

# European Environment Agency

## Europe's biodiversity

- biogeographical regions and seas

Seas around Europe

## The Caspian Sea

- enclosed and with many endemic species

**Author:**

Vladimir Mamaev, Woods Hole Group, Inc.

**Map production:**

UNEP/GRID Warsaw (final production)

**EEA Project Manager:** Anita Kunitzer (final edition)



## CONTENTS

<b>Summary</b>	<b>3</b>
<b>1 What are the characteristics of the Caspian Sea?</b>	<b>4</b>
<b>1.1 General characteristics</b>	<b>4</b>
1.1.1 Coastlines	4
1.1.2 Water level fluctuations	5
1.1.3 Currents	6
1.1.4 Rivers	6
1.1.5 Climate	6
1.1.6 Population	6
<b>1.2 Main influences</b>	<b>6</b>
<b>1.3 Main political instruments</b>	<b>7</b>
<b>1.4 Biodiversity status</b>	<b>7</b>
1.4.1 Plankton and Benthos	8
1.4.2 Large Fauna	8
<b>1.5 Fisheries and other living marine resources</b>	<b>9</b>
<b>2 What is happening to biodiversity in the Caspian Sea?</b>	<b>11</b>
<b>2.1 Contaminants</b>	<b>11</b>
<b>2.2 Sea level fluctuation</b>	<b>12</b>
<b>2.3 River regulation</b>	<b>13</b>
<b>2.4 Poaching and overfishing</b>	<b>13</b>
<b>2.5 Alien species</b>	<b>13</b>
<b>3 Policies at work in the Caspian Sea</b>	<b>14</b>
<b>3.1 Nature protection</b>	<b>14</b>
3.1.1 International collaboration	14
3.1.2 Protected areas	16
3.1.3 Red List species	21
<b>3.2 Protection of marine resources by restrictions on fishing and hunting</b>	<b>23</b>
<b>3.3 Research projects and monitoring programmes</b>	<b>23</b>
<b>Bibliography</b>	<b>24</b>

## Summary

- The Caspian is the largest enclosed sea in the world.
- It is brackish, with salinity up to 13.7 ‰.
- Significant changes in water levels occur. These, combined with the presence of large shallow areas, constitute a potential threat to biodiversity and especially to the many endemic species.
- The Caspian is rich in oil and gas. Increasing exploitation of these might pose a serious threat to biodiversity.
- The biological diversity of the Caspian Sea and its coastal zone makes the region one of the most valuable ecosystems in the world. The rate of biological endemism in the Caspian Sea is extremely high and it has a large number of representatives from almost all major phyla on earth. The Caspian, with its diversified habitats ranging from vast river systems to extensive wetland systems, supports a diverse flora and fauna with high natural productivity.
- The most important fauna of the Caspian Sea is the sturgeon, which constitute 85 % of the standing stock of the world's sturgeon population.
- The Caspian Sea lies on the crossing of migration routes of millions of migrating birds and offers refuge for a number of rare and endangered birds of the world ornithofauna.
- There is an urgent need to undertake an ecological survey of the coastal and marine species and habitats, their uses, values and threats, for each of the five Caspian states, which will result in an inventory of Caspian ecological resources. Strategies for the management of transboundary biodiversity, including threatened or endangered migratory species need to be developed.
- The major threats to the biodiversity of the Caspian Sea are:
  - Regulation of the Caspian rivers, causing reduction in the area of delta vegetation, loss of reeds, cattail and bushes. Loss of vegetation resulting in loss of aquatic and coastal fauna. Many anadromous and semi-migratory species have been deprived of their natural spawning grounds.
  - Illegal fishing and overfishing, dramatically reducing the sturgeon population.
  - Sea-level changes, causing loss of habitats such as spawning grounds and nesting sites.
  - Pollution, depressing biological processes including the growth of commercially important fish.
  - Introduced species, causing chronic (long-term) or acute (short-term) impact.

# 1. What are the characteristics of the Caspian Sea?

## 1.1 General characteristics

**Table 1: Statistics for the Caspian Sea**

Surface area km <sup>2</sup>	Water volume km <sup>3</sup>	Coastal length km	Depth average m	Surface temperature - winter °C	Salinity ‰
390 000	78 700	7 000	208 max 1 025	North 0-0.5 South 10-11	0.1-13.7

The Caspian Sea is located in an inland depression on the border of Europe and Asia. It is the largest enclosed sea in the world, with a catchment area of 3.5 million square kilometres (km<sup>2</sup>) (Map 1).

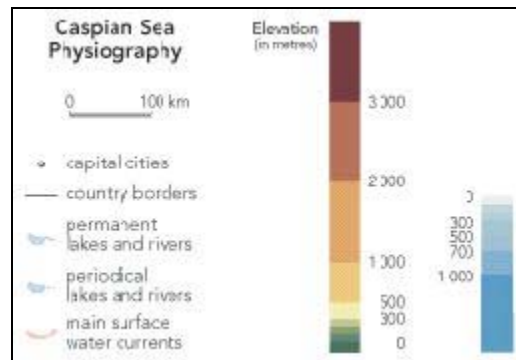
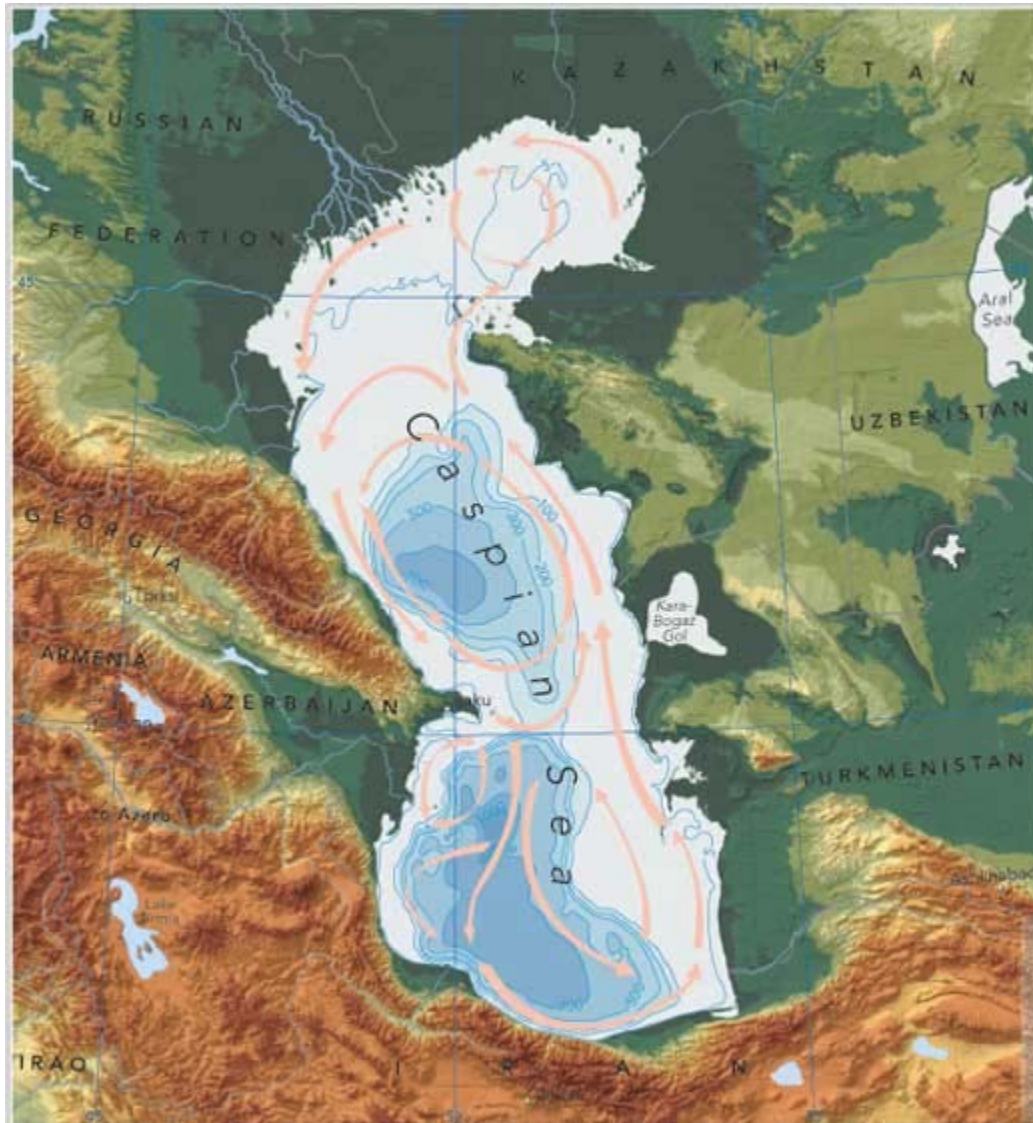
The modern Caspian Sea originated as part of an ancient, brackish Pontic lake-sea existing 5-7 million years ago. In the Late Mesozoic and Early Paleocene Ages, the ancient Tethys Sea occupied the area of the present Mediterranean, Black and Caspian seas. During Paleocene and Neocene times, the Black and Caspian Seas were joined and separated several times. In the Early Pliocene, the Caspian Sea was separated for the first time from the Black Sea. Accordingly, the primary marine fauna was partly eliminated and partly modified. During Mid-Pliocene, the Caspian Sea was completely isolated from the Black Sea. The development of the Caspian and Black Sea basins, as well as their fauna, proceeded independently from that time. The typical brackish-water Caspian fauna formed then and it has persisted to the present day (Kosarev and Yablonskaya, 1994).

The Caspian can be divided into three parts: a northern, shallow part (5-6 metres (m) deep) covering 80 000 km<sup>2</sup>, a middle part (average 190 m) covering 138 000 km<sup>2</sup> and a southern part (up to 1 025 m) covering 168 400 km<sup>2</sup> (Aubrey *et al.*, 1994; Aubrey, 1994).

### 1.1.1 Coastlines

The northern shoreline is strongly undulating and includes the deltas of the Volga, Ural, Emba and Sagiz rivers. The middle and south Caspian shorelines are varied, ranging from narrow beaches fronting seacliffs to broad sandy regions. Kara Bogaz Gol is a large gulf on the eastern shore. The western coast has a series of terraces, gradually rising to the Great Caucasus Mountains, comprised of sediments (small and medium-grained sands) carried by mountain rivers and streams. In the south Caspian (mainly Iran), the relatively smooth western coast is composed of small grained sands and silt (Aubrey, 1994).

Map 1: Caspian Sea physiography (depth distribution and main currents)



Source: EEA.UNEP/GRID Warsaw final map production.

### 1.1.2 Water level fluctuations

One of the most important features of the Caspian is its changing water level, which has a significant effect on biodiversity in the extensive shallow areas. The level of the Caspian Sea is below that of the World Ocean. The highest water level, - 22 m, was reached about 38 000 years ago (Aubrey, 1994), but may have been as low as - 64 m. Early in the last century (up to 1929), the sea level fluctuated around - 26.2 m, later decreasing to - 29.0

m in 1977 (Kosarev and Yablonskaya, 1994). This was the lowest level reached during the past 400-500 years. In 1978 a rapid rise began, the level reaching - 27.0 m by 1994. Since 1995 some regression has been observed in the sea level. At present the Caspian Sea level stands around the - 28.8 m mark. There are almost no tides.

The factors causing these fluctuations are not well understood and the causes are hotly debated. One study (Aubrey et al., 1994) suggests that 45 % of the change in the water level is due to an increase in river flow, 16 % to an increase in surface precipitation, 25 % to a decrease in evaporation rates, and 14 % to a decrease of flow to the Kara Bogaz Gol, which has a water level lower than the sea. Other studies suggest (Kosarev and Yablonskaya, 1994) that a significant fraction of recent sea-level change is tectonic in origin. There is a clear need for better methods for predicting sea-level change. The Caspian Environment Programme has therefore established a regional centre for water fluctuation in Kazakhstan, which is addressing the main causes of the changing water levels and is working on the development of models to predict future changes in the water level.

### **1.1.3 Currents**

The currents in the Caspian are primarily wind-generated. Maximum currents in open regions of the north Caspian are about 30 cm/s (Kosarev and Yablonskaya, 1994). In the coastal regions of the middle and southern parts of the sea, currents correlate with wind direction and are typically toward the north-west, north, south-east and south. Easterly currents are also observed near the east coast. Along the western coast of the middle Caspian, the prevailing currents are south-east and south. In this region the current speeds average 20-40 cm/s with a maximum of 50 to 80 cm/s (Aubrey, 1994).

### **1.1.4 Rivers**

About 130 rivers of various sizes drain into the Caspian with an annual input of about 300 km<sup>3</sup> (Aubrey, 1994). The main rivers are the Volga (80 % of the total volume of inflow), the Ural (5 %), the Terek, Sulak and Samur (total up to 5 %), the Kura (6 %), and Iran's small rivers of the Caucasus and others (45 %) (CEP, 1998a).

Salinity in the north Caspian varies markedly, from 0.1 ‰ at the mouth of the Volga and Ural rivers up to 10-11 near the middle Caspian. The middle and southern parts of the sea have only small fluctuations of salinity: surface salinity is about 12.6 to 13.5, increasing from north to south and from west to east. There is also a slight increase in salinity with depth observed in all regions of the sea (Aubrey, 1994).

### **1.1.5 Climate**

The climatic conditions of the region are determined by the influence of cold arctic air, moist sea air masses forming over the Atlantic Ocean, dry continental air masses from Kazakhstan, and warm air masses coming from the Mediterranean Sea and Iran.

### **1.1.6 Population**

About 11 million people live around the Caspian shoreline. The main urban centres are on the western and southern shores, the majority in the coastal provinces in Iran and Azerbaijan (CEP, 1998a).

## **1.2 Main influences**

The main influences on the biodiversity of the Caspian Sea are:

- sea level fluctuations
- regulation of river flow

- desertification influence on coastal habitats including wetlands
- contamination
- habitat changes
- fishing, including poaching for sturgeon
- introduction of species.

### 1.3 Main political instruments

- The level of ratification of global biodiversity-related conventions varies from country to country (see Table 4 below).
- All Caspian countries have been involved in the preparation of legal frameworks for the protection and sustainable management of biological resources since 1994. The framework convention for the protection of the Caspian Sea is now under final negotiation.
- The Caspian Environment Programme (CEP), launched in 1998, emphasises the importance of transboundary biodiversity issues.

### 1.4 Biodiversity status

The biological diversity of the Caspian and its coastal zone makes the region one of the most valuable ecosystems in the world. Many species are endemic and there are many representatives from almost all major groups on earth. A diversified range of habitats from vast river systems to extensive wetlands supports a diverse flora and fauna with high natural productivity. The most important element of the fauna is the sturgeon, with 85 % of the world's population at its peak in the late 1970s. The Caspian lies at the crossing of migration routes of millions of migrating birds and offers refuge for a number of rare and endangered species.

One of the most important features of Caspian biodiversity is high endemism. The longest established species are among the group of indigenous, brackish-water organisms. These include a high percentage of endemic species and even genera. The rest of the organisms found today are basically derived from the Mediterranean marine biogeographic region, the Arctic marine region or the freshwater (riverine) complex. The Caspian is a productive sea: 22.7 million tonnes primary production of organic carbon per year in the northern Caspian, 50.9 in the middle and 41 in the south (Kosarev and Yablonskaya, 1994).

Almost all the indigenous species are found in the middle Caspian because of its relative stability over time, its salinity regime (consistently brackish) and its central location; consequently the highest number of endemic species are found there. However, the north Caspian has the greatest diversity of both habitat and species. This is due to the big rivers, such as the Volga and the Ural, which create a zone where marine and freshwater fauna are mixed. The Volga River system was also the ancient route for the penetration of Arctic and Mediterranean species which are still found in the Caspian. The existence of vast shallows, some deep depressions, the wide Volga Delta and other rivers, and fluctuations of salinity from 0.12 to 10 ‰ provide different ecological niches which, in turn, provide high species diversity.



**Table 2: Numbers of species in the Caspian Sea**

Natural marine resources	No of species and subspecies	Endemic species
Phytoplankton	450	
Zooplankton	315	
Phytobenthos	64	
Zoobenthos	379	
Fish	126	115
Mammals	1	1
Birds	466	

Sources: CEP, 1998a; Aubrey, 1994; Dumont, 1998; Ivanov, 1997; Kasymov, 1994.

#### 1.4.1 Plankton and Benthos

- **Phytoplankton**

A total of 450 species, varieties or forms of phytoplankton are found in the Caspian. The dominant forms are *Cyanophyta*, *Bacillariophyta* and *Chlorophyta*. Middle and south Caspian phytoplankton are mixed marine, brackish and freshwater forms. By contrast, north Caspian phytoplankton are all freshwater forms.

- **Zooplankton**

The zooplankton in the Caspian has representatives of Arctic, Mediterranean and endemic species, a total of 315, made up of *Rotatoria* (135) *Cladocera* (50), *Copepoda* (43), *Mysidacea* (20), *Cumacea* (18) *Amphipoda* (73) and total *Crustacea* (236) (Dumont *et al.*, 1997).

- **Phytobenthos**

There are 64 species of algae in the Caspian, including 29 species of green, 22 of red and 13 of brown algae. The opening of the Volga-Don canal in 1954 allowed the introduction of new species of algae from the Black Sea.

- **Zoobenthos**

The bottom macrofauna of the Caspian Sea contains 379 species from 13 different classes of animals. The benthic fauna of the north Caspian is much less diverse than in the middle and south Caspian. Going from south to north, there is a steady disappearance of indigenous clams and snails, molluscs, nematodes, turbellarians, deepwater amphipods, isopods and crayfish.

#### 1.4.2 Large Fauna

- **Fish**

The Caspian is characterised by a small variety of fish species compared to open ocean regions, with approximately 76-126 species from 17 families. Two of them are introduced aliens: the flounders and a mullet (*Mugilidae* - family species), while another two - pipefish

and a sand-smelt (*Atherinidae* - family species) originate from an unknown source. The most diverse are the families of goby, carp, herring and sturgeon. Local rare endangered species include: Caspian lamprey (*Caspiomyzon wagneri*), spiny sturgeon (*Acipenser nudiventris*), Volga herring (*Alosa kessleri volgensis*), Caspian salmon (*Salmo trutta caspius*), *Stenodus leucichthys*, *Chalcalburnus chalcoides chalcoides*, *Vimba vimba perca*, *Barbus brachycephalus caspicus*, *Barbus ciscaucasicus*, *Barbus capito*.

Up to 126 subspecies may exist. Most are carps (33 %), gobies (28 %) and shads (14 %) (Aubrey, 1994). Most species are indigenous, with few representatives of the Mediterranean complex. There are four primary groups of fishes: sea fishes (kilka, shad and some gobies); anadromous fishes (lamprey, salmon and all sturgeon except sterlet); semi-migratory fishes (Caspian roach, sazan, zander and sterlet); and river fishes (perch, rudd and tench). Sturgeon are abundant, having originated from freshwater forms and acclimatised to higher salinity so that they now occupy the entire Caspian.

- **Birds**

A total of 466 species of bird can be found. Of these, 120 are nesting birds, 68 are wintering birds and 278 are migratory or summer residents. The region's marine birds include gulls, cormorants, pelicans and flamingoes. They congregate along the coast. The highest concentrations have been recorded in the Volga and Ural estuaries. The region is of high importance as the site for reproduction, moulting and rest during migrations.

- **Mammals**

The only mammal within the aquatic fauna is the Caspian seal (*Phoca (Pusa) caspica*). Thousands of Caspian seals have died in the Caspian Sea since April 2000. An international team of scientists, working as part of the Caspian Environment Programme's Ecotoxicology Project (ECOTOX), has now concluded that canine distemper virus infection was the primary cause of the epidemic disease.

## **1.5 Fisheries and other living marine resources**

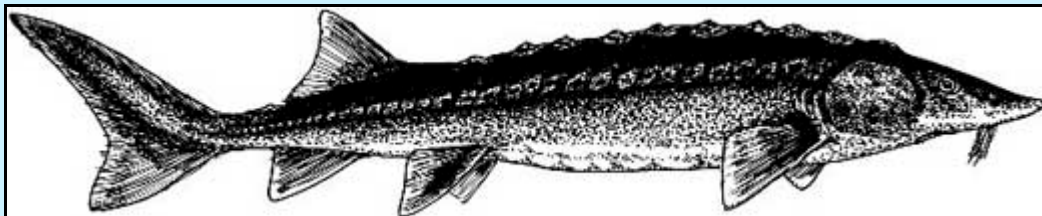
There have been significant alterations in fish populations during the past 50 years as a result of human activities, particularly fisheries and habitat alteration. The traditional Caspian sturgeon fishery is well known because of the economic value of caviar. At its peak in the late 1970s, the Caspian held more than 85 % of the world's sturgeon. In recent years, however, landings have decreased dramatically: from 30 000 tonnes in 1985 to only 5 672 tonnes in 1995 (Dumont *et al.*, 1997). A quota system, introduced together with a temporary ban on pelagic fishing, does not appear to have been effective in reviving the dwindling sturgeon population.

### Case study: Sturgeon

Different sturgeon species are the most valuable commercial fish in the Caspian. Important for their existence is the close proximity of brackish waters with rivers (the north Caspian being the most important example). Six species of sturgeon exist in the Caspian, belonging to the genera *Huso* and *Acipenser*.

- The biggest sturgeon, the beluga (*Huso huso*), reaches a length of more than 4 m and a weight of 500 kilograms (kg). Reproduction occurs in the Volga, Ural, Kura, Terek and Sefidrud rivers, with the Volga being most important. With the damming of all the major rivers, the range of migration has been reduced. The beluga feeds on gobies, shads, carps and *Mysidacae* (in its first month). In the early 20th century, the beluga accounted for nearly 40 % of the sturgeon catch. At present, it accounts for less than 10 %.
- Russian sturgeon (*Acipenser guldenstaedtii*) accounts for between 40 % and 50 % of the catch (CEP, 1998a). It uses the Volga, Ural and Terek rivers for spawning, the Volga being the most important.
- Persian sturgeon (*Acipenser persicus*) lives mainly in the middle and south Caspian, preferring the warmer waters there. It spawns in the river Kura, although some older individuals navigate the Volga and even fewer the Ural. The feeding habits are mixed (benthic invertebrates and other fishes).
- Sevryuga sturgeon (or starred sturgeon) is represented by two forms: north Caspian (*Acipenser stellatus stellatus*) and the south Caspian form (*Acipenser stellatus stellatus natio cyrenis*). Both are spread widely throughout the sea, but spawn in the Volga, Ural, Terek, Kura and Sefidrud rivers. The Ural River has become the most frequent spawning area for the sevryuga. The proportion of sevryuga catch has increased recently to 45 % of the total sturgeon catch (Ivanov *et al.*, 1995).
- Spiny sturgeon (or bastard sturgeon, or ship) (*Acipenser nudiventris*) is a minor sturgeon of the Caspian. The spiny sturgeon spawns in the Kura, Ural and Sefidrud rivers, and is rarely seen in the Volga. After damming of the Kura River, the Ural became the most important spawning river for spiny sturgeon. It forages on fishes and bottom invertebrates (mixed diet). Spiny sturgeon fishing is now prohibited in the Ural River, because of depleted stocks; it is listed in national Red Data Books of some Caspian countries (Kovshar, 1996).
- Sterlet sturgeon (*Acipenser ruthenus*), like the spiny sturgeon, is a relatively rare type of sturgeon in the Caspian Sea. Two populations exist in the Volga Basin: one limited to the upper and middle Volga and one semi-migratory type that forages in the brackish Caspian. Middle Volga sterlet stocks decreased dramatically with the initial regulation of the Volga, however, lower Volga sterlet flourished. A similar semi-migratory population may exist in the Ural River.

### Illustration: Sturgeon (*Acipenser sp.*)



Source: Petter Wang

Photo: Caviar



Source: Rolf Kuchling

## 2. What is happening to biodiversity in the Caspian Sea?

The preliminary Caspian transboundary diagnostic analysis (CEP, 1998b) identifies the major issues associated with the degradation of biodiversity in the Caspian:

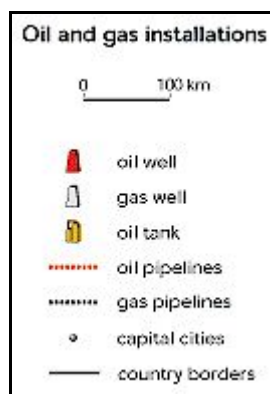
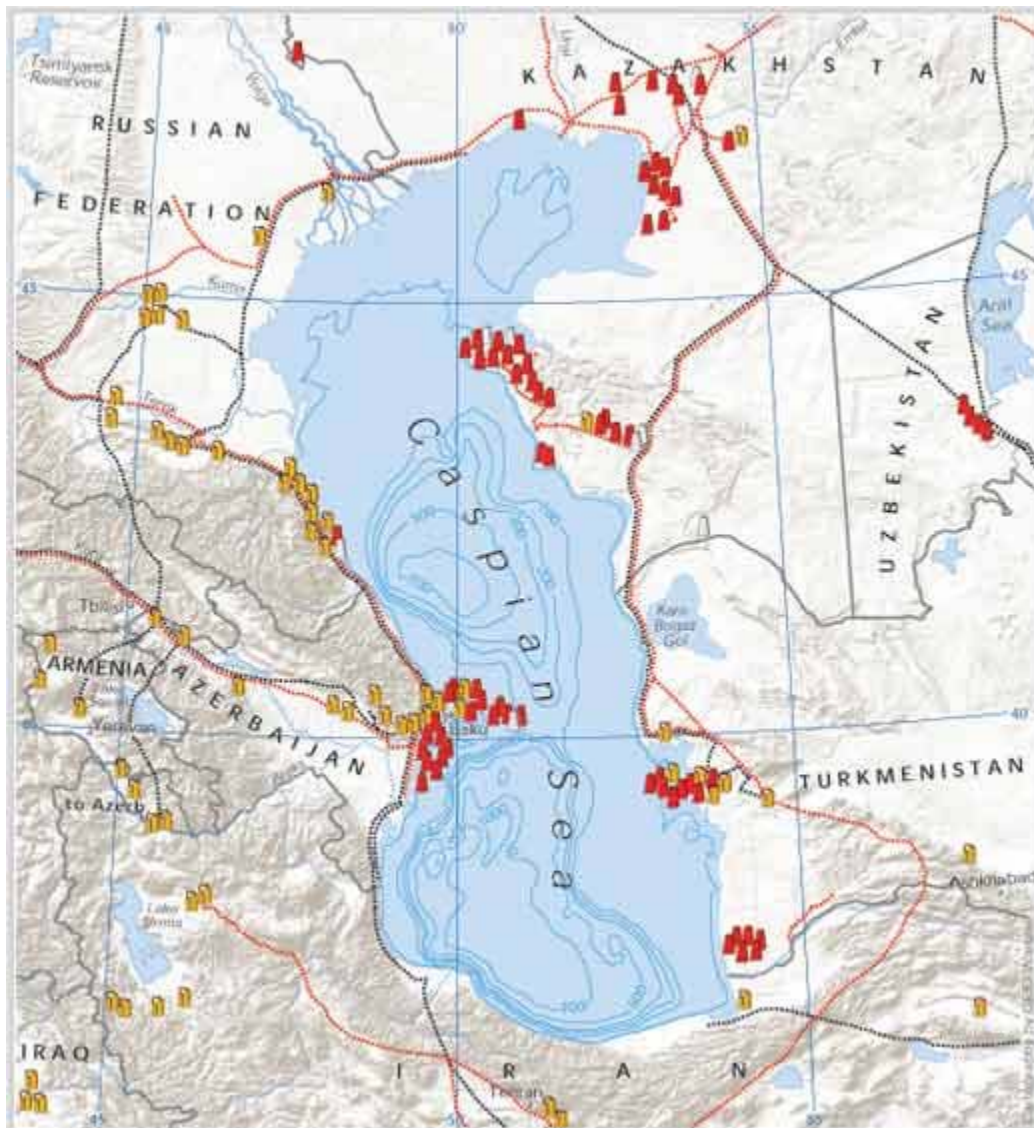
- loss of coastal habitats;
- loss or imminent loss of endangered species and their genomes;
- degradation of the landscape.

The major threats to biodiversity of the sea and its coastal zone are combinations of natural and anthropogenic factors including the following.

### 2.1 Contaminants

During the past 40 years, the level of contamination has increased as a result of anthropogenic activities, not all of which are in the immediate vicinity of the sea. The entire drainage basin contributes to the problems. Contaminants are transported to the sea directly by river flow (an estimated 80 % of the total load) (Glantz and Zonn, 1997), atmospheric input, groundwater flow and direct input (such as oil contamination in the Baku region). The major sources include untreated waste from industry and agriculture along the Volga River, offshore oil and gas production, processing, extraction and transportation, and marine dumping. Considerable concentrations of oils in the sediments close to some oil production, processing and transport installations depress biological processes including the growth of commercially important fish.

Map 2: Oil and gas installations and pipelines



Source: Compiled by Vladimir Mamaev

## 2.2 Sea level fluctuation

The rise in sea level causes alterations of valuable habitats, due to inundation of the vast coastal areas. The most affected areas are in the north Caspian near the deltas of the Ural and Volga, and the lowlands in Azerbaijan (Aubrey *et al.*, 1994; CEP, 1998a).

Environmental damage resulting from the sea level rise can be classified as pollution due to damage to the industrial infrastructure and consequent contamination of bioresources, and loss of habitats such as spawning grounds and nesting sites caused by the change in water depth.

### **2.3 River regulation**

Dam construction since the early 1930s has altered the hydrology and ecosystem of the Caspian. Several huge dams were built on the Volga, Terek, Sulak, Samur and Kura rivers. Effects on biodiversity include altered volume and timing of river flow, salinity variations, reduced input of inorganic nutrients, increased input of organic substances, reduced sediment delivery, reduced access to spawning grounds for certain fishes, reductions in spawning area and eutrophication (Kuksa, 1994). For instance, river regulation reduced the area of delta vegetation, causing loss of reeds, cat's tail and bushes. Loss of vegetation resulted in loss of aquatic and coastal fauna. However, not only deltas suffered the consequences of river regulation. Many anadromous and semi-migratory species were deprived of their natural spawning grounds. As river deltas became shallower, fish could not migrate to rivers for spawning.

### **2.4 Poaching and overfishing**

Poaching is the most serious current threat to the sturgeon population. According to local fisheries experts, the illegal catch in 1995 accounted for about 90 % of all sturgeon caught in the northern Caspian, comparable to the former USSR commercial catch of 15 000 tonnes per year in the whole Caspian (Ivanov *et al.*, 1995) (see also Section 1.5 above).

### **2.5 Alien species**

Occasionally an ecosystem will experience biological invasion by a species that is able to occupy a particular ecological niche. Natural control mechanisms may fail for a variety of reasons, leading to a massive explosion of the new species. Typically, growth is rapid but the decline may be equally fast. The potential damaging effects of such invasions into the Caspian are increased by its near isolation. Species can enter through the Volga-Don canal, but they cannot leave as easily, neither can predators be easily introduced. This may place the Caspian at risk, particularly for species such as the comb jellyfish (*Mnemiopsis*), which has disturbed the ecological balance of the Black Sea severely and could survive at the salinity levels of the Caspian. Since this jellyfish feeds on fish eggs and larvae, its introduction might pose a significant risk to fisheries. In 1999, *Mnemiopsis* was first recorded in the Caspian Sea, presumably after being introduced a few years earlier with ballast waters of oil tankers. Recently large blooms of *Mnemiopsis* were observed in the northern and central parts of the Caspian Sea. The CEP is urgently addressing this issue by bringing together world experts on *Mnemiopsis* to develop actions to control its population. Table 3 summarises the introduction of species into the Caspian Sea ecosystem.

**Table 3: Introduced species**

	Time of introduction	Species
1.	50 000 BP	<i>Zostera nana</i> (eelgrass), <i>Cardium edule</i> (usually <i>Cerastoderma lamarcki</i> – bivalves no common names in English), <i>Fabricia sabella</i> (polycheta worm, no common name), <i>Atherina mochon pontica</i> (usually <i>Atherina boyeri</i> – sand-smelt), <i>Syngnathus nigrolineatus</i> (pipefish), <i>Pomatoschistus caucasicus</i> (transcaucasian goby), <i>Bowerbankia imbricata</i>
2.	Beginning of 20th century	<i>Rhizosolenia calcar-avis</i> , <i>Mytilaster lineatus</i> (mussel), <i>Leander squilla</i> (Euro-African shrimp), <i>L. adspersus</i> ( <i>Paleomon adspersus</i> – European shrimp), <i>Mugil auratus</i> (golden mullet), <i>M. saliens</i> (grey mullet), <i>Pleuronectes flesus luscus</i> (now <i>Platichthys flesus luscus</i> – Black Sea flounder), <i>Nereis diversicolor</i> ( <i>Nereides</i> ), <i>Abra ovata</i> (bivalve), <i>Scomber scomber</i> (mackerel)
3.	Middle of 20th century (after building Volga-Don canal)	<i>Pleopis polyphemoides</i> (small crustacea – <i>Cladocera</i> ), <i>Balanus impovisus</i> (shellback), <i>B. eburneus</i> (shellback), <i>Membranipora crustulenta</i> (sometimes as <i>Conopeum seurati</i> , no common names), <i>Ceramium diaphanum</i> , <i>C. tenuissimum</i> , <i>Ectocarpus confervoides</i> , <i>Polysiphonia variegata</i> , <i>Blackfordia virginica</i> (jellyfish), <i>Rhithropanopeus harrisii</i> (crab), <i>Engraulis encrasicolus</i> (European anchovy), <i>Anguilla anguilla</i> (European eel), <i>Gambusia affinis</i> (Mosquito fish, topminnow), <i>Oncorhynchus keta</i> (chum salmon, dog salmon)
4.	End of 20th century	<i>Penilia avirostris</i> , <i>Calanipeda aquaedulcis</i> (small crustacea), <i>Acartia clausi</i> (small crustacea), <i>Mnemiopsis leidyi</i> (jellyfish), <i>Aurelia aurita</i> (jellyfish), <i>Oncorhynchus keta</i> (chum salmon), <i>Ctenopharyngodon idella</i> (grass carp), <i>Hypophthalmichthys molitrix</i> (silver carp), <i>Salmo salar</i> (Atlantic salmon), <i>Aristichthys nobilis</i> (spotted silver carp, bighead), <i>Oncorhynchus gorbusha</i> (pink (humpback) salmon), <i>O. kisutch</i> (coho (silver) salmon)
5.	Possible invaders in 21st century	<i>Pseudoevadne tergistina</i>

Sources: Aladin, 2001; Mitrofanov, 2000

### 3. Policies at work in the Caspian Sea

#### 3.1 Nature protection

##### 3.1.1 International collaboration

Most of the threats to the biodiversity of the Caspian are transboundary in nature and require effective measures from all Caspian states. International as well as national policies and planning actions are therefore needed to ensure adequate and sustainable protection.

Table 4 lists the main international conventions and instruments of relevance to the biodiversity of the Caspian Sea, and their status.

**Table 4: Status of international conventions and instruments in the Caspian Sea**

	<b>Azerbaijan</b>	<b>Iran</b>	<b>Kazakhstan</b>	<b>Russian Fed.</b>	<b>Turkmenistan</b>
Biodiversity Convention	S (1992)	R (1996)	R (1994)	R (1995)	R (1996)
Man and Biosphere Programme	+	+	+	+	+
Ramsar Convention	–	R (1975)	–	R (1977)	–
CITES <sup>1</sup>	1999	1976	2000	1992	–
World Heritage Convention	R (1993)	Ac (1975)	Ac (1994)	R (1988)	Su (1994)
Desertification Convention	1998	1997	1997	–	1996

1. The Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Ac = acceptance; R = ratified; S = signed; Su = notification of succession;  
+ = participation; otherwise date of entry in force.

*Source: CEP, 1998a*

In 1994, the countries bordering the Caspian prepared a Convention on Conservation and Utilization of Bioresources of the Caspian Sea. This Convention is still unsigned because of political problems related to the legal status of the Caspian.

Since 1995, all Caspian countries, with assistance from the United Nations Environment Programme (UNEP), have been actively involved in the preparation of the Caspian Framework Convention on the Protection and Sustainable Management of the Caspian Environment and its Resources. The convention is in final negotiations and is expected to be signed by the Caspian countries in 2002. A Bioresources Commission has been established as a regional technical body which has drafted a Fisheries Management Agreement. This agreement might become an associated document to the Caspian Framework Convention.

In 1998, the Caspian Environment Programme (CEP) was launched by the riparian states with support from the EU Tacis Programme (Technical Assistance to the Commonwealth of Independent States) and the Global Environment Facility (GEF). One of the most important components of CEP is an assessment of transboundary priorities for the protection of biodiversity. A regional centre for assessment of transboundary biodiversity priorities was established in Atyrau (Kazakhstan) in early 1999.

All Caspian countries have laws and regulations related to the protection of biodiversity. Biodiversity action plans have been or are being prepared in some countries; these plans

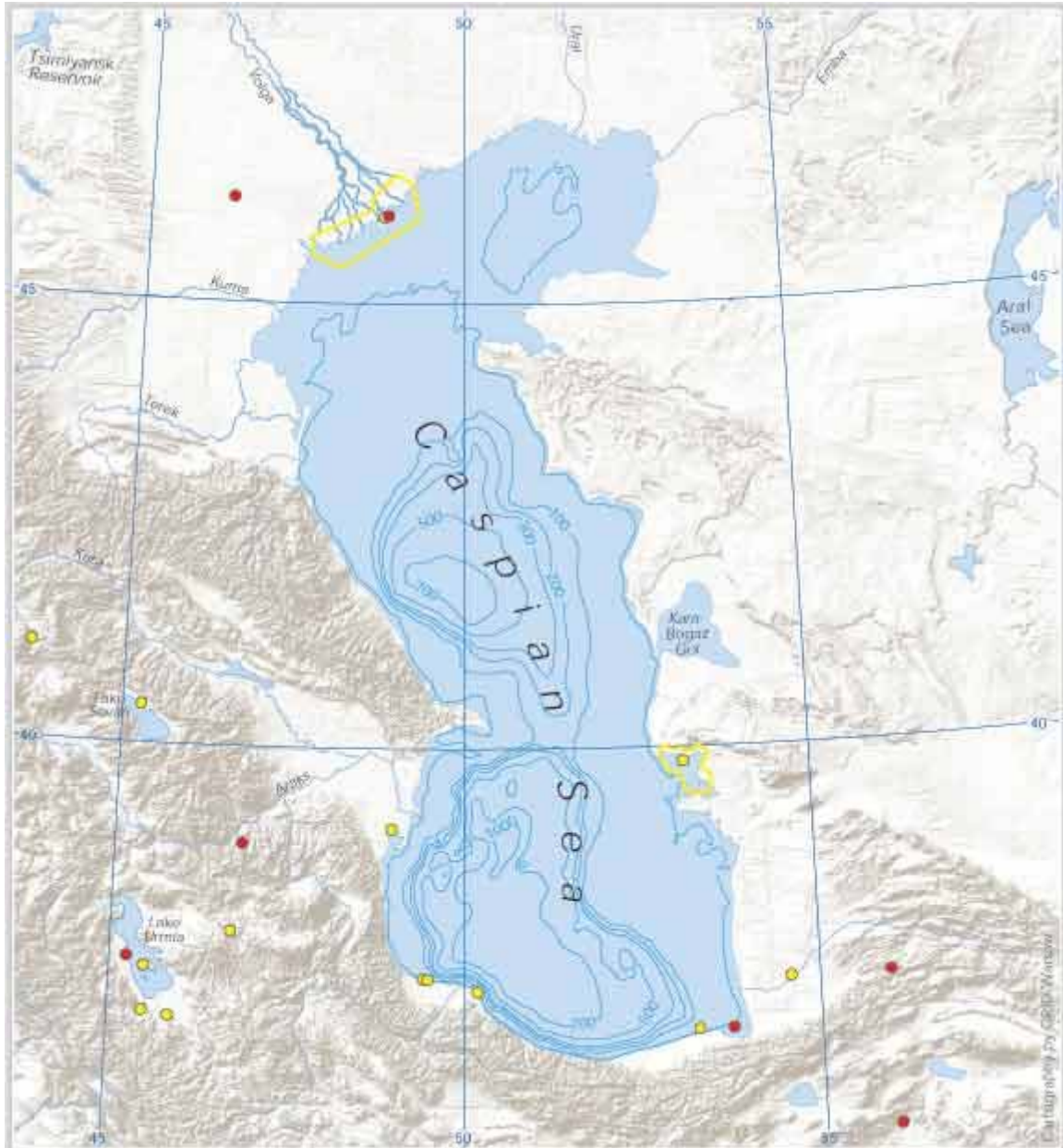


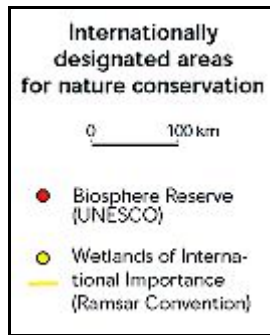
cover marine biodiversity issues. Unfortunately, national laws and regulations are generally weak and need enforcement.

### 3.1.2 Protected areas

There are protected areas in all the Caspian countries; these include coastal and marine areas, with different status, management regimes and functions. Table 5 lists the most important vulnerable habitats in the region.

**Map 3: Internationally designated areas for nature protection in the Caspian Sea**





Source: Compiled by Vladimir Mamaev

**Table 5: Major vulnerable sites in the Caspian Sea**

Country	Name	Status	Area ha x 1 000	Importance	Major species	Signifi- cance
Azerbaijan	Kyzylagach	State reserve	88.4	Protects and provides breeding area for winter and migratory birds (0.5–1 million species per year) and waterfowl	About 250 bird species in the reserve, including <i>Francolinus francolinus</i> , <i>Phoenicopterus ruber</i> , <i>Branta rufolis</i>	Global
Iran	Anzali wetland	Not officially protected	15.0	Feeding and resting station for breeding, migrating and wintering birds	Submerged vegetation includes species of duckweed ( <i>Lemna</i> ), pondweeds ( <i>Potamogeton</i> , <i>Elodea</i> ), milfoil ( <i>Myriophyllum</i> ), hornwort ( <i>Ceratophyllum</i> ) and arrowhead ( <i>Sagitaria</i> ), reed beds ( <i>Phragmites communis</i> and <i>Typhas</i> spp.), with rushes ( <i>Scirpus</i> spp. and <i>Cyperus</i> spp.), willow and alder ( <i>Salix</i> spp., <i>Alnus</i> spp.), grebe ( <i>Podiceps cristatus</i> ), black-necked grebe ( <i>P. nigricollis</i> ),	Ramsar site

					purple gallinule ( <i>Porphyrio porphyrio</i> ), herons ( <i>Ardeidae</i> ), rail ( <i>Rallidae</i> ), pygmy cormorant ( <i>Phalacrocorax pygmaeus</i> ), whiskered tern ( <i>Chlidonias hybrida</i> ), coot ( <i>Fulica atra</i> ), a few duck ( <i>Anatidae</i> ), swans ( <i>Cygnus</i> spp.)	
	Bandar-e-Kiashahr lagoon and the mouth of Sefid-rood River	Unprotected	0.5	Wintering area for waterfowl	Grebe ( <i>Podiceps</i> spp.), Dalmatian pelican ( <i>Pelecanus crispus</i> ), greater flamingo ( <i>Phoenicopterus ruber</i> ), herons ( <i>Ardeidae</i> ), greylag goose ( <i>Anser anser</i> ), shelduck ( <i>Tadorna tadorna</i> ), gulls ( <i>Laridae</i> ) and some waders ( <i>Limicolae</i> ). It is a breeding site for cormorant ( <i>Phalacrocorax carbo</i> ) and several species of heron ( <i>Ardeidae</i> )	Ramsar site
	Gorgan Bay, Lapoo-Zaghmarz Reservoirs	Nature reserve	40	Wintering station	Dalmatian pelican ( <i>Pelecanus crispus</i> ), greater flamingo ( <i>Phoenicopterus ruber</i> ), greylag goose ( <i>Anser anser</i> ), lesser white fronted goose ( <i>A. erythropus</i> ), swans ( <i>Cygnus</i> spp.), red-breasted merganser ( <i>Mergus serrator</i> )	Ramsar site

					and the rare white-headed duck ( <i>Oxyura leucocephala</i> ), heron ( <i>Ardeidae</i> ), pratincole ( <i>Glareola pratincola</i> ), Kentish plover ( <i>Charadrius alexandrinus</i> ), little tern ( <i>Sterna albifrons</i> ) and a large colony of whiskered tern ( <i>Chlidonias hybrida</i> )	
Kazakhstan	Ural delta	Most of the area is unprotected, only a small part (20 000 ha) is a wildlife reserve	60	Important wetland for migratory birds	Tall reed ( <i>Phragmites communis</i> ), glossy ibis ( <i>Plegadis falcinellus</i> ), spoonbill ( <i>Platalea leucorodia</i> ), small white egret ( <i>Egretta garzeta</i> ), the Egyptian ibis ( <i>Babulcus ibis</i> ), the yellow herons ( <i>Ardeola ralloides</i> ), sultan hen ( <i>Porphyrio porphyrio</i> ), the aquatic plant ( <i>Typha latifolia</i> ) and the willow ( <i>Salix silvestris</i> ), Caspian salmon ( <i>Salma trutta</i> ), Caspian seal ( <i>Phoca (Pusa) Caspica</i> )	
Russian Federation	Astrakhan Biospheric State Reserve	State reserve	66.8	Conserving and studying the development of natural processes and phenomena and the deltaic plant and animal gene pool, and	Flora survey revealed 278 species; white and French willows, dewberry, common reed ( <i>Phragmites australis</i> ), <i>Digraphis arundinacea</i> (L.) Trin., sedges ( <i>Carex</i> and <i>C.</i>	Ramsar site

				<p>developing scientific principles of nature protection</p>	<p><i>acutiformis</i> Ehrh.), Persian nightshade (<i>Solanum persicum</i>), lesser reedmace, simple bur-reed (<i>Sparganium simplex</i> Huds.), etc. About 230 bird species are observed in the reserve, including 84 nesting species, 105 migratory and wintering species and about 40 irregular transient species. The nesting birds are: mute swan, grey-leg goose, mallard, red-crested pochard, common, squacco, buff-backed and great white herons and little egret, night heron, spoonbill, glossy ibis and European cormorant. The Volga delta is a major area of massive accumulation of birds during seasonal migrations in the European continent: Dalmatian pelican, roseate pelican, spoonbill, glossy ibis, buff-backed heron, osprey, white-tailed eagle, little bustard, black-winged stilt, peregrine, golden eagle, Siberian crane, stone curlew, great bustard, black stork, flamingo,</p>	
--	--	--	--	--	---	--

					etc. There are 61 fish species belonging to 2 classes and 14 families. <i>Cyprinidae</i> : common carp, crucian carp, tench, bream, roach, rudd, white bream, asp, bleak and other fishes such as pike, wels, perch, pike-perch. Migratory fishes, the sturgeons (Russian sturgeon, great sturgeon, starred sturgeon, sterlet sturgeon) and herrings ( <i>Clupeidae</i> spp.)	
Turkmeni- stan	Khazar reservation (Krasnovodsk, north Cheleken bays)	Natural reserve	262	For genera with extinct species to maintain remaining species	280 species of birds, 40 species of mammals, 31 species of lizards and snakes, 2 species of amphibians, 20 species of fish, more than 400 species of higher plants	Ramsar sites

Source: CEP, 1998a

### 3.1.3 Red List species

Several countries (Azerbaijan, Kazakhstan, the Russian Federation and Turkmenistan) have Red Data Books describing endangered and rare species, including marine and coastal species (Table 6). Internationally, the Caspian species of sturgeon are listed as threatened by Fishbase (Froese and Pauly, 2001) and the Caspian seal is listed as vulnerable on the IUCN Red List.

Photo: Caspian seal at the seal haul-out site at Shakhova Kosa



Source: S. Wilson

Table 6: Number of rare and vanishing species from the Caspian Sea and its coastal zones, as listed in national Red Books

	Azerbaijan	Iran	Kazakhstan	Russian Federation	Turkmenistan
<b>Flora</b>	50		12	40	8
<b>Insects</b>			20		
<b>Amphibians</b>		17	0	0	
<b>Reptiles</b>			2	8	
<b>Birds</b>	2413	30	31	45	24
<b>Mammals</b>	14	8	5	18	2
<b>Fish</b>	6	3	5	5	4

Source: compiled by Vladimir Mamaev

### **3.2 Protection of marine resources by restrictions on fishing and hunting**

Until the collapse of the Soviet Union, management of the sturgeon fishery was handled by Iran and the Soviet Union. During this period, fishing was not allowed in the central parts of the sea in an attempt to ensure that younger fish would be able to return to the rivers to spawn. After the break-up of the Soviet Union the newly independent countries challenged the legal framework for the fishery and this created a difficult situation for the management of the sturgeon resources. One of the results is that poaching has become a major threat to the sturgeon populations in the Caspian Sea.

#### **Marine species protected in the Caspian Sea**

All Caspian sturgeon species are protected under CITES; the convention is not, however, in force in Turkmenistan (see Table 4). A quota system, introduced together with a temporary ban on pelagic fishing, does not appear to have been effective in reviving the dwindling sturgeon population. Restrictions on killing of the Caspian seal were introduced in the 1940s, and since 1970, annual killing has been 20 000 to 25 000 whitecoat and moulted pups a year. Illegal killing of seals is however known to occur.

### **3.3 Research projects and monitoring programmes**

Since the dissolution of the former Soviet Union, there has been little study of the biodiversity of the Caspian Sea. There is an urgent need for an ecological survey, in each of the five Caspian states, of the coastal and marine species and habitats, their uses, values and threats. Strategies are also urgently needed for the management of transboundary biodiversity issues, including threatened or endangered migratory species.

There are several small-scale research and monitoring projects in the countries of the former Soviet Union that border the sea. These projects are mainly supported by the oil companies and are focused primarily on very limited areas. For example, several research projects have been conducted in Iran during the past four years, covering subjects related to the conservation of Caspian biodiversity (CEP, 1998a).

- **Caspian Environment Programme (CEP)**

The CEP will address major issues related to the conservation of the unique biodiversity of the Caspian Sea. The regional biodiversity centre has developed a work plan, which was adopted at the first regional biodiversity working group meeting held in July 1999 in Kazakhstan. All the Caspian states have prepared national biodiversity reports, which describe the status of biodiversity in each of the coastal countries. The national reports will form the basis of a regional biodiversity assessment and biodiversity action plan. The biodiversity component of the CEP should contribute to the protection of regional biodiversity as well as the reinforcement of species and habitats of global significance. This component should result in comprehensive knowledge of the status of and threats to Caspian biodiversity, widely accessible biodiversity databases, agreed national and regional strategies for biodiversity protection and conservation, and identification of actions to mitigate threats from the introduction of alien species.



## Bibliography

- Aladin, N., 2001. *Biodiversity of the Caspian Sea*, CEP.
- Atamuradov, Kh.I. (ed.), 1999. *The Red Data Book of Turkmenistan*, Ashgabat, 360 pages.
- Aubrey, D.G., Glushko, T.A., Ivanov, V.A. et al., 1994. *North Caspian Basin: Environmental status and oil and gas operational issues*, Report for Mobil-oil, 650 pages.
- Aubrey, D.G., 1994. *Conservation of biological diversity of the Caspian Sea and its coastal zone. A proposal to the Global Environment Facility*, Report to GEF, 250 pages.
- CEP, 1998a. *National reports of the Caspian Sea countries (Azerbaijan, Iran, Kazakhstan, Russian Federation, Turkmenistan)*, Caspian Environment Programme.
- CEP, 1998b. *Caspian Sea transboundary diagnostic analysis*, preliminary draft outline, Caspian Environment Programme, 36 pages.
- Dumont, H., Wilson, S. and Wazniewicz, B. (eds), 1997. *Studies on the present status of marine biological resources of the Caspian Sea*, Proceedings from the First Bio-Network Workshop, Bordeaux, November 1997, 56 pages.
- Dumont, H.J., 1998. *The Caspian lake: History, biota, structure, and function*, Limnology and Oceanography, Vol. 43, No 1, pp. 44-52.
- Froese, R. and Pauly, D. (eds), 2001. *Fishbase*, electronic publication, [www.fishbase.org](http://www.fishbase.org) (9 April 2001).
- Glantz, M.H. and Zonn, I.S. (eds), 1997. *Scientific, environmental, and political issues in the circum-Caspian region*, Kluwer Academic Publishers, 350 pages.
- Ivanov, V.P., 1997. *The Caspian Sea fishery*, White Book, Astrakhan, 134 pages, in Russian.
- Ivanov, V.P., Vlasenko, A.D. and Khodorevskayu, R.P., 1995. *How to preserve sturgeons*, Rybnoe Khozyaistvo, No 2, pp. 26-30, in Russian.
- Kasymov, A.G. 1994. *Ecology of the Caspian Sea*, Baku, 146 pages, in Russian.
- Kosarev, A.N. and Yablonskaya, E.A., 1994. *The Caspian Sea*, SPB Academic Publishing, The Hague, 259 pages.
- Kovshar, A.F., (ed.), 1996. *The Red Data Book of the Republic of Kazakhstan*, Almaty, 325 pages.
- Kuksa, V.I., 1994. *The southern seas (Aral, Caspian, Azov and Black) under anthropogenic stress conditions*, Gidrometeoizdat, Sankt-Petersburg, pp. 74-150, in Russian.
- Mitrofanov, V.P., 2000. *Kazakhstan action plan, Conservation of Caspian Sea habitat*.

## **Internet addresses [URLs]**

(Last visited 2002)

Caspian Environment Programme (CEP): <http://www.caspianenvironment.org/>