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Environmental problems and precautions of Iskenderun Gulf in Eastern Mediterranean region

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Abstract: During Iskenderun Bay, located on the northeast corner of the Eastern Mediterranean, is under threat of pollution because of fishing, shipping and discharge from industrial enterprises scattered along the coast. The Bay is one of the regions where continental entrances are most concentrated in the Northeast Mediterranean. The Bay is also exposed to intensive environmental disturbances due to industrial enterprises, residential units, river discharges, and shipping traffic. Nearby fishing cages are increasingly becoming operational in the bay. All of these activities increase the discharge of nutrients into the water that could create an environment suitable for the development of phytoplankton. The bay is polluted because it is a closed sea like Iskenderun Bay, Gulf of İzmir and İzmit. The wastes of the other countries located on the Mediterranean Coasts are also being dragged into İskenderun Bay. The ships coming from different countries discharge their ballast waters to the Bay. Therefore, Iskenderun Bay's pollution problems are increasing every year. Furthermore the Iron-Steel Establishment causes acid rains on the Northern Region of Iskenderun Bay. The Mediterranean coastline must be protected and waste water treatment should be carried on along the coastline to prevent of pollution in Iskenderun Bay. An adequate national policy should be established on waste collecting facilities and sufficient waste collecting facilities should be established by various institutions, organizations and companies in the ports. In iron and steel factories, air pollution of harmful gases should be prevented through flue-filter systems.

Keywords: Iskenderun Bay, Pollution, Wastes, Precautions, Eastern Mediterranean Region.

Introduction

Marine pollution could be defined as the direct or indirect abandonment of marine environment by people as it harms the marine ecosystem, disrupts the human health, hinders the activities in the sea, affects the quality of marine use and reduces its value (Yiğit, 2006). Although it has damaging effects to humans in various ways, marine pollution is particularly damaging to organisms living in the sea. The decreasing number of living species and already extinct number of species in our seas is a direct result of the increase of sea pollution and the growth of the coastal structures resulting from urban, industrial and agricultural wastes. Marine pollution from various ways is of great importance in terms of the sustainability of natural resources and the future of human welfare. Most of the sources of marine pollution are originated from land and human activities. Sea pollution is caused directly by an excessive rate of nutrient discharge. Eutrophication on water surfaces occurs by increasing algal growth because of overabundant nutrients in the environment such as nitrogen and phosphorus. The rate of polluting elements within the entire pollution is shown in Figure 1 (Satır, 2007).

Main Causes of Marine Pollution: The effluents created by the cities, the industrial facilities located along the seaside, the oil platforms and pipelines installed in the sea and the oceans, the vehicles using air and sea way, the ship accidents (especially oil carrying vessels) are specifically an intentional or unintentional sources of marine pollution. In Turkey, as in the whole world, problems

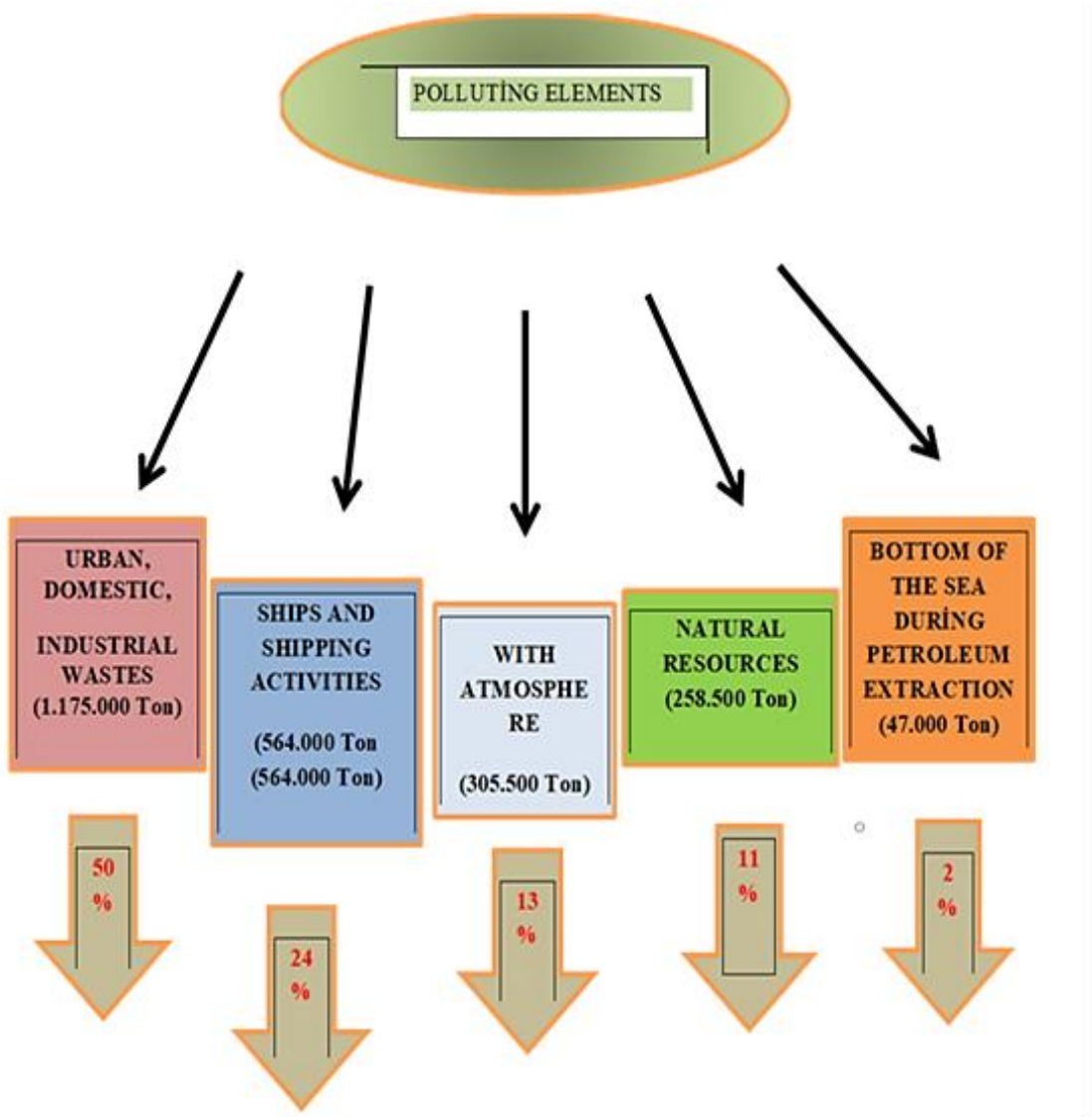

Figure 1. Polluting elements and their rate in pollution according to 1990 data (Satır, 2007).

related to marine pollution and coasts are of great importance. In addition to industrial, maritime transport, urbanization, tourism and waste disposal, Turkish seas started to become more polluted every day by sea accidents. However, Turkish waters are also contaminated with domestic and industrial wastes because of its geographical position which is surrounded by three major seas. Much of the wastes generated by industrial and household sewage are directly given to the waterbeds without any treatment and the solid wastes are left irregularly in the receiving environment. The seas are also become polluted due to the unconscious agricultural pesticide application and fertilization practices carried out throughout the country. As well as its direct harmful effects into the marine environment, it is known that liquid wastes generated by industrial activities also cause pollution on the soil and vegetation that results in the destruction of nature. Residue from spraying pesticides for agricultural pest control and the wastes generated as smoke from industrial factories could pollute the water sources due to the wind-water transferring of the dangerous chemical particles in the air. On the other hand, unconscious and excessive use of chemical fertilizers over time also makes the soil debilitate, which results in the deterioration of both soil fertility and water pollution due to infiltration of groundwater and surface water flows and superficial water contamination. Overall, the use of seas for transportation and tourism, the discharge of domestic and industrial wastes to the sea without being treated or partially purified, the oil flows from the aftermath of sea

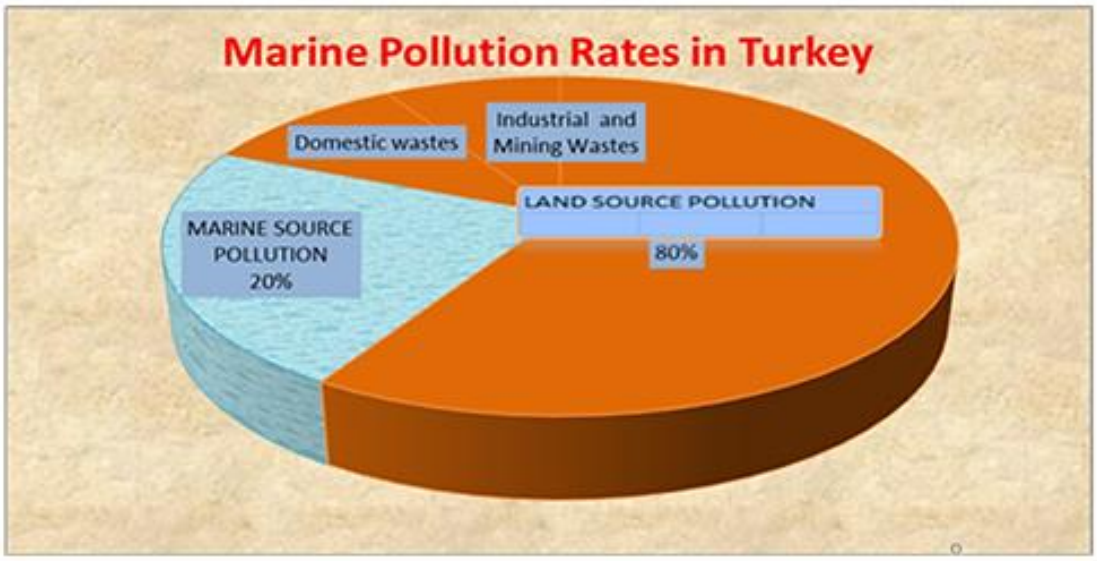

Figure 2. Percentage of marine pollution in Turkey (Baykal et al., 1999).

accidents, the agricultural wastes reaching the waters from the rivers are the main factors that cause pollution marine environment. The waters that cause marine pollution affect the human health and the environment negatively at a certain time, depending on the concentration of pollution in a certain area. Other factors that cause marine pollution could be listed as follows: Wastes discharged from the city centers and industrial facilities on the seashore and discharged to the sea without treatment; Soil and other contaminants that enters the sea with erosion after being used in agricultural areas. The soil is transported to the sea by erosion in considerable quantities every year from agricultural areas; Therefore, wastes generated by agricultural activities, mainly chemical wastes such as pesticides and fertilizers are transported into marine environment through the serious of rivers and their tributaries; Leaks consisting of platforms and pipelines installed in the seas.

Pollution from ships and other sea vessels are mainly oil, oil waste, toxic liquids, sewage, garbage etc. Because of sea accidents, a considerable amount of oil spillage accumulates in the water and threatens the marine habitats. Especially large oil tankers' accidents cause thousands of tons of crude oil to spill into the sea. Crude oil transportation, petro-chemical industries and developments in the organic chemistry industry have increased the amount of pollution in land, air and seas. The release of plastic materials from the land and from the ships to the sea could create serious damage to the beaches and the natural life of the seas.

In conclusion, Sea route transportation, oil refinery in Mersin and two oil pipeline terminals in Iskenderun Bay are important pollutants in the Eastern Mediterranean. However, the pollution rate in the Mediterranean Sea is lower than that of the Marmara and the Aegean Sea. Moreover, the rapid development of industrial and technological infrastructure in the region in recent years has resulted in an increase in migration from rural to urban areas leading to rapid and irregular urbanization. On the other hand, the ever-decreasing number of living species in our seas is a result of the increase of marine pollution resulting from urban, industrial and agricultural wastes and the growth of coastal formation. Marine pollution from various ways is of great importance in terms of the sustainability of natural resources and the future of people.

Marine Pollution in Turkish Seas: Turkey is exposed to intense sea traffic due to its geographical location surrounded by three major seas. The major sources of marine pollution consist of pollutants released from land and freshwater river systems into the marine environment. There is also pollution originating from the atmosphere or formed through the atmosphere (Fig. 2) (Baykal et al., 1999).

Marine Pollution Sources in the Mediterranean Region: The sources of marine pollution are very different and can be classified according to the characteristics of the pollutants as follows (Table 1) (Artüz, 1992). The sources of water pollution in Part XII of 1982 Convention on the Sea Law as to "protection and preservation of the marine environment" have been provided in six items (Fig. 3):

Table 1. Marine pollution sources (Artüz, 1992).

Organic Pollution	Eutrophication, Bacteriological contamination
Chemical contamination	Release of toxic substances into the environment resulting from the industry, detergents, hydrocarbons (oils), pesticides, heavy metals and other inorganic compounds
Thermal pollution	Thermal pollution is the deterioration of water quality by any process that changes the temperature of the surrounding water.
Acoustic pollution	Pollution caused by human pumping oceanic noise. The bales are uncomfortable.
Radioactive pollution	Radioactive Contamination Nuclear power plants, factories producing nuclear weapons, radioactive wastes are the main sources of radioactive contamination created.
Pollution as a result of mining	The most significant environmental problem of mining activities on a global scale is the negative effects on water resources.

1. Pollution originating from land-based sources.
2. Pollution originating from activities made within the sea bed of the national jurisdiction.
3. Pollution originating from activities carried out in the region (area).
4. Pollution originating from agricultural and industrial discharge to water (dumping).
5. Pollution originating from or through the atmosphere,
6. Pollution originating from shipping vessels.

Water that constitute the source of life on earth is also an important element of pollution on earth. Today, sea pollution causes the decrease of oxygen from seawater that is considered the sign of poisoning of marine organisms living in the sea.

1. Land-based pollution sources: One of the most important indicators of environmental pollution is sea pollution. Half of the world's population lives near the oceans and seas. For this reason, sea pollution is a vital issue for the countries connected with the sea. Wastes dumped from land to sea are classified in two categories as domestic and industrial wastes. From industrial facilities to marine water; wastes such as soluble salts, gases, chemical substances, organic molecules that cannot be otherwise purified by natural means and these are being considered seriously all over the world due to the high pollution impact that they could create. Industrial wastes also contain toxic heavy metals such as cadmium, mercury and lead. As a result of the production technology, the chemical substances used rapidly disrupt the marine environment. This problem, which is more prevalent in developed countries, causes damage affecting all countries. The fact that the Mediterranean has a very important role in the delivery of human food supply and transportation for the region, its integrity is greatly affected by human movements (Küçük and Topçu, 2012).

Wastewater received from the coastal cities is one of

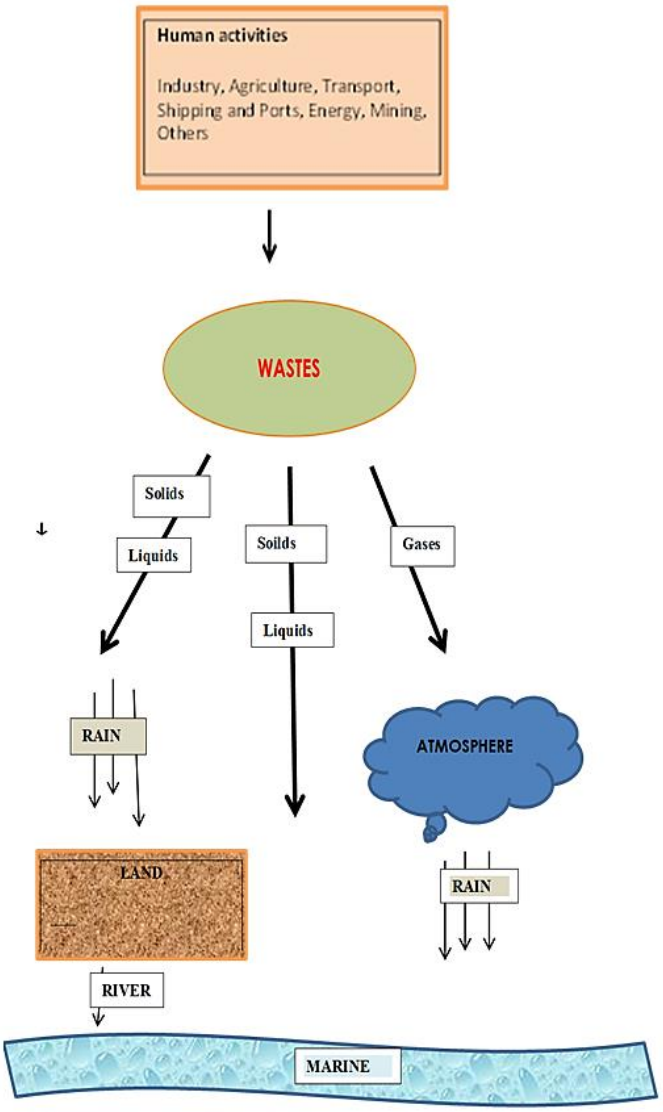

Figure 3. Pollution sources (Keskin, 2006).

the basic pollution aspects of the Mediterranean coast. The impact thereof on marine life is reflected on health of humans living in the coastal zone as well as the stability of the water ecosystem and economy (effects on tourism

and aquaculture) directly or indirectly. Rapid urban growth in southern coasts of the Mediterranean aggravates the issue more in particular. Wastewater collection system is furnished to a certain part of the urban population in general. And this leads to release of much of the untreated waste water directly into the sea by virtue of other systems. The primary pollutants in urban wastewaters are as follows: organic matter (measured as BOD5 and COD), suspended solid materials, nutrients (nitrogen and phosphorus) and pathogenic microorganisms. Other pollutants including heavy metals, petroleum and chlorinated hydrocarbons also exist in sewage water (Battal, 2011).

Amount of solid waste produced in city centers along the Mediterranean coast poses a serious threat to human health in addition to the marine and coastal environment. Besides disposal of uncontrolled waste as garbage, solid wastes are dumped on to dumping areas with minimum or no sanitary treatment in many countries. Such uncontrolled garbage disposal sites are mostly located within the city borders or along the water coasts. Such uncontrolled wastes pose risk of illness and waste for the areas in their vicinity. Generally, no measures are taken for leakage water originating from garbage collection areas and polluting the underground waters or marine environment due to organic pollutants and heavy metals they contain. Moreover, health of cities in the vicinity is also affected seriously due to fires and pollution caused by car accidents. Smoke particles release polycyclic aromatic hydrocarbons (PAHs) and dioxins. Domestic solid wastes are collected improperly in most of the coastal areas and generally are mixed with industrial solid wastes and thrown into open waste areas without applying the suitable management. The most important dumping areas located directly along the water coasts are Tripoli (3 hectares), Beirut (Borj Hammoud 15 hectares), Normandy (10 hectares) and Saida. These dumping areas along the water coasts are sources of leakage waters loaded with metals and organic compounds which directly affect the marine and coastal ecosystem.

Waste waters received from Alexandria province are poured into Mex Bay, Abou - Abou-Qir Bay and Maryut Lake. This situation is the serious indicator of degradation occurring within the environment (oxygen deficiency, discoloration, and increase in alg). Dumping of land-based heavy metal leads to an increase in metal concentrations in seawater close to the shore.

Coasts of Alexandria: have a critical wastewater problem because of high population growth and led to the rapid industrial development; total BOD5 loads in Mex Gulf and Abu-Qir related to urban and industrial waste waters are 219,000 and 91,700 tonnes per year respectively. There are high metal concentrations in sediments in the gulfs; and Lake Maryut: receives industrial waste water and in addition to severe eutrophication (anaerobic conditions, hydrogen supplied odors) there is a significant accumulation of heavy metals (mercury, cadmium, lead, zinc).

Land-based nutritional salts could positively affect the increase of productivity to a specific extent in oligotrophic environments such as the eastern Mediterranean. But neritic areas in the Mediterranean are becoming polluted increasingly. Giving nutritional salts to coastal areas leads to eutrophication in shallow and confined spaces in particular. Such environments occur in Northeast Mediterranean from time to time (Demirel, 2011). One of the most concrete examples in Turkey on this issue is the eutrophication which has taken place in the Gulf of İzmir (Polat et al., 2006; Koray, 1994). Harmful algae increases are also related with eutrophication (Richardson, 1997). Eutrophication can be observed more frequently in polluted regions. Excessive algae productions cause effects such as decrease in water quality, fish deaths due to toxicity issues and losses in cultural fishing areas, adverse effects on public health, aesthetic loss of aquatic environments due to bad smell and appearance problems. Frequency in production of harmful algae, defined as sudden and excessive increase of one or several phytoplankton species seen locally in seas (red- tide) has increased in recent years (Mann, 2000).

Increase in the amount of nutrients (nitrogen and phosphorus) in the water ecosystem increases primary production and may cause water eutrophication. This incidence has the following adverse effects: proliferation of planktonic bio mass, discoloration of water, reduction of water transparency, reduction of dissolved oxygen in deep waters and emergence of toxic algae in extreme cases. Urban waste has substantial nutrient burden especially when treatment is not applied to water. As a consequence, all cities or coastal areas around large cities which do not have the operational wastewater treatment plants effectively receive high nutrient loads.

Turkey has a total coastline length of 8,333 km. The Mediterranean shoreline is divided into two as the Aegean

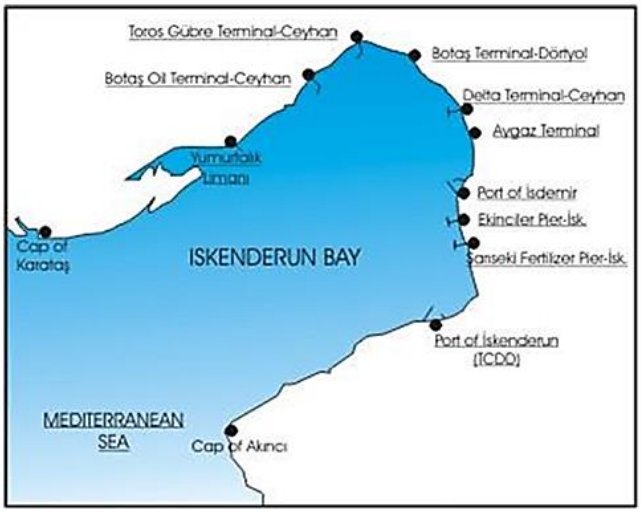

Figure 4. Quantity of waste discharged to Mediterranean yearly (Naturopa, 1987; Battal, 2011).

and the Eastern Mediterranean regions. Urban and industrial centers, oil facilities, agricultural and social facilities on the coast are among the most important land-based pollution sources in both regions (NDA Turkey, 2003). There is a rapid housing development on the Turkish coast due to the construction of recreational facilities on the Aegean and Eastern Mediterranean coastline as well as the widespread secondary (summer) housing constructions. This is a serious destruction of nature. Coastal erosion is also a significant issue. Gulf of İskenderun: Industrial activity including petroleum pipeline terminal (de ballasting and pollution due to operational oil spills); Mersin: urban and industrial waste waters and heavy shipping activity (Fig. 4) (Ornat, 2006).

Gulf of İskenderun is one of the regions where the continental entrances are most concentrated in the Northeastern Mediterranean. The Gulf is subject to intensive environmental impacts because of industrial establishments, residential units, river discharges and ship trafficking around it. Furthermore, large scale mariculture activities have been carried out in the bay recently. All these activities increase the content of nutrients in the water, creating environment suitable for the growth of phytoplankton (Priority environmental issues in the Mediterranean region, 2006).

Household wastewaters, which constitute a significant pollution in the marine environment, are very important in terms of forming organic substances, nutrients, suspended solids oil and coliforms. Organic matters do not always have a direct effect on the environment. Most of the organic materials are biodegradable and use dissolved oxygen in this process. This situation creates an undesirable situation for natural life in the marine environment while leading to lack of oxygen. The situation becomes even more serious when organic substances are mixed into semi-enclosed and warmer receiving water environments. In this case, besides the damage caused by natural life, also bad odors are created in the environment due to aerobic conditions caused with toxic and explosive gases.

Bad smell affects people more due the negative impact caused thereby in the marina where they have come to rest. Nutrients denote substances such as the nitrogen and phosphorous required for the growth of organisms on the marine environment. Nutrients are the materials required for sustainability of life within the marine environment. However, if they are too much in the environment, they increase primary production. This situation which is called eutrophication creates more important problems in water areas such as lakes, gulf and bays where there is not much water flow and circulation. If nutrient discharges are not controlled, the mass of water is filled quickly depending on the growth of this uncontrollable organism and shallowing starts and the water area turns into a swampy environment over time. Because of the serious problems caused by nutrients found in domestic wastewater of ships, it should be acted carefully and necessary measures should be taken in these environments to avoid eutrophication. Types of potentially harmful phytoplankton detected in the Gulf of İskenderun are provided below (Fig. 5A, B, C).

2. Pollution from marine bed activities: In Turkey, waterways are generally polluted by domestic and industrial wastes. The fact that these wastes are delivered to the waterbeds without being treated, the solid wastes are left irregularly in the receiving environment. It is also known that liquid wastes cause pollution on the soil and vegetation resulting in the destruction of natural habitats. Moreover, the rapid development in the industrial and technological infrastructure in recent years has resulted in an increase in migration from rural to urban areas leading to rapid and irregular urban structuring. Chemicals used in agriculture involve substances and create wastes containing pesticides and fertilizers. Wastes are polluted because the waste of medicine in the air is carried to the waters by the wind or the waste of the manufactures of agrochemicals is supplied to the water resources without treatment. On the other hand, the unconscious and

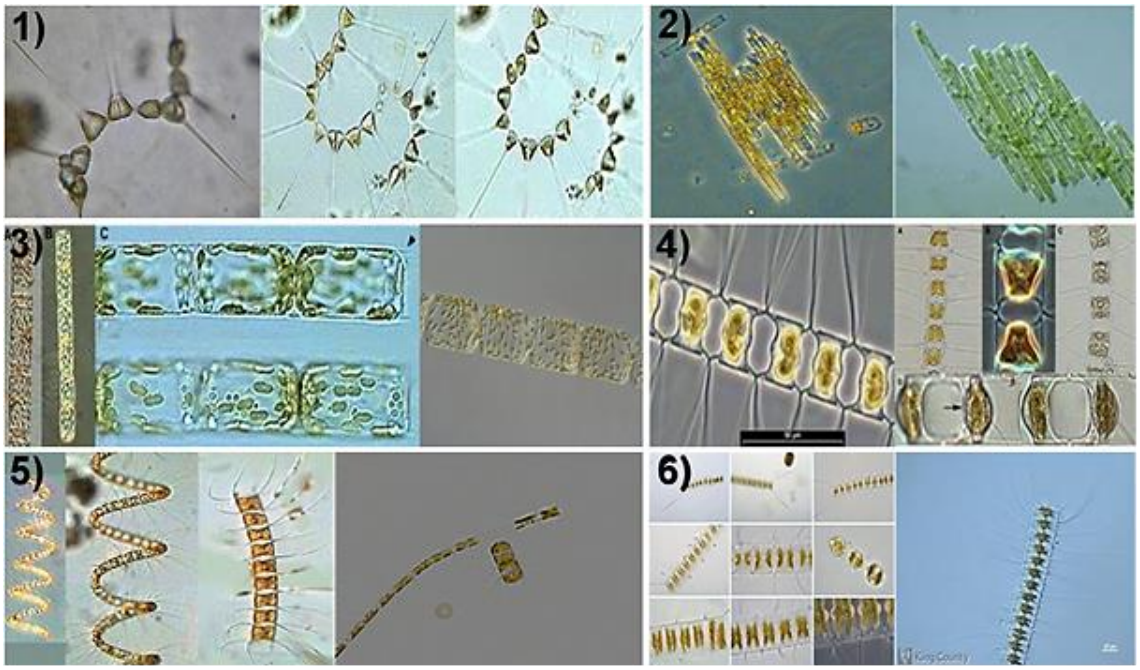

Figure 5A. Potentially Harmful Phytoplankton in the Gulf of İskenderun. (1) *Asterionellopsis glacialis (Castracane)* (Round, Crawford and Mann, 1990), (2) *Basillaria paxillifera* (Marsson, 1901), (3) *Cerataulina pelagica* (Hendey, 1937), (4) *Chaetoceros brevis* (Schütt, 1895), (5) *Chaetoceros atlanticus* (Cleve, 1873) and (6) *Chaetoceros didymus* (Ehrenberg, 1844).

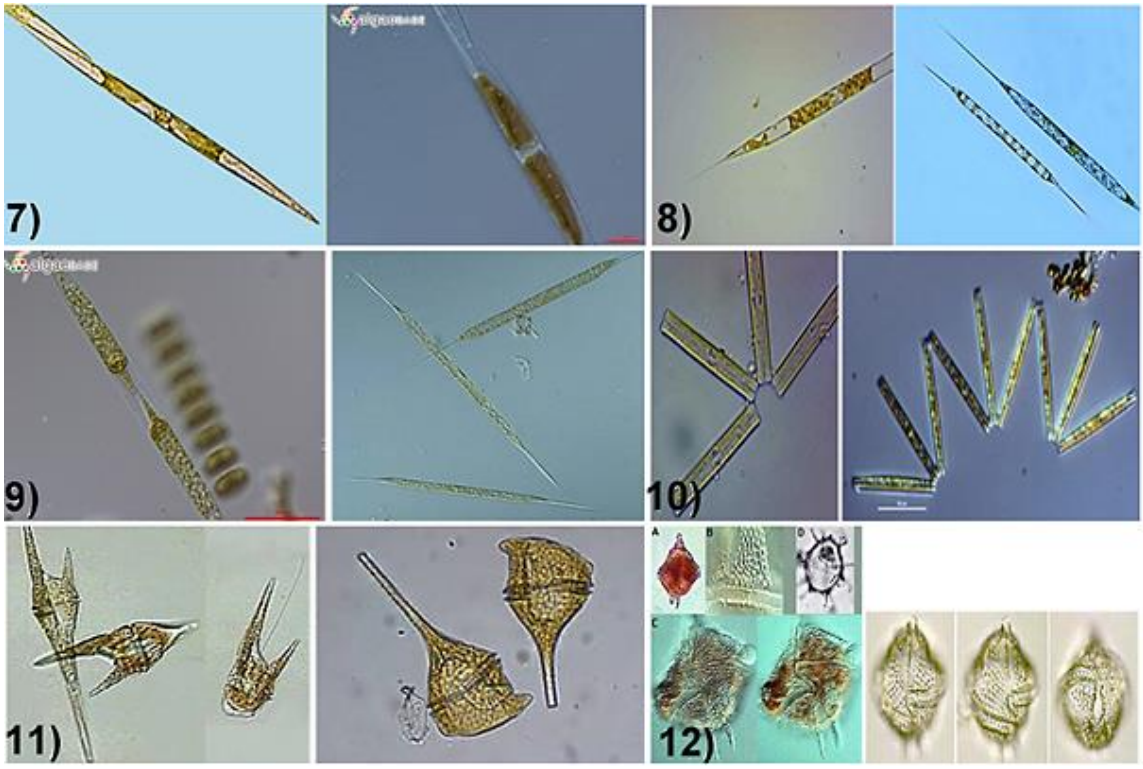

Figure 5B. Potentially Harmful Phytoplankton in the Gulf of İskenderun. (7) *Pseudonitschia pudens* (Hasle, 1993), (8) *Rhizosolenia hebetata* (Bailey, 1856), (9) *Rhizosolenia setigera* (Brightwell, 1858), (10) *Thalassionema nitschioides* (Mereschkowsky, 1902), (11) *Ceratium furca* (Claparede & Lachmann, 1859) and 12) *Gonyaulax polygramma* (Stein, 1883).

excessive use of chemical fertilizers also makes the soil debilitate over time, which results in both soil fertility and water pollution due to the infiltration into groundwater and surface water flows with surface water. The use of

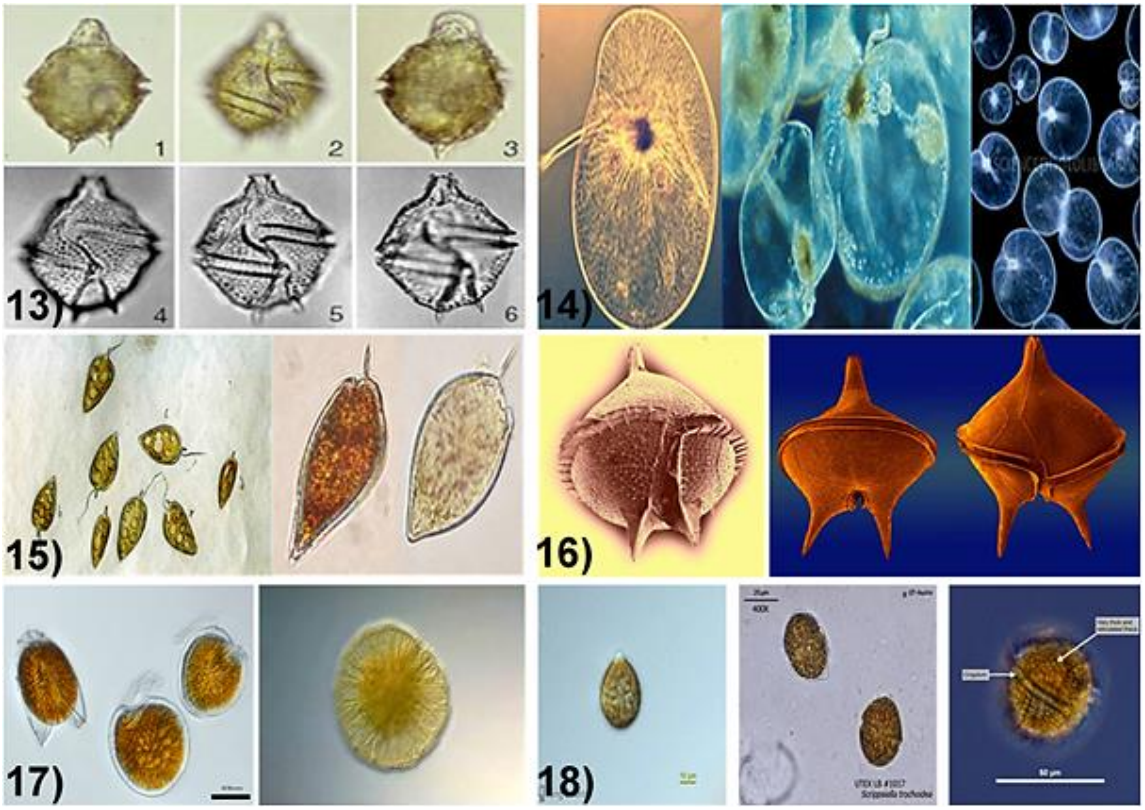

Figure 5C. Potentially Harmful Phytoplankton in the Gulf of İskenderun. (13) *Gonyaulax spinifera* (Diesing, 1866), (14) *Noctiluca scintillans* (Kofoid & Swezy, 1921), (15) *Prorocentrum micans* (Ehrenberg, 1844), (16) *Protoperidinium pellucidum* (Bergh, 1881), (17) *Pyrophacus steinii* (Wall & Dale, 1971) and (18) *Scrippsiella trochoidea* (Loeblich, 1976).

seas for transportation and tourism, the supply of domestic and industrial wastes to the sea without being treated or partially purified, the oil flows from the aftermath of sea accidents, the agricultural wastes reaching the waters from the rivers are the main factors that cause pollution.

3. Petroleum hydrocarbons resulting from maritime: activities: Petroleum hydrocarbons from shipping activities: Maritime transport is one of the major causes of pollution of petroleum hydrocarbons (petroleum) and polycyclic aromatic hydrocarbon (PAH) in the Mediterranean.

Transport of Invasive species: Invasive species are organisms transported by various means unintentionally from one natural water ecosystem to another. One way of transport of these organisms is fouling. Invasive species can pose a great risk ecologically and economically. They can lead to disappearance of economically important species, reduction of biologic diversity as well as transport and spread of various diseases in the region they are transferred to (Keskin, 2006; Battal, 2011).

4. Water from immersion (drain) resulting pollution: Leaks consisting of platforms and pipelines installed in the seas. Pollution from ships and other marine vehicles. As a result of sea accidents, a considerable amount of oil spillage accumulates in the water, threatening the life in marine environment. Thousands of tons of crude oil are spilled into the sea, especially because of accidents involving the big oil tankers. Crude oil transport, petro-chemical industries and organic chemical industry developments are increasing the amount of pollution in land, air and seas. Leaving plastic items from the land and from the ships to the sea causes serious damage to the beaches and the natural life of the sea.

Suspended solid materials lead to various issues in the sea environment. First and fore most they create unwanted situations in terms of aesthetics. Collapsible solid materials can precipitate to the bottom over time, reducing depth. These precipitated solids cover the benthic organisms while suspended solids cause turbidity and discoloration. Coliform is particularly important in terms of public health. Coliform in marine environment is used as an indicator of pathogenic microorganisms (pathogenic). Millions of coliforms are excreted through feces. Even though these pathogenic organisms are not

pathogenic on their own, they are a good indicator of diseases to be transmitted by water. Coliform is particularly important for the quality of the waters where people swim. If swimming cannot be restricted in such areas it must be controlled very carefully (Keskin, 2006).

5. Marine Pollution Caused by the air-borne pollutants: The wastes of air vessels are usually dumped into the open sea. However, the damages caused by these wastes have not yet reached very important levels. The most important reason for the pollution of the sea is the pollution of the air created by the industries or the residences. Air pollutants, along with rainwater, land on the ground and cause a large increase in the pollution load (Küçük and Topçu, 2012).

Air pollution: CO_2, SO_2 and NO_x levels of gases released to the atmosphere increase due to the excessive fuel consumption. The solvents used during the removal of anti-fouling paints from the vessel can also cause mixing of toxic chemicals into the atmosphere.

Following is the list of the pollutants that could cause sea pollution generated specifically by ship transportation: Petroleum products, radioactive substances, toxic liquid substances carried in bulk, packed or portable tanks, containers, wastes transported in wagons, bilge water, ballast and tank washing waters of vessels, domestic wastewater from ships (waters from toilets, washbasins, showers and kitchens), garbage of the ships. The release of plastic materials from the land and from the ships to the sea create serious damage to the beaches and the natural life of the sea.

Fuel consumption: Even very small quantities of fouling on a ship can cause considerable increase in fuel consumption. It can also cause up to 50% increase in fuel consumption of the ship.

Anti-fouling Agents in Ship Paints: Fouling is the layer consisting of live microorganisms as crustaceans, shellfish; algae and etc. adhere on the surface of vessels in water and grow there. There are many negative effects of foulings. The most important ones thereof can be listed as below (Keskin, 2006; Battal, 2011).

Marine litter: Mediterranean coasts are polluted with plastic waste frequently. However, the degree of the effect due to the pollution is not known yet. Increasing evidence shows each and every day that plastic wastes have an adverse impact on the environment when they are inconsiderately dumped, thrown or left into the sea environment. Environmental pollution causes costly cleaning processes as well as aesthetic disturbances. Environmental effects are caused by sea creatures which wind round plastic wastes and swallow them. Such wastes cause major risk to human health when the diver, ship or boats are exposed to them (Özdemir et al., 2016). The coastal area near Alexandria Province (Lake Manzala, Abu-Qir Bay and Mex Bay, Alexandrian coast) and Port Said is the most important area of environmental threat in Egypt. Major environmental issues arise from untreated urban and industrial wastewater and intense urbanization has led to coastline degradation (NDA Egypt, 2003).

Sea Pollution Caused by Accident: One of the most important substances causing sea pollution is fuel oil. Pollution; Shipping accidents generally result in the large amount of fuel pumped out into the sea creating a huge environmental catastrophe (Küçük and Topçu, 2012).

Coasts of Alexandria have a critical wastewater problem because of high population growth and led to the rapid industrial development; total BOD5 loads in Mex Gulf and Abu-Qir related to urban and industrial waste waters are 219,000 and 91,700 tonnes per year, respectively. There are high metal concentrations in sediments in the gulfs. Lake Maryut receives industrial wastewater and when this is combined with severe eutrophication (anaerobic conditions, hydrogen sulphide odors), a significant accumulation of heavy metals (mercury, cadmium, lead, zinc) occurs in the water.

Turkey has a total coastline length of 8,333 km. The Mediterranean shoreline is divided into two as the Aegean and the Eastern Mediterranean regions. Urban and industrial centers, oil facilities, agricultural and social facilities on the coast are among the most important land-based pollution sources in both regions (NDA Turkey, 2003). There is a rapid housing development on the Turkish coast due to the construction of recreational facilities on the Aegean and Eastern Mediterranean coastline as well as the widespread secondary (summer) housing constructions. This is a serious destruction of nature. Coastal erosion is also a significant issue in the region. Gulf of İskenderun: Industrial activity including petroleum pipeline terminal (de ballasting and pollution due to operational oil spills); Mersin: urbanization and industrial waste waters and heavy shipping activity (Ornat, 2006).

The substances causing the ships to pollute the seas were collected under five headings according to MARPOL. These are as follows: petroleum and petroleum

derived substances, toxic liquids, packaged hazardous materials, waste waters and garbage.

The facilities and equipments which have to be kept in ports according to MARPOL are as treatment facilities, facilities to destroy dry waste by grinding, laboratories and measuring devices follows: facilities to receive oily materials, facilities to receive wastes which contain toxic liquids, water, loading and unloading devices and facilities and devices suitable for pipes and fitting assemblies of ships. Another important issue related to the acceptance and treatment of wastes is the presence of waste acceptance and treatment facilities with appropriate capacity in ports.

Protocol for the Protection of the Mediterranean Sea against Pollution (RG 12.6.1981-17368)

It was approved in 1980 and signed to prevent environmental pollution caused due to wastes from ships, airplanes, petroleum platforms and facilities built at sea. Substances which are forbidden for discharge or which require special permission certificate are enlisted in the lists which are annexed to the protocol. For example, mercury, cadmium, permanent plastic materials, acid and alkali compounds in addition to biological and chemical warfare agents are all considered as absolutely prohibited substances for discharging to Mediterranean (Alkan et al., 2005; Öğüt, 1999).

The main cause of marine pollution arising from vessels is the discharge of ship wastes into the sea. The ships are either discharging the waste into the sea or destroying them by processing (burning, separating, etc) and disposing residues or storing the wastes during the sail or discharging them to waste acceptance facilities in the ports (Pollution originating from Marine Vehicles, 2014). Ships are obliged to store residues which are forbidden to be discharged into the sea and residues resulting from the processing of their wastes according to MARPOL. Since a national policy is not created in Turkey in the field of waste acceptance facilities, there are not enough waste acceptance facilities in ports operated by various institutions, organizations and companies. The majority of ports, including private ports do not have any waste acceptance facilities (T.R. Court of Accounts, 2002; Köseoğlu et al., 2016).

Most of the waste acceptance facilities in Turkey are aimed to take bilge and ballast water. Facilities for destroying and grinding solid wastes are scarce. In the survey made at the ports; it was seen that the treatment systems were neither existent nor operated properly. Bilge water is separated by the method of stilling because the treatment is not done. Therefore, the tanks to collect the bilge water from the vessels to be separated from are insufficient in terms of capacity, and this insufficiency causes undesirable results.

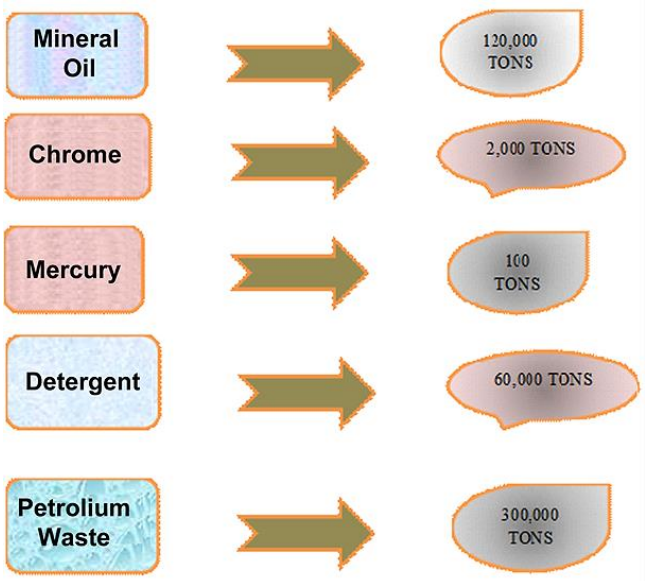

Figure 6. Quantity of waste discharged to Mediterranean yearly (Naturopa, 1987; Battal, 2011).

Measures

Parliamentary Assembly of the Council of Europe, has taken numerous decisions of recommendation for the improvement of the Mediterranean environment (Environmental Protection Magazine, 1986). Countries which have signed the Barcelona convention for the protection of the Mediterranean Sea have taken decisions in the meeting held in Genova; both to prevent sea pollution and to protect marine mammals, which are becoming extinct increasingly. The precautions to be taken for this purpose are;

Works as to protection of the Mediterranean coastline; improvement of the wastewater treatment along the coastal strip and presence of wastewater acceptance and treatment facilities with appropriate capacity at the ports and increase of the supervision have to be ensured.

- The transport conditions of toxic substances should be under control.
- Establishment of treatment facilities in cities with population over 100,000 people.
- Combating air pollution.
- Taking necessary measures against desertification due to

Table 2. Damages of motorine and petroleum wastes in ecosystem (Naturopa, 1987; Battal, 2011).

Damages	Effects of Precautions
Single-Cell Live and Ecosystem	Oils such as diesel oil and etc. density of which are lighter than water forming a film of oil on the surface of the water and prevent utilization of sunlight of vegetal unicellular organisms (phytoplankton) in water. These organisms constitute the first link of the food chain in water and enable the water to have dissolved oxygen by virtue of photosynthesis due to pollution and lack of light and die and accumulate on the bottom of the sea. Bacterias which break them down use the oxygen in water.
All Marine Ecosystem	When diesel and other oils dissolve many substances like lead or other similar substances are released, these substances threaten the microorganisms in the sea and cause them to die (Figure 25). The density of the detergent dilutes when various oils and motor are mixed with detergent in the sea. In this way, they become easily absorbed by organisms. They pass to other living organisms which eat detergent loaded organisms through food chain and affect all living things. If required measures are not taken, the marine ecosystem may vanish soon in a very short time.
Atmospheric Pollution	Iron-steel plants established in Iskenderun province and the surroundings thereof release gases such as SO_2, CO_2, CO, NO_X and NO_2 daily to the atmosphere. SO_2 and NO_2 gases out of these are transformed into H_2SO_4 and HNO_3 and fall as acid rain into the sea and surroundings. Filters can be placed to the gas outlet chimneys of iron-steel plants and thus contamination can be prevented partially.
Mediterranean Gulf and Ecosystem	Petroleum hydrocarbons from shipping activities: Maritime transport is one of the major causes of pollution of petroleum hydrocarbons (petroleum) and polycyclic aromatic hydrocarbon (PAH) in the Mediterranean.

fires.

- Tourism activities are also interrupted due to the pollution risk. Countries which generate big income from tourism are concerned regarding to this.

The oil tankers as well as trade and freight ships of numerous countries visit the Gulf of İskenderun. There are no measures taken for them to prevent them to pollute the sea (Environmental Protection Magazine, 1986) (Fig. 6).

Diesel and lubricating oil remains in bilge waters discharged into the sea pollute the sea and give the following damages to the sea creatures (Table 2).

As a result we desire that due importance and sensitivity are shown to natural cleanliness of İskenderun Gulf and Ports located on the Mediterranean Coast of our country.

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