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Contribution to the Freshwater Ostracoda (Crustacea) Fauna of Turkey: Distribution and Ecological Notes

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Abstract

In this study, a total of 37 freshwater ostracod species were collected from 47 stations between 31 August 2010 and 23 June 2011. Among them, three species (*Eucypris kerkyrensis*, *Cypridopsis elongata*, *Bradleystrandesia parva*) were new records for the Ostracoda fauna of Turkey. Bisexual populations of three species (*Ilyocypris inermis, Trajancypris serrata* and *Psychrodromus olivaceus*) were repeatedly occurred from Anatolia.

Spearman Rank Correlation analyses illustrated a significant correlation for the four most abundant species (*Condona neglecta, Heterocypris salina, Eucypris lilljeborgi* and *Potamocypris villosa*) with electrical conductivity while temperature did not show a significant effect on species occurrence. Five species (*Pseudocandona albicans, Ilyocypris gibba, Heterocypris incongruens, Heterocypris rotundata* and *Eucypris virens*) did not have any significant correlation to those variables used here, but correlation was significant between *Potamocypris villosa* and three variables (pH, electrical conductivity and salinity). According to Environmental Tolerance Index (ETI), most species with high ETI values were widespread species. Such species with high tolerance and widespread (or cosmopolitan) distribution were named as "cosmoecious species"

Keywords: Anatolia, freshwater, taxonomy, ecology, biodiversity.

Türkiye'nin Tatlısu Ostrakotları (Crustacea)'na Katkı: Dağılım ve Ekolojik Notlar

Özet

Bu çalışmada, 31 Ağustos 2010 ile 23 Haziran 2011 tarihleri arasında 47 istasyondan toplam 37 tatlısu ostrakot türü toplanmıştır. Bunlardan üç tür (*Eucypris kerkyrensis*, *Cypridopsis elongata*, *Bradleystrandesia parva*) Türkiye ostrakot faunası için yeni kayıttır. Üç türün (*Ilyocypris inermis*, *Trajancypris serrata* ve *Psychrodromus olivaceus*) eşeysel popülasyonuna ise Türkiye'de tekrar rastlanılmıştır.

Spearman Rank Correlation analizi, en sık rastlanılan dört tür (*Condona neglecta*, *Heterocypris salina*, *Eucypris lilljeborgi* ve *Potamocypris villosa*) ile elektriksel iletkenlik arasında anlamlı bir korelasyon gösterirken, sıcaklık ile bu türlerin rastlanılması arasında hiç bir anlamlı ilişki göstermemektedir. Çevresel değişkenler ile hiç bir korelasyon göstermemiş olan beş tür bulunmaktadır (*Pseudocandona albicans*, *Ilyocypris gibba*, *Heterocypris incongruens*, *Heterocypris rotundata* ve *Eucypris virens*). Ancak *Potamocypris villosa* türü üç değişken (pH, elektriksel iletkenlik ve tuzluluk) ile güçlü bir ilişki göstermiştir. Çevresel Tolerans İndeks (ETI) değerlerine bakıldığında, geniş dağılıma sahip olan (kozmopolit) çoğu türün aynı zamanda yüksek ETI değerine de sahip olduğu görülmektedir. Bu gibi toleransı yüksek ve geniş dağılımlı türlere "cosmoecious species" denilmektedir.

Anahtar Kelimeler: Anadolu, tatlısu, taksonomi, ekoloji, biyoçeşitlilik.

Introduction

Ostracods are tiny, fewer more than 3 mm crustaceans enclosed into two-valve calcified carapace, having well developed pare of first and second antennae, as well 6 paired appendages around the body. The body ends in a long appendage called uropodal ramus. The segmentation of the body is disappeared almost and only head region is separated completely from other parts (thorax and abdomen).

Ostracods are ubiquitous aquatic animals with environment-specific characteristics (De Deckker and Forester, 1988; Mezquita *et al.,* 2001). Because of their specific ecological preferences, they may show limited spatial and temporal distribution. For example, despite the water currents and immigrant

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birds in the estuaries, which can have important effects on transportation of species, there is no evidence of species-mixing in freshwater and brackishwater ostracods of estuaries (Yozzo, 1994). Moreover, adult individuals of stenochronal ostracods are found in specific seasons and months while eurychronal species can be found all year round. Additionally, having a chitinous carapace and leaving fossils in the sediment elevates the usage of ostracods to understand the past historical aquatic conditions (De Deckker and Forester, 1988).

Anatolia is located in Palearctic zoogeographic zone and plays important role as a bridge between Europe and Asia where it has high species diversity in variety of habitats. Therefore, studying biodiversity of this area is very important for understanding species distribution and their ecological characteristics. Indeed, such habitat diversity along with historical background can provide different opportunities for organisms where survival chances can be increased with changing modes of reproduction (e.g., parthenogenetic, sexual forms). Gülen (1985a) underlined such diversity in species or population with different reproductive modes. Accordingly, species with different reproductive modes may also require unique ecological conditions and habitat preferences (Külköylüoğlu *et al.*, 2012a).

In Turkey works on freshwater Ostracoda was started by Daday (1903), Schäfer (1952) and Hartmann (1964). After them, Gülen and his colleagues continued faunistic studies on ostracods in various regions of Anatolia. Limnoecological studies on ostracods via new perspective and methods have been achieved by Külköylüoğlu and his team.

The aim of this paper was to contribute knowledge on the ecology and distribution of non-marine ostracods in various habitats of Turkey.

Materials and Methods

Sampling and Species Determination

Field work was carried out from 31 August 2010 to 23 June 2011. Sampling was randomly done from 47 stations. The stations include a variety of aquatic environments, such as permanent pool, road-side temporary waters, swamp, marsh, spring, lake, trough and paddy field located in the 13 provinces of Turkey. (Figure 1).

Samples were taken by hand-net (80μm mesh size) and kept in the jars (330 cc) then fixed in 4% formalin. Samples were washed with tap water in vitro conditions and filtered through standard-sized sieves (2, 1, 0.5 and 0.3 mm mesh size). Individuals were separated from other materials and reserved in 70% ethylalcohol. Species were identified based on morphological characteristics of the soft parts and carapace structure. Specimens were mounted in Glycerin to make permanent slides. Although not limited, following references were used Bronshtein (1947), Meisch (2000) and Karanovic (2012) for species identification.

Physicochemical variables such as salinity, electrical conductivity and temperature were measured by using YSI 30 SCT meter when the values of dissolved oxygen, oxygen saturation were taken by WTW 330 oxygen meter and pH by WTW 330 pH meter (Table 1).

Statistical Methods

Statistical analysis were done with 10 species encountered in five or more sites. Since data were discrete, Spearman Rank Correlation was used to determine the probable correlation between 5 environmental variables (temperature, electrical conductivity, salinity, pH and altitude) and abundance of 10 species by SPSS15.

Ecological tolerance (t_k) and optimum (u_k) values were calculated by C2 software (Juggins, 2003).

Environmental Tolerance Index (ETI) was estimated from the following formula:

$$ETI = {}^{a}/_{A}$$

where α= variation range of a variable at stations where X species was found; A= variation range of a

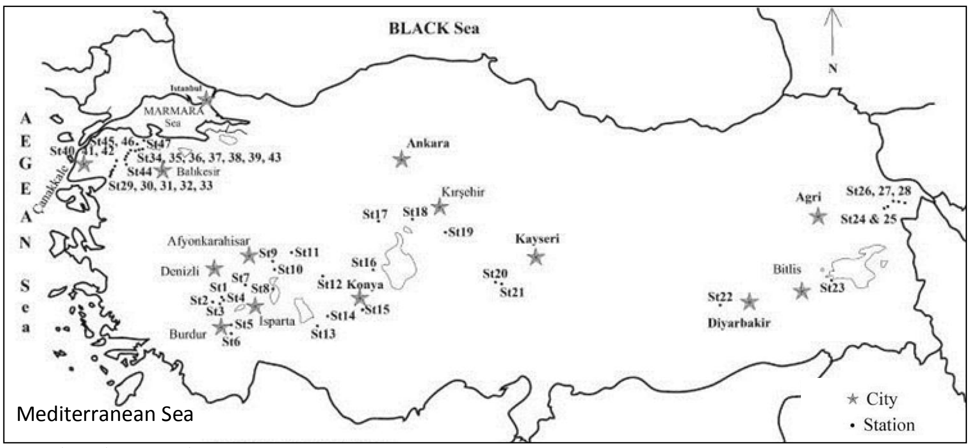

Figure 1. Spotted stations on the map.

Table 1. Data about 47 stations

Code	Location	Type	Name	Coordinate	T	pH	EC	S	DO	S%	Alt	Species
St1	Afyon	Pool		37º 50'N 29º 45'E	19.00	8.46	1050	1.50	NA	NA	860	Ev, Hi
St2	Denizli	Trough		37º 44'N 29º 30'E	11.00	7.56	1230	1.00	NA	NA	991	Pe
St3	Denizli	Lake	Beylerli	37º 43'N 29º 30'E	23.30	8.82	680	1.00	NA	NA	857	Cp, Hr, Hs
St4	Denizli	Lake	Acı Göl	37º 47'N 29º 44'E	15.00	8.10	10050	50.00	NA	NA	841	El, Hi, Hs
St5	Burdur	Spring		37º 35'N 29º 58'E	15.80	8.95	690	0.30	NA	NA	915	Hs, Hh
St6	Burdur	Lake	Karataş	37º 25'N 29º 58'E	14.00	8.76	520	0.20	NA	NA	1054	CP, Hi, Hr
St7	Afyon	Lake	Karakuyu	38º 04'N 30º 16'E	14.00	7.92	360	0.10	NA	NA	1010	Cn, Co, Ib, Im, Po, Pz
St8	Isparta	Lake	Eğirdir	38º 03'N 30º 50'E	22.20	8.70	350	0.20	NA	NA	922	Ff, Pa, Cp, Ig, Hr
St9	Afyon	Marsh	Armutlu	38º 28'N 30º 44'E	18.50	7.20	300	0.10	NA	NA	1398	Cn, Ig, Im, Ev, Hr, Hs
St10	Afyon	Lake	Karamık	38º 24'N 30º 48'E	13.30	8.46	470	0.10	NA	NA	1083	Ig
St11	Afyon	Lake	Eber	38º 41'N 31º 08'E	19.40	8.77	2260	1.50	NA	NA	967	Cp, Im
St12	Konya	Lake	Çavuşçu	38º 19'N 31º 51'E	25.60	7.90	340	0.10	NA	NA	1024	Pa, Cv
St13	Konya	Pool		37º 31'N 31º 48'E	19.50	8.10	300	0.10	NA	NA	1123	Cn, Cp, Ev, Sf, Ce, Pv
St14	Konya	Spring		37º 44'N 32º 09'E	18.80	7.70	150	0.00	NA	NA	1412	Cn, Ig, El, Pv
St15	Konya	Tempor ary		37º 50''N 32º 43'E	15.90	7.90	1940	2.00	NA	NA	1002	Ig, Cp, El, Hi, Hr, Hb
St16	Konya	Tempor ary		38º 30'N 32º 54'E	25.20	9.15	1820	1.70	NA	NA	942	Ig, Ev, El, Ek, Hi, Hr, Hs
St17	Ankara	Tempor ary	Akören	39º 17'N 32º 54'E	14.90	8.80	1330	1.50	NA	NA	1057	Hr, Hb
St18	Kırşehir	Spring		39º 20'N 33º 39'E	19.20	8.30	710	0.20	NA	NA	1133	Ii, Ek, Ko, Hi
St19	Kırşehir	Pool		39º 11'N 34º 20'E	16.70	7.60	450	0.20	NA	NA	1139	Cp, Tc, Hi, Hr, Cv
St20	Kayseri	Swamp	Sultan Sazlığı	38º 19'N 35º19'E	20.70	7.10	50	0.00	NA	NA	1073	Cn, Ff, Co
St21	Kayseri	Lake	Sobe	38º 25'N 35º 16'E	19.00	8.90	5290	3.30	NA	NA	1075	Cn, Ib, Im, Ko, Hs
St22	Diyarbakır	Tempor ary		38º 05'N 40º 07'E	25.90	7.34	280	0.10	NA	NA	753	Cp, Ic, Sf, Pv
St23	Bitlis	Pool		38º 28'N 42º 27'E	21.50	8.70	460	0.20	NA	NA	1648	Pa, Cp, Hi
St24	Ağrı	Tempor ary		39º 33'N 43º 54'E	15.50	8.30	520	0.20	NA	NA	1723	Cp, Ts, Tc, Hi,Pu, Pv
St25	Ağrı	Tempor ary		39º 33'N 43º 52'E	15.10	9.90	8920	6.00	NA	NA	1721	Hi
St26	Ağrı	Lake	Sazlı Göl	39º 40'N 44º 03'E	16.00	9.30	2760	2.50	NA	NA	1524	El, Hr
St27	Ağrı	Tempor ary		39º 39'N 44º 06'E	15.30	9.47	1790	1.50	NA	NA	1523	Ev
St28	Ağrı	Lake	Gölyüzü	39º 36'N 44º 08'E	16.30	8.10	1340	1.40	NA	NA	1520	Cp, Ev, El, Ts, Hr, Hb
St29	Balıkesir	Trough		39º 40'N 27º 05'E	18.20	7.50	286	0.20	10.40	113	395	Ps, Pv
St30	Balıkesir	Trough		39º 41'N 27º 08'E	23.20	7.47	286	0.10	6.10	75	612	Hi, Hr
St31	Balıkesir	Trough		39º 41'N 27º 09'E	19.70	7.60	147	0.10	9.80	116	736	Ps, Pv

Table 1. Continued

Code	Location	Type	Name	Coordinate	T	pH	EC	S	DO	S%	Alt	Species
St32	Balıkesir	Trough		39º 42'N 27º 10'E	14.60	7.83	78	0.00	8.70	93	653	Cn, Po
St33	Çanakkale	Trough		39º 43'N 27º 11'E	15.30	6.90	92	0.10	8.70	92	462	Ps, Pv
St34	Çanakkale	Trough		39º 56'N 27º 20'E	18.40	7.52	782	0.40	11.40	125	231	Hr, Hs
St35	Çanakkale	Trough		39º 57'N 27º 21'E	20.60	7.52	668	0.40	17.10	192	208	Hi, Hs, Pv
St36	Çanakkale	Trough		39º 58'N 27º 22'E	22.50	8.02	1071	0.60	9.30	125	198	Hr, Hs
St37	Çanakkale	Trough		39º 58'N 27º 27'E	19.90	7.52	878	0.50	8.20	92	119	Hs
St38	Balıkesir	Trough		40º 00'N 27º 30'E	23.20	7.30	641	0.30	8.80	104	110	Hc, Hi, Pg
St39	Balıkesir	Trough		40º 02'N 27º 33'E	24.20	8.43	498	0.20	9.20	108	114	Hi
St40	Çanakkale	Running		39º 51'N 27º 14'E	16.00	7.97	291	0.20	6.00	62	285	Po
St41	Çanakkale	Running		39º 51'N 27º 14'E	9.90	8.10	360	0.20	6.90	62	285	Pa, Ib
St42	Çanakkale	Running		39º 51'N 27º 14'E	12.60	8.08	298	0.20	10.40	99	285	Cn, Pa, Ff, Ib, Pf, Ev, El
St43	Balıkesir	Running		40º 02'N 27º 33'E	13.00	7.85	183	0.10	7.50	74	75	Cn, Po
St44	Çanakkale	Lake	Gümüşler	39º 53'N 27º 22'E	9.50	8.85	335	0.20	22.10	193	219	Ev
St45	Balıkesir	Running		40º 11'N 27º 31'E	18.20	8.11	370	0.20	8.60	94	66	Hi, Hr, Hs, Hsp.,Ssp., Cv
St46	Baılkesir	Rice field		40º 11N 27º 31'E	21.60	7.75	657	0.30	5.90	67	66	Hr, Hsp.,Ssp, Bp
St47	Balıkesir	Running		40º 15'N 27º 37'E	13.20	7.75	270	0.20	5.40	53	14	Ii

Abbreviations: Temperature [T (ºC)], pH, Electrical Conductivity [EC (µS.cm^{-1})], Salinity [S (ppt)], Dissolved Oxygen [DO (mg.L^{-1})], Oxygen Saturation [%S], Altitude [Alt (m)], Not Avaılable data [NA], *Candona neglecta* [Cn], *Fabaeformiscandona fabaeformis* [Ff], *Pseudocandona eremita* [Pe], *P. albicans* [Pa], *Cypria ophtalmica* [Co], *Ilyocypris gibba* [Ig], *I. monstrifica* [Im], *I. bradyi* [Ib], *I. inermis* [Ii], *Cypris pubera* [Cp], *Eucypris virens* [Ev], *E. kerkyrensis* [Ek], *E. lilljeborgi* [El], *Koencypris ornata* [Ko], *Prionocypris zenkeri* [Pz], *Trajancypris serrata* [Ts], *T. clavata* [Tc], *Bradleystrandesia parva* [Bp], *Herpetocypris chevreuxi* [Hc], *H. helenae* [Hh], *H. intermedia* [Ht], *Psychrodromus olivaceus* [Po], *P. fontinalis* [Pf], *Stenocypria fischeri* [Sf], *Stenocypris* sp. [Ssp.], *Heterocypris incongruens* [Hi], *H. rotundata* [Hr], *H. Barbara* [Hb], *H. salina* [Hs], *Hemicypris* sp. [Hsp.], *Isocypris beauchampi* [Ic], Cypridopsis vidua [Cv], *C. elongata* [Ce], *Potamocypris variegata* [Pg], *P. unicaudata* [Pu], *P. smaragdina* [Ps], *P. villosa* [Pv].

variable at all stations. The values of this index vary between 0 and 1. Values closer to 1 indicate that the species have higher adaptation to that certain variable and vice versa (Curry, 1999). Ecologıcal tolerance, optimum and ETI values of 10 species were calculated about 4 environmental variables (temperature, electrical conductivity, pH and altitude).

Results

Sampling

A total of 37 species [*Candona neglecta* Sars, 1887, *Fabaeformiscandona fabaeformis* (Fischer, 1851), *Pseudocandona eremita* (Vejdovsky, 1882), *P. albicans* (Brady, 1864), *Cypria ophtalmica* (Jurine, 1820), *Ilyocypris gibba* (Ramdohr, 1808), *I. monstrifica* (Norman, 1862), *I. bradyi* Sars, 1890, *I. inermis* Kaufmann, 1900, *Cypris pubera* O.F. Müller, 1776, *Eucypris virens* (Jurine, 1820), *E. kerkyrensis* Stephanides, 1937, *E. lilljeborgi* (G.W. Müller, 1900), *Koencypris ornata* (O.F. Müller, 1776), *Prionocypris zenkeri* (Cheyzer and Toth, 1858), *Trajancypris serrata* (G.W. Müller, 1900), *T. clavata* (Baird, 1838), *Bradleystrandesia parva* Hartmann, 1964, *Herpetocypris chevreuxi* (Sars, 1896), *H. helenae* G.W. Müler, 1908, *H. intermedia* Kaufmann, 1900, *Psychrodromus olivaceus* (Brady and Norman, 1889), *P. fontinalis* (Wolf, 1920), *Stenocypria fischeri* (Lilljeborg, 1883), *Stenocypris* sp., *Heterocypris incongruens* (Ramdohr, 1808), *H. rotundata* (Bronshtein, 1928), *H. barbara* (Gauthier and Brehm, 1928), *H. salina* (Brady, 1868), *Hemicypris sp.*, *Isocypris beauchampi* (Paris, 1920), *Cypridopsis vidua* (O.F. Müller, 1776), *C. elongata* (Kaufmann, 1900), *Potamocypris variegata* (Brady and Norman, 1889), *P. unicaudata* Schäfer, 1943, *P. smaragdina* (Vávra, 1891), *P. villosa* (Jurine, 1820)] belonging to the superfamily Cypridoidea were found from 47 stations. Of which, three species (*E. kerkyrensis*, *C. elongata* and *B. parva*) were new records for the freshwater ostracod fauna of Turkey. Bisexual populations of three species (*T. serrata*, *P. olivaceus* and *I. inermis*) were also recorded for the second time from Anatolia.

Statistical Results

In average, 3 species per station was found when station 16 had the highest numbers of species (7 spp.). Among the species, *H. rotundata* with about 40% of frequency was the most encountered species. In contrast, *P. eremita*, *H. helenae*, *H. intermedia*, *H. chevreuxi*, *P. zenkeri*, *P. fontinalis*, *C. elongata*, *P. unicaudata*, *P. variegata*, *I. beauchampi* and *B. parva* with one time occurrence had the lowest frequency (2.12%).

Four common species [*P. villosa* (r = -0.426, P = 0.004), *C. neglecta* (r = -0.408, P = 0.007), *H. salina* (r = 0.376, P= 0.013) and *E. lilljeborgi* (r = 0.306, P = 0.046)] displayed significant correlation to electrical conductivity. When *P. villosa* and *C. neglecta* showed a strong (P<0.01) negative correlation, the other two species (*H. salina* and *E. lilljeborgi*) showed strong (P<0.05) positive correlation (Table 2).

Candona neglecta had a negative correlation with salinity (r = -0.440, P = 0.003) which was the most powerful correlation compared with other species such as *H. salina* (r = 0.366, P = 0.016), *P. villosa* (r = -0.338, P = 0.027) and *E. lilljeborgi* (r = 0.336, P = 0.026).

Potamocypris villosa (r = -0.381, P = 0.012) showed negative correlation with pH while *C. pubera* was the only species showing a significant correlation to altitude (r = 0.390, P = 0.010). There are no other species found in a meaningful relationship to temperature.

Table 3 shows optimum,tolerance and ETI values for 10 most abundant species. High ETI values were mostly estimated for cosmopolitan species. In addition, having tolerance values more/less than average reveals that species were able to tolerate changes in wide/narrow ranges of fluctuations. Furthermore, scores related to the optimal column show suitable conditions for the relevant species.

Discussion

In addition to the new records for Turkey, there are also some species found for the first time from their encountered regions. For example, St4 is located in vicinity of Lake "Acı Göl" (Afyon - Turkey). Altınsaçlı and Mezquita (2008) have already reported 13 ostracods from this lake. Two species (*H. salina* and *H. incongruens*) reported in the present study were common but *E. lilljeborgi* was the new record for this lake.

The ostracod population of Lake Eğridir were previously investigated by Özuluğ *et al.* (2001) and Altınsaçlı (2001). *Ilyocypris gibba* and *C. pubera* were 2 common species between these and the present study. However, *F. fabaeformis*, *P. albicans* and *H. rotundata* were the new species for the lake area.

Isocypris beauchampi, S. fischeri and *C. pubera* have previously been reported from Diyarbakır region by some studies (Margaritora, 1977; Gülen *et al.*, 1996; Akdemir and Külköylüoğlu, 2011; Külköylüoğlu et al., 2012b). During this study, we reported *P.villosa* the addition species to the fauna of this area (St22). In Turkey, *K. ornata* has been reported only one time so far (Ustaoğlu *et al.*, 2003). It was found from a shallow lake situated on the Northwest of Izmir (Sazlıgöl) between February and May. We recorded this species from 2 stations. One of them is Akören Lake, a shallow temporary lake (St17) and the second one is Sobe Lake (St21) both on May. Now, it seems that the distribution area of this stenochronal species expanded through Turkey.

The exact systematical position of *P. eremita* is

Table 2. Spearman Rank Correlation between species and five environmental variables

		Cn	Pa	Hi	Hr	Hs	Cp	Pv	Ev	El	Ig
	Correlation Coefficient	-0.198	0.026	0.160	0.196	0.225	0.158	0.116	-0.095	-0.109	0.065
T	Sig. (2-tailed)	0.202	0.870	0.306	0.208	0.146	0.312	0.460	0.543	0.487	0.679
	N	43	43	43	43	43	43	43	43	43	43
	Correlation Coefficient	-0.224	0.094	0.106	0.087	0.028	0.110	-0.381(*)	0.184	0.135	0.039
pH	Sig. (2-tailed)	0.148	0.547	0.500	0.578	0.857	0.481	0.012	0.236	0.388	0.805
	N	43	43	43	43	43	43	43	43	43	43
	Correlation Coefficient	-0.408(**)	-0.202	0.297	0.289	0.376(*)	0.088	-0.426(**)	0.048	0.306(*)	-0.001
Ec	Sig. (2-tailed)	0.007	0.193	0.053	0.060	0.013	0.573	0.004	0.758	0.046	.997
	N	43	43	43	43	43	43	43	43	43	43
	Correlation Coefficient	-0.440(**)	-0.145	0.290	0.293	0.366(*)	0.056	-0.363(*)	0.090	0.338(*)	-0.071
S	Sig. (2-tailed)	0.003	0.353	0.059	0.056	0.016	0.722	0.017	0.565	0.027	.649
	N	43	43	43	43	43	43	43	43	43	43
	Correlation Coefficient	0.146	0.026	0.062	-0.012	-0.229	0.390(**)	0.026	0.199	0.213	0.246
Alt	Sig. (2-tailed)0	0.350	0.866	0.691	0.941	0.140	0.010	0.870	0.201	0.170	.111
	N	43	43	43	43	43	43	43	43	43	43

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Abbreviations: Correlation Coefficient (r), Significancy (P) and Number of examined samples (N). Others have been given in Table 1

Table 3. Optimum (uk), Tolerance (tk) and ETI values of 10 species along with numbers of occurrences (Count)

Code	Count	Max	T			pH			EC			Alt		
			u_k	t_k	ETI	u_k	t_k	ETI	u_k	t_k	ETI	u_k	t_k	ETI
Cn	9	52	16.55	3.08	0.49	7.82	0.57	0.60	978.59	1780.22	0.52	907.68	426.42	0.78
Pa	5	56	18.20	5.26	0.96	8.45	0.30	0.26	362.03	51.95	0.01	830.18	489.06	0.80
Ig	6	229	23.56	3.74	0.72	8.97	0.41	0.65	1662.80	461.44	0.18	967.18	80.57	0.28
Cp	11	9161	16.06	1.88	0.72	8.25	0.24	0.49	658.67	349.60	0.20	1635.00	217.69	0.57
Ev	8	59	17.65	2.95	0.96	8.00	0.59	0.76	841.08	556.21	0.15	1271.45	340.53	0.76
El	7	593	20.16	4.63	0.77	8.49	0.62	0.53	1932.32	768.53	0.26	991.00	110.52	0.72
Hi	14	3760	21.15	3.42	0.68	8.34	1.03	0.87	2399.10	3297.33	0.86	861.87	725.09	0.97
Hr	15	715	21.46	3.11	0.68	8.12	0.67	0.70	778.67	878.01	0.25	550.99	492.52	0.85
Hs	11	2242	20.38	1.36	0.62	7.96	0.74	0.65	1971.73	1996.31	0.50	444.75	399.06	0.779
Pv	8	6960	19.12	1.25	0.65	7.93	0.36	0.46	276.34	83.70	0.05	1012	10.31.93	0.89
Mean			18.53	3.06	0.72	8.23	0.55	0.60	1022.33	962.79	0.30	940.01	364.60	0.74
Maxi			23.56	5.26	0.96	8.97	1.03	0.87	3297.33	3485.85	0.86	1635.00	725.09	0.97
Min			10.12	1.25	0.49	7.82	0.24	0.26	51.95	50.67	0.01	444.75	80.57	0.28
S.D.			3.78	1.31	0.14	0.34	0.23	0.17	744.29	1032.31	0.26	336.10	204.39	0.19

Abbreviations have been given in Table 1.

somewhat doubtful, Martens and Savatenalinton (2011) used the oldest systematic and put it in the genus *Pseudocandona* Kaufmann, 1900. However, Karanovic (2012) replaced it into the genus *Typhlocypris* Vejdovsky, 1882. Gülen (1985b) reported this species from a water supply reservoir (Bentler, Istanbul) as the first occurrence from Turkey. Altınsaçlı and Griffiths (2002) stated that *P. eremita* normally is found from ground waters. In the present study it was reported from a trough at 991 m a.s.l. in Denizli

So far, 41 bisexual populations of various ostracod species have been reported from Turkey. (Gülen, 1985a; Külköylüoğlu *et al.*, 2012a; Sarı *et al.*, 2012). Among them, males of *I. inermis* were found from five different slow running water at Bolu and Erzincan provinces (Turkey) in summer 2006 by Sarı *et al.* (2012). During the present study, we collected bisexual population of *I. inermis* (16♂ and 62♀) from input water of a small pool in Kırşehir Province (St18). It is now contributed that distribution area of this species' bisexual populations is probably much broader than previously known. Gülen *et al.* (1994) described males of *T. serrata* for the first time from Turkey. They found only one male accompanied by 2 female individuals from Lake Erçek (Van, Turkey). We were able to collect bisexual individuals of this species (187♂ and 158♀) from littoral zone of Lake Gölyüzü (St28) in Ağrı Province. Since these two regions, where bisexual populations of *T. serrata* were found, are geographically close in distance, this may imply its limited geographical distribution is in eastern parts of Turkey. Similarly, former reports of the bisexual populations of P. olivaceus from Turkey include Lake Karamık in Afyon (Gülen, 1985a), Lake Sapanca in Sakarya (Altınsaçlı, 1997) and three springs around the Lake Aladağ in Bolu (Külköylüoğlu and Yılmaz, 2006). In the present study, we collected both males and females (32♂ and 58♀) from the littoral zone (depth<50 cm) of Lake Karakuyu in Afyon. Such new findings of some bisexual populations in Turkey may be important in terms of understanding their distribution and ecological preferences. In such a case, ecological similarities of particular habitats from which species were reported can be taken into consideration. For example, these studies mentioned above have at least two common information that they are all shallow and relatively cool habitats. Due to lack of knowledge on ecology, the conclusion cannot be generalized at the moment.

Correlations, optimum, tolerance and ETI values indicated that various species have a specific optimal level and a tolerable range for different variables. For example, the highest abundance of *P. villosa* in habitats with low electrical conductivity showed its tendency for living in freshwater conditions. These results can reveal that this taxon is not well adapted to a wide variations of electrical conductivity (low ETI).

Candona neglecta is a cosmopolitan species tolerating anaerobic conditions in low-oxygenated waters (Dügel *et al.*, 2008). In addition, Karakaş Sarı and Külköylüoğlu (2008) explained a negative correlation between the occurrence of this bisexual Candonid species and dissolved oxygen. Roca and Baltanás (1993) encountered this species in cold water bodies of Spain. Bronshtein (1947) introduced *C. neglecta* as a stenothermal ostracod species. In contrary point, Külköylüoğlu and Sarı (2011) proposed that this cosmopolitan ostracod can tolerate a wide range of temperature values. According to the findings of this study, the optimal temperature for this species is low (u_k = 16.55°C) and the tolerance is relatively moderate (t_k = 3.08). This eurychronal ostracod is able to live in a wide range of pH (Külköylüoğlu, 2005; Külköylüoğlu *et al.*, 2010).

Estimated pH optimum and tolerance (u_k = 7.82, t_k = 0.57) of present study prove that this species prefers alkaline environments.

Pseudocandona albicans inhabits stagnant or slow-flowing water bodies (Henderson, 1990). Meisch (2000) remarked that this mesohalophilic ostracod can tolerate salinity ranges up to 5.5 ppt. Despite the findings of Külköylüoğlu *et al.* (2010) in the Lake Sünnet (Bolu-Turkey), our estimated ETI (0.96), optimum (18.20°C) and tolerance value (5.26) about temperature were higher than those of studies. The results of present study for the optimum values of pH (u_k = 8.45), temperature (u_k = 18.20°C) and electrical conductivity (u_k = 362.03 µS.cm^{-1}) were closer to the findings of Mezquita *et al.* (1996) in Spain. Having a high pH optimum value, low tolerance to the changes of this variable (t_k = 0.30) and lower pH-ETI value (0.26) indicate being a probable resident of alkaline (7.9 - 8.7) environments.

Ilyocypris gibba is a widespread summer form ostracod preferring springs, rivers, streams, ditches, canals and rice fields, scarcely dwelling in temporary waters (Meisch, 2000). Although, it is a good swimmer, it prefers environments with muddy or sandy bottom (Klie, 1938; Bronshtein, 1947). According to the results of this study, this species may have a strong tendency to live in warm water (uk=23.56°C), and can tolerate the variation of this factor in a relatively wide range (tk=3.74). Indeed, our findings partially confirmed the claim of Hartmann and Hiller (1977) about the polythermophilic feature of this taxon. It was found from stations within range of 150-1940 µS.cm^{-1} electrical conductivity. Hence, these findings do not reflect any adaptation to the variations of electrical conductivity (ETI=0.18 and tk=461.44). However, it prefers an environment with high electrical conductivity (uk=1662.80 µS.cm^{-1}). During this research the individuals of *I. gibba* were occurred in a narrow altitude interval (922-1412 m).

Cypris pubera is an oligohalophilic ostracod species and an active swimmer that it can be found from slow-flowing streams, paddy fields and fish ponds (Meisch, 2000; Altınsaçlı and Griffiths, 2001). Mezquita *et al.* (1999a) assumed that *C. pubera* was a stenochronal species occurring in certain seasons. Similarly, Altınsaçlı and Mezquita (2008) reported this species from Acıgöl (Afyon - Turkey) only during spring season. In spite of its preference to live in relatively cold waters (u_k=16.06°C) it, however, observed in warm waters (St37, T=25.9°C, this study). *Cypris pubera* has a limited ability to tolerate pH changes (t_k=0.24). The estimated optimum value about electrical conductivity (u_k = 658.67 µS.cm^{-1}) for this ostracod is low and tolerance (t_k=349.60) and ETI (0.20) values showed that this species may not adapt sudden changes of electrical conductivity. So, these results enhance the oligohalophilic attribute of *C. pubera*. According to the correlation results (Table, 2), distribution of *C. pubera* is in related with altitude. Additionally, this ostracod with a low tolerance (217.69) prefers high altitudes (u_k = 1635 m).

Eucypris virens was another frequently occurring species. It is most likely called cosmocieus species due to its cosmopolitan distribution and relatively high tolerance ranges to different environmental variables. Both sexual and parthenogenetic populations (sympatric coexistence) were reported from the aquatic bodies of Spain and Poland with wide ecological tolerance (Martins *et al.*, 2009). According to the findings of Mezquita *et al.* (1999a, b) a wide range of salinity and electrical conductivity can be tolerated by this species. However, our statistics showed a weak tolerance (t_k = 556.21) and low ETI value (0.15) for the electrical conductivity. Delorme (1991) proposed that this species can be found in waters with pH more than 9. We found this species from an alkaline (pH=9.47) temporary water body. The species also showed relatively higher ETI value for temperature (0.96), pH (0.76) and altitude (0.76) than the means of all species. The lack of potent correlation between this species and various environmental variables support the cosmocieus trait of this species.

Eucypris lilljeborgi is one of the rare species of this genus and therefore its biological characteristics are poorly known. It is however known that this species normally inhabits meadowlands and is a stenochronal spring form (Klie, 1938). In the present study individuals were collected from running waters, temporary waters and from littoral zone of lakes with temperature between 12.6-25.2°C. Therefore, high adaptation for temperature (0.77) can be probable for this species when it generally prefers relatively warm waters (u_k=20.16°C) and can resist against temperature fluctuations (t_k=6.31). According to Table 2, there are meaningful and positive correlations between the abundance of *E. lilljeborgi* and two environmental factors, salinity and electrical conductivity.

Heterocypris incongruens' various types enable to produce resistant eggs to desiccated period of its habitats (Rossi *et al.,* 2011). Due to this ability, they usually inhabit the floor of troughs, small ponds and other temporary freshwater environments (Henderson, 1990). We found some populations of this species from some temporary waters, troughs and waters located proximity of two Lakes (Acı Göl and Karataş) connected with lakes' water. Benzie (1984) in his observation done in a pool in Ghana remarked that diurnal migrations of this species (bisexual population) was in result of reductions in oxygen concentration, however, Green (1959) proposed that *H. incongruens* showed a great tolerance to oxygen depletion. Meisch (2000) described this ostracod as an indicator of pollution in freshwater habitats. As a result, widespread distribution of this species can be due to a high ETI and tolerance against the changes of various environmental variables.

Some studies revealed the predatory and

cannibalistic behavior of *H. incogruens* (Gray *et al.*, 2010; Ottonello and Romano, 2011; Rossi *et al.*, 2011). They showed that this species is able to consume frog eggs, tadpoles, larvae of dragonflies, chironomids, ostracods and even other individuals of their population.

Heterocypris rotundata lives in the littoral zone of lakes and small pools. This halophilic ostracod (Bronshtein, 1947) is able to resist a gradual increase in salinity (Meisch, 2000). In present study although some populations of this species were found from habitats with low electrical conductivity, some others were found from habitats with electrical conductivity around 2760 $\mu S.cm^{-1}$ (St26). Therefore, individual numbers of this species were not correlated with this variable. Calculated ETI value about altitude (0.86) was high and shows the high ability of this species to live in various altitudes. Thus, there was no statistically important relationship between altitude and occurrence of this species. In terms of pH, *H. rotundata* is capable to tolerate the variations in a wide range (t_k=0.67). We found *H. rotundata* often from alkaline waters with pH ranging from 7.20 to 9.30.

Heterocypris salina is a diurnally active ostracoda which individuals were inactively accumulated near the surface of water during the dark periods (Ganning, 1967). Klie (1938) indicated that Heterocypris salina is an oligohaline and mesohaline ostracod, implying its abundance from inland salty and brackish waters. According to the findings of the present study, meaningful, positive correlation between abundance and electrical conductivity and salinity of habitats reveal the tendency of this species to live abundantly in habitats with high levels of salinity. This is also visible among the results of Table 3 which estimated optimum value for electrical conductivity is high (uk = 1971.73 $\mu S.cm^{-1}$). In the meantime, the wide tolerance for electrical conductivity (tk=1996.31) proves being a Euryhaline species. Then, occurrence of this species from a running water with 0.2 ppt (st45) as well from a salty lake with 50 ppt of salinity (st4) is not surprising due to the fact of its euryhaline feature. Ganning (1971) also found a population of this species from a eutrophic salty habitat. *Potamocypris villosa* prefers clear and well oxygenated waters. The individuals have relatively high resistance against freezing, drying and eutrophication (Bronshtein, 1947). Külköylüoğlu and Sarı (2011) in Bolu (Turkey) estimated a high optimum value for pH that our results consistent with their results. *P. villosa* adapted to live in different altitudes (ETI=0.89).The estimated optimal electrical conductivity and also toleration to the changes of this factor of this species are low (u_k=276.34, t_k=83.70). Thus, being a negative and potent relationship between this variable and the number of encountered individuals could be a logical result.

In conclusion, although a large number of cosmopolitan species can tolerate variations of many environmental factors in broad range, nevertheless, sometimes they show a dependency on some variables. It seems that the distribution and abundance of species can also be dependent on some other biotic factors such as predation and competition that we did not focused on them here. We suggest that further studies including biotic and abiotic factors can be done in the variety of habitats. This is what Ganning (1976) remarked.

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References

Akdemir, D. and Külköylüoğlu, O. 2011. Freshwater Ostracoda (Crustacea) of Diyarbakır province, including a new report for Turkey. Turkish Journal of Zoology, 35(5): 671-675. doi: 10.3906/zoo-0912-32

Altınsaçlı, S. 1997. The Ostracoda (Crustacea) fauna of Lake Sapanca. İstanbul Üniversitesi Fen Fakültesi Biyoloji Dergisi 60: 17–45.

Altınsaçlı, S. 2001. A study on the seasonal distribution of Ostracoda (Crustacea) species found in Lake Eğirdir (Isparta, Turkey). Turkish Journal of Zoology, 25: 431-439. doi: 10.1080/09397140.2002.10637941

Altınsaçlı, S. and Griffiths, HI. 2001. The freshwater Ostracods *Hungarocypris* and *Leucocythere* from Turkey. Crustaceana, 74: 681-688. doi: 10.1163/156854001750377957

Altınsaçlı, S. and Griffiths, HI. 2002. A review of the occurrence and distribution of the recent non-marine Ostracoda (Crustacea) of Turkey. Zoology in the Middle East, 27(1): 61-76. doi: 10.1080/09397140.2002.10637941

Altınsaçlı, S. Mezquita, F. 2008. Ostracod fauna of Salt Lake Acıgöl (AcıTuz) (Turkey). Journal of Natural History, 42: 1013-1025. doi: 10.1080/00222930701851735

Benzie, J.A.H. 1984. Small scale diurnal migrations by Heterocypris incongruens (Ramdohr, 1808) (Ostracoda: Cyprididae) in a temporary pool, Ghana, West Africa. Journal of Crustacean Biology, 4(1): 63-65.

Bronshtein, Z.S. 1947. Ostracodes des Eauxdouces. Institut Zoologique de l'Academie des Sciences de l'USSR, Nouvelle Serie.

Curry, B.B. 1999. An environmental tolerance index for ostracods as indicators of physical and chemical factors in aquatic habitats. Palaeogeography, Palaeoclimatology, Palaeoecology, 148(1): 51–63.

Daday, E. 1903. Mikroskopische Süßwassertiere aus Kleinasien. Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften, mathematsich-naturwissenschaftliche Classe (Abteilung 1), 112: 139–167.

De Deckker, P. and Forester, R.M. 1988. The use of ostracoda to reconstruction of continental palaeoenvironmental records. in: P. De Deckker, J.P. Colin and J.P. Peypouquet (Eds.) Ostracoda in the Earth Sciences, 175-199.

Delorme, LD. 1991. Ostracoda. In: JH. Thorp, A.P Covich Eds. Ecology and classification of North American freshwater invertebrates. Academic Press, San Diego: 691-722.

Dügel, M., Külköylüoğlu, O. and Kılıç, M. 2008. Species assemblages and habitat preferences of Ostracoda (Crustacea) in Lake Abant (Bolu, Turkey). Belgian Journal of Zoology, 138: 50-59.

Ganning, B. 1967. Laboratory experiments in the ecological work on rockpool animals with special notes on the ostracod *Heterocypris salinus*. Helgoländer wissenschaftliche Meeresuntersuchungen, 15: 27-40.

Ganning, B. 1971. On the ecology of *Heterocypris salinus*, *H. incongruens* and *Cypridopsis aculeata* (Crustacea : Ostracoda) from Baltic brackish-water rockpools. Marine Biology, 8: 271-279.

Gray, E.P., Nunziata, S., Snodgrass, J.W., Ownby, D.R. and Havel, J.E. 2010. Predation on Green Frog Eggs (Rana clamitans) by Ostracoda. Copeia, 2010(3): 452-456. doi: 10.1643/CH-09-074

Green, J. 1959. Pigmentation of an ostracod, Heterocypris incongruens. The Journal of Experimental Biology, 36: 575-582.

Gülen, D. 1985a. Bisexual Ostracoda (Crustacea) populations in Anatolia. İstanbul Üniversitesi Fen Fakültesi Mecmuesi, Seri B 50: 81-86.

Gülen, D. 1985b. The species and distribution of the group of Podocopa (Ostracoda-Crustacea) in freshwaters of western Anatolia. İstanbul Üniversitesi Fen Fakültesi Biyoloji Mecmuası: 50: 65–82.

Gülen, D., Altınsaçlı, S., Kubanç, C. and Kılıç, M. 1994. Türkiye Ostracoda (Crustacea) Faunası. The TBAG project report, 989: 1-45.

Gülen, D., Özuluğ, O. and Bilgin, H. 1996. Kabaklı kaynağı (Diyarbakır) Ostracod (Crustacea) faunası. XIII Ulusal Bioloji Kongresi Tebliğleri, İstanbul: 162-172.

Hartmann, G. 1964. Asistische Ostracoden, systematische und zoogeographische unter suchungen. Internationale revue der gesamten hydrobioloie (Systematische Beihefte), Berlin 3: 1-155.

Hartmann, G. and Hiller, D. 1977. Beitragzurkenntis der Ostracoden fauna des Harzes und seines nördlichen Vorlandes (unter besonderer Berücksichtigung des Männchens von Candona candida), Jahre 125 Naturwissenschaftlicher Verein Goslar: 99-116.

Henderson, PA. 1990. Freshwater Ostracods synopses of the British fauna. Universal Book Services/Dr W. Backhuys, Netherlands, 228 pp.

Juggins, S. 2003. C2 user guide. Software for ecological and palaeoecological data analysis and visualization. University of Newcastle, Newcastle upon Tyne, UK, 73 pp.

Karakaş Sarı, P. and Külköylüoğlu, O. 2008. Comparative ecology of Ostracoda (Crustacea) in two rheocrene springs (Bolu, Turkey). The Ecological Research, 23: 821-830. doi: 10.1007/s11284-007-0444-2

Karanovic, I. 2012: Recent freshwater Ostracods of the world, Crustacea, Ostracoda, Podocopida, Springer Heidelberg Dordrecht, London, New York, 608 pp.

Klie, W. 1938. Ostracoda. In: F. Dahl, M. Dahl and H. Bischoff (Eds.), Die Tierwelt Deutschlands und der Angrenzenden Meeresteile, Verlag Von Gustav Fischer, Jena: 1-230.

Külköylüoğlu, O. 2005. Ecology and phenology of freshwater Ostracods in Lake Gölköy (Bolu, Turkey). Aquatic Ecology, 39: 295-304. doi: 10.1007/s10452-005-0782-5

Külköylüoğlu, O., Akdemir, D. and Yüce, R. 2012b. Distribution, ecological tolerance and optimum levels of freshwater Ostracoda (Crustacea) from Diyarbakır, Turkey. Limnology, 13: 73-80. doi: 10.1007/s10201-011-0357-1

Külköylüoğlu, O., Dügel, M., Balcı, M., Deveci, A., Avuka, D. and Kılıç, M. 2010. Limnoecological relationships between level fluctuations and Ostracoda (Crustacea) Species composition Lake Sünnet (Bolu, Turkey). Turkish Journal of Zoology, 34: 429-442. doi: 10.3906/zoo-0904-17

Külköylüoğlu, O. and Sarı, N. 2011. Ecological characteristics of the freshwater Ostracoda in Bolu Region (Turkey). Hydrobiologia, 688: 37-46. doi: 10.1007/s10750-010-0585-0

Külköylüoğlu, O., Sarı, N., Akdemir, D., Yavuzatmaca, M. and Altinbağ, C. 2012a. Distribution of Sexual and Asexual Ostracoda (Crustacea) from Different Altitudinal Ranges in the Ordu Region of Turkey Testing the Rapoport Rule. High Altitude Medicine and Biology, 13(2): 126-137. doi: 10.1089/ham.2011.1111

Margaritora, FG., Stella E. and Mastrantuono L. 1977. Contributo allo studio della fauna ad Entomostraci delle acque temporance della Turchia Asiatica. Rivista di Biologia 16: 151–172.

Martins, M.J.F., Vandekerkhove, J., Mezquita, F., Schmit, O., Rueda, J., Rossetti, G. and Namiotko, T. 2009. Dynamics of sexual and parthenogenetic populations of *Eucypris virens* (Crustacea: Ostracoda) in three temporary ponds. Hydrobiologia, 636: 219–232. doi: 10.1007/s10750-009-9952-0

Meisch, C. 2000. Freshwater Ostracoda of western and central Europe. Suesswasserfauna von Mitteleuropa. SpektrumAkademischerVerlag, Heidelberg, Berlin, 522 pp.

Mezquita, F., Griffiths, HI., Dominguez, M.I. and Lozano-Quilis, M.A. 2001. Ostracoda (Crustacea) as ecological indicators: a case study from the Iberian Mediterranean brooks. Archiv für Hydrobiologie, 150: 545–560.

Mezquita, F., Hernandez, R. and Ruede, J. 1999a. Ecology and distribution of Ostracods in a polluted Mediterranean river. Paleogeography Palaeoclimatology Palaeoecology, 148: 87-103.

Mezquita, F., Roca, JR. and wansard, G. 1999b. Multing, Survival and Calcification the effects of temperature and water chemistry on an Ostracod under experimental conditions. ArchivfürHydrobiologie, 146: 219-238.

Mezquita, F., Sanz-Brau, A. and Miracle, MR. 1996. New data on freshwater ostracod assemblages (Crustacea, Ostracoda) from Cuenca (Central Spain). Bulletin de la Societe des Sciences Medicales du Grand Duche de Luxembourg (Luxembourg), 97: 239-247.

Ottonello, D. and Romano A. 2011. Ostracoda and Amphibia in temporary ponds: who is the prey? Unexpected trophic relation in a Mediterranean freshwater habitat. Aquatic Ecology, 45:55–62. doi: 10.1007/s10452-010-9323-y

Özuluğ, O., Kubanç, N. and Gülen, D. 2001. Ostracod (Crustacea) fauna of Lake Eğirdir (Isparta). Turkish

Journal of Zoology, 25: 421-425.

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

Rossi, V., Benassi, G., Belletti, F. and Menozzi, P. 2011. Colonization, population dynamics, predatory behaviour and cannibalism in Heterocypris incongruens (Crustacea: Ostracoda). Journal of Limnology, 70(1): 102-108. doi: 10.3274/JL11-70-1-12

Sarı, N., Külköylüoğlu, O. and Akdemir, D. 2012. First record and detailed description of the male of *Ilyocyprisinermis* Kaufmann, 1900 (Crustacea, Ostracoda). Turkish Journal of Zoology, 36(4): 484-495. doi: 10.3906/zoo-1012-78

Schäfer, HW. 1952. Über Süβwasser-Ostracoden aus der Türkei. Hidrobiologi, İstanbul Üniversitesi Fen Fakültesi, Hidrobiyoloji Araştırma Enstitüsü Yayınları, 1:7-32.

Ustaoğlu, M.R., Balık, S., Özdemir, Mis D. and Aygen, C., 2003. Microcrustacean Fauna of Lake Sazlıgöl (Menemen, İzmir). Turkish Journal of Zoology, 27: 15-18.

Yozzo, D.J. and Steineck, P.L. 1994. Ostracoda from tidal freshwater wetlands at Stockport, Hudson River Estuary: Abundance, distribution, and composition. Estuaries, 17(3): 680-684.