Erratom to: Gümüş Creek (Mardin-Kızıltepe) Ephemeroptera Fauna, 11(2): 1-6, 2018

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Gümüş Creek (Mardin-Kızıltepe) Ephemeroptera Fauna

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Abstract

The samples collected from 9 stations were investigated in order to determine the detection and distribution of the Ephemeroptera fauna of the Gümüş Creek (Mardin-Kızıltepe) in South-eastern Anatolia. At the end of the research, 5 species belonging to Ephemeroptera were determined. All identified species are the new record for Gümüş Creek.

During the collection of the samples, the physico-chemical and ecological properties of the stations were recorded.

Keywords: Gümüş Creek, fauna, Ephemeroptera

Note: This study is part of the Master Thesis of Tuğrul ÖNTÜRK.

INTRODUCTION

Although Ephemeroptera adults have a similar structure, nymphs show various variations due to adaptations to different environments. Their size usually varies from 4 mm (Caenidae) to 40 mm (Polymitarcyidae), except for the serk [1]. Yellow, white, brown, black and so on. show coloration in different tones. Especially in mature nymph's body length and wing drafts, elongation, body colour and darkening of the hair is observed [1, 2].

The body consists of three parts: head, thorax and abdomen. The head is usually flattened in oval or dorso-ventral direction [1, 3]. There are a couple of antennas in the structure, which can vary according to species. Antennas are generally short and consist of two pedestal segments, the scapus and pedicels, and an antenna whip at the end of the segmented structure [1, 3]. Honeycomb eyes have a dorsal or lateral position and have two partsand different colours, which are also called turban eyes, especially in some of the members of Baetidae members. The upper part of the Turban, which is pointing upwards, is characterized by rapid movements, and the lower area and the lower area, which is oriented downwards, to see the details [1, 3].

There are three points of eye (osel) between the honeycomb eyes. The front is the only medial median, while the other is called the lateral osel. The frontal suture extending to the sides of lateral osels is usually prominent with coronal stur, which divides the vertebra into two parts (Figure 1). Mouth members are of the orthopteroid type, usually with a prognostic or hypognate position [3].

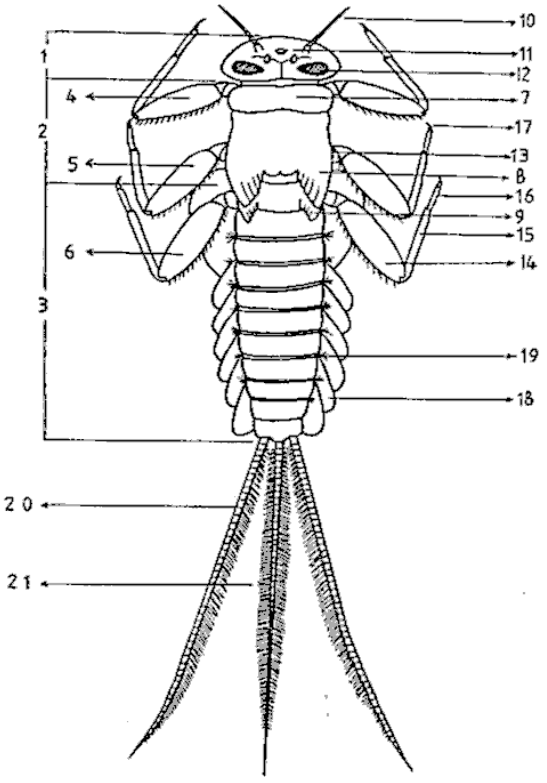
Ephemeroptera species spend about 99% of their lives as nymphs in aquatic environments. They complete their later lives as sub imago and adult [4, 5, 6, 7]. In adults, the body is long, cylindrical or flattened. The head is rather small. The antennas are relatively short [1]. The appearance of a general Ephemeroptera nymph from the dorsal view is given in Figure 1 (Figure 1).

Ephemeroptera are classified in a separate group under the name of Archipterygota unlike other insect groups because they have wings in sub imago period and they change their skin once more during this period [2].

Mouth members of the nymphs are chewers (Orthopteroid) (Fig. 2) [1].

Although most species are herbivores, some species are fed as detritus or carnivorous. The most important nutrients are Diatoms type algae. Because Ephemeroptera nymphs constitute an important link in the food chain, species diversity and abundance give accurate results in determining the biological efficiency of water [1, 4, 5, 7].

Figure 1. View of a general Ephemeroptera nymph from dorsal view [1]. 1. Head, 2. Thorax, 3. Abdomen, 4. Front



leg, 5. Middle leg, 6. End leg, 7. Prothorax, 8. Mesothorax, 9. Metathorax, 10. Antenna, 11. Osel eye, 12. Honeycomb eye, 13. Coxa, 14. Femur, 15. Tibia, 16. Tarsus, 17. Nail, 18. Gill, 19. Fibril bundle, 20. Serk, 21. Paraserk [1]

Ephemeroptera nymphs have been well adapted to all kinds of aquatic environments. The abundance and variety of species is closely related to the O2 concentration of water. Depending on the temperature, the oxygen concentration in the water drops below 2-5 mg / lt is known as lethal limits for nymphs. Especially the amount of oxygen in the environment pollution etc. because of their reasons, they respond in a very sensitive way to their changes. A decrease in the number of species is observed due to the decrease in the amount of oxygen [6, 7, 8]. They are important indicator organisms in water pollution studies due to the fact that

nymphs are found in all kinds of aquatic environments, they spend most of their life in waters and they can be collected easily in almost every season, and they can be concluded with a small number of species [6, 7, 8, 9].

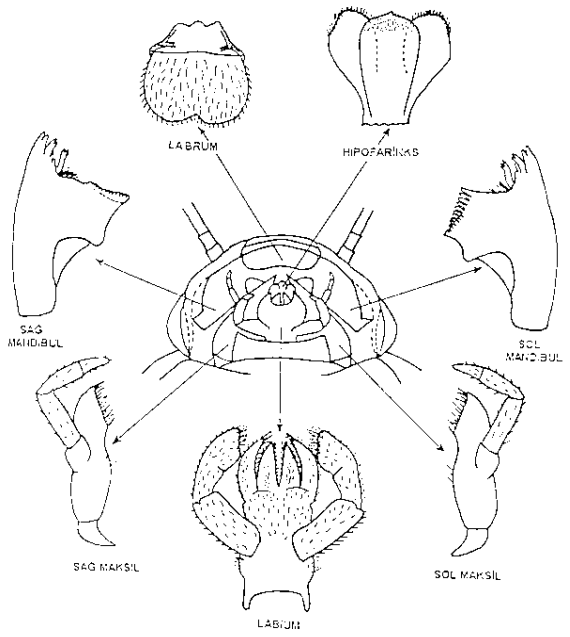


Figure 2. Ventral view of mouth parts in Ephemeroptera nymph [12]

Chemical analyses in water pollution surveys alone are not sufficient to detect changes in water. The values obtained from the chemical anal traces of the waters give only the conditions during the sampling [7, 8, 9]. Chemical data must be supported by biological data to demonstrate the presence of a discrete waste discharge or pollutants that may be missed in chemical sampling [7, 8, 9]. Therefore, they are used as bioindicators in medium and long-term water quality studies in many methods (except *B. rhodani*) [7, 8, 9].

The distribution and density of nymphs in water depends on biotic and abiotic factors. The most important of these are flow velocity, temperature, water level change, soil structure, pollution and oxygen content etc. biotic factors such as the condition of predators in the environment, especially with abiotic factors. Although they are spread to a depth of 15 meters in the waters, they are usually found near the surface [6, 7, 8, 9].

As nymphs are generally mobile, they can spread to large areas in the waters. It has been reported that developmental status is an important factor in the distribution. It has been reported that the species that spend the winter months as nymphs go deeper in the cold months and especially some Baetis species are more active at night. Ephemeroptera nymphs are classified by Needham and Traver according to their ecological characteristics and body forms [1, 10, 11].

According to this;

I. Lake, pond and stagnant parts of rivers:

a) Climbers: They usually make splash and climb movements on water plants. Their bodies are generally smooth and smooth. Tail extensions are frequent and hard hairy. Gills are quite large and flat. They are able to move quickly due to sudden and strong movements of tail extensions and gills. Typical examples are *Cloeon spp., Callibaetis spp* [1, 10, 11].

b) Residents: This type of nymphs moves slowly and crawl on sandy and muddy soils. Her legs are usually slanted to the sides and have hard hair. Tail extensions are hairy. The body and legs are usually covered with depris particles. The first gills are usually different in shape or position and protect the other gills from the negative effects of sand and mud. Typical examples include *Caenis spp, Ephemerella spp.* [1, 10, 11].

c) Excavators: This type of nymphs usually open "U" shaped cavities between mud, sandy-mud and debris. These are usually found in the first 5 cm of the ground, but they can go down to 15 cm. Usually the front legs are flattened. In addition, many types of mandibles are used for digging. Exemplary species are *Hexagenia spp, Ephemera spp.* [1, 10, 11].

II. The inhabitants of the fast-flowing stream and the wavy water (the eyes of these species are located in the dorsal part of the head):

a) Those who act freely in streams: In this type of nymphs the body is long cylindrical; Some have flattened. This type of nymphs can move despite the fast current. During rest, stones etc. they can protect themselves from discharge. Exemplary species are *Baetis spp, Ameletus spp* [1, 10, 11].

b) Retainer species: This type of nymphs, such as stone in water, etc. the other build ~ live in clinging. Their bodies are flattened and flat. The front part of the head is enlarged. A characteristic feature of the legs is that the femurs are flattened. Common species *Epeorus ssp, Heptagenia spp*, are some species [1, 10, 11].

c) Those who live in mud, shrubs and algae: These species are not found in streams. The legs of these species are upright and their bodies contain hard bristles. Typical examples of this group are *Ephemerella ssp* and *Neoephemera ssp* [1, 10, 11].

MATERIAL AND METHODS

In order to determine the Ephemeroptera fauna of Gümüş Creek, it is planned to collect samples from the pre-determined 9 stations shown in Figure. 3. However, sampling could not be performed since water could not be found in Stations 7 and 9.

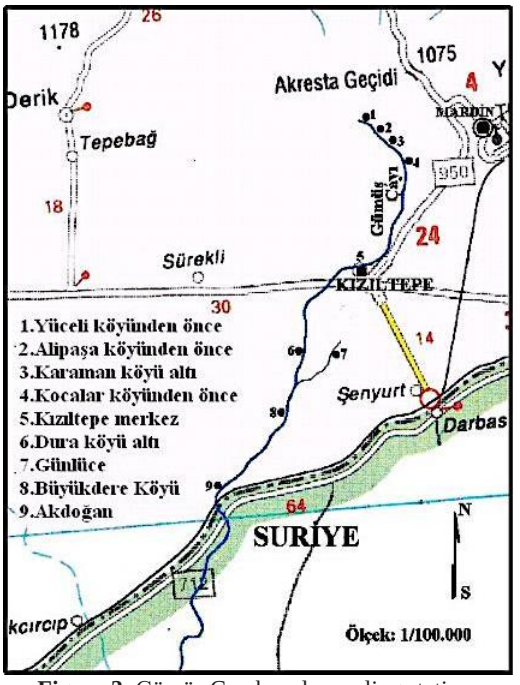


Figure 3. Gümüş Creek and sampling stations

The samples collected with the aquatic ladle were placed in a bucket and then the mesh intervals; 18, 60 were passed through the sieve system and fixed with 4% formaldehyde. Under laboratory conditions, it was taken under binocular

and separated from the debris into the tubes with special prepared mixture.

For Ephemeroptera; 500 ml of 70% Alcohol, 10 ml of 40% Formaldehyde and 5 ml of glycerine mixture was used [3, 7].

Determination of Ephemeroptera; Macan, 1979; Tanatmış, 1993; Malzacher, 1984, used [1, 3, 7,]. The mouth parts, the 1st and 3rd legs, and the gills (first and last gills) of the samples were prepared in Entellan for examination.

During the collection of samples, some physico-chemical characteristics of the water along with the baseline structure and the current data were recorded (Table 1).

Table 1. Physico-Chemical Values and Ecological Properties of Sample Stations.

Sta. No	Flow rate	Depth (cm)	Blur	Vegetation	Floor	pH	DO (mg/lt)	Con.	NaCl (%)	Turb. (mg/lt)	Temp. °C
1	Medium	20-25	Clear	✖	Gravel, sand and less mud	8.0	8.2	53.7* 0.05 **	0.03	4	16.4
2	Slow	30-50	Clear	✖	Gravel, sand and less mud	8,1	7,7	51,4* 0,05**	0,03	5	15.9
3	Medium	75-85	Clear	✖	Gravel and less mud	8,4	7,8	49,9* 0,05**	0,02	2	16
4	Medium	40-50	Clear	✖	Gravel, sand and less mud	8,2	8,2	47,5* 0,05**	0,02	6	16.5
5	Medium	90-110	Blurred	No plant	Sand and mud	7,9	5,9	40,6* 0,04**	0,02	1	17.4
6	Medium	25-35	Very Blurry	No plant	Very muddy	7,9	6,3	54 * 0,05**	0,03	14	20.5
7	It is a small branch poured into the Gümüş Creek and the sample could not be obtained because it was dried.										
8	Medium	25-35 cm	Clear	No plant	Gravel	9	10,5	50* 0,05**	0,02	6	21.3
9	The sample was not obtained because the water dried.										

* Maximum Conductivity Value (ms/m) ** Minimum Conductivity Value (s/m) ✖ Edge cuts are rich in aquatic plants.

RESULTS

Two of the 9 stations identified in the study area, Gümüş Çay, could not be sampled because there was no water, 5 of the remaining 7 stations were identified in the first 4 stations of Ephemeroptera class (Table 2). The distribution of the determined species according to the stations is given in Table 3.

Table 2. Systematic Distribution of Gümüş Creek Ephemeroptera Fauna.

Phylum	Classis	Ordo	Family	Species
ARTHROPODA	Insecta	Ephemeroptera	Baetidae	*Beatis sp.*
				Beatis digitatus
			Heptageniidae	*Ecdynorus sp.*
			Caenidae	*Caenis macrura*
			Ephemeridae	*Ephemera vulgata*

Table 3. Distribution of the species identification in the study area by stations.

	Species	Station No								
		1	2	3	4	5	6	7	8	9
Ephemeroptera	*Beatis sp.*	•	•	•	•					
	Beatis digitatus	•	•	•	•					
	Ecdynorus sp.	•	•	•	•					
	Caenis macrura	•			•					
	Ephemera vulgata	•								

No sample could be obtained because the water is dried in the regions where these stations are located.

Species and Characteristics Detected in the Study Area

Classis: INSECTA

Sub-classis: Pterygota

Ordo: Ephemeroptera

Family 1: Baetidae

Genus: *Baetis sp.* Leach, 1815 (Figure 4, 5, 6, 7, 8, 9, 10)

Taxonomic features: Body length is 7-8 mm, there is no paraserk short enough, the serk lengths are 4-5 mm. General body colour is usually dirty yellow. First and last tergites in the abdomen are usually light coloured. The legs are of similar structure and light colour.

Areas of life and distribution: Clean and run-off, the ground is found in the rocks. In our study area, it has been determined in stations 1,2,3 and 4.

Species: *Baetis digitatus* Bengtsson, 1912 (Figure 11, 12, 13, 14)

Taxonomic features: Body length 4-6 mm, no paraserk short enough to be short, 2-4 mm. General body colour is usually light yellow. The legs are of similar structure and light colour. The gills in the abdomen are similar. But the last gill leaflet is pointed towards the end.

Areas of life and distribution: They are found in clean and run-off waters, in aquatic plants and in stony rivers. In our work area only 1 station has been detected.

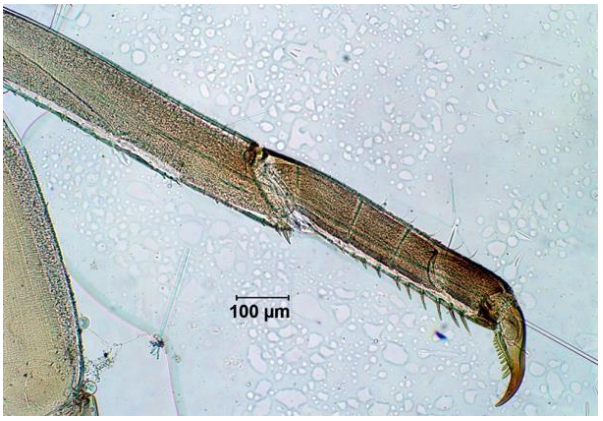


Figure 4. 1st leg of *Beatis* sp.

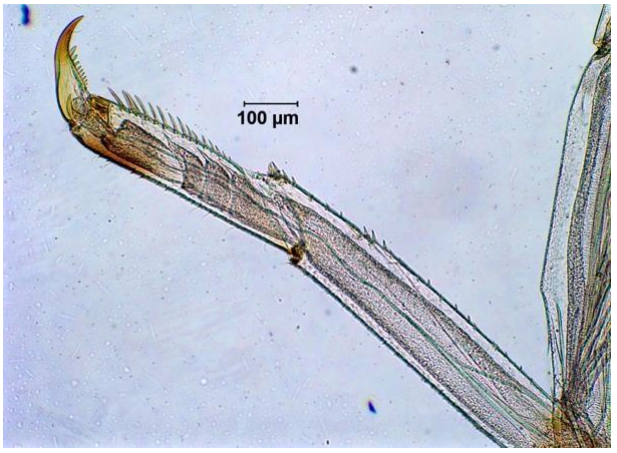


Figure 5. 3rd leg of *Beatis* sp.

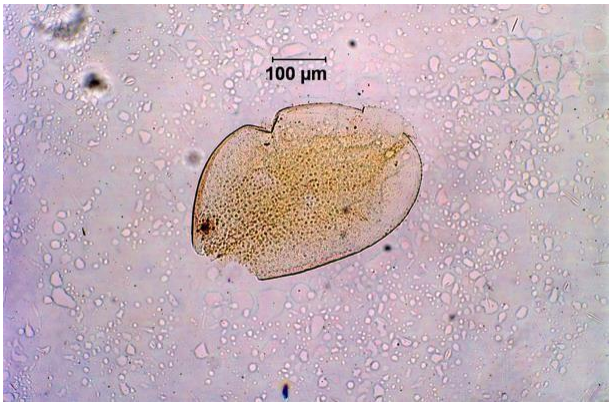


Figure 6. 1st gill leaf belonging to *Baetis* sp.

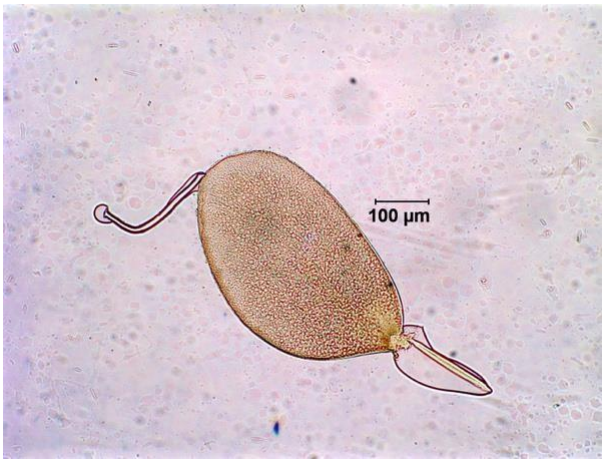


Figure 7. The last gill leaf from *Beatis* sp.

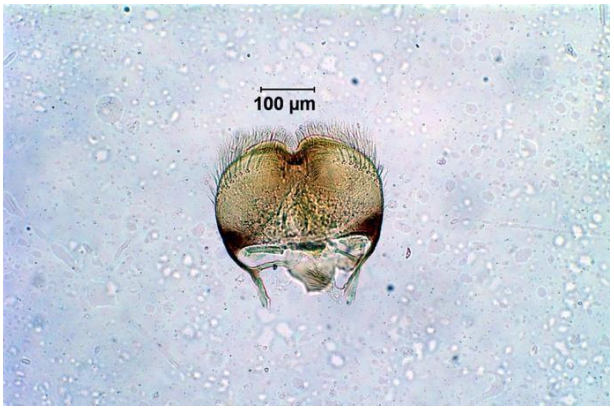


Figure 8. Labrum of *Beatis* sp.



Figure 9. Right mandible of *Beatis* sp.

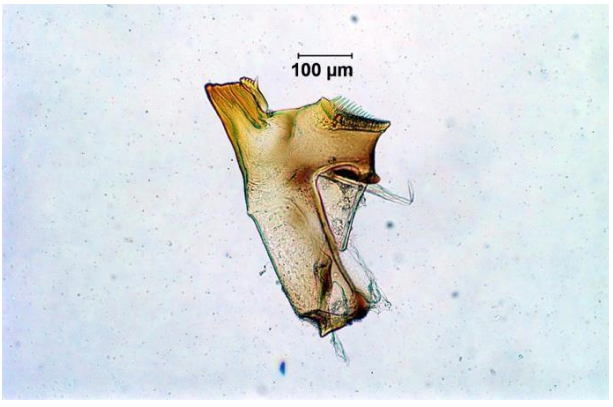


Figure 10. Left mandible of *Beatis* sp.

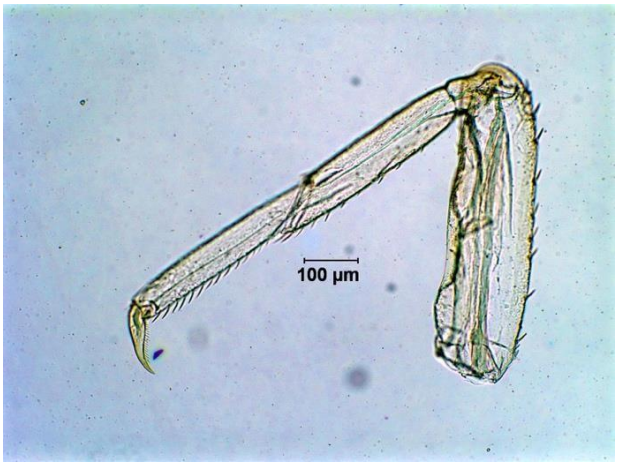


Figure 11. 1st leg of *Beatis digitatus.*

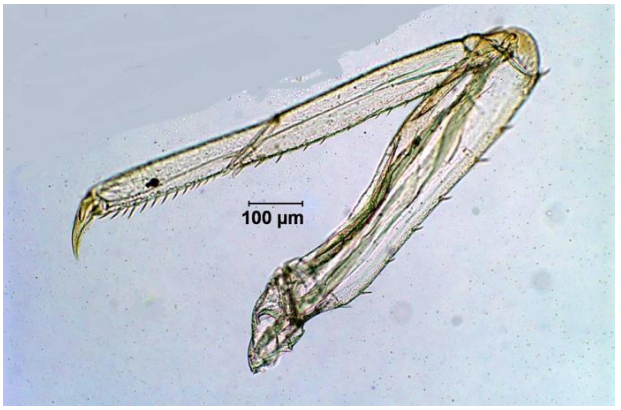


Figure 12. 3rd leg of *Beatis digitatus*

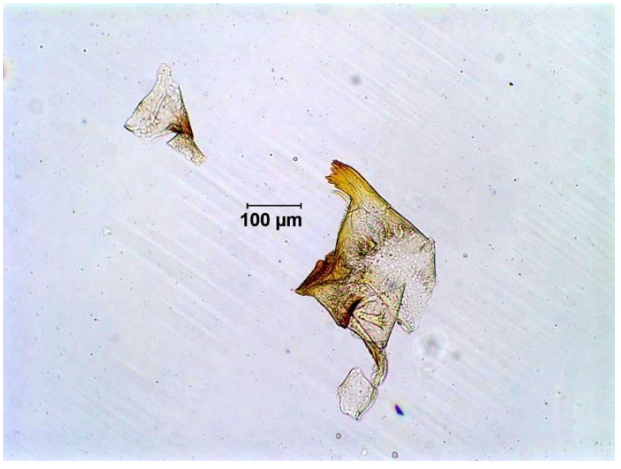


Figure 13. Right mandible of *Baetis digitatus*

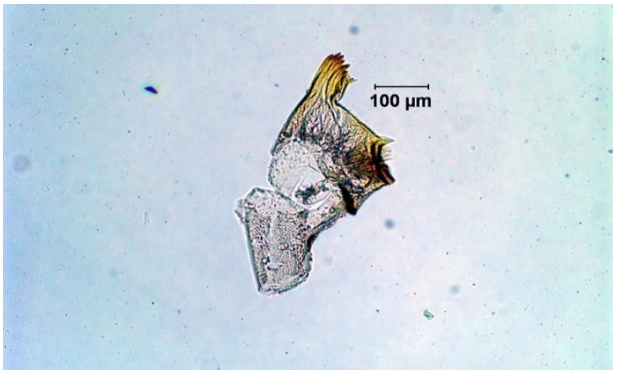


Figure 14. Left mandible of *Baetis digitatus.*

Family 2: Heptageniidae

Genus: *Ecdynorus sp*. Eaton, 1865

Taxonomic features: Body length is 10-15 mm, serk and paraserks length is 10-13 mm. The lateral edges of the head are enlarged. The anterior corners are oval. The legs are similar. The last leg is longer than the others. The femurs have enlarged and contain long and thick hair strands along their outer edges. On the lower edge and dorsal surfaces, there are short and steep spines. The tips of the nails are usually dark and sometimes contain 2 distinct teeth.

Areas of life and distribution: In clean and run-off waters, they prefer places where the ground is stony or gravel or where there are aquatic plants. In our study area 1 and 4 stations have been identified.

Family 3: Caenidae

Species: *Caenis macrura* Stephens, 1835 (Figure 15, 16, 17, 18)

Taxonomic features: The body length is 5-7 mm, and the length of the paraserks and paraserks is 3-5 mm. The head is dark brown and the honeycomb eyes are in lateral position. Legs are lighter than the body. The femur is enlarged. The length of the paraserks is about the size.

Areas of life and distribution: It is found in flowing, ground stony or sand dunes. It has been found in the stations 1,2,3 and 4 in our study area.

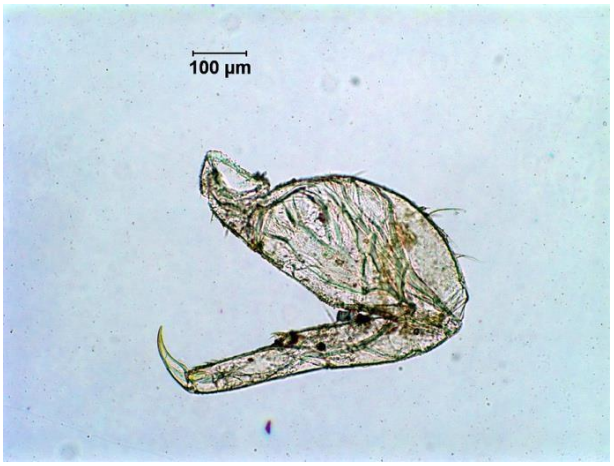


Figure 15. 1st leg of *Caenis macrura*

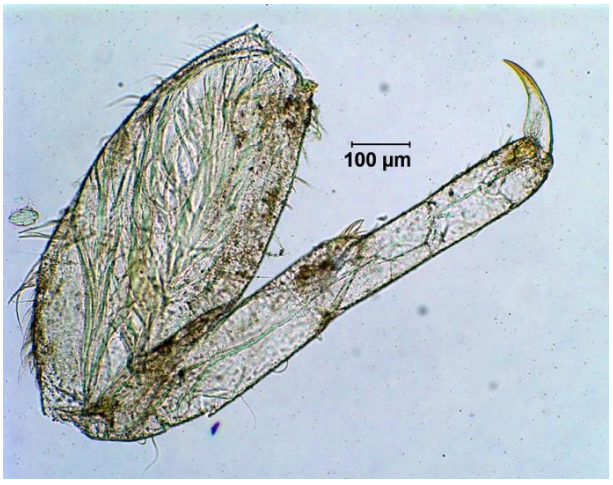


Figure 16. 3rd leg of *Caenis macrura's*

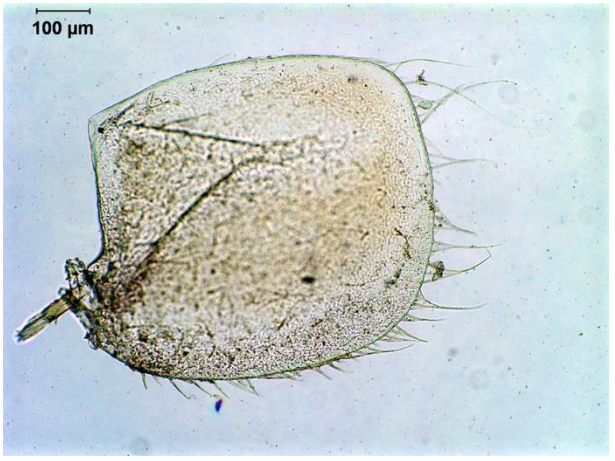


Figure 17. 1st gill leaf of *Caenis macrura*

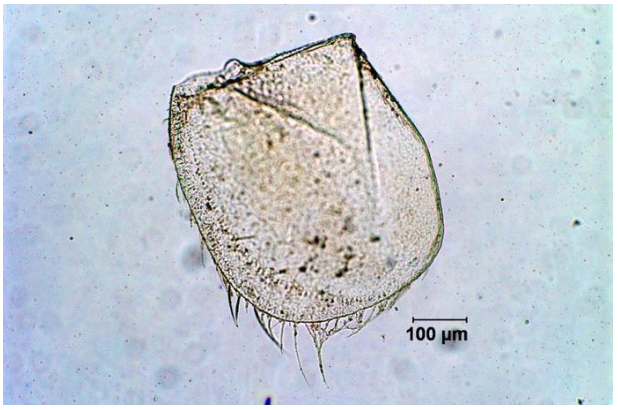


Figure 18. The last gill leaf from *Caenis macrura*

Family 4: Ephemeridae

Species: *Ephemera vulgata* Linne, 1758

Taxonomic features: Body length is 15-18 mm and length and paraserk length is 7-8 mm. Abdomen in the first and last tergit is smaller than the median line on both sides of the pattern is shaped as a dark brown bar. The leg is dark yellow in colour. The anterior femurs have long edges along the lower edge. The nails are tooth-free.

Areas of life and distribution: It is found in flowing, ground stony or sand dunes. In our study area, it has been determined in stations 1,2,3 and 4.

DISCUSSION

Only the Ephemeroptera species were identified from the first four stations. The remaining and water stations were not found in 3 stations. This shows us that there is no pollution and low oxygen tolerances. Ephemeroptera species also reveal the quality of the water body in which they are found [6, 7, 8, 9].

Dissolved Oxygen (D.O.). we can divide into two regions in terms of flow rate, turbidity and vegetation. These include the 1st zone (clean and plant rich) with stations 1, 2, 3 and 4 and II, stations 5, 6 and 8. The region (more dirty and poor in plant). In the 1st region, species *Beatis sp.*, *Caenis macrura*, which are accepted as indicator for clean water, were determined.

Common characteristics of stations 1, 2 and 4 are described in D.O. high (7,7-8,2 mg / lt, Table 1), rich in aquatic plants and small pebbles and sand.

It has been reported that the base structure in the rivers is effective on fauna, and that the biodiversity is less in the areas with a large stone-covered sediment and poor in aquatic plants; 3, 6, 7]. In addition, geographical factors are also effective on biodiversity [12].

As a result of the studies, 5 species of Ephemeroptera class have been identified. All identified species are new

records for Gümüş Creek. Turkey Ephemeroptera by determination of Gümüş Creek has contributed to the fauna species.

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