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A Study on the Fishes of the Central Black Sea Coast of Turkey

Türkiye'nin Orta Karadeniz Kıyısı Balıkları Üzerine Bir Araştırma

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Abstract

As a result of eutrophication caused by increased nutrient input via major northwestern rivers during the last few decades, the Black Sea ecosystem has been subject to extreme changes in recent years. Abnormal changes due to altered nutrient balance were reflected in the qualitative and quantitative composition of phytoplankton, zooplankton and also ichthyofauna. The present study was carried out in the central Black Sea coast of Turkey to recognition of the current status of fish fauna. Fish specimens examined in this study were obtained from the shore and offshore of Sinop-Samsun coast between 1997 and 2004, collecting from the commercial catch of vessels at sea or by SCUBA. A total of 94 species belonging to 44 families were identified. *Acipenser persicus* is recorded for the first time from the central Black Sea of Turkey. Previous records of the species were confined to the eastern part of the Black Sea, it is occurrence at Turkish coast of the Black Sea extends its distribution range to the central Black Sea.

Key words: Black Sea , fish species, habitat, zoogeoraphical origin.

Introduction

The Black Sea, a nearly enclosed and isolated environment, has suffered from severe ecological changes since the 1970s. The Black Sea has historically been one of the most biologically productive regions in the world (Ivanov and Beverton, 1985; Mee, 1992). Although it has 168 species of fish (Zaitsev and Mamaev, 1997), there are only a few species of economic importance and the supply of fishes is limited because of intensive fishing, industrialisation and

urbanisation have caused fisheries the most favoured species to decline (Anon., 1989; Kideys, 1994). In addition to anthropogenic changes, the 1980s and the 1990s have also been characterized by dramatic variations in the regional climate (Oguz, 2005a,b). It is also believed that the accidental introduction of the predatory ctenophore *Mnemiopsis leidyi* to the Black Sea waters has been a major cause (Volovik, 2004). This species is native to estuaries in North America and believed to have been introduced in discharged ballast water from oil tankers. This comb-jelly feeds on plankton, including fish eggs and appears to have no known predators in the Black Sea. Populations of this species exploded in the late 1980s. However another ctenophore *Beroe ovata* have occurred in the Black Sea in October 1997. The species of *Beroe ovata* is highly specific in its feeding, so that even its larval stage feeds on *Mnemiopsis leidyi* (Finenko *et al.,* 2003 and 2005; Svetlichny *et al.,* 2004). Its reproductive rate and fecundity are almost as great as that of *M. leidyi*, so that its populations can grow at similar rates to its prey. *Beroe ovata* is probably not a potential food resource for the Black Sea fish. The appearance of the ctenophore *Beroe ovata*, may promote the recovery of the Black Sea ecosystem from the effects of the *Mnemiopsis leidyi* invasion (Hubareva *et al.,* 2004; Gordina *et al.,* 2005; Anninsky *et al.,* 2005). The pelagic community was the first to respond to these changes (Shiganova, 1998).

There are about 20.000 different living species of fish in the world and new species are being discovered every year. In the Black Sea investigations on the determination of fish fauna started in the late 1940's. The Black Sea fishes have different origins. Rass (1949) divided the Black Sea fish fauna into four main groups, based on their origins and ecologies. These are: a) freshwater species; b) brackish Ponto-Caspian relicts; c) cold-water species with Boreal-Atlantic origin; and d) warm-water species with Mediterranean origin. The last two groups (c and d) include the most widely spread and commercially important species in the Black Sea. Bilecenoglu *et al.* (2002) have recently published a checklist of the marine fish fauna of Turkey and report a total of 151 species are given in the Black Sea coast. However, a few data are available on the fishes of the Turkish

Black Sea coast (Slastenenko, 1955-1956; Aksiray, 1987; Bilecenoglu *et al.,* 2002; Can and Bilecenoğlu, 2005).

The different kind of fish fauna occupy a wide range of habitats characterized by differences in biotic and abiotic conditions such as the availability of food, presence of predators, new exotic species, temperature, salinity, oxygen concentrations, light intensity and various anthropogenic factors. Therefore it can be said that fish distributions can change over time and space and that fish fauna have specialized functional roles within marine ecosystems, or that distributions and functional roles change as fish grow. The Black Sea was the most important spawning area for all commercial fish species, including the predator species, which migrated for spawning or feeding from the Mediterranean.

The main purpose of this study is to present the list of the fish fauna in the shore and offshore of Sinop-Samsun of the Black Sea between 1997 and 2004.

Materials and Methods

Fish samples were collected from the commercial catch of bottom trawl, drift net, dredge and seines at sea in fishing season or by SCUBA dives and snorkelling into the depth of 20 meters in neritic waters of Sinop and Samsun vicinity, the southern Black Sea between January 1998 and February 2003 (Fig. 1). The samples were transferred to labelled jars and fixed with 70% ethanol or 4-6% formalin in sea water except large size fish and animals identified to the species level through Slastenenko (1955-1956), Fischer *et al.* (1987), Mater *et al.* (2003) and Can and Bilecenoğlu (2005). Specimens are conserved in the Hydrobiological Laboratory at the Faculty of Fisheries, Sinop. Large size fishes which did not fit into jar were only pictured for demonstration. *Acipenser* spp. are still kept alive in the tanks at Research Centre of Sinop Fisheries Faculty.

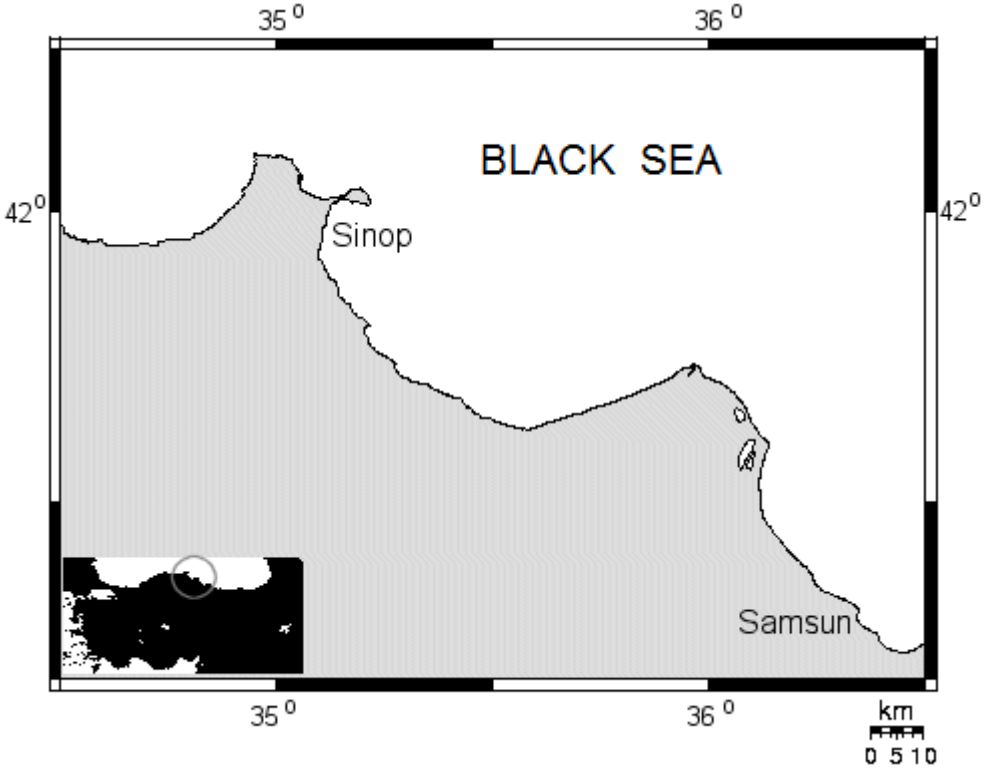

Figure 1. Sampling area

Results

The species determined are listed in Table 1. Our findings are not easily compared to previous local studies specific to Sinop marine ichthyofauna, except for preliminary results of Kara *et al.* (1994), who found a total of 24 fish species during trawling excursions carried out along the Sinop coast. In this study a total of 94 fish species belonging to 44 families were identified.

Table 1. The fishes of Sinop and Samsun coasts of the Black Sea. Status as per International Red Data Book: IUCN Red Data List;LR: Lower Risk; nt: Near Threatened; EN: Endangered; DD: Data Deficient. Zoogeoraphical origin: A-M- Atlanto Mediterranean, C- Cosmopolitan, P-C- Ponto Caspia, E- Endemic, I-P- Indo-Pasific. Habitat: Mu-muddy, S- sandy, R- rocky, V-vegetation, G-Gravel, Bp- benthopelagic, Bd- Bathydemersal, P-pelagic, D- Demersal, M- Marine, O- Oceanodromous, C- Catadromus, A- Anadromous, Amp- Amphidromous, Br- Brackish, Fw-Freshwater, Nm- Nonmigratory, Ra- Reef-associated

Species	Family	Status as per International Red Data Book.	Habitat	Zoogeographical Origin
Squalus acanthias Linnaeus, 1758	Squalidae	LR/nt	Mu,Bp,O,Br,M	A-M
Squalus blainville (Risso, 1827)	Squalidae	LR/nt	S-Mu,D,Br,M	A-M
Raja clavata Linnaeus, 1758	Rajidae	LR/nt	S-Mu,D,M	A-M
Dasyatis pastinaca (Linnaeus, 1758)	Dasyatidae	not in the list	S-Mu,D,Br,M	A-M
Acipencer stellatus Palas, 1771	Acipenseridae	EN	S-Mu,D,A,Fw,Br,M	P-C
Acipencer nudiventris Lovetzky,1828	Acipenseridae	EN	S-Mu,D,A,Fw,Br,M	P-C
Acipencer persicus Borodin,1897	Acipenseridae	EN	S-Mu,D,A,Fw,Br,M	P-C
Acipencer gueldenstaedtii Brandt & Ratzeberg, 1833	Acipenseridae	EN	S-Mu,D,A,Fw,Br,M	P-C
Huso huso (Linnaeus,1758)	Acipenseridae	EN	D,A,Fw,Br,M	P-C
Anguilla anguilla (Linnaeus, 1758)	Anguillidae	not in the list	S-Mu,D,C,Fw,Br,M	A-M
Conger conger (Linnaeus,1758)	Congridae	not in the list	S-R,D,O,M	A-M
Alosa fallax nilotica (Geoffroy St.-Hilaire, 1808)	Clupeidae	not in the list	Bp,A,Fw	A-M
Alosa tanaica (Grimm, 1901)	Clupeidae	not in the list	P,A,Fw,Br,M	P-C

Table 1 (Continued)

Species	Family	Status as per International Red Data Book.	Habitat	Zoogeographical Origin
Alosa caspia bulgarica Drensky, 1934	Clupeidae	DD	P,A,Fw,Br,M	P-C
Alosa pontica Eichwald, 1838	Clupeidae	DD	P,A,Fw,Br,M	P-C
Sardina pilchardus (Walbaum, 1792)	Clupeidae	not in the list	P,O,Fw,Br,M	A-M
Sprattus sprattus phalericus (Risso, 1827)	Clupeidae	not in the list	P,O,Br,M	E
Engraulis encrasicolus ponticus Aleksandrov, 1927	Engraulidae	not in the list	P,O,Br,M	E
Salmo trutta labrax Pallas, 1814	Salmonidae	*	D,A	E
Merlangius merlangus euxinus (Nordmann, 1840)	Gadidae	no information	S-Mu,Bp,O,M	A-M
Gaidropsarus mediterraneus (Linnaeus, 1758)	Lotidae	not in the list	R,D,O	A-M
Ophidion rochei Müller, 1845	Ophidiidae	not in the list	S-Mu	A-M
Diplecogaster bimaculata euxinica Murgoci, 1964	Gobiesocidae	not in the list	R,D,M	A-M
Lepadogaster candollei Risso, 1810	Gobiesocidae	not in the list	R,D,M	A-M
Atherina boyeri Risso, 1810	Atherinidae	DD	D,Amp	A-M
Atherina hepsetus Linnaeus, 1758	Atherinidae	not in the list	P,Br,M	A-M
Aphanius fasciatus (Valenciennes, 1821)	Cyprinidontidae	DD	D,Nm,Fw,Br,M	E
Belone belone (Linnaeus, 1761)	Belonidae	not in the list	P,O,Br,M	A-M
Gasterosteus aculeatus Linnaeus, 1758	Gasterosteidae	no information	Bp,A,Fw,Br,M	E

Table 1 (Continued)

Species	Family	Status as per International Red Data Book.	Habitat	Zoogeographical Origin
Syngnathus abaster Risso, 1827	Syngnathidae	DD	S-Mu-V,D,Amp,Fw,Br,M	A-M
Syngnathus acus Linnaeus, 1758	Syngnathidae	not in the list	S-Mu-V,D,Br,M	A-M
Hippocampus hippocampus (Linnaeus, 1758)	Syngnathidae	DD	V,D,Nm,M	A-M
Scorpaena porcus Linnaeus, 1758	Scorpaenidae	not in the list	R-V,D,Nm,M	A-M
Chelidonichthys lucerna Linnaeus, 1758	Triglidae	not in the list	S-Mu-G,D,M	A-M
Dicentrarchus labrax (Linnaeus, 1758)	Moronidae	not in the list	D,O,Fw,Br,M	A-M
Serranus cabrilla (Linnaeus, 1758)	Serranidae	not in the list	S-Mu-R-V,D,M	A-M
Serranus scriba (Linnaeus, 1758)	Serranidae	not in the list	R-V,D,M	A-M
Pomatomus saltatrix (Linnaeus,1766)	Pomatomidae	not in the list	P,O,Br,M	A-M
Trachurus trachurus (Linnaeus, 1758)	Carangidae	not in the list	P,O	A-M
Trachurus mediterraneus ponticus (Aleev, 1956)	Carangidae	not in the list	P,O,Br,M	A-M
Boops boops (Linnaeus, 1758)	Sparidae	not in the list	D,O,M	A-M
Dentex dentex (Linnaeus, 1758)	Sparidae	not in the list	R,Bp,M	A-M
Diplodus annularis (Linnaeus, 1758)	Sparidae	not in the list	S-V-R,Bp,Br,M	A-M
Diplodus puntazzo (Cetti, 1777)	Sparidae	not in the list	R,Bp,O,Br,M	A-M
Diplodus sargus (Linnaeus, 1758)	Sparidae	not in the list	R-S,D,O,Br,M	A-M

Table 1 (Continued)

Species	Family	Status as per International Red Data Book.	Habitat	Zoogeographical Origin
Diplodus vulgaris (Geoffrey Saint-Hilaire)	Sparidae	not in the list	R-S-V,Bp,O,M	A-M
Oblada melanura (Linnaeus, 1758)	Sparidae	not in the list	R-V,Bp,O,M	A-M
Sarpa salpa (Linnaeus, 1758)	Sparidae	not in the list	R-V,Bp,O,M	A-M
Sparus aurata Linnaeus, 1758	Sparidae	not in the list	S-V,D,Fw,Br,M	A-M
Spondyliosoma cantharus (Linnaeus, 1758)	Sparidae	not in the list	R-S-V,Bp,O,M	A-M
Spicara maena (Linnaeus, 1758)	Centracanthidae	not in the list	S-Mu,P,M	A-M
Spicara smaris (Linnaeus, 1758)	Centracanthidae	not in the list	Mu-V,P,M	A-M
Sciaena umbra Linnaeus, 1758	Sciaenidae	not in the list	R-S,D,Br,M	A-M
Umbrina cirrosa (Linnaeus, 1758)	Sciaenidae	not in the list	R-S,D,Br,M	A-M
Mullus barbatus ponticus Essipov, 1927	Mullidae	not in the list	Mu-S,D,M	C
Mullus surmuletus Linnaeus, 1758	Mullidae	not in the list	S-R,D,O	E
Mugil cephalus Linnaeus, 1758	Mugilidae	not in the list	Bp,C,Fw,Br,M	A-M
Mugil soiuy Basilewsky, 1855	Mugilidae	not in the list	D,C,Fw,Br,M	I-P
Liza aurata (Risso, 1810)	Mugilidae	not in the list	P,C,Br,M	A-M
Liza saliens (Risso, 1810)	Mugilidae	not in the list	P,C,Br,M	A-M
Chromis chromis (Linnaeus, 1758)	Pomacentridae	not in the list	R,Ra,Nm,M	A-M
Labrus viridis Linnaeus, 1758	Labridae	not in the list	R-V,Ra,M	A-M
Symphodus cinereus (Bonnaterre, 1788)	Labridae	not in the list	S-R-V,D,Br,M	A-M

Table 1 (Continued)

Species	Family	Status as per International Red Data Book.	Habitat	Zoogeographical Origin
Symphodus ocellatus (Forsskal, 1775)	Labridae	not in the list	R-V,Ra,M	A-M
Symphodus roissali (Risso, 1810)	Labridae	not in the list	R-V,Ra,Br,M	A-M
Symphodus tinca (Linnaeus, 1758)	Labridae	not in the list	R-V,Ra,Br,M	A-M
Gymnammodytes cicerelus (Rafinesque, 1810)	Ammodytidae	not in the list	S,D,M	A-M
Trachinus draco Linnaeus, 1758	Trachinidae	not in the list	Mu-S,D,M	A-M
Uranoscopus scaber Linnaeus, 1758	Uranoscopidae	not in the list	Mu-S,D,M	A-M
Tripterygion tripteronotus (Risso, 1810)	Tripterygiidae	not in the list	R-V,,D,Nm,M	A-M
Blennius ocellaris Linnaeus, 1758	Blenniidae	not in the list	D,M	A-M
Coryphoblennius galerita (Linnaeus, 1758)	Blenniidae	not in the list	R-V,D,M	A-M
Parablennius tentacularis (Brünnich, 1768)	Blenniidae	not in the list	S-R-V,D,Br,M	A-M
Parablennius sanguinolentus (Pallas, 1814)	Blenniidae	not in the list	V-R,D,Nm,M	A-M
Callionymus lyra Linnaeus, 1758	Callionymidae	not in the list	Mu-S,D,M	A-M
Callionymus fasciatus Valenciennes, 1837	Callionymidae	not in the list	Mu-S,D,M	A-M
Callionymus pusillus Delaroche, 1809	Callionymidae	not in the list	Mu-S,D,M	A-M
Gobius niger Linnaeus, 1758	Gobiidae	not in the list	Mu-S,D,Br,M	A-M
Gobius cobitis Pallas, 1811	Gobiidae	not in the list	R,D,O,Br,M	A-M
Gobius bucchichi Steindachner, 1868	Gobiidae	not in the list	Mu-S,D,M	A-M

Table 1 (Continued)

Species	Family	Status as per International Red Data Book.	Habitat	Zoogeographical Origin
Gobius paganellus Linnaeus, 1758	Gobiidae	not in the list	R-V,D,O,Fw,Br,M	A-M
Mesogobius batrachocephalus (Pallas, 1814)	Gobiidae	DD	Mu-S,D,Br,M	A-M
Neogobius melanostomus Pallas, 1814	Gobiidae	DD	Mu-G-S,D,Fw,Br,M	A-M
Zosterisessor ophiocephalus (Pallas, 1814)	Gobiidae	DD	Mu-V,D,O,Br,M	A-M
Scomber scombrus Linnaeus, 1758	Scombridae	not in the list	P,O,Br,M	C
Scomber japonicus Houttuyn, 1782	Scombridae	not in the list	P,O,M	C
Sarda sarda (Bloch, 1793)	Scombridae	not in the list	P,O,Br,M	C
Psetta maxima (Linnaeus, 1758)	Scopthalmidae	not in the list	Mu-S,D,O,Br,M	A-M
Scophthalmus rhombus (Linnaeus, 1758)	Scopthalmidae	not in the list	Mu-S,D,O,M	A-M
Arnoglossus laterna (Walbaum, 1792)	Bothidae	not in the list	Mu-S,D,M	A-M
Platichthys flesus luscus (Pallas, 1811)	Pleuronectidae	not in the list	Mu-S,D,Ca,F,B,M	A-M
Solea lascaris (Risso, 1810)	Soleidae	not in the list	Mu-S,D,Br,M	A-M
Solea solea (Linnaeus, 1758)	Soleidae	not in the list	Mu-S,D,O	A-M
Lophius piscatorius Linnaeus, 1758	Lophidae	not in the list	Mu-S,Bd,M	A-M

*= Status as per National Red Data Books. Turkey- EN

Concerning their zoogeographical origin, ichthyofauna of the Black Sea is dominated by Atlanto-Mediterranean species (79.8%) followed by Ponto-Caspia species (8.5%), endemic species (6.4%), cosmopolitan species (4.3%) and Indo-Pasific species (1%).

According to Dekhnik (1973) ichthyoplankton of the Black Sea comprised a total of 56 fish species: 28 fish species producing pelagic eggs and larvae with another 28 species having pelagic larvae only. Gordina *et al.* (1998) observed eggs of 28 and larvae of 44 fish species in the Black Sea during the period of 1986-1996.

Shiganova (1998) pointed out that the Black Sea has been the target of oppurtunistic invasions by temperate and subtropical animals and plants. Introduction of harmful exotic species that are dangerous for the ecosystem (Zaitsev and Öztürk, 2001). Of 26 exotic species now occuring in the Black Sea, six have had significant impact on its ecology. One of this species is the fish *Mugil soiuy* (Shiganova, 1998). The haarder *Mugil soiuy* was brought from the Sea of Japan for acclimatisation to the Black Sea in 1990 (Zaitsev and Mamaev, 1997). Eggs of the far-eastern grey mullet *Mugil soiuy* were also found in the Black Sea (Gordina *et al*., 1998). This finding proved that this species now spawns along the Ukranian, Russian, Georgian and Turkish coasts. During the study *Mugil soiuy* was caught by the commercial catch of vessels at the shore of Sinop.

Two fish species (*Diplecogaster bimaculata euxinica* and *Coryphoblennius galerita*) were collected from Sinop coasts, which were previously not recorded from the central Black Sea coasts of Turkey (Bat *et al.,* in press).

During the present survey, *Lophius piscatorius* were observed in Akliman of Sinop coast in 2003 and 2004. It is a very rare species and occurs on sandy and muddy bottoms in Akliman. Although fishers do not target this species, which are of commercial importance and are caught using trawlers by small local fisheries.

Five species of Acipenseriformes (*Huso huso, Acipenser sturio*, *Acipenser stellatus, Acipenser gueldenstaedti*; *Acipenser nudiventris*) are native to the Turkish waters of the Black Sea and to the river systems (Kızılırmak, Yeşilırmak, Sakarya, Çoruh and their estuaries).

The southeastern coast of the Black Sea is an important feeding and wintering area for five sturgeon species (Zarkua and Tsuladze, 1999). The CITES Management Authority of Turkey question the occurrence of *A. persicus* in Turkey (*in litt*. to TRAFFIC International, 11 November 2001 cited in Anon., 2002). All sturgeon species are under strict protection, fishing, domestic and international trade is banned in Turkey. Currently there is little reliable data which would allow estimation the status of stocks sturgeon species occurring in the Black Sea of Turkey. However, no detailed information is available on *Acipenser persicus* in the Black Sea coast of Turkey and the species is recorded for the first time from Sinop coasts.

Acipenser persicus is distributed mainly in the Caspian watershed. The name "persicus" obviously was chosen because of the frequent occurrence of this sturgeon in the southern Caspian Sea, along the shores of Iran (Persia). *Acipenser persicus* was first described as a valid species from the Ural River by Borodin in 1897. However, Berg (1933 cited in Holcik, 1989) reduced it to a subspecies of the Russian sturgeon with the name *Acipenser güldenstädti persicus* and reported its main range to be in the Kura and Sefid-Rud-Rivers.

Acipenser persicus enters mainly Kura, Volga and Ural Rivers to spawn and less frequently other rivers, including the Terek, Sulak and Samur. Investigations by Artyukhin and Zarkua (1986) have revealed the presence of *Acipenser persicus* in the Black Sea. Specimens were obtained from the Rioni River watershed in the Caukasus. These findings extend the range of the species to the eastern part of the Black Sea, Caucasian mountain rivers and possibly also the locations along the Anatolian Coast (Holcik, 1989). Artyukhin and Zarkua (1986) described two subspecies within *A. persicus*: the population inhabiting the Caspian Sea they named as *A. persicus persicus* Borodin, 1897, and the population inhabiting the Black Sea, as *A. persicus colchicus* Marti, 1940. Although some Russian authors follow this nomenclature, additional support from genetic and molecular data is desirable (Birstein *et al.*,1997).

It can be seen that many human-related factors in the Black Sea are affecting fish fauna distributions and therefore the biodiversity and functionality of local fish fauna. These factors include overfishing,

eutrophication and structural changes to fish habitats. It means that the biodiversity of present and future fish species is changing. Moreover, the most positive changes were recorded in the Black Sea after the invasion of *Beroe*, which apparently restructured the food web. There is a chance that the ecosystem will recover further if *Beroe* persists. For a detailed understanding of the fish fauna, taxonomic studies are required periodically.

Özet

Son çeyrek yüzyılda, özellikle Kuzeybatısındaki büyük nehirlerin taşıdığı besin tuzları konsantrasyonunun artması sonucu, Karadeniz ekosistemi çok köklü değişimlere uğramıştır. Besin tuzu dengesinin bozulması sonucu meydana gelen anormal değişimler, önce fitoplankton ve zooplankton daha sonra da ihtiyoplanktonun kalite ve miktarında yansıtılmıştır. Bu çalışma Türkiye'nin orta Karadeniz bölgesinde balık türlerinin mevcut durumunun belirlenmesi için sürdürülmüştür. Bu çalışmada incelenen balık türleri, 1997-2004 yılları arasında Sinop Samsun kıyıları ve açıklarından, ticari balıkçı tekneleri veya dalınarak elde edilmiştir. 44 familyaya ait toplam 94 tür saptanmıştır. *Acipenser persicus* Türkiye'nin orta Karadeniz kıyıları için yeni kayıttır. Bu türün önceki kaydı Karadeniz'in doğusu ile sınırlı olup bu çalışma ile orta Karadeniz'e kadar dağılım gösterdiği gözlenmiştir.

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