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Ostracoda (Crustacea) association and a new species (*Dolerocypris anatolia* nov. sp.) from the Pliocene-Pleistocene Afşin-Elbistan (Kahraman Maraş) Coal Basin of Turkey

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Abstract: The Afşin-Elbistan Coal Basin, which is one of the largest and most important Pliocene-Pleistocene lignite basins of Turkey, is located in Eastern Anatolia. The basin was formed between two normal faults having NE–SW direction and these faults controlled both the sedimentation and the subsidence. The coal horizon of over 50 meters in thickness indicates the balance between the sedimentation and subsidence rates, and was preserved during peat deposition. Coals were generated in this extensive and shallow freshwater lake and evolved from the Pliocene to Pleistocene. Typical faunal and floral assemblages of this ancient Afşin-Elbistan freshwater lake are Ostracoda, Mollusca (Gastropoda and Pelecypoda), spore-pollen and Characeae (gyrogonites). Eleven Cypridoidea species were identified from the investigation area. Eight of them are already known (*Candona neglecta* Sars, *Candona iliensis* Mandelstam, *Candona* aff. *candida* (Müller), *Pseudocandona compressa* (Koch), *Cyclocypris ovum* (Jurine), *Ilyocypris gibba* (Ramdohr), *Cypris pubera* Müller, *Heterocypris salina* (Brady)), whereas three belong to open nomenclature — *Candona* sp. and *Eucypris* sp.; *Dolerocypris anatolia* nov. sp. is proposed as a new species. *Dolerocypris* Kaufmann is one of the largest genera among the freshwater Ostracoda. It has a very wide geographical distribution. Representatives of this genus are actively swimming species found in shallow zones of freshwater lakes and reported from small grassy water bodies with megascopic plants. *Dolerocypris anatolia* nov. sp. is recorded from core samples of the Pliocene-Pleistocene Afşin-Elbistan Coal Basin for the first time.

Key words: Pliocene–Quaternary, Anatolia, Afşin-Elbistan, coal basin, Ostracoda, *Dolerocypris*.

Introduction

The Anatolian Peninsula is being uplifted and has been since the Middle–Late Miocene. After the marine regression, a large part of the Anatolian land was covered by brackish water (which is connected to or isolated from the seas) or freshwater lakes and fluvial systems. Today, on the Anatolian and Thracian Peninsulas numerous big and small lake systems, both natural and artificial are present. Especially during the past ten years many researchers (both biologists and geologists) have been investigating these ancient and existing lakes (Freels 1980; Altınsaçlı & Griffiths 2001; Witt 2003; Külköylüoğlu 2004, 2005; Külköylüoğlu & Dügel 2004; Matzke-Karasz & Witt 2005; Çenet 2006; Külköylüoğlu & Yılmaz 2006; Külköylüoğlu et al. 2007; Beker et al. 2008).

The Afşin-Elbistan Coal Basin, which is one of the largest and most important Pliocene-Pleistocene lignite basins of Turkey, is located in Eastern Anatolia (Fig. 1). The basin is named after the towns Afşin and Elbistan which are located north of Kahraman Maraş City. The basin was formed between two normal faults with a NE-SW direction and these faults controlled both the sedimentation and the subsidence.

The age of the Afşin-Elbistan Coal Basin is set to the beginning of the Pliocene (5.3 Ma) to Pleistocene (1.8 Ma). Previous investigations have yielded the following taxa: Emydidae, Gerbillinae, *Castor praefiber*, *Promimomys* sp., *Mimomys* sp. (Becker-Platen 1970). Some ostracod fossils were also reported from the basin (Freels 1980) and a palynological investigation was carried out by Çenet (2006).

In this study eleven Cypridoidea species were identified from forty six samples of different cores in the investigation area.

Dolerocypris Kaufmann, is the only genus of subfamily Dolerocypridinae Triebel. Its carapace is generally 2 mm long, elongated and laterally compressed. It comprises eight extant species (Meisch 2000). Two of them are known from Palaearctic regions (*D. fasciata* and *D. sinensis*). Three of them are known from the former Soviet Union (*D. fasciata*, *D. sinensis* and *D. pellucida* — Bronshtein, 1947). There are no fossil records of *D. sinensis*, *D. fasciata* is known from Pleistocene to Recent (Meisch 2000). This genus and related species are widespread in the Mediterranean, Balkans, Eurasia, Central Asia, North and South America, Europe, the Middle East and Far East (Bronshtein 1947; Meisch 2000).

The aim of this investigation is to present and discuss the taxonomy and paleoecology of the proposed species, *Dolerocypris anatolia* nov. sp. and the rest of the ostracod community, and also to perform a paleoenvironmental interpretation of the Afşin-Elbistan Basin with the help of the identified ostracod community.

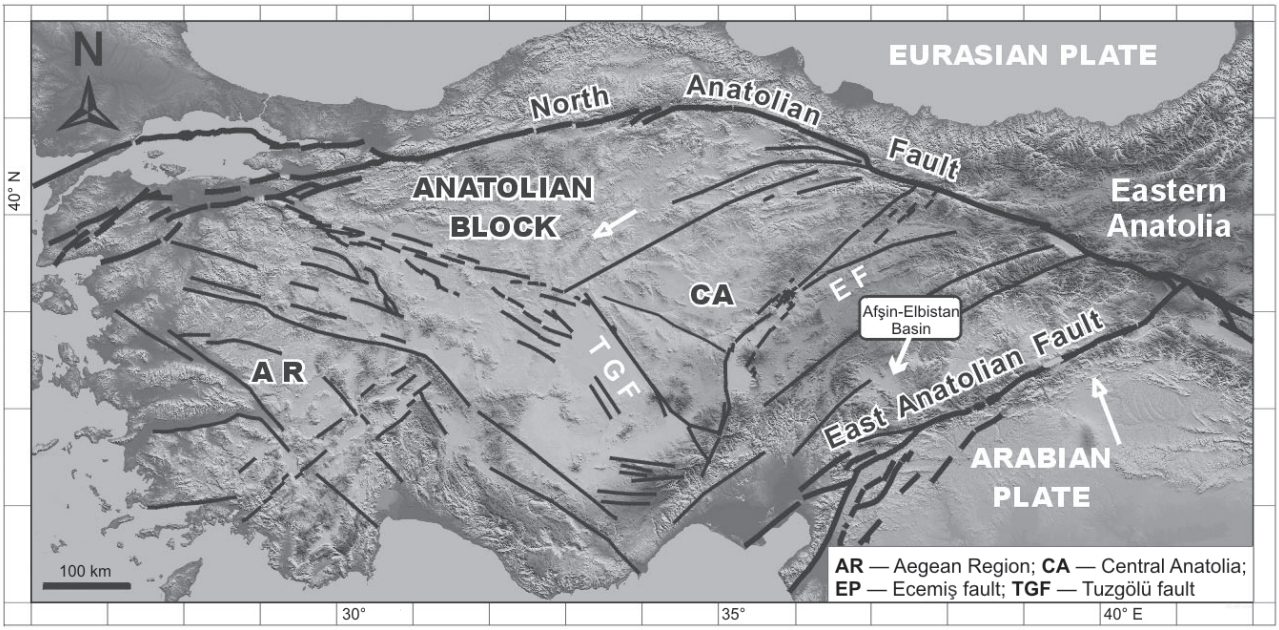

Fig. 1. Location map of the Afşin-Elbistan Coal Basin (simplified from Reilinger 2006).

Geological setting of the Afşin-Elbistan Coal Basin

Afşin-Elbistan Coal Basin is a Pliocene-Pleistocene basin which covers an area of 1150 km^2. Elevation varies between 1100–1200 meters within the basin and it is surrounded by mountains and plateaus mainly 1500–2000 meters high. The Afşin-Elbistan Basin evolved in the Taurus Mountain Belt at the end of the Alpine orogeny. The basement consists of Paleozoic metamorphites (shists and marble), Mesozoic ophiolitic rocks and Triassic–Cretaceous limestones (Fig. 2). Upper Miocene, Pliocene and Pleistocene deposits are dominated by continental clastics that pass laterally into Pliocene-Quaternary coal-bearing lacustrine levels. These levels comprise marls and sandstones at the base and sandy-silty claystones and organic rich mudstones (gyttja) at the top. Conglomerates (related to lacustrine deltaic systems) are the youngest deposits found in the region and they have a lacustrine and/or fluvial character. According to the previous works including vertebrate, ostracod and palynological determinations, it can be deduced that deposition in the Afşin-Elbistan Coal Basin took place during the Pliocene period, between 5.3–1.8 million years ago (Becker-Platen 1970; Freels 1980 and Çenet 2006).

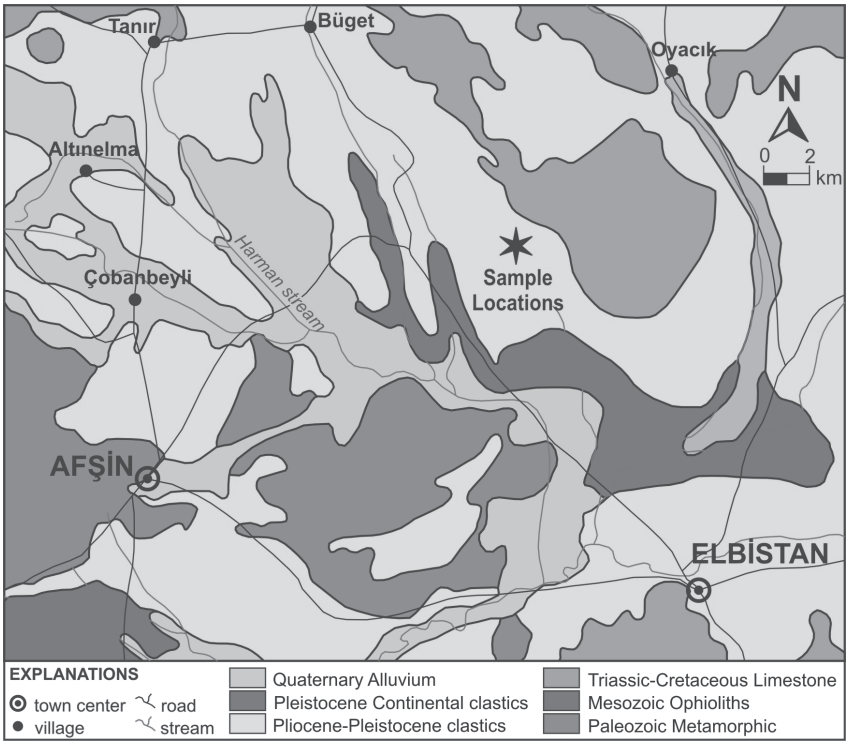

Fig. 2. Simplified geological map of the investigation area.

Methodology

Forty six samples have been examined to determine the ostracod fauna of the Afşin-Elbistan Coal Basin. These samples were partly gathered from two drilling cores (HD-393 — 12 samples, Fig. 3; and HD-411 — 4 samples, Fig. 4) and a stratigraphic section (5 samples, Fig. 5) which was measured from an

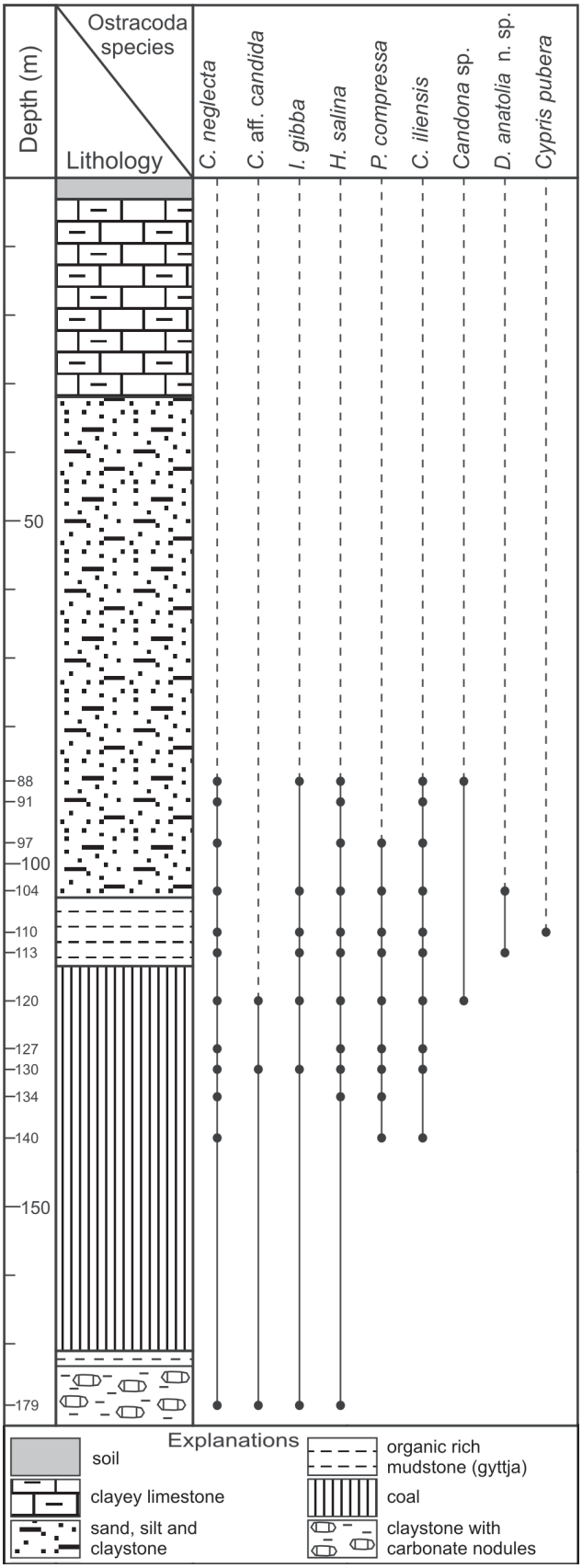

Fig. 3. Distribution of the ostracod species in the samples from core HD-393.

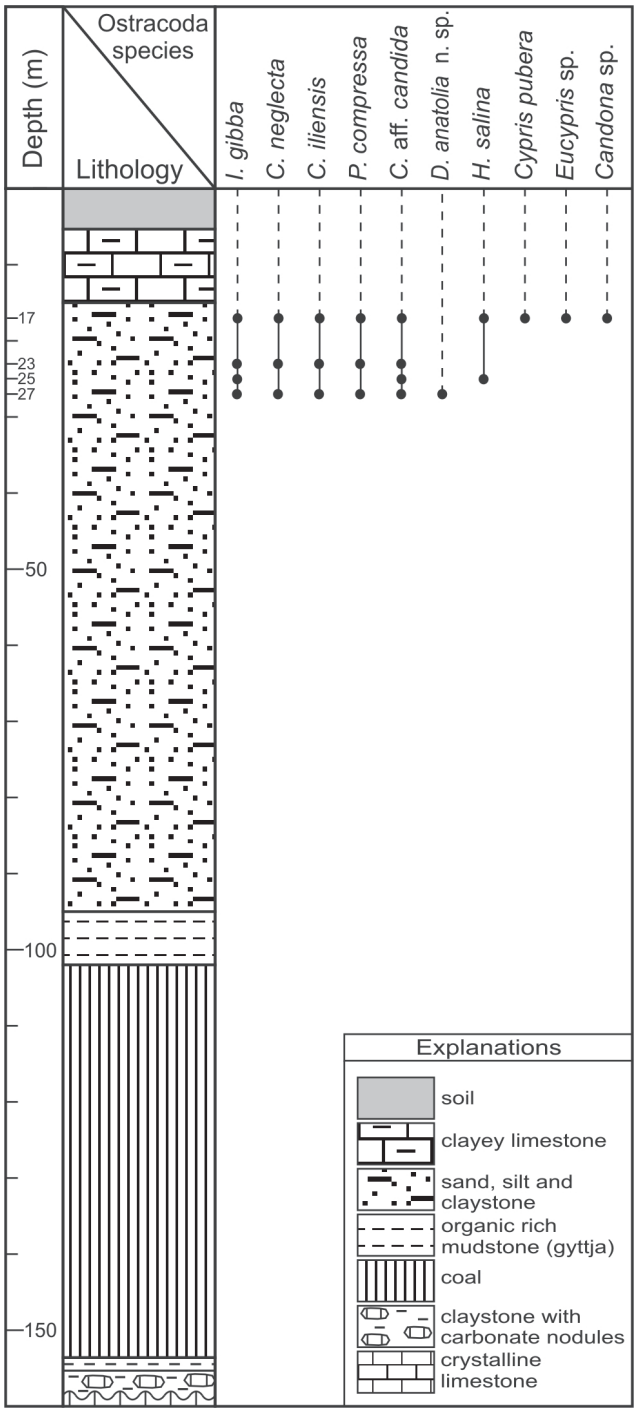

Fig. 4. Distribution of the ostracod species in the samples from core HD-411.

outcrop, representing the uppermost part of the fossiliferous levels. Coordinates of the drillings are given in Table 1. A further 25 samples gathered from the fossiliferous levels of different drilling cores are also examined (Table 1). Fixed weights of samples (100 g) were washed (0.25 mm mesh size) and ostracod valves and other fossil material (micro Gastropoda, Pelecypoda, Characea and gyrogonites) were picked up under a binocular microscope. The scanning electron microscope (SEM) images were taken using a scanning electron mi-

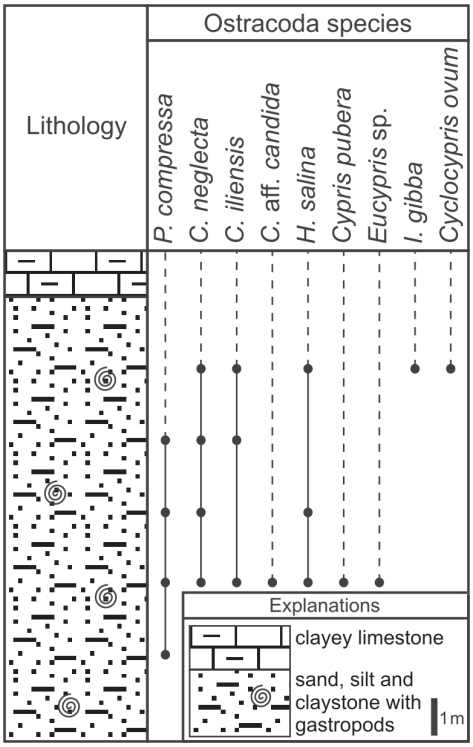

Fig. 5. Distribution of the ostracod species in the samples from the measured stratigraphic section (MSS).

croscope (EVO50-Zeiss) located in the Department of Geological Engineering, Hacettepe University, Ankara, Turkey.

Systematic description

Eleven Cypridoidea species were identified in the investigation area. Eight of them are already known, whereas two of them are still open in the nomenclature. *Dolerocypris anatolia* nov. sp. is proposed as new. Scanning electron microscope images of *D. anatolia* nov. sp. and the other ostracods are given in Figs. 6 and 7. For generic classification, Moore (1961) and Morkhoven (1962, 1963), Hartmann & Puri (1974) have been used. For species identification, the Catalogue of Ostracoda (Ellis & Messina 1953–1981), Bronshtein (1947) and Meisch (2000) were used. The material is archived at the Geological Engineering Department of Hacettepe University.

Phylum: **Arthropoda**
Subphylum: **Crustacea** Pennant, 1777
Class: **Ostracoda** Latreille, 1806
Order: **Podocopida** Sars, 1866
Suborder: **Podocopina** Sars, 1866
Infraorder: **Cypridocopina** Jones,1901
Superfamily: **Cypridoidea** Baird, 1845
Family: **Candonidae** Kaufmann, 1900
Genus: *Candona* Baird, 1845

Table 1: Distribution of the ostracod species in 25 samples gathered from the fossiliferous levels of different drilling cores.

Core number (sampling depth)	Coordinates		*Dolerocypris anatolia* nov. sp.	*Candona neglecta*	*Candona iliensis*	*Candona candida*	*Candona* sp.	*Pseudocandona compressa*	*Cypria opthalmica*	*Ilyocypris gibba*	*Cypris pubera*	*Eucypris* sp.	*Heterocypris salina*
HD 292 A (87.7)	38° 18' 27" N	37° 04' 22" E		*	*								*
HD 292 B (131.5)	38° 18' 32" N	37° 04' 32" E		*	*	*		*					
HD 292 C (94.7)	38° 18' 07" N	37° 04' 23" E		*	*			*		*			*
HD 292 D (97.5)	38° 18' 58" N	37° 04' 25" E		*	*	*		*		*			*
HD 309 (90.1)	38° 18' 03" N	37° 04' 16" E		*		*			*				*
HD 334 (115)	38° 18' 02" N	37° 03' 52" E		*	*			*					*
HD 343 (72)	38° 20' 11" N	37° 03' 27" E		*	*	*	*	*					
HD 344 (90)	38° 19' 50" N	37° 03' 32" E		*	*	*		*					
HD 345 (93.3)	38° 19' 39" N	37° 04' 32" E		*	*	*	*	*	*	*	*	*	*
HD 346 (99)	38° 19' 31" N	37° 03' 30" E		*	*	*	*		*			*	*
HD 348 (99.7)	38° 19' 15" N	37° 03' 33" E	*	*	*	*		*					*
HD 350 (115.6)	38° 19' 06" N	37° 03' 33" E	*	*	*	*		*		*			
HD 351 (117.5)	38° 18' 57" N	37° 03' 31" E		*	*				*				
HD 377 (71.8)	38° 20' 22" N	37° 03' 04" E		*	*	*	*	*					
HD 378 (76)	38° 20' 08" N	37° 03' 05" E		*									*
HD 379 (97.6)	38° 19' 50" N	37° 03' 04" E	*	*	*	*	*	*	*	*	*		
HD 380 (100)	38° 19' 38" N	37° 03' 06" E		*	*							*	*
HD 381 (103.9)	38° 19' 31" N	37° 03' 06" E		*	*				*				*
HD 384 (117)	38° 19' 06" N	37° 03' 06" E		*	*			*					*
HD 392 (145)	38° 19' 24" N	37° 02' 52" E		*	*	*		*			*	*	*
HD 393	38° 19' 06" N	37° 02' 54" E											
HD 404 (93)	38° 18' 54" N	37° 02' 41" E		*	*								
HD 411 (32)	38° 17' 40" N	37° 02' 45" E		*		*				*			*
HD 411 A (29.5)	38° 17' 26" N	37° 02' 43" E		*	*	*				*			*
HD 421 (52.5)	38° 17' 45" N	37° 02' 13" E		*	*	*	*	*		*			*

Candona neglecta Sars, 1887
Fig. 6.1–5

1887 *Candona neglecta* nov. sp. — Sars, p. 107, pl. 15, figs. 5–7, pl. 19
1947 *Candona neglecta* Sars — Bronshtein, p. 300–303, pl. 13, figs. 1–3
1957 *Candona neglecta* Sars — Wagner, p. 21, 22, pl. 3
1975a *Candona neglecta* Sars — Diebel & Pietrzeniuk, p. 33, pl. 2, figs. 6–8
1978 *Candona* cf. *neglecta* Sars — Diebel & Pietrzeniuk, pl. 49, figs. 3–5, 7, 8
1979 *Candona neglecta* Sars — De Deckker, p. 302–303, pl. 32, figs. 13, 14
1980 *Candona neglecta* Sars — Freels, p. 94, pl. 16, figs. 8–11
1998 *Candona neglecta* Sars — Gliozzi & Mazzini, pl. 1, fig.e
2000 *Candona neglecta* Sars — Meisch, p. 77–81, figs. 26, 27
2005 *Candona neglecta* Sars — Mischke, p. 135–136, pl. 1, figs. 6–9
2005 *Candona neglecta* Sars — Pipík & Bodergat, p. 296–297, pl. 2, figs. 1–5
2005 *Candona* (*Neglecandona*) aff. *neglecta* Sars — Matzke-Karasz & Witt, p. 120–121, pl. 1, figs. 6–7
2008 *Candona neglecta* Sars — Beker, Tunoğlu & Ertekin, p. 13–14, pl. 2, fig. 1

Geographical distribution in the world and Turkey: This species is common in freshwater systems of different regions (Europe, Middle East, North Africa, Asia and North America) as well as in Anatolia (Lake Ulubat/Turkey — (Altınsaçlı & Griffiths 2001; Afşin-Elbistan Coal Basin, in this study).

Candona iliensis Mandelstam, 1963
Fig. 6.6–10

1963 *Candona iliensis* Mandelstam sp. n., — Mandelstam & Snejder, p. 146, pl. 21, fig. 12
1980 *Candona iliensis* Mandelstam — Freels, p. 84–85, pl. 14, figs. 1–4

Geographical distribution in the world and Turkey: Kazakhstan, İli-Depression, Pliocene (Mandelstam 1963); Turkey, Ankara, Adıyaman, Muş, Kayseri, Gaziantep, Konya and Afşin-Elbistan Basin, Upper Miocene to Late Pleistocene (Freels 1980).

Candona aff. *candida* (Müller, 1776)
Fig. 6.11–14

Affinities: *Candona candida* has slightly rounded dorsal and posterior margin. Our taxon has very straight dorsal and posterior margin. Postero-dorsal and postero-ventral corners are evident. Postero-dorsal area has tapering. Anterior margin narrower than the other *C. candida* specimen. For this reason, "aff." has been used for this specimen.

Geographical distribution in the world and Turkey: This species belongs to the *candida* Group of *Candona*. It lives in almost every different type of freshwater bodies. It occurs generally in Eurasia and North America but it is found rarely in the southern hemisphere and its stratigraphic range is from Late Pliocene to Recent (Meisch 2000).

Candona sp.
Fig. 6.15

Description: Triangular shape in lateral view, dorsal margin strongly convex and tapering, anterior margin narrow and well rounded, posterior margin diagonal, straight and postero-ventral area like a beak shape. Ventral margin slightly concave. Posterior end more tapering than the anterior at the dorsal view. Valve surface smooth. Anterior vestibule wide, hinge and muscle scars are characteristic of the genus.

Dimensions: length: 1.15–1.25 mm; height: 0.50–0.60 mm; width: 0.25–0.30 mm.

Material: 3 valves.

Affinities: This taxon has been left open in the nomenclature due to insufficient material. This taxon differs from known species which have long, straight and diagonal posterior margins and slowly tapering postero-ventral corners from lateral and dorsal view.

Genus: *Pseudocandona* Kaufmann, 1900

Pseudocandona compressa (Koch, 1837)
Fig. 6.16–20

1837 *Cypris compressa* nov. sp. — Koch, Nr. XVI
1957 *Candona compressa* (Koch) — Wagner, p. 20–21, pl. 2
1962 *Candona compressa* (Koch) — Jordan et al., p. 74, pl. 6, fig. 77
1975b *Candona compressa* (Koch) — Diebel & Pietrzeniuk, p. 33, pl. 2, figs. 9,10
1977 *Candona compressa* (Koch) — Pietrzeniuk, p. 342, pl. 9, figs. 5–8
1978 *Candona compressa* (Koch) — Diebel & Pietrzeniuk, pl. 23, figs. 9, 10
1979 *Candona compressa* (Koch) — De Deckker, p. 300–302, pl. 32, fig. 12
1980 *Candona* (*Pseudocandona*) *compressa* (Koch) — Freels, p. 64–66, pl. 10, figs. 1–10
1998 *Candona compressa* (Koch) — Gliozzi & Mazzini, pl. 2, fig. f
2000 *Pseudocandona compressa* (Koch) — Meisch, p. 179–182, fig. 76
2005 *Pseudocandona compressa* (Koch) — Mischke, p. 135–136, pl. 2, figs. 7–10
2005 *Pseudocandona* cf. *compressa* (Koch) — Matzke-Karasz & Witt, p. 121–122, pl. 1, fig. 11
2008 *Pseudocandona compressa* (Koch) — Beker, Tunoğlu & Ertekin, p. 17, pl. 2, fig. 9

Geographical distribution in the world and Turkey: This species lives in the shallow zones of permanent and temporary lakes (Meisch 2000). It has been observed in Europe, Turkey, Iran, Siberia and North America (Meisch 2000).

Subfamily: **Cyclocypidinae** Kaufmann, 1900
Genus: *Cyclocypris ovum* Brady & Norman, 1889

Cyclocypris ovum (Jurine, 1820)
Fig. 6.21–26

1820 *Cyclocypris ovum* Jurine, Hist. Monocles env. Geneve, 179, pl. 19, figs. 18, 19
1984 *Cyclocypris ovum* (Jurine) — Diebel & Pietrzeniuk, p. 304, pl. 45, figs. 7, 8
1988 *Cyclocypris ovum* (Jurine) — Bronshtein, p. 223, 224, pl. 10, figs. 1, 2
2000 *Cyclocypris ovum* (Jurine) — Meisch, p. 238–242, figs. 101–102

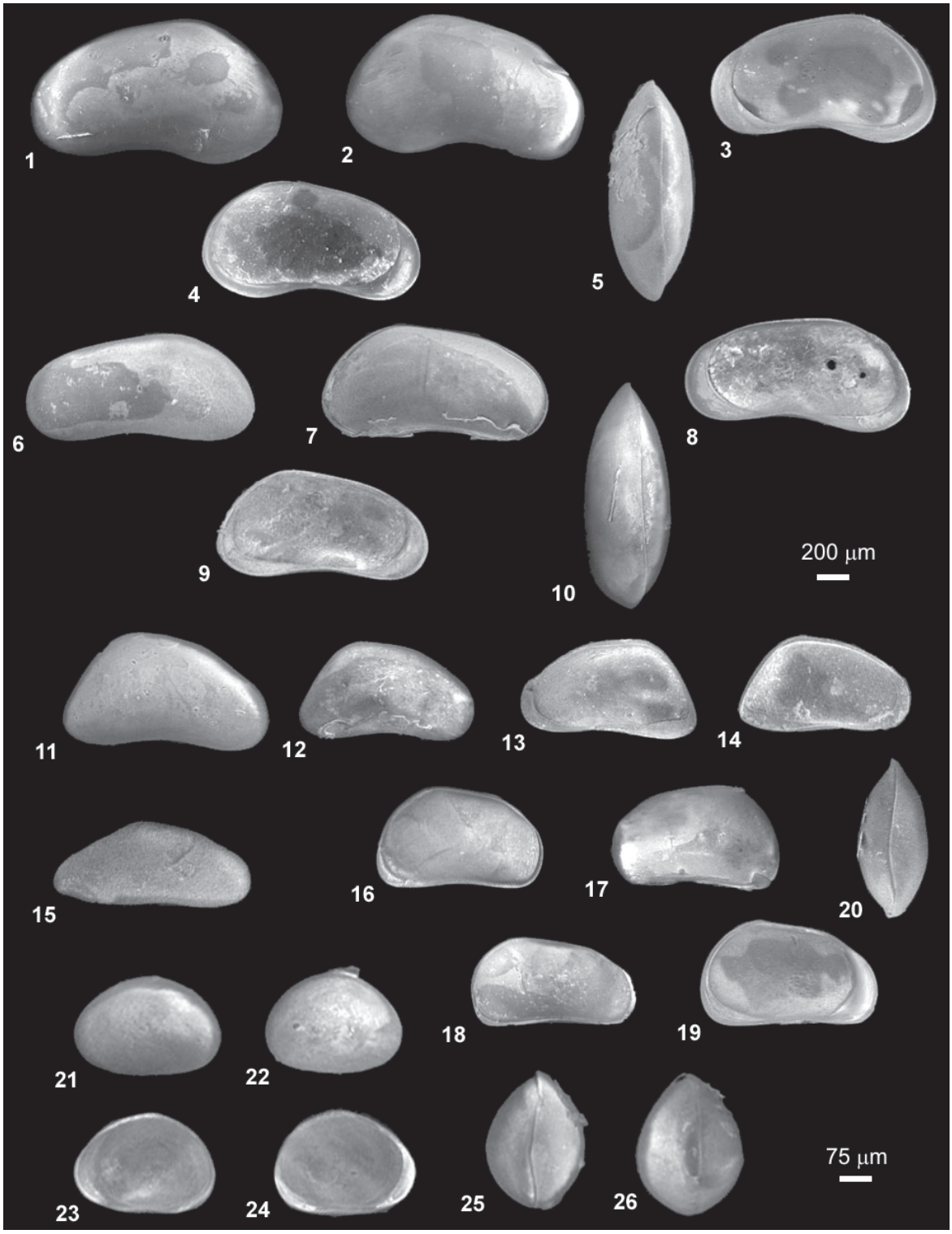

Fig. 6. 1–5 — *Candona neglecta* Sars HD-393, 110 m, Pliocene–Pleistocene. 1 — Left valve, external view; 2 — Right valve, external view. 3 — Right valve, internal view; 4 — Left valve internal view; 5 — Carapace, dorsal view. **6–10** — *Candona iliensis* Mandelstam HD-411, 23 m, Pliocene–Pleistocene. 6 — Left valve, external view; 7 — Right valve, external view; 8 — Right valve internal view; 9 — Right valve internal view; 10 — Carapace, dorsal view. **11–14** — *Candona* aff. *candida* (Koch) HD-411, 17 m, Pliocene–Pleistocene. 11 — Right valve, external view; 12 — Right valve, external view; 13 — Right valve, internal view; 14 — Left valve, internal view. **15** — *Candona* sp. HD-393, 120 m, Pliocene–Pleistocene. Right valve, external view. **16–20** — *Pseudocandona compressa* (Koch) HD-393, 127 m, Pliocene–Pleistocene. 16 — Carapace, right valve; 17 — Carapace, left valve; 18 — Left valve, internal view; 19 — Left valve, internal view; 20 — Carapace, dorsal view. **21–26** — *Cyclocypris ovum* (Jurine) MSS, sample 5, Pliocene–Pleistocene. 21 — Left valve, external view; 22 — Right valve, external view; 23 — Right valve, internal view; 24 — Left valve, internal view; 25 — Carapace, dorsal view; 26 — Carapace, ventral view.

Geographical distribution in the world and Turkey: Very common and widespread species in the world and also in Turkey. It is very tolerant to different environmental factors. *C. ovum* lives commonly in permanent, temporary, stagnant, flowing waters and littoral zone of lakes. Common species in the former Soviet Union in the European part, Caucasus, Siberia and Asian part and it has been recorded in Sweden, Norway, British Isles, Germany, Switzerland and North America (Bronshtein 1988). Its stratigraphic range is from Miocene, Pleistocene to Recent and Holactic (Meisch 2000).

Family: **Ilyocyprididae** Kaufmann, 1900
Subfamily: **Ilyocypridinae** Kaufmann, 1900
Genus: *Ilyocypris* Brady & Norman, 1889

Ilyocypris gibba (Ramdohr, 1808)
Fig. 7.1–7

1808 *Cypris gibba* nov. sp. — Ramdohr, Mag. Ges. Naturf. Fr. Berlin 2, 91, pl. 3, 13, 14, 17
1947 *Ilyocypris gibba* (Ramdohr) — Bronshtein, p. 109–110, figs. 5, 6
1957 *Ilyocypris gibba* (Ramdohr) — Wagner, p. 32–33, pl. 10
1962 *Ilyocypris gibba* (Ramdohr) — Jordan et al., p. 83, figs. 5, 6, pl. 4, figs. 44–48
1975a *Ilyocypris gibba* (Ramdohr) — Diebel & Pietrzeniuk, p. 32, figs. 9, 10, pl. 6, figs. 12–14
1978 *Ilyocypris gibb,* (Ramdohr) — Diebel and Pietrzeniuk, p. 212–213, pl. 52, figs. 1, 2, pl. 53, figs. 1, 2
1979 *Ilyocypris gibba* (Ramdohr) — De Deckker, p. 298, pl. 33, fig. 15
1979 *Ilyocypris gibba* (Ramdohr) — Van Harten, p. 71–75, pl. 1, figs. 1a, 2a,b, pl. 2, figs. 1a, 2a
1998 *Ilyocypris gibba* (Ramdohr) — Gliozzi & Mazzini, pl. 2, fig. a
2000 *Ilyocypris gibba* (Ramdohr) — Meisch, p. 245–248, fig. 104
2008 *Ilyocypris gibba* (Ramdohr) — Beker, Tunoğlu & Ertekin, p. 12–13, pl. 1, figs. 10, 11

Geographical distribution in the world and Turkey: *I. gibba* is known very well from nearly all the European countries (Griffiths 1995), North Africa, the Middle East, Central Asia, China and North America (Meisch 2000), the former Soviet Union and North America (Bronshtein 1988) and Turkey (Külköylüoğlu 2004).

Family: **Cyprididae** Baird, 1845
Subfamily: **Eucypridinae** Bronshtein, 1947
Genus: *Eucypris* Vávra, 1891

Eucypris sp.
Fig. 7.8,9

Description: Valves are very large; carapace with triangular shape in lateral view. Dorsal margin strongly convex, ventral margin straight or slightly concave, anterior margin broad and well rounded. Carapace subovate in dorsal view, anterior margin more tapering than the posterior. Maximum length in near or the ventral. Maximum height at the anterocenter. Maximum length at the center. Valve surface smooth and interior features of the valves (muscle scars, vestibule, hinge and marginal zone) are characteristic to the genus.

Dimensions: length: 2.14–2.40 mm; height: 0.90–1.00 mm; width: 0.90–1.00 mm.

Remarks: This taxon is very different from known *Eucypris* species. It closely resembles *E. virens* (Jurine), but the dorsal margin of our specimen is very strongly convex and the maximum height is in the front of the center.

Subfamily: **Cypridinae** Baird, 1845
Genus: *Cypris* Müller, 1776

Cypris pubera Müller, 1776
Fig. 7.10

1776 *Cypris pubera* nov. sp. Müller, Zool. Danicae Prodr., 198
1947 *Cypris pubera* Müller — Bronshtein, p. 127–128, pl. 2, fig. 9
1978 *Cypris pubera* Müller — Diebel & Pietrzeniuk, pl. 24, figs. 9, 10
1980 *Cypris pubera* Müller — Freels, p. 4, pl. 2, figs. 11,12
1998 *Cypris bispinosa* Müller — Gliozzi & Mazzini, pl. 1, fig. d
2000 *Cypris pubera* Müller — Meisch, p. 272–274, fig. 114

Geographical distribution in the world and Turkey: Its general geographical distribution is in Europe, North Africa, Middle East, Central Asia, China and North America (Meisch 2000). In Turkey: Afyon/Dinar, Isparta/Yalvaç (Freels 1980); Lake Ulubat (Altınsaçlı & Griffits 2001) and Afşin-Elbistan Coal Basin (this study).

Subfamily: **Cyprinotinae** Bronshtein, 1947
Genus: *Heterocypris* Claus, 1892

Heterocypris salina (Brady, 1868)
Fig. 7.11–14

1868 *Cypris salina* nov. sp. — Brady, p. 368
1962 *Cyprinotus salinus salinus* (Brady) — Jordan et al., p. 76, pl. 1, figs. 6–8, pl. 3, fig. 8
1975b *Cyprinotus salinus* (Brady) — Diebel & Pietrzeniuk, p. 35–36, pl. 4, figs. 1, 2
1978 *Cyprinotus salinus* (Brady) — Diebel & Pietrzeniuk, pl. 24, figs. 5, 6
1993 *Heterocypris salina* (Brady) — Meisch & Broodbakker, p. 10–15, figs. 2–5
1998 *Heterocypris salinus* (Brady) — Gliozzi & Mazzini, pl. 1, fig. a
2003 *Heterocypris salina* (Brady) — Witt, p. 100–101, pl. 1, figs. 14–16
2005 *Heterocypris salina* (Brady) — Matzke-Karasz & Witt, p. 126, pl. 3, fig. 4
2008 *Heterocypris salina* (Brady) — Beker, Tunoğlu & Ertekin, p. 18–19, pl. 3, figs. 6, 8

Geographical distribution in the world and Turkey: Its fossil records are from Late Miocene (Freels 1980) to Recent. This species has a very wide geographical distribution in fresh and brackish water bodies of some European, Middle Eastern and North African countries. This specimen is Holarctic, but known in the southern hemisphere (Meisch 2000).

Subfamily: **Dolerocypridinae** Triebel, 1961
Genus: *Dolerocypris* Kaufmann, 1900

Dolerocypris anatolia nov.sp.
Fig. 7.15–19; Fig. 8.1–5

Derivation of name: Anadolu, Anatolia, Asian part of Turkey.

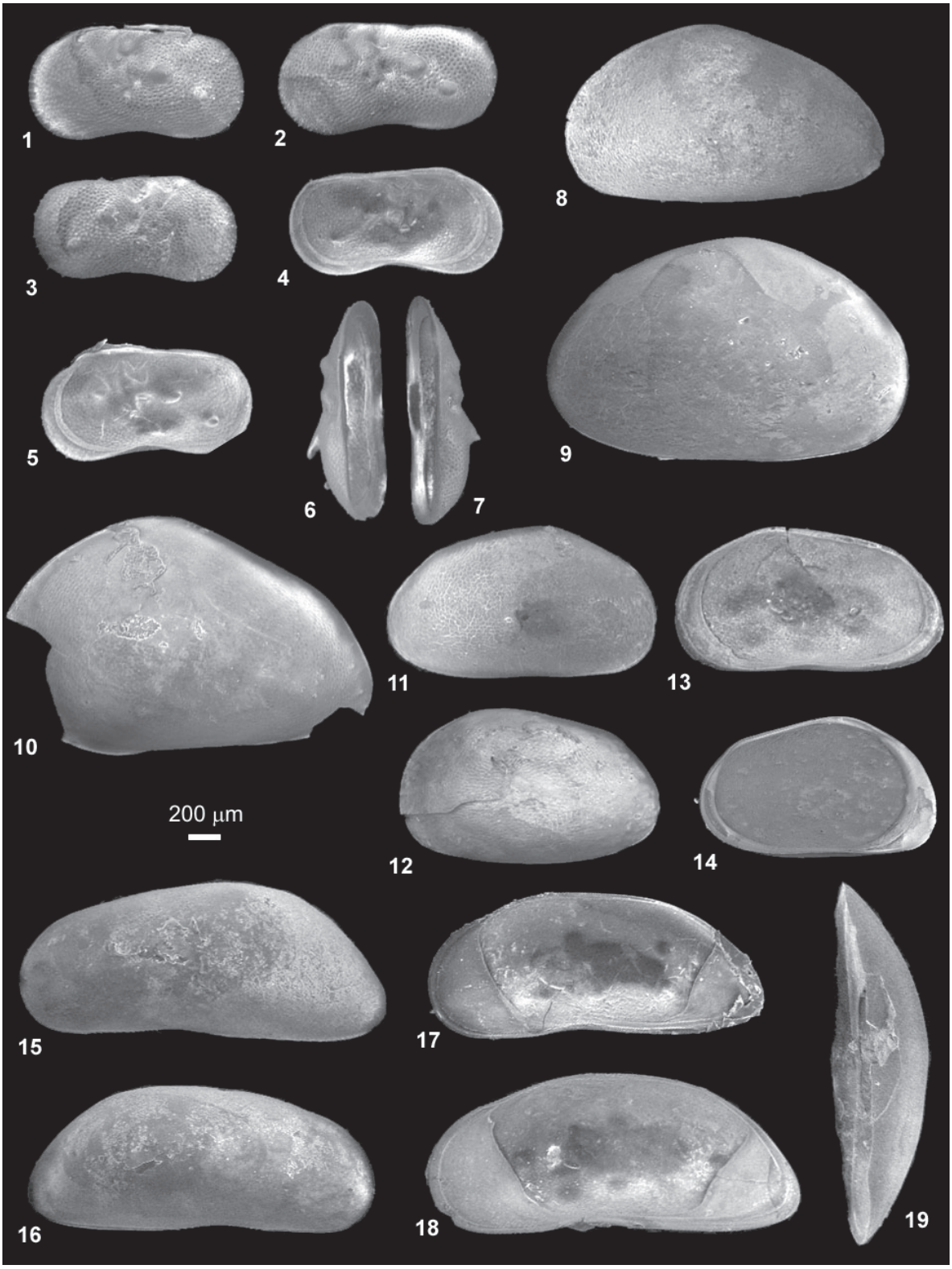

Fig. 7. 1–7 — *Ilyocypris gibba* (Ramdohr) HD-393, 110 m, Pliocene–Pleistocene. 1 — Left valve, external view; 2 — Left valve, external view; 3 — Right valve, external view; 4 — Left valve, internal view; 5 — Right valve, internal view; 6 — Left valve, dorsal view; 7 — Right valve, dorsal view. **8, 9** — *Eucypris* sp. HD-411, 17 m, Pliocene–Pleistocene. 8 — Left valve, external view; 9 — Right valve, external view. **10** — *Cypris pubera* Müller HD-411, 17 m, Pliocene–Pleistocene. Left valve, external view. **11–14** — *Heterocypris salina* Brady HD-393, 97 m, Pliocene–Pleistocene. 11 — Right valve, external view. 12 — Left valve, external view. 13 — Right valve, internal view; 14 — Left valve, internal view. **15–19** — *Dolerocypris anatolia* nov. sp. HD-393, 113 m, Pliocene–Pleistocene. 15 — Left valve, external view; 16 — Right valve, external view; 17 — Left valve, internal view; 18 — Right valve, internal view; 19 — Right valve, dorsal view.

Holotype: Left valve, Collection No: H.Ü. JMB-001-07.
Paratypes: 15 carapaces.
Type locality: Afşin-Elbistan Coal Basin.
Type-level: Pliocene–Pleistocene.
Diagnosis: Carapace elongated in lateral view. Dorsal margin strongly convex and oblique to the ventral. Ventral margin concave near the antero-center. Anterior margin well rounded. Posterior margin oblique and acute at the posteroventral. Valves slightly swollen in the central are and both ends equally tapering in dorsal view. Valve surface smooth and polished. Maximum length near the ventral margin, maximum height between posterior and center. Maximum width at the center of the carapace. Inner lamella wide at both ends. Central muscle scar pattern characteristic of the genus. Right valve overlaps left valve at both ends.

Description: Carapace nearly 2.5 mm long and elongated in lateral view. Dorsal margin strongly convex. Maximum height at the posterior part of dorsal margin. Dorsal margin posteriorly sloping more steeply than anteriorly. Anterodorsal and posterodorsal areas not angular. Anterior margin well rounded and fallen to the ventral. Posterior margin oblique and acute at the posteroventral. Ventral margin concave near the anterocenter. Surface of valves smooth. Both ends equally tapering in dorsal view. Right valve overlaps the left valve. Carapace nearly narrow in dorsal view. Maximum length near the ventral, maximum height between posterior and center. Maximum width at the center of the carapace. Inner lamella wide at both ends. Central muscle scar pattern characteristic of the genus.

Dimensions: length: 2.14–2.40 mm; height: 0.90–1.00 mm; width : 0.90–1.00 mm.

Remarks: *D. fasciata* Müller and *D. sinensis* Sars have very similar outlines to *D. anatolia* nov. sp. according to other known species of *Dolerocypris*. But, *D. anatolia* nov. sp. has much higher posterior half. Its greatest height is situated just between posterior and center of carapace and its dorsal margin is sloping more steeply posteriorly. *D. anatolia* is much more swollen than the other two known species in the dorsal view. The ventral margin of *D. anatolia* is markedly concave in the lateral view, but the other two species have slightly concave or straight ventral margins.

Locality and stratigraphic level in this study: Afşin-Elbistan Coal Basin, Pliocene–Pleistocene.

Environmental interpretation

The Afşin-Elbistan Coal Basin was an ancient freshwater environment during the Pliocene–Pleistocene period and the Afşin-Elbistan coals were generated in this extensive and shallow freshwater lake which evolved from the Pliocene to Recent. Typical faunal and floral assemblages of this ancient Afşin-Elbistan freshwater lake are Ostracoda, Mollusca (Gastropoda and Pelecypoda), spore-pollen and Characeae (gyrogonites). Eleven Cypridoidea species were identified from the investigation area.

Cypris pubera is known as a common component of semi-arid zone temporary water faunas, usually inhabiting lake margins (littoral) or (often slightly saline) waters that dry out (Altınsaçlı & Griffiths 2001). *C. candida* and *C. neglecta* occur in stagnant or slowly running waters on muddy substrates. *Heterocypris salina* is known mostly in freshwater and brackish-water environments (Meisch 2000).

D. sinensis has been reported from grassy small water bodies and the macrophyte belts of lakes (Meisch 2000), while *D. fasciata* is an actively swimming species found in the littoral zones of lakes. The new species *Dolerocypris anatolia* nov. sp. has been found in association with abundant Characeae, Gastropoda and grassy debris. For this reason, this specimen must have lived in the littoral and grassy zones of these ancient Pliocene-Pleistocene lakes.

The ostracod and the other faunal and floral associations of the thick coal-bearing sediments are more varied in the different parts of the basin and indicate a shallow, low energy, freshwater habitat.

Conclusions

The Afşin-Elbistan Coal Basin is one of the largest coal basins in Turkey. It holds many clues which shed light on the Pliocene–Quaternary paleoclimatic, paleogeographical and paleolimnologic evolution of Anatolia.

However, the discovery of these records requires consideration of all the fauna and flora elements (gastropods, pelecypods, spore-pollen, characeae, gyrogonite and others). Determination of the characteristics of these fauna and flora elements by experts would prove their paleoecological significance. Meanwhile, both whole-rock analysis, and isotope analysis of shells will shed light on the paleoclimatic processes.

This study allows us to assess only a small part of the Afşin-Elbistan Basin. Considering the gross size of the basin, it is possible that even a larger and more diverse fauna and flora are present within the sediments.

There are two active large thermical reactors present in the area and they contribute a considerable amount of electricity to the energy production of Turkey. Two additional thermal reactors are being constructed within the same basin and with coal reserves of well over 4000 million tones, the Afşin-Elbistan area plays a significant role in Turkey's economy. Unfortunately this immense economic importance of the basin greatly surpasses its scientific significance. Thousands of drilling cores had only been used to calculate coal reserves and a multi-disciplinary scientific work, which could be very easy to perform with this vast amount of core samples has never been initiated. Thus it is necessary to make it possible for scientists to examine this material. Development of countries is achieved not only by economic growth but with a co-operation of scientific background and economic power.

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