.6	142.3	209.6	1309.1	108.8
MK(D)							151.7	146.1	374.4	112.7	282.4

II. West the Black Sea of Turkish coast project (TBK) (unpublished data)

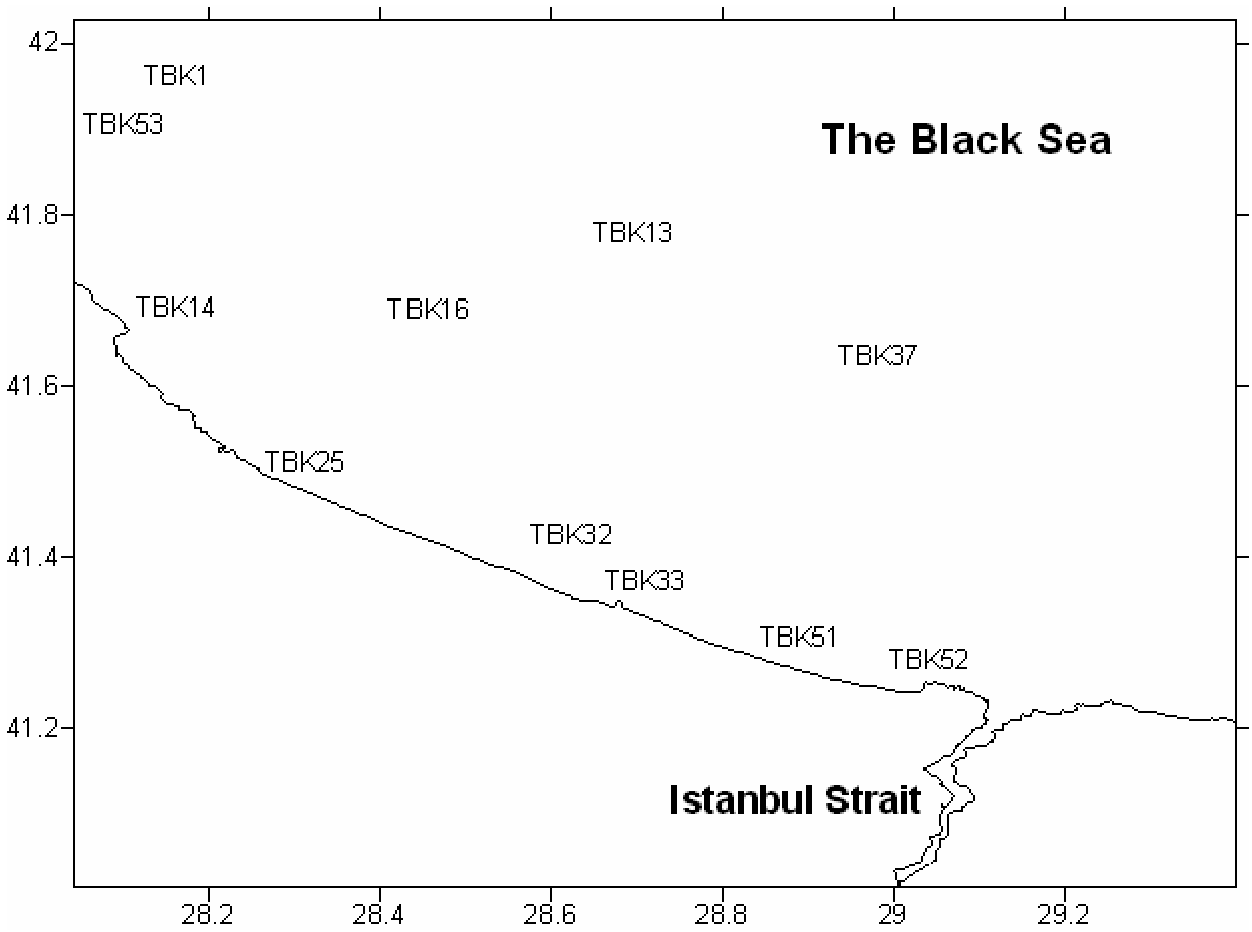

Figure 2. The sampling stations in TBK project

Table 4. Oil pollution level in sea water

Station	2003	2004
BK1 YÜZEY	8.9	11.3
BK1 DİP	7.0	92.4
BK2 YÜZEY	4.4	82.5
BK2 DİP	6.7	53.4
BK13 YÜZEY	9.1	76.9
BK13 DİP	73.6	65.9
BK14 YÜZEY	10.9	80.5
BK14 DİP	7.9	56.9
BK16 YÜZEY	6.5	104.7
BK 16 DİP	6.3	70.8
BK25 YÜZEY	5.7	91.1
BK25 DİP	7.63	54.1

Station	2003	2004
BK32 YÜZEY	9.6	92.5
BK32 DİP	7.7	77.3
BK33 YÜZEY	7.6	41.1
BK33 DİP	7.3	60.5
BK37 YÜZEY	4.5	46.7
BK37 DİP	5.6	52.4
BK51 YÜZEY	4.2	68.8
BK51 DİP	12.1	59.2
BK52 YÜZEY	1.1	66.3
BK52 DİP	9.9	45.3
BK53 YÜZEY	-	86.3
BK53 DİP	-	58.1

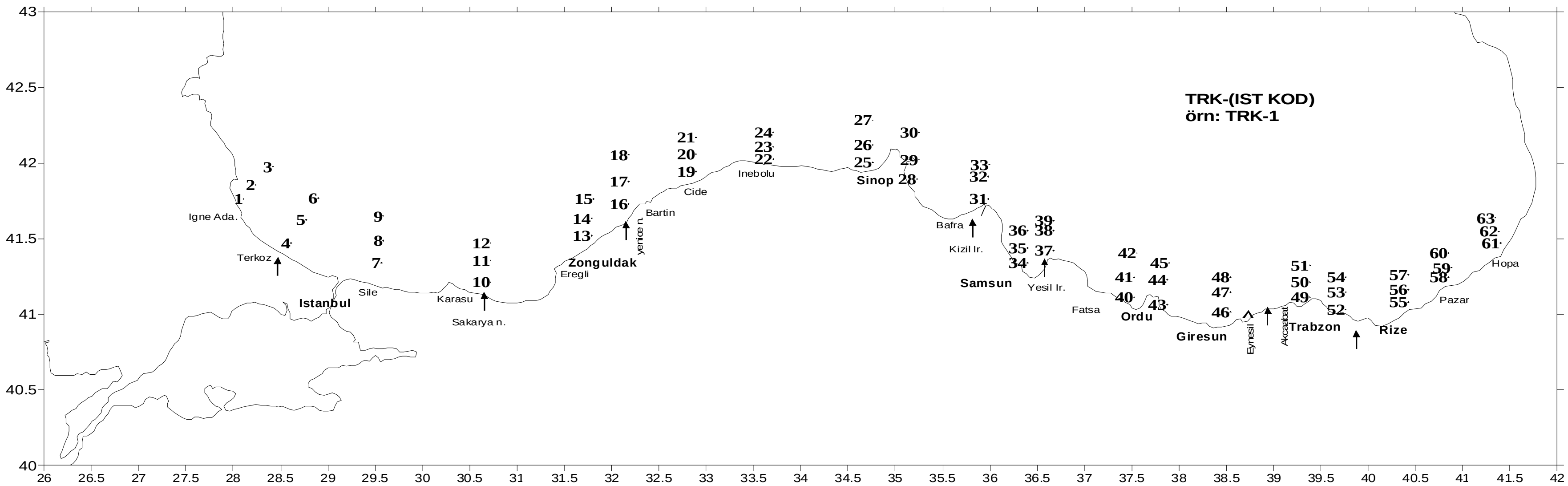

Figure 3. The sampling stations in TRK project

III. The Black Sea Project (TRK) (unpublished data)

Table 5. Oil pollution level in sea water.

Station	2004	2005	2006
TRK 1	11.4	1.9	82.8
TRK 2	42.2	25.5	49.1
TRK 3	6.9	1.6	33.4
TRK 4	10.5	855	37
TRK 5	2.4	489	34.1
TRK 6	3	1.1	32.3
TRK 7	51.8	537	48.9
TRK 8	2.6	105	39.6
TRK 9	77.2	900	16.3
TRK 10	1.2	498	62.2
TRK 10A	-	164	52.7
TRK 11	38.7	125	25.5
TRK 12	4.2	705	37
TRK 13	3.9	1.3	63.8
TRK 13A	-	363	977.3
TRK 14	15.2	898	21.1
TRK 15	14	217	40.9
TRK 16	2.7	81	75.4
TRK 17	5.2	223	58.3
TRK 18	13.9	573	64.6
TRK 19	11.5	305	43.2
TRK 19A	-	253	21
TRK 20	2.3	530	52.1
TRK 21	16.5	115	68.5
TRK 22	7	61	29
TRK 23	12.1	84	43.1
TRK 24	6.2	113	34.6
TRK 25	1	27	34.6
TRK 26	3	31	36.9
TRK 27	2.6	2	39.4
TRK 28	1.2	25	88.5
TRK 29	1.7	37	20.2
TRK 30	14	30	60.2
TRK 31	4.3	40	71.5

Station	2004	2005	2006
TRK 31A	-	122	23.3
TRK 32	4.4	66	75.9
TRK 33	6.2	47	30.2
TRK 34	42.3	27	27.1
TRK 35	17.2	34	83.5
TRK 36	3.1	2	91.3
TRK 37	3.1	62	104.1
TRK 37A	-	119	-
TRK 38	1.9	16	124.6
TRK 39	18.7	24	106.9
TRK 40	13.7	43	37.4
TRK 41	9.8	17	70.4
TRK 42	2.1	32	52.9
TRK 43	2.3	21	28.7
TRK 44	24.2	19	36.7
TRK 45	3.3	40	42.3
TRK 46	15.9	28	54.2
TRK 47	7.2	97	46.1
TRK 48	6.7	25	52.6
TRK 49	26.8	20	36.4
TRK 50	1.8	572	44.1
TRK 51	25.1	26	25.3
TRK 52	23.5	16	60.4
TRK 53	1.6	93	118.8
TRK 54	6.6	15	43.5
TRK 55	5.3	10	47.5
TRK 56	7.2	12	17.6
TRK 57	2.7	29	28.5
TRK 58	3.2	20	34.5
TRK 59	4.4	119	45.1
TRK 60	2.1	112	45
TRK 61	2	117	62.9
TRK 62	2.2	129	55.8
TRK 63	2.1	23	29.3

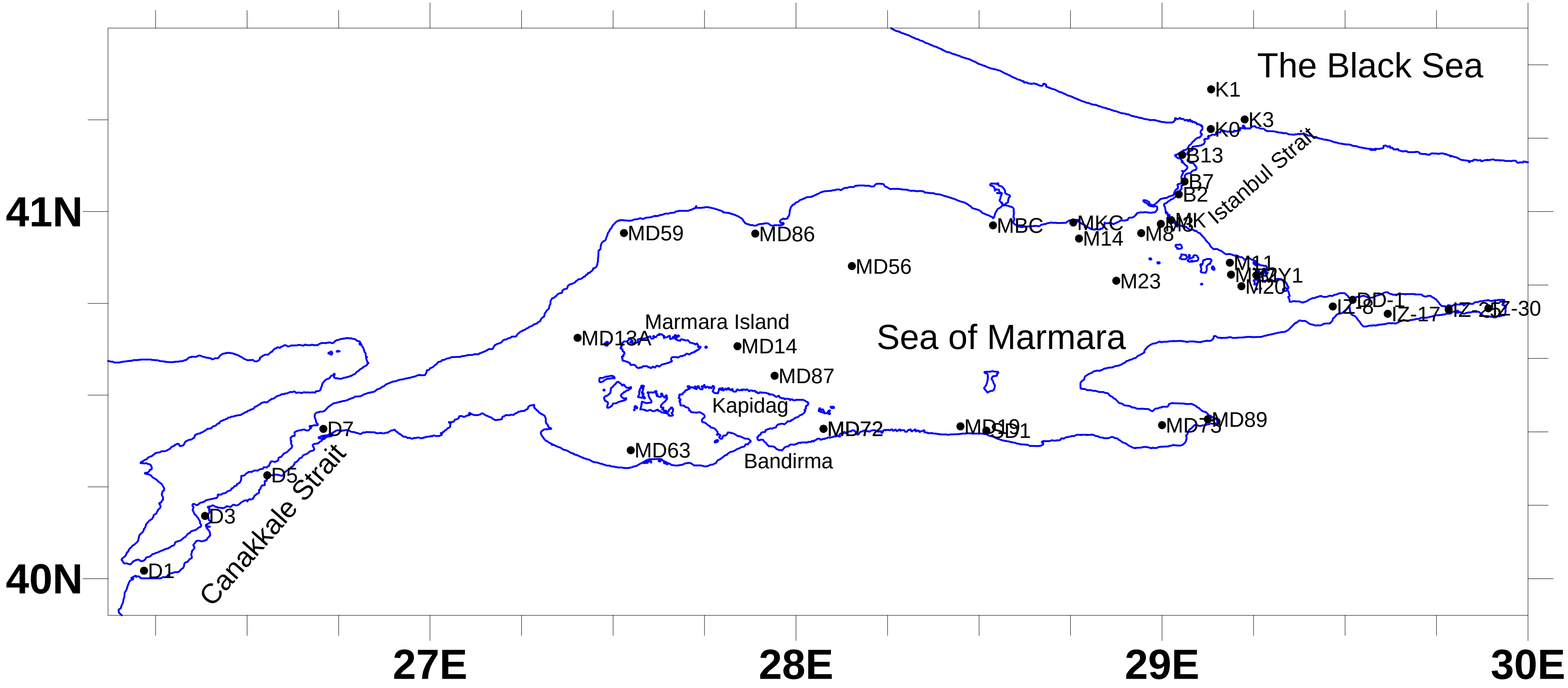

Figure 4. The sampling stations of Menfis project.

IV. Memphis (unpublished data)

4.1. Black Sea

Table 6. Oil pollution level in sea water

Station	2005
K1(S)	85.7
K1(D)	87.1
K3(S)	57.7
K3(D)	64.1

4.2.Istanbul strait

Table 7. Oil pollution level in sea water

Station	2005	2006
B2 (S)	75.9	39.2
B2 (D)	83.2	24.2
B7(S)	35.6	59.7
B7(D)	83.7	67.3
K0(S)	75.3	316.6
K0(D)	36.4	58.0
B13(S)	70.5	32.6
B13(D)	86.3	59.5

4.3. Çanakkale Strait

Table 8. Oil pollution level in sea water

Station	2005	2006
D1(S)	243.4	45.1
D3(S)	122.7	50.3
D5(S)	75.3	60.0
D7(S)	121.1	56.4

4.4. Sea of Marmara

Table 9. Oil pollution level in sea water

Station	2005	2006
MD 13A (S)	163.8	52.2
MD 11A(S)	158.4	49.6
MD 63(S)	140.3	62.5
MD 87(S)	206.6	46.2
MD 72(S)	73.6	49.7
SD 1(S)	110.1	114.6
MD 73(S)	125.7	48.4
MD 89(S)	898.1	44.7
MD 14(S)	179.3	53.9
MD 59(S)	75.9	37.0
MD 86(S)	73.1	52.4
MBC(S)	684.2	39.0
MBC(D)	91.8	31.3
MD 56(S)	92.0	59.2
M14(S)	106.5	-
M14(D)	27.5	-
MKC(S)	71.0	25.5
MKC(D)	89.6	46.9
M23(S)	60.5	-
M23(D)	42.2	-
M8(S)	67.0	-
M8(D)	70.7	-

Station	2005	2006
M3(S)	60.5	-
M3(D)	64.0	-
MK(S)	1309.1	55.1
MK(D)	112.7	31.7
M11(S)	66.7	-
M11(D)	77.8	-
MY1(S)	89.3	32.7
MY1(D)	88.0	48.6
MY2(S)	41.5	50.8
MY2(D)	54.1	87.0
M20(S)	45.7	-
M20(D)	104.8	-
DD1(S)	118.9	111.0

İZ 5C(S)	111.0	34.9
İZ 8(S)	1224.4	50.0
İZ 17(S)	1371.5	37.5
İZ 25(S)	507.3	71.7
İZ 30(S)	488.8	58.8

2. SEDIMENT

I. İSKİ Project (unpublished data)

Table 10. Oil pollution in sediment

Stations	1999	2000	2001	2002	2003	2004	2005	2006
K1	113.5	33.9						
K3	430.5							
K0	152.3	831.4	601.0	754.5	340.1	243.5	491.7	227.5
B2						60.1		
MY1	171.5	403.9	610.0	1613.6	1498.5	370.0	842.1	324.7
MY2			154.7	185.3	102.9	37.7	98.35	59.6
MBC	177.7	100.0	1008.4	482.7	91.4	84.5	112.1	136.7
MKC				1400.0	1690.2	1151.4	1300.0	685.5
MK					4541.5	1094.4	2763.8	1859.1
M3	228.9	268.9	588.0	290.1	638.3	81.1		138.4
M8	152.0	106.6	227.0	1947.3	217.7	106.9		364.3
M11	294.7	104.4	190.0	343.0	123.5	61.5		195.4
M14	39.7	59.6	148.0	241.9	189.8	86.4		445.1
M20		32.1 8	591.0	242.6	99.0	38.9		

II. West the Black Sea of Turkish coast project (TBK) *(*unpublished data*)*

Table 11. Oil pollution in sediment

Station	2003	2004
BK1	19.3	30.8
BK2	44.6	3.9
BK13	7.6	7.6
BK14	14.1	27.3

Station	2003	2004
BK16	3.1	24.6
BK51	30.2	262.0
BK52	27.7	-

III. The Black Sea Project TRK (unpublished data)

Table 12. Oil pollution in sediment

Station	2004	2005	2006
TRK 1	-	74.5	43
TRK 2	11	233.2	5.1
TRK 3	4.5	31.4	30.8
TRK 4	-	2.6	1.6
TRK 5	-	3.5	26.7
TRK 6	21.5	40.6	5.3
TRK 7	2.1	60.7	7.3
TRK 8	7.3	5.5	33.9
TRK 9	8.5	6.6	3.6
TRK 10	4	15.9	5.9
TRK 11	6.4	38.6	20.6
TRK 12	6.7	30.7	12.4
TRK 13	68.3	11919.1	9092.4
TRK 14	863.8	9024.9	4849.9
TRK 15	41.2	475.5	507.2
TRK 16	62.2	7.1	134.1
TRK 17	89.3	77.4	575
TRK 18	170.1	284.8	574.6
TRK 19	21.1	389.2	54.7
TRK 20	54.2	411	80.6
TRK 21	28.6	793.6	28.8
TRK 22	25.2	30.4	20.3
TRK 23	11.1	4.6	53.2
TRK 24	18.3	39.6	68.3
TRK 25	0.8	5.5	18.4
TRK 26	3.5	2.3	17.4
TRK 27	27	11.7	47.9
TRK 28	18.4	513.5	238.9
TRK 29	12.7	40.2	9.9
TRK 30	2.9	29.2	44.8
TRK 31	2.1	4.5	24.1
TRK 32	2.4	63	20.6
TRK 33	71.8	3.7	13.5

Station	2004	2005	2006
TRK 34	2.7	313.9	854.7
TRK 35	1.6	56.9	5.2
TRK 36	0.3	31.4	35.7
TRK 37	3.8	4.3	6.3
TRK 38	5.7	2.8	14.1
TRK 39	1.6	29.3	64.8
TRK 40	4.4	28	28.6
TRK 41	1.5	169.8	5.5
TRK 42	5.3	3.3	28.4
TRK 43	7.7	3.7	15.6
TRK 44	9.6	149.8	15.3
TRK 45	15	7.1	24.6
TRK 46	13.5	905.8	58.6
TRK 47	9.5	69.1	62.3
TRK 48	0.9	21.7	3.9
TRK 49	9.9	50.9	5.9
TRK 50	9.4	55.9	7.8
TRK 51	53.5	41.2	6.9
TRK 52	32.3	108.9	13.1
TRK 53	15.2	93.1	57.1
TRK 54	14.3	38.6	41.3
TRK 55	24.5	72.2	40.2
TRK 56	22.6	84.1	72.2
TRK 57	8.7	139.3	7.9
TRK 58	22.3	24.8	3.4
TRK 59	3.9	178.8	9
TRK 60	1.6	9.3	16.6
TRK 61	28.8	32	45.6
TRK 62	6.9	54.3	45.4
TRK 63	-	2512.3	41.7
TRK E 1	-	-	25
TRK E 2	-	-	76.5
TRK E 3	-	-	26.7

Earlier studies of pollutions areas are summarized as follows.

Baştürk *et al*. (28) found DDPH level in Bosphorus-Marmara junction as 0.76μg/L in 1986 and 1.25 μg/L in 1987 (through chrysene equiv.). When compared these findings with our results the values given are very low. As indicated above the chrysene equivalent did not provide the true results and did not correspond to the oil pollution in this area.

The pollution level in the Turkish Straits after the Nassia accident (April 1994), in the Black Sea, at the station Karaburun at surface 12.1 μg/L, at thermocline as 56.5 μg/L; at Poyraz 24.9 μg/L, at Altınkum 18.6 μg/L, at Beykoz 12.3 μg/L (31, 35). In the Sea of Marmara the pollution level varied as 0.4-6.6 μg/L at surface water, 0.4-45.7 μg/L at thermocline and 0.1-64.5 μg/L at deep water (32).

After the TPAO tanker accident (13 February 1997) in Tuzla Bay, during 1997-1998, the highest level of pollution found to be as 32.2 mg/L (37), in Izmit Bay during 1994–1995 as 12.74–383.4 μg/L at station 1 and station II 32.0-986.5 μg/L (31) and during 2002-2003 in these areas maximum oil levels of surface water were 144.3 μg/L –549.2 μg/L and 9011.3 μg/L in 10 m depth (44).

After the earthquake (17 August 1999) in Izmit Bay, the maximum level was 179 mg/L (36).

After the Volganeft accident (29 December1999) of Florya, the amount of the oil pollution was 14.05 g/L -2178.5μg/L at S3 and A5 stations respectively, (Güven *et al.*, Unpublished data).

In the Gotia accident (7 Octaber 2002) (Emirgan, Istanbul Strait) 813.5 mg/L (max.) in Bebek Cove, 7.3 mg/L in Golden Horn and 27.4 mg/L in Yenikapı Sea of Marmara (42).

In Çanakkale Strait the highest oil concentration was found in 1996-1997 at the entrance 162.0-429.5 μg/L, the exit 539.1 μg/L (34).In the same strait in 2001-2002, the highest oil level found, at the entrance (Gelibolu) was 148.3 μg/L in 2001 and 13.2 μg/L in 2002 and at the exit were 226.2 μg/L in 2001 and 6.6 μg/Lin 2002 (38,39).

Unfortunately, there is no research available on the Independent accident. The oil pollution studies of the Nassia tanker accident was made one month after by our institute. The oil pollution investigations were began systematically by our institute since 1994 up to day.

In this article the recent results on studies made for the coast of the Black Sea, Istanbul Strait, Sea of Marmara and Çanakkale Strait of Turkey were summarized below.

1. In sea water

In İSKİ project the highest level found in 2006 was 320.0 μg/L at K1 in the Black Sea, 316.6 μg/L at K0, 222.3 μg/L at B13 in Istanbul Strait, 846.0 μg/L at MY2 in Sea of Marmara. The highest oil concentration was found in TBK stations in 2004 as BK51 262.0 μg/L.

The highest oil pollution value in TRK was found in the year of 2005 at the stations 855.0μg/L at TRK4, 489.0 μg/L at TRK5, 537.0 μg/L at TRK7, 900.0 μg/L at TRK9, 498.0 μg/L at TRK10, 898.0μg/L at TRK 14, 223.0 μg/L at TRK17, 573 μg/L at TRK18, 530 μg/L at TRK 20, 572 μg/L at TRK50, >110 μg/L at TRK61, TRK62

In the Memphis project the highest value was found in the Istanbul Strait at K0(S) 316.6 μg/L, in the Çanakkale Strait at D1(S) 243.4 μg/L and D3(S) 122.7 μg/L.

In the Sea of Marmara the maximum oil concentration was found at MK(S) 1309.1 μg/L at MD89(S) 898.1 μg/L, at MBC(S) 684.27 μg/L, in İzmit Bay at IZ17(S) 1371.5 μg/L and IZ8(S) 1224.4 μg/L

2. In sediment

In the İSKİ project the highest oil concentration found in the Istanbul Strait (2005) at K0 842.1μg/g, In Sea of Marmara at MK 2763.4 μg/g.

In the TBK project the maximum oil concentration was 262.0 μg/g at TBK51.

In the TRK project (2005) the highest value was 11919.1 μg/g (11.9 mg/g) at TRK13, 9024.9 μg/g at TRK14, 793.0 μg/g at TRK21, 513.5 μg/g at TRK28, 2512.9 μg/g at TRK63.

The Readman *et al*. (20) survey of 1995 was 12-60 μg/g in vicinity of Istanbul Strait of sediments collected at 10 stations. This author noted that the origin of this pollution was the combustion derived of oil. The oil pollution of sediment found at the entrance of the Istanbul Strait by our Institute was 841.1 µg/g. This value is higher than the Readman *et al*. findings.

CONCLUSION

The oil concentration recorded in sea water and sediment was higher ranges in the years of 2005. The distribution of oil concentration of the west zones Black Sea (İğneada- Sinop) was higher than in east zones of the Black Sea (except Hopa station).

The highest oil pollution was found in the west part of the Black Sea stations were there is tanker/ship traffic and also Danube River pollution. Among the east part of the Black Sea station, Hopa is affected by the Novorosiysk – Gelendzhik region.

As can be seen in introduction part of this article there are various opinions on the oil pollution of Black Sea. Unfortunately there are many special monitoring programmes for protection of the Black Sea but their results were not sufficient. There is a need for permanent observation on the oil pollution in all the Black Sea countries. The present study showed that the oil pollution analysis must be made on a daily basis.

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