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RESEARCH ARTICLE ARAŞTIRMA MAKALESİ

Contribution to the knowledge on distribution of freshwater mollusc species of **İzmir (Turkey)**

İzmir'in (Türkiye) tatlısu mollusca türlerinin dağılımı

Gözde Gürelli[1]* • Murat Özbek[2]

[1]*Kastamonu University, Faculty of Science and Art, Biology Department, 37100, Kuzeykent-Kastamonu, Turkey*
[2]*Ege University, Faculty of Fisheries, Department of Hydrobiology, 35100, Bornova-İzmir, Turkey*
**Corresponding author: ggurelli@yahoo.com*

Özet: İzmir'in Tatlısu mollusca türlerini belirlemek amacıyla Mayıs 1994-Mayıs 1996 tarihleri arasında 22 istasyondan mevsimsel olarak örnekleme yapılmıştır. Kalitatif çalışmanın sonucunda toplam 15 takson tespit edilmiş olup, bunlardan 12'si Gastropoda'ya 3'ü Bivalvia'ya aittir. İstasyonlardaki mollusca türleri arasında en yaygın olanları *Melanopsis praemorsa* (9 istasyon) ve *Physella acuta* (7 istasyon), en az olanları ise *Unio crassus* (1 istasyon) ve *Theodoxus anatolicus* (1 istasyon)'tur.

Anahtar kelimeler: Mollusca, İzmir, Gastropoda, Bivalvia, Türkiye

Abstract: In order to determine the mollusca fauna of some freshwaters of Izmir, samplings were made as seasonal from 22 stations between May 1994 and May 1996. As a result of the qualitative study, totally 15 taxa were determined; of them 12 belong to Gastropoda and 3 to Bivalvia. Among the mollusc species at stations, the commonest ones were *Melanopsis praemorsa* (9 stations) and *Physella acuta* (7 stations). The least ones were *Unio crassus* (1 station), *Theodoxus anatolicus* (1station).

Keywords: Mollusca, Izmir, Gastropoda, Bivalvia, Turkey.

INTRODUCTION

Gastropoda and Bivalvia are likely the common group of macrobenthic fauna in aquatic ecosystems. Molluscs are well suited to the recognition of geologichistorical developments. They allow easy distinction of the biotopes: marine, brackish, terrestrial or mountainous. Some molluscs are intermediate hosts of trematodes (Öktener 2004).

There are some studies on mollusca fauna of Western Anatolia Region, Turkey. Bilgin (1967) made ecological and systematical research on the living gastropods in freshwaters in the vicinity of İzmir. Bilgin (1973, 1980) carried out systematics and distributions of Mollusca species and anatomic features of some Prosobranchia species, collected from some freshwaters of Western Anatolia. Ustaoğlu *et al.* (2001) studied the mollusc fauna of Işıklı Lake (Çivril-Denizli). Balık *et al.* (2002) made a preliminary research about aquatic fauna of Yelköprü Cave (Dikili, İzmir) and its vicinity. Ustaoğlu *et al.* (2003) carried out the mollusca fauna of Yuvarlakçay Stream (Köyceğiz-Muğla). Balık *et al.* (2004) studied the benthic fauna of Buldan Dam Lake (Buldan-Denizli).

The aim of the present study is to contribute to the knowledge on distribution of mollusc species inhabited inland waters of İzmir.

MATERIALS AND METHOD

Field studies were conducted seasonally between May 1994 and May 1996 in the vicinity of İzmir (Figure 1). Their habitat characteristics of different stations were mainly shallow, sludge-sandy ground and sandy ground with aquatic plants. Materials were taken from littoral zones by 0.5 mm mesh-sized hand-net, spatula and oar. The mud and benthic materials were cleaned off on varied mesh sieve with water. Some species were taken out of aquatic plants. Specimens were studied qualitatively.

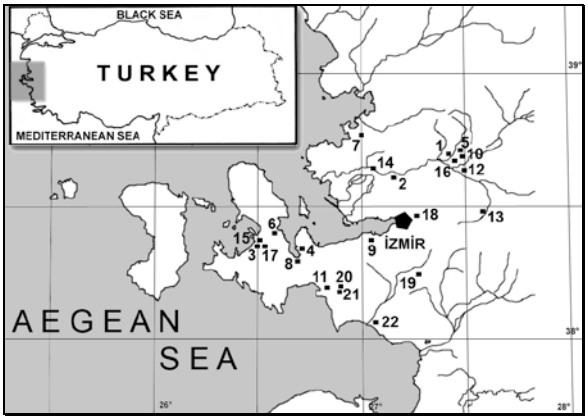

Figure 1. Geographical positions of sampling locations.

Collected mollusc samples were preserved in 4 % formalin solution and stored in glass vials with plastic screw-caps. In identification, the most important diagnostic characters of molluscs, for example general appearance, apex, apertur, helezon were examined. Temperature, salinity and conductivity have measured with a YSI 30 model SCT meter, pH has measured with a WTW Oxi 330 model pH meter and dissolved oxygen has measured with a WTW Oxi 330 model oxygen meter. The following references were reviewed for taxonomical determinations of the specimens: (Bilgin 1967, 1973, 1980; Glöer and Meier-Brook 1998; Schütt 1983; Yıldırım *et al*. 2006; Zhadin 1952).

RESULTS

The physico- chemical parameters of the stations were given in Table 1.

Table 1. Some of the physico-chemical variables of the stations.

Stat. No.	Locations ad sampling date(s)	Temperature (°C)	pH	Dis. Oxygen (mg/l)	Conductivity ($\mu S_{25\text{-}C}$)	Salinity (%)
1	Sarma Village, Sarma Stream, Muradiye-Manisa, 26.11.1994	7.5	7.6	10.4	503.33	0.04
2	Değirmendere Stream, İzmir, 26.11.1994	11	8.2	12	643.45	0.04
3	Ildır Springs (C), Çeşme-İzmir, 30.10.1994	21.5	6.9	8.8	2063.97	0.76
4	Özbek Village, Pınarlı Stream, Urla-İzmir, 29.10.1994	19	7.2	4.4	563.05	0.07
5	Gülbahçe Village Stream, Muradiye-Manisa, 26.11.1994	9.5	8	10.8	648.7	0.06
6	Balıklıova Spring, Balıklıova-İzmir, 29.10.1994	19	7.3	4	2076.69	0.65
7	Güzelhisar Reservoir, Aliağa-İzmir, 27.11.1994	8.5	8.3	14.8	515.51	0.04
8	Urla Mineral Springs, Urla-İzmir, 29.10.1994	21	6.9	6	6764.89	2.52
9	Balçova Hot Spring, Balçova-İzmir, 29.10.1994	26	6.1		724.88	0.03
10	Üçpınar Village Trough, Muradiye-Manisa, 26.11.1994	10	7.3	7.6	301.25	0.07
11	Karagöl Lake, Seferihisar-İzmir, 30.10.1994	21	8.6	10.4	818.44	0.08
12	Göksu Springs, Muradiye-Manisa, 26.11.1994	8	7.7	9.6	722.98	0.05
13	Yiğitler Stream, Kemalpaşa- İzmir, 22.05.1994	17	8	12	333.32	0.02
14	Gediz River Maltepe Village, Menemen-İzmir, 26.11.1994	8	7.3	2.8	2083.34	0.12
15	Kadıovacık Fountain, Çeşme-İzmir, 30.10.1994	18	6.8	8.8	643.29	0.05
16	Kanı Fountain, Üçpınar Village, Muradiye-Manisa, 26.11.1994	7.2	7.3	7.2	740.89	0.07
17	Ildır Springs (B), Çeşme-İzmir, 30.10.1994	22	6.9	6.4	14063.44	6.06
18	Bornova Stream, Bornova-İzmir, 19.05.1996	19	8.1	8.2	911.49	0.043
19	Oğlanağası Pond, Menderes-İzmir 17.03.1996	17	7.3	10.2	478.73	0.03
20	Seferihisar Reservoir, Seferihisar-İzmir, 16.03.1996	14	7.3	11.5	519.55	0.05
21	The stream runs off to the Seferihisar Reservoir, Seferihisar-İzmir 16.03.1996	19	8	12.3	558.55	0.07
22	A Pond in front of Gümuşsu Sitesi, Gümüldür-İzmir 16.03.1996	17	8.1	12	14372.82	8.04

Phylum: Mollusca

Classis: Gastropoda

Ordo: Archaegastropoda

Familia: Neritidae

Theodoxus subthermalis Issel, 1865

Stations and dates of specimens: Ildır Springs (C), Çeşme-İzmir, 30.10.1994; Gülbahçe Village Stream, Muradiye-Manisa, 26.11.1994; Balıklıova Spring, Balıklıova-İzmir, 29.10.1994; Urla Mineral Springs, Urla-İzmir, 29.10.1994.

Theodoxus anatolicus (Récluz, 1844)

Station and date of specimen: Gülbahçe Village Stream, Muradiye-Manisa, 26.11.1994.

Ordo: Mesogastropoda

Familia: Hydrobiidae

Potamopyrgus jenkinsi (Smith, 1889)

Stations and dates of specimens: Ildır Springs (B), Çeşme-İzmir, 30.10.1994; A Pond in front of Gümüşsu Sitesi, Gümüldür-İzmir, 16.03.1996.

Familia: Valvatidae

Valvata piscinalis (O.F. Müller, 1774)

Stations and dates of specimens: Göksu Springs, Muradiye-Manisa, 26.11.1994; Kanı Fountain, Üçpınar Village, Muradiye-Manisa, 26.11.1994; Oğlanağası Pond, Menderes-İzmir, 17.03.1996.

Familia: Thiaridae

Melanopsis praemorsa (L., 1758)

Stations and dates of specimens: Sarma Village, Sarma Stream, Muradiye-Manisa, 26.11.1994; Ildır Springs (C), Çeşme-İzmir, 30.10.1994; Gülbahçe Village Stream, Muradiye-Manisa, 26.11.1994; Balıklıova Spring, Balıklıova-İzmir, 29.10.1994; Urla Mineral Springs, Urla-İzmir, 29.10.1994; Oğlanağası Pond, Menderes-İzmir, 17.03.1996; Özbek Village, Pınarlı Stream, Urla-İzmir, 29.10.1994; Göksu Springs, Muradiye-Manisa, 26.11.1994; Yiğitler Stream, Kemalpaşa-İzmir, 22.05.1996.

Subclassis: Pulmonata

Ordo: Basommatophora

Familia: Lymnaeidae

Radix peregra (O.F. Müller, 1774)

Stations and dates of specimens: Güzelhisar Reservoir, Aliağa-İzmir, 27.11.1996; Özbek Village, Pınarlı Stream, Urla-İzmir, 29.10.1994; Karagöl Lake, Seferihisar-İzmir, 30.10.1994; Göksu Springs, Muradiye-Manisa, 26.11.1994; Oğlanağası Pond, Menderes-İzmir, 17.03.1996.

Familia: Planorbidae

Planorbis carinatus O.F. Müller, 1774

Stations and dates of specimens: Güzelhisar Reservoir, Aliağa-İzmir, 27.11.1996; Oğlanağası Pond, Menderes-İzmir, 17.03.1996.

Gyraulus albus (O. F. Müller, 1774)

Stations and dates of specimens: Güzelhisar Reservoir, Aliağa-İzmir, 27.11.1996, Gediz Stream, Maltepe Village, Menemen-İzmir, 26.11.1994; Oğlanağası Pond, Menderes-İzmir, 17.03.1996.

Gyraulus laevis (Alder, 1838)

Stations and dates of specimens: Özbek Village, Pınarlı Stream, Urla-İzmir, 29.10.1994; Gülbahçe Village Stream, Muradiye-Manisa, 26.11.1994; Güzelhisar Reservoir, Aliağa-İzmir, 27.11.1996; Üçpınar Village Trough, Muradiye-Manisa, 26.11.1994; Göksu Springs, Muradiye-Manisa, 26.11.1994; Kanı Fountain, Üçpınar Village, Muradiye-Manisa, 26.11.1994.

Familia: Ancylidae

Ancylus fluviatilis O.F. Müller, 1774

Stations and dates of specimens: Değirmendere Stream, İzmir, 26.11.1994; Özbek Village, Pınarlı Stream, Urla-İzmir, 29.10.1994; Yiğitler Stream, Kemalpaşa-İzmir, 22.05.1996; The stream runs off to the Seferihidar Reservoir, Seferihisar-İzmir, 16.03.1996.

Familia: Physidae

Physa fontinalis (Linnaeus, 1758)

Stations and dates of specimens: Balçova Hot Spring, Balçova-İzmir, 29.10.1994; Gediz Stream, Maltepe Village, Menemen-İzmir, 26.11.1994.

Physella acuta (Draparnaud, 1805)

Stations and dates of specimens: Gülbahçe Village, Muradiye-Manisa, 26.11.1994; Güzelhisar Reservoir, Aliağa-İzmir, 27.11.1996; Üçpınar Village Trough, Muradiye-Manisa, 26.11.1994; Göksu Springs, Muradiye-Manisa 26.11.1994; Kanı Fountain, Üçpınar Village, Muradiye-Manisa, 26.11.1994; Bornova Stream, Bornova-İzmir, 19.05.1996; Seferihisar Resrvoir, Seferihisar-İzmir, 16.03.1996.

Classis: Bivalvia

Subclassis: Eulamellibranchiata

Ordo: Unionoida

Familia: Unionidae

Unio crassus Philipsson, 1788

Station and date of specimen: Sarma Village, Sarma Stream, Muradiye-Manisa, 26.11.1994.

Ordo: Veneroida

Familia: Sphaeriidae

Musculium lacustre (O.F. Müller, 1774)

Stations and dates of specimens: Güzelhisar Reservoir, Aliağa-İzmir, 27.11.1996; Göksu Springs, Muradiye-Manisa, 26.11.1994; Oğlanağası Pond, Menderes-İzmir, 17.03.1996.

Pisidium casertanum (Poli, 1791)

Stations and dates of specimens: Özbek Village, Pınarlı Stream, Urla-İzmir, 29.10.1994; Gülbahçe Village Stream, Muradiye-Manisa, 26.11.1994; Göksu Springs, Muradiye-Manisa, 26.11.1994; Kadıovacık Fountain, Çeşme-İzmir, 30.10.1994; Oğlanağası Pond, Menderes-İzmir, 17.03.1996.

The determined species on the stations were given in Table 2.

Table 2. The determined species according to the stations.

Species/ Stations	*T. subthermalis*	*T. anatolicus*	*P. jenkinsi*	*V. piscinalis*	*M. praemorsa*	*R. peregra*	*P. carinatus*	*G. albus*	*G. laevis*	*A. fluviatilis*	*P. fontinalis*	*P. acuta*	*U. crassus*	*M. lacustre*	*P. casertanum*
1. Sarma Village, Sarma Stream					*								*		
2. **Değirmendere Stream**										*					
3. Ildır Springs (C)	*				*										
4. Özbek Village, Pınarlı Stream					*	*			*	*					*
5. Gülbahçe Village Stream	*	*			*				*			*			*
6.Balıklıova Spring	*				*										
7. Güzelhisar Reservoir						*	*	*	*			*		*	
8. Urla Mineral Springs	*				*										
9. Balçova Hot Spring											*				
10. Üçpınar Village Trough									*			*			
11. Karagöl Lake						*									
12. Göksu Springs				*	*	*			*			*		*	*
13. Yiğitler Stream					*					*					
14. Gediz River Maltepe Village								*			*				
15.Kadıovacık Fountain															*
16. Kanı Fountain, Üçpınar Village				*					*			*			
17. Ildır Springs (B)			*												
18. Bornova Stream												*			
19. Oğlanağası Pond				*	*	*	*	*						*	*
20. Seferihisar Reservoir												*			
21. The stream runs off to the Seferihisar Reservoir										*					
22. A Pond in front of Gümuşsu Sitesi			*												

DISCUSSION

As a result of qualitative study, 12 species belonging to Gastropoda and 3 species belonging to Bivalvia, totally 15 mollusca species were determined. Among the mollusc species at stations, the most common one is *M. praemorsa* (9 stations) and the other is *P. acuta* (7 stations). The least species are *U. crassus* (at 1 station), *T. anatolicus* (at 1 station). Oğlanağası Pond and Göksu Springs are the richest stations. According to Zhadin (1952) *T. subthermalis* inhabits rivers, brooks, springs and the marginal zone of lakes. Bilgin (1973) found it in springs. Ustaoğlu *et al.* (2003) reported in Yuvarlakçay brook. *T. anatolicus* are mostly found in springs (Bilgin 1980), especially in clean habitats (Bilgin 1967). Similarly, Ustaoğlu *et al.* (2001) were reported it from Işıklı Lake. In this study *T. subthermalis* is mostly reported from springs and *T. anatolicus* is only found in a stream. *P. jenkinsi* lives in brackish waters and marine waters of reduced salinity along the coasts of Western Europe (Zhadin 1952). But this species also adopts freshwaters (Bilgin 1973). Ustaoğlu *et al.* (2001) were reported it from Işıklı Lake. In present study, it was found in springs and a pond in front of Gümuşsu Sitesi. *V. piscinalis* lives in various freshwaters (Bilgin 1967, 1980). It is distributed in Europe, Northern, Western and Central Asia (Zhadin 1952). In this study, it was determined in a pond, springs and a fountain. *M. praemorsa* lives in springs (Bilgin 1967, 1980) and mountain brooks (Zhadin 1952). Balık *et al.* (2002) reported it from Yelköprü Cave and its vicinity. Ustaoğlu *et al.* (2003) found it in Yuvarlakçay brook. In our study, we mostly observed it from springs and streams. *R. peregra* lives mostly in slow running aquatic habitats (Bilgin 1973, 1980). Ustaoğlu *et al.* (2001) found it from Işıklı Lake. It was recorded from Yuvarlakçay brook (Ustaoğlu *et al.* 2003). In present study it was found in a pond, a dam, a lake, a stream and springs. *P. carinatus* lives in lakes and ponds (Bilgin 1980, Zhadin 1952). It was found in a pond and a dam in our study. According to Zhadin (1952), *G. albus* inhabits lakes, ponds and the littoral zones of sluggish rivers. Bilgin (1973) found it from a lake and a pond. Ustaoğlu *et al.* (2001, 2003) reported it in Işıklı Lake and Yuvarlakçay brook. It was also found in Buldan Dam Lake (Balık *et al.* 2004). In this study it was reported in a pond, a dam and a stream. *G. laevis* lives in swamps, springs and river floodplains (Zhadin 1952). In present study it was found in streams, a dam, springs, a village trough and a fountain. According to Zhadin (1952) *A. fluviatilis* inhabits in rivers, in brooks and some lakes. Bilgin

(1973) was mostly found it in streams. Ustaoğlu *et al.* (2001) found it in Işıklı Lake. Ustaoğlu *et al.* (2003) reported it in Yuvarlakçay. In present study it was reported from streams. *P. fontinalis* lives in brooks, ponds, lakes, etc., mostly among the marginal vegetation (Zhadin 1952). According to Bilgin (1973, 1980) it inhabits in slow, much and clean lakes and ponds. *P. fontinalis* was found in a hot spring and a stream in our study. *P. acuta* inhabits brooks, rivulets, irrigation ditches, submerged ricefields and spring bogs. It adopts readily to life in an aquarium (Zhadin 1952). In present study it was reported from streams, dams, a village trough, springs and a fountain. *U. crassus* inhabits in rivers, including channels and backwaters. Usually it is absent from lakes and ponds (Zhadin 1952). According to Bilgin (1980) *U. crassus* lives in streams. It was only found in a stream in our study. *M. lacustre* lives in pools, swamps, ponds, brooks and rivers (Zhadin 1952). It was reported from a pond, a dam and springs in this study. According to Zhadin (1952), *P. casertanum* lives in various types of water bodies, from rivers to swamps. In our study it was found in a pond, streams, springs and a fountain.

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