DETERMINATION OF ECOLOGICAL FEATURES

OF THE FRESHWATER OSTRACODA (CRUSTACEA)

IN BOLU REGION (TURKEY)

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by

NECMETTİN SARI

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Approval of the Graduate School of Natural Sciences

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This is the certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

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TO MY FAMILY

ABSTRACT

DETERMINATION OF ECOLOGICAL FEATURES OF THE FRESHWATER OSTRACODA (CRUSTACEA) IN BOLU REGION (TURKEY)

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The study includes samples gathered from 144 different aquatic environments randomly chosen from 9 counties affiliated to Bolu region on June- August 2006. In determining the worksite, special attention is paid in designating zones of varied features in order to attain general distribution. Hence; stations of varied features such as pond, spring, lake, creek, trough, pool etc. are included in the worksite. A total of 41 taxa pertaining to 21 genus (*Psychrodromus olivaceus, Ps. fontinalis, Candona neglecta, C. candida, C. weltneri, C. sanociensis, C. lactea, Pseudocandona compressa, Pse. albicans, Pse.* cf. *semicognita, Fabaeformiscandona fabaeformis, F.* cf. *breuili, F. balatonica, F. brevicornis, F. protzi, F. latens, Schellencandona* cf. *belgica, Heterocypris incongruens, H. salina, H. rotundata, Ilyocypris bradyi, I. gibba, I. getica, I. inermis, Herpetocypris chevreuxi, Hr. reptans, Hr. brevicaudata, Potamocypris villosa, P. similis, P. fulva, P. smaragdina, Cypridopsis vidua, Cypria ophthalmica, Scottia pseudobrowniana, Prionocypris zenkeri, Trajancypris serrata, Cyclocypris laevis, Eucypris virens, Physocypria kraepelini, Cavernocypris* sp., *Darwinula* aff. *stevensoni*) are defined. As to the aforementioned species, while for the first time in literature the bisexual population of *I. inermis* is detected, 12 new

species (*C. weltneri, C. sanociensis, C. lactea, F.* cf. *breuili, F. balatonica, F. brevicornis, F. protzi, F. latens, Schellencandona* cf. *belgica, Pse.* cf. *semicognita, P. similis, P. smaragdina*) are registered to Turkish Ostracoda fauna. Among these *Schellencandona* is a newly recorded genus for non-marine Ostracoda fauna of Turkey. Besides, six species (*Herpetocypris brevicaudata*, *Cyclocypris laevis, Ilyocypris getica, Trajancypris serrata, Potamocypris fulva, Psychrodromus fontinalis*) are recorded for the second time in Turkey. Furthermore, 17 species which determined in this study (*C. weltneri, C. sanociensis, C. lactea, F.* cf. *breuili, F. balatonica, F. brevicornis, F. protzi, F. latens, Schellencandona* cf. *belgica, Pse.* cf. *ssemicognita, Hr. brevicaudata, H. salina, H. rotundata, P. similis, P. smaragdina, Cyclocypris laevis, Trajancypris serrata*) are first record for the Bolu region.

According to Unweighted Pair Group Mean Averages (UPGMA) results, 11 species have shown relationship in five groups according to their stations. According to the species distribution among nine counties, 75% of species analogy is recorded between Yeniçağa and Göynük, while Seben and the central region have shown the least amount of analogy, being 20%.

While the species with the highest toleration level, as primarily to dissolved oxygen, water temperature and redox potential, is recorded as *H. incongruens*, the species with the highest tolerance to pH change is *C. candida,* yet another cosmopolitan species. *Hr. chevreuxi* which shows a cosmopolitan distribution at least in Holarctic region is recorded as the species to have the highest tolerance level against electrical conductivity. Therefore; the results generally support the idea that advocates cosmopolitan species to have high tolerance levels.

According to the results of Spearman Correlation Analysis between species and environmental variables, two species (*Pro. zenkeri*, *Ps. fontinalis*) have shown negative correlation with pH, while the same species show a positive correlation with redox potential (SHE). Among the species, only *C. candona and Ps. olivaceus* have shown a significant positive correlation with electrical conductivity ($P<0.05$). While some species have shown considerable statistical correlation among each other, the relation among environmental variables (pH- redox potential for instance) proves to be as anticipated.

The first axis of the Canonical correspondence analysis (CCA) can only define 52 % of the relationship between species and environmental variables (with 4.3 % of error). According to the analysis five most effective variables on species are as follows; temperature, redox potential, dissolved oxygen, pH and electrical conductivity. The results have generally reconciled with ETI and Spearman correlation results.

Key Words: Ostracoda, Ecology, Tolerance and Optimum, ETI, Bolu.

ÖZET

BOLU BÖLGESİ (TÜRKİYE) TATLISU OSRAKODLARININ (CRUSTACEA) EKOLOJİK ÖZELLİKLERİNİN BELİRLENMESİ

SARI, Necmettin

Master, Biyoloji Bölümü

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Bu çalışmada Bolu iline bağlı 9 ilçeden rasgele seçilen 144 farklı sucul ortamdan Haziran-Ağustos 2006 tarihleri arasında örnekleme yapılmıştır. Çalışma alanı seçilirken, genel bir dağılım göstermesi amacıyla, değişik özelliklere sahip noktaların belirlenmesine özen gösterildi. Bu yüzden yalak, kaynak, birikinti, akarsu, göl, gölet gibi farklı ekolojik özellikler içeren istasyonlar çalışma alanının içinde yer almaktadır. Toplam 21 cinse ait 41 taksa (*Psychrodromus olivaceus, Ps. fontinalis, Candona neglecta, C. candida, C. weltneri, C. sanociensis, C. lactea, Pseudocandona compressa, Pse. albicans, Pse.* cf. *semicognita, Fabaeformiscandona fabaeformis, F.* cf. *breuili, F. balatonica, F. brevicornis, F. protzi, F. latens, Schellencandona* cf. *belgica, Heterocypris incongruens, H. salina, H. rotundata, Ilyocypris bradyi, I. gibba, I. getica, I. inermis, Herpetocypris chevreuxi, Hr. reptans, Hr. brevicaudata, Potamocypris villosa, P. similis, P. fulva, P. smaragdina, Cypridopsis vidua, Cypria ophthalmica, Scottia pseudobrowniana, Prionocypris zenkeri, Trajancypris serrata, Cyclocypris laevis, Eucypris virens, Physocypria kraepelini, Cavernocypris* sp., *Darwinula* aff. *stevensoni*) tanımlanmıştır. Bu türler arasında, *I. inermis*'in biseksüel populasyonuna literatürde ilk defa rastlanırken, 12 tür ise (*C. weltneri, C. sanociensis, C. lactea, F.* cf. *breuili,*

F. balatonica, F. brevicornis, F. protzi, F. latens, Schellencandona cf. *belgica, Pse.* cf. *semicognita, P. similis, P. smaragdina*) Türkiye ostrakot faunası için ilk kayıttır. Bunlardan *Schellencandona* ise Türkiye için yeni kayıt bir cinstir. Ayrıca 6 türe ise (*Herpetocypris brevicaudata*, *Cyclocypris laevis, Ilyocypris getica, Trajancypris serrata, Potamocypris fulva, Psychrodromus fontinalis*) Türkiye'de ikinci defa rastlanmıştır. Bu çalışmada tanımlanan 17 tür (*C. weltneri, C. sanociensis, C. lactea, F.* cf. *breuili, F. balatonica, F. brevicornis, F. protzi, F. latens, Schellencandona* cf. *belgica, Pse.* cf. *ssemicognita, Hr. brevicaudata, H. salina, H. rotundata, P. similis, P. smaragdina, Cyclocypris laevis, Trajancypris serrata*) Bolu bölgesi için yeni kayıttır.

Ağırlıksız Basit Çift Grup Ortalama Analizi (Unweighted Pair Group Mean Averages) (UPGMA) sonuçlarına göre 11 tür 5 gurupta bulundukları istasyonlara göre akrabalık benzerlikleri göstermiştir. Dokuz ilçe arasındaki tür dağılımına göre Yeniçağa-Göynük arasındaki tür benzerliği %75 olurken, en az benzerlik gösteren ilçeler ise %20 benzerlik oranı ile Seben ve Merkez ilçeleridir.

Çevresel değişkenlerden çözünmüş oksijen, su sıcaklığı ve redoks potansiyeli başta olmak üzere en fazla tolerans seviyesi yüksek olan tür *H. incongruens* bulunurken, pH değişmelerine toleransı en fazla olan tür ise yine başka bir kozmopolitan tür olan *C. candida*'dır. En azından Holarktik bölge için kozmopolitan bir dağılım gösteren *Hr. chevreuxi* ise elektriksel iletkenliğe karşı tolaransı en yüksek olan tür olarak bulunmuştur. Bu sonuçlar genel anlamda kozmopolitan türlerin tolerans seviyelerinin yüksek olduğunu savunan görüşü desteklemektedir.

Tür ve çevresel değişkenler arasındaki ilişkilerin Spearman Korelasyon Analiz sonuçlarına göre iki tür (*Pro. zenkeri*, *Ps. fontinalis*) pH ile negatif bir ilişki gösterirken, aynı türler redoks potansiyeli (SHE) ile pozitif bir ilişki göstermiştir.

Türler arasında sadece *C. candida* ve *Ps. olivaceus* elektrik iletkenliği ile önemli pozitif ilişki ifade etmiştir. Bunun dışında bazı türlerin aralarındaki korelasyonda istatistik açıdan önemli olduğu görülürken, çevresel değişkenlerin kendi aralarındaki ilişki de (örn., pH – redoks potansiyeli) beklenen seviyelerde bulunmuştur.

Çok Yönlü Bağlantılı Uyum Analizi'nin (Canonical correspondence analysis, (CCA)) ilk ekseni türler ile çevresel değişkenler arasındaki ilişkinin %52 kadarını (%4,3lük bir hata ile) açıklayabilmiştir. Buna göre türler üzerinde en etkin beş değişken sırasıyla sıcaklık, redoks potansiyeli, çözünmüş oksijen, pH ve elektriksel iletkenliktir. Bu sonuçlar genel anlamda ETİ ve Spearman korelasyon sonuçlarıyla uyum göstermiştir.

Anahtar Kelimeler: Ostrakoda, Ekoloji, Tolerans ve Optimum, ETİ, Bolu

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1. INTRODUCTION

The species of ostracods can be found almost all types of water bodies such as brackish, fresh and saline waters, including underground waters, cave waters and semiterrestrial habitats. Ostracods are small aquatic crustaceans, generally 0.3-5 mm long that can live in very different aquatic habitats. Although some pelagic species used to live in marine exceed 30 mm in length (Meisch 2000). They have a wide tolerance to the environmental variations. Any species tolerates in different levels to the different ecological parameters of the aquatic habitats where they live (Delorme 1991). Some ostracod species can be used as a bioindicator species, just because of this feature and can inform us about the water quality (Külköylüoğlu 1999). To determine environmental pollution, usega of bioindicator species can be more cheaper, easier and shorter. Although the concept of bioindicator species has already been used for different organisms, we poorly know the ecological requirements of ostracods. However, in total, 65.000 nominal extant and fossil species have been described and it is guessed that more than 20.000 living species exist (Ikeya et al., 2005). Even though 90 species belonging to 39 genera were reported from Turkish non-marine habitats (Altınsaçlı and Griffiths 2002), this number is believed to be underestimated. For example, untill now, the studies completed in the Bolu region (Külköylüoğlu and Dügel 2004, Külköylüoğlu et al. 2007) suggested that this number extents up to 100 or more species in Turkey.

On the other hand, Bolu region plays an important role as a bridge between Karadeniz, Marmara and Central Anatolia in geogeographic distribution of the species. In which case, there must be three probabilities in ostracods fauna of Bolu region as: (1) It is so far only known 36 species belong to 23 genera at present. However, it is possible that the transition species can be more because of its role as a bridge between different regions, (2) It may be more different species with different interforms in region and (3) Number of the species that have wide tolerance ranges to the ecological variables which called “cosmopolitan” may be more, because of the ecological features in Bolu region.

In the lights of these information, thus, the aims of this study were to (1) confirm both the ostracod fauna of the region and their ecologic characteristics, (2) characterize the distribution features of each species that found, (3) show the relationship between the species and environmental variables, (4) find optima and tolerance values of the species that can help us to reconstruct the past history, and (5) determine the dominant ostracod species of the region.

1. 1. Ostracoda

The Ostracoda are small bivalved crustaceans that were first formally described by O. F. Müller in 1776 (Henderson 1990). These aquatic invertebrates were first named as ‘Ostrachoda’ by Latreille in 1802 then after, the name was changed to ‘Ostracoda’ in 1806 by him (Ikeya et al., 2005). Ostracods are small aquatic invertebrate animals with an adult length ranging between 0.3 and 30 mm with the majority of freshwater species (Henderson 1990), especially in some marine planktonic Myodocopida (Martens 1998). It is an ancient group with a fossil record spreading to the Cambrian (Henderson 1990). They are bivalved invertebrates with a pair of calcium carbonated carapace. The whole unsegmented body is completely enveloped by the calcified carapace, which is made up of two lateral valves (Martens 1998). Most appendages and organs are paired that enclosed by carapace. Ostracoda are the most diverse crustaceans with their marine and non-marine species. In total, 65.000 nominal extant and fossil species have been described and it is guessed that more than 20.000 living species exist (Ikeya et al., 2005).

The Class, Ostracoda is represented in the Phylum Arthropoda and the Subphylum Crustacea. There are two subclasses of the Ostracoda, namely Myodocopa and Podocopa (Horne et al., 2002). While the Subclass Podocopa includes Podocopida, Platycopida, Palaeocopida; the subclass Myodocopa includes Myodocopida and Halocyprida (Horne 2003). There are three orders of Ostracoda as Myodocopida, Platycopida, Podocopida (Meisch 2000). When Myodocopa is found in the marine pelagic realm and nektobenthic taxa, Platycopida includes only marine species, and Podocopida includes marine, brackish, and freshwater species (Meisch 2000). Podocopida have three superfamilies as Cypridoidea, Cytheroidea, and Darwinuloidea. Cypridoidea is the most diverse group of the non-marine Podocopids including following 4 orders:

Order: Palaeocopida Henningsmoen, 1953, includes only fossil species.

Order: Myodocopida Sars, 1866, includes only marine species;

Order: Platycopida Sars, 1866, includes marine and few brackish species;

Order: Podocopida Sars, 1866, includes marine, brackish, freshwater, and few terrestrial species.

1. 1. 1. Ecology

Ostracods occur in every aquatic habitat, such as in the oceans living from the shallow littoral zone to the abyssal depths, from oceanic surface waters to the lagoons, estuaries and marginal marine environments with fluctuating salinities. They also occur in almost all kinds of freshwater habitats, whether permanent or temporary, limnic or with increased ionic content, epigean or hypogean, stagnant or flowing (Meisch 2000). Besides, a limited number of ostrocod taxa are known from semi-terrestrial environments (Külköylüoğlu and Vinyard 2000). Indeed, they can be found in Arctic regions and in tropical zones, also in underground waters. In many kinds of waters the ostracods are one of the dominant animal groups and may reach amazing densities. They can live as predators, herbivores, omnivores or detritivores. Some cytheroid ostracods can live as symbionts, commensals or ectoparasits on the appendages of hypogean Isopoda, Decapoda (Meisch 2000). Some species of Ostracoda have a wide geographical distribution depending on their dispersal abilities and tolerances of environmental variables. Distribution can be achieved through passive or active transport, which is common in freshwater invertabrates (Bilton et al., 2001). Living ostracods can be transported by some parts of birds, by sediment transportation, by fishes and humans (Külköylüoğlu 1999, Horne and Boomer 2000). The wind is also another important factor in the dispersion of resting eggs (Horne and Martens 1998).

Ostracods are sensitive to both environmental variations such as elevation, latitude, longitude, seasonal changes (Delorme 1983) and to the physical, chemical and ecological characteristics of different aquatic habitats (temperature, conductivity, dissolved oxygen, pH) (Külköylüoğlu 2005a). Different species prefer different types of water bodies related to their tolarence limits to environmental variations and different species respond in different ways to the organic pollution (Eager 1999, Mezquita et al., 1999a).

Also, some species known as cosmopolitans do have broad ranges of tolerances to environmental fluctuations and to changes in such variables in polluted or disturbed habitats (Külköylüoğlu 2004). They can recolonize easily to the new environment (Külköylüoğlu 2005a). The endemic species, however, are of small ranges of tolerances to the ecological variables and usually have more limited tolerance levels than cosmopolitan species. Hence, an increase in the numbers of cosmopolitan species may imply the effect of disturbance and pollution, causing a reduction in the numbers of native species (Külköylüoğlu 2005b) such phenomenon is called 'pseudorichness' (Külköylüoğlu 2004). Moreover, ostracods provide suitable responses to the environmental pollution by disappearance, replacement, appearance of specific species or presence of morphological anomalies or the alteration of population dynamics (Geslin et al., 2002). Nevermore, it is well known that anthropogenic factors affect many freshwater biotic communities (Heino et al., 2005). From this point of view, ostracods as indicator species can be used to characterize past and current ecological conditions of aquatic habitats (Mezquita et al., 1999a; Külköylüoğlu and Dügel 2004). However, useing ostracods, as bioindicator species require knowledge about the ecological preferences of individual species (Külköylüoğlu 2003a). Besides, current ecological requirements of the ostracods to environmental variables help us to estimate the past conditions of the habitats. This is because ostracods have a pair of calcium carbonate carapace that can be preserved as fossilized forms which they can be called as *paleoindicators* and each species has a specific preference of tolerances for ecological variables such as temperature, salinity, and pH as well (Delorme 1983).

Furthermore, they show different spatial and temporal samples in different aquatic habitats (Külköylüoğlu 1998) and have considerably consistent ecological reqirements on the order of thousands of years (Smith and Forrester 1994). They also enable us great scope for testing biological theories in evolution and ecology because of their long-detailed fossil record broad life histories (Henderson 1990). Thus, if present ecological requirements of the ostracods are known, it is possible to ascertain past environmental conditions on the basis of fossil evidence (Külköylüoğlu and Dügel 2004). Despite all the respect to these earlier studies, Ostracoda ecology has not been completely known yet (Külköylüoğlu 2004).

The knowledge on the ecology of ostracods are important to (1) understand the water quality of different aquatic habitats because of using them as indicator species, (2) establish their role in the food web, since some species have active role at second or third trophic levels and some others may be herbivores or can be food source of the other living things such as fishes (Horne and Boomer, 2000), (3) reconstruct the history of water body and its enveloping climate by analyzing sedimentary records (Mezquita et al., 1999a) and guess the past ecologic conditions of the habitats since they are preserved as fossils. Therefore, the ostracods are important invertebrates which can allow us to understand and compare past, present and the future conditions in a variety of habitats.

1. 2. History of Ostracoda Studies in Turkey

Although previously studies have listed total of 90 ostracods belonging to 39 genera in Turkey (Altınsaçlı and Griffiths 2002), as pointed above such number is believed to be underestimated, and is possibly much higher. Two possible reasons for a small numbers of species recorded so far can be either difficulties in taxonomic works that includes many regions unsampled so far, or a few numbers of ostracodologist found in Turkey. Nevertheless, known numbers of ostracods are even higher than many other countries in Europe and other countries in similar size. Below, there is a brief historical development about freshwater ostracod studies in Turkey.

First studies on Ostracoda in Turkey were made by H. W. Schäfer in 1954 and later by Hartmann in 1964. Hartmann found many species new for Ostracoda fauna of Turkey such as *Candona neglecta, Ilyocypris gibba, Ilyocypris bradyi, Eucypris zenkeri, Heterocypris inaequivalves, Heterocypris incongruens, Herpetocypris chevreuxi,* and *Ilyodromus olivaceus*. After him, Prof. Dinçer Gülen from University of Istanbul studied hot-springs of Turkey between 1965 and 1971 and reported a new species for the literature as *Heterocypris sabirae*. He generally studied in the western parts of Anatolia including Eskişehir, Kütahya, İzmir, Çanakkale, Balıkesir during 1971 and 1975. Thus, eleven species were newly recorded for the ostracod fauna of Turkey as (*Cyclocypris ovum, Physocypria klie, Ilyocypris divisia, Eucypris lutaria, E. hamadanensis, E. clavata, Dolerocypris sinensis, Stenocypris malcolmsoni, Cypridopsis vidua, Cytherissa lacustris* and *Cypretta dubiosa*). Prof. Gülen, also studied the western Anotalia during 1977 to 1985 and reported 9 more species which new for Turkey such as (*Ilyocypris biplicata, Candonopsis kingsleii, Cypris bispinosa, Cypria ophtalmica, Eucypris* *inflata, Cypridopsis* (syn. *Sarscypridopsis*) *aculeata, Cypridopsis pavra, Darwinula stevensoni,* and *Limnocythere relicta*). In 1982, Gülen was able to find two species (*Notodromas persica, Notodromas monacha*) of the new genus for Turkey *Notodromas*, along with another species *Cypris pubera*. In 1985, he focused on bisexual populations of ostracods in Anatolia and found bisexual populations of five species that were reported for the first time in Turkey (*Candona paralella, Ilyodromus olivaceus, Cyridopsis newtoni, Limnocythere inopinata* and *Cyprideis littoralis*). In 1988, Gülen collected samples belonging to 11 ostracod species from Antakya, Mersin, and Adana. In this study, he also attracted more attention to the zoogeographical feature of two species *Eucpris inflata* and *Candonopsis kingsleii*.

In 1988, Altınsaçlı studied in İzmir region and recorded two new species (*Ilyocypris inermis* and *Potamocypris zschokkei*) for ostracod fauna of Turkey. In 1990, he was able to recognize eight ostracods from Balıkesir. In 1993, he collected samples from Lake Sapanca and aquatic habitats from its environments, and found out 25 species, 6 of which were recorded as new for the Ostracoda fauna of Turkey as (*Candona crispata, Candona vavrai, Candona fabaeformis, Candona angulata, Tyrrhenocythere amnicola* and *Loxoconchissa immodulata*). Later, he reported a new species (*Heterocypris rotundata*) for Turkey in his studies at Lake Beyşehir. Altınsaçlı and Griffiths (2001a) studied in Lake Uluabat and then in Lake Kuş (Altınsaçlı and Griffiths 2001b). Following these studies, they recorded *Hungarocypris* and *Leucocythere* genera from Turkey (Altınsaçlı and Griffiths 2001c). Later, Kubanç and Altınsaçlı studied in Ayvalık (1990) and reported 20 species of ostracods. Following that studies, Kaleli (1993) collected 8 species from the coastal areas of the Middle Black Sea Region.

Koç (2000) studied seasonal distribution of freshwater ostracods in Ömerli reservoir (İstanbul) and found 10 species (in which *Cypridopsis parva* was given as different species, but it is synonym of *C. vidua*).

Kılıç et al., (2000) studied in the coasts of Gökçeada Island (Aegean Sea), and Kılıç completed his Ph.D. thesis in the Black Sea coasts of Turkey in the year 2001.

Özuluğ et al., (2000) studied in Lake Eğirdir, and these authors were able to report the first parthenogenetic populations of *Plesiocypridopsis newtoni* from Anatolia .

Aygen and Balık (2002) collected a bisexual population of *Hungarocypris madaraszi* in Küçük Menderes (İzmir). This species was a new record for Turkey. Furthermore, Aygen et al. (2004) studied near Köyceğiz in southwestern Anatolia and found two new species (*Humpcypris subterranea* and *Herpetocypris brevicaudata*) for Turkey.

Recently, Akdemir (2004) reported 8 species (excluding 7 unidentified species) from three crater lakes in Konya region.

Özuluğ (2005) studied in Thrace which was in the European part of Turkey and the author reported a new species (*Ilyocypris salebrosa*) for the freshwater Ostracoda fauna in Turkey. Besides, living specimens of *I. salebrosa* recorded in the current study were the first time in Europe.

Külköylüoğlu et al. (1993) studied in Lake Küçükçekmece from 1989 to 1990 and reported *Cytheretta adriatica* which was a new record for Turkey. Külköylüoğlu et al. (1995) worked in Lake Büyükçekmece where six species were a new report for Turkey (*Potamocypris varigeata, Potamocypris longisetosa, Loxoconcha tamarindus, Callistocythere rostrifera, Semicytherrura sulcata* and *Heterocythereis albomaculata*). Külköylüoğlu (1998) studied in Lake Şamlar during 1990 and 1991 and two new species, *Ilyocypris divisa* and *Eucypris lilljeborgi* were recorded for Marmara region. In this study, he first introduced a graphical model called Ostracoda Watch Model (OWM) for seasonal occurance of species. He collected samples from freshwater habitats in Bolu, in which his study was one of the first applied to Canonical Correspondense Analyses on Ostracoda by adding months as variables. In 2003, Külköylüoğlu firstly recorded *Scottia pseudobrowniana* from a limnocrene spring in Turkey (Külköylüoğlu 2003a). After that in 2003 he found a new species (*Isocypris beauchampi*) from Lake Gölköy (Külköylüoğlu 2003b), stating that these last two genera were the first reports for Turkey. Külköylüoğlu also studied in lakes and reservoirs in Bolu (Külköylüoğlu 2003c), and reported a rare species *Paralimnocythere psammophila* from Lake Aladağ (Külköylüoğlu 2003d). He studied different aquatic habitats in Bolu region in 2004 also in this study the usage of ostracods as bioindicator species was discussed. Külköylüoğlu and Dügel (2004) worked on the ecology and seasonality of Ostracoda in a man-made lake, located at 1231 m a.s.l in Bolu. In this study, ostracods seasonal occurrences were studied over two years of monthly sampling. In 2005, Külköylüoğlu worked on the species richness in Yumrukaya Reedbeds, a small wetland located in the western part of Bolu (Külköylüoğlu 2005a). In the same year he worked on the ecological requirements of Ostracoda species (Külköylüoğlu 2005b). Külköylüoğlu (2005c) recorded a new species (*Limnocythere inopinata*) from a reservoir Lake Gölköy as a new report for the Bolu region.

Most recently, Yılmaz and Külköylüoğlu (2006) studied in Lake Aladağ and reported nine ostracod taxa (*Candona candida, Cypridopsis vidua, Darwinula stevensoni, Eucypris virens, Lymnocytere inopinata, Eucypris* sp., *Heterocypris* sp., *Physocypria kraepelini* and *Tonnacypris lutaria*). Külköylüoğlu et al., (2007) newly published another studies done in a heavily polluted shallow lake Lake Yeniçağa (Bolu) where they reported 13 species of Ostracoda (*Candona neglecta, C. candida, Ilyocypris bradyi, Darwinula stevensoni, Cypridopsis vidua, Physocypria kraepelini, Cypria ophtalmica, Prionocypris zenkeri, Eucypris virens, Herpetocypris reptans, Pseudocandona compressa, Fabaeformiscandona fabaeformis Potamocypris* cf. *fulva*), among which *Potamocypris* cf. *fulva* was a new record for the Turkish freshwater ostracod fauna.

Karakaş-Sarı (2006) listed 10 more species from two rheocrene springs in Bolu region, where *Scottia pseudobrowniana* was reported second time from Turkey.

Dügel et al., (2007, in press) studied in Lake Abant Nature Park where one of the most famous among 16 nature parks in Turkey. They reported a total of 16 taxa of Ostracoda (*Cypridopsis vidua*, *C. neglecta, C. candida, Darwinula stevensoni*, *Cypria ophtalmica, Physocypria kraepelini*, *I. bradyi*, *H. incongruens, Notodromas monacha, Pseudocandona compressa, Eucypris pigra, Hr. chevreuxi, Ps. olivaceus, Ps. fontinalis, Cypris pubera, Leucocythere* sp.). 80% of these species had a cosmopolitan distribution, within the Holarctic region, while two species (*Ps. fontinalis* and *E. pigra*) among them were recorded for the first time for Ostracoda fauna of the region.

There is another ongoing study on freshwater ostracods in a land-slide lake (Lake Sünnet, Bolu) where results show 9 species including 1 new report (*I. getica*) for Turkish ostracod fauna (Külköylüoğlu, pers. comm.).

Hence, it is so far 98 freshwater ostracod species pertained to 41 genera from Turkey, while 36 species belonging to 23 genera were recorded from freshwater habitats of Bolu region. The numbers of species reported from Bolu region have risen to 53 species and 26 genera after this study, when they have changed as 110 species and 42 genera for Turkey.

2. MATERIALS AND METHODS

2. 1. Site Description

During this study, 144 different study sites (Figure 1) were selected randomly from the nine counties of the city Bolu. Acordingly, on the physical map of Bolu, the map was divided into 100 equal squares that each covers 1 cm^2 of area. The distribution of stations per county follows as 47 in Bolu downtown, 20 in Mudurnu, 18 in Göynük, 10 in Seben, 7 in Kıbrıscık, 17 in Gerede, 8 in Dörtdivan, 8 in Yeniçağa, and 9 in Mengen. The selected stations includes different aquatic habitats such as lakes, creeks, ponds, reedbeds, permanent or temporary pools and springs etc. The station which was not possible to arrive there at, we tried to collect samples from the nearest aquatic resource as well.

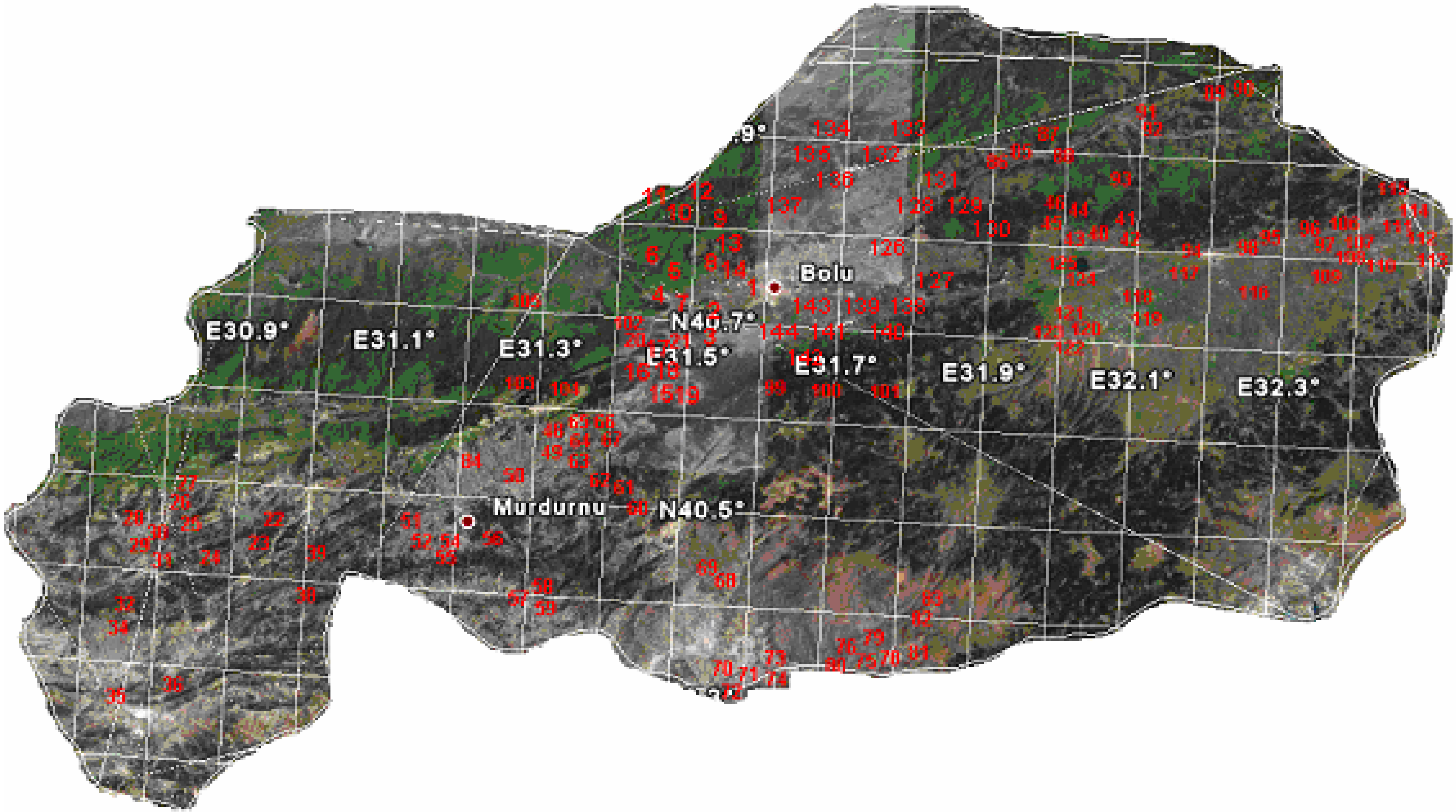

Figure 1. Map shows 144 study sites in Bolu region.

2. 2. Methodology

Materials were collected from June to August 2006. Samples were collected from the different depths of the most acceptable areas of the aquatic habitats about 100 cm of depth. Furthermore, during the sampling time the suggested major environmental variables (e.g., pH, temperature, electrical conductivity, dissolved oxygen, redox potential and percent oxygen saturation) were measured at the study sites. A Hanna model HI-98150 pH/ORP meter was used to measure pH and redox potential (Eh) and a YSI-85 model oxygen-temperature meter was used to measure the remaining variables.

Redox potential (Eh) was calculated for the value of SHE (Standard Hydrogen Electrode) as: $SHE = Eh + 207 + 0.65 * (25 - T\ ^{o}C)$

Electrical conductivity (EC) values were transferred to calculate Total Dissolved Solid (TDS) as: $TDS = EC*0.65$ (Forester and Brouwers 1985).

Geographical data (altitude, latitude, longitude) was evaluated with a global positioning system (GPS 12 XL) unit. The samples taken up to various depths from the muddy parts of the acceptable areas were collected with a standart hand-net (200 µm mesh size) and fixed in 70% ethanol *in situ*. All samples were kept in 250 ml plastic or glass jars available. In the laboratory, samples washed under tap water were filtered through three standard-sized sieves (0.25; 1.00; 1.5 mm in mesh size) and were stored in ethanol as well. Species identification was based on the soft body parts and carapace structures. The species were identified under the Olympus BX-51 model microscope and saved in lactophenol solution for permanent slides. During species identification, the systematic keys of Meisch (2000) for western and central Europe, a key to the genera of the subfamily Candoninae of Karanovic

(2001), Recent Candoninae of North America (Karanovic 2006), and the index and bibliography of non-marine Ostracoda of Kempf (1980, 1997) were used.

2. 3. Statistical Analyses

During the present study, Sorenson Similarity Index was used to compare community structures based on species presence/absence data.

Sorenson Similarity Index = 2c / a + b × 100

c = the number of species common in both site A and B

a = the number of species found in site A

b = the number of species found in site B

Besides, to estimate ecological tolerance (*tk*) and optima (*uk*) values of species occured at least three or more times were calculated for six environmental variables (Ter Braak and Barendregt 1986, Külköylüoğlu and Dügel 2004).

$$\textit{Optima}\ (\mathrm{uk}) = \frac{\sum_{i=1}^{n} yik.xi}{\sum_{i=1}^{n} yik} \qquad \textit{Tolerance}\ (\mathrm{tk}) = \sqrt{\frac{\sum_{i=1}^{n} yik.(xi-uk)^2}{\sum_{i=1}^{n} yik}}$$

Environmental Tolerance Index (ETI) was calculated from species binary (presence/absence) data for 16 species, occurred at least three times during the study, with six variables. ETI aims to calculate relative tolerance range of species for different environmental variables (Curry 1999). ETI values range from zero to one, which indicates the highest tolerance range.

$$ETI = \frac{\text{range of x}_{\text{species}}}{\text{range of x}_{\text{data set}}}$$

Unweighted Pair Group Mean Averages (UPGMA) was used to understand the associations between species and between nine counties of Bolu region. Sorenson's Coefficient test was applied to UPGMA dendogram. The UPGMA analyses were performed with Multi-Variate Statistical Package (MVSP) version 3. 1. (Kovach 1998).

The relationships among species and environmental variables selected, two correlation analyses were used. First, Spearman Correlation analysis was performed with SPSS 10.0 software program to observe associations among 11 species and six environmental variables. Second, Canonical Correspondance Analysis (CCA) included 22 species with five environmental variables. In each of these two analyses, species occurred at least two times were counted while subfossils were excluded from the analyses. CCA was performed with log(e)-transformation to reduce skewness arc-effect (Ter Braak 1986) and to eliminate the effect of multicolinearity among the variables.

3. RESULTS

41 taxa were found in this study. The taxonomy, distribution and ecology of the species are given below.

3. 1. Taxonomy

The species found in this study are belonged to two infraorders (Darwinulocopina, Cypridocopina). Darwinulocopina included one genus (Darwinula) with one species. Cypridocopina had nine genera (Candona, Cypria, Ilyocypris, Eucypris, Prionocypris, Herpetocypris, Psychrodromus, Scottia, Heterocypris) in three families (Cyprididae, Ilyocyprididae, Candonidae). The taxonomy of species found in this study was given below. These species are only from the subclass of Podocopa and order Podocopida.

PHYLUM: ARTHROPODA

SUBPHYLUM: CRUSTACEA Pennant, 1777

CLASS: OSTRACODA Latreille, 1806

SUBCLASS: PODOCOPA Müller, 1894

ORDER: PODOCOPIDA Sars, 1866

Suborder Podocopina Sars, 1866

Infraorder Darwinulocopina Sohn, 1988

Superfamily Darwinuloidea Brady and Norman, 1889

Family Darwinulidae Brady and Norman, 1889

Genus Darwinula Brady and Robertson, 1885

Darwinula stevensoni

Infraorder Cypridocopina Jones, 1901

Superfamily Cypridoidea Baird, 1845

Family Candonidae Kaufmann, 1900

Subfamily Candoninae Kaufmann, 1900

Genus Candona Baird, 1845

Candona candida (O.F.Müller, 1776)

Candona lactea (Baird, 1850)

Candona neglecta (Sars, 1887)

Candona weltneri (Hartwig, 1899)

Candona sanociensis (Sywula, 1971)

Genus Fabaeformiscandona Krstic, 1972

Fabaeformiscandona fabaeformis (Fischer, 1851)

Fabaeformiscandona balatonica (Daday, 1894)

Fabaeformiscandona protzi (Hartwig, 1898)

Fabaeformiscandona breuili (Paris, 1920)

Fabaeformiscandona brevicornis (Klie, 1925)

Fabaeformiscandona latens (Klie, 1940)

Genus Schellencandona Meish, 1996

Schellencandona belgica (Klie, 1937)

Genus Pseudocandona Kaufmann, 1900

Pseudocandona compressa (Koch, 1838)

Pseudocandona albicans (Brady, 1864)

Pseudocandona semicognita (Schäfer, 1934)

Subfamily Cyclocypridinae Kaufmann, 1900

Genus Cypria Zenker, 1854

Cypria ophtalmica (Jurine, 1820)

Subfamily Cyclocypridinae Kaufmann, 1900

Genus Physocypria Vávra, 1897

Physocypria kraepelini (G. W. Müller, 1903)

Subfamily Cyclocypridinae Kaufmann, 1900

Genus Cyclocypris Brady and Norman, 1889

Cyclocypris laevis (O. F. Müller, 1776)

Family Ilyocyprididae Kaufmann, 1900

Subfamily Ilyocypridinae Kaufmann, 1900

Genus Ilyocypris Brady and Norman, 1889

Ilyocypris gibba (Ramdohr, 1808)

Ilyocypris bradyi (Sars, 1890)

Ilyocypris inermis (Kaufmann, 1900)

Ilyocypris getica (Masi, 1906)

Family Cyprididae Baird, 1845

Subfamily Eucypridinae Bronshtein, 1947

Genus Eucypris Vávra, 1891

Eucypris virens (Jurine, 1820)

Genus Trajancypris Martens, 1989

Trajancypris serrata (G. W. Müller, 1900)

Genus Prionocypris Brady and Norman, 1896

Prionocypris zenkeri (Chyzer and Toth, 1858)

Subfamily Herpetocypridinae Kaufmann, 1900

Genus Herpetocypris Brady and Norman, 1889

Herpetocypris reptans (Baird, 1835)

Herpetocypris chevreuxi (Sars, 1896)

Herpetocypris brevicaudata (Kaufmann, 1900)

Genus Psychrodromus Danielopol and Mc Kenzie, 1977

Psychrodromus olivaceus (Brady and Norman, 1889)

Psychrodromus fontinalis (Wolf, 1920)

Subfamily Cyprinotinae Bronshtein, 1947

Genus Heterocypris Claus, 1892

Heterocypris incongruens (Ramdohr, 1808)

Heterocypris salina (Brady, 1868)

Heterocypris rotundata (Bronshtein, 1928)

Subfamily Scottinae Bronshtein, 1947

Genus Scottia Brady and Norman, 1889

Scottia pseudobrowniana (Kempf, 1971)

Subfamily Cypridopsinae Kaufmann, 1900

Genus Cypridopsis Brady, 1867

Cypridopsis vidua (O. F. Müller, 1776)

Subfamily Cypridopsinae Kaufmann, 1900

Genus Potamocypris Brady, 1870

Potamocypris villosa (Jurine, 1820)

Potamocypris fulva (Brady, 1868)

Potamocypris smaragdina (Vávra, 1891)

Potamocypris similis (Müller, 1912)

Subfamily Cypridopsinae Kaufmann, 1900

Genus Cavernocypris Hartmann, 1964

Cavernocypris sp.

3. 2. Ecology and Distribution

The ecology and distribution of each species reported herein are given below while the number of the species are tabulated in Appendix 1.

Darwinula* aff. *stevensoni (Brady and Robertson, 1885)

General Distribution: A cosmopolitan species known with its widespread distribution (Meisch 2000).

Material Station Numbers: 142 (2 subfossil forms)

Old records from Turkey: Bolu, Afyon (Gülen, 1985a), Bolu (Külköylüoğlu, 2003c; Külköylüoğlu 2005c; Karakaş-Sarı 2006; Yılmaz and Külköylüoğlu 2006), Bursa (Altınsaçlı 1993; Altınsaçlı and Griffiths 2001a), İstanbul (Altınsaçlı and Yılmam 1995), Diyarbakır (Gülen et al., 1996), Kocaeli, Sakarya (Altınsaçlı 1997), Konya, Isparta (Altınsaçlı et al., 2000a; Özuluğ et al., 2000).

Ecology: *Darwinula stevensoni* has a wide range of tolerance to environmental variables (Ramdani et al, 2001). This detritivorous species is found in the littoral, shallow limnic zone of many permanent lentic habitats (Rossi et al., 2004). It is found in almost all water bodies (Baltanás 1992) with a cosmopolitan distribution

(Gandolfi et al., 2001). It prefers low temperatures and high oxygen level (Külköylüoğlu and Vinyard 2000) but also tolerates high levels of pH (Yılmaz and Külköylüoğlu 2006). Due to lack of swimming setae, it is a bottom dwelling ostracod (Külköylüoğlu 2005b).

Candona candida (O.F.Müller, 1776)

General Distribution: Euroasia and North America (Meish 2000, Karanovic 2006). It is widely distributed in Europe and Britain (Henderson 1990).

Material Station Numbers: 12, 15, 16, 17, 18, 19, 24, 49, 112, 113, 119, 142 (9 females mounted)

Old records from Turkey: Spring waters in Çanakkale (Altınsaçlı and Griffiths 2002), Bolu (Külköylüoğlu 2004; Külköylüoğlu and Dügel 2004; Yılmaz and Külköylüoğlu 2006; Külköylüoğlu and Yılmaz 2006; Külköylüoğlu et al., 2007; Dügel et al., 2007, in press).

Ecology: Reported from littoral and profundal zones of lakes, ponds, ditches, swamps, peaty waters with acid conditions, brooks, rivers, springs, wells and different types of subterranean habitats (Meisch 2000). It prefers permanents waters and not recorded from brackish sites (Henderson 1990).

Candona lactea (Baird, 1850)

General Distribution: According to Henderson (1990) this species is widely distributed and common in Britain. However, it can be confused with the juveniles of other species so its distribution is not known accurately.

Material Station Numbers: 20,125 (2 females mounted)

Old records from Turkey: -

It is a new record for the Turkish freshwater Ostracoda fauna.

Ecology: It was recorded from permanent and temporary habitats which dried in summer (Henderson 1990).

Candona neglecta (Sars, 1887)

General Distribution: Europe (Roca and Baltanás 1993), North Africa (Klie 1938), Central Asia, Russia (Bronshtein 1947), Algeria (Sars 1928) and America (Külköylüoğlu 1999). It has a wide distribution in Europe but also shows almost cosmopolitan distribution throuhout the South hemisphere (Roca and Baltanás1993).

Material Station Numbers: 6, 7, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 27, 30, 45, 51, 57, 58, 61, 84, 94, 102, 125, 132, 137, 142 (19 females and 1 male mounted)

Old records from Turkey: Gaziantep (Hartmann 1964), Kütahya (Gülen 1977, 1984; Gülen and Altınsaçlı 1999), Aydın (Gülen 1984, 1985a), Bilecik, Zonguldak, Bolu (Gülen 1985a, b; Külköylüoğlu 2003a, 2005a, 2005c; Külköylüoğlu and Dügel 2004; Külköylüoğlu and Yılmaz 2006; Karakaş-Sarı 2006; Külköylüoğlu et al., 2007; Dügel et al., 2007, in press), Adana (Gülen 1988), İzmir (Gülen 1985a, b; Altınsaçlı, 1999; Aygen and Balık 1998), Bursa (Altınsaçlı and Griffiths 2001a), Sinop, Samsun (Kaleli, 1993), İstanbul (Altınsaçlı and Yılmam 1995), Diyarbakır (Gülen et al., 1996), Kocaeli, Sakarya (Altınsaçlı, 1997), Bilecik, Bolu, Kütahya (Gülen and Altınsaçlı 1999), Isparta (Özuluğ et al., 2000; Altınsaçlı and Griffiths 2001a), Afyon and Konya (Altınsaçlı et al., 2000a, b), Kırklareli (Altınsaçlı and Griffiths 2001b)

Ecology: Earlier reports pinpointed that *Candona neglecta* is a stenothermic cold-loving species but it can only tolerate temperatures above 20°C (Bronshtein 1947). It is however widespread in eutrophic springs that have a high organic matter (Roca and Baltanás 1993). It can be found in lakes, ponds, springs, ditches, streams and rarely underground waters (Meisch 2000). Species can tolerate lower oxygen concentrations and high tolerance of conductivity changes (Külköylüoğlu 2005b). Moreover, it was frequent in flowing waters (Mezquita et al., 1999b). It has wide range of dissolved oxygen (3.2-15.4 mg/L), pH values (6.8-9.4), conductivity (56-890 μScm^{-1}) (Roca and Baltanás1993).

Candona weltneri (Hartwig, 1899)

General Distribution: It is known in Britain, Germany, the Netherlands (Meisch 2000) Belgium (Martens and Dumont 1984), Hungary (Meisch and Forró 1998) and the Czech Republic (Meisch 2000).

Material Station Numbers: 6 (1 female mounted)

Old records from Turkey: -

It is a new record for the Turkish freshwater ostracoda fauna.

Ecology: It was reported from the lakes, ponds and both permanent and temporary small water bodies, mainly the ditches. It mainly reported from the littoral zone of the lakes, it also occurs in the profundal (Meisch 2000).

Candona sanociensis (Sywula, 1971)

General Distribution: So far only known from Hungary and the Czech Republic, also recorded from southern Poland and Romania (Meisch 2000).

Material Station Numbers: 12, 60 (1 female and 1 male mounted)

Old records from Turkey: -

It is a new record for the Turkish freshwater ostracoda fauna.

Ecology: Reported from the waters that connected to springs and small ponds (Meisch 2000). Its synonymous *Candona dancaui* collected from springs, streams, wells and groundwater (Danielopol 1978).

Fabaeformiscandona fabaeformis (Fischer, 1851)

<u>General Distribution:</u> A common species. Known from Europe, Asia and North America (Meisch 2000, Karanovic 2006).

<u>Material Station Numbers:</u> 16, 137 (2 females mounted)

<u>Old records from Turkey:</u> Kocaeli, Sakarya (Altınsaçlı 1997), Kırklareli (Altınsaçlı 2001b), Bolu (Külköylüoğlu 2003c; Külköylüoğlu et al., 2007).

<u>Ecology:</u> It usually prefers muddy temporary small water bodies. It is reported from the deeper part of the littoral zone (Meisch 2000) but also from a 3 m shallow lake in Germany (Kempf and Scharf 1981) (see discussion). The species was recorded to tolerate in slightly increasing salt waters (Vesper 1975). Ecological charactrestics include Mesohalophilic, euryplastic for pH (Meisch 2000).

Fabaeformiscandona balatonica (Daday, 1894)

<u>General Distribution:</u> It is recorded from Germany, the Netherlands Czech Republic, Sweden, Poland, Romania, Italy, Russia, Central Asia and North America (Meisch 2000). It is possibly Holarctic (Meisch 2000).

<u>Material Station Numbers:</u> 8, 113 (2 males mounted)

<u>Old records from Turkey:</u> -

It is a new record for the Turkish freshwater Ostracoda fauna.

<u>Ecology:</u> It is found from the temporary pools and the shallow zone of lakes. Also, reported from canals, the deep areas of the littoral zone of lakes and streams (Meisch 2000). It is probably mesothermophilic (Absolon 1970).

Fabaeformiscandona protzi (Hartwig, 1898)

<u>General Distribution:</u> Except northern France, it is a common species in Europe (Sweden, Poland, Ukraine, Italy and Russia Known) (Meisch 2000) but also known from Canada (Delorme 1991).

Material Station Numbers: 112 (1 male mounted)

Old records from Turkey: -

It is a new record for the Turkish freshwater Ostracoda fauna.

Ecology: It was found from the deep of the lakes such as reported from depths of 17-23 m in Lake Arendsee (Meisch 2000). It prefers the permanent small water bodies, ponds, and muddy ditches but recorded from rivers and slightly brackish area of the Baltic Sea (Meisch 2000). Ecological characterization includes cold stenothermal, euryplastic for pH (Hiller 1972). The maximum salt content which reported in the literature was 5.8%.

Fabaeformiscandona* cf. *breuili (Paris, 1920)

General Distribution: It is a common species in Europe (Meisch 2000).

Material Station Numbers: 112 (1 female mounted)

Old records from Turkey: -

It is a new record for the Turkish freshwater Ostracoda fauna.

Ecology: Ecological data is poorly known but so far reported from the caves, springs and groundwaters (Meisch 2000).

Fabaeformiscandona brevicornis (Klie, 1925)

General Distribution: It is known from Germany, the Czech Republic, Slovakia (Absolon 1973), Hungary (Meisch 2000), Poland (Sywula1971).

Material Station Numbers: 135 (1 female mounted)

Old records from Turkey: -

It is a new record for the Turkish freshwater ostracoda fauna.

Ecology: It is reported from the stagnant and slow flowing waters connected to springs (Meisch 2000). It is also reported from the hyporheic habitat of a stream (Nüchterlein 1969).

Fabaeformiscandona latens (Klie, 1940)

General Distribution: It is recorded in Germany, Austria and so far only known in Poland (Meisch 2000).

Material Station Numbers: 25 (1 male mounted)

Old records from Turkey: -

It is a new record for the Turkish freshwater Ostracoda fauna.

Ecology: Reported from the interstitial and hyporheic habitats of streams and springs. It is probably a stygobitic species which, because of its widely ecological tolerance (Meisch 2000).

Schellencandona* cf. *belgica (Klie, 1937)

It is a new genus for Ostracoda fauna of Turkey.

General Distribution: It is recorded in Belgium, France and Germany (Meisch 2000).

Material Station Numbers: 43 (1 male mounted)

Old records from Turkey: -

It is a new record for the Turkish freshwater Ostracoda fauna.

Ecology: It prefers wells and interstitial habitats (Meisch 2000).

Pseudocandona compressa (Koch, 1838)

General Distribution: Europe, Iran, Turkey, Siberia (Meisch 2000) and Italy (Rossetti et al. 2004), Canada (Delorme 1991), North America (Karanovic 2006).

Material Station Numbers: 9 (1 female mounted)

Old records from Turkey: Sinop (Ghetti 1973), İstanbul (Altınsaçlı and Yılmam, 1995), Konya, Isparta (Altınsaçlı et al. 2000a), Kırklareli (Altınsaçlı 2001b), Afyon, Konya (Altınsaçlı et al., 2000b), Bolu (Külköylüoğlu et al., 2007; Dügel et al., 2007, in press).

Ecology: It is recorded slightly brackish waters at Lake Beyşehir and freshwater wetlands (Altınsaçlı and Griffiths 2002). It is recorded from pools, ditches and salty waters (Meisch 2000). It has a mesohaline range: 8.4%. Reported a significant correlation between the species and water temperature (Külköylüoğlu et al., 2007).

Pseudocandona albicans (Brady, 1864)

General Distribution: Northern Italy (Rossetti et al., 2005), Canary Islands, Europe, western Asia and North America (Meisch 2000).

Material Station Numbers: 80 (1 female mounted)

Old records from Turkey: İzmir (Gülen 1985a), Bolu (Külköylüoğlu, pers. comm.). This is the second record from Bolu Region.

Ecology: It lives in permanent, muddy and slowflowing waters, while it prefers very low salt content (Meisch 2000). It is a crawling species that shows stygophilic behaviors (Roca and Danielopol 1991).

Pseudocandona* cf. *semicognita (Schäfer, 1934)

General Distribution: Bavaria (Scharf 1982), Saxonia (Meisch 2000), Poland (Sywula 1977).

Material Station Numbers: 101 (1 female mounted)

Old records from Turkey: It is a new record for the Turkish freshwater Ostracoda fauna.

Ecology: It reported from a few shallow pools. It likes acidic conditions (Meisch 2000).

Cypria ophtalmica (Jurine, 1820)

General Distribution: It has worldwide distribution except Australia (Meisch 2000). It is almost cosmopolitan.

Material Station Numbers: 26, 94, 117, 142 (2 females mounted)

Old records from Turkey: İstanbul (Gülen 1985a; Altınsaçlı and Yılmam 1995; Külköylüoğlu 1998), Bursa (Altınsaçlı 1999), Trabzon (Gülen et al., 1994a), Kütahya, Eskişehir (Gülen and Altınsaçlı 1999), Diyarbakır (Gülen et al., 1996), Kocaeli, Sakarya (Altınsaçlı 1997), İzmir (Aygen and Balık 1998; Ustaoğlu et al., 2003), Konya, Isparta (Altınsaçlı 2001), Bolu (Külköylüoğlu 2003c; 2004; Külköylüoğlu et al., 2007; Karakaş-Sarı 2006;; Dügel et al., in press).

Ecology: It tolerates pH values from very low to very high (Delorme 1991). It has a wide range of temperature and hidrochemically tolarence (Curry 1999). The temperature range of species is between 2.2°C and 8.4°C (Meisch 2000). It has a high ability to swim due to its long notatory setae. Therefore, it has an advantage to colonize easily by means of active movement (Scharf 1998). The species is reported from the salty habitats, which is called oligohaline range (Meisch 2000). It was found in the areas with high ionic content and rich in chloride (Rossetti et al., 2005).

Physocypria kraepelini (G. W. Müller, 1903)

General Distribution: Europe and Asia (Meisch 2000). Reported from European shallow waters and reservoirs (Kiss 2002). Holarctic (Külköylüoğlu et al., 2007).

Material Station Numbers: 100, 124, 125, 135 (2 females mounted)

Old records from Turkey: Gaziantep (Hartmann 1964), Sakarya (Gülen 1977; Altınsaçlı 1999), Balıkesir, Muğla, Bolu, Zonguldak (Gülen 1988a), Bursa (Gülen 1988a; Altısaçlı 1993; Altınsaçlı and Griffiths 2001a, b), İstanbul (Altınsaçlı and Yılmam 1990; Külköylüoğlu et al., 1995; Külköylüoğlu 1998; Koç 2000), Kocaeli, Sakarya (Altınsaçlı 1997), Konya, Isparta (Altınsaçlı et al., 2000a), Bolu (Külköylüoğlu 2004; Yılmaz and Külköylüoğlu 2006; Külköylüoğlu et al., 2007; Dügel et al., in press).

Ecology: It occurs in less alcaline waters that means high temperature and conductivity. It shows a positive correlation with dissolved oxygen and it prefers water with high temperature (Yılmaz and Külköylüoğlu 2006). It has a oligohaline range (Meisch 2000). It was reported from the aquatic habitats that contained ionic content with higher trophic conditions (Rossetti et al., 2004).

Cyclocypris laevis (O. F. Müller, 1776)

General Distribution: Europe, Central Asia, Siberia and North America (Meisch 2000), Northern Italy (Rossetti et al., 2005).

Material Station Numbers: 124, 125 (1 female and 1 male mounted)

Old records from Turkey: Van (Gülen et al. 1994a). It is the second record for Ostracoda fauna of Turkey and a new species for Bolu region.

Ecology: It has a wide tolerance to environmental conditions (Meish 2000). It was the one of most common specieses in lowland springs (Rossetti et al., 2005).

Ilyocypris gibba (Ramdohr, 1808)

General Distribution: Europe, Africa, the Middle East, China, central Asia and America (Meisch 2000).

Material Station Numbers: 9, 12, 16, 29, 43, 94, 99, 124, 132, 135 (6 females and 1 male mounted)

Old records from Turkey: İzmir (Gülen 1977; Altınsaçlı 1988; Aygen and Balık 1998), Kütahya (Gülen 1977; Gülen 1984; Gülen 1985b), Balıkesir (Gülen 1985a; Altınsaçlı and Kubanç 1990), Nevşehir (Gülen 1985b), Adana (Gülen 1988), Çankırı (Gülen et al., 1994b), Trabzon (Gülen et al., 1994a), İstanbul (Altınsaçlı and Yılmam 1990; Külköylüoğlu et al., 1995), Eskişehir, Ankara (Gülen and Altınsaçlı 1999), Isparta (Altınsaçlı 2001a; Altınsaçlı et al., 2000a; Özuluğ et al. 2001), Afyon

(Altınsaçlı et al., 2000b), Konya (Altınsaçlı et al., 2000a, b), Bursa (Altınsaçlı and Griffiths 2001a, b), Bolu (Külköylüoğlu 2004).

Ecology: It is found from warm waters and it is possible that called as a eurythermophilic species (Külköylüoğlu 2004). It can live in low (Roca and Baltanás 1993), and high (Gülen 1977) water temperature. It is also reported from temporary spring and salty waters (Meisch 2000). It shows cosmopolitan characteristics (Külköylüoğlu 2004).

Ilyocypris bradyi Sars, 1890

General Distribution: The species is well known from holarctic region (Külköylüoğlu 2005a) but also shows almost cosmopolitan characteristics.

Material Station Numbers: 5, 6, 7, 8, 12, 13, 16, 17, 18, 22, 24, 25, 26, 28, 29, 31, 32, 33, 34, 35, 40, 42, 45, 49, 50, 51, 53, 56, 58, 59, 60, 61, 62, 64, 66, 67, 68, 69, 73, 79, 80, 81, 83, 85, 86, 87, 89, 90, 92, 94, 96, 97, 99, 100, 103, 105, 106, 109, 112, 114, 115, 126, 130, 131, 136, 137, 140, 141, 142 (33 females mounted)

Old records from Turkey: Antakya, Malatya (Hartmann 1964), Eskişehir (Gülen 1977), Bilecik (Gülen 1985a), İstanbul (Külköylüoğlu et al.,1993; Gülen et al., 1994a Külköylüoğlu et al., 1995), Adapazarı (Altınsaçlı 1997), Bursa (Altınsaçlı 1999), Diyarbakır (Gülen et al., 1996), Bilecik, Balıkesir, Bergama, Amasya, Sivas, Antalya, Trabzon, Van, Kars, Nevşehir and Ankara (Gülen et al., 1994a), Bolu (Külköylüoğlu 2003a, 2004; Külköylüoğlu and Dügel 2004; Külköylüoğlu 2005a, b, c; Karakaş-Sarı 2006; Külköylüoğlu et al., 2007; Dügel et al., in press; Külköylüoğlu, pers. comm.).

Ecology: It has a widespread distribution in almost all kinds of freshwaters. This species can be used to understand water quality in Spain (Mezquita et al., 1999a). The species shows a positive correlation to redox potential and a strong negative correlation to pH values (Külköylüoğlu 2005c). It was found in running waters (Cole 1966). The species prefers cooler waters (14-25°C) and dissolved oxygen level differs 4 to 6.3 mg/L (Külköylüoğlu and Vinyard 2000).

Ilyocypris inermis (Kaufmann, 1900)

General Distribution: Northern Italy (Rosett et al., 2005), Britain, France, Germany, Switzerland, Hungary, Austria, Czech Republic, Belgium, Spain, Luxembourg, Slovakia (Meisch 2000).

Material Station Numbers: 15, 23, 30, 44, 85 (4 females and 1 male mounted)

Old records from Turkey: İstanbul (Külköylüoğlu et al., 1993), Bursa (Altınsaçlı 1993), Tokat (Gülen et al., 1994b), Elazığ, Van (Gülen et al., 1994a), İzmir (Altınsaçlı 1988), Sinop (Kılıç 2001), Kastamonu (Kılıç 1997, 2001), Bolu (Külköylüoğlu and Yılmaz 2006).

Ecology: It is recorded from limnocrene spring and there is a possitive relationship to redox potential and temperature (Külköylüoğlu and Yılmaz 2006). It is posibble to find it in waters with lower oxygen. It is reported from cold waters with low salinity (Meisch 2000).

Ilyocypris getica (Masi, 1906)

General Distribution: Europe, North Africa and China (Palaearctic) (Meisch 2000).

Material Station Numbers: 17 (1 female mounted)

Old records from Turkey: Bolu (Külköylüoğlu, pers. comm.). It is recorded the second time from Turkey.

Ecology: Reported from the ponds and ditches (Meisch 2000). It is not clear that it prefers the temporary habitats such as pools. It has a tollerance to the slightly increase in salinity (Meisch 2000).

Eucypris virens (Jurine, 1820)

General Distribution: Europe, Geenland, Azores, North Africa, Middle East, Central Asia, China and North America (Holarctic) (Meisch 2000).

Material Station Numbers: 90 (1 female mounted)

Old records from Turkey: İzmir (Tareen 1974; Gülen 1975; Gülen 1977; Aygen and Balık 1998), Kütahya (Gülen 1977; Gülen and Altınsaçlı 1999), Kütahya (Gülen 1984, 1985a), Muğla, Manisa, Afyon, Antalya, Zonguldak (Gülen 1985a), Mersin, Antakya, Adana (Gülen 1988), Samsun (Kaleli, 1993), İstanbul (Gülen 1985a; Külköylüoğlu et al., 1993; Külköylüoğlu et al., 1995; Çakıl 1996; Külköylüoğlu 1998; Koç 2000), Diyarbakır (Gülen et al., 1996), Kocaeli, Sakarya (Altınsaçlı 1997), Eskişehir, Bilecik, Ankara (Gülen and Altınsaçlı 1992), Konya (Altınsaçlı et al., 2000a), Isparta (Altınsaçlı 2001; Altınsaçlı et al., 2000a), Kırklareli (Altınsaçlı 2001b), Bursa (Gülen 1985b; Altınsaçlı 1993, 1999; Altınsaçlı and Griffiths 2001a, b), Bolu (Yılmaz and Külköylüoğlu 2006; Külköylüoğlu et al., 2007).

Ecology: It is reported in slow-running waters and temporary ponds with low temperature and high alkalinity (Külköylüoğlu 2004). It prefers the open field ponds and ditches that dry up in the summer (Meisch 2000).

Trajancypris serrata (G. W. Müller, 1900)

General Distribution: Europe (Meisch 2000).

Material Station Numbers: 84 (1 female mounted)

Old records from Turkey: Van (Gülen et al., 1994a). It is here recorded the second time in Turkey.

Ecology: Reported from an altitude of 2350 m in the Caucasus (Bronshtein 1947). The datas about it showed that was a summer forms. Reported from the habitats type that dry up anytimes such as pools and ditches (Meisch 2000).

Prionocypris zenkeri (Chyzer and Toth, 1858)

General Distribution: England, France, Hungary, Sweden, Yugoslavia (Klie 1938), Germany (Scharf 1976). Generally distributed Europa and Asia minor (Turkey) (Meisch 2000).

Material Station Numbers: 1, 22, 23, 26, 27, 44, 49, 50, 51, 104, 127, 130, 142 (7 females mounted)

Old records from Turkey: Southwest Anatolia (Hartmann 1964), Eskişehir (Gülen 1977), Afyon, Eğirdir-Isparta, Tokat (Gülen et al., 1994a), Lake Eftali-Bolu (Gülen 1985a), Bolu (Külköylüoğlu 2004; Karakaş-Sarı 2006; Külköylüoğlu et al., 2007; Külköylüoğlu, pers. comm.), İstanbul (Külköylüoğlu et al., 1995; Külköylüoğlu 1998), Diyarbakır (Gülen et al., 1996), Bursa (Altınsaçlı 1999), Isparta (Özuluğ et al., 2000).

Ecology: It prefers springs or habitats connected to springs (Rossetti et al., 2005). The species was found in some of the undisturbed habitats of Bolu, Turkey (Külköylüoğlu 2004). Also prefers slow flowing streams with reach aquatic vegetation (Meisch 2000). It occured very localized form in the study of Rossetti et al. (2005) since environmental variables could not affect the occurence of species.

Herpetocypris reptans (Baird, 1835)

General Distribution: West and Central Europe (Mozo et al., 1996). Cosmopolitan, except Antarctica (Meisch 2000).

Material Station Numbers: 14 (2 females mounted)

Old records from Turkey: Diyarbakır (Gülen et al., 1996), Bolu (Külköylüoğlu et al., 2007). This is the second record from Bolu Region.

Ecology: It is generally found from the littoral zone of the lakes (Scharf 1981). Reported from the permanent water bodies with rich vegetation and muddy such as ponds, slow streams and rivers. It also occurs in small lakes and slowly flowing waters (Mozo et al., 1996). It is usually a selective consumer that chooses the macrophyte (*Eleocharis* sp.) and macroalgae (*Chara* sp.) before any other foods (Meisch 2000).

Herpetocypris chevreuxi (Sars, 1896)

General Distribution: Germany, Netherlands (Klie 1938), America-Nevada (Külköylüoğlu and Vinyard 2000). There are only a few records. It is widely distributed in the circum-Mediterranean (Meisch 2000). It is reported from most of europe aand sometimes by the name of *H.helenae* (Mozo et al., 1996).

Material Station Numbers: 8, 76, 77, 108, 142 (5 females mounted)

Old records from Turkey: Antakya (Hartmann 1964), İzmir (Gülen 1977), Bolu (Gülen1985a; Külköylüoğlu 2004; Karakaş-Sarı 2006; Dügel et al., in press), Bilecik, Kütahya, Muğla, Bursa (Gülen 1985a), İstanbul (Külköylüoğlu et al., 1993), Amasya (Gülen et al., 1994b), Erzurum, Kahramanmaraş (Gülen et al., 1994a), Diyarbakır (Gülen 1985a), Kocaeli, Sakarya (Altınsaçlı 1997).

Ecology: While it prefers stagnant waters also occurs in saline aquatic habitats (Baltanás 1992). It also recorded in coastal ponds near estuaries (Mozo et al., 1996). It was reported in different habitats in Turkey. It is a holoarctic species which prepers less alkaline (pH 8.0 or more), cooler (15-24°C), high oxygeneted (6.3-8 mg/L) waters (Külköylüoğlu and Vinyard 2000). The species prefers saline springs altitudes below than 1400 m. and it was found pH 7.8, dissolved oxygen 9.0 ppm, conductivity 798 $\mu S\ cm^{-1}$ and temperature 16°C in a spring (Roca and Baltanás 1993).

Herpetocypris brevicaudata (Kaufmann, 1900)

General Distribution: Northern Italy (Rosett et al., 2005), Britain (Henderson 1990), France, Germany, Belgium, Luxembourg, Spain and Czech Republic (Meisch 2000). Parthenogenetic populations are known in Europe; bisexual populations are reported from Algeria and Portugal (Mozo et al., 1996).

Material Station Numbers: 31, 90 (2 females mounted)

Old records from Turkey: Muğla-Köyceğiz (Aygen et al., 2004). This is the second report for non-marine ostracod fauna of Turkey.

Ecology: Reported from the springs and the waters closed to the springs at last. In lakes it prefers the littoral zone. Also reported from the slowly flowing streams and ditch waters (Meisch 2000). It usually occurs in permanent waters but some of the North African localities could be temporary (Mozo et al., 1996). It is a widespread thermophilic species (Forester 1991; Roca and Wansard 1997). *Hr. brevicaudata* is the only species which has syngamic populations. These populations thus far only reported from the western part of the Mediterranean (Mozo et al., 1996).

Psychrodromus olivaceus (Brady and Norman, 1889)

General Distribution: It was reported from Caucasus (Bronshtein 1947), Germany (Klie 1938), Yugoslavia (Baltanás 1992), Rumania (Danielopol and McKenzie 1977), Bulgaria (Sywula 1967) and France (Meisch 1987). It is common everywhere in suitable habitats (Meisch 2000).

Material Station Numbers: 1, 2, 3, 8, 17, 31, 33, 44, 51, 55, 57, 58, 59, 60, 61, 81, 85, 86, 87, 90, 93, 97, 101, 103, 104, 106, 107, 112, 113, 114, 115, 126, 127, 128, 129, 130, 132, 136, 140, 141 (29 females and 2 males mounted)

Old records from Turkey: Kütahya (Gülen 1977), Bursa (Gülen 1985a; Altınsaçlı 1993, 1999), Afyon (Gülen 1985a), İzmir (Altınsaçlı 1988; Aygen and Balık 1998), İstanbul (Külköylüoğlu et al., 1993), Konya (Gülen at al., 1994b; Altınsaçlı et al., 2000a, b), Malatya, Van (Gülen et al., 1994a), Kocaeli (Hartmann 1964; Altınsaçlı 1997), Isparta (Altınsaçlı et al., 2000a; Özuluğ et al., 2000; Altınsaçlı 2001), Kırklareli (Altınsaçlı 2001), Bolu (Hartmann 1964; Külköylüoğlu 2004; Külköylüoğlu and Yılmaz 2006; Karakaş-Sarı 2006; Dügel et al., 2007, in press).

Ecology: The species exists commonly spring or habitats connected springs (Keyser and Nagorskaya 1998). It prefers cold waters (Mezquita et al., 1999b). Partenogenetic populations exist but males were recorded from Turkey (Gülen 1985b; Külköylüoğlu and Yılmaz 2006). It was found at about 600-1380 m. of elevation, temperature 6.5-16.4°C, dissolved oxygen 8.0-9.9 mg/L, pH 6.9-7.4, conductivity 108-636 µS cm^{-1} ranges in a spring (Roca and Baltanás 1993).

Psychrodromus fontinalis (Wolf, 1920)

General Distribution: Bavarian Alps (Gerecke et al., 1998), Austria (Baltanás et al., 1993), Slovakia (Petkovski 1966), Switzerland (Meisch, 2000).

Material Station Numbers: 23, 25, 33, 42, 61, 88, 90, 104, 109, 110, 115, 124, 129, 135, 137 (11 females and 1 male mounted)

Old records from Turkey: Bolu (Dügel et al., in press)

It is the second record for the Turkish freshwater ostracoda fauna.

Ecology: Reported in springs and subterranean waters such as interstitial groundwater and cave waters. It prefers permanently cold waters (Meisch 2000). *Ps. fontinalis* and *Ps. betharrami* are two species which have closely related taxa and they resembled each other very strongly. They have similar features such as unpigmented carapaces, elongated in shape and furcal pattern (Baltanás, 1993). Parthenogenetic populations of *Ps. fontinalis* mainly occur in cold springs and brooks at high altitude (Petkovski and Meisch, 1995). Both *Ps. fontinalis* and *Ps.*

betharrami colonize the epigean and hypogean habitats of cold mountain springs and brooks (Petkovski and Meisch, 1995).

Heterocypris incongruens (Ramdohr, 1808)

General Distribution: This species shows cosmopolitan characteristics . It has a widespread distribution (Meisch 2000).

Material Station Numbers: 13, 17, 19, 21, 28, 29, 32, 34, 35, 40, 43, 46, 47, 49, 50, 53, 54, 56, 58, 64, 65, 67, 68, 69, 70, 72, 73, 74, 78, 82, 85, 87, 89, 91, 92, 96, 98, 100, 104, 106, 111, 114, 115, 117, 118, 126, 131, 133, 134, 136, 137, 138, 139, 141 (29 females mounted)

Old records from Turkey: Antalya, İskenderun (Hartmann 1964), Eskişehir, İzmir (Gülen 1977), Aydın, Bolu, Denizli, Isparta, Kastamonu, Zonguldak (Gülen 1985a), İzmir (Altınsaçlı 1988), İstanbul (Külköylüoğlu et al., 1993; Külköylüoğlu et al., 1995; Külköylüoğlu 1998), Bursa (Altınsaçlı 1999; Altınsaçlı and Griffits 2001a), Trabzon, Kars, Van (Gülen et al., 1994a), Kocaeli, Sakarya (Altınsaçlı 1997), Kırklareli (Altınsaçlı 2001), Çorum (Gülen et al.,1994a), Diyarbakır (Gülen et al., 1996), Bolu (Külköylüoğlu 2004, 2005a, b; Karakaş-Sarı 2006; Dügel et al., in press).

Ecology: It has been reported in nearly all kind of water bodies, ponds, ditches, limnic or lotic, temporary or permanent habitats (Külköylüoğlu and Vinyard 2000). The species was also recorded from polluted waters (Mezquita et al., 1999a, b.). The range of different environmental variables has been shown that is relatively wide comparing to other conspecific taxa (Külköylüoğlu 2004). It can withstand the high salinity (Külköylüoğlu 1999). The species was exist slightly eutrophic springs with a high organic matter content (Roca and Baltanás 1993). It prefers the little interspecific competition habitats (Keyser and Nagorskaya 1998). The species may indicate the torphic conditions of the environment (Mezquita et al., 1999b). The species has wide tolerance levels of pH, water, dissolved oxygen, and electrical conductivity (Külköylüoğlu 2005a).

Heterocypris salina (Brady, 1868)

General Distribution: Recorded in almost all the countries. Holarctic (Meisch 2000).

Material Station Numbers: 86, 108 (2 females mounted)

Old records from Turkey: Mersin (Hartmann 1964), Kütahya (Gülen 1977; Gülen 1984), Aydın (Gülen 1984; Gülen 1985a), Eskişehir, Bilecik, Antalya, Zonguldak (Gülen 1985a), İzmir (Altınsaçlı 1988), Antakya (Hartmann 1964; Gülen 1988), Balıkesir (Altınsaçlı and Kubanç 1990), İstanbul (Külköylüoğlu et al., 1993; Külköylüoğlu et al., 1995; Çakıl 1996; Kılıç 2001), Samsun (Kaleli 1993), Bursa (Altınsaçlı 1993; Gülen 1985a), Denizli, Uşak (Gülen et al., 1994a), Çankırı (Gülen et al., 1994b), Diyarbakır (Gülen et al., 1996), Kocaeli, Sakarya (Altınsaçlı 1997), Isparta (Altınsaçlı et al., 2000a; Altınsaçlı 2001a; Özuluğ et al., 2001), Konya (Altınsaçlı et al., 2000a, b), Afyon (Altınsaçlı et al., 2000b), Kırklareli (Altınsaçlı 2001b; Kılıç 2001). A new species for Ostaracod fauna of Bolu region.

Ecology: It is known as a typical Holarctic species (Bronstein 1947). Known from small salty coastal and inland water bodies. It also reported from freshwater habitats (Meisch 2000). It is collected from springs (Klie 1939; Petkovski 1966), and wells (Meisch and Broadbakker 1993). Recorded from salty sulphurous springs with 34^{o}C of temperatures (Pax 1948). It is cultured for several years in pure freshwater in the laboratory (Diebel and Pietrzeniuk 1975). Its abundance may be related to fluctuations in the trophic state of the habitat (Mezquita et al., 1999a). It can be used as indicator species of organic pollution, but being slightly less tolerant than *H. incongruens attenuata* (Mezquita et al., 1999a).

Heterocypris rotundata (Bronshtein, 1928)

General Distribution: Hungary (Meisch 2000), Slovakia (Petkovski 1970), Caucasuss, Romania, Bulgaria, Turkey, Iran and Afghanistan. Palaearctic (Meisch 2000).

Material Station Numbers: 86, 126, 141 (3 females mounted)

Old records from Turkey: Ağrı (Hartmann 1964), Konya, Isparta (Altınsaçlı et al., 2000a). A new species for Bolu Region.

Ecology: Recorded from permanent waters, littoral zone of the lakes and rice-fields (Meisch 2000). It is known as a thermophilic summerform species (Petkovski 1964). It is tolerated to the slight increase salinity (Meisch 2000).

Scottia pseudobrowniana (Kempf, 1971)

General Distribution: Russia (Bronstein 1947), Ireland (Meisch 2000), Germany (Kempf 1971), Slovakia (Petkovski 1966), Hungary (Meisch and Forró 1998), Belgium (Meisch 2000), U.S.A (Külköylüoğlu 1999; Külköylüoğlu and Vinyard 2000).

Material Station Numbers: 57, 87 (1 female mounted)

Old records from Turkey: Bolu (Külköylüoğlu 2003a; Karakaş-Sarı 2006).

Ecology: It is not a very common species. It is a crenobiont species (Külköylüoğlu 2003a), which shows holarctic distribution (Külköylüoğlu 1999). The species can be thougth to be semiterrestrial bottom dependent (Meisch 2000) and is classified as cold water stenotherm (Cole 1966). It has a wide tolerance range of environmental variables; for instance, the species can tolerate temperature values from 9.2 to 28°C, dissolved oxygen 3.0 to 8.5 mg/L (Külköylüoğlu 2003a). It is detritivorous and probably occurs throughout the year (Meisch 2000).

Cypridopsis vidua (O. F. Müller, 1776)

General Distribution: Cosmopolitan (Meisch 2000).

Material Station Numbers: 84, 88, 119, 124, 125 (3 females mounted)

Old records from Turkey: Eskişehir (Gülen 1977), Çanakkale, Zonguldak, Kırklareli (Gülen 1985a), Bolu (Gülen 1985a; Külköylüoğlu and Yılmaz 2006; Yılmaz and Külköylüoğlu 2006; Karakaş-Sarı 2006; Külköylüoğlu et al., 2007; Dügel et al., in press), Balıkesir (Gülen 1985a; Altınsaçlı and Kubanç 1990), Bursa (Altınsaçlı 1993, 1999; Altınsaçlı and Griffiths 2001a, b), Sakarya (Gülen 1977; Altınsaçlı 1997; Gülen and Altınsaçlı 1999), İstanbul (Gülen 1985a; Altınsaçlı and Yılmam 1990; Külköylüoğlu et al., 1995; Çakıl 1996; Külköylüoğlu 1998; Koç 2000), Trabzon (Gülen et al., 1994a), Diyarbakır (Gülen et al., 1996), Ordu (Kılıç 1997, 2001), İzmir (Aygen and Balık 1998), Eskişehir, Bilecik, Ankara (Gülen and Altınsaçlı 1999), Isparta (Altınsaçlı et al., 2000a; Altınsaçlı 2001a; Özuluğ et al., 2001), Konya (Altınsaçlı et al., 2000a, b), Kırklareli (Altınsaçlı 2001b), Afyon (Altınsaçlı et al., 2000b).

Ecology: It is an active swimmer, so that prefers ponds, rivers and littoral zone of the lakes (Meisch 2000) but also reported from the helocrene, limnocrene and rheocrene types of springs (Külköylüoğlu and Yılmaz 2006). Known from habitats with rich vegetation (Mbahinzireki et al., 1991). It tolerates to slight increase salinity (Hiller 1972) with a low tolerance to dissolved oxygen (Meisch 2000). It has been showed a possitive correlation to the water temperature (Külköylüoğlu et al., 2007), redox potential and pH (Külköylüoğlu 2005). It was collected from about 72 m of depth (Monard 1920 in Meisch 2000).

Potamocypris villosa (Jurine, 1820)

General Distribution: It is common everywhere, worldwide except Australia (Meish 2000).

Material Station Numbers: 10, 20, 25, 75, 80, 100, 110, 111, 114, 115, 121, 122, 130, 132 (11 females mounted)

Old records from Turkey: İzmir (Altınsaçlı 1988), İstanbul (Külköylüoğlu et al., 1993; Külköykuoğlu et al., 1995; Külköylüoğlu 1998), Bursa (Altınsaçlı 1993; Altınsaçlı and Griffiths 2001b), Elazığ, Van, Rize (Gülen et al., 1994a; Çakıl 1996), Zonguldak, Kastamonu (Kılıç 1997), Ankara, Eskişehir, Sakarya, Bilecik (Gülen and Altınsaçlı 1999), Bolu (Külköylüoğlu and Yılmaz 2006). This the second record for freshwaster ostracods of Bolu region.

Ecology: A swimming species of *Potamocypris* (Meisch 1984). It is probably a cosmopolitan species (Meisch 1985). It is reported from helocrene, limnocrene and rheocrene springs. It shows a significant correlation to environmental variables such as water temperature, pH, redox potential, dissolved oxygen. It is negatively correlated with temperature, pH and conductivity of water. Reported from waters with high oxygen (Külköylüoğlu and Yılmaz 2006). It is almost a cosmopolitan species (Baltanás 1992). It is tolerant of eutrophic conditions (Meisch 2000).

Potamocypris fulva (Brady, 1868)

General Distribution: England (Fox 1965), Germany, Switzerland, Hungary, Belgium, Bulgaria (Meisch 2000), Northern Italy (Rossetti et al., 2005).

Material Station Numbers: 103 (1 female mounted)

Old records from Turkey: Bolu (Külköylüoğlu et al., 2007). It is recorded for second time from Turkey and Bolu in this study.

Ecology: A non-swimming species of *Potamocypris* (Meisch 1984). It is a stygophilic species (Meisch 2000). It is recorded in ditches filled with filamentous algae (Stephanides 1948) and in a slow stream (Fox 1965). Reported from a heavily polluted shallow lake (Külköylüoğlu et al., 2007). It was found the values of ecological variables were pH 7.68, dissolved oxygen 11.3 mg/l, conductivity 465.6 µS $cm-1^{-1}$ and temperature 1.56 C^{o} in a lake (Külköylüoğlu et al., 2007).

Potamocypris smaragdina (Vávra, 1891)

General Distribution: A swimming species of *Potamocypris* (Meisch 1984). England under name of *P. dianae* (Fox 1965), Scotland (Griffiths and Martin 1993), France (Meisch and Broodbaker 1990), Belgium under name of *P. dianae* (Martens and Dumont 1984), Luxembourg (Meisch 1990), Czech Republic (Vávra 1891 in Meisch 2000) and Germany (Hiller 1972).

Material Station Numbers: 83 (1 female mounted)

Old records from Turkey: -

It is a new record for the Turkish freshwater Ostracoda fauna.

Ecology: It is reported from the ponds, slow streams and the littoral zone of the lakes but never from temporary waters. It has a tolerance to the slightly salty conditions (Meisch 2000). It is probably euryplastic for pH (Hiller 1972).

Potamocypris similis (Müller, 1912)

General Distribution: England (Fox 1965), Wales (Griffiths and Evans 1991), France, Luxembourg (Meisch 1984), Belgium, Austria (Meisch 2000), Germany (Scharf 1981).

Material Station Numbers: 23, 30, 44, 112 (4 females mounted)

Old records from Turkey: -

It is a new record for the Turkish freshwater Ostracoda fauna.

Ecology: A non-swimming species of *Potamocypris* (Meisch 1984). Its ecology is poorly known. Reported from the stony and muddy bottoms of weedy ponds and littoral zone of the lakes (Meisch 2000).

3. 3. Evaluation of Data

During the study, samples were collected and data gained for 41 taxa (*Psychrodromus olivaceus, Ps. fontinalis, Candona neglecta, C. candida, C. weltneri, C. sanociensis, C. lactea, Pseudocandona compressa, Pse. albicans, Pse.* cf. *semicognita, Fabaeformiscandona fabaeformis, F.* cf. *breuili, F. balatonica, F. brevicornis, F. protzi, F. latens, Schellencandona* cf. *belgica, Heterocypris incongruens, H. salina, H. rotundata, Ilyocypris bradyi, I. gibba, I. getica, I. inermis, Herpetocypris chevreuxi, Hr. reptans, Hr. brevicaudata, Potamocypris villosa, P. similis, P. fulva, P. smaragdina, Cypridopsis vidua, Cypria ophtalmica, Scottia pseudobrowniana, Prionocypris zenkeri, Trajancypris serrata, Cyclocypris laevis, Eucypris virens, Physocypria kraepelini, Cavernocypris* sp., *Darwinula* aff. *stevensoni*) were evaluated below. The distribution of stations per county follows as 47 in Bolu downtown, 18 in Göynük, 8 in Yeniçağa, 20 in Mudurnu, , 10 in Seben, 7 in Kıbrıscık, 9 in Mengen, 17 in Gerede and 8 in Dörtdivan. The selected 144 stations were included different aquatic habitats such as lakes, creeks, ponds, reedbeds, permanent or temporary pools and springs etc. A total of 25 species were collected from 47 stations of downtown, 14 species from 18 stations of Göynük, 10 species from 8 stations of Yeniçağa, 9 species from 20 of Mudurnu, 5 species from 10 stations of Seben, 9 species from stations of Kıbrıscık, 10 species from 9 stations of Mengen, 15 species from 17 stations of Gerede and 9 species from 8 stations of Dörtdivan. Moreover, two taxa (*Cavernocypris* sp. and *Darwinula* aff. *stevensoni*) were found from two different stations (St. 105 and St. 142) of downtown. Except a few subfossil forms, no ostracods found in fourteen stations as (St. 4, St. 36, St. 37, St. 38, St. 39, St. 41, St. 48, St. 52, St. 63, St. 71, St. 95, St. 116, St. 120 and St. 123). The species *H. incongruens* was the most common species which found in 54 stations with 1623 individuals of all nine counties, while *I. bradyi* was found in 69 stations with 893 individuals of eight counties except Dörtdivan. A cosmopolitan species, *Ps. olivaceus* was the third common species with 635 individuals from 40 stations. The new records for the fauna of Turkish freshwater Ostracoda in this study were 12 species. Two new recording species for Turkey fresfwaters *F. breuli* and *F. latens* were collected from the same station (St. 112) with total of six individuals by three for each, while bisexual populations of *I. inermis* were found in the St. 30 with nineteen individuals for the first time in the literature. Futhermore, bisexual populations of *Ps. fontinalis* were collected from St. 109 with 52 individuals after a long time. Finding bisexual populations of *Ps. olivaceus* (St. 58 and St. 106) has been built up the idea that told most of bisexual species populations can be presented in Turkey. A new record for Turkey *Shellencandona* cf. *belgica* (also a new genus for ostracods of Turkey) was confirmed from the St. 43 with two individuals.

The species which found from the stations and the environmental variables were measured for each station were shown in the Appendix 1 and Appendix 2. Six different calculated environmental variables (pH, redox potential; *Eh*, disolved oxygen; *DO,* electrical conductivity; *EC*, saturation; *% Sat*., water temperature; *T ºC*, salinity; *Sal.*) are shown. Some abbreviations are used for species are given below; *Psychrodromus olivaceus* (Po), *Psychrodromus fontinalis* (Pf), *Candona neglecta* (Cn), *Candona candida* (Cc), *Candona weltneri* (Cw), *Candona sanociensis* (Cs), *Candona lactea* (Ca), *Pseudocandona compressa* (Pc), *Pseudocandona albicans*

(Pa), *Pseudocandona* cf. *semicognita* (Pe), *Fabaeformiscandona fabaeformis* (Ff), *Fabaeformiscandona* cf. *breuili* (Fb), *Fabaeformiscandona balatonica* (Fa), *Fabaeformiscandona brevicornis* (Fr), *Fabaeformiscandona protzi* (Fp), *Fabaeformiscandona latens* (Fl), *Schellencandona* cf. *belgica* (Sb), *Heterocypris incongruens* (Hi), *Heterocypris salina* (Hs), *Heterocypris rotundata* (Ho), *Ilyocypris bradyi* (Ib), *Ilyocypris gibba* (Ig), *Ilyocypris getica* (Ie), *Ilyocypris inermis* (Ii), *Herpetocypris chevreuxi* (Hc), *Herpetocypris reptans* (Hr), *Herpetocypris brevicaudata* (Hb), *Potamocypris villosa* (Pv), *Potamocypris similis* (Ps), *Potamocypris fulva* (Pu), *Potamocypris smaragdina* (Pm), *Cypridopsis vidua* (Cv), *Cypria ophtalmica* (Co), *Scottia pseudobrowniana* (Sp), *Prionocypris zenkeri* (Pz), *Trajancypris serrata* (Ts), *Cyclocypris laevis* (Cl), *Eucypris virens* (Ev), *Physocypria kraepelini* (Pk), *Cavernocypris* sp. (Cr), *Darwinula* aff. *stevensoni* (Ds).

After laboratory and field study, data collected from 141 stations were evaluated. The average values of the variables calculated as Dissolved Oxygen (DO) 7.57 mg/L, Saturation (%S) 80.05%, Eh (as SHE) 158.38 mV, Electrical Conductivity (EC) 517.98 µS cm-1, pH 7.31, Temperature of water (TºC (w)) 20.48ºC, Temperature of air (TºC (a)) 21.97ºC and salinity 0.26 ppt (Appendix 2).

Unweighted Pair Group Mean Averages (UPGMA) was used to indicate relationships among counties (Figure 2). Accordingly, this analysis showed five main clustering groups of counties. First group (G. I) includes three counties as Dörtdivan, Kıbrıscık and Seben, when the second clustering group (G. II) consists of one (Mengen) county, and third group (G. III) had two counties as Mudurnu and Gerede. Also, fourth clustering group (G. IV) included two counties as Yeniçağa and Göynük and fifth group (G. V) contained Merkez county. The counties of the fourth group

Yeniçağa and Göynük showed at the most similarity, while the counties Mengen (G. II) and Merkez (G. V) had very different similarities from the others.

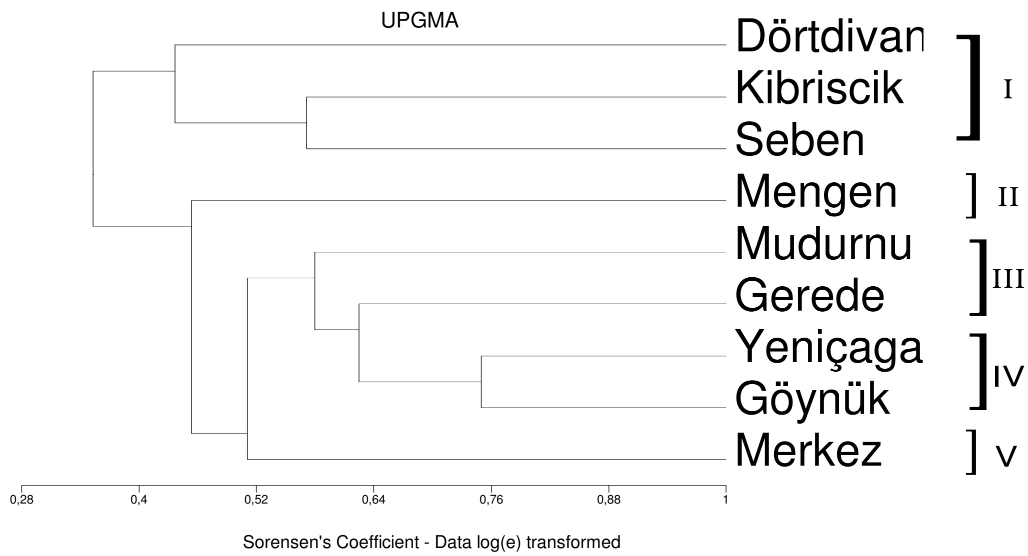

Figure 2. Unweighted Pair Group Mean Averages (UPGMA) shows the clustering relationships of nine counties.

According to Sorrenson Similarity Index among nine counties, the most similarity of species was between Göynük and Yeniçağa by 70%, while the counties where have at least ratio of similarity were Merkez and Seben by 20% (Table 1). Dörtdivan was the most different county where shown the minimal similarity to the other counties. The highest similarity ratio of Dörtdivan was 43.48% to Göynük and the least one was 21.05% to Mengen (Table 1).

Location	Göynük	Yeniçağa	Mudurnu	Seben	Kıbrıscık	Mengen	Gerede	Dörtdivan
Merkez	56,41	45,71	41,17	20	29,41	34,28	55	41,17
Göynük		75	60,87	31,58	52,17	50	68,97	43,48
Yeniçağa			63,16	26,6	42,1	50	56	42,1
Mudurnu				28,58	44,4	52,63	41,6	33,3
Seben					57,14	26,6	40	42,86
Kıbrıscık						31,58	41,6	44,4
Mengen							40	21,05
Gerede								41,6

Table 1. Similarities calculated with Sorenson Index among counties

Unweighted Pair Group Mean Averages (UPGMA) was also used to indicate relationships among 11 species (Figure 3). Accordingly, this analysis showed five main clustering groups of species. First group (G. I) includes two species that so related to each other as *Cyclocypris laevis* (Cl) and *Physocypria kraepelini* (Pk). Both the second (G. II) and the third (G. III) clustering group with the inclusion of two species are acquired. First group includes *H. salina* (Hs) and *H. rotundata* (Ho), while third group consists of *I. inermis* (Ii) and *P. similis* (Ps). Also, fourth clustering group (G. IV) composed of two species *C. candida* (Cc) and *C. neglecta* (Cn). *H. incongruens* (Hi), *I. bradyi* (Ib) and *Ps. olivaceus* were the species of fifth group (G. V). The species of fifth group (*H. incongruens*, *I. bradyi and Ps. olivaceus*) were found mainly common during this study. *H. incongruens* was the species which found abundantly from all counties, while *I. bradyi* was ascertained from eight counties (Merkez, Göynük, Yeniçağa, Mengen, Seben, Kıbrıscık, Mudurnu, Gerede) except Dörtdivan. *Ps. olivaceus* was found in fourty stations.

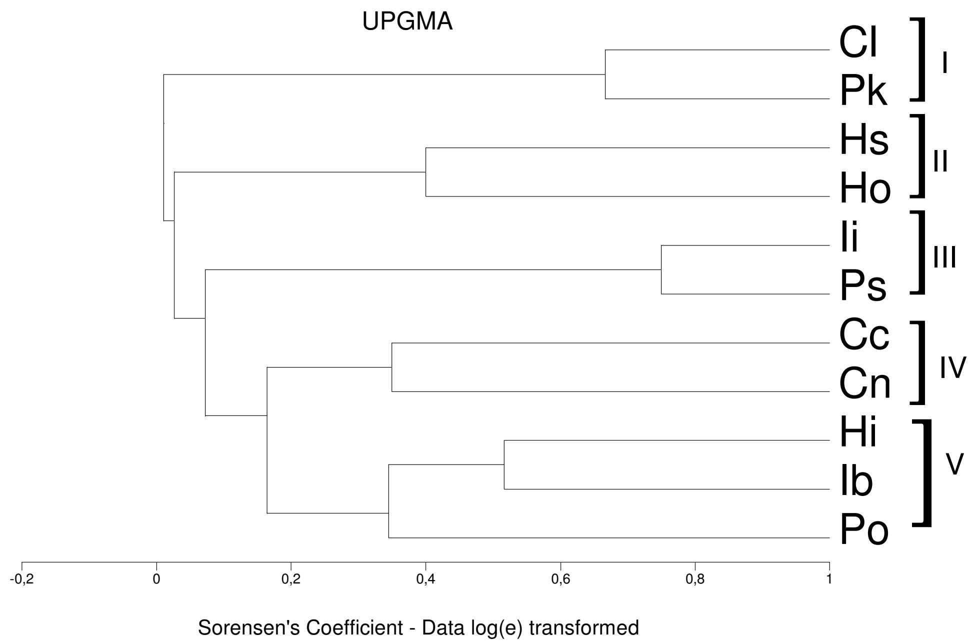

Figure 3. Unweighted Pair Group Mean Averages (UPGMA) shows the clustering relationships of 11 ostracods which collected at least two times in this study. Abbreviations for species includes: Po; *Psychrodromus olivaceus,* Ib; *Ilyocypris bradyi,* Hi; *Heterocypris incongruens,* Cn; *Candona neglecta,* Cc; *Candona candida,* Ps; *Potamocypris similis,* Ii; *Ilyocypris inermis,* Pk; *Physocypria kraepelini,* Cl; *Cyclocypris laevis,* Ho; *Heterocypris rotundata,* Hs; *Heterocypris salina.*

Spearman Correlation Analysis was used to observe associations between 11 species and five environmental variables and some outcomes were tabulated in Table 2. Spearman Correlation displayed that there was a negative significant relationship between *Pro. zenkeri* (Pz) and *Ps. fontinalis* (Pf) with pH. Besides, pH had a positive significant relationship with water temperature ($P<0.01$), while its relationship was negatively significant to redox potential ($P<0.01$).

Although Spearman Correlation showed relationships among some of the environmental variables, it did not explain enough the relationships between some environmental variables and species. On the other hand, this analysis was able to put out some important knowledge for interspecific relationships between species. For example, *I. bradyi* displayed a positive relationship with *H. incongruens*, *Ps. olivaceus,* (P<0.01) and *C. neglecta* (P<0.05), while *I. bradyi* had the most strong positive relationship with *Pro. zenkeri* (P<0.01) and after *H. incongruens*. Such findings were also supported by UPGMA analysis. The relationship between *I. bradyi* and these two species may depend on their wide distribution and cosmopolitan characteristics. There was a strong positive significant relationship between *Ps. olivaceus* and *Ps. fontinalis* (P<0.01), which had common ecological characteristics (Table 2).

Table 2. Spearman Correlation shows relationship among both environmental variables with species and species with species. In this table "*" shows the significant relationship at 0.05 level (2 -tailed) and "**" shows significant relationship at 0.01 level (2-tailed). "-" reffered to negative relationship.

Correlations

			PH	SHE	DO	EC	TMP	PO	PZ	CN	CC	IB	IG	PV	CV	HI	PF	II
Spearman's rho	PH	Correlation Coefficient	1,00															
		Sig. (2-tailed)	,															
		N	90															
	SHE	Correlation Coefficient	-,906**	1,00														
		Sig. (2-tailed)	,000	,														
		N	90	90														
	DO	Correlation Coefficient	,199	-,179	1,00													
		Sig. (2-tailed)	,059	,092	,													
		N	90	90	90													
	EC	Correlation Coefficient	-,248*	,208*	-,061	1,00												
		Sig. (2-tailed)	,019	,049	,565	,												
		N	90	90	90	90												
	TEMP	Correlation Coefficient	,275**	-,395**	,032	,120	1,00											
		Sig. (2-tailed)	,003	,000	,766	,260	,											
		N	90	90	90	90	90											
	PO	Correlation Coefficient	,016	,028	-,236	,381*	-,139	1,00										
		Sig. (2-tailed)	,929	,879	,186	,029	,441	,										
		N	33	33	33	33	33	33										
	PZ	Correlation Coefficient	-,669*	,611*	-,299	,536	,335	,812*	1,00									
		Sig. (2-tailed)	,012	,027	,321	,059	,264	,050	,									
		N	13	13	13	13	13	6	13									
	CN	Correlation Coefficient	-,265	,232	-,125	,267	,037	,000	,667	1,00								
		Sig. (2-tailed)	,201	,265	,551	,197	,861	1,00	,219	,								
		N	25	25	25	25	25	6	5	25								
	CC	Correlation Coefficient	,159	-,085	,558	,633*	,172	-,866	,	,936**	1,00							
		Sig. (2-tailed)	,622	,793	,059	,027	,594	,333	,	,002	,							
		N	12	12	12	12	12	3	2	7	12							
	IB	Correlation Coefficient	-,116	,033	-,193	,196	,254*	,551**	,934**	,534*	,279	1,00						
		Sig. (2-tailed)	,360	,797	,126	,121	,043	,004	,002	,049	,504	,						
		N	64	64	64	64	64	25	7	14	8	64						
	IG	Correlation Coefficient	-,402	,366	-,562	,119	-,111	,	,	,894	1,00**	,574	1,00					
		Sig. (2-tailed)	,284	,333	,115	,760	,776	,	,	,106	,	,312	,					
		N	9	9	9	9	9	1	0	4	2	5	9					
	PV	Correlation Coefficient	-,012	,042	-,042	,321	-,564	1,00**	,	-1,0	,	,551	,	1,00				
		Sig. (2-tailed)	,973	,907	,907	,365	,090	,	,	1,00	,	,257	,	,				
		N	10	10	10	10	10	4	1	2	0	6	1	10				
	CV	Correlation Coefficient	,359	-,872	-,154	-,359	,359	,	,	-1,0	,	,	,	,	1,00			
		Sig. (2-tailed)	,553	,054	,805	,553	,553	,	,	1,00	,	,	,	,	,			
		N	5	5	5	5	5	0	0	2	1	0	1	0	5			
	HI	Correlation Coefficient	,085	-,099	-,221	-,085	,071	,562	,500	,700	,000	,843**	1,00**	1,00**	,	1,00		
		Sig. (2-tailed)	,612	,555	,182	,613	,673	,072	,667	,188	1,00	,000	,	,	,	,		
		N	38	38	38	38	38	11	3	5	3	32	2	4	0	38		
	PF	Correlation Coefficient	-,686**	,615*	-,226	,398	-,329	,986**	,	,866	,	,790*	1,00**	,500	1,00**	,500	1,00	
		Sig. (2-tailed)	,005	,015	,418	,142	,232	,000	,	,333	,	,020	,	,667	,	,667	,	
		N	15	15	15	15	15	6	2	3	0	8	2	3	2	3	15	
	II	Correlation Coefficient	-,200	-,300	,700	-,500	,300	-1,0	1,00**	,866	,	,	,	,	,	,	,	1,00
		Sig. (2-tailed)	,747	,624	,188	,391	,624	1,00	,	,333	,	,	,	,	,	,	,	,
		N	5	5	5	5	5	2	2	3	1	1	0	0	0	1	1	5

**. Correlation is significant at the .01 level (2-tailed).

*. Correlation is significant at the .05 level (2-tailed).

Canonical Correspondence Analysis (CCA) was applied to illustrate the relationship among five environmental variables and 22 species (Figure 4.). Thus, the associations between the environmental data and the species of the 94 stations were analyzed. Besides, critical values of CCA tabulated in Table 3. Critical values interpretted the correlations among species and environmental variables as 52.2% for Axis 1.

Canonical Correspondence Analysis displays that the most effective variables on species abundance are the temperature of water, redox potential and dissolved oxygen. These results were also implied consistency to ETI and Spearman Correlation Analysis. The placement of the species in CCA shows the relationships between the five environmental variables and 22 species with 94 stations. Accordingly, 14 species (*Pr. kraepelini, H. incondruens, H. rotundata, Cl. laevis, Hr. chevreuxi, Hr. brevicaudata, Cp. ophtalmica, C. candida, C. neglecta, C. sanociensis, S. pseudobrowniana, F. balatonica, I. bradyi, I. inermis*) are located closer to the center of CCA diagram. In such a case, the location of these species means that they have wide tolerance ranges for these environmental variables.

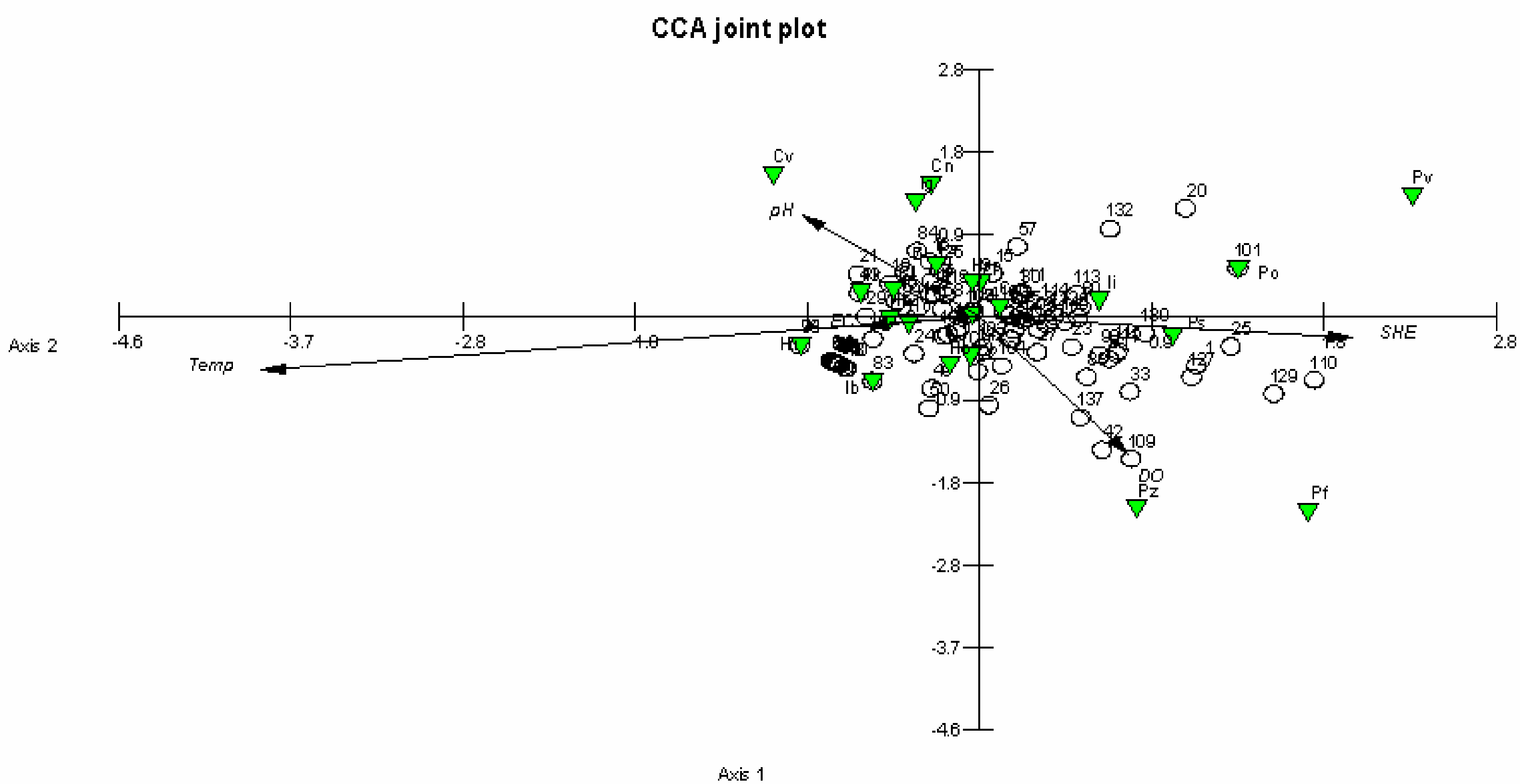

Figure 4. Canonical Correspondence Analysis (CCA) was used to illustrate relationships among 22 species and five environmental variables. In CCA diagram, deltoids are symbolizing to the species, arrows are environmental variables and circles are the stations.

Variable	Weighted mean	Weighted SD	Inflation Factor
pH	7.893	0.449	1.241
SHE	123.335	63.024	1.097
DO	6.719	2.669	1.086
EC	420.152	293.521	1.121
T°C	18.602	7.318	1.258

Eigenvalues	Axis 1	Axis 2	Axis 3	Axis 4	Tot.In
Eigenvalues	0.096	0.036	0.021	0.015	2.22
Percentage variance	4.324	1.627	0.964	0.686	
Cum. Percentage var.	4.324	5.951	6.915	7.601	
Cum.Constr.Percent.	53.749	73.977	85.957	94.480	
Spec.-env. correlations	0.522	0.396	0.370	0.354	
Sum of all eigenvalues					2.22
Sum of all canonical eigenvalues					0.17

Table 3. Critical Eigen values of CCA

Optima *(uk)*, tolerance *(tk)* and ETI formulas were calculated for sixteen species to six environmental variables and tabulated in Table 4. and Table 5. Accordingly, species have different optimum limits to different environmental variables. ETI values range from zero to one, that some species adapted to environments very well when ETI ranges were calculated as 1.

According to Table 4, pH optima values of species are generally ranged from neutral to little basic. Among sixteen species the highest tolerance limits to pH were found for in order of *C. candida, C. neglecta* and *Cy. vidua*, while the least limits were found for *Pr. kraepelini, P. similis* and *Cp. ophtalmica* (Table 4). Dissolved oxygen (DO) optima values changed from 4.962 to 9.373 mg/L that *H. rotundata* had the least and *P. similis* the highest optima for DO. The species that had the least tolerance value for redox potential (5.971 mV), saturation (6.694%) and water temperature (0.651ºC) was *Pk. kraepelini* of which tolerance limit was the least for pH (0.09). The least tolerance limit for electrical conductivity (EC) was found for *H. rotundata*. *Hr. chevreuxi* has the highest optima values for electrical conductivity as 1106.85 µS cm^{-1}. The least tolerance *(tk)* value for DO and the highest optima *(uk)* value for saturation was found for *Hr. chevreuxi* in contrast to Karakaş-Sarı (2006). Although the author specified the tolerance value for DO as 2.20 mg/L and optima value for conductivity as 37.37 µS cm^{-1} for *Hr. chevreuxi*, they were found as 0.355 mg/L and 1106.85 µS cm^{-1} herein the present study.

Ps. olivaceus	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,617	174,06	5,842	531,15	62,896	18,977
Tolerance	0,325	35,004	1,7445	120,99	25,165	6,682

Pro. zenkeri	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,71	169,54	7,2438	523,9	39,947	18,273
Tolerance	0,414	21,63	2,047	171,81	35,456	4,253

C. neglecta	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,76	168,22	5,816	513,06	50,827	19,818
Tolerance	0,546	29,34	1,935	186,96	26,465	4,727

C. candida	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,807	165,58	6,501	422,31	69,105	19,486
Tolerance	0,624	34,81	3,008	121,38	42,175	4,331

I. bradyi	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,889	155,64	6,344	622,09	71,687	23,241
Tolerance	0,345	54,27	2,078	296,16	34,311	5,814

I. gibba	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,911	157,01	5,589	516,4	58,861	22,142
Tolerance	0,274	14,98	1,159	175,9	17,612	4,295

Hr. chevreuxi	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	8,011	146,69	7,266	1106,85	87,869	23,611
Tolerance	0,38	101,33	0,355	486,3	13,412	4,762

P. villosa	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	8,103	149,08	7,319	366,52	81,724	19,363
Tolerance	0,384	18,4	6,272	223,75	40,859	5,312

Cy. vidua	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	9,295	58,107	5,836	115,758	87,125	28,3
Tolerance	0,516	15,525	1,228	120,895	13,536	2,559

H. incongruens	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,994	150,18	7,151	654,69	66,205	24,864
Tolerance	0,419	69,36	6,694	358,48	39,142	6,045

Table 4. cont.

Ps. fontinalis	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,608	173,17	6,803	499,05	68,41	19,842
Tolerance	0,351	25,62	2,578	103,69	19,243	9,209
H. rotundata	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,693	165,8	4,962	584,83	62,176	23,02
Tolerance	0,143	90,36	1,338	5,13	8,605	3,942
Pr. kraepelini	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	8,223	132,556	6,223	347,01	74,052	24,527
Tolerance	0,09	5,971	0,566	66,24	6,694	0,651
Cp. ophtalmica	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,87	161,82	7,721	644,692	75,492	23,632
Tolerance	0,56	40,16	2,312	206,876	24,125	2,617
P. similis	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	8,144	150,13	9,373	400,895	83,483	15,096
Tolerance	0,093	4,67	2,092	76,565	32,554	2,298
I. inermis	**pH**	**SHE**	**DO**	**EC**	**%S**	**TºC (w)**
Optima	7,87	162,55	7,595	380,542	61,264	15,3
Tolerance	0,421	48,14	4,093	148,625	45,538	5,336

Table 4. Descriptive statistics, Optima (*uk*) and Tolerances (*tk*) for mean pH; Redox potential, (SHE); Dissolved oxygen (DO); Electrical conductivity (EC); Saturation (%Sat.) and Temperature of water (TºC (w)) for sixteen species.

According to Table 5**.**, the most tolerant species with the highest ETI ranges to pH is *C. neglecta*. Its tolerance (*tk*) value for pH (0.546) was also higher. *H. rotundata, Cp. ophtalmica* and *Pr. kraepelini* have the least ETI ranges to pH. Despite the highest tolerance value for pH relatively, *Cp. ophtalmica* shown lower ETI range. *C. neglecta* and *C. candida* have wide ETI ranges to redox potential, while the ostracod species which show the least ETI ranges to SHE are in order of *P.*

similis and *Pr. kraepelini*. The ETI ranges to dissolved oxygen (DO) was changed from 0.065 (*Hr. chevreuxi*) to 0.98 (*H. incongruens*). *Hr. chevreuxi* was also the species which shown the least tolerance (*tk*) value for DO and the highest optima *(uk)* value for electrical conductivity and saturation. *H. incongruens* was mainly common species that collected from all counties. In which case, it already has higher ETI ranges to almost all environmental variables but pH, relatively. Firstly *P. similis, H. rotundata* and then *Pr. kraepelini* have the least ETI value to electrical conductivity. *H. rotundata* was the species which shown the least ETI value to saturation (%S), when *H. incongruens* had the highest value. The least tolerance (*tk*) value for saturation was belonging to *H. rotundata* (Table 4). *Pr. kraepelini* and *I. inermis* have lower ETI values to temperature of water, while *H. incongruens* and *I. bradyi* show a wide tolerance to temperature of water with high ETI values.

Ps. olivaceus	**pH**	**SHE**	**DO**	**EC**	**%S**	**T ^{o}C (w)**
Max.	8,9	205,33	14,06	946	137,2	28,3
Min.	7,1	134,45	1,96	95,6	6,4	7,1
ETI	0,689	0,432	0,641	0,606	0,672	0,823
range	1,8	70,88	12,1	850,4	130,8	21,3
average	7,7525	133,55	6,9455	334,4475	73,1875	15,7125

Pro. zenkeri	**pH**	**SHE**	**DO**	**EC**	**%S**	**T ^{o}C (w)**
Max.	8,7	203,45	14,6	946	137,2	28,4
Min.	7,1	105,3	3,34	164,1	6,4	13,1
ETI	0,613	0,599	0,597	0,557	0,672	0,482
range	1,6	98,15	11,26	781,9	130,8	15,3
average	7,928	139,25	7,778	327,361	45,876	17,03

C. neglecta	**pH**	**SHE**	**DO**	**EC**	**%S**	**T ^{o}C (w)**
Max.	9,45	214,33	11,99	946	119,5	29,1
Min.	6,84	53,335	1,38	77,1	5,5	13,1
ETI	1	0,98	0,562	0,62	0,586	0,504
range	2,61	160,995	10,61	868,9	114	16
average	7,87	130,01	5,7125	404,562	55,94	18,84

C. candona	**pH**	**SHE**	**DO**	**EC**	**%S**	**T °C (w)**
Max.	9,16	205,28	14,72	659	178,2	27,5
Min.	7,12	74,225	1,72	135	5,5	13,8
ETI	0,781	0,8	0,689	0,373	0,887	0,432
range	2,04	131,055	13	524	172,7	13,7
average	7,8	107,076	5,92	316,06	62,29	17,941

Table 5. cont.

I. bradyi	**pH**	**SHE**	**DO**	**EC**	**%S**	**T °C (w)**
Max.	8,8	204,115	17,1	1431	157,2	32,5
Min.	7,12	89,625	1,72	116,8	5,5	7,1
ETI	0,643	0,699	0,815	0,937	0,779	0,801
range	1,68	114,49	15,38	1314,2	151,7	25,4
average	7,897	126,75	7,025	422,073	67,671	19,662

I. gibba	**pH**	**SHE**	**DO**	**EC**	**%S**	**T °C (w)**
Max.	8,4	178,6	8,45	849	99,1	27,5
Min.	7,47	131,295	4,34	326,7	8	15,8
ETI	0,356	0,288	0,217	0,372	0,468	0,369
range	0,93	47,305	4,11	522,3	91,1	11,7
average	7,991	140,534	6,077	402	61,98	20,62

Hr. chevreuxi	**pH**	**SHE**	**DO**	**EC**	**%S**	**T °C (w)**
Max.	8,74	187	7,88	1475	117,5	33,9
Min.	7,32	96,115	6,65	359,2	72,8	18,8
ETI	0,544	0,554	0,065	0,796	0,229	0,476
range	1,42	90,885	1,23	1115,8	44,7	15,1
average	8,13	82,22	7,3	580,3	95,02	26,6

P. villosa	**pH**	**SHE**	**DO**	**EC**	**%S**	**T °C (w)**
Max.	8,9	192,16	17,1	696	122,7	24,7
Min.	7,25	120,52	1,14	116,8	7,4	15
ETI	0,632	0,437	0,846	0,413	0,592	0,305
range	1,65	71,64	15,96	579,2	115,3	9,7
average	7,99	146,72	6,212	310,39	57,45	16,171

Cy. vidua	**pH**	**SHE**	**DO**	**EC**	**%S**	**T °C (w)**
Max.	9,45	131,3	14,72	552	178,2	29,1
Min.	7,36	53,34	5,6	77,1	64,5	18,5
ETI	0,8	0,476	0,48	0,338	0,584	0,33
range	2,09	77,96	9,12	474,9	113,7	10,6
average	8,49	97,716	7,872	332,84	95,6	24,7

H. incongruens	**pH**	**SHE**	**DO**	**EC**	**%S**	**T °C (w)**
Max.	8,89	217,1	20	1431	200	33,1
Min.	7,14	87,15	1,51	73,6	6,5	12,5
ETI	0,67	0,793	0,98	0,968	0,994	0,649
range	1,75	129,95	18,49	1357,4	193,5	20,6
average	7,84	122,843	6,973	440,22	68,309	20,58

Ps. fontinalis	**pH**	**SHE**	**DO**	**EC**	**%S**	**T ^{o}C (w)**
Max.	8,8	200,495	17,1	654	119	28,3
Min.	7,12	98,425	5,11	146,4	12,3	13,8
ETI	0,643	0,62	0,635	0,362	0,54	0,479
range	1,68	102,07	11,99	507,6	106,7	15,2
average	7,874	144,94	7,65	374,73	74,006	17,386

Table 5. cont.

H. rotundata	**pH**	**SHE**	**DO**	**EC**	**%S**	**T ^{o}C (w)**
Max.	7,94	170,285	6,8	755	78,4	26,1
Min.	7,58	152,335	3,85	504	55,8	16,7
ETI	0,137	0,109	0,156	0,179	0,116	0,296
range	0,36	17,95	2,95	251	22,6	9,4
average	7,77	111,473	5,673	450,3	66,7	21,3

Pr. kraepelini	**pH**	**SHE**	**DO**	**EC**	**%S**	**T ^{o}C (w)**
Max.	8,25	164,16	8,45	605	99,1	24,7
Min.	7,74	131,3	4,1	116,8	47,7	21,7
ETI	0,195	0,2	0,23	0,348	0,264	0,094
range	0,51	32,86	4,35	488,2	51,4	3
average	8,1175	140,6	6,2475	218,45	73,75	23,425

Cp. ophtalmica	**pH**	**SHE**	**DO**	**EC**	**%S**	**T ^{o}C (w)**
Max.	8,71	187	13,63	849	92,2	25
Min.	7,32	105,3	5,4	164,1	16	20,4
ETI	0,532	0,498	0,436	0,488	0,391	0,145
range	1,39	81,7	8,23	684,9	76,2	4,6
average	8,017	91,315	8,382	550,025	62,725	18,4

P. similis	**pH**	**SHE**	**DO**	**EC**	**%S**	**T ^{o}C (w)**
Max.	8,2	154,49	11,99	526	119,5	20,4
Min.	7,87	143,96	6,46	326,2	12,4	13,1
ETI	0,126	0,064	0,293	0,142	0,55	0,23
range	0,33	10,53	5,53	199,8	107,1	7,3
average	8,047	151,532	8,947	455,6	69,5	12,375

I. inermis	**pH**	**SHE**	**DO**	**EC**	**%S**	**T ^{o}C (w)**
Max.	8,2	205,28	11,99	528	119,5	17,7
Min.	7,12	143,955	1,96	135	12,4	13,1
ETI	0,413	0,374	0,531	0,28	0,55	0,145
range	1,08	61,325	10,03	393	107,1	4,6
average	7,886	126,35	6,802	392,68	49,82	15,14

Table 5. Descriptive statistics, ETI (Environmental Tolerance Index) for mean pH; Redox potential, (SHE); Dissolved oxygen (DO); Electrical conductivity (EC); Saturation (%Sat.) and Temperature of water (T^{o}C (w)) for sixteen species.

4. DISCUSSION and CONCLUSION

41 ostracod taxa collected from 144 stations in nine counties were determined in this study. Among which, 12 are new report for freshwater Ostracoda fauna of Turkey, while 17 species are determined first time for Bolu region. Furthermore, the genus *Shellencadona* is a new genus for freshwater habitats of Turkey. *H. incongruens* was the only species which found in all counties (Bolu downtown, Göynük, Yeniçağa, Mudurnu, Seben, Kıbrıscık, Mengen, Gerede and Dörtdivan) with 54 stations. *I. bradyi* was collected from 69 stations in eight counties but Dörtdivan, when *Ps. olivaceus* ascertained in 40 stations. Besides, 16 individuals of different species were found from one station. Finding 41 taxa from the region supported the idea that the area studies is of high ostracod species richness (Külköylüoğlu 2004). Additionaly, reporting 12 new species along with one new genus for Turkey also backup the idea of high species diversity in Turkey. However, comparing with the earlier reports (Altınsaçlı and Griffiths 2002), finding relatively high species diversity may also be related to at least two main reasons: i) lack of studies in the area, and ii) limited focus of earlier studies. This is also to say that increasing numbers of study sites will eventually enhance the chance of finding more species (MacArthur and Wilson 1963, 1967).

Tolerance *(tk)* and Optima *(uk)* values calculated for species are associated with ETI values. When ETI value of a species is higher also tolerance value of species higher, too (Table 4 and Table 5). Also UPGMA dendogram supported these results and some species clustered in UPGMA also related to Canonical Correspondence Analysis (Figure 3 and Figure 4), confirming the results. For example, UPGMA dendogram clustered species as Group I which were *Pr. kraepelini* and *Cl. laevis* (Figure 4). These two species are located closer to center of CCA near each other

(Figure 4). *Pr. kraepelini* is the species that have the least tolerance value for pH and redox potential with *P. similis* (Table 4). Also, its tolerance value for dissolved oxygen, saturation and temperature of water are very low, while its optima value for these environmental variables are higher relatively. Külköylüoğlu (2005c) stated mean pH values changing from 6.73 to 8.97, dissolved oxygen from 6.37 mg/L to 11.79 mg/L and temperature of water from 9.78^{o}C to 27.91^{o}C for *Pr. kraepelini*. These variables value found for *Pr. kraepelini* such as; the pH value was changed from 7.74 to 8.25, dissolved oxygen value was changed from 4.10 mg/L to 6.45 mg/L and temperature of water value was canged from 21.70^{o}C to 24.70^{o}C (Appendix 1 and Appendix 2). *Cl. laevis* is the other species of Group I in UPGMA. It is also located nearby *Pr. kraepelini* closer to center of CCA diagram. Their placement on CCA diagram means that they have wide distribution.

Cyclocypris laevis is reported for second time from Turkey, while it is a new report for non-marine ostracod fauna of Bolu region. It is found from a lake where have environmental variables values such as; pH 8.24, dissolved oxygen 6.22 mg/L, redox potential -75.9 mV (as SHE 131.30), electrical conductivity 346 µS cm^{-1} (as Total Dissolved Solids (TDS) 224.9 mg/l), saturation 74.1, salinity 0.2 ppt and temperature of water 24.7^{o}C. Meisch (2000) stated that it is tolerant a wide range of environmental conditions. It was found from littoral and profundal zones of lakes which built up this study because of finding it from littoral zone of a small lake (St. 124-125, Lake Dörtdivan) (Appendix2). Hiller (1972) specified that is a europlastic for pH, when Vesper (1975) reported the maximum salt content in the literature as 8.4%.

Physocypria kraepelini is a well-known cosmopolitan species. Altınsaçlı and Griffiths (2001a) characterized it as a nektonic species. Külköylüoğlu (1998) offered that it was a most common species which ascertained from the lakes of Turkey. In this study, *Pr. kraepelini* was found from four stations of which two were from a lake where *Cl. laevis* was provided (St. 124-125). Hence, Canonical Correpondence Analysis interprets that it shows cosmopolitan character because of its location closer to center of CCA diagram. Besides, according to CCA both *Pr. kraepelini* and *Cl. laevis* have negatively significant relationship with temperature of water, electrical conductivity and pH. Location of species on the center of CCA diagram suggests that they were not affected by the changes in different environmental variables. Yılmaz and Külköylüoğlu (2006) offer that *Pr. kraepelini* is a polythermophilic, mesohalophilic and eurycronal species which this idea has been standed by present study.

Two species of genus *Heterocypris* (*H. salina* and *H. rotundata*) are clustered as Group II by UPGMA dendogram (Figure 3). These two species also located closer to center of CCA diagram (Figure 4). Accordingly, *H. rotundata* occured in waters with high electrical conductivity in contrast to *H. salina* (Figure 4). Tolerance value of *H. rotundata* for pH that one of the least among all species was computed as 0.143, while optima values was found 7.69. Optima value of *H. rotundata* for redox potential was found 75.6 mV, concurrently shown the highest tolerance value to redox potential as 70.03 mV. The stations which in collected *H. rotundata* is shown different ecological features. For example, St. 141 has a very low value for dissolved oxygen as 3.85 mg/L and saturation as 55.8%. Another station that nestled both *H. rotundata* and *H. salina* was St. 86 which shown very high value for conductivity as 755 μScm^{-1} (Appendix 2). *H. rotundata* which a new reported species for freshwater ostracods of Bolu region was collected from three stations with 73 individuals. Meisch (2000) stated that *H. rorundata* was tolerant to a slight increase in salinity similar to this study, while Petkovski (1964) suggested the species as a thermophilic summerform.

H. salina which a new species for Ostaracoda fauna of Bolu region was collected from two stations with 90 individuals. Külköylüoğlu and Vinyard (2000) implied that *H. salina* was similar to *Cyprinotus salinus*. It is a typical halobiont where it lives in brackish waters with high salinity. Löffler (1990) submitted that *H. salina* was a halophilic species. Külköylüoğlu and Vinyard (2000) found it from springs of Idaho where highest value of electrical conductivity as 1149 μScm^{-1}, pH from 7.9 to 8.14 and temperature of water as 29.5^{o}C. The values of two stations (St.86 and St.108) where *H. salina* found in this study were changed as electrical conductivity from 755 μScm^{-1} to 1475 μScm^{-1}, pH from 7.79 to 7.97, dissolved oxygen from 6.37 mg/L to 7.29 mg/L, temperature of water from 16.70^{o}C to 21.40^{o}C and salinity from 0.4 ppt to 0.8 ppt (Appendix 1 and Appendix 2). These results countenanced the authors results. Furthermore, *H. salina* really shown a significant relationship with electrical conductivity and pH in CCA diagram (Figure 4). Also, it could be understood from the location of *H. salina* on CCA diagram that it was a cosmopolitan species as Külköylüoğlu and Vinyard (2000) suggested.

The third group clustered in the UPGMA dendogram is represented by two species, *Ilyocypris inermis* and *Potamocypris similis* (Figure 3). The location of these two species on CCA diagram are near to each other, while *I. inermis* is closer to the center than *P. similis*. However, Spearman analysis did not show any significant correlation among these species, while it reffered a significant relationship ($P<0.01$) among *I. inermis* and *Prionocypris zenkeri* (Table 2).

I. inermis was found from five stations with 85 individuals. Correspondence analysis (Figure 3) confirmed that *I. inermis* is cosmopolitan species because of its ocurrence closer to the center of CCA diagram. CCA displayed that *I. inermis* was related to redox potential and dissolved oxygen (Figure 3) while it was negatively correlated with temperature of water, electrical conductivity and pH (Figure 3). In contrast to Külköylüoğlu and Yılmaz (2006) the species shows a positive correlation to dissolved oxygen and a negative correlation to temperature of water. However, CCA displayed a positive relationship between the occurence of *I. inermis* and redox potential as the authors suggested. The same authors submitted the optima 115.73 μScm^{-1} and tolerance 13.05 μScm^{-1} values to electrical conductivity, while the optima 6.51 mg/L and tolerance 2.24 mg/L values to dissolved oxygen. Contrary to their results I evaluated these values in order of 380.542 μScm^{-1} and 148.625 μScm^{-1} to electrical conductivity and 7.59 mg/L and 4.09 mg/L to dissolved oxygen (Table 4). Nevermore, both the ETI value range of *I. inermis* to electrical conductivity was relatively low (Table 5) and the electrical conductivity values of stations where it found were changing from 135 μScm^{-1} to 528 μScm^{-1}. Anyway, Mezquita et al., (1999c) and Meisch (2000) reported *I. inermis* from cold waters with less conductivity. *I. inermis* was shown the highest ETI ranges to by order of salinity and dissolved oxygen. Spearman correlation analysis (Table 2) shows that *I. inermis* is not significantly related to changing in the values of environmental variables.

Meisch (2000) suggests that *I. inermis* has parthenogenetic populations. I already could not encountered bisexual populations of *I. inermis* in the literature. However, I found bisexual populations of *I. inermis* from St. 30 (Boyalıköy) with 19 individuals. Station 30 is a stony and wasted water body near an unimproved village road. It was a slow running creek. The values of pH and dissolved oxygen were relatively high, while water temperature value was a little lower than the other stations in county Göynük. The altitude of the station was 708 m.

P. similis that is reported from muddy - stony ponds and the littoral zone of lakes (Meisch 2000) is a new ostracod species for non – marine habitats of Turkey, so Bolu region. *P. similis* had the least tolerance value to pH with *Physocypria kraepelini*. Moreover, the highest optima value (*uk*: 9.37) to dissolved oxygen among 16 species was for *P. similis*, while the least ETI range of *P. similis* was for redox potential (Table 5). Anyway, the species was shown a positively significant correlation with redox potential on CCA diagram (Figure 4). Although, *P. similis* had a positive significant correlation to dissolved oxygen, its relationship with redox potential was very close on CCA diagram. It was found from four stations with 124 individuals (Appendix 1 and Appendix 2). Whether, Spearman analysis shows a significant relationship between the species and pH, the values of environmental variables were changing from minimum to maximum such as; dissolved oxygen values 6.46-11.99 mg/L, temperature of water 13.10-20.40^{o}C, saturation 12.4-119.5%, electrical conductivity 326-526 µScm^{-1}. *P. similis* also had almost constant values for pH (7.87–8.2) and redox potential (as SHE 143.96–154.49 mV).

Two species of family Candonidae, *C. candida* and *C. neglecta* were clustered in UPGMA dendogram as Group IV (Figure 3). Moreover, they were shown a location closer to the center of CCA diagram near to each other (Figure 4), while Spearman correlation analysis was indicated a significant relationship (r: 936, P<0.01) among them (Table 2).

C. candida was described as oligothermophilic (Hiller 1972), mesohalophilic, stenochronal, cold stenotermal (Yılmaz 2005), euchronal (Keyser and Nagorskaya 1998) and cosmopolitan (Külköylüoğlu 2004). Indeed, the location closer to the center of the species in the CCA ordination diagram was reffered that *C. candida* had widely distribution as a cosmopolitan species (Figure 4). Moreover, in this study, bisexual populations of species was found from 12 stations with 60 individuals (Appendix 1). Correspondence analysis shows that *C. candida* has a positive significant correlation by order of temperature of water, electrical conductivity and pH (Figure 4). Although, Spearman correlation shows that there is not a significant relationship between *C. candida* and environmental variables, it is found in cool (2.4^{o}C) water (Appendix 2). Though, (Yılmaz 2005) suggested that *C. candida* was negatively correlated with increasing of water temperature and positively related to high oxygen concentration, the location of the species closer to the center of CCA diagram (Figure 4) displayed that *C. candida* was positively related to five environmental variables (pH, EC, DO, SHE and temperature of water) which calculated in this study. ETI values of *C. candida* to environmental variables were relatively high but electrical conductivity (Table 5), while optima and tolerance estimation analysis confirmed that *C. candida* had the highest optima value (*uk* : 0.624) for pH (Table 4). Optima and tolerance values (*uk*: 422.31 and *tk*: 121.38) for electrical conductivity were higher in contrast to Yılmaz (2005). The author submitted these values by order of 97.65 and 11.04, while the optima value of the species for dissolved oxygen cited very high in such study. The calculated ranges for environmental variables of the stations that *C. candida* found were changing by the least to the highest (Appendix 1 and Appendix 2). Both these calculated variables (Appendix 2) and optima – tolerance estimation (Table 4) show that *C. candida* can be found with redox potential levels between 74.23 mV and 205.28 mV, dissolved oxygen levels between 1.72 mg/L and 14.72 mg/L, electrical conductivity between 135 μScm^{-1} and 659 μScm^{-1} and water temperature between 13.80^{o}C and 27.50 ^{o}C. The results built up the idea that specified *C. candida* as cosmopolitan species.

The other species in Group IV in the UPGMA dendogram was *C. neglecta*, which was shown with same relationships in the analyses of Karakaş-Sarı (2006). *C. neglecta* can be called as cold-stenotherm and oligothermophilic (Roca and Baltanás 1993). Mischke (2001) pinpointed that *C. neglecta* is known from Holarctic regions with wide tolerance to cold and organically habitats. Besides, in the present study, it has optimum value for temperature (18.50ºC), which represents oligothermophilic characteristic, like *C. candida*. The species shown relatively high pH tolerance with *C. candida* among 16 species (Table 4), while ETI ranges of *C. neglecta* for pH was the highest (Table 5). Furthermore, in this study, *C. neglecta* was found from pH ranges as 6.84 to 9.45 similar to Roca and Baltanás (1993) that reported the species between 6.8 to 9.4 pH ranges. Anyway, in this study, the placement of the species in CCA diagram reffered that it has a positive significant correlation especially with pH (Figure 4). Supportive knowledges also come from optima and tolerance levels of the species (Table 4). Moreover, Karakaş-Sarı (2006) reported the species from pH 6.9 and Külköylüoğlu (2005c) found species from pH 6.73. It is also counted that *C. neglecta* has higher dissolved oxygen tolerance ranges (Külköylüoğlu 2003c). Meisch (2000) suggested that the species could even survive under hypoxic conditions with oxygen levels below (3 mg/L). *C. neglecta* was collected from 27 stations, where minimum 1.38 mg/L and maximum 11.99 mg/L dissolved oxygen levels found (Appendix 1 and Appendix 2). Moreover, the optima and tolerance levels of *C. neglecta* for dissolved oxygen were as 5.81 mg/L and 1.93 mg/L (Table 4). Correspondence analysis shows a negative significant correlation between *C. neglecta* and two environmental variables as redox potential and dissolved oxygen, while its occurence positively related to pH, electrical conductivity and water temperature (Figure 4). Although, Spearman analysis (Table 2) shows that there is not a significant correlation between *C. neglecta* and environmental parameters, saturation values of the 27 stations ranged from 5.5% to 119.5% (Appendix 1 and Appendix 2). Such result also suggests that the species may be considered as stenochronal and oligothermophilic species.

H. incongruens in UPGMA dendogram clustered in the same group (G. V) with *I. bradyi* and (Figure 3) that these two species were found related each other in Spearman Correlation analyses (Table 2). The other species which clustered in UPGMA dendogram with them (G. V) was *Ps. olivaceus.* The relationship between these species could be explained by the Optima *(uk)* and Tolerance *(tk)* values. Therefore, optimum and tolerance levels of three species are relatively close each other. Dissolved oxygen (DO) optimum value for *H. incongruens* is 7.15 mg/L and the tolerance value 6.69 mg/L where *I. bradyi* had optimum value for dissolved oxygen 6.34 mg/L and tolerance of 2.07 mg/L and *Ps. olivaceus* had by order of 5.84 mg/L and 1.74 mg/L (Table 4). Karakaş-Sarı (2006) found dissolved oxygen optima value for *H. incongruens* as 6.17 mg/L and tolerance value 0.78 mg/L that the tolerance value is very lower than the ranges from this study. This result can grow out of being widespread of *H. incongruens*. Moreover, *H. incongruens* and *I. bradyi* are located closer to center of CCA diagram, while *Ps. olivaceus* shows positive significant correlation with especially redox potential and then dissolved oxygen (Figure 4).

Heterocypris incongruens is known with widespread distribution. Schornikov and Trebukhova (2001) submitted that the species could even tolerate heavily polluted water bodies. *H. incongruens* was collected from 54 stations with 1623 individuals. It was common only species of all nine counties. ETI values for environmental variables are higher, while ETI value for pH (0.67) is relatively lower

(Table 5) in contrast to Karakaş-Sarı (2006). She suggested that the species had higher tolerances (*tk*) and ETI values for pH, redox potential and electrical conductivity, while temperature tolerance *(tk)* and ETI value were relatively lower. Besides, in this study, the water temperature tolerance (*tk*) and ETI values were higher than her results (*tk*: 8.84^{o}C, ETI: 0.96), while similar to Karakaş-Sarı (2006) the species had higher tolerance and ETI value for electrical conductivity (*tk*: 358.48 μScm^{-1}, ETI: 0.968). Külköylüoğlu (2005a) recorded the species in waters with 6.0°C -29.0°C temperature ranges. It appears from the calculated values of the stations that this species had a wide tolerance range for pH (6.95 - 8.99), water temperature (12.50-33.10^{o}C) and it was also reported from waters with very low oxygen (1.51-20.0 mg/L), conductivity (73.6-1431μScm^{-1}), saturation (6.5-200%) in this study. Külköylüoğlu (2005a) found species dissolved oxygen between 0.40 mg/L to 14.50 mg/L, while Karakaş-Sarı (2006) affirmed the range of species for dissolved oxygen very low as 2.88 mg/L. Spearman analysis did not show any significant relationship between *H. incongruens* and environmental variables, it displayed a positive significant correlation (r: 0.843, $P<0.01$) between *H. incongruens* and *I. bradyi* (Table 2). It has wide ranges of tolerances as a cosmopolitan species, in this study species was found frequently, like *I. bradyi* and *Ps. olivaceus*.

Mezquita et al. (1999a) found *I. bradyi* with minimum 1030 μScm^{-1} and maximum 2320 μScm^{-1} conductivities in Mediterranean river, while Külköylüoğlu (2005b) reported with minimum 314.5 μScm^{-1} and maximum 734 μScm^{-1} conductivities in two limnocrene springs. *I. bradyi* had a greater tolerance to conductivity that was changing from 116.8 to 1431 μScm^{-1} in this study (Appendix 1 and Appendix 2), when its tolerance range for dissolved oxygen was listed in order of between 1.96 mg/L and 13.63 mg/L. *I. bradyi* really has a wide tolerance limits to environmental variables, although it is sensitive to pH that is not too change (7.12 – 8.80). It is stated that this species existed throughout the year by Meisch (2000).

According to ETI of *Ps. olivaceus,* this species can occur at the environmental conditions with relatively high ETI values. The least ETI value of *Ps. olivaceus* was for redox potential (Table 5). While similar to Karakaş-Sarı (2006) the tolerance (*tk*: 0.32) of species are the least for pH, the species has the highest optimum value for redox potential with *Ps. fontinalis* among the other species (Table 4). Külköylüoğlu and Yılmaz (2006) found this species from the springs with the average of temperature 13°C, dissolved oxygen 7.26 mg/L and conductivity 116.83 μScm^{-1}, while Roca and Baltanás (1993) reported the species with the range of temperature as 6.5-16.4°C, dissolved oxygen as 8.0-9.9 mg/L, pH as 6.9-7.4, and conductivity as 108-636 μScm^{-1} ranges in a spring. Similarly, Karakaş-Sarı (2006) reported the optimum values for this species from the springs as optimum of pH (7.58), conductivity (624.49 μScm^{-1}), dissolved oxygen (8.76 mg/L), and temperature of water (15.20°C). The values of environmental variables from the species found stations were changing from minimum to maximum as pH 7.10-8.90, redox potential (as SHE) 137.86-205.33 mV, dissolved oxygen 1.96-14.06 mg/L, conductivity 95.6-946.0 μScm^{-1} , saturation 6.4-137.2% and water temperature 7.10-28.40°C. Although, Spearman analysis (Table 2) did not display any significant correlation between *Ps. olivaceus* and environmental variables, the species was shown positive significant relationship with five species as *P. similis* (r: 1, P<0.01), *H. rotundata* (r: 1, P<0.01), *Ps. fontinalis* (r: 0.98, P<0.01), *Pro. zenkeri* (r: 0.81, P<0.05) and I. *bradyi* (r: 0.55, P<0.01). The species is described as oligothermophilic (Meisch 2000; Roca and Baltanás 1993) and generally prefer cold waters (Baltanás et al., 1993). *Ps. olivaceus* which considered to be a parthenogenetic ostracod (Yılmaz

2005) was found from 40 stations with 635 individuals (Appendix 1 and Appendix 2). During this study, I found males and females from two stations. Anyway, Gülen (1985b) and Külköylüoğlu and Yılmaz (2006) reported bisexual populations of *Ps. olivaceus* from Turkey freshwater habitats.

The other species which belonging to genus *Psychrodromus* being found in this study was *Ps. fontinalis*. The species found from 16 stations with 275 individuals in this study (Appendix 1 and Appendix 2). The environmental variables values of these stations were changing from minimum to maximum as pH 7.12-8.80, redox potential (as SHE) 98.43-200.50 mV, electrical conductivity 146.4-654 μScm^{-1}, saturation 12.3-119% and water temperature 13.10-28.30^{o}C, while the stations were located at altitudes from 581 m to 1418 m (Appendix 2). Although, the location of *Ps. fontinalis* in CCA diagram (Figure 4) was so far to the center unlike *Ps. olivaceus*, Spearman analysis shown a significant correlation (r: 0.98, $P<0.01$) between these two species (Table 2). Furthermore, Spearman analysis shows a negatif correlation with pH and positive correlation both redox potential and a different cosmopolitan species, *I. bradyi*. Anyway, Correspondence analysis displays that *Ps. fontinalis* has a positive significant correlation to redox potential and dissolved oxygen, while it shows a negative significant relationship with pH, conductivity and water temperature like *Ps. olivaceus* (Figure 4). The highest ETI value of *Ps. fontinalis* was for water temperature and the least one for conductivity (Table 5). The optima and tolerance estimation analysis confirmed (Table 4) that *Ps. fontinalis* has a too high optima value for redox potential, while tolerance level for temperature of water is relatively low that can be described the species as oligothermophlic. Besides, this result built up the idea that explained the habitats of the species as cold slow running water bodies.

Danielopol and McKenzie (1977) connoted that *Ps. fontinalis* could be a more primitive species than the others in the genus. Baltanás et al. (1993) suggested that *Ps. fontinalis* was closely related to *Ps. betharrami* and they strongly resembled each other. The authors subsequently infered that *Ps. betharrami* was synonym to *Ps. fontinalis*. Moreover, Petkovski and Meisch (1995) submitted that both *Ps. fontinalis* and *Ps. betharrami* colonized the epigean and hypogean habitats of cold mountain springs and creeks. Same aouthors attracted notice that all known populations of *Ps. fontinalis* reproduced parthenogenetically. Although, Fox (1965a) described the males of the species from northern Italy, it was recognized that these males actually were belonging to *Ps. betharrami* by Baltanás et al. (1993). However, Petkovski and Meisch (1995) reported bisexual populations of *Ps. fontinalis* from Dautica Mountains in former Yugoslavia where they collected adult males and females which just reached sexual maturity in 1985. I collected adult males of *Ps. fontinalis* from St. 109 with 52 individuals after a long time. Ecologic characterization of *Ps. fontinalis* was described as coldstenothermal, polyrheophilic and stygophilic by Meisch (2000), when Baltanás et al. (1993) suggested that its vertical distribution was limited to a depth of 20 – 40 cm unlike some stygophilous and stygobiont species. *Ps. fontinalis* was found in six stations (St. 33, St. 61, St. 90, St. 104, St. 115, and St. 129) with *Ps. olivaceus* in this study (Appendix 1).

I. gibba (Ig) and *I. getica* (Ie) are the other species of genus *Ilyocypris* except *I. bradyi* (Ib) and *I. inermis* (Ii) which are collected in this study (Appendix 1). *I. gibba* was collected from ten stations with 119 individuals (Appendix 1). Although, Spearman analysis shows that there is not a significant correlation between *I. gibba* and environmental variables, it implies a significant relationship with *Ps. fontinalis*, and *H. incongruens* (Table 2). The location of I. gibba on CCA diagram displays that it shows a positive significant correlation for pH, conductivity and water temperature (Figure 4). The mean environmental values of the stations that *I. gibba* was found for pH as 7.99, redox potential (as SHE) 154.03 mV, dissolved oxygen 6.08 mg/L, electrical conductivity 517.2 μScm^{-1}, saturation 61.98% and temperature of water 20.62°C. The highest ETI value of the species was for water temperature (0.794 °C), while the least one for dissolved oxygen (0.217 mg/L). Optima and tolerance estimation analysis denotes relatively low values, while similar to Külköylüoğlu (2004) the species was collected from water bodies with low oxygen. It was determined as a cosmopolitan (Külköylüoğlu 2004), mesothermophilic to polythermophilic, rheoeuryplastic (Hartmann and Hiller 1977) and oligohalophilic (Meisch 2000) species.

Ilyocypris getica was found with five individuals in just one station (St. 17) where have values of environmental variables as pH 7.14, redox potential (as SHE) 200.8 mV, dissolved oxygen 5.24 mg/L, electrical conductivity 463.40 μScm^{-1}, saturation 58.9% and temperature of water 21.8°C (Appendix 1 and Appendix 2). *I. getica* is found before in Lake Sünnet (Külköylüoğlu, pers. comm.) and finding in this study is the second record for freshwater ostracods fauna of Bolu region. Meisch (2000) described the species as a stenothermal for a temperature range of 10-15°C. In this study, it is found from a creek with altitude of 861 m.

Five species belong to genus *Candona* were collected in this study. *C. lactea* is a new record for the Turkish freshwater Ostracoda fauna. Moreover, it is found in two stations (St. 20 and St. 125) with seven individuals. The environmental variables ranges of these stations were calculated as ph 8.24-8.90, redox potential 131.3-149.93 mV, dissolved oxygen 1.38-6.22 mg/L, electrical conductivity 346-696 μScm^{-1}, saturation 14.3-74.1% and temperature of water 16.80-24.70°C, while finding stations stated at altitudes from 897 m to 1190 m. Hence, it can depict as a polythermophilic and rheoeuryplastic. Although, Station 20 was a temporary pond where possibly could be affected by animal (e.g cows, sheep) and human, number 125 was a much rushy lake where close to a very busy road.

Candona weltneri was found in Station 6 where had environmental values such as pH 7.96, relatively high redox potential 157.98 mV, low dissolved oxygen 6.67, relatively low electrical conductivity 459.30 μScm^{-1}, low saturation 68.1% and relatively low water temperature 15.80^{o}C (Appendix 2). *C. weltneri* is also a new record for the Turkish freshwater Ostracoda fauna like *C. lactea*. Hiller (1972) determined two intraspecific forms of the species as *C. weltneri* forma *weltneri* and *C. weltneri* forma *obtusa*. However, I could not characterized the form of the species but the calculated datas shown that it could be *C. weltneri* forma *obtusa* because of its ecological features which Meisch (2000) suggested as oligothermophilic (prefering cold waters) and oligorheophilic (occuring in flowing waters).

Candona sanociensis which is a new record for the Turkish freshwater Ostracoda fauna is collected from two stations. The ranges of ecological variables were as pH 7.78-8.10, redox potential 145.28-171.14 mV, dissolved oxygen 4.34-7.95 mg/L, conductivity 326.7-530 μScm^{-1}, saturation 56.2-85.7% and temperature of water 7.10-27.50^{o}C. The location of *C. sanociensis* closer to the center of correspondence analysis diagram (Figure 4) designates that it shows wide distribution as a cosmopolitan. CCA diagram displays a strong correlation between the species and especially redox potential and dissolved oxygen (Figure 4). The ecological features of the species found stations are very different from each other. Station 12 is a small running, muddy and roadside brook at altitude of 1075 m, Station 60 is a stagnant and small temporary pond.

Potamocypris villosa which recorded second time for Bolu region was collected from 14 stations with 208 individuals. Külköylüoğlu and Yılmaz (2006) reported first time from a helocrene spring in Bolu. The measurement ranges of environmental variables were as pH 7.25-8.90, redox potential (as SHE) 120.52-192.16 mV, dissolved oxygen 1.38-17.10 mg/L, conductivity 116.80-696 μScm^{-1}, oxygen saturation 70.40-122.70% and water temperature 14.80-24.70^{o}C. Baltanás (1992) described the species as a most probably cosmopolitan. However, in this study, the location of *P. villosa* is so far to the center of CCA diagram (Figure 4) in contrast to Külköylüoğlu and Ylımaz (2006). However, the authors suggested that it was negatively correlated with pH, electrical conductivity and temperature of water, when it prefered oxygen rich water and positivly correlated with redox potential similar to the results of this study. Although, they explained optima estimate for conductivity (*uk*: 120.16) that was called “high” by them, it was actually more lower than the optima (*uk*: 366.52) results of this study (Table 4). The highest ETI value is for pH and the least one for water temperature (Table 5). The tolerance estimates especially for oxygen saturation and water temperature were relatively high. Spearman correlation analysis displays that there is not a significant correlation between the species and environmental variables, while it shows a specific relationship to *Ps. olivaceus* and *H. incongruens* (Table 2). Mezquita et al. (1999) submitted that was a cold stenothermal species and the results here recorded actually confirmed this characterization.

Potamocypris fulva was found in one station (Appendix 1). It is recorded for second time from Turkey, while the first one is also found in Lake Yeniçağa, in Bolu by Külköylüoğlu et al. (2007). The measurement values of the station (St. 103) were as pH 8.36, SHE 134.45 mV, dissolved oxygen 8.46 mg/L, conductivity of water

209.10 μScm^{-1}, oxygen saturation 80.1% and water temperature 13.30^{o}C (Appendix 1 and Appendix 2). Külköylüoğlu et al. (2007) found it in winter with a very low water temperature (1.56 ^{o}C) and relatively high water conductivity (465.6 μScm^{-1}) and dissolved oxygen (11.368 mg/L). Although, the authors found it from a heavily polluted shallow lake, the station where the species was collected in present study was a small running creek near a busy plateau road in the forest. There were many *Leucopthere* in the water. Meisch (2000) determines its ecological characterization as a stygophilic species which occur throughout the year in epigean habitats.

Potamocypris smaragdina is a new record for the Turkish freshwater Ostracoda fauna. It was collected from Station 83 where seemed to be a permenant ditch water at altitude of 1190 m (appendix 2). The station was an oxygen (4.33 mg/L), conductivity (367.30 μScm^{-1}) and saturation (54.9%) low water where had relatively high temperature (27.40^{o}C), pH (7.48) and redox potential (174.94 mV) values. Hiller (1972) characterized as polythermophilic, oligorheophilic, mesotitanophilic and euryplastic for pH, while Meish (2000) suggested that it tolerated slightly salty conditions.

Another cosmopolitan species was *Darwinula* aff. *stevensoni* which was collected from only the Station 142 (Appendix 2). When Karakaş-Sarı (2006) implied that tolerance levels of *D. stevensoni* were very high, Külköylüoğlu (2004) confirmed her highly environmental tolerances. Moreover, Yılmaz and Külköylüoğlu (2006) found relatively high dissolved oxygen (*tk*: 0.15) and oxygen saturation (*tk:* 5.24) and low pH (3.67) tolerances of the species. Karakaş-Sarı suggested ETI values for these variables were relatively lower. Furthermore, the values of these variables calculated as pH 7.32, SHE 187.0 mV, dissolved oxygen 6.65 mg/L, conductivity of water 659 μScm^{-1}, oxygen saturation 84.2%, water temperature 25.0^{o}C and salinity

0.3 ppt. Rossetti et al. (2004) explained a close relationship between *D. stevensoni* and pH, when Yılmaz and Külköylüoğlu (2006) confirmed this result. Külköylüoğlu (2005c) considers that *D. stevensoni* can exist throughout the year, while Yılmaz and Külköylüoğlu (2006) submit it strongly related to cold water temperatures. Hiller (1972) determined *D. stevensoni* as a species which tolerated to mesohaline range, while Karakaş-Sarı reported it from a rheocrene spring where shown salinity range differs from 0.1 to 0.3 ppt. Regrettably, in this study, just a few subfossil forms of the species were found from a spring with high temperature.

Herpetocypris chevreuxi was collected from five stations during this study (Appendix 1). The species is appeared to have low ETI ranges for environmental conditions in contrast to Karakaş-Sarı (2006), while water conductivity ETI values are relatively higher (Table 5). Besides, the tolerance values for dissolved oxygen, pH and water temperature are very low (Table 4). Moreover, the optima value for electrical conductivity and saturation of *Hr. chevreuxi* were the highest among 16 species (Table 4). *Hr. chevreuxi* was collected from variable ranges as pH 7.32-8.64, SHE 96.12-187.0 mV, dissolved oxygen 6.65-7.88 mg/L, conductivity 359.2-1475 μScm^{-1} , oxygen saturation 72.8-117.5% and water temperature 18.8-33.9°C. Despite the results of Karakaş-Sarı (2006) dissolved oxygen values relatively lower. Although, temperature range of the species was given between 15-24°C (Külköylüoğlu and Vinyard 2000), said values that calculated in this study were relatively higher. Anyway, Finn (2005) in Germany found positive correlation between the species and temperature that the species was found was 20.7°C. In present study, *Hr. chevreuxi* located closer to center of CCA diagram that displayed the species had wide tolerance to the environmental variables (Figure 4). In CCA diagram the species strongly related to water conductivity, pH and temperature of water, while it was shown a negative relationship with dissolved oxygen and redox potential.

Herpetocypris brevicaudata here reported the second time for non-marine ostracod fauna of Turkey and certanly new for Bolu region. It was collected from two stations (St. 31 and St. 90) where one of them was a small lake (Appendix 1 and Appendix 2). The Lake Şirinyazı is frequently visited by people and it seemed to be a polluted lake. When the samples were collected from littoral zone of the lake, it was already very busy. The variables ranges of the stations were as pH 7.65-8.8, SHE 141.16-169.15 mV, dissolved oxygen 7.77-9.52 mg/L, water conductivity 244.80-396.20 μScm^{-1}, oxygen saturation 91.5-116.0% and water temperature 21.9-24.6^{o}C. *Hr. brevicaudata* was located closer to the center of CCA diagram (Figure 4). CCA diagram displays that the species positively related to conductivity, water temperature, dissolved oxygen and pH, while it shows a negative relationship with redox potential just like *Hr. chevreuxi*. It shows higher survival rates and faster development at 19-23^{o}C (Meisch 2000). The water temperatures value (21.9-24.6^{o}C) that calculated in present study confirmed this suggetion. Mozo et al. (1996) emphasized that parthenogenetic populations were known throughout Europe, while bisexual populations were reported from Algeria and Portugal.

Herpetocypris reptans which is reported second time for Bolu region is found in Station 14 with 150 individuals (Appendix 1). *Hr. reptans* is well known cosmopolitan species. Firstly, Külköylüoğlu et al. (2007) reported it from a heavilly polluted shallow lake with values of environmental variables as pH 8.09, redox potential -67.6 mV, dissolved oxygen 8.99 mg/L, water conductivity 500.7 μScm^{-1}, saturation 102.5%, water temperature 16.4^{o}C and salinity 0.24 ppm. Despite these values, the values here calculated were relatively lower such as pH 7.24, dissolved oxygen 5.57 mg/L, conductivity 544 µScm^{-1}, oxygen saturation 53.2%, water temperature 13.2 ^{o}C and salinity 0.3 ppt. Both Hiller (1972) and Vesper (1975) described its ecological characterization as thermoeuryplastic, mesorheophilic and titanoeuryplastic, when Meisch (2000) submitted it as mesohalophilic and Keyser and Nagorskaya (1998) characterized as meso- to oligotrophic and eurythermophilic.

Scottia pseudobrowniana was collected from only two stations with five living individuals (Appendix 1). It is known as a crenobiont species. Moreover, Karakaş-Sarı (2006) shows low values whose of both ETI and tolerance estimation of the species for environmental variables. It appears that the species is very sensitive to all environmental values. Furthermore, species was found when the salinity was relatively lower in contrast to Karakaş-Sarı (2006). When Külköylüoğlu (1999) showed the oxygen range of species changes between 3.0 to 8.5 mg/L, Karakaş-Sarı (2006) found the species in a rheocrene spring with maximum dissolved oxygen 9.24 mg/L. Whereas, in this study species found maximum 2.93 mg/L that was appeared it had a wide range for dissolved oxygen. Furthermore, the species was located on the negative side of dissolved oxygen and redox potential, when its occurrence was strongly related to pH, electrical conductivity and temperature of water (Figure 4). Meisch (2000) cited that species could have a wide range of environmental variables depending to its thick valves, heavily developed clams and strong muscles which obtain the species living in semi-terrestrial habitats. Moreover, Meisch (2000) emphasized that it was detritivorous.

Prionocypris zenkeri was collected from 13 stations with 98 individuals (Appendix 1). Even though Karakaş-Sarı (2006) defined that the species had “super tolerance” ETI levels to environmental variables, the ETI values of *Pro. zenkeri* here calculated were relatively lower (Table 5). Besides, optima and tolerance estimation values were seemed lower (Table 4). Spearman Correlation both found *Pro. zenkeri* strongly related to *I. bradyi* similar to Karakaş-Sarı (2006) and it shown a significant correlation between the species and two environmental variables; pH and redox potential (Table 2). Moreover, Spearman analysis displays that *Pro. zenkeri* is also strongly related to *Ps. olivaceus* and *I. inermis* all but *I. bradyi*. This positive relationship can be arised because these species are non-swimming and cosmopolitan species. Besides, CCA diagram implies that the occurrence of *Pro. zenkeri* is strongly related to redox potential and dissolved oxygen (Figure 4). Anyway, the ranges of these variables were calculated as SHE 105.30-203.45 mV and dissolved oxygen 3.34-14.60 mg/L (Appendix 2).

Cypria ophtalmica which described as almost cosmopolitan by Külköylüoğlu (2003c) was found from relatively warm (20.4-25.0^{o}C) with low to high oxygen as 5.40-13.63 mg/L and alkaline (7.32-8.71) water (Appendix 1 and Appendix 2). These species appeared to show tolerances to the changes in environmental variables during this study. Meisch (2000) reported that species optimum temperature can lie between (2.2-8.4ºC) and he also considered that species have wide tolerance to temperature. Even though, this species was shown very high optima (*uk*: 21.472) and tolerance (*tk*: 7.096) level for temperature in this study (Table 4), ETI value for temperature (0.145) was very lower than the others (Table 5). Moreover, Keyser and Nagorskaya (1998) suggested that the species used to thrive in eutrophic conditions, when Rossetti et al. (2005) found it from a spring where could be characterized by high ionic content and rich chloride (13 gl^{-1}). Species was found the range of 164.10 to 849 μScm^{-1} of water conductivity also have a relatively high optima (*uk*:644.692) and tolerance (*tk*: 206.876) estimates for conductivity (Table 4). Oxygen saturation related to dissolved oxygen species was found (16 to 92.2%) of saturation (Appendix

2). When Karakaş-Sarı (2006) found the species abundantly in a rheocrene spring where the high contamination of lime dust was observed on the aquatic plants, Rossetti et al. (2005) commonly collected *Cp. ophtalmica* from the springs with high degree of eutrophication. *Cp. ophtalmica* was located closer to the center of CCA diagram by very close to *Hr. brevicaudata* (Figure 4). CCA diagram displays that the species positively related to conductivity, water temperature, dissolved oxygen and pH, while it shows a negative relationship with redox potential.

Cypridopsis vidua is a well known cosmopolitan species. It is collected from five stations with 222 living form. According to correlation analysis, even though there was a significant correlation between *Cy. vidua* and *Ps. fontinalis*, analysis displayed that the species was not related to environmental variables (Table 2). Its location opposite of CCA center implied that the occurrence of the species seemed to be relatively specific to the ecological conditions (Figure 4). Still, *Cy. vidua* shown a positif significant relationship with pH, water conductivity and temperature of water. Species was found the range of 7.36 to 9.45 of pH, 53.34 mV to 131.30 mV of SHE, 5.6 mg/L to 14.72 mg/L of dissolved oxygen, 77.10 μScm^{-1} to 552 μScm^{-1}, 64.5% to 178.2% oxygen saturation and 18.5^{o}C to 29.1 ^{o}C (Appendix 2). Indeed, these values shown that it could tolerate high levels of environmental variables which confirmed suggestion of Lim and Wong (1986), Kiss (2001) and Külköylüoğlu et al. (2007). They reported the species from different habitats by order of water with high levels of pesticides from ricefield and heavily polluted shallow lakes. Especially, the report of Kiss (2001) emphasized that the species could be occured in waters with pH level increasing up to 9.09 which confirmed suggestion (9.45) of present study. Interestingly, Mbahinzireki et al. (1991) submitted that precence of *Cy. vidua* was closely related to the aquatic plant *Chara* because of prefering it as a shelter food source. Moreover, the highest ETI value of *Cy. vidua* was for pH (0.8) and the least for temperature of water (0.33) and conductivity (0.338) (Table 5). The optimum and estimated tolerance levels were relatively lower all but pH was one of the highest among 16 species. Interstingly, *Cy vidua* was the only species which its optima (*uk*: 115.758) for conductivity shown the higher level than tolerance (*tk*: 120.895). This result can grow out of lower value (77.1 μScm^{-1}) of the station (St. 84) where the species was found with 200 individuals (Appendix 1 and Appendix 2). The water conductivity values of the other stations were also lower, while conductivity value of Station 84 was already lower than its oxygen saturation value. Ecological features of *Cy. vidua* were characterized as polythermophilic, mesorheophilic (Hiller 1972), phytophilic (Danielopol and Roca 1991) and oligohalophilic (Meisch 2000).

Trajancypris serrata which is second record for freshwater habitats of Turkey and first record in Bolu region is collected from Station 84 at altitude of 1439 m (Appendix 1 and Appendix 2). Sywula et al. (1982) collected from Polland the juveniles in springtime and adults in autumn which could be called summer form (Meisch 2000). Station 84 where was rich for algae was a muddy and stagnant water near slow flowing creek. It was close to a very busy road. The value of pH 9.45, redox potential 53.34 mV, dissolved oxygen 5.60 mg/L, water conductivity 77.1 μScm^{-1}, oxygen saturation 87.1% and temperature of water 29.1^{o}C (Appendix 2). Bronshtein (1947) captured the species at altitude of 2350 m. Keyser and Nagorskaya (1998) collected *T. serrata* from the small shallow and muddy ponds where they were shown mesotrophic conditions, while the authors determined it as Palearctic.

Eucypris virens was collected from one station where it was a small lake. *E. virens* is a cosmopolitan species which shows wide tolerance ranges to environmental variables. For example, when Mezquita et al. (1999a) suggested that the species was shown wide tolerance ranges to pH from 7.60 up to 9.27, Külköylüoğlu et al. (2007) promulgated these datas from 7.34 up to 8.39. Indeed, in this study, this value was calculated as 8.80. Furthermore, species was found in level of redox potential 141.16 mV, dissolved oxygen 9.52 mg/L, conductivity 396.2 μScm^{-1} , oxygen saturation 116%, water temperature 24.60^{o}C, salinity 0.2 ppt and Total Dissolved Solids (TDS) 257.53 mg/l (Appendix 2). The value of water temperature is confirmed the suggestion of Külköylüoğlu (2000) such as he announced that value did not exceed 24^{o}C. *E. virens* has a wide distribution in the Holarctic region. Although, the species was reported from water with an altitude up to 2000 m (Meisch 2000), it was found in a lake at altitude up to 1073 m, in this study. Interestingly, it is reported that *E. virens* can feed on both dead and live animals whose members of its own species (Meisch 2000).

Fabaeformiscandona is a genus of family *Candonidae*. It containes ca 50 recent species (Meisch 2000). So far only known three species (*F. caudata*, *F. csickii* and *F. fabaeformis*) of *Fabaeformiscandona* from Turkey (Altınsaçlı and Griffiths 2002). Whereas, I ascertained six species (*F.balatonica, F. fabaeformis, F. breuli, F. brevicornis, F. protzi* and *F. latens*) during this study. This result has been causing to think the idea of high species diversity in Turkey.

Fabaeformiscandona fabaeformis (Ff) is a known species in Turkey. It is collected from two stations (St. 16 and St. 137) with the ranges of pH 7.71-7.90, redox potential 161.88-165.46, dissolved oxygen 5.6-7.57 mg/L, water conductivity 435.9-523 μScm^{-1} , saturation 52.5-92.6% and water temperature 15.8-24.3^{o}C (Appendix 2). Although, the datas that was given by Külköylüoğlu et al. (2007) were almost similar to result of this study, dissolved oxygen (13.14 mg/L) accordingly oxygen saturation (142.3%) which they suggested were relatively higher. It is previously reported maximum of 8.1% salt content which has a mesohaline range. Anyway, its salinity range lies from 0.2 to 0.3 ppt in this study, while Külköylüoğlu et al. (2007) emphasized it 0.26 ppm. However, Hiller (1972) characterized *F. fabaeformis* as mesothermophilic, oligorheophilic, mesohalophilic and euryplastic for pH. It is a Holarctic species.

Fabaeformiscandona balatonica (Fa) is a new report for non-marine Ostracod fauna of Turkey. Bisexual populations was captured from two stations with the ranges of pH 7.88-8.90, SHE 146.75-160.93 mV, dissolved oxygen 6.80-7.43 mg/L, electrical conductivity 251-490.1 μScm^{-1}, oxygen saturation 72.8-84.4%, temperature of water 18.8-21.3^{o}C, salinity 0.1-0.2 ppt and Total Dissolved Solids 163.15-118.57 mg/l (Appendix 2). These two stations were creeks and one of them was slow running and roadside, while the other was closed at least to a canal where probably summer dried. It characterized as mesothermophilic (Meisch 2000) that was confirmed by results of present study. It is possibly Holarctic.

Fabaeformiscandona protzi (Fp) is also a new record for Turkey. Bisexual population of the species was found in Station 112 where had the values of environmental variables as relatively low dissolved oxygen (6.46 mg/L) level, low water temperature (20.4^{o}C) level, conductivity 522 μScm^{-1}, oxygen saturation 73.2% and salinity 0.3 ppt (Appendix 2). Although, Hiller (1972) submitted it as winter form, the species was found from May to June (Keyser and Nagorskaya) in the literature. The species usually prefers cold and shallow waters. Anyway, Station 112 is a medium cold and shallow creek where was located in the middle of a village at altitude up to 1048 m. This cold stenotherm species (Keyser and Nagorskaya) was reported from the depths of 17-23 m in Lake Arendsee (Meisch 2000), when Löffler (1969) collected subfossil valves from the deepest area (250 m) of Lake Constance.

F. protzi was also reported from the water had partially recovered from eutrophication due to human activities (Danielopol et al., 1985 in Meisch 2000). When Hiller (1972) characterized the species as cold stenothermal, mesorheophilic and euryplastic for pH, Meisch (2000) additonally implied that was a mesohalophilic. The species mainly found in the northern part of Palaearctic region.

Fabaeformiscandona cf. *breuli* (Fb) was collected from the same stations with *F. protzi.* The ecological features of the station were given above. *F. breuli* is reported first time for freshwater habitats in Turkey. Adult females were collected from February to May by the name of *F. hertzogi* (Klie 1938). This stygobitic species survives in epigean habitats where at least connecting to underground waters. It was collected from springs an altitude up to 1230 m in Poland (Meisch 2000). *F. breuli* has a wide distribution in central and southern Europe.

Fabaeformiscandona brevicornis (Fr) which is captured from Station 135 is a new report for Turkey. The species finding station was a slow flowing creek in the heart of the forest, while there were more *Gammarus*. The station had relatively high water conductivity (605 μScm^{-1}) and warm water (22.6^{o}C) conditions (Appendix 2). The creek was low oxygenated (8.45 mg/L), while medium high value of redox potential was acceptable. Even though its life history is poorly known, it is reported from both hyporheic habitat of a stream (Nüchterlein 1969) and slow flowing waters (Meisch 2000). Moreover, the ecological characterization of *F. brevicornis* is given as coldstenothermal, mesorheophilic and euryplastic for the substrate by Nüchterlein (1969). Accordingly, the datas of this study relatively confirmes the suggestion of the author.

Another species belong to genus *Fabaeformiscandona* which here reported newly for Turkey is *F. latens*. The species was found in Station 25 whose calculated values for environmental variables were largely different than the others. For example, it was rich oxygenated (17.1 mg/L) for dissolved oxygen and accordingly for oxygen saturation (119%) and relatively cold water (14.8°C) (Appendix 2). The values for redox potential (144.43 mV) and electrical conductivity (241.4 µScm^{-1}) were relatively lower, when the altitude (897 m) of it was already low. The station was a probably permanent brook where located close to a road. Besides, there was a running stream the other side of the road. Although, this stygobitic species (Meisch 2000) has wide ecological tolerance, it sometimes can survive in epigean habitats. The ecologic characterization (oligothermophilic, mesorheophilic and oligotitanophilic) which announced by Nüchterlein (1969) was confirmed by this study. Interestingly, there is no fossil record of *F. latens*, as well (Meisch 2000).

Schellencandona is a genus of family *Candonidae*. Although, it includes five stygobitic species, it is so far unknown from Turkey. Furthermore, *S. belgica* was collected from Station 43 with the values of pH 7.65, redox potential 167.4 mV, dissolced oxygen 5.26 mg/L, electrical conductivity 517 µScm^{-1}, oxygen saturation 63.3%, water temperature 24.7°C, salinity 0.3 ppt and Total Dissolved Solids 336.05 mg/l (Appendix 2). The station was located an altitude up to 1113 m. The species life history is actually unknown, while there is no fossil record of the species. It is previously reported from the wells, rivers and interstitial habitat. The species here finding station was a trough where was entertained permanently from a spring.

Pseudocandona compressa was previously captured from the waters with high ionic contents, trophic conditions (Rossetti et al., 2004) and lakes (Dügel and Külköylüoğlu 2007, in press). It has a geographical distribution in the Holarctic region (Meisch 2000). Moreover, in present study, the species was collected from one station where seem to be a devoid oxygen conditions (5.1 mg/L) accordingly percent oxygen saturation (64.9%) (Appendix 2). The values of redox potential and electrical conductivity were also relatively lower in contrast to Külköylüoğlu et al. (2007). Because, they documented relatively higher ranges as pH 8.07-8.66, dissolved oxygen 7.34-16.47 mg/L, water temperature11.08-26.5^{o}C and oxygen saturation 82.3-193.8%. Although, Dügel and Külköylüoğlu (2007, in press) suggested that *Pse. compressa* was shown the highest tolerance value for redox potantial with a negative correlation to pH, I could not calculated tolerance and optima values because of finding the species from just one station. Anyway, it may be gathered from the calculated values that the species could have wide tolerance to environmental variables. Besides, Keyser and Nagorskaya (1998) defined *Pse. compressa* as a eurytherm which can tolerate eutrophic environments, when they collected adults from the Lake Minsk throughout the year. Hiller (1972) characterizes as mesothermophilic, oligorheophilic and euryplastic for pH, while Meisch (2000) defines it as oligo- to mesohalophilic and Dügel et al. (2007) emphasizes as a non-cosmopolitan species.

Pseudocandona albicans is here reported for second time from the region. It is found from a temporary pond where shows relatively low values to ecologic variables as pH 7.85, redox potential 159.65 mV, dissolved oxygen 6.87 mg/L, conductivity 281.7 μScm^{-1}, oxygen saturation 65.3%, temperature of water 19.7^{o}C and salinity 0.2 ppt. Roca and Danielopol (1991) suggest that the species has stygophilic behaviours, while it usually prefers very low salty conditions (Meisch 2000). It is mesothermophilic, mesorheophilic (Hartmann and Hiller 1977) and mesohalophilic (Meisch 2000) species. The results of the present study are largely confirming these suggestion. Still, outnumbered of finding both species and station can avoid to think like that.

Station 101 was a slowflowing creek close to a fish-hatchery an altitude up to 1467 m. Hence, it was usually visited by people and the values were relatively lower. For example, dissolved oxygen is calculated as 5.15 mg/L, electrical conductivity 95.6 μScm^{-1}, while the water was shown relatively cold (20.7^{o}C) conditions (Appendix 2). When pH showed a medium level (7.96), redox potential was also low. Whereas, Meisch (2000) emphasized that *Pseudocandona* cf. *semicognita* was reported from a shallow pond with acidic (5.5-6) conditions. *Pse. semicognita* which is collected from this station is a new record for Turkey freshwater ostracod fauna. *Pse. semicognita* which produces one generation in the year can survive in different habitats such as pools, seasonal ditches, littoral zones of lakes etc. Despite this limited data, its life history is waiting to descry.

Unweighted Pair Group Mean Averages (UPGMA) was used to indicate relationships among counties (Figure 2), when Sorrenson Similarity Index displayed the similarity of species among said counties (Table 1). When UPGMA analysis showed five main clustering groups of counties, the most similarity of species was between Göynük and Yeniçağa by 70% ratio. First group in UPGMA dendogram includes three counties as Dörtdivan, Kıbrıscık and Seben, while the second clustering group consists of one (Mengen). When the nearest relationship was between Yeniçağa and Göynük where grouped at fourth, Mengen (G. II) and Merkez (G. V) had very different similarities from the others. In fact, Sorrenson index showed a very low similarity between Mengen and Merkez, while the utmost similarity seemed btween Yeniçağa and Göynük (Table 1) on a support basis UPGMA analysis. Indeed, there were nine associated species between Göynük and Yeniçağa, while the common species of Mengen and Merkez were six (Appendix 3). Moreover, I collected five species from ten stations in Seben, this number was 25 from 47 stations for Merkez (Appendix 3 and Appendix 4). Besides, Kıbrıscık was the county where found the most species (9) from the least stations (7). The similarity index of Dörtdivan where found nine species from eight station was relatively lower (Table 1).

Finally, overall analysis which used to display both ecologic requirements of the species and environmental features of Bolu region supply some important estimations. Accordingly, the present study tried to determine the relationship between the species and show the distribution of the ostracods species of region. In fact, a great number of species is recorded in present study supports the idea claiming that there may be affluent species in Bolu because of its role between different regions. Needless to say that this idea can be current for Turkey due to its position as an ecological bridge between Europe and Asia.

REFERENCES

Absolon, A., 1970. Fossiles Vorkommen von Candona balatonica Daday, 1894 (Ostracoda). Mitteilungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie. 10: 199-204.

Absolon, A., 1973. Ostracoden aus einigen Profilen spät- und postglazialer Karbonatablagerungen in Mitteleuropa. Mitt. Bayer. Staatssamml. Paläont. hist. Geol. 13: 47-94.

Akdemir, D., 2004. Konya-Karapınar krater göllerinin Ostracot faunası [Ostracoda fauna of the crater lakes of Konya, Karapınar]. MSc Thesis, İstanbul University, İstanbul. 40 sayfa.

Altınsaçlı, S., 1988. Bergama (İzmir) Yöresi Ostrakod (Crustacea) Faunası ve Mevsimsel dağılımları [The Ostracoda fauna of the Bergama region and its seasonal changes]. Msc thesis, İstanbul University, İstanbul.

Altınsaçlı, S., 1993. The Ostracoda (Crustacea) fauna of Bergama (İzmir) region. İstanbul Üniv. Fen Fak. Biyoloji Der. 56: 9-20.

Altınsaçlı, S., 1997. The Ostracoda (Crustacea) Fauna of Lake Sapanca. İstanbul Üniv. Fen Fak. Biyoloji Der. 60: 17-45.

Altınsaçlı, S., 1999. The Ostracoda (Crustacea) fauna of Lake İznik. İstanbul Üniv. Fen Fak. Biyoloji Der. 61-32: 81-105.

Altınsaçlı, S., 2001a. A study on the seasonal distributions of Ostracoda (Crustacea) species found in Lake Eğirdir (Isparta/Turkey). Turkish Journal of Zoology. 25: 431-439.

Altınsaçlı, S., 2001b. The Ostracoda fauna of Lakes Erikli, Hamam, Mert, Pedina and Saka (İğneada, Kırklareli, Turkey). Turkish Journal of Zoology. 25: 343-355

Altınsaçlı, S., and Griffiths, H. I., 2001a. Ostracoda (Crustacea) of Lake Uluabat (Apolyont Gölü) (Bursa Province, Turkey). Limnologica. 31: 109-117.

Altınsaçlı, S., and Griffiths, H. I., 2001b. Ostracoda (Crustacea) from the Turkish Ramsar site of Lake Kuş (Manyas Gölü). Aquatic Conserv: Mar. Freshw. Ecosyst. 11: 217-225.

Altınsaçlı, S., and Griffiths, H. I., 2001c. The freshwater ostracods *Hungarocypris* and *Leucocythere* from Turkey. Crustaceana. 74(7): 681-688.

Altınsaçlı, S., and Griffiths, H. I., 2002. A review of the occurrence and distribution of the recent non-marine Ostracoda (Crustacea) of Turkey. Zoology in the Middle East. 27: 61-67.

Altınsaçlı, S., Kılıç, M., and Altınsaçlı, S., 2000a. A preliminary study on the Ostracoda (Crustacea) fauna of Lake Beyşehir. Turkish Journal of Zoology. 24: 375-385.

Altınsaçlı, S., Kılıç, M., and Altınsaçlı, S., 2000b. A preliminary study on the Ostracoda (Crustacea) fauna of Lake Akşehir. Turkish Journal of Zoology. 24: 9-16.

Altınsaçlı, S., and Kubanç, C., 1990. Ayvalık Yöresi Ostrakod (Crustacea) Faunası. X. Ulusal Biyoloji Kongresi Tebligleri. Erzurum. Sayfa: 55-62.

Altınsaçlı, S., and Yılmam, S., l995. Terkos Gölü (Durusu Gölü) Ostrakod (Crustacea) Faunası [The Ostracoda (Crustacea) fauna of Lake Terkos (Lake Durusu)]. Turkish Journal of Zoology. 19: 207-212.

APHA, 1988. Standard Methods for the examination of water and wastewater, American Public Health Association.

Athersuch, J., Horne, D. J., and Whittaker, J. E., 1989. Marine and brachish water ostracods. Synopses of the British Fauna (New Series). No: 43, 343 pp., 8 pls., E. J. Brill.

Aygen, C., and Balık, S., 1998. İzmir ili ve civarında tatlısu Ostrakoda (Crustacea) faunası. Su Ürünleri Dergisi. 15 (3-4): 283-292.

Aygen, C., and Balık, S., 2002. A new record for the freshwater ostracod fauna of Turkey: *Hungarocypris madaraszi* (Örley, 1886) (Crustacea: Ostracoda). Zoology in the Middle East. 25: 49-52.

Aygen, C., and Balık, S. and Ustaoğlu, R., 2004. Two new records for the non-marine ostracod fauna of Turkey: *Humphcypris subterranea* (Hartmann, 1964) and *Herpetocypris brevicaudata* Kaufmann, 1900. Zoology in the Middle East. 31: 77-81.

Baltanás, A., 1992. A contribution to the knowledge of the cypridid ostracode fauna (Crustacea, Ostracoda, Cyprididae) on the Iberian Peninsula, and a comparison with adjacent areas. Arch. Hydrobiologia. 3: 419-452.

Baltanás, A., Danielopol, D. L., Roca, J. R., and Marmonier, P., 1993. *Psychodromus betharrami* n. sp. (Crustacea, Ostracoda): Morphology, Ecology and Biogeography. Zool. Anz. 1/2: 39-57.

Bilton, T. D., Freeland, J. R., and Okamura, B., 2001. Dispersal In Freshwater Invertebrates. Ann. Rev. Ecol. Syst. 32: 159–81.

Boomer, I., Horne, D. J., and Slipper I. J., 2003. The use of palaeoenvironmental studies, or what can you do with an ostracod shell? The Paleontological Society. 9: 153-179.

Bronshtein, Z. S., 1947. Fauna SSSR. Crustacea. vol 2 no: 1 Ostracodes des Eaux Douches. Institut Zoologique de l'Academine des Sciences de URSS, Nouvelle Serie. 31:1–339.

Cole, M. E., 1966. Four genera of ostracods from Tennessee (*Darwinula, Limnocythere, Ilyocypris* and *Scottia*). Journ. Tennessee Acad. Science. 41: 135-146.

Curry, B. B., 1999. An environmental tolerance index for ostracodes as indicators of physical and chemical factors in aquatic habitats. Palaeogeog. Palaeoclim. Palaeoecol. 148: 51-63.

Çakıl, A., 1996. Küçükçekmece Gölü'nün Faunası ve Ekolojisi. Yüksek Lisans Tezi, İstanbul Üniversitesi, Biyoloji ABD, Sistematik Zooloji ve Müze Tekniği Programı, 82 sayfa.

Danielopol, D.L., 1978. Über Herkunft und Morphologie der Süßwasser-hypogäischen Candoninae (Crustacea, Ostracoda): On the origin and morphology of freshwater hypogean Candoninae (Crustacea, Ostracoda). Sitzungsberichte der Österreichische Akademie der Wissenschaften, Mathematisch-naturwissenschaftliche Klasse. Abt.I 187(1-5): 1-162.

Danielopol, D. L., and McKenzie, K. G., 1977. *Psychrodromus* gen. n. (Crustacea, Ostracoda), with Redescription of the Cypridid Genera *Prionocypris* and *Ilyodromus*. Zoologica Scripta. 6: 301-322.

Danielopol, D. L., Geiger, W., Tölderer-Farmer, M., Orellana, C. P., and Terrat, M. N., 1985. The Ostracoda of Montsee: spatial and temporal changes during the last 50 years. *In* D.L. Danielopol, R. Schmidt & E. Schultze, (eds.): Contributions to the Paleolimnology of the Trumer Lakes (Salzburg) and the

Lakes Mondsee, Attersee and Traunsee (Upper Austria). (Limnologisches Institut der Österreichischen Akademie der Wissenschaften, Mondsee): 99-121.

Delorme, L. D. 1983. Lake Erie oxygen: the prehistoric record. Can. J. Fish. Aquat. Sci. 39:1021-1029.

Delorme, D. 1991. Ostracoda. P. 691-722. *In* Ecology and Classification of North American Invertebrates (J. H. Thorpe, and A. P. Covich, eds). Academic Press, New York.

Diebel, K., and Pietzeniuk, E. 1975. Ostracoden aus dem holozänen Travertin von Bad Langensalza. Quartärpaläontologie. 1: 27-55.

Douglas, D. J., and McCall, G., 1992. The freshwater Ostracoda of Ireland. Bull. Irish biogeogr. Soc. 15: 91-109.

Dügel, M., Külköylüoğlu O., Kılıç M., 2007. Species assemblages and habitat preferences of Ostracoda (Crustacea) in Lake Abant (Bolu, Turkey). In press.

Eager, S. H., 1999. Distridution of Ostracoda around a coastal sewer outfall: a casestudy from Wellington, New Zeland. J. Royal Soc. New Zeland. 29: 257-264.

Finn, A. V., 2005. Freshwater ostracod assemblages and their relationship to environmental variables in waters from northeast Germany. In: Quantitative paleoenvironmental studies using freshwater ostracods in northeast Germany. Ph.D. dissertation. Ernts-Moritz-Arndt Universitat Greifswald. 135 pages.

Forester, R. M. 1991. Ostracode assemblages from springs in the western United States: Implications for Paleohydrology. Memoirs of the Entomological Society of Canada. 155: 181-201.

Forester, R. M., and Brouwers, E. M., 1985. Hydrochemical parameters governing the occurrence of estuarine and marginal estuarine ostracodes: an example from South-Central Alaska. J. of Paleontology. 59: 344-369.

Fox, H. M., 1965. New and interesting Cyprids (Crustacea, Ostracoda) in Britain. Annals and Magazine of Natural History, Review Series 13. 82: 623-633.

Gandolfi, A., Todeschi, E. B. A., Rossi, V., and Menozzi, P., 2001. Life hisroty traits in Darwinula stevensoni (Crustacea: Ostracoda) from Southern European populations under controlled conditions and their relationship with genetic features. J. Limnol. 60(1): 1-10.

Gauthier, H. I., and Evans, J. G., 1991. Some freshwater ostracods (Crustacea: Ostracoda) from South Wales. Freshwater Forum. 1(1): 64-66.

Gerecke, R., Meisch, C., Stoch, F., Acri, F., and Franz H., 1998. Eucrenon-hypocrenon ecotone and spring typology in the Alps of Berchtesgaden (Upper Bavaria, Germany). A study of microcrustacea (Crustacea: Copepoda, Ostracoda) and water mites (Acari: Halacaridae, Hydrachnellae). The bology of springs and spring brooks. 167-182. Backhuys Publishers Leiden.

Geslin, E., Debenay, J. P., Duleba, W., and Bonetti, C., 2002. Morphological abnormalities of foraminiferal tests in Brazilian environments: comparison between polluted and non-polluted areas. Marine Micropaleontology. 45: 151-168.

Ghetti, P. F., 1973. Dynamique des populations d'Ostracodes de duoze rizières italiennes. Notes d'écologie. Annales de la Station Biologique de Besse-en-Chandesse. 7: 273-294.

Griffiths, H. I., Evans, J. G. 1991. Some freshwater ostracods (Crustacea: Ostracoda) from South Wales. Freshwater Forum. 1: 64-72.

Griffiths, H. I., and Martin, D. S., 1993. The spatial distribution of benthic ostracods in the profundal zone of Loch Ness. The Scottish Naturalist. 105: 137-147.

Gülen, D., 1975. Kuzey Batı Anadolu sıcaksu kaynaklarında rastlanan hayvanlar. Med. Terap. Hidro Klimatoloji Yıllığı. 16-17.

Gülen, D., 1977. Contribution to the knowledge of the freshwater Osracoda fauna of Turkey. İstanbul Üniv. Fen Fak. Biyoloji Der. 42(1-4): 101-106.

Gülen, D., 1982. Türkiye için yeni Notodromus (Ostracoda) türleri. Tübitak VII. Bilim Kongresi Tebliğleri: 561-564.

Gülen, D., 1984. Ege Bölgesi sıcak su kaynaklarında rastlanan favna elemanlarından ostracodlar (Crustacea) [The living ostracod (*Crustacea*) species of the hot spring of the Aegean Region]. Tıbbi Ekoloji ve Hidro-klimatoloji Dergisi, 1.Ulusal Balneoloji Sempozyumu. Özel Sayısı. Cilt: 2, Sayı: 2-3: 124-130.

Gülen, D., 1985a. The Species and Distribution of the Group of *Podocopa* (Ostracoda-Crustacea) in Freshwaters of Western Anatolia. İstanbul Üniv. Fen Fak. Mec. Seri B. 50: 65-80.

Gülen, D., 1985b. Bisexual Ostracoda (Crustacea) Populations in Anatolia. İstanbul Üniv. Fen Fak. Biyoloji Mecmuası (Seri B). 50: 81-86.

Gülen, D., 1988. Contribution to the taxonomy of the freshwater Ostracod Fauna of Turkey. Su Ürünleri Dergisi. 2(1): 199–203.

Gülen, D., and Altınsaçlı, S., 1999. The Ostracoda (Crustacea) fauna of Sakarya River Basin. –Yerbilimleri (Geosound). 35: 69-84.

Gülen, D., Altınsaçlı, S., Kubanç, C., and Kılıç, M., 1994a. Türkiye Ostracoda (Crustacea) Faunası [The Ostracoda (Crustacea) fauna of Turkey]. -Unpublished project report TBAG-989: 1-45. –TÜBİTAK, Ankara.

Gülen, D., Altınsaçlı, S., Kubanç, C., and Kılıç, M., 1994b. İç Anadolu Ostrakod (Crustacea) Faunası [The Ostracoda (Crustacea) fauna of Central Anatolia Region]. -Ulusal Biyoloji Kongresi Tebliğleri, 6-8 Temmuz, Edirne. p: 187-190.

Gülen, D., Özuluğ, O., and Bilgin, H., 1996. Kabaklı Kaynağı (Diyarbakır) Ostrakod (Crustacea) Faunası [The Ostracoda (Crustacea) Fauna of Kabaklı Spring (Diyarbakır)]. XIII. Ulusal Biyoloji Kongresi Tebliğleri, 17-20 Eylül, İstanbul: 162-172.

Hartmann, G., 1964. Asiatische Ostracoden, Systematische und Zoogeographische Untersuchungen-Internationale Revue der Gesamten Hydrobiologie. Systematische Beihefte. 3: 1-155. Henderson, P. A., 1990. Freshwater Ostracods. –Synopses of the British Fauna (New Series) 42 (D.M. Kermack and R.S.K. Barnes, editors). Universal Book Services/Dr. W. Backhuys. 228 pages.

Hartmann., G., and Hiller D., 1977. Beitrag zur Kenntnis der Ostracodenfauna des Harzes und seines nördlichen Vorlandes (under besonderer Berücksichtigung des Mannchens von *Candona candida*. Jahre Naturwissenschaftlicher Verein Goslar. 125: 99-116.

Heino, D. J., Virtanen, R., Vuori, K. M., Saastamoinen, J., Ohtonen, A., and Moutka, T., 2005. Spring bryophytes in forested landscapes: Land use effects on bryophyte species richness, community structure and persistence. Biological Conservation. 124: 539-545.

Henderson, P. A., 1990. Freshwater Ostracoda: Keys and notes for the identification of the species. Synopses of the British Fauna (New Series). Edited by Doris M. Kernack and R.S.K. Barnes. No:42. 228 pages.

Hiller, D., 1972. Untersuchungen zur Biologie und-Okologie Limnischer Ostracoden aus der Umgebung von Hamburg. Arch. Hydrobiol. Suppl. 40 (4): 400-497.

Horne, D. J., 2003. Key events in the ecological radiation of the ostracoda. The Paleontological Society. 9: 181-201.

Horne, D. J., and Martens, K., 1998. An assesment of the importance of resting eggs for the evolutionary success of Mesozoic non-marine cypridoidean Ostracoda (Crustacea). Arch. Hygrobiol. Spec. Issues Advanc. Limnol. 52: 549-561.

Horne, D. J., and Boomer, I., 2000. The role of Ostracoda in saltmarsh meiofaunal communities, in: Sherwood, B.R. et al. (Ed.) (2000). British saltmarshes. pp. 182-202.

Horne, D. J., Cohen, A., and Martens, K., 2002. Taxonomy, Morphology and Biology of Quaternary and Living Ostracoda. Application in Quaternary Researh Geophysical Monograph. 131: 5-35

Horne, D. J., Schön, I., Smith, R.J., and Martens, K. 2005. What are Ostracoda? A. Cladistic analysis of the extant superfamilies of the subclasses Myodocopa and Podocopa (Crustacea: Ostracoda). Crustacean Issues. 16: 249-273

Hynes, H. B. N., 1970. The ecology of running waters. University of Toronto Press, Toronto, Canada. 555 pp.

Ikeya, N., Tsukagoshi, A., and Horne, D. J., 2005. Preface: The phylogeny, fossil record and ecological diversity of ostracod crustaceans. Hydrobiologia 538: 7-8.

Kaleli, A., 1993. Orta Karadeniz Sahil Ostrakod (Crustacea) Faunası ve Zoocoğrafik Yayılışı. Yüksek Lisans Tezi, İstanbul Üniversitesi. 33 sayfa.

Karakaş-Sarı, P., 2006. Comparative ecology of Ostracoda (Crustacea) in two rheocrene springs (Bolu,Turkey). MSc Thesis, Abant İzzet Baysal University, Bolu. 70 pages.

Karanovic, I., 2001. Meischcandona gen. now. From Africa, with a key to the genera of the subfamily Candoninae (Crustacea, Ostracoda). Biologie, 71: 93-99.

Karanovic, I., 2006. Recent Candoninae (Crustacea, Ostracoda) of North America. Records of the Western Australian Museum Supplement. No.71. pp.75.

Kempf, E. K., 1971. Ökologie, Taxonomie und Verbreitung der nichtmarinen Ostracoden-Gattung *Scottia* im Quartär von Europa. Eiszeitalter und Gegenwart. 22: 43-63.

Kempf, E. K., 1980. Index and Bibliography of Marine Ostracoda, part 1. Sonderveröffentlichungen des Geologischen Instituts der Universität zu Köln. 35: 1-188. [Index A.]

Kempf, E. K., 1997. Index and Bibliography of Nonmarine Ostracoda, part 6. Sonderveröffentlichungen des Geologischen Instituts der Universität zu Köln. 109: 1-143. [Index A, Suppl.]

Kempf, E. K. and Scharf B. W., 1981. Lebende und fossile Muschelkrebse (Crustacea, Ostracoda) vom Laacher See. Mitteilungen der Pollichia. 68: 205-236.

Keyser, D., and Nagorskaya, L., 1998. Ostracods in the vicinity of Minsk, Belarus. Mitt. hamb. zool. Mus. Inst. Band. 95: 115-131.

Kılıç, M., 1997. Karadeniz kıyıları ostracod (Crustacea) faunası [The Ostracoda (Crustacea) fauna of the Black Sea coasts]. PhD Thesis, İstanbul University, İstanbul.

Kılıç, M., 2001. Recent Ostracoda (Crustacea) fauna of the Black Sea coasts of Turkey. Turkish Journal of Zoology. 25: 375-388

Kılıç, M., Altınsaçlı, S., Balkıs, H., and Balkıs, N. 2000. The ostracods Species Collected From Coasts of the Gökçeada (Imbroz) Island (Aegean Sea). Tr. J.Marine Sciences. 6(1): 87-102.

Kiss, A., 2001. Limnological investigations of small water bodies in the Pilis Biosphere Reserve, Hungary. Part II. Kőhegyi-tó and Unkás-tócsa. Opusc. Zool. Budapest, 33: 67-74.

Kiss, A., 2002. Distribution of microcrustacea in different habitats of a shallow lake in the Fertő-Hanság National Park, Hungary. Opusc. Zool. Budapest, 34: 43-50.

Klie, W., 1938. Ostracoda. In: Die Tierwelt Deutschlands und der Angrenzenden Meeresteile, Verlag Von Gustav Fischer Jena. 34: 1-230.

Klie, W., 1939. Beitrage zur Kenntnis der Ostracodenfauna Ungarns. Allatani Közlemenyek. 36 (3/4): 168-174.

Koç, E., 2000.The Ostracoda (Cructacea) fauna of Dam Lake Ömerli (İstanbul) and its seasonal variation. MSc thesis, İstanbul University. İstanbul.

Kovach, W., 1998. Multi-variate statistical package, ver. 3.0. Kovach Computer Services. Pentraeth, UK.

Kubanç, C., and Altınsaçlı, S., 1990. Ayvalık-Bergama Lagün Ostrakod Faunası X. Ulusal Biyoloji Kongresi Tebliğleri, Erzurum. 1990: 37-46.

Kubanç, C., Meriç, E., and Gülen, D., 1999. *Urocythereis britannica* Athersuch'nın İzmit Körfezi (KB Türkiye) Pleyistosen'inde bulunuşu üzerine. Turkish Journal of Zoology. 23(3): 791-799.

Külköylüoğlu, O., 1998. Freshwater Ostracoda and their Quarterly Occurance in Şamlar Lake (Istanbul,Turkey). Limnologica. 28: 229-235.

Külköylüoğlu, O., 1999. Seosanal distribution of freshwater Ostracoda (Crustacea) in springs of Nevada. Geosound. 35: 85-91.

Külköylüoğlu, O., 2000. The importance of cosmopolitan and indicator species of Ostracoda (Crustacea) in Turkey based on some water parameters. Sinop Water Product Conference 2000: 421-437.

Külköylüoğlu, O., 2003a. A new report on and the loss of *Scottia pseudobrownianana* Kempf, 1971 (Ostracoda) from a limnocrene spring in Bolu, Turkey. Crustaceana.76 (3): 257-268.

Külköylüoğlu, O., 2003b. First report of the genus, Isocypris (Ostracoda) from Turkey: Taxonomy, ecology, and general distribution. Crustaceana. 75: 1083–1093.

Külköylüoğlu, O., 2003c. Ecology of freshwater ostracoda (Crustacea) from lakes and reservoirs in Bolu, Turkey. Journal of Freshwater Ecology. 18:343-347.

Külköylüoğlu, O., 2003d. *Paralimnocythere psammophila* (Flössner, 1965) (Crustacea), a species new for the freshwater ostracod fauna of Turkey. Zoology in the Middle East. 30: 114-116.

Külköylüoğlu, O., 2004. On the usage of Ostracoda (Crustacea) as bioindicator species in the different aquatic habitats in the Bolu region, Turkey. Ecological Indicators. 4: 139-147.

Külköylüoğlu, O., 2005a. Factors effecting Ostracoda (Crustacea) occurrence in Yumrukaya Reedbeds (Bolu, Turkey). Wetlands. 25: 224–227

Külköylüoğlu, O., 2005b. Ecological requirements of freshwater Ostracoda (Crustacea) in two limnocrene springs (Bolu, Turkey). Ann. Limnol. –Int. J. Lim. 41 (4): 237-246.

Külköylüoğlu, O., 2005c. Ecology and phenology of freshwater ostracods in Lake Gölköy (Bolu, Turkey). Aquatic Ecology. 39: 295–304.

Külköylüoğlu O., Altınsaçlı, S., Kılıç, M. and Kubanç, C., 1995. The Ostracoda (Crustacea) Fauna of Lake Büyükçekmece (İstanbul) and seasonal distributions. Tr. J. Zool. 19: 249–256.

Külköylüoğlu O., Altınsaçlı, S., and Kubanç, C., 1993. The Ostracoda (Crustacea) Fauna of Küçükçekmece Lake (İstanbul) and seasonal distributions. Tr. J. Zool. 17: 19–27.

Külköylüoğlu, O., and Dügel, M., 2004. Ecology ad spatiotemporal patterns of Ostracoda (Crustacea) from Lake Gölcük (Bolu, Turkey). Arch. Hydrobiol. 160: 67–83.

Külköylüoğlu, O., Dügel, M. and Kılıç, M., 2007. Ecological Requirements of Ostracoda (Crustacea) in a heavily polluted shallow lake, Lake Yeniçağa (Bolu, Turkey). Hydrobiologia. 585: 119-133.

Külköylüoğlu, O., and Vinyard, G. L., 2000. Distribution and ecology of freshwater Ostracoda (Crustacea) collected from springs of Nevada, Utah, and Oregon: A preliminary study. West. North Amer. Natur. 60: 291-303.

Külköylüoğlu, O., and Yılmaz, F., 2006. Ecological requirements of Ostracoda (Crustacea) in three types of springs in Turkey. Limnologica. 36: 172-180.

Lim, R. P., and Wong, M. C., 1986. The effects of pesticides on the population dynamics and production of Stenocypris major Baird (Ostracoda) in ricefields. Archiv für Hydrobiologie. 106: 421-427.

Löffler, H., 1969. Resent and subfossil distribution of *Cytherissa lacustris* (Ostracoda) in Lake Constance. Mitteilungen der Internationalen Vereinigung für theoretische und angewandte Limnologie. 17: 240-251.

Löffler, H., 1990. Paleolimnology of Neusiedlersee, Austria. I. The Succession of Ostracods. Hydrobiologia. 214: 229-238.

Lubchenco, J., and Real, L. A., 1991. Manipulative Experiments as Tests of Ecological Theory. Pages 715-733. In L. Real and J. Brown (eds.) Foundations of Ecology, University of Chicago Press.

MacArthur, R. H., and Wilson, E. O., 1963. An equilibrium theory of insular zoogeography. Evolution, 17: 373-387.

MacArthur, R. H., and Wilson, E. O., 1967. The theory of island biogeography. Princeton University Press, Princeton, N.J. 203 pages.

Martens, K., 1998. General morphology of non-marine ostrocods, p.57-75. In K.Martens (ed.), Sex and parthenogenesis: evolutionary ecology of reproductive modes in non-marine ostrocods. Backhuys Publishers, Leiden, The Netherlands.

Martens, K., Dumont H. J., 1984. The Ostracoda Fauna (Crustacea, Ostracoda) of Lake Donk (Flanders): A comparison between two surveys 20 years apart. Biologisch Jaarboek Dodonaea. 52: 95-111.

Mbahinzireki, G., Uiblein, F., and Winkler, H., 1991. Microhabitat selection of ostracods in relation to predation and food. Hydrobiologia. 222: 115-119.

Meisch, C., 1984. III. Revision of the recent western Europe species of genus *Potamocypris* (Crustacea, Ostracoda). Part I. Species with short swimming setae on the second antennae.Travaux Scientifiques Du Musée D'Historie Naturelle de Luxembourg. p.1-55.

Meisch, C., 1985. VI. Revision of the recent west european species of the genus Potamoypris (Crustacea, Ostracoda) Part II. Travaux Scientifiques Du Musée D'Histoire Naturelle De Luxembourg. p.2-95.

Meisch, C., 1987. Ostracods D'eau Douce Rècoltes Danslesud-Quest de la France (Crustacea, Ostracoda), Bull. Soc. Not. Luxemb. 87: 89-118.

Meisch, C., 1990. Ostracodes et écologie de deux étangs de gravières d'Alsace et du Luxembourg (Crustacea, Ostracoda).Bull. Soc. Nat. luxemb. 90: 183-197.

Meisch, C., 2000. Freshwater Ostracoda of Western and Central Europe. Süsswasserfauna von Mitteleuropa 8/3. Spektrum Akademischer Verlag, Heidelberg, Berlin. 522 pages.

Meisch, C., and Broodbaker, N. W., 1990. On freshwater ostracoda (Crustacea) collected on the Canary islands. Beaufortia. 41(21): 151-157.

Meisch, C., and Broodbakker, N. W., 1993. Freshwater Ostracoda (Crustacea) collected by J. H. Stock on the Canary and Cape Verde Islands. With an annotated checklist of freshwater Ostracoda of the Azores, Maderia, the Canary, the Selvagens and Cape Verde Islands. Travaux scientifiquies du Musse national d'historie naturelle de Luxembourg. 19: 1-67.

Meisch, C., and Forró, L., 1998. Checklist of Recent Ostracoda (Crustacea) from Hungary. Misc. Zool. Hungarica. 11: 33-48.

Mezquita, F., Hernández, R., and Rueda, J., 1999a. Ecology and distribution of ostracods in a polluted Mediterranean river. Palaeogeogr. Palaeoclimatol. Palaeoecol. 148: 87–103.

Mezquita, F., Griffiths, H. I., Sanz, S., Soria, J. M., and Piňón, A., 1999b. Ecology and distribution of ostracods associated with flowing waters in the eastern Iberian Peninsula. J Crustn Biol. 19: 344–354.

Mezquita, F., Tapia, G., and Roca, J. R., 1999c. Ostracoda from springs on the eastern Iberian Peninsula: ecology, biogeography and palaeolimnological implications. Palaeogeogr. Palaeoclimatol. Palaeoecol. 148: 65-85.

Mezquita, F., Sanz-Brau, A., and Wansard, G., 2000. Habitat preferences and population dynamics of Ostracoda in a helocrene spring system. Can. J. Zool. 78: 840–847.

Mozo, M. E. G., Martens, K., and Baltanás, A., 1996. A taxonomic revision of European Herpetocypris Brady and Norman, 1889 (Crustacea, Ostracoda). Biologie. 66: 93-132.

Nielsen, A., 1950. On the zoogeography of springs. Hydrobiologia. 2: 313-321.

Nüchterlein, H., 1969. Fresh water Ostracods from Franconia: A contribution to the knowledge of systematic and ecology of ostracoda. Int. Revue ges. Hydrobiology. 54(1): 223-287.

Özuluğ, O., 2005. Living specimens of *Ilyocypris salebrosa* Stepanaitys, 1959 (Crustacea: Ostracoda) from Thrace, Turkey. Zoology in the Middle East. 34: 114-116.

Özuluğ, O., Kubanç, N., and Gülen, D., 2000. Ostracoda (Crustacea) Fauna of Lake Eğridir (Isparta). Turk. J. Zool. 25: 421-425.

Pax, F., 1948. Die Tierwelt der mitteleuropäischen Schwefelguellen. Senckenbergiana. 28 (4/6): 89-110.

Petkovski, T., 1964. Bemerkenswerte Entomostraken aus Jugoslavien. Acta Musei Macedonici Scientiarum Naturalium. 9: 147-182.

Petkovski, T., 1966. Ostracoden aus einigen Quellen der Slowakei. Acta Mus. Macedonia, (Sci. Nat.) 10: 91-107.

Petkovski, T., 1970. Wlassicsia pannonica Daday aus Mazedonien und der Slowakei (Crustacea-Cladocera). Fragmenta Balcanica Musei Macedonici Scientiarum Naturalium. 7: 185-196.

Petkovski, T. K., and Meisch, C., 1995. Interesting freshwater Ostracoda (Crustacea) from Macedonia. Bull.Soc.Nat.luxemb. 96:167-183.

Ramdani, M., Flower R. J., and Elkhiati, N., 2001. Open water zooplankton communities in North African wetland lakes: the CASKARAKAŞ-SARINA Project. Aquat. Ecol. 35: 319–333.

Roca, J. R., and Baltanás, A., 1993. Ecology and distribution of ostracoda in Phyrenean springs. Journal of Crustacean Biology. 13 (1): 165-174.

Roca, J. R., and Danielopol D. L., 1991. Exploration of interstitial habitats by the phytophilous ostracod *Cypridopsis vidua* (O. F. Müller): experimental evidence. Annales de Limnologie. 27: 243-252.

Roca, J. R., and Wansard, G., 1997. Temperature influence on development and calcification of *Herpeteocypris brevicaudata* Kaufmann, 1900 (Crustacea: Ostracoda) under experimental conditions. Hydrobiologia. 347: 91-95.

Rossetti, G., Bartoli, M., and Martens, K., 2004. Limnological characteristics and recent ostracods (Crustacea, Ostracoda) of freshwater wetlands in the Parco Oglio Sud (Northern Italy). Ann. Limnol. - Int. J. Lim. 40 (4), 329-341.

Rossetti, G., Pieri, V., and Martens, K., 2005. Recent ostracods (Crustacea, Ostracoda) found in lowland springs of the provinces of Piacenza and Parma (Northern Italy). Hydrobiologia. 542: 287-296.

Rossi, V., Bellavere, V., Benassi, G., Gandolfi, A., Todeschi, E. B. A., and Menozzi, P., 2004. Spatial segregation of *Darwinula stevensoni* (Crustacea: Ostracoda) genotypes in lentic and lotic habitats of Northern Italy. J. Limnol., 63(1): 13-20.

Ruiz, F., González-Regalado, M. L., Borrego, J., Abad, M., and Pendón, J. G., 2004. Ostracoda and foraminifera as short-term tracers of environmental changes in very polluted areas: the Odiel Estuary (SW Spain). Environmental Pollution. 129:49-61.

Sars, G. O., 1928. Ostracoda –An account of the Crustacea of Norway, Bergan. 9:1-227.

Särkkä, J., Levonen, L., and Mäkelä, J., 1997. Meiofauna of springs in Finland in relation to environmental factors. Hydrobiologia. 347, 139-150.

Schäfer, H. W., 1954. Über süswaser-Ostracoden aus der Türkei. Hidrobiologi İstanbul ser. B. 1(1): 7-32.

Scharf, B.W., 1976. Zur rezenten Muschelkrebsfauna des Naturschutzgebietes "Hördter Rheinaue" (Crustacea: Ostracoda). Mitt. Pollichia. 64: 121-128. 1 Abb. 3 Tab. Bad Dürkheim/ Pfalz.

Scharf, B. W., 1981. Zur rezenten Muschelkrebsfauna der Eifelmaare (Crustacea: Ostracoda). Mitteilungen der Pollichia. 68: 185-204.

Scharf, B. W., 1982. Muschelkrebse aus dem Murnauer Moos (Crustacea, Ostracoda). Entomofauna. Suppl. 1: 119-123.

Scharf, B. W., 1998. Eutrophication history of Lake Arendsee (Germany), Palaeogeography, Palaeoclimatology, Palaeoecology. 140 (1-4): 85-96.

Shornikov, E. I., and Trebukhova, Y. A., 2001. Ostracods of Brackish and Freshwaters of Southwestern Coast of Peter The Great Bay. Vladivostok: Dalnauka. 3: 56-84.

Smith, A. J., Forester, R. M., 1994. Estimating Past Precipitation and Temperature From Fossil Ostracodes. The 5th Annual International High-Level Radioactive Waste Management Conference and Exposition. May 22-26, Las Vegas, Nevada. Radioactive Waste Management. 2545-2551.

Smith, H., Wood, P. J., and Gunn, J., 2003. The influence of habitat structure and flow permanence on invertebrate communities in karst spring systems. Hydrobiologia. 510: 53-66.

Stephanides, T., 1948. A Survey of the fresh-water biology of Corfu and of certain other regions of Greece. Prak. Hellenic Hydrobiol. Inst. 2: 1-263.

Sywula, T., 1967. Notes on Ostracoda II: On some Bulgarian Species. Bull. Soc. Amis. Sci. Lettr. Ponzan. (D.) 8: 11-142.

Sywula, T., 1971. Notes on Ostracoda. XII New and Interesting Species from Poland. Bulletin de'l Académie Polonaise des Scienses, cl. 2, 19(10): 665-670.

Sywula, T., 1977. Bottom fauna of the heated Konin lakes. VII. Ostracoda. Monografie Fauny Polski. 7: 181-203.

Sywula, T., Sell, J., and Lorenc, R., 1982. Ostracods from the vicinity of Otomin in the Kashubian Lake District. Zeszyty Naukowe Wydzialu Biologii I Nauk O Ziemi Universytetu Gdanskiego Biologia. 3: 5-17.

Tareen, I. U., 1974. Gölcük Gölü (Ödemiş-İzmir)'nün Limnolojik Araştırılması [Limnological research on Lake Gölcük (Ödemiş-İzmir)]. PhD thesis, Ege University, İzmir.

Ter Braak, C. J. F., 1986. Canonical correspondence analysis: a new eigenvector technique for multivariate direct gradient analysis. Ecology. 67: 1167-1179.

Ter Braak, C. J. F., and Barendregt, L.G., 1986. Weighted averaging of species indicator values: its efficiency in environmental calibration. Math. Biosci. 78: 57-72.

Ustaoğlu, M. N., Balık, S., Özdemir Mis, D., and Aygen, C., 2003. Microcrustacean Fauna of Lake Sazlıgöl (Menemen, İzmir). Turk. J. Zool. 27: 15-18.

Vesper, B., 1975. Ein Beitrag zur Ostracodenfauna Schleswig-Holsteins. Mitteilungen aus dem hamburgischen zoologischen Museum und Institut. 72: 97-108.

Wansard, G., and Mezquita, F., 2001. The response of ostracod shell chemistry to seasonal change in a Mediterranean freshwater spring environment. Journal of Paleolimnology. 25: 9-16.

Yılmaz, F., 2005. Temporal and Spatial changes of Ostracoda (Crustacea) in Lake Aladağ (Bolu, Turkey). MSc Thesis, Abant İzzet Baysal University, Bolu. 77 pages.

Yılmaz, F., and Külköylüoğlu, O., 2006. Tolerance, optimum ranges, and ecological requirements of freshwater Ostracoda (Crustacea) in Lake Aladağ (Bolu, Turkey). Ecological Research. 21: 165-173.

APPENDICES

Appendix 1. The species and collected station numbers.

St. No.	Po	Pz	Cn	Cc	Ib	Ig	Hc	Pc	Pv	Cv	Cs	Hi	Hr	Pf	Co	Ps	Ii	Hb	Ie	Sp	Ho	Ts	Hs	Pm	Pa	Ev	Pk	Pe	Pu	Fb	Fa	Cl	Fl	Fr	Ff	Cw	Fp	Ca	Sb	Cr	Ds	Tot.
1	4	2																																								6
2	7																																									7
3	97																																									97
5					2																																					2
6			3		2																															7						12
7			3		2																																					5
8	33				16		4																								5											58
9						13		2																																		15
10									3																																	3
11			7																																							7
12			1	1	6	7					4																															19
13					87							17																														104
14													150																													150
15			3	1													13																									17
16			23	9	5	17																													2							56
17	2		16	8	8							6							5																							45
18			3	4	7																																					14
19			8	5								13																														26
20			4						19																													2				25
21			2									3																														5
22		3	2		4																																					9
23		1	1											2		60	8																									72
24				3	6																																					9
25					4				55					14																			9									82
26		3			4										3																											10
27		7	6																																							13
28					7							9																														16
29					5	7						8																														20
30			3													45	19																									67
31	4				7													4																								15
32					5							4																														9
33	8				13									11																												32
34					12							30																														42
35					14							12																														26
40					103							12																														115
42					4									5																												9
43						23						45																											2			70
44	15	14														13	9																									51
45			2		4																																					6
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49		17		8	23							40																														88
50		11			13							16																														40
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55	7																																									7
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57	2		7																	4																						13
58	5		4		13							9																														31
59	8				35																																					43
60	2				2						4																															8
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70												24																														24
72												121																														121
73					157							300																														457
74												53																														53
75									44																																	44
76							3																																			3
77							4																																			4
78												280																														280

Appendix 1. cont.

79					1																																					1
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81	7				4																																					11
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84			4							200												3																				207
85	22				3							9					7																									41
86	10				6																17		37																			70
87	5				9							11								1																						26
88										13				7																												20
89					15							21																														36
90	2				1									1				2								2																8
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106	5				7							13																														25
107	4																																									4
108							27																53																			80
109					14									52																												66
110									4					6																												10
111									20			60																														80
112	8			4	3											6														3							3					27
113	6			4																											3											13
114	8				7				5			9																														29
115	203				31				23			65		113																												435
117												6			3																											9
118												4																														4
119				6						4																																10
121									3																																	3
122									6																																	6
124						2				2				1													48					2										55
125			5							3																	7					4						5				24
126	8				7							13									13																					41
127	19	11																																								30
128	3																																									3
129	14													17																												31
130	14	5			9				8																																	36
131					6							5																														11
132	23		11			17			13																																	64
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135						5								2													2							2								11
136	2				2							3																														7
137			1		3							2		21																					2							29
138												6																														6
139												3																														3
140	5				4																																					9
141	18				24							32									43																					117
142		17	6	7	13		5								11																										+	59
Total	635	98	149	60	893	119	43	2	208	222	8	1623	150	275	25	124	56	6	5	5	73	3	90	3	3	2	59	3	4	3	8	6	9	2	4	7	3	7	2			4997

Appendix 2. Measurements of ten variables and coordinates of 141 stations and habitat types. The abbrevations of variables pH; Eh (mV): redox potential; SHE (mV): redox potential; DO (mg/L): dissolved oxygen; EC (µS/cm): electrical conductivity; TDS (mg/l): Total Dissolved Solids; %S: oxygen saturation; T(w)(°C): water temperature; T(a)(°C): air temperature; Sal (ppt): salinity and habitat type codes are A: lake; B: Pond; C: Creek; D: Spring; E: Others (streams, roadside and/or in the forest pool, permanen t/temporary water bodies, brooks etc.).

St. No	St. Name	St. Type	pH	EH	SHE	DO	EC	TDS	%S	T°C(w)	T°C(a)	Sal.	Altitude	Latitude	Longitude
1	Gölköy A	C	7,87	-49,70	164,84	14,06	442,20	287,43	137,20	13,40	23,60	0,20	753m	40º42' 55" N	31º31' 59" E
2	BM 2	C	7,58	-31,70	182,58	6,57	450,70	292,96	63,70	13,80	23,60	0,20	763m	40º41' 59" N	31º32' 18" E
3	Poyrazbey	D	7,14	-9,60	205,33	4,13	523,00	339,95	39,30	12,80	23,60	0,30	795m	40º41' 34" N	31º31' 38" E
4	Trafo	E	7,84	-48,40	160,42	3,27	488,40	317,46	35,10	22,20	23,60	0,20	782m	40º42' 54" N	31º29' 33" E
5	Doşe Gölü	A	8,54	-91,00	114,25	6,18	285,30	185,45	78,10	27,70	23,60	0,10	1013m	40º44' 34" N	31º29' 16" E
6	Sazlık	C	7,96	-55,00	157,98	6,67	459,30	298,55	68,10	15,80	23,60	0,20	1006m	40º44' 30" N	31º29' 21" E
7	Yumrukaya	D	7,44	-26,10	185,13	5,34	547,00	355,55	57,40	18,50	23,60	0,30	900m	40º43' 42" N	31º29' 43" E
8	Atyolu	C	7,88	-50,10	160,93	6,80	490,10	318,57	72,80	18,80	23,60	0,20	1028m	40º45' 15" N	31º31' 31" E
9	Sarıbey	E	7,47	-29,20	178,06	5,01	593,00	385,45	64,90	24,60	23,60	0,30	1052m	40º46' 05" N	31º31' 02" E
10	Atyaylası	E	7,25	-15,10	192,16	3,86	578,00	375,7	23,40	24,60	23,60	0,30	1080m	40º45' 57" N	31º30' 09" E
11	Atpiknik	E	6,84	8,50	214,33	2,62	460,20	299,13	34,10	26,80	23,60	0,20	1076m	40º45' 56" N	31º30' 20" E
12	Manda	E	8,01	-60,10	145,28	4,34	326,70	212,36	56,20	27,50	23,60	0,20	1075m	40º46' 14" N	31º30' 05" E
13	Kuruyalak	B	7,95	-55,30	154,17	4,28	467,70	304,01	46,40	21,20	23,60	0,20	1046m	40º45' 41" N	31º31' 12" E
14	Pınarya	E	7,24	-14,50	200,17	5,57	544,00	353,6	53,20	13,20	23,60	0,30	1028m	40º45' 15" N	31º31' 31" E
15	Pelitköy	E	7,12	-9,00	205,28	2,72	135,00	87,75	25,90	13,80	22,80	0,10	1021m	40º37' 23" N	31º27' 47" E
16	Pelit	E	7,90	-51,10	161,88	5,06	435,90	283,34	52,50	15,80	22,80	0,20	1018m	40º37' 26" N	31º27' 40" E
17	Kuzguncuk	C	7,14	-9,00	200,08	5,24	463,40	301,21	58,90	21,80	22,80	0,20	861m	40º38' 32" N	31º28' 43" E
18	Güvemyol	C	7,59	-34,00	180,28	5,16	432,10	280,87	50,50	13,80	22,80	0,20	862m	40º38' 31" N	31º28' 42" E
19	Kanal	E	7,67	-38,80	174,83	4,54	406,30	264,1	45,00	14,80	22,80	0,20	890m	40º38' 24" N	31º29' 11" E
20	Piroğlu	E	8,09	-62,40	149,93	1,38	696,00	452,4	14,30	16,80	22,80	0,30	897m	40º39' 44" N	31º28' 02" E
21	Köprü	D	8,35	-76,80	136,18	5,30	619,00	402,35	52,20	15,80	22,00	0,30	837m	40º39' 43" N	31º28' 31" E
22	Güneytepe	B	8,07	-63,60	148,67	3,34	301,00	195,65	35,00	16,90	19,60	0,20	781m	40º28' 31" N	31º00' 18" E
23	Sünnetsapak	C	8,02	-61,30	153,44	7,63	326,20	212,03	72,90	13,10	19,60	0,20	894m	40º27' 25" N	30º56' 33" E
24	Arıkçayırı	E	7,13	-8,80	204,12	1,72	174,20	113,23	16,70	15,90	19,60	0,10	951m	40º27' 51" N	30º54' 49" E
25	Örencik	E	8,17	-69,20	144,43	17,01	241,40	156,91	119,00	14,80	19,60	0,10	897m	40º27' 05" N	30º50' 20" E
26	Çubuk Gölü 1	A	8,71	-103,00	105,30	13,63	164,10	106,67	160,00	23,00	19,60	0,10	1013m	40º28' 51" N	30º50' 04" E
27	Çubuk Gölü 2	A	7,34	-20,70	192,09	6,90	355,10	230,82	70,10	16,10	19,60	0,20	1030m	40º29' 13" N	30º50' 07" E
28	Bulanık	E	8,04	-61,50	150,38	12,58	310,80	202,02	131,20	17,50	19,60	0,20	730m	40º25' 34" N	30º45' 20" E
29	Seki	E	8,04	-62,00	150,07	8,11	448,00	291,2	80,00	17,20	19,60	0,20	705m	40º24' 53" N	30º45' 21" E
30	Boyalıköy	E	8,16	-68,70	143,96	11,99	448,20	291,33	119,50	16,30	19,60	0,20	708m	40º24' 53" N	30º45' 20" E
31	Bayındır yolu	E	7,65	-40,00	169,02	7,77	244,80	159,12	91,50	21,90	19,60	0,10	865m	40º22' 42" N	30º46' 57" E
32	Bayındır	E	7,66	-40,20	166,22	11,68	592,00	384,8	144,20	25,90	19,60	0,30	910m	40º20' 04" N	30º44' 18" E
33	Karafakılar	B	8,08	-67,00	137,86	8,02	507,00	329,55	102,30	28,30	19,60	0,30	935m	31º11' 40" N	34º52' 08" E
34	Sarıcalar	E	8,35	-82,60	124,40	6,66	215,00	139,75	81,20	25,00	19,60	0,10	673m	40º15' 35" N	30º43' 08" E
35	Kuyubaşı	E	8,64	-100,00	106,68	11,85	650,00	422,5	144,00	25,50	19,60	0,30	612m	40º15' 04" N	30º44' 42" E
36	Bölücekova	E	7,30	-18,60	192,56	7,31	677,00	440,05	78,30	18,60	19,60	0,30	680m	40º17' 43" N	30º50' 03" E
38	Bekirfakılar	E	7,10	-7,00	204,88	7,15	654,00	425,1	75,30	17,50	19,60	0,30	983m	40º20' 58" N	30º58' 49" E
39	Sünnet Gölü	A	7,97	-58,90	150,44	9,37	412,90	268,39	109,40	21,40	19,60	0,20	1049m	40º25' 35" N	30º57' 27" E
40	Sarayköy	C	8,27	-78,40	128,80	4,50	484,00	314,6	52,90	24,70	20,80	0,20	1034m	40º48' 03" N	32º04' 10" E
41	Çamlık	B	7,56	-33,70	179,54	7,23	437,70	284,51	72,50	15,40	20,80	0,20	1050m	40º48' 26" N	32º03' 30" E
42	Adaköy	E	7,74	-44,05	169,32	5,11	556,00	361,4	51,10	15,20	20,80	0,30	1056m	40º48' 28" N	32º03' 22" E
43	Gölbaşı	E	7,65	-39,80	167,40	5,26	517,00	336,05	63,30	24,70	20,80	0,30	1113m	40º48' 37" N	32º01' 06" E
44	Beyköyü	C	7,96	-57,50	154,25	9,71	526,00	341,9	102,40	17,70	20,80	0,30	1075m	40º49' 12" N	32º00' 36" E
45	Kındıra	B	7,92	-55,20	156,29	7,08	501,00	325,65	84,00	18,10	20,80	0,30	1099m	40º49' 20" N	32º59' 36" E
46	Dereköy	B	7,80	-62,40	150,97	6,92	513,00	333,45	85,60	15,20	20,80	0,20	1114m	40º49' 20" N	31º59' 36" E
47	Ören	C	7,24	-54,30	155,11	7,13	496,00	322,4	79,80	21,30	20,80	0,10	941m	39º05' 31" N	31º17' 23" E
48	Mangırlar	E	8,16	-69,50	143,22	6,73	401,70	261,11	72,30	16,20	20,70	0,20	933m	40º33' 36" N	31º19' 17" E
49	Sarıyer	B	7,70	-42,40	170,00	6,47	400,10	260,07	66,80	16,70	20,70	0,20	826m	40º32' 31" N	31º16' 10" E
50	Pelitözü	C	7,83	-50,20	162,85	6,47	415,70	270,21	60,50	15,70	20,70	0,20	812m	40º31' 09" N	31º14' 49" E
51	Ormanpınar	B	8,02	-62,10	142,69	6,63	946,00	614,9	70,30	28,40	20,70	0,50	829m	40º27' 22" N	31º09' 01" E
52	Yüzüncüyıl	B	7,70	-42,40	167,79	6,83	1171,00	761,15	75,90	20,10	20,70	0,60	866m	40º26' 30" N	31º09' 42" E
53	Akbaşlar	E	7,83	-51,20	160,09	7,14	890,00	578,5	64,90	18,40	20,70	0,20	881m	40º26' 40" N	31º10' 22" E
54	Dolayüz	E	7,91	-55,20	154,79	9,25	463,40	301,21	104,80	20,40	20,70	0,20	909m	40º26' 42" N	31º11' 40" E
55	Parmaksızlar	B	7,95	-57,40	155,97	8,40	430,90	280,09	93,50	15,20	20,70	0,20	924m	40º26' 21" N	31º11' 22" E
56	Gürçam	C	7,98	-61,10	143,89	4,38	670,00	435,5	58,80	28,10	20,70	0,30	1003m	40º27' 27" N	31º14' 23" E
57	Uğurlualan	E	7,45	-30,10	182,10	10,56	482,00	313,3	109,10	17,00	20,70	0,20	1152m	40º25' 06" N	31º16' 50" E
58	Dere	B	7,54	-32,20	180,91	8,60	513,00	333,45	87,70	15,60	20,70	0,30	1132m	40º27' 07" N	31º18' 47" E
59	Güllüören	E	7,59	-35,80	178,48	7,46	442,60	287,69	78,30	13,80	20,70	0,20	1155m	40º25' 00" N	31º20' 24" E
60	Sırçalı	B	7,78	-47,50	171,14	7,95	530,00	344,5	85,70	7,10	20,70	0,30	1089m	40º29' 34" N	31º21' 58" E
61	Yaylabeli	E	7,12	-8,00	200,50	4,49	654,00	425,1	49,10	22,70	20,70	0,30	1125m	40º30' 02" N	31º20' 59" E
62	Dedeler	B	7,69	-41,90	168,94	7,10	674,00	438,1	79,30	19,10	20,70	0,30	1126m	40º31' 11" N	31º19' 25" E
63	Göncek	E	7,42	-25,40	189,21	11,88	608,00	395,2	115,30	13,30	20,70	0,30	1140m	40º31' 34" N	31º21' 22" E
64	Yazılar	E	7,70	-43,70	162,85	8,46	637,00	414,05	103,30	25,70	20,70	0,30	884m	40º32' 20" N	31º19' 55" E
65	Hacıhalimler	C	7,23	-14,40	198,91	4,98	806,00	523,9	49,70	15,30	20,70	0,40	958m	40º33' 45" N	31º21' 23" E
66	Keçikıran	E	7,56	-33,90	179,47	7,77	613,00	398,45	84,60	15,20	20,70	0,30	1166m	40º34' 20" N	31º22' 43" E
67	Güneyfelakettin	B	7,38	-22,90	192,23	11,90	431,40	280,41	111,20	12,50	20,70	0,20	1153m	40º35' 29" N	31º23' 26" E
68	Bozbey	B	7,88	-52,60	159,21	6,04	695,00	451,75	61,80	17,60	21,70	0,40	797m	40º25' 38" N	31º35' 14" E
69	Tepeköy	E	7,59	-35,60	175,89	7,31	1431,00	930,15	77,80	18,10	21,70	0,80	797m	40º23' 52" N	31º34' 08" E
70	Susuz	E	7,63	-38,10	173,32	6,01	699,00	454,35	66,70	18,20	21,70	0,40	1027m	40º20' 31" N	31º34' 17" E
71	Çatak	B	8,27	-77,00	131,95	9,79	626,00	406,9	112,70	22,00	21,70	0,30	705m	40º19' 41" N	31º35' 14" E
72	Hocaş	B	8,51	-95,50	106,24	5,73	1345,00	874,25	81,60	33,10	21,70	0,70	692m	40º20' 01" N	31º35' 39" E

Appendix 2. Cont.

73	Çeltikdere	B	7,82	-51,50	150,82	7,39	1132,00	735,8	122,40	32,20	21,70	0,60	652m	40º20' 12" N	31º38' 27" E
74	Kırıkçı	B	7,74	-45,20	165,38	6,81	703,00	456,95	63,20	19,50	21,70	0,30	676m	40º20' 06" N	31º38' 23" E
75	Kuzca	C	8,34	-81,50	125,70	10,14	122,40	79,56	122,70	24,70	21,70	0,10	1017m	40º20' 38" N	31º45' 22" E
76	Alanhimmetler1	B	8,74	-105,10	96,12	7,88	359,20	233,48	117,50	33,90	21,70	0,20	1002m	40º20' 55" N	31º45' 51" E
77	Alanhimmetler2	B	8,74	-105,10	96,12	7,88	359,20	233,48	117,50	33,90	21,70	0,20	1002m	40º20' 55" N	31º45' 51" E
78	Borucak	C	8,06	-65,30	140,66	9,35	361,40	234,91	108,40	26,60	21,70	0,20	1022m	40º21' 17" N	31º46' 56" E
79	Geriş	C	8,80	-112,50	89,63	11,57	349,20	226,98	157,20	32,50	21,70	0,20	1024m	40º21' 17" N	31º46' 56" E
80	Taşlık	B	7,85	-50,80	159,65	6,87	281,70	183,11	65,30	19,70	21,70	0,20	1012m	40º21' 13" N	31º45' 31" E
81	Gerişköprü	E	7,88	-53,00	157,06	5,85	283,00	183,95	74,50	20,30	21,70	0,10	1024m	40º22' 52" N	31º50' 35" E
82	Bölücekaya	C	8,41	-87,70	114,95	6,30	73,60	47,84	85,90	31,70	21,70	0,10	1144m	40º25'06" N	31º50' 13" E
83	Kökez	C	7,48	-30,50	174,94	4,33	367,30	238,75	54,90	27,40	21,70	0,20	1190m	40º25' 50" N	31º49' 53" E
84	Gerenözü	B	9,45	-151,00	53,34	5,06	77,10	50,115	87,10	29,10	21,70	0,00	1439m	40º31' 53" N	31º42' 24" E
85	Kadılar	B	7,99	-58,80	154,83	10,96	528,00	343,2	108,40	14,80	21,10	0,30	358m	40º53' 03" N	31º55' 42" E
86	Şahbazlar	C	7,79	-47,60	164,80	6,37	755,00	490,75	65,90	16,70	21,10	0,40	658m	40º53' 23" N	31º54' 54" E
87	Gökçesu	D	7,27	-17,10	194,91	2,93	472,20	306,93	29,90	17,30	21,10	0,20	539m	40º53' 46" N	31º58' 07" E
88	Yaylan	C	7,36	-112,80	98,43	6,06	552,00	358,8	64,50	18,50	21,10	0,30	581m	40º53' 52" N	31º59' 29" E
89	Çırdak	C	8,03	-63,60	140,93	5,24	424,20	275,73	67,30	28,80	21,10	0,20	975m	40º58' 14" N	32º12' 07" E
90	Şirinyazı Gölü	A	8,08	-66,10	141,16	9,52	396,20	257,53	116,00	24,60	21,10	0,20	1073m	40º58' 49" N	32º13' 00" E
91	Teberikler	B	8,01	-62,00	144,87	12,71	378,80	246,22	142,90	25,20	21,10	0,20	712m	40º56' 28" N	32º07' 00" E
92	Sazlar	B	7,41	-25,10	185,67	7,79	518,00	336,7	87,30	19,20	21,10	0,30	721m	40º56' 06" N	32º07' 01" E
93	Yumrutaş	C	7,52	-31,10	181,62	8,70	673,00	437,45	113,80	16,20	21,10	0,30	784m	40º51' 37" N	32º04' 33" E
94	Gerede Sazlık	A	8,04	-63,20	144,97	7,85	849,00	551,85	92,20	23,20	21,10	0,40	1314m	40º47' 56" N	32º09' 59" E
95	Çayören	E	7,85	-50,90	161,04	7,98	522,00	339,3	82,90	17,40	21,10	0,30	1292m	40º48' 35" N	32º17' 39" E
96	Afşartarakçı	E	7,72	-44,20	165,14	8,44	775,00	503,75	103,50	21,40	21,10	0,40	1282m	40º49' 19" N	32º19' 42" E
97	Eymür	C	7,89	-54,30	153,94	6,21	781,00	507,65	71,70	23,10	21,10	0,40	1276m	40º49' 04" N	32º20' 24" E
98	Koçumlar	B	8,22	-72,70	139,24	6,55	237,10	154,12	68,10	17,40	21,10	0,10	1308m	40º48' 47" N	32º15' 39" E
99	Beşpınarlar	C	8,12	-68,40	139,51	4,64	371,40	241,41	53,10	23,60	18,80	0,20	1346m	40º37' 44" N	31º38' 09" E
100	Demirciler Yayla	D	8,25	-73,50	135,65	4,10	116,80	75,92	47,70	21,70	18,80	0,10	1363m	40º37' 06" N	31º41' 07" E
101	Sarıalan özcan	D	7,96	-58,30	151,50	5,15	95,60	62,14	57,50	20,70	18,80	0,10	1467m	40º38' 54" N	31º45' 07" E
102	Abant Yeşilev	C	7,95	-55,20	158,50	7,30	387,70	252,01	72,10	14,70	19,70	0,20	850m	40º40' 08" N	31º26' 07" E
103	Sinekliyayla	C	8,36	-80,20	134,41	8,46	209,10	135,92	80,10	13,30	19,70	0,10	1273m	40º37' 38" N	31º17' 60" E
104	Beyköy	C	8,20	-71,30	141,10	6,73	258,30	167,9	71,10	16,70	19,70	0,10	1418m	40º38' 49" N	31º17' 06" E
105	Samandere Ş.	C	8,34	-78,80	134,83	9,53	274,50	178,43	94,70	14,80	19,70	0,10	758m	40º41' 47" N	31º15' 06" E
106	Akçabey	C	7,79	-48,80	158,53	9,70	220,10	143,07	121,60	24,50	25,20	0,10	1323m	40º49' 60" N	32º22' 08" E
107	Çağış	B	7,26	-16,30	196,94	7,29	787,00	511,55	73,70	15,40	25,20	0,40	1202m	40º49' 03" N	32º23' 55" E
108	Ocak	E	7,97	-59,10	150,24	7,29	1475,00	958,75	83,10	21,40	25,20	0,80	1070m	40º48' 47" N	32º24' 14" E
109	Demirsopran	B	7,30	-18,80	194,57	6,75	576,80	374,92	65,10	15,20	25,20	0,20	1267m	40º46' 08" N	32º23' 07" E
110	Ortaca	E	7,49	-28,50	185,00	7,37	146,40	95,16	74,70	15,00	25,20	0,10	1321m	40º46' 51" N	32º25' 09" E
111	Kayısopran	E	7,62	-37,60	173,69	3,29	565,00	367,25	38,90	18,40	25,20	0,30	1289m	40º48' 06" N	32º28' 60" E
112	Davutbeyli	C	7,87	-55,50	154,49	6,46	522,00	339,3	73,20	20,40	25,20	0,30	1048m	40º49' 08" N	32º29' 07" E
113	Macarlar	C	8,09	-62,70	146,71	7,43	251,00	163,15	84,40	21,30	25,20	0,10	1058m	40º49' 36" N	32º30' 24" E
114	Asmaca	B	7,82	-49,40	161,44	8,90	665,00	432,25	83,10	19,10	25,20	0,30	1159m	40º49' 07" N	32º29' 32" E
115	İmamoğlu	C	7,62	-37,50	172,17	5,63	488,00	317,2	65,80	20,90	25,20	0,20	1258m	40º51' 19" N	32º28' 09" E
116	Süllertoklar	C	8,05	-62,50	150,09	11,02	383,10	249,02	93,20	16,40	25,20	0,20	1173m	40º44' 08" N	32º14' 26" E
117	Toklar	C	7,64	-39,00	170,99	5,40	528,00	343,2	58,50	20,40	25,20	0,30	1350m	40º47' 06" N	32º10' 09" E
118	Doğancı	C	7,26	-17,90	186,70	7,30	372,30	242	96,70	28,70	25,20	0,20	1161m	40º44' 07" N	32º06' 08" E
119	Adaköylü	C	9,16	-131,80	74,23	14,72	343,10	223,02	178,20	26,50	25,20	0,20	1166m	40º43' 08" N	32º06' 09" E
120	Kılıçlar	B	7,90	-55,30	151,44	0,24	2796,00	1817,4	8,40	25,40	25,20	0,90	1179m	40º42' 08" N	32º06' 26" E
121	Sorgun	C	8,27	-77,00	132,28	5,80	146,70	95,355	70,40	21,50	25,20	0,10	1183m	40º42' 15" N	32º02' 07" E
122	Ortaköy	C	8,46	-88,30	120,52	9,88	169,10	109,92	120,10	22,20	25,20	0,10	1188m	40º41' 19" N	32º02' 14" E
123	Yağbaşlar	C	8,10	-66,60	140,79	4,12	168,40	109,46	49,60	24,40	25,20	0,10	1177m	40º42' 14" N	32º00' 09" E
124	DörtdivanGölet1	A	8,24	-75,90	131,30	6,22	346,00	224,9	74,10	24,70	25,20	0,20	1190m	40º45' 05" N	32º02' 48" E
125	DörtdivanGölet2	A	8,24	-75,90	131,30	6,22	346,00	224,9	74,10	24,70	25,20	0,20	1190m	40º45' 05" N	32º02' 48" E
126	Çanakçılar	C	7,94	-57,20	152,34	6,80	504,00	327,6	78,40	21,10	23,00	0,30	838m	40º45' 24" N	31º47' 08" E
127	Muratlar	C	7,10	-9,40	203,45	5,90	670,00	435,5	60,40	16,00	23,00	0,30	764m	40º46' 07" N	31º48' 42" E
128	Tarakçı	C	7,43	-26,40	185,48	6,90	502,00	326,3	81,50	17,50	23,00	0,30	701m	40º46' 09" N	31º47' 19" E
129	Yukarıçamlık	C	7,62	-37,70	172,42	7,40	434,70	282,56	82,70	20,20	23,00	0,20	738m	40º47' 06" N	31º48' 06" E
130	Yayladin	C	7,94	-56,80	153,00	6,46	601,00	390,65	73,50	20,70	23,00	0,30	762m	40º47' 24" N	31º50' 06" E
131	Müştakimler	C	8,26	-78,90	123,36	7,01	372,00	241,8	97,50	32,30	23,00	0,20	865m	40º48' 53" N	31º44' 13" E
132	Değirmendere	B	7,89	-54,00	156,06	5,02	680,00	442	56,40	20,30	23,00	0,30	870m	40º48' 54" N	31º44' 50" E
133	Taşçılar	B	7,24	-19,10	192,71	10,51	526,00	341,9	110,30	17,60	23,00	0,30	875m	40º49' 06" N	31º44' 06" E
134	Çobankaya	C	7,37	-23,80	182,23	8,67	446,30	290,1	110,10	26,50	23,00	0,20	1022m	40º49' 23" N	31º43' 45" E
135	Gölcük	C	7,74	-44,40	164,16	8,45	605,00	393,25	99,10	22,60	23,00	0,30	1038m	40º49' 23" N	31º43' 06" E
136	Yukarıbayat	B	7,60	-38,50	170,78	2,83	773,00	502,45	32,60	21,50	23,00	0,40	810m	40º47' 12" N	31º41' 09" E
137	Hamzabey	B	7,71	-42,00	165,46	7,57	523,00	339,95	92,60	24,30	23,00	0,30	783m	40º46' 05" N	31º39' 09" E
138	Saraycık	B	8,89	-116,80	87,02	20,00	513,00	333,45	200,00	29,90	23,00	0,30	772m	40º44' 49" N	31º44' 39" E
139	Susuzkınık	C	6,95	3,90	217,01	4,46	1099,00	714,35	54,40	15,60	23,00	0,60	758m	40º44' 48" N	31º44' 28" E
140	Gökpınar	C	7,33	-20,70	191,18	8,80	674,00	438,1	89,70	17,50	23,00	0,30	814m	40º43' 06" N	31º44' 21" E
141	Demirciler	C	7,58	-36,00	170,29	3,85	542,00	352,3	55,80	26,10	23,00	0,30	797m	40º42' 06" N	31º43' 14" E
142	Çaygökpınar	D	7,32	-20,00	187,00	6,65	659,00	428,35	84,20	25,00	23,00	0,30	759m	40º42' 34" N	31º41' 08" E
		Min.	6,84	-151,00	53,34	0,24	73,60	47,84	8,40	7,10	18,80	0,00			
		max.	9,45	8,50	217,01	20,00	2796,00	1817,40	200,00	33,90	25,20	0,90			
		Mean	7,83	-51,83	158,05	7,23	530,80	345,02	80,38	20,48	21,97	0,26			

Appendix 3. The number of the species found per counties.

Species	Merkez	Göynük	Yeniçağa	Mudurnu	Seben	Kıbrıscık	Mengen	Gerede	Dörtdivan
Po	1	1	1	1	0	1	1	1	0
Pz	1	1	1	1	0	0	0	0	0
Cn	1	1	1	1	0	1	0	1	1
Cc	1	1	0	1	0	0	0	1	0
Hc	1	0	0	0	1	0	0	1	0
Co	1	1	0	0	0	0	0	1	0
Ps	0	1	1	0	0	0	0	1	0
Ii	1	1	1	0	0	0	1	0	0
Hb	0	1	0	0	0	0	1	0	0
Ig	1	1	1	0	0	0	0	1	1
Hr	1	0	0	0	0	0	0	0	0
Pf	1	1	1	1	0	0	1	1	1
Ie	1	0	0	0	0	0	0	0	0
Sp	0	0	0	1	0	0	1	0	0
Ev	0	0	0	0	0	0	1	0	0
Pk	1	0	0	0	0	0	0	0	1
Pu	1	0	0	0	0	0	0	0	0
Ib	1	1	1	1	1	1	1	1	0
Ho	1	0	0	0	0	0	1	0	0
Ts	0	0	0	0	0	1	0	0	0
Hs	0	0	0	0	0	0	1	1	0
Pm	0	0	0	0	0	1	0	0	0
Pa	0	0	0	0	0	1	0	0	0
Pe	1	0	0	0	0	0	0	0	0
Fa	1	0	0	0	0	0	0	1	0
Fb	0	0	0	0	0	0	0	1	0
Fp	0	0	0	0	0	0	0	1	0
Cw	1	0	0	0	0	0	0	0	0
Pc	1	0	0	0	0	0	0	0	0
Pv	1	1	0	0	1	1	0	1	1
Cs	1	0	0	1	0	0	0	0	0
Cv	0	0	0	0	1	1	0	0	1
Hi	1	1	1	1	1	1	1	1	1
Fr	1	0	0	0	0	0	0	0	0
Fl	0	1	0	0	0	0	0	0	0
Sb	0	0	1	0	0	0	0	0	0
Ff	1	0	0	0	0	0	0	0	0
Ca	1	0	0	0	0	0	0	0	1
Cl	0	0	0	0	0	0	0	0	1
Total	**25**	**14**	**10**	**9**	**5**	**9**	**10**	**15**	**9**

Appendix 4. Total station number of nine counties

Merkez	**Göynük**	**Yeniçağa**	**Mudurnu**	**Seben**	**Kıbrıscık**	**Mengen**	**Gerede**	**Dörtdivan**
1	22	40	48	68	78	85	94	118
2	23	41	49	69	79	86	95	119
3	24	42	50	70	80	87	96	120
4	25	43	51	71	81	88	97	121
5	26	44	52	72	82	89	98	122
6	27	45	53	73	83	90	106	123
7	28	46	54	74	84	91	107	124
8	29	47	55	75	**Total**	92	108	125
9	30	**Total**	56	76	**7**	93	109	**Total**
10	31	**8**	57	77		**Total**	110	**8**
11	32		58	**Total**		**9**	111	
12	33		59	**10**			112	
13	34		60				113	
14	35		61				114	
15	36		62				115	
16	37		63				116	
17	38		64				117	
18	39		65				**Total**	
19	**Total**		66				**17**	
20	**18**		67					
21			**Total**					
99			**20**					
100								
101								
102								
103								
104								
105								
126								
127								
128								
129								
130								
131								
132								
133								
134								
135								
136								
137								
138								
139								
140								
141								
142								
143								
144								
47	**18**	**8**	**20**	**10**	**7**	**9**	**17**	**8**

PHOTOS

Photo 1. Station 122; a very polluted stream.

Photo 2. Station 106; a temporary pond.

Photo 3. Station 52; a small pond under threes. Attention to cow dung.

Photo 4. Station 8; a few waterholes between the threes.

Photo 5. Station 10; a small pool in Atyaylası.

Photo 6. Station 138; a few water holes to water animals.

Photo 7. Station 24; a polluted creek is most probably linking to a sewer outlet.

Photo 8. Station 26; littoral zone of a shallow lake, Lake Çubuk.

Photo 9. Station 44; a slowflowing creek under a bridge.

Photo 10. Station 22; a trough maden from a log.

Photo 11. Station 115; a small pond enclosed by watercress.

Photo 12. Station 119; a creek that was passed through a village

Photo 13. Station 108; a running stream.

Photo 14. Station 114; a few roadside and temporary waterholes in the middle of a village.

Photo 15. Station 124; littoral zone of a small lake, Lake Dörtdivan.