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# MERSİN-ADANA-GAZİANTEP HIGH STANDARD RAILWAY PROJECT

## HYDROBIOLOGICAL STUDIES REPORT

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NOVEMBER 2021

ANKARA

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# MERSİN-ADANA-GAZİANTEP HIGH STANDARD RAILWAY PROJECT

## HYDROBIOLOGICAL STUDIES REPORT

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## 1. SCOPE OF STUDIES

At the aquatic sampling points where Mersin-Adana-Gaziantep High Standard Railway Project Line will pass, sampling and habitat assessments of fish, benthic organisms, zooplanktonic organisms, algae were made. As a result of the studies, the presence of the species belonging to all groups according to the basins, their general abundance, endemism and conservation status were also evaluated. In addition, habitat descriptions were made by defining the general ecological characteristics of aquatic environments.

Phytoplanktonic organisms, zooplanktonic organisms, benthic invertebrates and fish form the links of the food chain in wetland ecosystems. All of these aquatic organisms were sampled at 16 aquatic sampling points located in three different river basins along the line.

During the construction of the Mersin-Adana-Gaziantep High Standard Railway Project Line, it may cause some effects on the aquatic ecosystem in the areas where aquatic ecosystem transitions will be made. It is important to know the reactions of aquatic organisms that will be exposed to these effects and the precautions to be taken. For this purpose, all aquatic organisms at the determined stations were examined and the effects and precautions to be taken were given.

Within the scope of Mersin-Adana-Gaziantep High Standard Railway Project, the effects on aquatic ecosystems in the sections where the route passes will be evaluated. Impacts that may occur on aquatic habitats in the area where the line passes will be identified and precautions will be given. Accordingly, the following studies were carried out within the scope of aquatic studies.

- Habitat assessment of the aquatic stations where the train line passes were made according to EUNIS.
- Sampling and laboratory studies were carried out for algae, zooplanktonic organisms, benthic organisms and fish species from aquatic stations.
- Protected areas in the regions and impact areas where the line passes were determined and the effects of the project on these areas will be evaluated.
- National and international protection status and endemism status of the species were stated.

The effects of the project on aquatic environments were defined and the measures to be taken will be given.

## 2. MATERIALS AND METHOD

### 2.1 Research Period

Sampling studies for aquatic organisms were carried out between 14 - 16 October, 2021 at 16 different stations (river/stream), located along the Mersin-Adana-Gaziantep High Standard Train axis.

### 2.2 Sampling Areas

Sampling and observation studies were carried out in all aquatic stations. Sampling areas were selected considering some ecological characteristics such as drainage area size, flow rate and riparian areas. All aquatic stations where the line passes are composed of flowing water environments and there is no stagnant water ecosystem within the stations.

There are 25 different river basins in Turkey and the MAG route passes through three of these river basins. Within the scope of this study, studies were carried out at 16 different aquatic sampling stations from three different basins (Figure 1). Accordingly, four of the aquatic sampling stations started from Mersin (1st-4th aquatic stations) are located in the East Mediterranean Basin (Figure 2). Three of the stations (5th-7th aquatic stations) are located in the Seyhan River Basin (Figure 3). Finally, 9 stations (8th-16th aquatic stations) were determined in the Ceyhan River Basin (Figure 4).

The aquatic sampling stations and their coordinates examined along the Mersin-Adana-Gaziantep High Standard Railway Project route are given in Table 2-1, Figure 2-1, Figure 2-2, Figure 2-3 and Figure 2-4.

**Table 2-1.** Aquatic Sampling Points for Mersin-Adana-Gaziantep High Standard Railway Project

| STATIONS   | COORDINATES (36 S, 37 S) | HABİTAT       | BASIN              |
|------------|--------------------------|---------------|--------------------|
| Aquatic_1  | 651728.55 D 4078838.22 K | Running Water | East Mediterranean |
| Aquatic_2  | 662494.98 D 4083840.59 K | Running Water | East Mediterranean |
| Aquatic_3  | 668610.99 D 4089355.47 K | Running Water | East Mediterranean |
| Aquatic_4  | 674531.43 D 4090697.69 K | Running Water | East Mediterranean |
| Aquatic_5  | 689707.78 D 4095656.76 K | Running Water | Seyhan River       |
| Aquatic_6  | 707804.07 D 4098186.90 K | Running Water | Seyhan River       |
| Aquatic_7  | 726383.56 D 4094737.39 K | Running Water | Seyhan River       |
| Aquatic_8  | 740842.93 D 4097587.13 K | Running Water | Ceyhan River       |
| Aquatic_9  | 233389.72 D 4106112.05 K | Running Water | Ceyhan River       |
| Aquatic_10 | 245248.05 D 4106505.22 K | Running Water | Ceyhan River       |
| Aquatic_11 | 260634.37 D 4112545.26 K | Running Water | Ceyhan River       |
| Aquatic_12 | 263265.48 D 4122086.99 K | Running Water | Ceyhan River       |
| Aquatic_13 | 265516.89 D 4123208.2 K  | Running Water | Ceyhan River       |
| Aquatic_14 | 272588.36 D 4122649.7 K  | Running Water | Ceyhan River       |
| Aquatic_15 | 277435.76 D 4117583.13 K | Running Water | Ceyhan River       |
| Aquatic_16 | 308572.05D 4116525.32 K  | Running Water | Ceyhan River       |

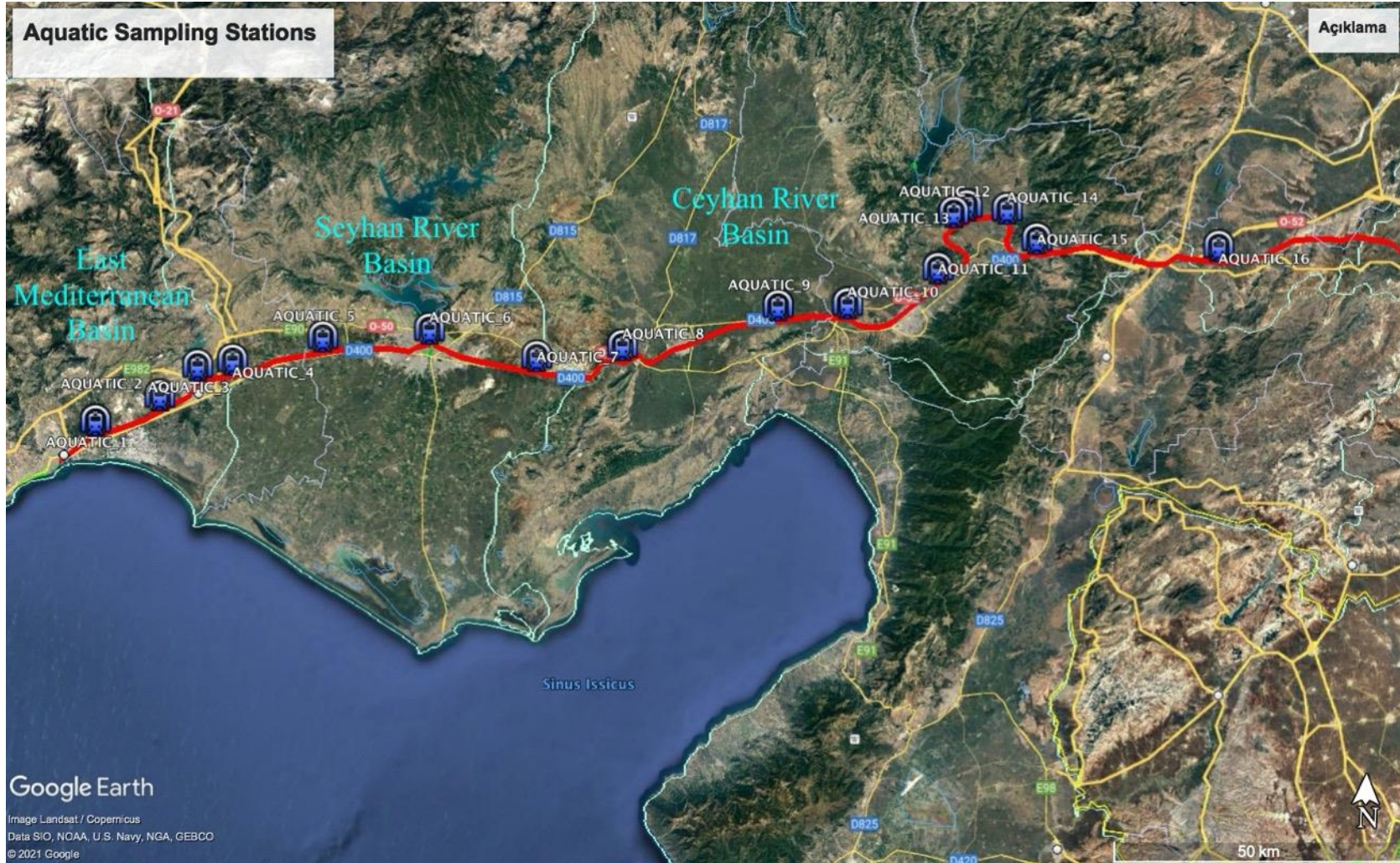


**Figure 2-1.** Aquatic Stations and River Basins

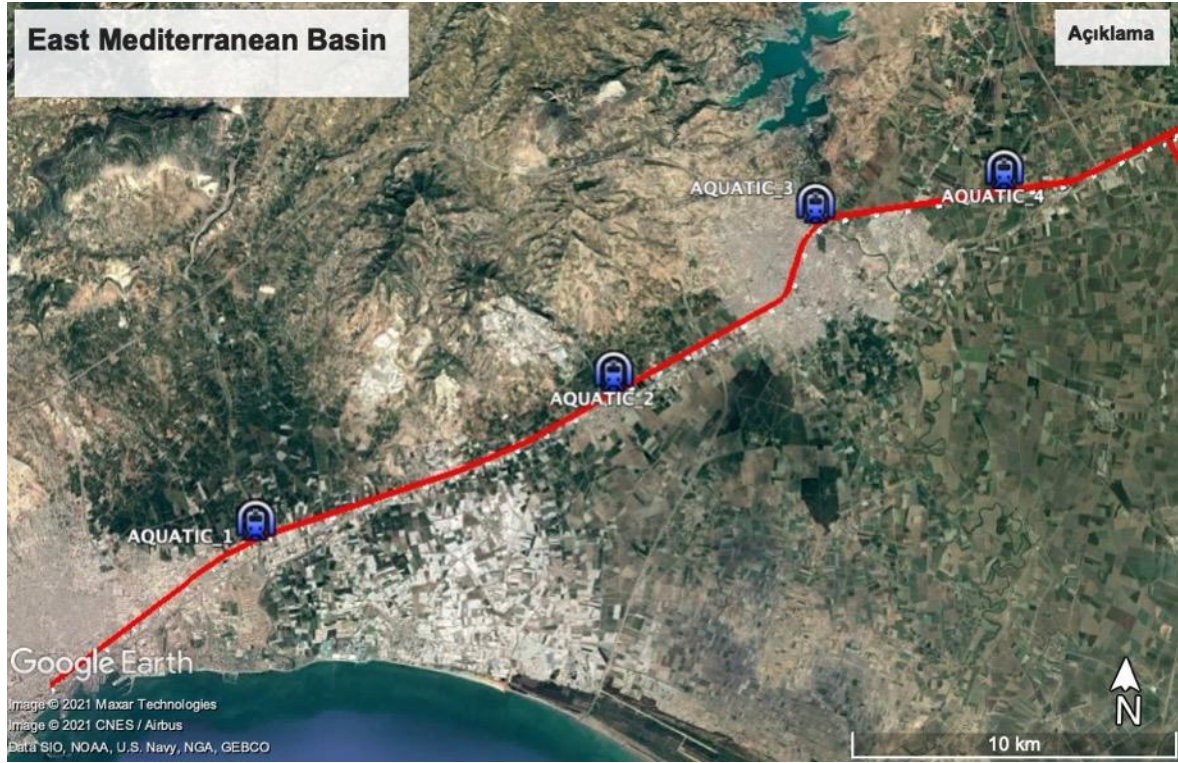


**Figure 2-2.** East Mediterranean Basin Stations



**Figure 2-3.** Seyhan River Basin Stations



**Figure 2-4.** Ceyhan River Basin Stations

## 2.3 Sampling of Aquatic Organisms

### 2.3.1 Aquatic Habitat Assessment

The assessment of habitat quality of aquatic environment is based on the important physical characteristics of the water body and the surrounding terrains, particularly the catchment areas of the investigated site. All habitat parameters evaluated are related to the use of aquatic life and are a potential source of limitation of the aquatic environments. EUNIS habitat codes of aquatic stations were given.

The matrix used for the assessment of habitat quality of aquatic environments is based on the important physical characteristics of the water body and the surrounding terrain, particularly the catchment area of the investigated site. All habitat parameters evaluated are related to the use of aquatic life and are a potential source of limitation of the aquatic environment. The parameters used in habitat assessments mainly consist of epifauna substrate and its properties, velocity and depth conditions, sedimentation, stream bed width and occupancy conditions, stability of the riparian zone and cover condition. -

Tables with introductory information and habitat assessments of the stations studied are given in Appendix-1.

### 2.3.2 Planktonic Studies (Phytoplankton and Zooplankton) and Attached Algae

In order to identify phytoplanktonic and zooplanktonic organisms, a plankton net with a pore size of 55 µm, a diameter of 20 cm and a length of 50 cm was used. The plankton net was kept horizontally in the direction of the flow rate of the water for 5 minutes and the samples were taken into 250 cc plastic bottle. In addition, since freshwater algae occupy very different habitats in aquatic environments (on plants and Stones, depending on the sediment at the bottom), samples were taken by scraping the surfaces of the plants, stones and sediments. Planktonic samples were fixed by buffering with 4% formaldehyde (Türk Standartları Enstitüsü, 1991; European Committee for Standardization, 2004; 2010; EPA, 2016)

Temporary preparations of freshwater algae other than diatoms were prepared from the samples brought to the laboratory and their identification was made under the microscope.

Permanent slides are prepared only for the identification of diatom species. Accordingly, acid boiling method was used in order to clearly see structures such as raphe and stria used in the identification of diatoms (Round, 1973).

The following literature was used in the diagnosis of algae; Krammer and Lange-Bertalot, 1986; 1988; 1991a; 1991b; Bold and Wynne, 1985; Czernecki and Blen, 1982; Foged, 1981, 1982; Germain 1981; Hustedt, 1930; Patrick and Reimer, 1966; Sreenivasa and Duthie, 1973; Van Heurck, 1962; Cox, 1996; Huber Pestalozzi, 1938; 1941; 1955; 1961; 1968; 1982; Prescott, 1975, Komarek, 1983).

For the recognition of zooplanktonic organisms, two types of preparations, temporary and permanent, were prepared.

In the diagnosis of Rotifera species, Hutchinson (1967); Pejler (1962); Kuttikova (1970); Kolisko (1974); Koste (1978a; 1978b); Ridder (1981) resources were used. For Cladocera and Copepoda, the reference to Kiefer (1978) was used. In addition, the distribution areas of the identified species were also controlled according to Illies (1978).

### 2.3.3 Benthic Invertebrates

Benthic invertebrate specimens were collected at the study sites by dredging the stream bed with a Kick net bottom scoop for five minutes. The samples collected, were stored in 80% alcohol, and were examined and identified with a binocular microscope in the laboratory (NC Department of Environmental Quality. 2016).

The literatures used for diagnosis are as follows; Sennika, 1943; Mann, 1962; Needham and Needham, 1962; Macan, 1982; Quigley, 1977; Pennak, 1978; Illies, 1978; Elliot and Mann, 1979; Biro, 1981; Edington, 1981; Bellman, 1988; Gloer, 1992; Ludwig, 1993.

### 2.3.4 Fishes

Fish samples were made using electro-shockers in the stations within the scope of the High Standart Train project (see. Figure 2-5 and Figure 2-6) (European Committee for Standardization, 2003; 2004).



**Figure 2-5.** SAMUS 725 MP Electro shocker



**Figure 2-6.** Fish Sampling Using Electro-Shocker (Aquatic\_3. Station)

### 3. FINDINGS

#### 3.1 Habitat Assessment of Aquatic Sampling Points

Aquatic habitat assessments were made in the regions where the High Standart Train Line will cross rivers, streams and streams. The downstream and upstream of each sampling point were considered.

Within the scope of evaluation of habitat quality; Important physical characteristics such as the water body and the surrounding land, the catchment area of the investigated area and the bottom of the stream/creek/river are evaluated. The characteristics of the habitat are directly related to the aquatic organisms. These physical factors significantly affect the presence and density of aquatic organisms.

While making habitat assessments; existing cover, burial characteristics of ground stones, substrate properties of stagnant water environments, velocity, depth, structure of stagnant water environments, sedimentation, river/Stream bed occupancy, river bed variability, geomorphological condition of the river bed, stability of river banks, vegetation cover of river banks parameters are taken into account.

Stations with water at 16 crossing points selected along the Train Line route were taken into consideration. Accordingly, in the October 2021 sampling period, it was determined that five stations were completely dry and the other 11 stations contained water. In addition, it was determined that 3 of the stations with water were irrigation channels and this situation was taken into account in the habitat evaluations (Table 2).

Accordingly, the water flow rates in the Seyhan and Ceyhan Rivers were observed to be high during the sampling period. It has been determined that the water levels in the stations that are channels (stations 2, 5, 10) also have very high water currents due to the irrigation period. However, due to seasonal creeks at 1 point in Seyhan Basin (7th Station) and 4 points (12th, 13th, 14th and 16th stations) in Ceyhan Basin, no water was found and it was determined that they were completely dry. In the remaining 8 stations, the presence of low and moderate flowing water environments was observed depending on seasonal conditions (see. Table 3-1).

Detailed evaluations of the aquatic sampling stations described above are given in Appendix-1.

**Table 3-1.** Water availability at the stations during the sampling period

| Sampling Points | Flow Rate in October 2021 Sampling Period |          |        |          |
|-----------------|-------------------------------------------|----------|--------|----------|
|                 | High                                      | Moderate | Little | No water |
| Aquatic_1       |                                           |          | *      |          |
| Aquatic_2       | * (channel)                               |          |        |          |
| Aquatic_3       |                                           | *        |        |          |
| Aquatic_4       |                                           | *        |        |          |
| Aquatic_5       | * (channel)                               |          |        |          |
| Aquatic_6       | *                                         |          |        |          |
| Aquatic_7       |                                           |          |        | *        |
| Aquatic_8       | *                                         |          |        |          |
| Aquatic_9       |                                           | *        |        |          |
| Aquatic_10      | * (channel)                               |          |        |          |
| Aquatic_11      |                                           | *        |        |          |
| Aquatic_12      |                                           |          |        | *        |
| Aquatic_13      |                                           |          |        | *        |
| Aquatic_14      |                                           |          |        | *        |
| Aquatic_15      |                                           |          | *      |          |
| Aquatic_16      |                                           |          |        | *        |

### 3.2. Freshwater Algae

Algae are primary producers in the aquatic environment. Thanks to the pigments in their structure, they convert carbon dioxide and water into carbohydrates with the effect of light, thus increasing the nutritional value and dissolved oxygen ratio in the aquatic environment. As a result, they form the first link of the food chain by ensuring their own development. In this way, they are important in terms of their contribution to production and being the food source of the organisms at the upper level of the food chain.

Especially benthic algae can be used as indicator organisms in water quality assessment studies.

- Since benthic algae are autotrophs, they have a very important place in the aquatic ecosystem. This is a critical chain in the aquatic ecosystem, and disruptions in this chain can profoundly affect the rest of the aquatic communities.
- Because benthic algae are sessile, they cannot escape potential contamination by migration or other means. They either tolerate the abiotic (environmental) factors that surround them or die.
- Algae communities generally have relatively rich species diversity compared to other aquatic groups. Each species has its own unique tolerance and preferences for environmental factors. Thus, the whole association offers a wealth of information for environmental indicators.

- Algae have a relatively short life cycle. The cells of some species can divide two or more times a day, so they can respond more quickly to changes in environmental conditions. Existing benthic algae communities are often representative of current environmental conditions, as they are among the organisms that first respond to environmental stress.

Considering all of the sampling stations, a total of 258 algal species were identified. Among these, the most dominant group in terms of diversity and density was the Bacillariophyta division. A total of 131 taxa belonging to this group, 69 taxa belonging to Chlorophyta, 38 belonging to Cyanobacteria, 8 belonging to Miozoa and 14 taxa belonging to Euglenozoa were identified (see. Appendix-2)

In terms of species diversity of algae, a total of 129 algae taxa are represented in the stations in the East Mediterranean basin, 199 in the Seyhan River Basin and 185 in the Ceyhan River Basin (see. Table 3-2).

**Table 3-2.** Number of Algae Species by Basin and Divizio

|                        | EAST MEDITERRANEAN BASIN | SEYHAN RIVER BASIN | CEYHAN RIVER BASIN |
|------------------------|--------------------------|--------------------|--------------------|
| <b>BACILLARIOPHYTA</b> | 64                       | 95                 | 103                |
| <b>CHLOROPHYTA</b>     | 40                       | 53                 | 42                 |
| <b>CYANOBACTERIA</b>   | 17                       | 32                 | 27                 |
| <b>MIOZOA</b>          | 5                        | 12                 | 9                  |
| <b>EUGLENOZOA</b>      | 3                        | 6                  | 4                  |
| <b>TOTAL</b>           | 129                      | 199                | 185                |

This change in the number of algae species between stations is closely related to the physical and chemical content of the waters. Physical factors such as dissolved oxygen, pH, salinity, temperature, amount of water, turbidity, bottom structure, shading of sampling areas affect the presence of species in an area. Nitrogen and phosphorus compounds also have significant effects on the presence and population of algae.

The high number of species in the stations is closely related to the diversity of habitats. The number of species is high in these areas as they have different habitats suitable for algae. For example, even in very close areas, there may be epipelagic (sediment-bound), epilithic (stone-bound), epiphytic (plant-bound) habitat types. In addition, phytoplanktonic forms may develop and the number of species may increase with the decrease in the flow rate and the excess in pool areas.

The main distribution areas of phytoplanktonic organisms are stagnant waters or lotic habitats with very low currents. They are either absent or represented very little in fast-flowing streams and rivers, as the current velocity will cause the drift of freely floating phytoplanktonic organisms. The main dominant algae communities of such areas are attached algae. These algae adhere to plants, stones and sediments, minimizing the physical effect of the current and do not drift. Therefore, fast flowing systems are not suitable habitats

for phytoplankton. Particularly epilithic (attached to stones) forms from bound algae are very dominant in all sampling stations. It is expected that epilithic algae will be dominant due to the shallowness of the stations and the abundance of stones in the ground structures. Due to the mud and sandy soil structure of some sampling stations, there is also the predominance of macro and micro algae living in the sediment (epipellic).

When the population dominance of freshwater algae at the division level of the study areas is examined, a situation similar to the distribution profile in other freshwater wetlands in Turkey.

There are no endemic, rare or any algae species that need to be protected in the study areas, and they consist of cosmopolitan species.

### 3.3 Zooplanktonic Organisms

The zooplanktonic organisms living in the freshwater system are represented by three major dominant animal groups, these are the Cladocera, Copepoda and Rotifera groups. Zooplanktonic organisms not only form the food of plantivorous fish, but also feed all fish larvae, aquatic insects, insect larvae and other aquatic animals in the ecosystem. Changes in zooplanktonic organisms in terms of quantity or variety also affect the other organisms in the upper step of the food pyramid. In addition, changes in the amount or diversity of planktonic organisms depending on the changes in environmental conditions are used in biological monitoring studies. Environmental changes can be monitored by determining the structure of planktonic organisms in the stream before and after the disposal of polluting waste.

Individuals belonging to Rotifera, another group of zooplanktonic organisms, are very small and microscopic creatures. Most of them are distributed in fresh waters. The number of marine species is less than in freshwater. There are also species living in ponds, small ponds, brackish water environments and salt waters. Most of the species are planktonic and live in the limnetic and littoral regions of the lakes, while some of them spread sessile in the bottom parts. The use of Rotifera species as indicators in determining the water quality of freshwater systems is important because they constitute the food of many invertebrates and vertebrates in aquatic ecosystems. It is very important that most of the Rotifera species feed on bacteria and detritus, have a high metabolism, reproduce very quickly, and form the food of fish and many aquatic invertebrates.

Zooplanktonic organisms are mostly displaced by the movement of water and live in stagnant water habitats. Their availability in fast flowing parts of streams is very limited. However, in some groups, they can be seen as psammophiles, that is, as species that can live under stones in fast-flowing streams. Especially the species belonging to the Rotifera group use rock bottoms and eliminate the negative effect of the current speed.

As a result of the sampling and literature studies, a total of 38 taxa were identified belonging to Rotifera, Cladocera and Copepoda from zooplanktonic organisms. The most dominant

group of these is Rotifera. 25 taxa belonging to Rotifera, 5 taxa belonging to Copepoda and 8 taxa belonging to Cladocera group were determined.

Considering the total number of species according to the stations, the Seyhan River Basin (27 taxa) has the highest number of species, followed by the Ceyhan River Basin with 24 taxa and the Eastern Mediterranean Basin with 18 taxa (see. Table 3-3).

Zooplanktonic organisms identified according to the evaluations made on the basis of station and basin are given in Appendix-3. Since the main habitats of zooplanktonic organisms are stagnant waters, they are more represented in stations with high flow water bodies.

**Table 3-3.** Number of Zooplanktonic Organisms by Basin and Groups

|                  | EAST MEDITERRANEAN BASIN | SEYHAN RIVER BASIN | CEYHAN RIVER BASIN |
|------------------|--------------------------|--------------------|--------------------|
| <b>OTİFERA</b>   | 13                       | 17                 | 15                 |
| <b>CLADOCERA</b> | 3                        | 6                  | 6                  |
| <b>COPEPODA</b>  | 2                        | 4                  | 3                  |
| <b>TOTAL</b>     | 18                       | 27                 | 24                 |

Zooplanktonic organisms, like phytoplankton, prefer stagnant environments with little flow. Among the three large groups of zooplankton in the study area, Rotifera is the most dominant group in terms of species number and population density.

An important part of the species identified in all three basins belong to Rotifera. Cladocera and Copepoda are very rare in current waters. A significant number of Rotifera species have developed an adaptation to current velocity. These species are able to protect themselves from the sweeping effect of water by clinging to the bottom of the stones in flowing environments. The fact that Rotifera is represented by more species than other groups is due to these adaptive features.

Zooplanktonic organisms must be fed with phytoplanktonic organisms in order to continue their development. Therefore, they prefer areas where this nutrient is abundant and other physical and chemical factors are optimum for them. Rivers and streams are not suitable habitats for these organisms. In these areas, the phytoplanktonic organisms they use as food are low, and the river current is an important limiting factor. Due to their very small size, they can easily be dragged to death. As a matter of fact, the abundance values of zooplanktonic organisms in all sampling areas were found at very low levels.

The reasons for the low density values of zooplanktonic organisms have been discussed above. The decrease in the flow rate at the sampling point in the Seyhan and Ceyhan Rivers and the formation of a stagnant water system in a large area have created a suitable environment for zooplankton as well as other living groups.

Rotifera is the most dominant group in terms of population density, which is better adapted to flowing environments compared to other zooplankton groups. It has been observed that

zooplanktonic organisms have come to the forefront due to the decrease in the current speed of the work stations.

There are no endemic, rare or need to be protected zooplanktonic organisms in the study areas and it has been determined that they are cosmopolitan species.

### 3.4 Benthic Organisms

It includes organisms that spend at least a part of their life in the bottom parts of the waters (on sediment, debris, macrophytes, filamentous algae). Animals that can be caught with a mesh with a pore diameter of 500 µm fall within this definition. The concept of benthic organisms also includes nektons and forms embedded in the bottom.

Biological monitoring studies with benthic organisms are of two types. The first is to monitor the changes in benthic organisms before and after a project that is thought to affect the aquatic environment. For example, it is used to evaluate the environmental impact by determining the type, diversity and abundance of benthic invertebrates found in streams before and after the disposal of polluting wastes. In this way, water quality standards are determined by taking into account the presence of benthic invertebrates or changes in their numbers.

Benthic organisms are among the preferred groups in biological monitoring studies due to their stated characteristics (Rosenberg and Resh, 1992); Some of the reasons why benthic organisms are preferred in such a study are as follows.

1. Although there are many different environments in aquatic systems, they have adapted to every environment
2. A wide variety of species groups respond across a broad spectrum, depending on the severity of environmental pressure.
3. It generally depends on the areas where it is located. They cannot escape from environmental change and polluting effects.

According to the sampling studies and literature data, the benthic organisms of the Train Line are given in APPENDIX\_4, taking into account the East Mediterranean, Seyhan and Ceyhan Basins.

The presence of benthic organisms in the stations in terms of species numbers varies according to habitat structures. However, as a result of diagnosis and literature data, a total of 83 taxa were identified.

Of the 83 taxa belonging to the 4 large phylum identified, 18 belong to Mollusca, 2 to Annelida, 5 to Platyhelminthes and 58 to Arthropoda (Appendix 3). The Arthropoda is the most dominant phylum in terms of species number. Examples of Mollusca were Gastropoda and Bivalvia classes. Annelida consists of the families Hirudinidae and Lumbriculidae under the

class Clitellata. Platyhelminthes phylum includes five taxa belonging to Planariidae and Naididae families. Within the Arthropoda, there are two major classes, Malacostroca and Insecta. A total of 4 taxa belonging to the class Malacostroca were identified. Within the Insecta class, 54 taxa belonging to the orders Diptera, Hemiptera, Odonata, Ephemeroptera, Coleoptera, Trichoptera and Plecoptera were identified. However, the most species of the Insecta class is Diptera with 16 taxa, followed by Trichoptera with 12 taxa.

According to the evaluation made according to the number of species identified from the study areas, the highest number of taxa was determined in the Seyhan basin with 71 taxa. 68 taxa were identified in the Ceyhan basin and 58 taxa in the East Mediterranean Basin (see. Table 3-4).

**Table 3-4.** Benthic Organisms according to Basin

| PHYLUM          | EAST MEDITERRANEAN BASIN | SEYHAN RIVER BASIN | CEYHAN RIVER BASIN |
|-----------------|--------------------------|--------------------|--------------------|
| MOLLUSCA        | 12                       | 12                 | 13                 |
| ANNELIDA        | 2                        | 2                  | 2                  |
| PLATYHELMINTHES | 5                        | 4                  | 5                  |
| ARTHROPODA      | 39                       | 53                 | 48                 |
| TOTAL           | 58                       | 71                 | 68                 |

The more heterogeneous the bottom structure of an environment, the more species are represented by benthic. Presence of muddy, sandy and gravelly areas at the study points means an increase in the species diversity of benthic organisms. Because benthic organisms determine their habitats according to the bottom structure. One species does not spread in both muddy and gravelly areas. There are species specific to each environment. For example, members of the family Chironomidae, belonging to the class Diptera, are found only in muddy, low-oxygen environments, while members of orders such as Trichoptera, Odonata and Ephemeroptera live in gravelly and oxygen-rich environments. Therefore, the diversity of the bottom structure is an important factor that increases the number of species. There are other physical and chemical factors affecting the existence and distribution of benthic species. Some species may like polluted environments, while others can only live in clean water environments. In the Diptera order, members of the family Chironomidae are found in polluted environments, while members of the family Simuliidae prefer clean water environments. Therefore, factors such as flow rate and pollution factors are a suppressive factor on the species. This situation is also reflected in the sampling results in the study areas. Almost all of the members of the family Chironomidae were found in stations with muddy, stagnant and muddy bottoms. Members of the Simuliidae family were also found in environments with fast flowing, abundant oxygen and gravelly ground structure.

In general, benthic species identified from the region are cosmopolitan and there are no rare and endangered species specific to the region.

### 3.5 Fishes

Fish are important biological components in the upper link of the food chain in aquatic systems. Ecologically, they feed on algae, zooplankton or benthic organisms. They are important living things in terms of their economic as well as ecological importance.

Fishing activities are almost non-existent in the study areas. Among the stations, it is known that such activities only occur in the Seyhan and Ceyhan Rivers.

In this study, the presence and distribution of fish species were evaluated at the basin level. The Train Line route passes through 3 major river basins. These consist of the East Mediterranean, Seyhan and Ceyhan Basins. In general, the fish species in these basins were examined and then the identifications and morphological evaluations of the fish in the rivers and streams were made.

During October 2021, water was found in 11 of the sampling points and fish capture studies were carried out. Fish were sampled at all transition points where water was observed and sampled, but fish could be caught in 8 of them, and no fish species could be caught in the other three stations (see. Table 3-5).

Three stations (stations 2, 5 and 10) where fish cannot be caught despite the availability of water are irrigation channels created by human. The water flow in these stations is quite high and fast flowing. In addition, the bottom structure of these points is completely covered with concrete and is not a natural ecological environment.

Information on the presence of the species identified in the study areas, their distribution according to the stations where they were caught, and various protection statuses are given in Table 7.

The total number of fish taxa in all aquatic systems studied was recorded as 33. 23 of these species were sampled and collected by us during the field studies carried out for the Train Line project, and the remaining species were taken from the literature records (see. Table 3-6).

**Table 3-5.** Fish caught stations in aquatic sampling areas

| Stations   | Station Name     | Water Yes/No | Fish Caught/<br>Not caught |
|------------|------------------|--------------|----------------------------|
| Aquatic_1  | Deliçay          | Yes          | Caught                     |
| Aquatic_2  | Irrigation Canal | Yes          | Not caught                 |
| Aquatic_3  | Tarsus Stream    | Yes          | Caught                     |
| Aquatic_4  | Küskün Stream    | Yes          | Caught                     |
| Aquatic_5  | Irrigation Canal | Yes          | Not caught                 |
| Aquatic_6  | Seyhan River     | Yes          | Caught                     |
| Aquatic_7  | Seasonal Stream  | No           | Not caught                 |
| Aquatic_8  | Ceyhan River     | Yes          | Caught                     |
| Aquatic_9  | Karasu Stream    | Yes          | Caught                     |
| Aquatic_10 | Irrigation Canal | Yes          | Not caught                 |
| Aquatic_11 | Akçasu Stream    | Yes          | Caught                     |
| Aquatic_12 | Seasonal Stream  | No           | Not caught                 |
| Aquatic_13 | Seasonal Stream  | No           | Not caught                 |
| Aquatic_14 | Düziçi Stream    | No           | Not caught                 |
| Aquatic_15 | Akçasu Stream    | Yes          | Caught                     |
| Aquatic_16 | Atmalı Stream    | No           | Not caught                 |

Table 3-6. Fish species according to stations

|                                    |               |                           | East Mediterranean Basin |   |   |   | Seyhan River Basin |   |   | Ceyhan River Basin |   |    |    |    |    |    |    | Introduced | Endemic | BERN | ERL | CITES |       |
|------------------------------------|---------------|---------------------------|--------------------------|---|---|---|--------------------|---|---|--------------------|---|----|----|----|----|----|----|------------|---------|------|-----|-------|-------|
| İstasyonlar                        |               |                           | 1                        | 2 | 3 | 4 | 5                  | 6 | 7 | 8                  | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16         |         |      |     |       |       |
| Latin Name                         | Family        | Common Name               |                          |   |   |   |                    |   |   |                    |   |    |    |    |    |    |    |            |         |      |     |       |       |
| <i>Anguilla anguilla</i>           | Anguillidae   | European eel              |                          |   | * | * |                    | * |   | *                  |   |    |    |    |    |    |    |            |         |      |     | CR    | Ek II |
| <i>Atherina boyeri</i>             | Atherinidae   | Big-scale sand-smelt      |                          |   |   |   |                    | * |   | *                  |   |    |    |    |    |    |    |            | X       |      |     | LC    |       |
| <i>Cobitis levantina</i>           | Cobitidae     | Orontes spined loach      | *                        |   | * |   |                    | * |   | *                  |   |    | *  |    |    |    |    |            |         |      |     | EN    |       |
| <i>Cobitis evreni</i>              | Cobitidae     | Ceyhan spined loach       | *                        |   | * | * |                    | * |   | *                  | * |    | *  |    |    |    |    |            |         | X    |     | EN    |       |
| <i>Oxynoemacheilus samanticus</i>  | Nemacheilidae | Kizilirmak Sportive Loach |                          |   | * |   |                    | * |   |                    |   |    |    |    |    |    |    |            |         | X    |     | LC    |       |
| <i>Oxynoemacheilus seyhanicola</i> | Nemacheilidae | Cilician loach            |                          |   | * |   |                    | * |   |                    |   |    |    |    |    |    |    |            |         | X    |     | EN    |       |
| <i>Oxynoemacheilus seyhanensis</i> | Nemacheilidae | Zamantı loach             |                          |   |   |   |                    | * |   |                    |   |    |    |    |    |    |    |            |         | X    |     | CR    |       |
| <i>Oxynoemacheilus ceyhanensis</i> | Nemacheilidae | Elbistan Loach            |                          |   |   |   |                    |   |   |                    |   |    | *  |    |    |    |    |            |         | X    |     | DD    |       |
| <i>Oxynoemacheilus evreni</i>      | Nemacheilidae | Ceyhan Sportive Loach     |                          |   |   |   |                    |   |   | *                  | * |    |    |    |    |    |    |            |         | X    |     | LC    |       |
| <i>Oxynoemacheilus tigris</i>      | Nemacheilidae | Halap loach               |                          |   | * | * |                    | * |   |                    | * |    | *  |    |    |    |    |            |         |      |     | CR    |       |
| <i>Acanthobrama thisbeae</i>       | Leuciscidae   |                           |                          |   |   |   |                    |   |   | *                  |   |    |    |    |    |    |    |            |         | X    |     | NE    |       |
| <i>Acanthobrama orontis</i>        | Leuciscidae   |                           |                          |   |   |   |                    | * |   | *                  |   |    |    |    |    |    |    |            |         | X    |     | NE    |       |
| <i>Alburnus kotschy</i>            | Leuciscidae   | Iskenderun Shah Kuli      |                          |   | * | * |                    | * |   | *                  |   |    | *  |    |    |    |    |            |         | X    |     | LC    |       |
| <i>Alburnus sellal</i>             | Leuciscidae   | Shah Kuli                 |                          |   | * |   |                    |   |   |                    | * |    | *  |    |    |    |    |            |         |      |     | LC    |       |
| <i>Chondrostoma ceyhanense</i>     | Leuciscidae   |                           |                          |   | * | * |                    | * |   | *                  |   |    |    |    |    |    | *  |            |         | X    |     | NE    |       |
| <i>Pseudophoxinus zekayi</i>       | Leuciscidae   | Ceyhan spring minnow      |                          |   | * | * |                    | * |   | *                  | * |    | *  |    |    |    | *  |            |         | X    |     | VU    |       |
| <i>Pseudophoxinus firati</i>       | Leuciscidae   | Euphrates spring minnow   |                          |   |   |   |                    | * |   | *                  |   |    |    |    |    |    |    |            |         | X    |     | EN    |       |
| <i>Luciobarbus pectoralis</i>      | Cyprinidae    | Levantine barbel          | *                        |   |   |   |                    | * |   | *                  |   |    |    |    |    |    | *  |            |         |      |     | LC    |       |
| <i>Capoeta damascina</i>           | Cyprinidae    | Levantine Scraper         | *                        |   | * | * |                    | * |   | *                  | * |    | *  |    |    |    |    |            |         |      |     | LC    |       |

|                             |             |                      | East<br>Mediterranean<br>Basin |   |   |   | Seyhan<br>River<br>Basin |   |   | Ceyhan River Basin |   |    |    |    |    |    |    | Introduced | Endemic | BERN | ERL    | CITES |    |
|-----------------------------|-------------|----------------------|--------------------------------|---|---|---|--------------------------|---|---|--------------------|---|----|----|----|----|----|----|------------|---------|------|--------|-------|----|
| İstasyonlar                 |             |                      | 1                              | 2 | 3 | 4 | 5                        | 6 | 7 | 8                  | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16         |         |      |        |       |    |
| Latin Name                  | Family      | Common Name          |                                |   |   |   |                          |   |   |                    |   |    |    |    |    |    |    |            |         |      |        |       |    |
| <i>Capoeta barroisi</i>     | Cyprinidae  | Orontes Scraper      |                                |   | * |   |                          | * |   | *                  |   |    |    |    |    |    |    |            |         |      |        |       | EN |
| <i>Capoeta erhani</i>       | Cyprinidae  | Ceyhan Scraper       |                                |   |   |   |                          | * |   | *                  |   |    |    |    |    |    |    |            |         | X    |        |       | LC |
| <i>Garra rufa</i>           | Cyprinidae  | Red garra            |                                |   | * | * |                          | * |   | *                  | * |    | *  |    |    |    | *  |            |         |      |        |       | LC |
| <i>Carassius gibelio</i>    | Cyprinidae  | Prussian carp        |                                |   | * | * |                          | * |   | *                  |   |    |    |    |    |    |    |            | X       |      |        |       | NE |
| <i>Cyprinus carpio</i>      | Cyprinidae  | Common Carp          |                                |   | * | * |                          | * |   |                    |   |    |    |    |    |    |    |            |         |      |        |       | VU |
| <i>Squalius seyhanensis</i> | Cyprinidae  | Seyhan chub          |                                |   | * | * |                          | * |   |                    |   |    |    |    |    |    |    |            |         | X    |        |       | DD |
| <i>Squalius kottelati</i>   | Cyprinidae  | Cilician pike chub   |                                |   |   |   |                          | * |   | *                  |   |    |    |    |    |    |    |            |         |      |        |       | NT |
| <i>Squalius adanaensis</i>  | Cyprinidae  | Adana chub           |                                |   |   |   |                          | * |   |                    |   |    |    |    |    |    |    |            | X       |      |        |       | NT |
| <i>Aphanius mento</i>       | Aphaniidae  | Iridescent Killifish |                                |   |   |   |                          | * |   |                    |   |    | *  |    |    |    |    |            |         |      |        |       | LC |
| <i>Esox lucius</i>          | Esocidae    | Northern Pike        |                                |   |   |   |                          | * |   |                    |   |    |    |    |    |    |    |            | X       |      |        |       | LC |
| <i>Gambusia holbrooki</i>   | Poeciliidae | Eastern Mosquitofish | *                              |   | * | * |                          | * |   | *                  |   |    |    |    |    |    | *  |            | X       |      |        |       | LC |
| <i>Silurus glanis</i>       | Siluridae   | Wels Catfish         |                                |   | * |   |                          | * |   | *                  |   |    |    |    |    |    |    |            |         |      | EK III |       | LC |
| <i>Clarias gariepinus</i>   | Clariidae   | African Catfish      |                                |   |   |   |                          | * |   | *                  |   |    |    |    |    |    |    |            |         |      |        |       | LC |
| <i>Salaria fluviatilis</i>  | Blenniidae  | Freshwater blenny    |                                |   | * | * |                          | * |   | *                  | * |    |    |    |    |    |    |            |         |      |        |       | LC |

|   |                                               |
|---|-----------------------------------------------|
| * | : Fish caught in this study                   |
| * | : Literature records                          |
| * | : No fish species were caught at this station |

CR: CRITICALLY ENDANGERED

EN: ENDANGERED

VU: VULNERABLE

NT: NEAR THREATENED

LC: LEAST CONCERN

NE: NOT EVALUATED

**DD: DATA DEFFICIENT**

A total of 33 fish species were identified as a result of sampling studies in three different basins. According to the evaluations made on the basin, a total of 20 fish species were identified at the stations of the Eastern Mediterranean Basin, 29 fish species at the stations of the Seyhan basin, and 26 fish species at the stations of the Büyük Menderes Basin (see. Table 3-7).

When the same table is examined, the 6th station (Seyhan River) on the Seyhan River, which has the highest number of species on the basis of stations, comes to the fore with 29 species. While 11 of the species given in the Seyhan Basin were caught within the scope of this study, the remaining 18 species were given according to the literature. Three stations were identified in this basin, but one station was an irrigation canal and the other was completely dry.

The second basin in which the most species were detected in the studies is the Ceyhan River Basin with 26 species. There are nine different stations in the Ceyhan Basin. Four of these stations are completely dry and one is an irrigation canal, and fish data could not be obtained from these stations. However, the station on the Ceyhan River (Station 8) was the richest (22 species) study area in terms of fish species. While 19 of the 26 species identified in this basin were caught and identified as a result of the samplings made by us, 7 of them were given according to the literature information.

Four aquatic sampling stations were identified in the East Mediterranean Basin, and three of them were caught fish, while one of them was an irrigation channel and no fish sampling could be done. In this basin, 20 fish species were determined, 12 of which were caught and identified by us, and 8 of them were given according to the literature. The highest number of fish in this basin were identified with 19 taxa from Tarsus Stream (3rd Station). In the fourth station, Küskun creek, 13 species were caught.

Table 3-7. Number of Fish Species by Basin and Stations

| Basin                       | Station No | Station Name River /Stream | Number of Fish Species |            |                         | Total Number of Fish Species Detected by Basin |
|-----------------------------|------------|----------------------------|------------------------|------------|-------------------------|------------------------------------------------|
|                             |            |                            | In this study          | Literature | Total Number of Species |                                                |
| Eastern Mediterranean Basin | Aquatic_1  | Deliçay                    | 5                      | --         | 5                       | 20                                             |
|                             | Aquatic_2  | Irrigation Canal           | --                     | --         | --                      |                                                |
|                             | Aquatic_3  | Tarsus Stream              | 9                      | 10         | 19                      |                                                |
|                             | Aquatic_4  | Küskün Stream              | 8                      | 5          | 13                      |                                                |
| Seyhan River Basin          | Aquatic_5  | Irrigation Canal           | --                     | --         | --                      | 29                                             |
|                             | Aquatic_6  | Seyhan River               | 11                     | 18         | 29                      |                                                |
|                             | Aquatic_7  | Seasonal Stream            | --                     | --         | --                      |                                                |
| Ceyhan River Basin          | Aquatic_8  | Ceyhan River               | 11                     | 11         | 22                      | 26                                             |
|                             | Aquatic_9  | Karasu Stream              | 8                      | --         | 8                       |                                                |
|                             | Aquatic_10 | Irrigation Canal           | --                     | --         | --                      |                                                |
|                             | Aquatic_11 | Akçasu Stream              | 10                     | --         | 10                      |                                                |
|                             | Aquatic_12 | Seasonal Stream            | --                     | --         | --                      |                                                |
|                             | Aquatic_13 | Seasonal Stream            | --                     | --         | --                      |                                                |
|                             | Aquatic_14 | Düziçi Stream              | --                     | --         | --                      |                                                |
|                             | Aquatic_15 | Akçasu Stream              | 5                      | --         | 5                       |                                                |
|                             | Aquatic_16 | Atmalı Stream              | --                     | --         | --                      |                                                |

According to the sampling studies carried out, a total of 33 fish species belonging to 12 different families were determined as a result of sampling and literature data. In the evaluations made in terms of families, the most species were seen in the Cyprinidae family, and 10 species were determined. Next come the families Leuciscidae with 7 taxa, Nemacheilidae with 6 taxa, and Cobitidae families with 2 taxa. One taxon each belonging to the other families Anguillidae, Atherinidae, Aphaniidae, Esocidae, Poeciliidae, Siluridae, Clariidae and Blenniidae are listed (see. Table 3-8).

**Table 3-8.** Number of Species according to Families

| Family        | Number of Species |
|---------------|-------------------|
| Cyprinidae    | 10                |
| Leuciscidae   | 7                 |
| Nemacheilidae | 6                 |
| Cobitidae     | 2                 |
| Anguillidae   | 1                 |
| Atherinidae   | 1                 |
| Aphaniidae    | 1                 |
| Esocidae      | 1                 |
| Poeciliidae   | 1                 |
| Siluridae     | 1                 |
| Clariidae     | 1                 |
| Blenniidae    | 1                 |

Cyprinidae family was the most important family in terms of species diversity and densities, considering the specimens caught from all study areas. Although the prominent species belonging to this family vary according to the basins, they are *Capoeta damascina*, *Pseudophoxinus intelligence* and *Garra rufa* (see. Table 3-9).

**Table 3-9.** Number of captured species according to stations (individual/half hour)

| Stations                           | 1 | 3 | 4 | 6  | 8  | 9 | 11 | 15 |
|------------------------------------|---|---|---|----|----|---|----|----|
| <b>Anguillidae</b>                 |   |   |   |    |    |   |    |    |
| <i>Anguilla anguilla</i>           |   | 1 | 2 | 1  | 1  |   |    |    |
| <b>Cobitidae</b>                   |   |   |   |    |    |   |    |    |
| <i>Cobitis levantina</i>           | 2 |   |   |    |    |   | 1  |    |
| <i>Cobitis evreni</i>              | 1 |   |   |    |    | 2 | 1  |    |
| <b>Nemacheilidae</b>               |   |   |   |    |    |   |    |    |
| <i>Oxynoemacheilus samanticus</i>  |   |   |   | 8  |    |   |    |    |
| <i>Oxynoemacheilus seyhanensis</i> |   |   |   | 11 |    |   |    |    |
| <i>Oxynoemacheilus ceyhanensis</i> |   |   |   |    |    |   | 1  |    |
| <i>Oxynoemacheilus evreni</i>      |   |   |   |    |    | 1 |    |    |
| <i>Oxynoemacheilus tigris</i>      |   | 1 | 9 |    |    | 2 | 1  |    |
| <b>Leuciscidae</b>                 |   |   |   |    |    |   |    |    |
| <i>Alburnus kotschy</i>            |   | 2 | 8 |    | 11 |   | 13 |    |
| <i>Alburnus sellal</i>             |   | 5 |   |    |    | 7 | 2  |    |

| Stations                       | 1 | 3 | 4 | 6 | 8  | 9 | 11 | 15 |
|--------------------------------|---|---|---|---|----|---|----|----|
| <i>Chondrostoma ceyhanense</i> |   |   |   |   | 1  |   |    | 1  |
| <i>Pseudophoxinus zekayi</i>   |   | 6 | 3 | 6 | 5  | 8 | 13 | 17 |
| <b>Cyprinidae</b>              |   |   |   |   |    |   |    |    |
| <i>Luciobarbus pectoralis</i>  | 5 |   |   |   |    |   |    | 8  |
| <i>Capoeta damascina</i>       | 1 | 7 | 5 | 4 | 12 | 6 | 2  |    |
| <i>Capoeta barroisi</i>        |   |   |   | 1 | 2  |   |    |    |
| <i>Garra rufa</i>              |   | 6 | 8 | 7 | 9  | 5 | 14 | 11 |
| <i>Carassius gibelio</i>       |   |   |   | 9 | 2  |   |    |    |
| <i>Squalius seyhanensis</i>    |   |   |   | 2 |    |   |    |    |
| <i>Squalius kottelati</i>      |   |   |   |   | 5  |   |    |    |
| <b>Aphaniidae</b>              |   |   |   |   |    |   |    |    |
| <i>Aphanius mento</i>          |   |   |   |   |    |   | 1  |    |
| <b>Esocidae</b>                |   |   |   |   |    |   |    |    |
| <i>Esox lucius</i>             |   |   |   | 1 |    |   |    |    |
| <b>Poeciliidae</b>             |   |   |   |   |    |   |    |    |
| <i>Gambusia holbrooki</i>      | 3 | 2 | 2 | 4 | 2  |   |    | 4  |
| <b>Blenniidae</b>              |   |   |   |   |    |   |    |    |
| <i>Salaria fluviatilis</i>     |   | 7 | 1 |   | 6  | 5 |    |    |

According to IFC Guide 6, Critical habitats are (i) habitats of great importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or limited range species; (iii) habitat supporting global concentrations of migratory and/or important community species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes. Accordingly, in terms of the first two headings for critical habitat assessment of the stations examined, the Critically Endangered and/or Endangered species and endemic and/or limited range species are given in Table 3-10.

**Table 3-10.** Critical Species Table by Station (according to IFC PS6)

| Stations  | Critically Endangered and/or Endangered species                                                                                                                     | Endemic and/or restricted-range species                                                                                                                                                                                                                                                                   |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aquatic_1 | Cobitis levantina (EN)<br>Cobitis evreni (EN)                                                                                                                       | Cobitis evreni (Endemic and RRS)                                                                                                                                                                                                                                                                          |
| Aquatic_3 | Anguilla anguilla (CR)<br>Cobitis levantina (EN)<br>Cobitis evreni (EN)<br>Oxyneomacheilus seyhanicola (EN)<br>Oxyneomacheilus tigris (CR)<br>Capoeta barroisi (EN) | Cobitis evreni (Endemic and RRS)<br>Oxyneomacheilus samanticus (Endemic and RRS)<br>Oxyneomacheilus seyhanicola (Endemic and RRS)<br>Alburnus kotschy (Endemic and RRS)<br>Chondrostoma ceyhanense (Endemic and RRS)<br>Pseudophoxinus zekayi (Endemic and RRS)<br>Squalius seyhanensis (Endemic and RRS) |
| Aquatic_4 | Anguilla anguilla (CR)<br>Cobitis evreni (EN)<br>Oxyneomacheilus tigris (CR)                                                                                        | Cobitis evreni (Endemic and RRS)<br>Alburnus kotschy (Endemic and RRS)<br>Chondrostoma ceyhanense (Endemic and RRS)<br>Pseudophoxinus zekayi (Endemic and RRS)<br>Squalius seyhanensis (Endemic and RRS)                                                                                                  |

| Stations   | Critically Endangered and/or Endangered species                                                                                                                                                   | Endemic and/or restricted-range species                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aquatic_6  | Anguilla anguilla (CR)<br>Cobitis levantina (EN)<br>Cobitis evreni (EN)<br>Oxynoemacheilus seyhanensis (CR)<br>Oxynoemacheilus tigris (CR)<br>Pseudophoxinus firati (EN)<br>Capoeta barroisi (EN) | Cobitis evreni (EN)<br>Oxynoemacheilus samanticus (Endemic and RRS)<br>Oxynoemacheilus seyhanicola (Endemic and RRS)<br>Oxynoemacheilus seyhanensis (Endemic and RRS)<br>Acanthobrama orontis (Endemic and RRS)<br>Alburnus kotschyi (Endemic and RRS)<br>Chondrostoma ceyhanense (Endemic and RRS)<br>Pseudophoxinus zekayi (Endemic and RRS)<br>Pseudophoxinus firati (Endemic and RRS)<br>Capoeta erhani (Endemic and RRS)<br>Squalius seyhanensis (Endemic and RRS)<br>Squalius adanaensis (Endemic and RRS) |
| Aquatic_8  | Anguilla anguilla (CR)<br>Cobitis levantina (EN)<br>Cobitis evreni (EN)<br>Pseudophoxinus firati (EN)<br>Capoeta barroisi (EN)                                                                    | Cobitis evreni (Endemic and RRS)<br>Oxynoemacheilus evreni (Endemic and RRS)<br>Acanthobrama thisbeae (Endemic and RRS)<br>Acanthobrama orontis (Endemic and RRS)<br>Alburnus kotschyi (Endemic and RRS)<br>Chondrostoma ceyhanense (Endemic and RRS)<br>Pseudophoxinus zekayi (Endemic and RRS)<br>Pseudophoxinus firati (Endemic and RRS)<br>Capoeta erhani (Endemic and RRS)                                                                                                                                  |
| Aquatic_9  | Cobitis evreni (EN)                                                                                                                                                                               | Cobitis evreni (Endemic and RRS)<br>Oxynoemacheilus evreni (Endemic and RRS)<br>Pseudophoxinus zekayi (Endemic and RRS)                                                                                                                                                                                                                                                                                                                                                                                          |
| Aquatic_11 | Cobitis levantina (EN)<br>Cobitis evreni (EN)<br>Oxynoemacheilus tigris (CR)                                                                                                                      | Cobitis evreni (Endemic and RRS)<br>Oxynoemacheilus ceyhanensis (Endemic and RRS)<br>Alburnus kotschyi (Endemic and RRS)<br>Pseudophoxinus zekayi (Endemic and RRS)                                                                                                                                                                                                                                                                                                                                              |
| Aquatic_15 |                                                                                                                                                                                                   | Chondrostoma ceyhanense (Endemic and RRS)<br>Pseudophoxinus zekayi (Endemic and RRS)                                                                                                                                                                                                                                                                                                                                                                                                                             |

Among the caught and detected fish samples, there are 4 taxa that are not naturally distributed in Turkey and defined as introduced (*Atherina boyeri*, *Carassius gibelio*, *Esox lucius*, *Gambusia holbrooki*).

It is observed that the endemism rates of the fish species identified in the project area are very high. Of the 33 listed species, 15 are known to be endemic. 6 of 7 taxa of Leuciscidae family and 5 of 6 taxa of Nemacheilidae family are endemic. Cyprinidae family is represented by 3 endemic species (see Table 7).

There is a total of 1 taxa (*Silurus glanis*) included in the Annex III list of the Bern Convention.

In addition, there is only one species (*Anguilla anguilla*) included in Appendix II of the CITES Convention.

According to the European Red List (ERL\_Europe Red List) evaluation criteria;

- 3 species (*Anguilla anguilla*, *Oxynoemacheilus seyhanensis*, *Oxynoemacheilus tigris*) in the category of Critically Endangered (CR),
- 5 species (*Cobitis levantina*, *Cobitis evreni*, *Oxynoemacheilus seyhanicola*, *Pseudophoxinus firati*, *Capoeta barroisi*) in the Endangered (EN) category,
- 2 species (*Pseudophoxinus zekayi*, *Cyprinus carpio*) in Vulnerable (VU) category,
- 2 species (*Squalius kottelati* and *Squalius adanaensis*) in the Near Threatened (NT) category,
- 4 species (*Acanthobrama thisbeae*, *Acanthobrama orontis*, *Pseudophoxinus zekayi*, *Carassius gibelio*) in Not Evaluated (NE) category,
- 2 species (*Oxynoemacheilus ceyhanensis*, *Squalius seyhanensis*) in Data Deficient (DD) category
- The other 15 fish species on the list are in the Least Concern (LC\_Low Risk) category,

Fish species caught from aquatic sampling points along the route of the MAG Train Line are given in Figure 3-1 - Figure 3-23.



**Figure 3-1.** *Anguilla anguilla*



**Figure 3-2.** *Cobitis levantina*



**Figure 3-3.** *Cobitis evreni*



**Figure 3-4.** *Oxynoemacheilus samanticus*



**Figure 3-5.** *Oxynoemacheilus seyhanensis*



**Figure 3-6.** *Oxynoemacheilus ceyhanensis*



**Figure 3-7.** *Oxynoemacheilus evreni*



**Figure 3-8.** *Oxynoemacheilus tigris*



**Figure 3-9.** *Alburnus kotschy*



**Figure 3-10.** *Alburnus sellal*



**Figure 3-11.** *Chondrostoma ceyhanense*



**Figure 3-12.** *Pseudophoxinus zekayi*



**Figure 3-13.** *Luciobarbus pectoralis*



**Figure 3-14.** *Capoeta damascina*



**Figure 3-15.** *Capoeta barroisi*



**Figure 3-16.** *Garra rufa*



**Figure 3-17.** *Carassius gibelio*



**Figure 3-18.** *Squalius seyhanensis*



**Figure 3-19.** *Squalius kottelati*



**Figure 3-20.** *Aphanius mento*



**Figure 3-21.** *Esox lucius*



**Figure 3-22.** *Gambusia holbrooki*



**Figure 3-23.** *Salaria fluviatilis*

## 4. GENERAL EVALUATION IN TERMS OF IMPORTANT NATURE AREAS

The MAG Train Line route was also examined in terms of Important Biodiversity Areas (IPA). Evaluations were made in terms of protected areas and important biodiversity areas in the vicinity of the High Standard Train Line. Accordingly, there is no aquatic ecosystem that can interact with the train line in terms of aquatic ecosystem. Seyhan Dam Lake, one of the protected areas of Turkey, is located in Adana city center and 3.5 km north of the planned train line. However, this dam lake does not have a unique conservation status.

Seyhan Dam Lake is located at the upstream of the train line route and therefore, it is not expected to be adversely affected by the processes that may occur during the construction and operation periods.

The train line passes over two major rivers, Seyhan and Ceyhan. The effects of the line on these river systems were examined within the scope of the assessment given for other transitional regions.

## 5. CONCLUSION AND RECOMMENDATIONS

In the field sampling studies carried out in October 2021, it was observed that the construction works of the high-speed train bridges were completed at the 1st, 2nd, 3rd, 4th, 5th, 9th and 10th stations (see. Figure 5-1 - Figure 5-7). Therefore, it has been observed that the effects for these aquatic ecosystems are also complete. In other parts, it has been determined that the aquatic ecosystem bridge crossing works of the train line are continuing or have not started yet.



**Figure 5-1.** Completed train bridge over Deliçay, the first aquatic sampling site



**Figure 5-2.** Second sampling site - irrigation canal



**Figure 5-3.** The completed bridge over the Tarsus stream



**Figure 5-4.** The fourth station (Küskun Stream) is the completed railway crossing



**Figure 5-5.** Completed train crossing over the irrigation canal at the fifth station



**Figure 5-6.** The bridge where the works were completed on the Karasu Stream at the 9th station



**Figure 5-7.** The railway bridge over the irrigation canal (10th station) whose works have been completed

Better aquatic habitat conditions should be created by monitoring studies for the sections where the aquatic system transition works are completed or about to be completed. It is also important to follow the necessary bank stability and ecorestoration studies in these regions. In stations where the works have started or have not started yet, some measures should be taken for the protection of aquatic habitats and living creatures.

During the construction of transition structures on aquatic systems, the bridge piers should be designed so that they do not come into the stream beds. In this case, there will be no direct interference with aquatic habitats. However, during these studies, there may be interventions on both the riparian areas and beds of aquatic systems for various reasons. In order to create the necessary sensitivity against such situations that may occur, it is recommended to take the measures given below and related to the aquatic ecosystem.

Some effects and precautions to be taken on aquatic organisms in the river and stream crossing areas along the Mersin-Adana-Gaziantep High Standard Railway Project route are given below.

**Impact: In case the bridge construction piers are built inside the stream bed or on the coastal part, excessive sediment loading and destruction of the aquatic ecosystem may occur during construction. Downstream and in working areas, the spawning grounds of fish may be destroyed. Excessive sediment loading can block the fish's gills, hindering their respiratory function.**

April, May and June are the breeding seasons of aquatic organisms. During these periods, interference with aquatic systems should be avoided. The sediment that will be mixed with the stream as a result of an intervention to be made in these months may cause some negativities.

Interventions to be made will cause an increase in the sediment load of the river/creek systems. Especially in rainy periods, the increase in sediment due to erosion is very high and aquatic organisms are used to this seasonally. There will be no interference to the stream bed under normal operating conditions. However, sedimentation that may occur as a result of unexpected effects may have some negative consequences. This increase in sediment has a particularly negative effect on fish. The sediment flowing to the lower parts of the activity area damages the gills of the fish and deaths may occur due to insufficient respiration. Malnutrition and growth disorders can also be seen. In addition, undesirable results can be seen in terms of aquatic plants and phytoplanktonic organisms that cannot photosynthesize because intense sedimentation prevents sunlight from entering the water body for a certain period of time.

If the construction activities are carried out in the water body without changing the river bed, the use of sediment traps gives positive results. Apart from this, if it is necessary to intervene in the bed, it should be preferred to work on dry ground by

changing the bed of the rivers and streams where the transitions will take place. If the geographical conditions allow, work should be done on dry ground by changing the direction of the river and stream in the transition zone. In this way, no damage will be done to the downstream part of the river and stream systems. After the transition process is completed, the flow direction of the river and stream should be given back to its old bed.

Sediment traps made of some kind of geo-textile or more effective materials have a filter feature. This material will minimize the effects of downstream aquatic life as a result of sediment overload.

**Impact: Activities to be carried out during the breeding season (April-June) of species belonging to the Cyprinidae family may have adverse effects.**

First of all, it is recommended that no work should be done in these periods (April-June) that would interfere with the river and stream bed. If it is obligatory to work in these periods, some sensitivities of the region to be studied should be taken into consideration. The bottom structure of the places where large river crossings will be made is muddy, pebbly, sandy and the coastal parts are covered with macrophytes. These environments can be suitable spawning grounds for fish. If there is no direct impact on these spawning areas in the activity zone, it will not be a significant problem.

Most of the sampling points have suitable ground structure in terms of fish species and spawning areas. In addition, the presence of macrophytes in the coastal areas has suitable habitats for fish to use these areas as shelter, feeding and spawning areas. For this reason, all necessary precautions should be taken in order not to interfere with the aquatic systems during the specified breeding periods.

**Impact: Construction works to be carried out at the crossing point may cause the destruction of benthic organisms.**

The works in the river crossing areas will have an impact on the benthic system, but the system will be able to recover itself in a short time. The bottom structure of the sections where the transitions will be made consists of mud, small and large pebbles and large rock blocks. Rebuilding the same ground structure after construction will create a suitable habitat for benthic organisms to use this area again.

After the bridge construction works are completed at the aquatic working points, if any intervention has been made to the aquatic ecosystem, re-establishing the same ground structure is sufficient for benthic organisms to use this area again. Accordingly, the bottom structure of the transition zone should be restored to its natural state by laying the same material shortly after the work is completed.

First of all, in all transition zones, the surface sediment to be extracted from the works in the area where the activity is carried out should be stored in a separate zone. After the works are finished, this material should be laid on the bottom of the river/stream again. After the work is completed, the bottom structure of the aquatic areas should be laid again on the intervened area and eco restoration should be carried out. The dominant ground structure in all stations is a mud and loamy bottom structure. However, pebbly and stony ground structures were also observed.

Thus, a suitable environment will be created again for the development of benthic organisms that were removed from the environment during the activity in the transition zone.

**Impact: Destructions will occur in the riparian vegetation in the bank areas during the works.**

The riparian vegetation of many sampled transition areas is strong, with predominantly willow trees and in some places small reeds. Machinery to be used in construction works should not go beyond a certain route and unnecessary destruction should not be allowed. Because the strong vegetation in the riparian area is also important for many terrestrial organisms, especially amphibians and reptiles. In addition, plant communities and stony areas in riparian vegetation are suitable habitats for many organisms. In this regard, due to the dense bank vegetation of some stream and river systems, which are also given in the habitat descriptions, special attention should be paid during the breeding season. In areas where intervention is inevitable, it will be important to take the precautions defined in the flora section regarding these areas.

**Impact: Deterioration of bank stability may occur.**

The transition zones in the stream/river systems of the Train Line do not have steep slopes and the riparian vegetation is relatively well known and therefore there is no bank zone that could cause erosion. However, necessary information and warnings should be given to the relevant personnel so that the machines to be used do not cause bank disruption. In addition, after the completion of the transition construction, reinforcement works with rock blocks should be carried out to ensure the stability of the bank area.

**Impact: Impact on endemic and high conservation status fish species living in aquatic ecosystems along the route.**

There are 15 different fish taxa that are endemic in the stations where the study was carried out. Some of these species are wide-spread endemic species, and some are regional endemic species.

The Train Line works are expected to have a temporary impact in the aquatic transition areas, especially during the construction phase, and it is not thought that it will have a negative impact in terms of species with high conservation status and endemic species during the operation phases. These impacts will not cause a significant negative impact on the availability and population densities of these fish species if necessary precautions are taken.

In case the works will interfere with the river/Stream bed, the effects on protected and endemic species will be minimal by taking the precautions described above.

As long as there is no direct intervention to the aquatic systems during the construction works of the MAG Train Line project, none of these effects may be seen. However, the evaluations were made considering the worst-case scenario.

All adverse developments that may occur to the creek and riverbed during construction will be seen for a short time and cause temporary effects. All of the aquatic ecosystems studied are dynamic and healthy ecosystems that can tolerate these temporary negativities if necessary precautions are taken.

The effects of the activity on aquatic habitats and the precautions to be taken are defined in this report. However, it is also important to monitor the presence and population status of fish species. In this context, the recommended action plan for the works on the entire line is given in Table 5-1.

The monitoring program for aquatic ecosystems and their living creatures, especially endemic species, should be planned twice a year. The effects of the activity on aquatic habitats should be observed and reported during the construction period and for two years after the start of operation. Monitoring of possible effects on the availability and population status of fish species and taking precautions should be carried out by a Hydrobiologist.

For freshwater ecosystems, the monitoring program should basically include water quality, flow and freshwater biodiversity (Table 13).

On the basis of the impacts described above, the timing, problems and precautions related to the construction works on the Train Line creek and river crossing systems are given in Table 5-1.

Table 5-1. Action Plan for Conservation of Fish Species

| Biodiversity Component | Objective                                                                     | Action                                                                                               | Timeline                          | Responsibility / Partnership           | Indicator                                                                                                |
|------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------|
| Fish Species           | No net loss of populations or habitats of the species                         | Limiting project activities to designated areas to avoid direct impacts                              | During construction and operation | Investor / Contractor / Hydrobiologist | No direct impact on fish populations                                                                     |
|                        |                                                                               | Monitoring the presence and population status of aquatic environments downstream of the project site | During construction and operation | Investor / Contractor / Hydrobiologist | Conservation of species and population status during operation<br>Positive results in monitoring reports |
|                        | All personnel are aware of the importance of the conservation of fish species | Informing and training of project personnel                                                          | During construction and operation | Investor / Contractor / Hydrobiologist | Number of trained personnel, written informative documents                                               |

Table 5-2. Aquatic Ecosystem Monitoring Program

| Monitoring species | Monitoring Method                                                                                                                                                                                      | Reasons for Monitoring                                                                                                                                                    | Monitoring Period                                                                                                                                                         | Monitoring Stations                                                                                                  | Monitoring Parties |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------|
| What?              | How?                                                                                                                                                                                                   | Why?                                                                                                                                                                      | When?                                                                                                                                                                     | Where?                                                                                                               | Who?               |
| All Fish Types     | <p>Fish sampling will be done in certain areas with Standard Methods.</p> <p>Species and population densities to be determined</p> <p>Aquatic habitats that make up their habitats will be defined</p> | <p>They are nationally or internationally protected species.</p> <p>They are at the top of the food pyramid.</p> <p>There is a decreasing trend in population status.</p> | <p><b><u>under construction</u></b><br/>Twice a year (May and October)</p> <p><b><u>Operational Phase</u></b><br/>Twice a year (May and October)<br/>at least 2 years</p> | <p>Aquatic_1<br/>Aquatic_3<br/>Aquatic_4<br/>Aquatic_6<br/>Aquatic_8<br/>Aquatic_9<br/>Aquatic_11<br/>Aquatic_15</p> | Hydrobiologist     |

**Table 5-3.** Problems and precautions that may occur with the study

| TARGET GROUP             | TIME             |                |            |              | PROBLEM                                                                                                                                                                   | PRECAUTION                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------|------------------|----------------|------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          | November-January | February-March | April-June | July-October |                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                  |
| Benthic Organisms        |                  |                |            |              | Benthic organisms will be harmed due to the activities to be carried out at the river/stream crossing points and the intervention to the river bed.                       | After the construction activities are completed, a mixture of mud, mud, small and medium-sized pebbles and stones with the characteristics of the system should be laid on the treated ground.                                                                                                                                                                                   |
| Fish Species             |                  |                |            |              | Activities to be carried out especially in the spring periods, during the breeding periods of aquatic organisms, especially fish (April-June), may have negative effects. | It is recommended not to conduct any studies during the breeding season of aquatic organisms (April-June). Areas of activity should be limited in transition zones and coastal vegetation should not be damaged unnecessarily. In-water and above-water vegetation areas and small gravel areas in the study areas are important as they are possible breeding grounds for fish. |
| All Aquatic Creatures    |                  |                |            |              | Interventions to the aquatic environment in transition zones will cause dense sedimentation to flow downstream..                                                          | Sediment traps should be used in order to prevent the negative impact of the sediment that will be generated by construction activities. Apart from this, it should be preferred to work on dry ground by changing the bed where the water flows in rivers and streams where there will be transitions.                                                                          |
| Riparian Vegetation      |                  |                |            |              | During the works, destructions will occur in the riparian vegetation in the bank areas.                                                                                   | Machinery to be used in construction works should not go beyond a certain route and unnecessary destruction should not be allowed. Because these macrophytes and stony areas in the water are suitable habitats for fish eggs.                                                                                                                                                   |
| Bank Stability (Erosion) |                  |                |            |              | Deterioration of coastal stability may be observed.                                                                                                                       | In order to ensure the stability of the coast, it is necessary to carry out reinforcement works with certain rock blocks.                                                                                                                                                                                                                                                        |

|  |                                                                         |
|--|-------------------------------------------------------------------------|
|  | Work can be done                                                        |
|  | Work can be done but attention should be paid to riparian vegetation    |
|  | No work should be done, it is the breeding period of aquatic organisms. |

## 6. REFERENCES

- A.O.A.C. 1975. Official methods of analysis of the Association of Official Analytical Chemists. Horwitz, W (ed.). 12th Edition. Augier, H. 1977. Les hormones des algues. Etat
- Akbulut, A., 1996, Türkiye Tatlısu Algleri, In Demirsoy, Genel ve Türkiye Zoocoğrafyası "Hayvan Coğrafyası", sf. 405-463, Ankara.
- Alagöz, S., Ergüden, D., Göksu, M.Z.L., 2006, Seyhan Baraj Gölü'nde (Adana) İlk Kez Tesbit Edilen Balık Türleri, I. Balıklandırma Ve Rezervuar Yönetimi Sempozyumu 7 - 9 Şubat 2006, Antalya.
- Alagöz. S., 2005, Seyhan , Baraj Gölü (Adana) Balık Faunasının Belirlenmesi, Çukurova Üniversitesi Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi.
- Arslan, N., Timm, T., Erséus, C., 2007, Aquatic Oligochaeta (Annelida) of Balıkdami wetland (Turkey), with description of two new species of Phallodrilinae, Biologia, Bratislava, 62/3: 323—334
- Ayaş, R., Kara, C., 2014, Deliçay (Kahramanmaraş)'ın Makroinvertebrat Faunasının Mevsimsel Dağılımı, Yunus Arastırma Bülteni 2014 (4): 47-55
- Bahadır, M., Emet, K., 2013, Anadolu'da Yayılış Gösteren Omurgalı Endemik Fauna Elemanlarının Cbs İle Dağılış Alanlarının Haritalanması, Uluslararası Sosyal Araştırmalar Dergisi, 6 (24): 34-50
- Balık S., 1995. Freshwater Fish in Anatolia, Turkey, Biological Conservation, Elsevier Science Limited, 72, 213-223
- Balık, S., Ustaoglu, R., 1992, Türkiye Tatlısu Balıklarının Tanımlama Esasları, E.Ü. Fen Fakültesi Kitaplar Serisi No:137, İzmir, 58 s
- Bayçelebi, E., 2020, Distribution and diversity of fish from Seyhan, Ceyhan and Orontes river systems, Zoosyst. Evol. 96 (2) 2020, 747–767.
- Baydar, T., 2020, Büyük Menderes Nehri Su Kalitesinin Bentik Makroomurgasız Fauna Çeşitliliği Kullanılarak Tahmini, Aydın Adnan Menderes Üniversitesi Fen Bilimleri Enstitüsü Su Ürünleri Anabilim Dalı, Yüksek Lisans Tezi
- Bellmann, H., 1988, Leben in Bach und Teich. Pflanzen und Wirbellose der Kleingewässer. Steinbach Naturführer. 287 s.
- Biro, K., 1981, Kleiner Bestimmungsschlüssel für Zuckmückenlarven (Diptera: Chironomidae). Wien 329 s.
- Bold, H.C., Wynne, M.J., 1985, Introduction to the Algae, Structure and Reproduction, Second Ed., 720 pp., New Jersey
- Borutski, E.V., 1963, Fauna of the U.S.S.R. Crustacea, Vol. III, No: 4, Freshwater Harpacticoida. I.P.S.T. Jerusalem, 314 pp.

- Bozkurt, A., Doğu Akdeniz Bölgesi'ndeki Bazı Baraj ve Göletlerin Zooplankton Faunası Üzerine İlk Gözlemler.
- Bozkurt, A., Seyhan baraj Gölü (Adana) Zooplanktonu, Çukurova Üniversitesi Fen Bilimleri Enstitüsü, Su Ürünleri Anabilim Dalı Yüksek Lisans Tezi.
- Cox, E.J., 1996, Identification of Freshwater Diatoms From Live Material, Chapman and Hall, 158 pp., London
- Czernecki. D. B. and Blinn, D. W., 1978, Diatoms of Colorado River, J. Cramer, 181 p. Germany Foged, N., 1981, Diatoms in Alaska, J. Cramer, 310 p., Germany.
- Çabuk, Y., Arslan, N., Yılmaz, V., 2004, Species Composition and Seasonal Variations of the Gastropoda in Upper Sakarya River System (Turkey) in Relation to Water Quality, Acta hydrochim. hydrobiol., 32 (6): 393-400.
- Çicek, E., 2019, *Seminemacheilus dursunavsari*, a new nemacheilid species (Teleostei: Nemacheilidae) from Turkey, Iran. J. Ichthyol. (March 2020), 7(1): 68-77
- Çicek, E., Birecikligil, S.S., Fricke, R., 2015, freshwater fishes of Turkey: a revised and updated annotated checklist, Biharean Biologist 9 (2): 141-157
- Çiçek, E., Birecikligil, S., Öztürk, S., Seçer, B., Celepoğlu, Y., 2016, Nevşehir İli Balık Faunası İçin Koruma ve İzleme Programı Önerileri, Nevşehir Bilim ve Teknoloji Dergisi Cilt 5 (1) 1-9 2016.
- Çiçek, E., Fricke, R., Sungur, S., Eagderi, s., 2018, Endemic freshwater fishes of Turkey, FishTaxa 3(4): 1-39
- Dungan, P.J., 1990, Sulakalanların Korunması, IUCN-The World Conservation Union, DHKD Yayınları, 95 sf., İstanbul
- Dussart, B., 1967, Les Copépodes des Eaux Continentales d'Europe Occidentale. Tome I, Calanoides et Harpacticoides, N. Boubée et cie, Paris, 500 pp.
- Dussart, B., 1969, Les Copépodes des Eaux Continentales d'Europe Occidentale. Tome II, Cyclopoides et Biologie, N. Boubée et cie, Paris, 292 pp.
- Duysak, T., 2016, Seyhan Baraj Gölü (Adana) Zooplanktonunun Vertikal Göçlerinin Tespiti, İskenderun Teknik Üniversitesi Mühendislik ve Fen Bilimleri Enstitüsü, Su Ürünleri Anabilim Dalı Yüksek Lisans Tezi
- Edington, J. M., A. G. Hildrew, 1981, Caseless Caddis larvae of the British Isles. Freshwater Biological Association Scientific Publication No:43, 92 p.
- Einsle U., 1996, Guides to the Identification of the Microinvertebrates of the Continental Waters of the World. Copepoda: Cyclopoida, Genera Cyclops, Megacyclops, Acanthocyclops. SPB Academic Publishing, No: 10, 82 pp.
- Elliott, J. I., 1977, Seasonal changes in the abundance and distribution of planktonic rotifers in Grasmere, (English lake District) Freshwater Biology, 7, 147-166.

- Elliot, J. M., K. H. Mann, 1979, A key to British Freshwater Leeches. Freshwater Biological Association Scientific Publication No: 40, 72 s.
- Elliot. W., Stoching, C. R., Barbour, M. G., Rost, T. L., 1992, Botany, An Introduction to Plant Biology, 6 nd. Ed., John Wiley and Sons, Singapore.
- Emergency and Remedial Response, Washington, DC. EPA/540/1-89/002. NTIS PB90-155581.
- Emir, N.(1994): Zooplankton community structure of Çavuşcu and Eber lakes in Central Anatolia-Acta hydrochim. Hydrobiol. 22, 280-288.
- Emiroğlu, Ö., 2011, Alien fish species in upper Sakarya River and their distribution, African Journal of Biotechnology Vol. 10(73), pp. 16674-16681
- EPA, 2016, Standard Operating Procedure for Zooplankton Analysis, P.19
- EPA. *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertebrates and Aquatic\_*. Of.ce of Water, U.S. Environmental Protection Agency, Washington, D.C. EPA 841/B-99/002. 1999.
- Ergüden, D., Göksu, M.Z.L., 2012, The Fish Fauna Of The Seyhan Dam Lake (Adana), Journal of FisheriesSciences.com, 6(1): 39-52.
- Ergüden, S.A., 2015, Length-weight relationships for six freshwater fish species from the Seyhan Reservoir (south-eastern Anatolia, Turkey), J. Appl. Ichthyol, 1–3
- Erk'akan F.,1983 a. Sakarya Havzasının Balıklarının Sistematiği ve Biyo-Ekolojisi Üzerine Araştırmalar, Doğa ve Bilim Dergisi: Veterinerlik ve Hayvancılık Cilt:7, 141-154
- Erk'akan F.,1983 b. The Fish Species of the Sakarya Basin and Their Abundance. Hacettepe Bulletin of Natural Sciences and Engineering Volume:12, 21-38.
- Erk'akan, F., Atalay-Ekmekçi, F.G. and Nalbant, T.T., 1999. A review of the genus Cobitis in Turkey (Pisces:Ostariophysi:Cobitidae). Hidrobiologia, 403:13-26
- Erk'akan, F., Atalay-Ekmekçi, F.G. and Nalbant, T.T., 1999. A review of the genus Cobitis in Turkey (Pisces:Ostariophysi:Cobitidae). Hidrobiologia, 403:13-26
- Erkakan, F., Özdemir, F., 2011, Revision of the Fish of the Seyhan and Ceyhan River Basins in Turkey, Research Journal of Biological Science 6 (1): 1-8.
- European Committee for Standardization, (2004), Water quality – Guidance standard for the routine sampling and pretreatment of benthic diatoms from rivers.
- European Committee for Standardization, (2010), Water quality – Guidance standard for the surveying, sampling and laboratory analysis of phytobenthos in shallow running water.
- European Committee for Standardization, 2003, European Standard EN 14011: Water quality - sampling of fish with electricity.
- European Committee for Standardization, 2006, European Standard EN 14962: Water quality - guidance on the scope and selection of fish sampling methods.

- FAO, 1991, *Recent developments in animal waste utilization*". REUR Technical Series No. 17, 1991
- Fındık, Ö., 2000, berdan Baraj Gölü (İçel) Bentik Faunası, Çukurova Üniversitesi Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi.
- Fındık, Ö., 2006, Aslantas Baraj Gölü (Osman Ye) Bent K Faunası, Çukurova Üniversitesi Fen Bilimleri Enstitüsü, Doktora Tezi.
- Fındık, Ö., Göksu, M.Z.L., 2013, Seasonal Changes of Larval Chironomids in Berdan Dam Lake (İçel, Turkey), Menba Journal of Fisheries Faculty, Sayı-Yıl/Vol.-Year: 1: 44-48
- Foged, N., 1982, Diatoms in Bornholm, Denmark, J. Cramer, 174 p., Germany
- Freyhof, J., Erk'akan, F., Özeren, C., Perdices, A., 2011, An overview of the western Palaearctic loach genus *Oxynoemacheilus* (Teleostei: Nemacheilidae), Ichthyol. Explor. Freshwaters, Vol. 22, No. 4, pp. 301-312
- Freyhof, J. and M. Özulug, 2014. *Acanthobrama thisbeae*, a new species of bream from southern Anatolia, Turkey (Teleostei: Cyprinidae). Ichthyol. Explor. Freshwat. 25(1):1-10.
- Geldiay, R. ve Balık, S., 1999, Türkiye Tatlısu Balıkları, E.Ü. Su Ürünleri Fakültesi Yayınları No:46, İzmir, 532 s.
- Geldiay, R., Balık, S., 1996. Türkiye Tatlısu Balıkları. Ege Üniversitesi Yayınları No:46 İZMİR 532 s.
- Germain, H., 1981, Flora Des Diatomés, Diatomophycées, 441 p., Paris.
- Glöer, P., C. Meier Brook, O. Ostermann, 1992, Süßwasser mollusken: Ein Bestimmungsschlüssel für die Bundesrepublik Deutschland. Hamburg. 111 s.
- Göksu, M.Z.L., Çevik, F., Bozkurt, A., Sarıhan, E., 1997, Rotifera and Cladocera fauna of the River Seyhan (the part within borders of Adana city) [Seyhan Nehrinin (Adana ıl Merkezi sinirlari iç indeki bölümünde) Rotifera ve Cladocera Faunası, Tr J of Zoology, 21: 439-443
- Güçlü, S. S. and F. Küçük. 2008, Population Age, Sex Structure, Growth and Diet of *Aphanius mento* Heckel in: Russegger, 1843 (Cyprinodontidae: Teleostei), at Kırkgöz Spring, Antalya-Türkiye, Turkish Journal of Fisheries and Aquatic Sciences 8: 269-274.
- Güçlü, S.S., Erdoğan, Ö., küçük, F., 2019, Biology of *Chondrostoma fahirae* (Ladiges, 1960) (Actinopterygii: Cyprinidae), an Endangered and Endemic Fish of Turkey, Acta zool. bulg., 71 (1), 2019: 73-78
- Güçlü, S.S., küçük, F., 2015, The Ichthyofauna of Gediz River (Turkey): Taxonomic and Zoogeographic Features, Annual Research & Review in Biology 6(3): 202-214
- Güçlü, S.S., Küçük, F., Ertan, Ö.O., Güçlü, Z., 2013, The Fish Fauna of the Büyük Menderes River (Turkey): Taxonomic and Zoogeographic Features, Turkish Journal of Fisheries and Aquatic Sciences 13: 685-698

- Gül, A., Benzer, S., Saylar, Ö., Gül, G., Yılmaz M., Mogan Gölü balık faunası, AUN Fen Bil. Enst. Dergisi, 19(1), 91-103.
- Gülle, İ., Küçük, F., Güçlü, S.S., 2017, Re-Description and New Distribution Area of an Endemic Anatolian Fish Species, *Alburnus nasreddini* Battalgil, 1944, Turkish Journal of Fisheries and Aquatic Sciences 17: 863-869 (2017)
- Gülşah Saç, G., *Pseudophoxinus cilicicus*, a new spring minnow from southern Anatolia (Teleostei: Leuciscidae), *Zootaxa* 4671(1):105-118
- Gürlek, M., Kara, C., Korkmaz, M., 2010, The Fish Fauna of Upper Zamantı Stream (Tomarza-Örenşehir), *Biyoloji Bilimleri Araştırma Dergisi* 3 (2): 91-98.
- Gürlek, M.E., 2015, Seyhan Havzası Tatlısu Mollusk Faunası, Kahramanmaraş Sütçü İmam Üniversitesi Fen Bilimleri Enstitüsü, Biyoloji Anabilim Dalı, Doktora Tezi.
- Gürlek, M.E., 2019, A new genus and two new species of freshwater Gastropoda from the Ceyhan River Basin in the eastern Mediterranean (Mollusca: Gastropoda: Truncatelloidea), *Zoology in the Middle East*, Vol. 65, No. 1, 59–65.
- Gürlek, M.E., Kebapçı, Ü., Lopes-Lima, M., 2016, Mersin Limonlu (Lamos) Çayı Malakofaunası, *Yunus Araştırma Bülteni* 2016 (1): 19-25.
- Güzel, U., 2019, Akarçay Ve Sakarya Havzalarında Bulunan Göllerin Fitoplankton Komünite Yapısının Çevresel Değişkenler İle Karşılaştırılması, Sakarya Üniversitesi Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi
- Holmes, N., Whitton, B.A., 1977. Macrophytic vegetation of the river Tees in 1975 observed and predicted changes. *Freshwater Biology* 7, 43-60.
- Holtacı, A., 2015, Afyon ve Aydın İllerinden Toplanan Odonata Larvalarının Faunası, Hitit Üniversitesi Fen Bilimleri Enstitüsü, Yüksek lisans Tezi
- Hrbek T., Wildekamp R.H., 2003. *Aphanius villwocki*, a new species from the Sakarya River basin of central Anatolian plain, Turkey (Teleostei: Cyprinodontiformes), *Ichthyoi.Explor. Freshwaters*, Vol. 14, No.2, pp. 137-144.
- Hrbek, T. and A. Meyer. 2003, Closing of the Tethys Sea and the phylogeny of Eurasian killifishes (Cyprinodontiformes: Cyprinodontidae), *J. Evol. Biol.* 16(1): 17-36.
- Huber Pestalozzi G (1941). *Das Phytoplankton des Süswassers, 2. Teil, 1. Hälfte, Chrysophyceen*. Stuttgart: E. Schweizerbart'sche Verlagsbuehhandlung.
- Huber Pestalozzi G (1955). *Das Phytoplankton des Süswassers, 4. Teil, Euglenophyceen*. Stuttgart: E. Schweizerbart'sche Verlagsbuehhandlung.
- Huber Pestalozzi G (1961). *Das Phytoplankton des Süswassers, 5. Teil, Chrysophyceae (Ordnung:Volvocales)*. Stuttgart: E. Schweizerbart'sche Verlagsbuehhandlung.
- Huber Pestalozzi G (1968). *Das Phytoplankton des Süswassers, 3. Teil, Cryptophyceae, Chloromonadophyceae, Dinophyceae*. Stuttgart: E. Schweizerbart'sche Verlagsbuehhandlung.

- Huber Pestalozzi G (1982). *Das Phytoplankton des Süswassers, 8. Teil, 1. Hälfte, Conjugatophyceae (Zynematales und Desmidiates)*. Stuttgart: E. Schweizerbart'sche Verlagsbuehhandlung.
- Hustedt, 1930, Die Süswasser-Flora Mitteleuropas, 466 pp. Jena
- Hutchinson, G.E., 1967, A Treatise on Limnology, Department of Yale University, 1115 P.
- Illies, J., 1978, Limnofauna Europea. Gustav Aquatic\_er Verlag. 532 s.
- İlhan, A., Balık, S., Sarı, H.M., 2014, Orta Ve Batı Anadolu Endemik İçsu Balıklarının Günümüzdeki Dağılımları Ve Koruma Statüleri, İstanbul Üniversitesi Su Ürünleri Dergisi (2014) 29-2: 9-34
- İlhan, A., Sarı, H.S., 2013, Marmara gölü balık faunası ve balıkçılık faaliyetleri, Ege J Fish Aqua Sci 30(4): 187-191
- İnnal, D., 2020, Fish Diversity and Abundance in the Seyhan River Estuary, Mediterranean Sea Basin, Turkey, Acta Zool. Bulg., Supplement 15, August 2020: 173-180
- Kalyoncu, H., Salur, A., 2018, Odonata Fauna Of Alara And Karpuz Stream and Their Relations With Physico-Chemical Variables, Volume 27 – No: 187-195.
- Kara, C., Alp, A., Şimşekli, M., 2010, Distribution of Fish Fauna on the Upper and Middle Basin of Ceyhan River, Turkey, Turkish Journal of Fisheries and Aquatic Sciences 10: 111-122.
- Kara, C., Çömlekçioğlu, U., 2004, Karaçay (Kahramanmaraş)'ın Kirliliğinin Biyolojik ve Fiziko-Kimyasal Parametrelerle İncelenmesi, KSU Journal of Science and Engineering 7(1): 1-7
- Kargioğlu, M., Serteser, A., Kıvrak, E., İçağa, Y., Konuk, M., 2012, Relationships between epipelagic diatoms, aquatic macrophytes, and water quality in Akarçay Stream, Afyonkarahisar, Turkey, Oceanological and Hydrobiological Studies, International Journal of Oceanography and Hydrobiology, 41 (1): 74-84
- Kayan, A., 2021, The Trichoptera Fauna of Ulupınar Stream and Its Relationship with Water Quality, Turkish Journal of Water Science & Management, Volume: 5 Issue: 1: 59-79
- Kazancı N., 1987, *Gümüşhane, Erzurum, Erzincan, Artvin, Kars illerinde Ephemeroptera (Insecta) takımı larvalarının ve erginlerinin sistematik yönden incelenmesi*. TÜBİTAK Proje No: TBAG-574, 80 s.
- Kazancı, N., 2001, Gümüşhane, Erzurum, Erzincan, Artvin, Kars İlleri Ephemeroptera Faunasına İlişkin Ön Çalışma. Türkiye İç Suları Araştırmaları Dizisi V. İmaj Yayınevi, 80 s., Ankara.
- Kazancı, N., Ertunç, Ö., 2008, Bazı Simuliidae (Insecta, Diptera) Türlerinin Habitat Özellikleri, E.U. Journal of Fisheries & Aquatic Sciences, Cilt/Volume 25, Sayı/Issue 4: 319–323

- Kazancı, N., Girgin, S., Dügel, M., Oğuzkurt, D., 1997, *Akarsuların Çevre Kalitesi Yönünden Değerlendirilmesinde ve İzlenmesinde Biyotik İndeks Yöntemi*, Türkiye İç Suları Araştırmaları Dizisi II (Ed. Nilgün Kazancı), Form Ofset, 100 s., Ankara.
- Kence, A. ve Bilgin, C., 1996, Türkiye Omurgalıları Tür Listesi, Ankara, 183 s.
- Keşir, Ü.E., 2016, Ceyhan Nehri Trichoptera Faunası, Nevşehir Hacı Bektaş Veli Üniversitesi Fen Bilimleri Enstitüsü, Biyoloji Anabilim Dalı, Yüksek Lisans Tezi
- Kılıçaslan, I., Özbek, M., Contributions to the knowledge on the distribution of freshwater Mollusca species of Turkey, Review of Hydrobiology 3,2: 127-144 (2010)
- Kıvrak, E., Uygun, A., 2012, The structure and diversity of the epipelagic diatom community in a heavily polluted stream (the Akarçay, Turkey) and their relationship with environmental variables, Journal of Freshwater Ecology Vol. 27, No. 3, September 2012, 443–457
- Kıvrak, E., Uygun, A., Kalyoncu, H., 2012, Akarçay'ın (Afyonkarahisar, Türkiye) Su Kalitesini Değerlendirmek için Diatom İndekslerinin Kullanılması, Akü Febid 12 (2012) 021003 (27-38).
- Kiefer, F., 1955, Freilebende Ruderfusskrebse (Crustacea, Copepoda) aus Türkischen Binnengewasser. II. Cyclopoida und Harpacticoida. I.Ü.F.F. Hydrobiyoloji Araşt. Enst. Yayınları, Seri B, II (4): 108-132.
- Kiefer, F., 1978, Das Zooplankton der Binnengewässer 2. Teil. Freilebende Copepoda. Die Binnengewässer Band XXVI E. Schweizerbart'sche, Verlagbuchhandlung, Stuttgart. 315 pp.
- Kolisko, R., 1974, Plankton rotifers biology and taxonomy. Biological Station Lunz of Austrian Academy of Science, Stuttgart.
- Kolisko, R.A., 1974, Plankton Rotifers Biology and Taxonomy, Biological Station Lunz of the Austrian Academy of Science, Stuttgart, 974 p.
- Komárek J (1983). *Das Phytoplankton des Süßwassers, 7. Teil, 1. Hälfte, Chlorophyceae (Ordnung: Chlorococcales)*. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung.
- Koste, W., 1978a, Die Radetiere Mitteleuropas 1. Textband Berlin Stuttgart 670 P.
- Koste, W., 1978b, Die Radetiere Mitteleuropas II. Tafelband Berlin Stuttgart, 235 P.
- Krammer, K., Lange-Bertalot, H., 1986, Süßwasserflora von Mitteleuropa, Bacillariophyceae, Band 2/1, 1. Teil: Naviculaceae, Gustav Fischer Verlag, 876 pp., Stuttgart
- Krammer, K., Lange-Bertalot, H., 1988, Süßwasserflora von Mitteleuropa, Bacillariophyceae, Band 2/2, 2. Teil: Bacillariaceae, Epithemiaceae, Surirellaceae, Gustav Fischer Verlag, 584 pp., Stuttgart
- Krammer, K., Lange-Bertalot, H., 1991a, Süßwasserflora von Mitteleuropa, Bacillariophyceae, Band 2/3, 3. Teil: Centrales, Fragilariaceae, Gustav Fischer Verlag, 576 pp., Stuttgart

- Krammer, K., Lange-Bertalot, H., 1991b, Süßwasserflora von Mitteleuropa, Bacillariophyceae, Band 2/4, 4. Teil: Achnanthaceae, Kritische Ergänzungen zu Navicula (Lineolatae) und Gomphonema Gesamtliteraturverzeichnis, Gustav Fischer Verlag, 436 pp., Stuttgart
- Kuru, M., 1980. Key to Inland Water Fishes of Turkey. Hacettepe Bull. Nat. Sci. Eng., 9, 103-133.
- Kuru, M., 2004. Türkiye İçsu Balıklarının Son Durumu, GÜ, Gazi Eğitim Fakültesi Dergisi, Cilt 24, Sayı (3) 1-21.
- Kuttikova, A., 1970, Rotatoria (The Rotifer fauna of SSCB), 670 P.
- Küçük, F., D. Turan, S.S. Güçlü, A.G. Mutlu and Y. Çiftci, 2017. Two new species of Chondrostoma Agassiz, 1832 (Teleostei; Cyprinidae) from Ceyhan, Seyhan and Göksu Rivers in the East Mediterranean region of Turkey. Turk. J. Fish Aquat. Sci. 17:795-803.
- Küçük, F., Turan, D., Güçlü, S.S., Mutlu, A.G., Çiftci, Y., 2017, Two New Species of Chondrostoma Agassiz, 1832 (Teleostei: Cyprinidae) from the Ceyhan, Seyhan and Göksu Rivers in the East Mediterranean Region of Turkey, Turkish Journal of Fisheries and Aquatic Sciences 17: 793-801
- Lackey, J. B. 1938 The flora and fauna of surface waters polluted by acid mine drainage. Publ. Health Rep. 53: 1499-1507.
- Le Cren, E.D. 1951. The length-weight relationship and seasonal cycle in gonad weight and condition in Perch (*Perca fluviatilis*). J. Anim. Ecol. 20:201-219.
- Ludwig, H.W., 1993, Tiere in Bach, Fluss, Tümpel, See, Merkmale, biologie, Lebensraum Gefährdung BLV Bestimmungsbuch 255 s.
- Lund, J.W.G., Kipling, C. & LeCren, E.D. (1958). The inverted microscope method of estimating algal numbers and the statistical basis of estimations by counting. Hydrobiologia, 11, 143-170.
- Macan, T. T., 1982, A guide to Freshwater Invertebrate Animals. Longman. 118 p.
- Mann, K. H., 1962, Leeches (Hirudinea) Their Structure, Physiology, Ecology and Embryology. Pergamon Press. 201 p.
- NC Department of Environmental Quality. 2016. Standard Operating Procedures for the Collection and Analysis of Benthic Macroinvertebrates. Division of Water Resources. Raleigh, North Carolina. February 2016.
- Needham, J. G., P. R. Needham, 1962, A guide to the study of Freshwater Biology. San Francisco 107 p.
- Negrea, S.T., 1983, Fauna Republici Socialiste Romania Crustacea Cladocera. Academia Republicii Socialiste Romania, 4: (12), Buceristi, p. 399.

- Odabaşı D.A., Arslan, N., 2015, Description of a new subterranean nerite *Theodoxus gloeri* n sp with some data on the freshwater gastropod fauna of Balıkdamı Wetland Sakarya River Turkey *Ecologica Montenegrina* 2 (4): 327-333.
- Odum, E. P. 1971. *Fundamentals of ecology*. W.B. Saunders Co., Philadelphia.
- Öscan, G., Tarkan, A.S., 2019, Distribution Revised- Fifteen Years Of Changes In The Invasion Of A Freshwater Fish, *Pseudorasbora parva* (Temminck And Schlegel, 1846) In Turkey, *Transylv. Rev. Syst. Ecol. Res.* 21.2: 69-80
- Özesmi, U., 1988, Sultan Sazlığı'nın Sucul heteroptera ve Coleoptera türleri üzerinde bir faunistik araştırma. TÜBİTAK BAYG-Proje yarışması Araştırma raporu.
- Patrick, R., Reimer, C. W., 1966, *The Diatoms of the United States*, Vol. 1-2, Part I, Philadelphia.
- Pauly, D. and Navaluna, N.A. 1983. Monsoon-induced seasonality in the recruitment of Philippine Aquatic\_ies. In G.D Sharp and J. Csirke (eds.) *Proceedings of the Expert Consultation to Examine Changes in Abundance and Species Composition of Neritic Aquatic\_ Resources*, 18-29 April 1983, San Jose, Costa Rica. FAO Aquatic\_eries Report 291, Vol. 3.
- Pejler, B., 1962, Taxonomic notes on some planktonic-freshwater rotifers, *zoologiska Bidrag Fran Uppsalla*, Bond 35, 302-319
- Pennak, R. W., 1978, *Freshwater Invertebrates of the United States*. John Wiley and Sons Publication. 803 p.
- Prescott, G.W., 1975, *Algae of Western Great Lake Area*, Brown Comp. Pub., 977 p.
- Quigley, M., 1977, *Invertebrates of Streams and Rivers. A key to Identification*. London 874 p.
- Rider, M. de, 1981, *Rotifera*, Cercle Hydrobiologique de Bruxelles, 190 P.
- Rosenberg, D. M., and Resh, V. H., 1993, *Freshwater biomonitoring and benthic macroinvertebrates*, New York, 326p.
- Round, F.E., 1973, *The Biology of the Algae*, Second Ed., Edward Arnold Pub., 278 pp., London
- Rylov, V.M., 1963, *Fauna of U.S.S.R. Crustacea*, Vol. III, No: 3, *Freshwater Cyclopoida*, I.P.S.T. Jerusalem, 314 pp.
- Salur, A., Kiyak, S., 2006, Additional Records for the Odonata Fauna of East Mediterranean Region of Turkey, *Mun. Ent. Zool.* Vol. 1, No. 2.
- Sennika, S.A.B., 1943, *Contributions to the Ecology and Biology of the Danish Freshwater Leeches (Hirudirea)*. København Denmark 109 p.
- Serteser, A., Kargıoğlu, M., İçağa, Y., Konuk, M., 2008, Vegetation as an Indicator of Soil Properties and Water Quality in the Akarçay Stream (Turkey), *Environmental Management* (2008) 42:764–770

- Sladeczek, V., 1983, Rotifers as indicators of water quality, *Hydrobiologia*, 100, 169-201.
- Smirnov, N.N., 1992, Guides to the Identification of the Microinvertebrates of the Continental Waters of the World. The Macrothricidae of the World. SPB Academic Publishing, No: 1, 140 pp.
- Solak, C.N., Çetin, T., Karaaslan, Y., kaleli, A., Yılmaz, E., Duran, M., Kıvanç, G., Kimençe, T., Koyunluoğlu, Ş.A., Çankaya, B.F., Aşık, D.Y., 2019, Common Diatoms of Phytobenthos in Gediz River Basin, Volume: 3 Issue: 2:58-70
- Sreenivasa, M. R., Duthie, H. C., 1973, Diatom Flora of the Grand River Ontario, Canada, *Hydrobiologia*, 42: 161-224.
- Şahin, Y., (1991): Türkiye Chironomidae Potamofaunası TÜBİTAK Proje No: TBAG-869. Ankara 88 s.
- Şişli, N., 1996, Ekoloji, Yeni Fersa Matbaacılık, 492 s.
- Tanatmış, M., 1995, Sakarya Nehir Sistemi ephemeroptera Limnofaunasının Belirlenmesi Üzerinde Araştırmalar, *Türk. Entomol. Derg.*, 19 (4): 287-298.
- Taşdemir, A., Ustaoglu, R.M., Balık, S., 2009, Gediz Deltası (Menemen-İzmir) Chironomidae (Diptera) Faunası'na Katkılar, *Journal of FisheriesSciences.com*, 3(1): 32-39
- Temiz, G., 2019, Mersin İli Tatlı Su Balık Faunası, Nevşehir Hacı Bektaş Veli Üniversitesi Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi
- Turan, D., Kottelat, M., Doğan, E., 2013, Two new species of *Squalius*, *S. adanaensis* and *S. seyhanensis* (Teleostei: Cyprinidae), from the Seyhan River in Turkey, *Zootaxa* 3637 (3): 308–324
- Türk Standartları Enstitüsü, (1991), Water quality – Using Techniques and classification for sampling phytoplankton in surface water.
- U.S. EPA. 2001. *Risk Assessment Guidance for Superfund: Volume I. Human Health Evaluation Manual, Part D: Standardized Planning, Reporting, and Review of Superfund Risk Assessments*. Office of Emergency and Remedial Response. Washington, DC. OSWER Directive No. 9285-47. December.
- Uslu ve Türkman, 1987, Su Kirliliği ve Kontrolü, T.C. Başbakanlık Çevre Genel Müdürlüğü Yayınları Eğitim dizisi 1, 364 sf.
- Uygun, A., 2010, Akarçay'ın (Afyonkarahisar) Bentik Diyatomeleleri Ve Çay Su Kalitesinin Değerlendirilmesinde Kullanılması Üzerine Bir Araştırma, Afyon Kocatepe Üniversitesi Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi.
- Van Heurck, H., 1962, A Treatise on the Diatomaceae, J. Cramer, 555 p., London.
- Vollenweider, R. A. (1974). A manual on methods for measuring primary production in aquatic environments. Blackwell Scientific Publications, Oxford
- Wetzel, 1983, *Limnology*, Michigan State University, 767 pp., USA

- Wildekamp, R.H., F. Küçük, M. Ünlüsayın, and W. V. Neer. 1999, Species and Subspecies of the Genus *Aphanius* Nardo 1897 (Pisces: Cyprinodontidae) in Turkey, Turk. J. Zool. 23: 23-44.
- Yeğen, V., Balık, S., Bilçen, E., Sarı, H.M., Uysal, R., İlhan, A., Bostan, H., 2007, Afyon İli Akarsularında Yayılış Gösteren Balık Türleri Ve Dağılımları, Türk Suçul Yaşam Dergisi Ulusal Su Günleri, 3: 419-428.
- Yoğurtçuoğlu, B., Ekmeçci, F. G., 2017, New Records of Kızılırmak Toothcarp, *Aphanius marassantensis* from Central Yeşilırmak River Basin (Turkey), Turkish Journal of Aquatic Sciences 17: 205-208.
- Zahrandik, J., Cihar, J., 1990, Der Kosmos-Tierführer. Ein bestimmungsbuch mit 1092 Farbbildern. Prag. 389 s.

# Appendix - 1

## General Features of the Stations

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |            |                 |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------|
| <b>Sampling Point</b>                           | <b>Aquatic_1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |            |                 |
| <b>Basin</b>                                    | East Mediterranean                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |            |                 |
| <b>River/Stream</b>                             | Deliçay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |            |                 |
| <b>MAGHTH Kilometer</b>                         | 7+523                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 |            |                 |
| <b>Coordinates</b>                              | 651728.55 D 4078838.22 K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |            |                 |
| <b>Field Photo</b>                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |            |                 |
| <b>EUNIS Habitat Type</b>                       | <b>C2.5: Temporary running waters</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 |            |                 |
| <b>Habitat Features</b>                         | <p>Although it is a wide creek bed, there is very little water flow during the sampling period. Even from 100 m above the transition zone, the stream bed was dry. Just after the bridge, the water returning from the agricultural irrigation brought by pipe from the agriculture fields feeds the stream. In this section, where the bridge works have been completed, a temporary bridge has been built over the stream bed and vehicles still use it for crossing. Fish have been caught in areas with water, and the bottom structure of the stream is mud and muddy. Reedy areas in riparian areas attract attention.</p> |                 |            |                 |
| <b>Visual Water Quality</b>                     | <b>Good</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Moderate</b> | <b>Bad</b> | <b>Very Bad</b> |
|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | X               |            |                 |
| <b>Riparian Vegetation</b>                      | Bank stabilization has deteriorated and there are dense reeds areas close to the water.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |            |                 |
| <b>Current Situation in the Transition Area</b> | Bridge works have been completed by making important interventions to the river bed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |            |                 |

|                                                                                     |                                                                                                                                                                                                                                                        |          |     |          |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|----------|
| Sampling Point                                                                      | Aquatic_2                                                                                                                                                                                                                                              |          |     |          |
| Basin                                                                               | East Mediterranean                                                                                                                                                                                                                                     |          |     |          |
| River/Stream                                                                        | Irrigation Canal                                                                                                                                                                                                                                       |          |     |          |
| MAGHTH Kilometer                                                                    | 19+458                                                                                                                                                                                                                                                 |          |     |          |
| Coordinates                                                                         | 662494.98 D 4083840.59 K                                                                                                                                                                                                                               |          |     |          |
| Field Photo                                                                         |                                                                                                                                                                                                                                                        |          |     |          |
|  |                                                                                                                                                                                                                                                        |          |     |          |
| EUNIS Habitat Type                                                                  | C2.3: Permanent non-tidal, smooth-flowing watercourses                                                                                                                                                                                                 |          |     |          |
| Habitat Features                                                                    | It is a concrete canal built for irrigation purposes. It is an artificial aquatic area, which has no natural features and is completely covered with concrete. It is an artificial habitat where aquatic food chain elements do not function properly. |          |     |          |
| Visual Water Quality                                                                | Good                                                                                                                                                                                                                                                   | Moderate | Bad | Very Bad |
|                                                                                     |                                                                                                                                                                                                                                                        | X        |     |          |
| Riparian Vegetation                                                                 | The riparian area is covered with concrete and there are ruderal herbaceous plant communities right next to it.                                                                                                                                        |          |     |          |
| Current Situation in the Transition Area                                            | The bridge construction works on this section have been completed.                                                                                                                                                                                     |          |     |          |

|                                                                                     |                                                                                                                                                                                                                                                                               |          |     |          |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|----------|
| Sampling Point                                                                      | Aquatic_3                                                                                                                                                                                                                                                                     |          |     |          |
| Basin                                                                               | East Mediterranean                                                                                                                                                                                                                                                            |          |     |          |
| River/Stream                                                                        | Tarsus Stream                                                                                                                                                                                                                                                                 |          |     |          |
| MAGHTH Kilometer                                                                    | 28+000                                                                                                                                                                                                                                                                        |          |     |          |
| Coordinates                                                                         | 668610.99 D 4089355.47 K                                                                                                                                                                                                                                                      |          |     |          |
| Field Photo                                                                         |                                                                                                                                                                                                                                                                               |          |     |          |
|  |                                                                                                                                                                                                                                                                               |          |     |          |
| EUNIS Habitat Type                                                                  | C2.3: Permanent non-tidal, smooth-flowing watercourses                                                                                                                                                                                                                        |          |     |          |
| Habitat Features                                                                    | It has a wide bed and the bottom structure consists of sand, stone and gravel areas. Since the amount of water is low, the current is also low, but large areas of water are observed in stagnant and deep parts. In some parts, it is dense in reed areas close to the bank. |          |     |          |
| Visual Water Quality                                                                | Good                                                                                                                                                                                                                                                                          | Moderate | Bad | Very Bad |
|                                                                                     |                                                                                                                                                                                                                                                                               | X        |     |          |
| Riparian Vegetation                                                                 | The bank structure has a stable structure away from the effect of erosion. Willow and poplar trees are observed in the garden areas. Riparian areas are under the pressure of urbanization.                                                                                   |          |     |          |
| Current Situation in the Transition Area                                            | Bridge construction work has been completed.                                                                                                                                                                                                                                  |          |     |          |

|                                                 |                                                                                                                                                                                                                     |                 |            |                 |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------|
| <b>Sampling Point</b>                           | <b>Aquatic_4</b>                                                                                                                                                                                                    |                 |            |                 |
| <b>Basin</b>                                    | East Mediterranean                                                                                                                                                                                                  |                 |            |                 |
| <b>River/Stream</b>                             | Küskün Stream                                                                                                                                                                                                       |                 |            |                 |
| <b>MAGHTH Kilometer</b>                         | 34+166                                                                                                                                                                                                              |                 |            |                 |
| <b>Coordinates</b>                              | 674531.43 D 4090697.69 K                                                                                                                                                                                            |                 |            |                 |
| <b>Field Photo</b>                              |                                                                                                                                  |                 |            |                 |
| <b>EUNIS Habitat Type</b>                       | <b>C2.3:</b> Permanent non-tidal, smooth-flowing watercourses                                                                                                                                                       |                 |            |                 |
| <b>Habitat Features</b>                         | Although it is a dry period, there is a high amount of water in the stream bed. The bank areas are covered with dense reeds and the bottom part of the stream consists of mud, fine gravel, stones and rocky areas. |                 |            |                 |
| <b>Visual Water Quality</b>                     | <b>Good</b>                                                                                                                                                                                                         | <b>Moderate</b> | <b>Bad</b> | <b>Very Bad</b> |
|                                                 |                                                                                                                                                                                                                     | X               |            |                 |
| <b>Riparian Vegetation</b>                      | The riparian area is predominantly covered with annual herbaceous plants, the slope is low and the effect of erosion is not observed.                                                                               |                 |            |                 |
| <b>Current Situation in the Transition Area</b> | Bridge crossing works in this section have been completed.                                                                                                                                                          |                 |            |                 |

|                                          |                                                                                                                                                                                                          |          |     |          |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|----------|
| Sampling Point                           | Aquatic_5                                                                                                                                                                                                |          |     |          |
| Basin                                    | Seyhan River Basin                                                                                                                                                                                       |          |     |          |
| River/Stream                             | Irrigation Canal                                                                                                                                                                                         |          |     |          |
| MAGHTH Kilometer                         | 353+000                                                                                                                                                                                                  |          |     |          |
| Coordinates                              | 689707.78 D 4095656.76 K                                                                                                                                                                                 |          |     |          |
| Field Photo                              |                                                                                                                                                                                                          |          |     |          |
|                                          |                                                                                                                                                                                                          |          |     |          |
| EUNIS Habitat Type                       | C2.3: Permanent non-tidal, smooth-flowing watercourses                                                                                                                                                   |          |     |          |
| Habitat Features                         | It is a large irrigation canal and a significant portion of the canal is filled with water during sampling. All sides of the channel are covered with concrete and the aquatic ecosystem is not healthy. |          |     |          |
| Visual Water Quality                     | Good                                                                                                                                                                                                     | Moderate | Bad | Very Bad |
|                                          | X                                                                                                                                                                                                        |          |     |          |
| Riparian Vegetation                      | The area behind the concrete channel is dominated by annual plants and there are also few trees.                                                                                                         |          |     |          |
| Current Situation in the Transition Area | Channel transition works have been completed.                                                                                                                                                            |          |     |          |

|                                                 |                                                                                                                                                                                                                                                                                               |                 |            |                 |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------|
| <b>Sampling Point</b>                           | <b>Aquatic_6</b>                                                                                                                                                                                                                                                                              |                 |            |                 |
| <b>Basin</b>                                    | Seyhan River Basin                                                                                                                                                                                                                                                                            |                 |            |                 |
| <b>River/Stream</b>                             | Seyhan River                                                                                                                                                                                                                                                                                  |                 |            |                 |
| <b>MAGHTH Kilometer</b>                         | 371+485                                                                                                                                                                                                                                                                                       |                 |            |                 |
| <b>Coordinates</b>                              | 707804.07 D 4098186.90 K                                                                                                                                                                                                                                                                      |                 |            |                 |
| <b>Field Photo</b>                              |                                                                                                                                                                                                            |                 |            |                 |
| <b>EUNIS Habitat Type</b>                       | <b>C2.3:</b> Permanent non-tidal, smooth-flowing watercourses                                                                                                                                                                                                                                 |                 |            |                 |
| <b>Habitat Features</b>                         | The bank structure of the transition zone of the Seyhan River, located in the city center, is completely covered with concrete. Due to a regulator downstream of the transition zone, the water is inflated and the depth is quite high. The bottom part of the river consists of mud fields. |                 |            |                 |
| <b>Visual Water Quality</b>                     | <b>Good</b>                                                                                                                                                                                                                                                                                   | <b>Moderate</b> | <b>Bad</b> | <b>Very Bad</b> |
|                                                 |                                                                                                                                                                                                                                                                                               | X               |            |                 |
| <b>Riparian Vegetation</b>                      | The bank areas are completely concreted and surrounded by artificial environments brought by urbanization. For this reason, the riparian area and vegetation have also disappeared.                                                                                                           |                 |            |                 |
| <b>Current Situation in the Transition Area</b> | No work has been carried out on the construction of the river crossing.                                                                                                                                                                                                                       |                 |            |                 |

|                                                 |                                                                                                                                                                            |                 |            |                 |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------|
| <b>Sampling Point</b>                           | <b>Aquatic_7</b>                                                                                                                                                           |                 |            |                 |
| <b>Basin</b>                                    | Seyhan River Basin                                                                                                                                                         |                 |            |                 |
| <b>River/Stream</b>                             | Seasonal Stream                                                                                                                                                            |                 |            |                 |
| <b>MAGHTH Kilometer</b>                         | 390+515                                                                                                                                                                    |                 |            |                 |
| <b>Coordinates</b>                              | 726383.56 D 4094737.39 K                                                                                                                                                   |                 |            |                 |
| <b>Field Photo</b>                              |                                                                                         |                 |            |                 |
| <b>EUNIS Habitat Type</b>                       | <b>C2.5: Temporary running waters</b>                                                                                                                                      |                 |            |                 |
| <b>Habitat Features</b>                         | It is a seasonal creek station where there is no flow in the stream bed. The stream bed is small and no aquatic biota development was observed during the sampling period. |                 |            |                 |
| <b>Visual Water Quality</b>                     | <b>Good</b>                                                                                                                                                                | <b>Moderate</b> | <b>Bad</b> | <b>Very Bad</b> |
|                                                 |                                                                                                                                                                            |                 |            |                 |
| <b>Riparian Vegetation</b>                      | There is a highly sloping riparian area and the vegetation is also quite poor.                                                                                             |                 |            |                 |
| <b>Current Situation in the Transition Area</b> | It was observed that within the scope of the transition works, large rock blocks were placed in the stream bed and the works were started.                                 |                 |            |                 |

|                                                 |                                                                                                                                                                                                                                       |                 |            |                 |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------|
| <b>Sampling Point</b>                           | <b>Aquatic_8</b>                                                                                                                                                                                                                      |                 |            |                 |
| <b>Basin</b>                                    | Ceyhan River Basin                                                                                                                                                                                                                    |                 |            |                 |
| <b>River/Stream</b>                             | Ceyhan River                                                                                                                                                                                                                          |                 |            |                 |
| <b>MAGHTH Kilometer</b>                         | 406+324                                                                                                                                                                                                                               |                 |            |                 |
| <b>Coordinates</b>                              | 740842.93 D 4097587.13 K                                                                                                                                                                                                              |                 |            |                 |
| <b>Field Photo</b>                              |                                                                                                                                                    |                 |            |                 |
| <b>EUNIS Habitat Type</b>                       | <b>C2.3: Permanent non-tidal, smooth-flowing watercourses</b>                                                                                                                                                                         |                 |            |                 |
| <b>Habitat Features</b>                         | There is a very large river bed and the bottom structure consists predominantly of mud and sand areas. In addition, gravel and stony areas are also seen. It has been observed that the current is high enough to fill the river bed. |                 |            |                 |
| <b>Visual Water Quality</b>                     | <b>Good</b>                                                                                                                                                                                                                           | <b>Moderate</b> | <b>Bad</b> | <b>Very Bad</b> |
|                                                 |                                                                                                                                                                                                                                       | X               |            |                 |
| <b>Riparian Vegetation</b>                      | It has a bank structure formed by poplar and willow trees and with a slight slope. There are intensive agricultural areas just behind the riparian area.                                                                              |                 |            |                 |
| <b>Current Situation in the Transition Area</b> | No activity related to construction works was observed.                                                                                                                                                                               |                 |            |                 |

|                                                 |                                                                                                                                                                                                                                                                                                         |                 |            |                 |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------|
| <b>Sampling Point</b>                           | <b>Aquatic_9</b>                                                                                                                                                                                                                                                                                        |                 |            |                 |
| <b>Basin</b>                                    | Ceyhan River Basin                                                                                                                                                                                                                                                                                      |                 |            |                 |
| <b>River/Stream</b>                             | Karasu Stream                                                                                                                                                                                                                                                                                           |                 |            |                 |
| <b>MAGHTH Kilometer</b>                         | 435+100                                                                                                                                                                                                                                                                                                 |                 |            |                 |
| <b>Coordinates</b>                              | 233389.72 D 4106112.05 K                                                                                                                                                                                                                                                                                |                 |            |                 |
| <b>Field Photo</b>                              |                                                                                                                                                                                                                      |                 |            |                 |
| <b>EUNIS Habitat Type</b>                       | <b>C2.3: Permanent non-tidal, smooth-flowing watercourses</b>                                                                                                                                                                                                                                           |                 |            |                 |
| <b>Habitat Features</b>                         | A healthy aquatic ecosystem environment has been observed and the bottom part is predominantly composed of sand areas. Gravel and stony areas also form the other bottom structure. Although the amount of water is low and the flow rate is slow, suitable habitats especially for fish were observed. |                 |            |                 |
| <b>Visual Water Quality</b>                     | <b>Good</b>                                                                                                                                                                                                                                                                                             | <b>Moderate</b> | <b>Bad</b> | <b>Very Bad</b> |
|                                                 | X                                                                                                                                                                                                                                                                                                       |                 |            |                 |
| <b>Riparian Vegetation</b>                      | Riparian vegetation is not strong, annual herbaceous plants are dominant, bank slope is relatively low.                                                                                                                                                                                                 |                 |            |                 |
| <b>Current Situation in the Transition Area</b> | Bridge construction works for the crossing of the stream in the study area have been completed.                                                                                                                                                                                                         |                 |            |                 |

|                                                 |                                                                                                                                                                                               |                 |            |                 |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------|
| <b>Sampling Point</b>                           | <b>Aquatic_10</b>                                                                                                                                                                             |                 |            |                 |
| <b>Basin</b>                                    | Ceyhan River Basin                                                                                                                                                                            |                 |            |                 |
| <b>River/Stream</b>                             | Irrigation Canal                                                                                                                                                                              |                 |            |                 |
| <b>MAGHTH Kilometer</b>                         | 447+000                                                                                                                                                                                       |                 |            |                 |
| <b>Coordinates</b>                              | 245248.05 D 4106505.22 K                                                                                                                                                                      |                 |            |                 |
| <b>Field Photo</b>                              |                                                                                                            |                 |            |                 |
| <b>EUNIS Habitat Type</b>                       | <b>C2.3:</b> Permanent non-tidal, smooth-flowing watercourses                                                                                                                                 |                 |            |                 |
| <b>Habitat Features</b>                         | It is a large irrigation channel and there is no natural habitat. At this station, there are no natural aquatic habitats and organisms, and all sides of the canal are covered with concrete. |                 |            |                 |
| <b>Visual Water Quality</b>                     | <b>Good</b>                                                                                                                                                                                   | <b>Moderate</b> | <b>Bad</b> | <b>Very Bad</b> |
|                                                 |                                                                                                                                                                                               | X               |            |                 |
| <b>Riparian Vegetation</b>                      | The riparian area is covered with concrete and there is no riparian area with natural features.                                                                                               |                 |            |                 |
| <b>Current Situation in the Transition Area</b> | The construction works for the passage of the irrigation canal have been completed.                                                                                                           |                 |            |                 |

|                                                 |                                                                                                                                                                                                                                             |                 |            |                 |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------|
| <b>Sampling Point</b>                           | <b>Aquatic 11</b>                                                                                                                                                                                                                           |                 |            |                 |
| <b>Basin</b>                                    | Ceyhan River Basin                                                                                                                                                                                                                          |                 |            |                 |
| <b>River/Stream</b>                             | Akçasu Stream                                                                                                                                                                                                                               |                 |            |                 |
| <b>MAGHTH Kilometer</b>                         | 16+629                                                                                                                                                                                                                                      |                 |            |                 |
| <b>Coordinates</b>                              | 260634.37 D 4112545.26 K                                                                                                                                                                                                                    |                 |            |                 |
| <b>Field Photo</b>                              |                                                                                                                                                          |                 |            |                 |
| <b>EUNIS Habitat Type</b>                       | <b>C2.3:</b> Permanent non-tidal, smooth-flowing watercourses                                                                                                                                                                               |                 |            |                 |
| <b>Habitat Features</b>                         | The bottom of the stream consists of small pebbles and rocky areas. Sand deposits are observed in the parts where the water gets deeper. In areas where the water stagnates, the proportion of aquatic plants, especially reeds, increases. |                 |            |                 |
| <b>Visual Water Quality</b>                     | <b>Good</b>                                                                                                                                                                                                                                 | <b>Moderate</b> | <b>Bad</b> | <b>Very Bad</b> |
|                                                 |                                                                                                                                                                                                                                             | X               |            |                 |
| <b>Riparian Vegetation</b>                      | Riparian vegetation is strong and reeds and willow trees are dominant. The bank slope is low and the erosion effect is low due to the strong vegetation.                                                                                    |                 |            |                 |
| <b>Current Situation in the Transition Area</b> | Construction works for the passage of the stream in the study area have not started.                                                                                                                                                        |                 |            |                 |

|                                                                                     |                                                                                                        |          |     |          |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------|-----|----------|
| Sampling Point                                                                      | Aquatic_12                                                                                             |          |     |          |
| Basin                                                                               | Ceyhan River Basin                                                                                     |          |     |          |
| River/Stream                                                                        | Seasonal Stream                                                                                        |          |     |          |
| MAGHTH Kilometer                                                                    | 31+345                                                                                                 |          |     |          |
| Coordinates                                                                         | 263265.48 D 4122086.99 K                                                                               |          |     |          |
| Field Photo                                                                         |                                                                                                        |          |     |          |
|  |                                                                                                        |          |     |          |
| EUNIS Habitat Type                                                                  | C2.5: Temporary running waters                                                                         |          |     |          |
| Habitat Features                                                                    | It is a seasonal creek with a small bed and was observed as completely dry during the sampling period. |          |     |          |
| Visual Water Quality                                                                | Good                                                                                                   | Moderate | Bad | Very Bad |
|                                                                                     |                                                                                                        |          |     |          |
| Riparian Vegetation                                                                 | Riparian vegetation is relatively weak and is under the pressure of agricultural areas.                |          |     |          |
| Current Situation in the Transition Area                                            | In this section, the train line passes through the tunnels.                                            |          |     |          |

|                                                                                     |                                                                                                                                                                                 |          |     |          |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|----------|
| Sampling Point                                                                      | Aquatic_13                                                                                                                                                                      |          |     |          |
| Basin                                                                               | Ceyhan River Basin                                                                                                                                                              |          |     |          |
| River/Stream                                                                        | Seasonal Stream                                                                                                                                                                 |          |     |          |
| MAGHTH Kilometer                                                                    | 33+745                                                                                                                                                                          |          |     |          |
| Coordinates                                                                         | 265516.89 D 4123208.2 K                                                                                                                                                         |          |     |          |
| Field Photo                                                                         |                                                                                                                                                                                 |          |     |          |
|  |                                                                                                                                                                                 |          |     |          |
| EUNIS Habitat Type                                                                  | C2.5: Temporary running waters                                                                                                                                                  |          |     |          |
| Habitat Features                                                                    | It is a seasonal stream that is completely dry during the sampling period. The bottom part is covered with small stones and agricultural areas are dominant in the close parts. |          |     |          |
| Visual Water Quality                                                                | Good                                                                                                                                                                            | Moderate | Bad | Very Bad |
|                                                                                     |                                                                                                                                                                                 |          |     |          |
| Riparian Vegetation                                                                 | Riparian vegetation is weak and under the pressure of agricultural areas.                                                                                                       |          |     |          |
| Current Situation in the Transition Area                                            | In this section, the train line passes through the tunnels.                                                                                                                     |          |     |          |

|                                                 |                                                                                                                                                                                                                                                                                                       |                 |            |                 |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------|
| <b>Sampling Point</b>                           | <b>Aquatic_14</b>                                                                                                                                                                                                                                                                                     |                 |            |                 |
| <b>Basin</b>                                    | Ceyhan River Basin                                                                                                                                                                                                                                                                                    |                 |            |                 |
| <b>River/Stream</b>                             | Düziçi Stream                                                                                                                                                                                                                                                                                         |                 |            |                 |
| <b>MAGHTH Kilometer</b>                         | 41+692                                                                                                                                                                                                                                                                                                |                 |            |                 |
| <b>Coordinates</b>                              | 272588.36 D 4122649.7 K                                                                                                                                                                                                                                                                               |                 |            |                 |
| <b>Field Photo</b>                              |                                                                                                                                                                                                                    |                 |            |                 |
| <b>EUNIS Habitat Type</b>                       | <b>C2.5: Temporary running waters</b>                                                                                                                                                                                                                                                                 |                 |            |                 |
| <b>Habitat Features</b>                         | Due to seasonal conditions and irrigation period, the stream has completely dried up. In this section where the line will pass, the bottom and sides of the stream have been completely concreted and canalized. In this environment, it is observed that the natural characteristics have been lost. |                 |            |                 |
| <b>Visual Water Quality</b>                     | <b>Good</b>                                                                                                                                                                                                                                                                                           | <b>Moderate</b> | <b>Bad</b> | <b>Very Bad</b> |
| <b>Riparian Vegetation</b>                      | The transition section is completely canalized and there is no riparian area.                                                                                                                                                                                                                         |                 |            |                 |
| <b>Current Situation in the Transition Area</b> | There is no construction work for the bridge crossing in the area.                                                                                                                                                                                                                                    |                 |            |                 |

|                                          |                                                                                                                                                                                                                      |          |     |          |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|----------|
| Sampling Point                           | Aquatic_15                                                                                                                                                                                                           |          |     |          |
| Basin                                    | Ceyhan River Basin                                                                                                                                                                                                   |          |     |          |
| River/Stream                             | Akçasu Stream                                                                                                                                                                                                        |          |     |          |
| MAGHTH Kilometer                         | 51+443                                                                                                                                                                                                               |          |     |          |
| Coordinates                              | 277435.76 D 4117583.13 K                                                                                                                                                                                             |          |     |          |
| Field Photo                              |                                                                                                                                   |          |     |          |
| EUNIS Habitat Type                       | C2.3: Permanent non-tidal, smooth-flowing watercourses                                                                                                                                                               |          |     |          |
| Habitat Features                         | There is a very low flow of water at the sampling point, and the bottom part is predominantly composed of sand areas.                                                                                                |          |     |          |
| Visual Water Quality                     | Good                                                                                                                                                                                                                 | Moderate | Bad | Very Bad |
|                                          |                                                                                                                                                                                                                      | X        |     |          |
| Riparian Vegetation                      | There is a sloping riparian area dominated by willow and, to a lesser extent, poplar trees.                                                                                                                          |          |     |          |
| Current Situation in the Transition Area | The train line passes 70 m north of this station and does not cross the stream. This station was investigated as a checkpoint near the train line. Therefore, there will be no bridge crossing work in this section. |          |     |          |

|                                                 |                                                                                                                                                                                            |                 |            |                 |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-----------------|
| <b>Sampling Point</b>                           | <b>Aquatic_16</b>                                                                                                                                                                          |                 |            |                 |
| <b>Basin</b>                                    | Ceyhan River Basin                                                                                                                                                                         |                 |            |                 |
| <b>River/Stream</b>                             | Atmalı Stream                                                                                                                                                                              |                 |            |                 |
| <b>MAGHTH Kilometer</b>                         | 86+157                                                                                                                                                                                     |                 |            |                 |
| <b>Coordinates</b>                              | 308572.05D 4116525.32 K                                                                                                                                                                    |                 |            |                 |
| <b>Field Photo</b>                              |                                                                                                         |                 |            |                 |
| <b>EUNIS Habitat Type</b>                       | <b>C2.5: Temporary running waters</b>                                                                                                                                                      |                 |            |                 |
| <b>Habitat Features</b>                         | It was observed that there was no flow in the stream during the sampling period and it was completely dry. It has a wide stream bed and its bottom part is covered with large rock blocks. |                 |            |                 |
| <b>Visual Water Quality</b>                     | <b>Good</b>                                                                                                                                                                                | <b>Moderate</b> | <b>Bad</b> | <b>Very Bad</b> |
|                                                 |                                                                                                                                                                                            |                 |            |                 |
| <b>Riparian Vegetation</b>                      | There is a weak riparian area formed by agriculture fields.                                                                                                                                |                 |            |                 |
| <b>Current Situation in the Transition Area</b> | No construction work was observed in the sampling area.                                                                                                                                    |                 |            |                 |

## Appendix - 2

# Algal Species in the Study Areas

Table. Freshwater Algae according to Basin

|                                             | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|---------------------------------------------|----------------------|----------------------|----------------------|
| <b>BACILLARIOPHYTA</b>                      |                      |                      |                      |
| <i>Achnanthes</i> sp.                       | *                    | *                    | *                    |
| <i>A. affinis</i> Grun.                     | *                    | *                    |                      |
| <i>A. lanceolata</i> (Breb.) Grun.          |                      |                      | *                    |
| <i>A. microcephala</i> Kütz.                |                      | *                    | *                    |
| <i>A. minutissima</i> Kütz.                 |                      |                      | *                    |
| <i>Amphiprora alata</i> Kütz.               | *                    |                      | *                    |
| <i>Amplipleura pellucida</i> Kütz.          |                      | *                    |                      |
| <i>Amphora</i> sp.                          | *                    | *                    |                      |
| <i>A. coffeaeformis</i> Ag.                 |                      | *                    | *                    |
| <i>A. commutata</i> Grun.                   | *                    |                      |                      |
| <i>A. ovalis</i> Kütz.                      | *                    | *                    | *                    |
| <i>A. venata</i> Kütz.                      |                      |                      | *                    |
| <i>Anomoeoneis costata</i> (Kütz) Hust.     | *                    | *                    | *                    |
| <i>A. sphaerophora</i> (Ehr.) Pf.           | *                    | *                    | *                    |
| <i>Asterionella formasa</i> Hass.           |                      | *                    | *                    |
| <i>Bacillaria paradoxa</i> Gmelin           |                      | *                    | *                    |
| <i>Caloneis alpestris</i> (Grun.) Cl.       | *                    | *                    |                      |
| <i>C. amphibaena</i> (Bory.) Cl.            |                      | *                    | *                    |
| <i>C. bacillum</i> (Grun.) Cl.              | *                    | *                    | *                    |
| <i>C. permagna</i> (Bailey) Cl.             | *                    |                      | *                    |
| <i>C. silicula</i> (Ehr.) Cl.               |                      | *                    |                      |
| <i>Campylodiscus nobilis</i>                |                      | *                    |                      |
| <i>Ceratoneis arcus</i> Kütz.               | *                    |                      | *                    |
| <i>Cocconeis pediculus</i> Ehr.             |                      | *                    | *                    |
| <i>C. placentula</i> Ehr.                   | *                    | *                    | *                    |
| <i>C. scutellum</i>                         |                      |                      | *                    |
| <i>C. bodanica</i> Eulenst.                 |                      | *                    | *                    |
| <i>C. comta</i> (Ehr.) Kütz.                |                      | *                    | *                    |
| <i>C. kützingiana</i> Thwaites              | *                    |                      | *                    |
| <i>C. meneghiniana</i> Kütz.                | *                    | *                    | *                    |
| <i>C. ocellata</i> Pantocksek               | *                    | *                    | *                    |
| <i>Cymatepleura elliptica</i> (Breb.) W. S. | *                    | *                    | *                    |
| <i>C. solea</i> (Breb.) W. S.               |                      | *                    | *                    |
| <i>Cymbella affinis</i> Kütz.               | *                    | *                    | *                    |
| <i>C. caespitosa</i> (Kütz.) Grun.          |                      |                      | *                    |

|                                              | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|----------------------------------------------|----------------------|----------------------|----------------------|
| <i>C. cistula</i> (Hemprich) Grun.           | *                    | *                    | *                    |
| <i>C. cymbiformis</i> (Ag.) V. H.            |                      | *                    | *                    |
| <i>C. ehrenbergii</i> Kütz.                  | *                    |                      |                      |
| <i>C. lanceolata</i> (Ag.) Ag.               |                      | *                    | *                    |
| <i>C. microcephala</i> Grun.                 |                      |                      | *                    |
| <i>C. minuta</i> Hilse ex. Rabh.             |                      | *                    |                      |
| <i>C. parva</i> (W.S.) Cl.                   |                      | *                    | *                    |
| <i>C. prostrata</i> (Berk.) Cl.              | *                    | *                    | *                    |
| <i>C. tumida</i> (Breb.ex.Kütz.) V. H.       | *                    | *                    |                      |
| <i>C. turgida</i> (Gregory) Cl.              |                      |                      |                      |
| <i>C. ventricosa</i> Kütz.                   | *                    | *                    | *                    |
| <i>Denticula elagans</i> Kütz.               |                      | *                    |                      |
| <i>D. anceps</i> (Ehr.) Grun.                |                      |                      | *                    |
| <i>D. elliptica</i> (Kütz.) Cleve            |                      | *                    | *                    |
| <i>D. hiemale</i> (Lyng.) Herbeig            |                      | *                    | *                    |
| <i>D. vulgare</i> Bory.                      |                      | *                    | *                    |
| <i>Didymosphenia geminata</i> (Lyng.) Sch.   |                      | *                    | *                    |
| <i>Diploneis elliptica</i> (Kütz.) Cl.       |                      |                      | *                    |
| <i>D. ovalis</i> (Hilse) Cl.                 | *                    |                      | *                    |
| <i>Epithemia adnata</i> (Kütz.) Breb.        |                      | *                    | *                    |
| <i>E. argus</i> Kütz.                        | *                    | *                    | *                    |
| <i>E. sorex</i> Kütz.                        | *                    | *                    | *                    |
| <i>E. turgida</i> (Ehr.) Kütz.               |                      | *                    | *                    |
| <i>Fragilaria brevistriata</i> Grun.         |                      | *                    | *                    |
| <i>F. capucina</i> A. V.H.                   | *                    |                      | *                    |
| <i>F. contruens</i> (Ehr.) Grun.             | *                    | *                    | *                    |
| <i>F. pinnata</i> Ehr.                       |                      | *                    |                      |
| <i>Fragilaria vaucheriae</i> (Kütz.) Peters. | *                    | *                    | *                    |
| <i>Frustulia rhomboides</i> (Ehr.) de Toni   | *                    |                      |                      |
| <i>Gomphonema abbreviatum</i> Ag., Kütz.     |                      | *                    | *                    |
| <i>G. acuminatum</i> Ehr.                    | *                    | *                    | *                    |
| <i>G. affine</i> Kütz.                       |                      | *                    | *                    |
| <i>G. angustatum</i> (Kütz.) Rabh.           |                      | *                    | *                    |
| <i>G. augur</i> Ehr.                         |                      |                      | *                    |
| <i>G. constrictum</i> Ehr.                   | *                    | *                    | *                    |
| <i>G. gracile</i> Ehr.                       | *                    | *                    | *                    |

|                                           | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|-------------------------------------------|----------------------|----------------------|----------------------|
| <i>G. intricatum</i> Kütz.                | *                    |                      | *                    |
| <i>G. lanceolatum</i> Ehr.                |                      | *                    |                      |
| <i>G. olivaceum</i> (Lyng.) Kütz.         | *                    | *                    | *                    |
| <i>G. parvalum</i> Kütz.                  | *                    | *                    | *                    |
| <i>G. turuncatum</i> Ehr.                 |                      | *                    | *                    |
| <i>Gyrosigma acuminatum</i> (Kütz.) Rabh. | *                    | *                    | *                    |
| <i>Hannaea arcus</i> (Ehr.)               |                      | *                    | *                    |
| <i>Melosira granulata</i> (Ehr.) Ralfs.   | *                    | *                    | *                    |
| <i>M. varians</i> C.A. Ag.                | *                    | *                    |                      |
| <i>Mastogloia braunii</i>                 |                      | *                    | *                    |
| <i>M. elliptica</i> Ag.                   |                      | *                    | *                    |
| <i>M. smithii</i> Thwaites                |                      |                      | *                    |
| <i>Meridion circulare</i> (Grev.) Ag.     | *                    | *                    |                      |
| <i>N. capitata</i> Ehr.                   |                      | *                    | *                    |
| <i>N. cari</i> Ehr.                       |                      |                      | *                    |
| <i>N. cincta</i> (Ehr.) Kütz.             | *                    | *                    | *                    |
| <i>N. cryptocephala</i> Kütz.             | *                    | *                    | *                    |
| <i>N. cuspidata</i> (Kütz.) Kütz.         | *                    | *                    | *                    |
| <i>Navicula gracilis</i> Ehr.             |                      |                      | *                    |
| <i>N. graciloides</i> A. Mayer            |                      |                      | *                    |
| <i>N. mutica</i> Kütz.                    |                      | *                    | *                    |
| <i>N. nivalis</i> (Ehr.)                  | *                    |                      |                      |
| <i>N. oblonga</i> Kütz.                   |                      | *                    | *                    |
| <i>N. pupula</i> Kütz.                    |                      |                      | *                    |
| <i>N. radiosa</i> Kütz.                   |                      | *                    | *                    |
| <i>N. tripunctata</i> (O.F. Müll.) Bory   |                      | *                    | *                    |
| <i>Nitzschia</i> sp.                      | *                    | *                    | *                    |
| <i>N. acicularis</i> W. S.                |                      | *                    |                      |
| <i>N. amphibia</i> Grun.                  | *                    |                      | *                    |
| <i>N. angustata</i> (W. S.) Grun.         | *                    | *                    | *                    |
| <i>N. filiformis</i> (W. S.) Hust.        | *                    | *                    |                      |
| <i>N. frustulum</i> (Kütz.) Grun.         |                      |                      | *                    |
| <i>N. gracilis</i> Hantz.                 |                      | *                    |                      |
| <i>N. linearis</i> W. S.                  |                      |                      | *                    |
| <i>N. palea</i> (Kütz.) W. S.             | *                    |                      | *                    |
| <i>N. punctata</i> (W. S.) Grun.          | *                    | *                    |                      |

|                                              | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|----------------------------------------------|----------------------|----------------------|----------------------|
| <i>N. sigma</i> (Kütz.) W. S.                | *                    | *                    |                      |
| <i>N. sigmoidea</i> (Ehr.) W. S.             | *                    | *                    | *                    |
| <i>N. spectabilis</i> (Ehr.) Ralfs.          |                      |                      | *                    |
| <i>N. tryblionella</i> Hantz.                |                      | *                    | *                    |
| <i>Pinnularia biceps</i> Greg.               |                      |                      | *                    |
| <i>P. borealis</i> Ehr.                      | *                    | *                    |                      |
| <i>P. brebissonii</i> (Kütz.) Rabh.          | *                    | *                    | *                    |
| <i>P. gibba</i> Ehr.                         |                      |                      | *                    |
| <i>P. microstauron</i> (Ehr.) Cl.            | *                    | *                    | *                    |
| <i>P. viridis</i> (Nitz.) Ehr.               | *                    | *                    | *                    |
| <i>Rhoicosphenia curvata</i> (Kütz.) Grun.   | *                    | *                    | *                    |
| <i>Rhopalodia gibba</i> (Ehr.) O. Müll.      | *                    | *                    | *                    |
| <i>R. gibberula</i> (Ehr.) O. M.             |                      | *                    | *                    |
| <i>Stauroneis anceps</i> Ehr.                | *                    |                      | *                    |
| <i>Stauroneis smithii</i> Grun.              | *                    | *                    |                      |
| <i>Stephanodiscus astraea</i> Grun.          |                      | *                    |                      |
| <i>Surirella angustata</i> Kütz.             |                      |                      | *                    |
| <i>S. biseriata</i> Breb.                    |                      | *                    | *                    |
| <i>S. linearis</i> W. S.                     | *                    | *                    |                      |
| <i>S. ovalis</i> Breb.                       | *                    |                      | *                    |
| <i>S. ovata</i> Kütz.                        |                      | *                    | *                    |
| <i>S. tenuis</i> Mayer                       |                      | *                    |                      |
| <i>Synedra capitata</i> Ehr.                 | *                    | *                    | *                    |
| <i>Ulnaria ulna</i> (Nitzsch) Ehr.           | *                    | *                    | *                    |
| <b>CHLOROPHYTA</b>                           |                      |                      |                      |
| <i>Asteriococcus limneticus</i>              |                      | *                    |                      |
| <i>Botryococcus braunii</i> Kütz.            | *                    |                      |                      |
| <i>Carteria</i> sp.                          |                      | *                    | *                    |
| <i>C. klepsii</i>                            | *                    |                      |                      |
| <i>C. globosa</i>                            |                      | *                    | *                    |
| <i>Cerasterias staurasroides</i> W. and W.   |                      | *                    |                      |
| <i>Chlamydomonas</i> sp.                     | *                    | *                    | *                    |
| <i>C. globosa</i> Snow.                      |                      | *                    | *                    |
| <i>C. polypyrenoideum</i> Pr.                | *                    |                      |                      |
| <i>Chlorhormidium flaccidum</i> (A. Br.) Fo. |                      | *                    |                      |
| <i>Chlorella</i> sp.                         | *                    | *                    | *                    |

|                                             | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|---------------------------------------------|----------------------|----------------------|----------------------|
| <i>Chlorella ellipsoidea</i> Gernech.       |                      | *                    |                      |
| <i>Cladophora</i> sp.                       | *                    | *                    | *                    |
| <i>C. fracta</i> (Dillw.) Kütz.             | *                    | *                    | *                    |
| <i>C. glomerata</i> (L.) Kütz.              | *                    |                      |                      |
| <i>C. acicularis</i>                        | *                    | *                    |                      |
| <i>C. microporum</i>                        | *                    | *                    | *                    |
| <i>C. parvulum</i> Naeg.                    |                      | *                    | *                    |
| <i>C. rostratum</i> Ehr.                    | *                    | *                    |                      |
| <i>Coealastrum</i> sp.                      | *                    |                      |                      |
| <i>C. microporum</i> Naeg.                  |                      | *                    | *                    |
| <i>Cosmarium</i> sp.                        | *                    | *                    | *                    |
| <i>Cosmarium abbreviatum</i> Racib.         |                      | *                    |                      |
| <i>C. formosolum</i> Hoff.                  | *                    | *                    | *                    |
| <i>C. granatum</i> Brew.                    | *                    | *                    | *                    |
| <i>C. obtusatum</i> (Sch.) Sch.             | *                    | *                    |                      |
| <i>C. punctulatum</i> Breb.                 | *                    |                      |                      |
| <i>Crucigenia apiculata</i> (Lemm.) Kom.    |                      |                      | *                    |
| <i>C. irregularis</i> Wille                 |                      | *                    |                      |
| <i>Euastrum insulare</i> (Wittr.) Roy.      |                      | *                    | *                    |
| <i>Eudorina</i> sp.                         | *                    | *                    | *                    |
| <i>Eudorina elegans</i> Ehr.                |                      |                      | *                    |
| <i>Kirchneriella</i> sp.                    | *                    | *                    | *                    |
| <i>Kirchneriella lunaris</i> (Kirch.) Moeb. |                      | *                    |                      |
| <i>Mougeotia</i> sp.                        | *                    | *                    | *                    |
| <i>M. genflexa</i>                          |                      |                      | *                    |
| <i>Oedogonium</i> sp.                       | *                    | *                    | *                    |
| <i>Oocystis</i> sp.                         | *                    | *                    |                      |
| <i>O. borgei</i> Snow.                      |                      | *                    | *                    |
| <i>O. crassa</i> Wittrock.                  | *                    | *                    |                      |
| <i>O. elliptica</i> W. West.                | *                    | *                    | *                    |
| <i>O. solitaria</i> Wittrock.               |                      | *                    |                      |
| <i>Pandorina morum</i> Bory.                |                      | *                    | *                    |
| <i>Pediastrum</i> sp.                       |                      |                      | *                    |
| <i>P. boryanum</i> (Turp.) Mene.            | *                    | *                    | *                    |
| <i>P. duplex</i> Meyen.                     | *                    | *                    | *                    |
| <i>P. simplex</i> Meyer                     |                      | *                    |                      |

|                                            | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|--------------------------------------------|----------------------|----------------------|----------------------|
| <i>Scenedesmus</i> sp.                     | *                    | *                    | *                    |
| <i>Scenedesmus acuminatus</i> (Lage.) Cho. | *                    | *                    | *                    |
| <i>S. acutus</i> Meyen.                    | *                    |                      | *                    |
| <i>S. bijuga</i> (Turp.) Lagerh.           | *                    | *                    |                      |
| <i>S. ecornis</i> (Ralfs.) Chod.           | *                    | *                    | *                    |
| <i>S. disciformis</i> (Chod.) Fott.        | *                    | *                    | *                    |
| <i>S. opoliensis</i> P. Richt.             |                      | *                    |                      |
| <i>S. quadricauda</i> (Tur.) Bre.          | *                    | *                    | *                    |
| <i>Spirogyra</i> sp.                       | *                    | *                    | *                    |
| <i>S. granulata</i> Jao.                   |                      | *                    |                      |
| <i>S. rivularis</i>                        |                      |                      | *                    |
| <i>S. varians</i> (Hass.) Kütz .           | *                    | *                    |                      |
| <i>S. weberi</i> Kütz.                     |                      | *                    | *                    |
| <i>S. gracile</i> Ralfs.                   |                      | *                    |                      |
| <i>Stigeoclonium</i> sp.                   | *                    | *                    |                      |
| <i>Tedraedron minimum</i> (A. Braun) Han.  | *                    | *                    | *                    |
| <i>T. trigonum</i> (Naeg.) Hans.           |                      | *                    | *                    |
| <i>Ulotrix</i> sp.                         |                      | *                    | *                    |
| <i>U. variabilis</i> Kütz.                 | *                    |                      | *                    |
| <i>U. zonata</i> (Web. and Mohr.) Kütz.    | *                    |                      |                      |
| <i>Zygnema</i> sp.                         | *                    | *                    | *                    |
| <i>Z. pectinatum</i> (Vauc.) Agard.        |                      |                      | *                    |
| <b>CYANOBACTERIA</b>                       |                      |                      |                      |
| <i>Anabaena</i> sp.                        | *                    | *                    | *                    |
| <i>Anabaena affinis</i> Lemm.              |                      | *                    | *                    |
| <i>A. flos-aquae</i> (L.) Breb.            | *                    |                      |                      |
| <i>A. spiroides</i> Kleb.                  |                      | *                    | *                    |
| <i>Aphanizomenon</i> sp.                   |                      |                      | *                    |
| <i>Aphanocapsa</i> sp.                     |                      | *                    | *                    |
| <i>A. biformis</i> Braun.                  | *                    |                      | *                    |
| <i>Chroococcus</i> sp.                     | *                    | *                    | *                    |
| <i>C. minutus</i> (Kütz.) Naeg.            |                      | *                    | *                    |
| <i>C. turgidus</i> (Kütz.) Naeg.           | *                    | *                    |                      |
| <i>Coelosphaerium</i> sp.                  |                      | *                    |                      |
| <i>Cylindrospermum majus</i> Kütz.         |                      | *                    |                      |
| <i>Gleocapsa</i> sp.                       | *                    | *                    | *                    |

|                                   | Doğu Akdeniz<br>Havzası | Seyhan Nehir<br>Havzası | Ceyhan Nehir<br>Havzası |
|-----------------------------------|-------------------------|-------------------------|-------------------------|
| <i>G. aponina</i> Kütz.           |                         | *                       |                         |
| <i>Lyngbya hieronymusii</i> Lemm. |                         | *                       | *                       |
| <i>Merismopedia</i> sp.           | *                       | *                       | *                       |
| <i>M. glauca</i> (Ehr.) Naeg.     |                         | *                       |                         |
| <i>M. punctata</i> Meyen.         |                         | *                       | *                       |
| <i>M. tenuissima</i> Meyen        |                         |                         | *                       |
| <i>Microcystis</i> sp.            | *                       | *                       | *                       |
| <i>M. aeruginosa</i> Kütz.        |                         | *                       |                         |
| <i>M. flos-aquae</i> (Wit.) Elan. |                         |                         | *                       |
| <i>Nodularia</i> sp.              |                         | *                       | *                       |
| <i>Nostoc</i> sp.                 | *                       | *                       |                         |
| <i>N. commune</i>                 |                         | *                       | *                       |
| <i>Oscillatoria</i> sp.           | *                       | *                       | *                       |
| <i>O. amphibia</i> Agardh         | *                       | *                       | *                       |
| <i>O. brevis</i> (Kütz.) Gomont   |                         | *                       | *                       |
| <i>O. formasa</i> Bory.           | *                       | *                       | *                       |
| <i>O. limnetica</i> Lemm.         |                         | *                       | *                       |
| <i>O. limosa</i> (Roth.) Ag.      | *                       | *                       | *                       |
| <i>O. rubescens</i> Gom.          | *                       | *                       | *                       |
| <i>O. subbrevis</i>               |                         | *                       |                         |
| <i>O. tenuis</i> Ag.              | *                       | *                       | *                       |
| <i>Spirulina</i> sp.              |                         | *                       | *                       |
| <i>S. laxissima</i>               | *                       |                         |                         |
| <i>S. major</i> Kütz.             | *                       | *                       | *                       |
| <i>Tetrapedia</i> sp.             |                         | *                       |                         |
| <b>EUGLENOZOA</b>                 |                         |                         |                         |
| <i>Euglena</i> sp.                | *                       | *                       | *                       |
| <i>Euglena acus</i>               | *                       | *                       |                         |
| <i>E. gracilis</i> Klebs.         |                         | *                       | *                       |
| <i>E. minuta</i> Presc.           |                         |                         | *                       |
| <i>E. oxyuris</i> Sch.            | *                       | *                       | *                       |
| <i>E. polymorpha</i> Dang.        |                         | *                       | *                       |
| <i>E. viridis</i>                 | *                       | *                       | *                       |
| <i>Lepocinclus acuta</i> Presc.   |                         | *                       |                         |
| <i>Phacus acuminatus</i> Stok.    |                         | *                       |                         |
| <i>P. caudatus</i> Hüb.           |                         | *                       |                         |

|                                    | Doğu Akdeniz<br>Havzası | Seyhan Nehir<br>Havzası | Ceyhan Nehir<br>Havzası |
|------------------------------------|-------------------------|-------------------------|-------------------------|
| <i>P. curvicauda</i> Suriv.        |                         | *                       | *                       |
| <i>Trachelomonas</i> sp.           | *                       | *                       | *                       |
| <i>T. hispidata</i> (Perty.) St.   |                         | *                       |                         |
| <i>T. volvocina</i> Ehr.           |                         |                         | *                       |
| <b>MIOZOA</b>                      |                         |                         |                         |
| <i>Ceratium</i> sp.                | *                       | *                       | *                       |
| <i>C. hirundinella</i> (Müll) Sch. |                         | *                       |                         |
| <i>Gymnodinium</i> sp.             |                         | *                       | *                       |
| <i>Peridinium</i> sp.              | *                       | *                       | *                       |
| <i>P. cinctum</i>                  | *                       | *                       | *                       |
| <i>P. incospicuum</i>              |                         | *                       |                         |

## Appendix - 3

# Zooplanktonic Organisms in the Study Areas

**Table.** Zooplanktonic Organisms Detected by Study Basin

|                                               | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|-----------------------------------------------|----------------------|----------------------|----------------------|
| <b>ROTİFERA</b>                               |                      |                      |                      |
| <i>Anuraeopsis fissa</i> (Gosse)              |                      | *                    |                      |
| <i>Ascomorpha ovalis</i> Bartsch              | *                    |                      | *                    |
| <i>Brachionus angularis</i> Gosse             | *                    |                      | *                    |
| <i>Brachionus calyciflorus</i> Pallas         | *                    | *                    | *                    |
| <i>Brachionus plicatilis</i> O. F. M.         | *                    |                      |                      |
| <i>Brachionus caudatus</i> Ehrenberg          |                      | *                    | *                    |
| <i>Brachionus urceolaris</i> O. F. M.         | *                    | *                    | *                    |
| <i>Cephalodella gibba</i> (Ehrenberg)         |                      |                      | *                    |
| <i>Collotheca pelagica</i> Seligo             | *                    | *                    |                      |
| <i>Euchlanis opoliensis</i> Gosse             |                      | *                    |                      |
| <i>Hexarthra fennica</i> Levander             |                      | *                    | *                    |
| <i>Keratella cochlearis</i> (Gosse)           | *                    |                      | *                    |
| <i>Keratella tecta</i> (O. F. M.)             |                      | *                    | *                    |
| <i>Keratella tropica</i> (Apstein)            |                      | *                    |                      |
| <i>Lecane bulla</i> (Gosse)                   |                      | *                    |                      |
| <i>Lecane luna</i> (O. F. M.)                 | *                    | *                    |                      |
| <i>Lecane hamata</i> (Stokes)                 | *                    | *                    | *                    |
| <i>Lecane closterocerca</i> (Gosse)           |                      | *                    |                      |
| <i>Lepidocharis salpina</i> (Ehrenberg)       |                      | *                    | *                    |
| <i>Polyarthra dolichoptera</i> Idelson        | *                    | *                    | *                    |
| <i>Rotaria neptunia</i> Ehrenberg             | *                    |                      |                      |
| <i>Rotaria rotatoria</i> Pallas               |                      | *                    | *                    |
| <i>Synchaeta pectinata</i> Ehrenberg          | *                    |                      | *                    |
| <i>Synchaeta stylata</i> Wierzejski           | *                    |                      |                      |
| <i>Trichocerca similis</i>                    |                      | *                    | *                    |
| <b>CLADOCERA</b>                              |                      |                      |                      |
| <i>Bosmina longirostris</i> (Müller, 1785)    | *                    | *                    | *                    |
| <i>Diaphanosoma birgei</i>                    | *                    | *                    | *                    |
| <i>Simocephalus vetulus</i> (O.F.Müller,1776) |                      |                      | *                    |
| <i>Moina micrura</i>                          |                      | *                    |                      |
| <i>Ceriodaphnia pulchella</i> Müller, 1867    |                      | *                    |                      |
| <i>Disparalona rostrata</i>                   |                      | *                    | *                    |
| <i>Chydorus latus</i> Sars, 1862              |                      |                      | *                    |
| <i>Alona rectangula</i> Sars, 1862            | *                    | *                    | *                    |

|                                              | Doğu Akdeniz<br>Havzası | Seyhan Nehir<br>Havzası | Ceyhan Nehir<br>Havzası |
|----------------------------------------------|-------------------------|-------------------------|-------------------------|
| <b>COPEPODA</b>                              |                         |                         |                         |
| <i>Arctodiaptomus denticornis</i>            |                         | *                       |                         |
| <i>Cyclops abyssorum</i> G.O. Sars, 1863     |                         |                         | *                       |
| <i>Cyclops vicinus</i> Uljanin, 1875         | *                       | *                       | *                       |
| <i>Eucyclops serrulatus</i> (Fischer, 1851 ) | *                       | *                       | *                       |
| <i>Mesacyclops leucarti</i>                  |                         | *                       |                         |

## Appendix - 4

# Benthic Organisms in the Study Areas

**Table.** Benthic Organisms Detected in the Basin of the Train Line Route

|                               | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|-------------------------------|----------------------|----------------------|----------------------|
| <b>ŞUBE: MOLLUSCA</b>         |                      |                      |                      |
| <b>Sınıf: Gastropoda</b>      |                      |                      |                      |
| <b>Familya: Neritidae</b>     |                      |                      |                      |
| Theodoxus sp.                 | *                    | *                    | *                    |
| <b>Familya: Melanopsidae</b>  |                      |                      |                      |
| Melanopsis sp.                | *                    |                      | *                    |
| <b>Familya: Physidae</b>      |                      |                      |                      |
| Physa sp.                     | *                    | *                    | *                    |
| Physella acuta                | *                    |                      |                      |
| <b>Familya: Lymnaeidae</b>    |                      |                      |                      |
| Lymnae sp.                    |                      | *                    | *                    |
| Galba sp.                     |                      | *                    | *                    |
| Galba truncatula              | *                    |                      |                      |
| Radix ovata                   | *                    | *                    | *                    |
| Radix labiata                 | *                    |                      |                      |
| <b>Familya: Planorbidae</b>   |                      |                      |                      |
| Gyraulus sp.                  |                      | *                    | *                    |
| Gyraulus piscinarum           | *                    |                      |                      |
| <b>Familya: Succineidae</b>   |                      |                      |                      |
| Oxyloma elegans               | *                    | *                    |                      |
| <b>Familya: Hydrobiidae</b>   |                      |                      |                      |
| Pseudamnicola sp.             |                      | *                    | *                    |
| <b>Sınıf: Bivalvia</b>        |                      |                      |                      |
| <b>Familya: Unionidae</b>     |                      |                      |                      |
| Unio crassa                   | *                    | *                    | *                    |
| Unio delicatus                |                      | *                    | *                    |
| <b>Familya: Sphaeriidae</b>   |                      |                      |                      |
| Pisidium sp.                  |                      | *                    | *                    |
| <b>Familya: Cyrenidae</b>     |                      |                      |                      |
| Corbicula sp.                 | *                    | *                    | *                    |
| Corbicula fluminalis          |                      |                      | *                    |
| <b>ŞUBE: ANNELIDA</b>         |                      |                      |                      |
| <b>Sınıf: Clitellata</b>      |                      |                      |                      |
| <b>Familya: Lumbriculidae</b> |                      |                      |                      |
| Lumbriculus sp.               | *                    | *                    | *                    |
| <b>Familya: Hirudinidae</b>   |                      |                      |                      |

|                              | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|------------------------------|----------------------|----------------------|----------------------|
| Hirudo sp.                   | *                    | *                    | *                    |
| <b>ŞUBE: PLATYHELMINTHES</b> |                      |                      |                      |
| <b>Sınıf: Tricladida</b>     |                      |                      |                      |
| <b>Familya: Planariidae</b>  |                      |                      |                      |
| Planaria sp.                 | *                    | *                    | *                    |
| <b>Sınıf: Oligochaeta</b>    |                      |                      |                      |
| <b>Familya: Naididae</b>     |                      |                      |                      |
| Dero digitata                | *                    | *                    | *                    |
| Tubifex tubifex              | *                    | *                    | *                    |
| Potamotheix sp.              | *                    | *                    | *                    |
| Limnodrilus sp.              | *                    | *                    | *                    |
| <b>ŞUBE: ARTHROPODA</b>      |                      |                      |                      |
| <b>Sınıf: Malacostraca</b>   |                      |                      |                      |
| <b>Familya: Atyidae</b>      |                      |                      |                      |
| Atyaephyra desmarestii       |                      | *                    |                      |
| <b>Familya: Gammaridae</b>   |                      |                      |                      |
| Gammarus sp.                 | *                    | *                    | *                    |
| <b>Familya: Asellidae</b>    |                      |                      |                      |
| Asellus aquaticus            | *                    | *                    | *                    |
| <b>Familya: Potamidae</b>    |                      |                      |                      |
| Potamon sp.                  | *                    | *                    | *                    |
| <b>Sınıf: Insecta</b>        |                      |                      |                      |
| <b>Takım: Diptera</b>        |                      |                      |                      |
| <b>Familya: Chironomidae</b> |                      |                      |                      |
| Tanypus punctipennis         | *                    | *                    | *                    |
| Procladius sp.               |                      |                      |                      |
| Chironomus sp.               | *                    | *                    | *                    |
| Chironomus plumosus          | *                    | *                    | *                    |
| Chironomus anthracinus       |                      | *                    | *                    |
| Cryptochironomus sp.         | *                    | *                    | *                    |
| Paracladopelma sp.           | *                    | *                    | *                    |
| Micropsectra sp.             | *                    | *                    | *                    |
| Ablabesmyia sp.              |                      | *                    |                      |
| <b>Familya: Culicidae</b>    |                      |                      |                      |
| Culex sp.                    | *                    | *                    | *                    |
| Anopheles                    | *                    | *                    | *                    |

|                                 | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|---------------------------------|----------------------|----------------------|----------------------|
| <b>Familiya: Simuliidae</b>     |                      |                      |                      |
| Simulium sp.                    | *                    | *                    | *                    |
| Simulium vittatum               |                      |                      | *                    |
| <b>Familiya: Tabanidae</b>      |                      |                      |                      |
| Tabanus sp.                     | *                    | *                    | *                    |
| <b>Familiya: Tipulidae</b>      |                      |                      |                      |
| Tipula sp.                      | *                    | *                    | *                    |
| <b>Familiya: Empididae</b>      |                      |                      |                      |
| Hemerodromia sp.                |                      | *                    | *                    |
| <b>Takım: Hemiptera</b>         |                      |                      |                      |
| <b>Familiya: Notonectidae</b>   |                      |                      |                      |
| Notonecta sp.                   | *                    | *                    | *                    |
| <b>Familiya: Hydrometridae</b>  |                      |                      |                      |
| Hydrometra                      | *                    | *                    | *                    |
| <b>Familiya: Gerridae</b>       |                      |                      |                      |
| Gerris sp.                      | *                    | *                    | *                    |
| <b>Familiya: Corixidae</b>      |                      |                      |                      |
| Corixa sp.                      | *                    | *                    | *                    |
| <b>Takım: Odonata</b>           |                      |                      |                      |
| <b>Familiya: Aeshnidae</b>      |                      |                      |                      |
| Anax sp.                        | *                    | *                    | *                    |
| <b>Familiya: Libellulidae</b>   |                      |                      |                      |
| Libellula sp.                   | *                    | *                    | *                    |
| <b>Familiya: Corduliidae</b>    |                      |                      |                      |
| Epicordulia sp.                 |                      | *                    |                      |
| <b>Familiya: Aeshnidae</b>      |                      |                      |                      |
| Anax imperator                  | *                    | *                    | *                    |
| <b>Familiya: Calopterygidae</b> |                      |                      |                      |
| Calopteryx sp.1                 | *                    | *                    | *                    |
| Calopteryx sp.2                 | *                    | *                    | *                    |
| <b>Familiya: Euphaeidae</b>     |                      |                      |                      |
| Epallage fatime                 | *                    | *                    | *                    |
| <b>Familiya: Gomphidae</b>      |                      |                      |                      |
| Gomphus schneideri              | *                    | *                    |                      |
| <b>Familiya: Coenagrionidae</b> |                      |                      |                      |
| Ischnura sp.                    | *                    | *                    | *                    |

|                                  | Doğu Akdeniz Havzası | Seyhan Nehir Havzası | Ceyhan Nehir Havzası |
|----------------------------------|----------------------|----------------------|----------------------|
| <b>Familiya: Platycnemididae</b> |                      |                      |                      |
| Platycnemis pennipes             | *                    |                      |                      |
| <b>Takım: Ephemeroptera</b>      |                      |                      |                      |
| <b>Familiya: Oligoneuriidae</b>  |                      |                      |                      |
| <i>Oligoneuriella</i> sp.        |                      | *                    | *                    |
| <b>Familiya: Heptageniidae</b>   |                      |                      |                      |
| Heptagenia sp.                   | *                    | *                    | *                    |
| Ritrogena sp.                    | *                    | *                    | *                    |
| Electrogena sp.                  |                      | *                    | *                    |
| <b>Familiya: Ephemerellidae</b>  |                      |                      |                      |
| Ephemerella sp.                  | *                    | *                    | *                    |
| <b>Familiya: Baetidae</b>        |                      |                      |                      |
| Cloeon sp.                       | *                    | *                    | *                    |
| Baetis sp.                       | *                    | *                    | *                    |
| <b>Takım: Coleoptera</b>         |                      |                      |                      |
| <b>Familiya: Hydrophilidae</b>   |                      |                      |                      |
| Enochrus sp.                     |                      | *                    | *                    |
| <b>Familiya: Dytiscidae</b>      |                      |                      |                      |
| Dytiscus sp.                     |                      | *                    | *                    |
| <b>Familiya: Hydrophilidae</b>   |                      |                      |                      |
| Hydrobius sp.                    | *                    | *                    | *                    |
| <b>Order: Trichoptera</b>        |                      |                      |                      |
| <b>Familiya: Glossosomatidae</b> |                      |                      |                      |
| Agapetus sp.                     |                      | *                    |                      |
| Glossosoma sp.                   |                      | *                    | *                    |
| <b>Familiya: Hydropsychidae</b>  |                      |                      |                      |
| Hydropsyche spp.                 | *                    | *                    | *                    |
| <b>Familiya: Hydroptilidae</b>   |                      |                      |                      |
| Agraylea sp.                     |                      | *                    | *                    |
| Hydroptila sp.                   | *                    | *                    |                      |
| Oxyethira sp.                    | *                    | *                    | *                    |
| <b>Familiya: Psychomyiidae</b>   |                      |                      |                      |
| Psychomyia pusilla               |                      | *                    | *                    |
| <b>Familiya: Limnephilidae</b>   |                      |                      |                      |
| Limnephilus flavicornis          |                      | *                    |                      |
| <b>Familiya: Glossomatidae</b>   |                      |                      |                      |

|                                 | Doğu Akdeniz<br>Havzası | Seyhan Nehir<br>Havzası | Ceyhan Nehir<br>Havzası |
|---------------------------------|-------------------------|-------------------------|-------------------------|
| Agapetus sp.                    |                         | *                       | *                       |
| <b>Familiya: Limnephilidae</b>  |                         |                         |                         |
| Potamophylax sp.                |                         | *                       | *                       |
| <b>Familiya: Rhyacophilidae</b> |                         |                         |                         |
| Rhyacophila dorsalis            |                         | *                       | *                       |
| Rhyacophila sp.                 | *                       | *                       |                         |
| <b>Takım: Plecoptera</b>        |                         |                         |                         |
| <b>Familiya: Perlidae</b>       |                         |                         |                         |
| Perla sp.                       | *                       | *                       | *                       |
| Isoperla sp.                    | *                       | *                       | *                       |