Some notes on the morphology of *Emys orbicularis* in Anatolia, especially on *E. o. luteofusca* and *E. o. colchica*, with the description of a new subspecies from southeastern Turkey

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Abstract

New data on morphological variation among European pond turtles (*Emys orbicularis*) from Anatolia and adjacent areas in the Middle East are presented. These results are based on 114 specimens, mainly in the collections of 21 natural history museums, and additional photo records and published data. Large areas are still poorly documented by specimens and plenty of open questions remain regarding infraspecific variation within Anatolia. It is suggested to extend the concept of the subspecies *E. o. luteofusca* to most populations inhabiting the Central Anatolian plateau, which were originally thought to share characteristics with *E. o.* cf. *hellenica* and *E. o. colchica*. Not included in *E. o. luteofusca* are the populations occurring around Adapazarı, Akşehir, and Kayseri. These either represent intermediate populations of *E. o. luteofusca* with neighbouring subspecies, or separate taxa. The population occurring in the upper section of the Amik-Maraş rift valley is extremely distinct from all other populations of *E. orbicularis* and elevated to subspecific rank here (*E. o. eiselti* subspec. nov.). Among others, it is distinguished from all other subspecies by its extremely small gular scutes. More in the South, in the area of the Gulf of İskenderun, this subspecies probably intergrades with the Aegean population (*E. o.* cf. *hellenica*). *E. o. colchica* from eastern Turkey and the adjacent western Caucasus is regarded as a highly problematic taxon and is most probably a conglomerate of several evolutionary units, sharing as common traits a smaller size and a lighter colouration than the nominotypical subspecies.

Key words: Testudines: Emydidae: *Emys orbicularis*, *E. o. colchica*, *E. o. eiselti* subspec. nov., *E. o.* cf. *hellenica*, *E. o. luteofusca*; Anatolia, Turkey, taxonomy.

Zusammenfassung

Anhand von 114 Exemplaren, hauptsächlich aus den Sammlungen von 21 Naturkundemuseen, Fotobelegen und einer Literaturauswertung werden neue Daten zur morphologischen Variabilität der Europäischen Sumpfschildkröte (*Emys orbicularis*) in Anatolien und den angrenzenden Regionen des Nahen Ostens vorgestellt. Dort sind immer noch große Gebiete schlecht erforscht, da zu wenig Belegexemplare bekannt sind. Es wird vorgeschlagen, das Konzept der Unterart *E. o. luteofusca* auf die meisten zentralanatolischen Populationen auszudehnen, die ursprünglich als intermediäre Vorkommen zu *E. o. colchica* und *E. o.* cf. *hellenica* eingestuft worden waren. Nicht zu *E. o. luteofusca* gestellt werden hier nach wie vor die Sumpfschildkröten aus den Gebieten um Adapazarı, Akşehir und Kayseri. Bei ihnen könnte es sich entweder tatsächlich um Mischformen mit benachbarten Unterarten oder aber um eigene Taxa handeln. Die Population im oberen Teil des Amik-Maraş-Grabens unterscheidet sich durch ihre sehr kleinen Gularschilder und andere Merkmale deutlich von allen anderen Vorkommen der Europäischen Sumpfschildkröte. Sie wird daher hier als neue Unterart beschrieben (*E. o. eiselti* subspec. nov.). Weiter im Süden des Grabenbruchs, im Gebiet des Golfes von İskenderun, intergradiert die neue Subspezies wahrscheinlich mit der Ägäis-Population (*E. o.* cf. *hellenica*). Die osttürkisch-westkaukasische Unterart *E. o. colchica* wird als hochgradig problematisches Taxon betrachtet, das sich höchstwahrscheinlich aus verschiedenen Evolutionseinheiten zusammensetzt. Die

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unter *E. o. colchica* zusammengefaßten Sumpfschildkröten zeichnen sich dadurch aus, daß sie für die Nominatform zu klein und zu hell gefärbt sind.

Schlagwörter: Testudines: Emydidae: *Emys orbicularis*, *E. o. colchica*, *E. o. eiselti* subspec. nov., *E. o.* cf. *hellenica*, *E. o. luteofusca*; Anatolien, Türkei, Taxonomie.

Introduction

The primary problem for *Emys* taxonomy in Asia Minor heretofore is that several regions are poorly represented in scientific collections, and too little field work has been done in the past which might clarify taxonomic problems. Over the years, the senior author investigated the pond turtle holdings of some of the major natural history museums (see below). Even from the well traveled Aegean and Marmara coast no more than eleven adult specimens were thus found, insufficient to allow a definite treatment of the taxonomy yet. As a further step towards a better understanding of the systematics, here we present data obtained from 114 museum specimens, enriched with some colour and pattern data from photos of live turtles (photos deposited in the Herpetological Section of the Staatliches Museum für Tierkunde Dresden). Special attention is given to a comparison of *Emys orbicularis luteofusca* sensu lato and *E. o. colchica* with other populations from Asiatic Turkey. One of these is so distinct that it is described here as a new subspecies.

Materials and Methods

Measurements (all straight line) and notes on colour and pattern of specimens follow FRITZ (1995). All museum specimens are alcoholic specimens, if not otherwise noted. We compared by easy statistical methods a total of 114 pond turtles from Asia Minor (including the adjacent western Transcaucasus) from the following collections:

AMNH – American Museum of Natural History (New York)
BMNH – The Natural History Museum, formerly British Museum (Natural History), London
GNM – Göteborgs Naturhistoriska Museet
HLMD – Hessisches Landesmuseum Darmstadt
HUJ – Zoological Museum of the Hebrew University Jerusalem
MHNG – Muséum d'Histoire naturelle Genève
MTKD – Staatliches Museum für Tierkunde Dresden
MZUF – Museo Zoologico "La Specola" (Università di Firenze)
NMB – Naturhistorisches Museum Basel
NMBe – Naturhistorisches Museum Bern
NMW – Naturhistorisches Museum Wien
RMNH – Nationaal Natuurhistorisch Museum, formerly Rijksmuseum van Natuurlijke Historie Leiden
SMF – Senckenberg-Museum Frankfurt a. M.
SMNS – Staatliches Museum für Naturkunde Stuttgart
SNM – Slovenské Národné Muzeum (Bratislava)
ZDEU – Zooloji Anabilim Dali, Ege Üniversitesi Fen Fakültesi (Bornova-İzmir)
ZFMK – Zoologisches Forschungsinstitut und Museum A. Koenig (Bonn)
ZIN – Zoological Institute of the Russian Academy of Sciences (St. Petersburg)

ZMB – Zoologisches Museum Berlin
ZMH – Zoologisches Museum Hamburg
ZSM – Zoologische Staatssammlung München.

Locality Groups

Due to their general appearance, our material of European pond turtles from Asiatic Turkey can easily be divided into several geographic groups (fig. 1) which are largely congruent with the ones already defined in FRITZ (1993). However, using more specimens, we refined this classification somewhat. One of the major changes is a new concept for *E. o. luteofusca,* now including most populations originally thought to be intermediates with darker coloured taxa by FRITZ (1989, 1993). In the following, we discuss each locality group in regard to some important morphological characters.

Aegean Group (*Emys orbicularis* cf. *hellenica)*

Specimens examined: 5 males, 6 females, 4 juv., 3 pull.
İzmit, Vilayet İzmit: MTKD 35512, 1 female, NMBe 2 juv. without catalogue numbers; İznik Gölü, Vilayet Bursa: SNM 364, 1 female; Balikli near Bursa, Vilayet Bursa: NMW 14567, 1 female; Çanakkale, Vilayet Çanakkale: ZDEU 123/1978:1-2, 1 juv., 1 male; Manisa, Vilayet Manisa: NMW 14566, 1 pull.; Ephesos, Vilayet İzmir: HUJ-R 16010, 1 male, SMNS 4688, 1 male; İzmir, Vilayet İzmir: GNM 1930, 1 pull., ZDEU 18/1967, 1 female, ZDEU 24/1972, 1 male; some kilometres N of İzmir, Vilayet İzmir: RMNH 23300, 1 male (badly preserved); Aydin, Vilayet Aydin: ZDEU 14/1961, 1 female, ZFMK 44172, 1 juv.; between Kos and Kap Psolidi, Island Kos: NMW 28291, 1 pull.; marshy dune area E of Finike, Vilayet Antalya: NMW 18549, 1 female (shell).
Photo records: 4 males, 2 females, 1 ad. sex ?, 1 juv.
Pergamon, Vilayet İzmir: 1 female (A. LAUTERWASSER, 1971); Ephesos, Vilayet İzmir: 2 males (M. FRANZEN, 23.-25.III.1988); Düvertepe, Vilayet Balikesir: 1 juv. (H. WEISSINGER, V/VI.1989); Kapıkargın, Vilayet Muğla: 1 male (photo and measurements published in GRAMENTZ 1993); eastern Samos, between Mesokambos and Mykali: 1 ad. (A. MEYER, 12.IV.1996, published as fig. 1 in MEYER & FRITZ 1996); Milet, Vilayet Aydin: 1 male, 1 female (G. VOGEL, 25.III.1985).

The few specimens availabe to us from the Aegean and Marmara regions are hardly distinguishable from *E. o. hellenica* from the western Balkans. They are quite small, reaching about 13 cm carapace length in both sexes (fig. 2) with entirely or predominantely yellow throats. The three males with measurable heads are quite large headed, with distinctly longer heads in relation to the carapace length than the females. Remarkably, the (other) three males whose eye colouration is known have a yellow iris, like Balkan specimens. Two of these males are from the surroundings of Ephesos, the third is from Kapıkargın (photo published by GRAMENTZ 1993, in which the iris colour is inaccurately called "rötlich"). However, some females exhibit a reticulate brownish head pattern, whereas Balkanic specimens tend to have round yellow spots on a black background instead. Moreover, some males show a scanty, fine mottled black pattern on the predominantely yellow plastron, reminiscent of certain Bulgarian specimens, which belong to the *orbicularis* subspecies group. TAŞKAVAK & REIMANN (pers.

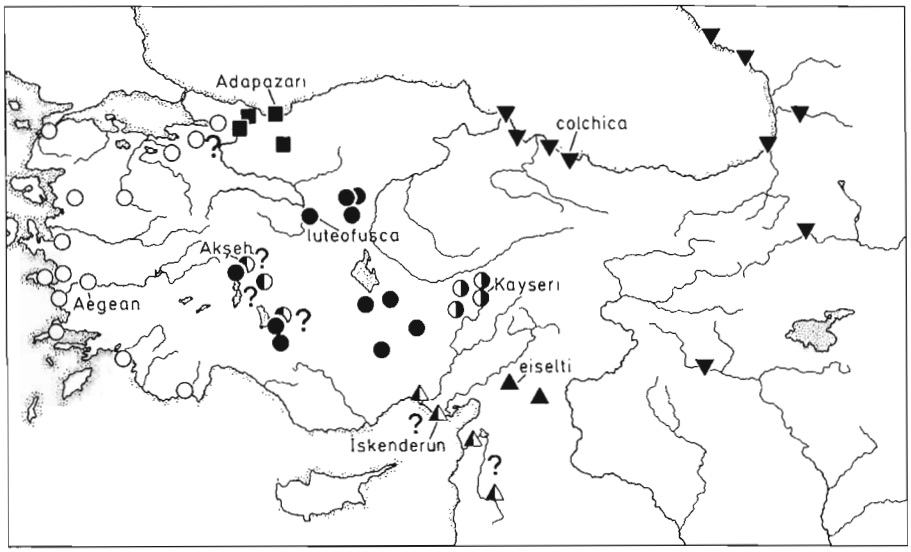
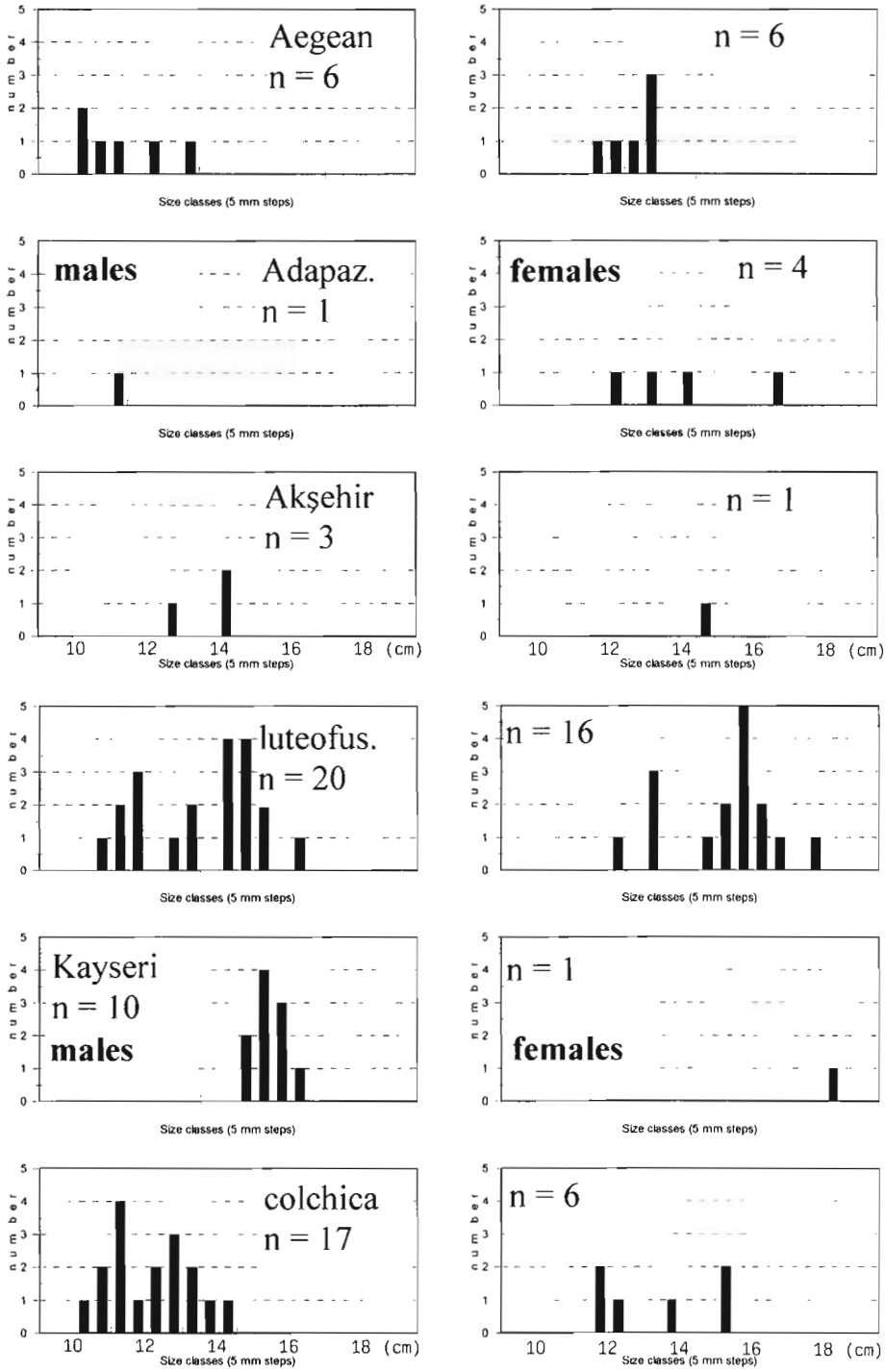


Fig. 1. Distribution of different subspecies and locality groups of *Emys orbicularis* in Asia Minor. Locality symbols self-explanatory: Aegean group (*E. o.* cf. *hellenica*); Adapazarı group (specimens morphologically resembling pond turtles from the southeastern Balkans); Akşehir group (intermediates between *E. o. luteofusca* and *E. o.* cf. *hellenica* or the Adapazarı population?); *E. o. luteofusca* sensu lato; Kayseri group (large, in part very dark coloured pond turtles, intermediates between *E. o. luteofusca* and *E. o. colchica*?); *E. o. eiselti;* İskenderun group (intermediates of *E. o. eiselti* and *E. o.* cf. *hellenica*); *E. o. colchica* sensu lato. In the Kayseri sample are specimens which were listed in FRITZ (1994) as intergrades between *E. o. luteofusca* and *E. o. colchica.*

Verbreitung verschiedener Unterarten und Verteilung der Fundortgruppen von *Emys orbicularis* in Kleinasien. Aegean: Ägäis-Gruppe (*E. o.* cf. *hellenica*); Adapazarı: Adapazarı-Gruppe (morphologisch Sumpfschildkröten vom südöstlichen Balkan ähnlich); Akşeh.: Akşehir-Gruppe (intermediär zwischen *E. o. luteofusca* und *E. o.* cf. *hellenica* oder der Adapazarı-Population?); luteofusca: *E. o. luteofusca* sensu lato; Kayseri: Kayseri-Gruppe (große, zum Teil sehr dunkel gefärbte Sumpfschildkröten, intermediär zwischen *E. o. luteofusca* und *E. o. colchica*?); eiselti: *E. o. eiselti*; İskenderun: İskenderun-Gruppe (Intergrades zwischen *E. o. eiselti* und *E. o.* cf. *hellenica*); colchica: *E. o. colchica* sensu lato. Zur Kayseri-Gruppe werden hier auch Exemplare gestellt, die in FRITZ (1994) als Intergrades zwischen *E. o. luteofusca* und *E. o. colchica* aufgefaßt wurden.

Fig. 2. Distribution of carapace length in European pond turtles from Asia Minor (5 mm size classes).

Verteilung der Carapaxlängen bei Europäischen Sumpfschildkröten aus Kleinasien (5 mm Größenklassen).


Aegean
n = 6
n = 6
males
Adapaz.
n = 1
females
n = 4
Akşehir
n = 3
n = 1
luteofus.
n = 20
n = 16
Kayseri
n = 10
males
n = 1
females
colchica
n = 17
n = 6
number
Size classes (5 mm steps)
10
12
14
16
18
(cm)

comm.) report specimens from the central Aegean region of Turkey with heavily patterned plastra and dark throats, which is not characteristic for Balkanic *hellenica*. For this reason we treat the pond turtles of this group as *E. o.* cf. *hellenica* and not as *hellenica* itself, despite the fact that the latter subspecific allocation is corroborated by Taşkavak & Reimann (1998).

Adapazarı Group

Specimens examined: 1 male, 4 females, 1 juv.
Adapazarı, Vilayet Adapazarı: MTKD 39119, 1 female; between Ereğli and Karasu, Vilayet Adapazarı: SMNS 4640, 1 female, SMNS 7846, 1 juv., SMNS 7847-48, 1 male, 1 female (carapaces); Abant Gölü, Vilayet Bolu: SMF 69557, 1 female.
Photo records: 1 male, 1 female, 1 pull.
Solman Gölü, Vilayet Adapazarı: 1 male (fig. 9 in Fritz 1993), 1 pull. (both: U. Sattler, IV./V.1991); Akgöl near Adatepe, Vilayet Adapazarı: 1 female (M. Franzen, 17.VI.1989).

Only a few adult specimens from this area are available to us, morphologically much resembling pond turtles from the southeastern Balkans, e.g. from Bulgaria and Turkish Thrace. The same is true for some additional specimens on colour slides. The turtles of this group are small to medium sized, one female from the Abant Gölü reaching about 16.7 cm shell length (fig. 2). Their throats are heavily speckled with black and their general appearance is darker as in the specimens from the Aegean and Marmara regions. Predominantely black plastra occur (fig. 3). As mentioned already in Fritz (1993), the male from Solman lake has yellowish eyes (the orange tinge of the iris of this specimen in Fritz 1993: figure 9 is due to a bad reproduction of the slide and is not natural).

Akşehir Group

Specimens examined: 3 males, 1 female, 1 pull.
Çay, Vilayet Afyon: BMNH 1896.3.30.1, 1 female (carapace); Akşehir Gölü, Vilayet Konya: NMW 18550:1-2, 1 male, 1 pull., SMF 72934, 1 male; NE of Beyşehir, Vilayet Konya: NMW 18550:3, 1 male.
Photo records: 2 males.
Akşehir Gölü, Vilayet Konya: 1 male (J. Eiselt, 11.V.1965, published as fig. 14 in Fritz 1989); Beyşehir Gölü, Vilayet Konya: 1 male (J.F. Schmidtler, 2.VI.1996).

Two males and the sole female available to us from the area around Akşehir and one male from Beyşehir are superficially similar to the Adapazarı group, but their carapaces are somewhat lighter coloured. Notably, in the males the carapace is very finely mottled with tiny yellow dots, like in the specimens from Saysalli (Kayseri group), and the iris of two males is intensely reddish. The plastra of these specimens are light to dark coloured (fig. 3) and a speckled plastral pattern as characteristic for the *orbicularis* group may occur.

Due to the geographical location of the populations of the Akşehir group, it would be sensible to conclude that they represent intergrades between *E. o.* cf. *hellenica* and *E. o. luteofusca*. However, then it would be hard to explain why these intermediates have such dark plastra, a character neither present in *hellenica* nor in *luteofusca*. More probable is that they are intermediates between the dark

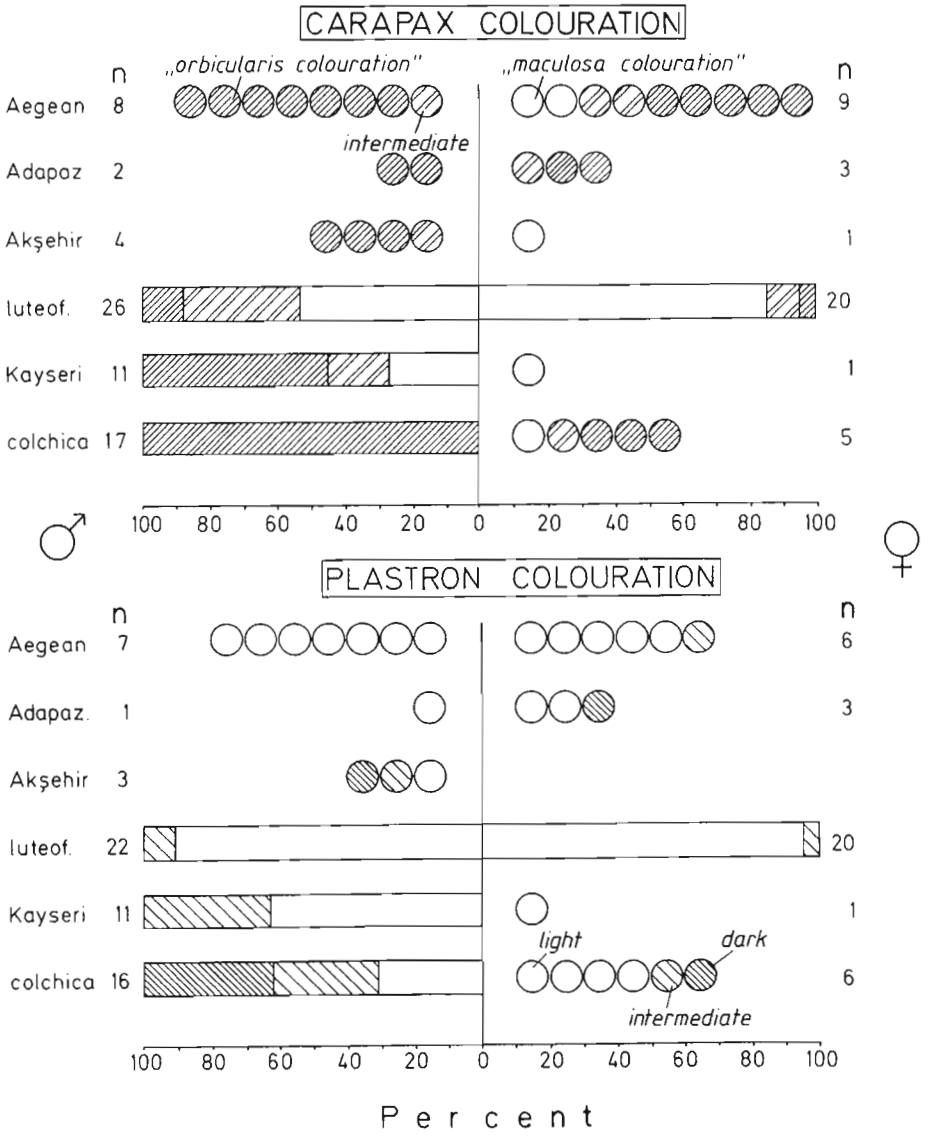


Fig. 3. Percentage of different carapace and plastron colourations in pond turtles from Asia Minor. In addition to museum specimens, data from some photos of live specimens were used. Colouration categories as defined in FRITZ (1995). In small samples, the individuals are indicated with dots, otherwise the figure is self-explanatory.

Prozentualer Anteil verschiedener Carapax- und Plastronfärbungen bei Sumpfschildkröten aus Kleinasien. Zusätzlich zu den Museumsexemplaren wurden anhand von Fotos ermittelte Daten lebender Tiere verwendet. Färbungskategorien wie in FRITZ (1995) definiert. Bei kleinen Stichproben wurden die Individuen mit Punkten dargestellt, ansonsten erklärt sich die Abbildung selbst.

coloured Adapazarı group populations and *E. o. luteofusca*, or represent even a separate evolutionary unit within the *orbicularis* group.

Perhaps the dark coloured female from Gümüssu, mentioned in FRITZ (1989) erroneously as from "Dinar" (cf. FRITZ 1993), belongs to this group, too.

Emys orbicularis luteofusca sensu lato

Specimens examined: 20 males, 17 females, 1 ad. carapace (probably female), 3 juv.
Karamikbatakliği, along the road Çay-Dinar, Vilayet Afyon: MZUF 31062-63, 2 females; Sakarya River, 95 km SW of Ankara, bridge near the street Ankara-Eskişehir, Vilayet Eskişehir: RMNH 11394, 2 males (fig. 4 in FRITZ 1989); Polatlı, Vilayet Ankara: MTKD 31527-28, 2 males (one badly preserved); Ankara, Vilayet Ankara: BMNH 1915.12.28.3-4, 2 females, NMW 14568:1-3, 3 juv., NMW 14569-70, 1 male, 1 female, ZSM 16/1919:1-6, 5 males, 1 female (fig 4, 8 in FRITZ 1989); Eymir Gölü (Emir Gölü) near Ankara, Vilayet Ankara: MTKD 2776, 1 female (dry); km 59 at street Ankara-Balâ, Vilayet Ankara: SMF 55463, 1 male (fig. 4 in FRITZ 1989), SMF 59594, 1 female, SMF 67820, 1 male; between Hasanoğlan and Ankara, Vilayet Ankara: SMF 53104, 1 male; Aksaray, Vilayet Niğde: MTKD 39123, 1 male; Sultanhanı, Vilayet Niğde: MTKD 10453, 14545, 14366, 14369, 39124, 2 males, 3 females, NMBe 1 male without catalogue number, SMF 72935, 1 female; W of Ereğli, Vilayet Konya: MTKD 29137, 1 carapace (probably female, fig. 2e in FRITZ 1989), SMNS 4615:1, 1 female (holotype of *E. o. luteofusca*, fig. 2a, h, 3a, b in FRITZ 1989), SMNS 4615:2, 1 subad. female (fig. 2b in FRITZ 1989), SMNS 5474, 1 male (fig. 2c in FRITZ 1989), SMNS 5493, 1 female (fig. 2d in FRITZ 1989), probably also: MTKD 11886-87, 2 males; Seydişehir, Vilayet Konya: AMNH 97652, 1 female (fig. 2g in FRITZ 1989); carstic water pit near Niğde, Vilayet Niğde: MTKD 15682, 1 female (fig. 2f in FRITZ 1989).
Photo records: 5 males, 6 females.
Beyşehir, Vilayet Konya: 3 females (H. WEISSINGER, spring 1987); Aksaray, Vilayet Niğde: 4 males (O. FREYTAG, X.1992); Sultanhanı, Vilayet Niğde: 1 male, 3 females (O. FREYTAG, X.1992 and P.H. STETTLER, autumn 1994).

The description of *E. o. luteofusca* was based mainly on specimens collected by the German reptile dealer K. GUTSCHE in 1975 near the Central Anatolian town Ereğli. They are remarkably light coloured, yellow brownish, and unusually small headed. During a preliminary investigation of the morphological variation among Turkish pond turtles, it turned out that the populations from western, eastern, and northern Turkey look much more like that what was thought at that time to be "typical" representatives of *E. orbicularis*. Hence, it was concluded that *E. o. luteofusca* is a Central Anatolian endemic, encircled by populations of "dark coloured *E. orbicularis* sensu lato" (FRITZ 1989).

In fact, altogether only seven specimens from three localities in the southern part of the Anatolian plateau were attributed to *E. o. luteofusca* in that study (the type series comprises: MTKD 29137, SMNS 4615:1-2, 5474, 5493). Even turtles from localities from farther north and west in the high plateau proved to be more variable in colouration. There, in the same local populations, specimens were encountered, closely resembling *E. o. luteofusca*, occurring together with darker and heavily patterned turtles. The first interpretation was that these populations represent intergrades with one or more dark coloured subspecies which occur to the East, to the West, and to the North of the area of *luteofusca* (FRITZ 1989).

However, when the senior author assumed his position as herpetologist in the Staatliches Museum für Tierkunde Dresden in March 1996, he came across two pond turtles from Turkey (MTKD 11886-87, adult males), also collected by GUTSCHE in the same year as the type series (fig. 4). This suggests that they may come from the same locality as the types of *E. o. luteofusca*. The MTKD specimens are very similar to ones which were interpreted by FRITZ (1989) as morphological intermediates between *E. o. luteofusca* and "dark coloured pond turtles". Later the dark coloured parental taxon was more precisely identified as *E. o.* cf. *hellenica* in the western part of Asia Minor and *E. o. colchica* in the eastern (FRITZ 1993, 1994). However, if MTKD 11886-87 should really be from the same locality as the type series, the question arises whether *E. o. luteofusca* could not be much more variable as previously believed.

Unfortunately, it is not certain whether GUTSCHE collected MTKD 11886-87 indeed at the same locality as the *luteofusca* type series. When GUTSCHE donated both specimens in the mid 1970's to the Dresden museum, as locality information only "Turkey" was provided. However, GUTSCHE (pers. comm. 1988) collected pond turtles only at two localities in Turkey: on the Black Sea coast, and at Ereğli in the southern Anatolian plateau. Black Sea specimens represent a totally different

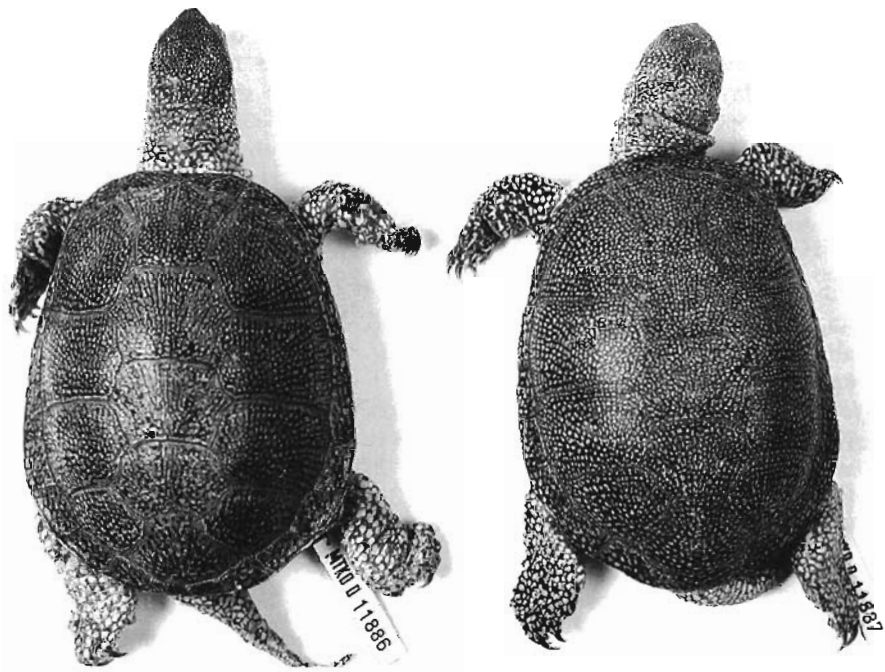


Fig. 4. The two dark coloured *Emys orbicularis* males, most probably collected at the type locality of *E. o. luteofusca* in Central Anatolia (collection of the Staatliches Museum für Tierkunde Dresden).

Die beiden dunkel gefärbten Männchen von *Emys orbicularis*, höchstwahrscheinlich an der Typuslokalität von *E. o. luteofusca* in Zentralanatolien gesammelt (Sammlung des Staatlichen Museums für Tierkunde Dresden).

phenotype of pond turtle, so that there are indeed compelling arguments for the origin of these two specimens as being Ereğli.

This point of view is supported by a photo shown to the senior author, taken by M. KASPAREK some years ago near Ereğli. The depicted specimen is quite similar to MTKD 11886-87. However, if such patterned specimens occur at the type locality together with light specimens of the characteristic *luteofusca* morph, a redefinition of the morphological and geographical concept of *E. o. luteofusca* would be necessary. A reasonable way could then be to include in *E. o. luteofusca* all populations formerly thought to be intermediate with dark subspecies. We have not done so. We restricted *luteofusca* only to the localities represented by solid black circles in figure 1 and did not include several populations from the surroundings of Akşehir and Kayseri because there are such dark specimens among the turtles from there that we are reluctant to overstretch the concept of *luteofusca*. Anyhow, it is obvious that additional investigations in these areas are overdue to determine the taxonomic allocation of these populations.

Even with the expanded concept of *E. o. luteofusca*, specimens of this taxon mainly have a pale shell colouration (fig. 3). As in several other taxa, there is a clear sexual dimorphism, males being in the mean distinctly darker than females, and having a reddish iris colouration instead of a yellow one.

It is important to note that there is an obvious variation in carapace length (fig. 2), resulting in a bimodal size class distribution in both sexes. As a general rule, specimens from habitats within a semidesert or dry steppe area (e.g. close to the great salt lake Tuz Gölü) tend to be smaller than specimens occurring in a moister area. The largest specimen examined by us is a female from the environs of Seydişehir, Vilayet Konya (AMNH 97652) with 17.6 cm shell length. However, among five pond turtles measured by CRUCITTI et al. (1990) from Karamik-batakliği,Vilayet Afyon, one reached 20.6 cm shell length, indicating that much bigger specimens occur.

Kayseri Group

Specimens examined: 10 males, 1 female.
Bünyan, 35 km ENE of Kayseri, Vilayet Kayseri: MTKD 39118, 1 male; Saysalli (Soisally), Vilayet Kayseri: NMW 14564:1-2, 14565:1-2, 4 males; lake near Karpuzatan, Vilayet Kayseri: NMW 19000:1, 1 male; Karpuzatan near Kayseri, Vilayet Kayseri: NMB 13046, 13222, 2 males, NMB 13363, 1 female; small river S of Kayseri, Vilayet Kayseri: ZMH-R 00303-04, 2 males.
Photo records: 1 male, 1 ad. sex ?.
Small creek, 51 km E of Kayseri, Vilayet Kayseri: 1 male (J.F. SCHMIDTLER, VI.1994); Sultan Swamps near Yeşilhisar, Vilayet Kayseri: 1 ad. (photo published in KASPAREK 1985).

The specimens from the surroundings of Kayseri are quite large, the 10 males ranging from 14.5 to 16.5 cm carapace length, the sole female has a shell length of about 18.2 cm (fig. 2). SCHWEIGER (1994) mentions from Bünyan specimens with an average carapace length of 13 cm for males and 18 cm for females (maximum: 24 cm) without giving his sample size. Our specimen from this locality, a male, measures 15.5 cm. All are relatively broad-headed.

Some of the turtles of this group are quite light coloured (*maculosa* phase) and resemble therefore the geographically adjacent *E. o. luteofusca*. This is probably

the reason why SCHWEIGER (1994) calls the population from Bünyan "*Emys orbicularis luteofusca* intergrades". However, in others the carapace has a black primary colour with more or less fine yellow spots. Such a specimen from the Sultan Swamps near Yeşilhisar (S Kayseri) is figured in KASPAREK (1985). Sometimes the yellow spots are so numerous that their colour predominates. In one big male from the lake at Karpuzatan (NMW 19000:1) the carapace is entirely black. The plastra of these turtles are usually predominately yellow (cf. fig. 3). A male from a little creek 51 km east of Kayseri, photographed by J.F. SCHMIDTLER, has a reddish iris. The heads are moderately sized, the mean head length being insignificantly different from *E. o. luteofusca* sensu lato (t-test, fig. 5).

The specimens of this locality group could either represent an own taxon or intermediates between *E. o. luteofusca* and *E. o. colchica*.

Emys orbicularis eiselti subspec. nov.

Specimens examined: 2 males, 2 females.
Holotype and terra typica: NMW 18551:1, adult male, marshy meadows along the street, 14 km NE of Fevzipaşa (about 450 m above sea level), Vilayet Gaziantep, leg. J. EISELT, 26.IV.1966.
Paratypes: NMW 18551:2, adult female, same data as holotype (photo in dorsal view of NMW 18551:1-2, published as fig. 9 in FRITZ 1989); ZDEU 40/1972:1,

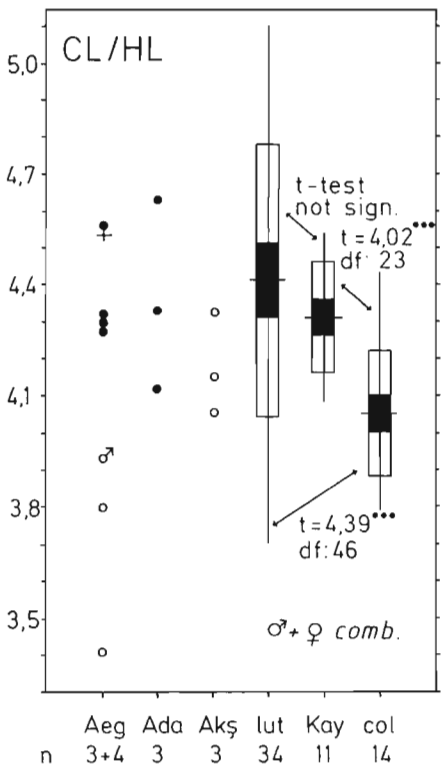


Fig. 5. Comparison of the ratio of carapace length (CL) to head length (HL) in the samples from Asia Minor. For the three larger samples the t-scores of the mean are given (df = degrees of freedom). In larger samples, the following scores are plotted: range (vertical line), mean (horizontal line), one standard deviation (white rectangle) and one standard error (black rectangle) above and below the mean (Dice Leraas diagram). In the Dice Leraas diagrams males and females are combined because in these samples no statistically significant differences were detected.

Vergleich des Verhältnisses von Carapaxlänge (CL) zu Kopflänge (HL) bei den Stichproben aus Kleinasien. Für die drei größeren Stichproben sind die t-Werte des Mittels angegeben (df = Freiheitsgrade). Bei größeren Stichproben sind folgende Daten graphisch dargestellt: Wertespanne (vertikale Linie), Mittel (horizontale Linie), eine Standardabweichung (weißes Rechteck) und ein Standardfehler (schwarzes Rechteck) über und unter dem Mittel (Dice-Leraas-Diagramm). In den Dice-Leraas-Diagrammen sind Männchen und Weibchen zusammengefaßt, da kein statistisch signifikanter Unterschied vorliegt.

adult male, and MTKD 40468 (ex ZDEU 40/1972:2), adult female, between Kömürler and Sakçagözu, Vilayet Gaziantep, leg. A. BUDAK 24.IV.1972.

Diagnosis: Small subspecies of the *orbicularis* subspecies group. Dark coloured, with nearly entirely black plastron and very dark throat. Differs from all other subspecies of *E. orbicularis* by the extremely small gular scutes and the short midseam between them (cf. fig. 6-7).

Description of holotype: Measurements: Carapace length 115.2 mm, maximum carapace width 90.5 mm at the seam between the seventh and eighth marginal pair. Maximum shell height 45.2 mm on the second vertebral scute. Plastron length 103.3 mm, length of midseam of gulars 11.5 mm, humerals 14.5 mm, pectorals 20.0 mm, abdominals 14.8 mm, femorals 14.8 mm, anals 24.7 mm. Head length (tip of the snout to skin fold in neck, neck maximally extended) 31.5 mm, head width 22.5 mm.
Colouration and pattern: Carapace ground colour black, with a few small yellow spots. Plastron entirely black. Head dorsally finely reticulated with black and brown, throat black with a few small yellow dots.

Derivatio nominis: The new subspecies is named in honour of Hofrat Dr. JOSEF EISELT, one of the outstanding herpetologists of the 20th century. He contributed much to the knowledge of the herpetofauna of Asia Minor.

Variation: Biometry: Measurements of the three paratypes are given in table 1. In figure 6 the relation of the midseam length of the gular scutes to the plastron length (index PL/GuL × 10) of *E. o. eiselti* is compared as Dice Leeras diagram

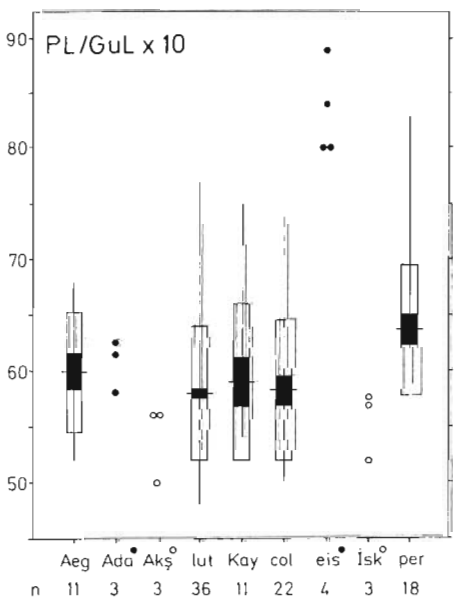


Fig. 6. Comparison of the indices PL/GuL × 10 (plastron length/midseam length between gulars × 10) in the samples from Asia Minor and of *E. o. persica* (= per).
Vergleich der Indizes PL/GuL × 10 (Plastronlänge/Intergularnahtlänge × 10) bei den Stichproben aus Kleinasien und bei *E. o. persica* (= per).

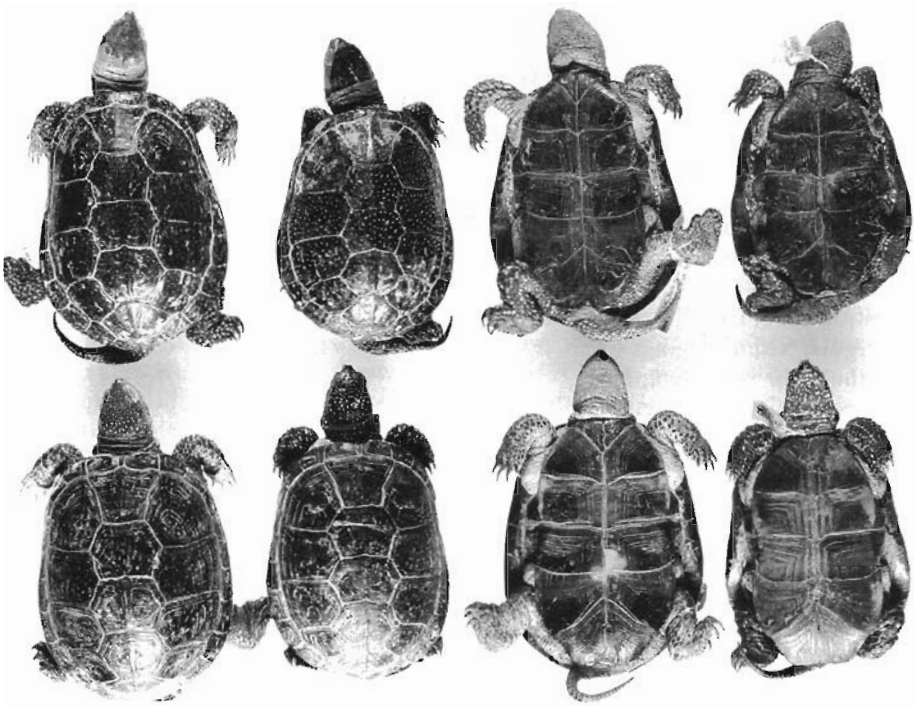


Fig. 7. Dorsal (left) and ventral view (right) of the type series of *Emys orbicularis eiselti*. From the left to the right, upper row (males): ZDEU 40/1972:1, NMW 18551:1 (holotype), lower row (females): MTKD 40468, NMW 18551:2.

Dorsal- (links) und Ventralansicht (rechts) der Typenserie von *Emys orbicularis eiselti*. Von links nach rechts, obere Reihe (Männchen): ZDEU 40/1972:1, NMW 18551:1 (Holotypus), untere Reihe (Weibchen): MTKD 40468, NMW 18551:2.

with the other pond turtle populations from Asia Minor. In addition to these populations, *E. o. persica* is plotted, the subspecies with the very smallest gulars, occurring in northern Iran and western Turkmenia. Despite the small sample size, it is obvious that *E. o. eiselti* has significantly smaller gulars and hence a shorter intergular seam than *E. o. persica*.

Colouration: The carapaces of the two males bear a few small yellow dots which are replaced by a few short, thin streaks in the females. The plastra of the males are entirely, of the females nearly entirely black (fig. 7). The soft parts of MTKD 40468 and ZDEU 40/1972:1 have a more grayish tinge than the other ones, most probably a result of the bleaching influence of light to the alcohol preserved specimen. The dorsal side of the heads of the males is extremely finely reticulated, with a black and brown vermiform pattern. The females show instead round yellow dots on a black or grayish black primary colour. The ground colour of the throats of all specimens is black or grayish black, respectively, on which some yellow spots occur (somewhat more in the females).The forelegs of the females have, besides a few yellow spots, only one thin yellow stripe which is broken up in the males.

Sex	NMW 18551:2 ♀	ZDEU 40/1972:1 ♂	MTKD 40468 ♀
Carapace length	121.8	128.8	131.2
Carapace width (maximum)	93.3	97.1	98.6
Location of maximum carapacial width	M 7/8	M 8	M 7/8
Shell height (maximum)	49.3	47.3	53.0
Location of maximum shell height	V 2/3	V 3	V 3
Plastron length	117.0	117.8	123.0
Intergular seam length	13.9	15.0	15.5
Interhumeral seam length	16.4	14.5	15.3
Interpectoral seam length	20.9	20.6	21.8
Interabdominal seam length	17.3	17.7	19.2
Interfemoral seam length	12.5	14.8	13.8
Interanal seam length	32.0	26.8	30.5
Head length	31.0	31.8	31.3
Head width	21.8	23.8	25.5

Tab. 1. Measurements of paratypes of *Emys orbicularis eiselti* (all in mm). Abbreviations: M 7/8 = maximum carapace width located at seam between seventh and eighth marginal pair, M 8 = located upon eighth marginal pair. V 2/3 = maximum shell height located at seam between second and third vertebral, V 3 = on third vertebral.

Maße der Paratypen von *Emys orbicularis eiselti* (alle in mm). Abkürzungen: M 7/8 = die maximale Carapaxbreite liegt auf der Naht zwischen dem siebten und achten Marginaliapaar, M 8 = auf dem achten Marginaliapaar. V 2/3 = die maximale Panzerhöhe liegt auf der Naht zwischen dem zweiten und dritten Vertebrale, V 3 = auf dem dritten Vertebrale.

Distribution: Restricted to the northern part of the Amik-Maraş rift valley in Turkey. More southerly populations are different by their lighter colouration and longer intergular seam (see İskenderun group). *E. o. eiselti* is partially identical with *E. orbicularis* subsp. "D" of FRITZ (1993), see further comments under İskenderun group.

İskenderun Group

Specimens examined: 1 male, 2 females.
Tarsus, Vilayet Mersin: MZUF 29770, 1 male (fig. 11a, b in FRITZ 1993); Amik plain, Vilayet Antakya: ZDEU 68/1974, 1 subad. female; creek between Ain Krayem and Ain Taqa, catchment system of central Orontes River, Syria: MTKD 39470 (ex ZFMK 30536), 1 subad. female (fig. 6 in KINZELBACH 1988: ventral view).
Photo records: 1 male, 1 female.
Karataş, Vilayet Adana: 1 female (H. WEISSINGER, V/VI.1989, fig. 11c, d in FRITZ 1993); Çukurova delta, Vilayet Adana: 1 male (H. NIJMEIJER, 1990).

This locality group is another major contrast to FRITZ (1993). The specimens which were referred to *E. orbicularis* subspecies "E" by FRITZ (1993) are here

lumped together with the southern representatives of subspecies "D" from the catchment system of the Orontes River (or Asi Nehri, southeastern Turkish/ northwestern Syrian Levantine coast). They are best understood as intermediates between *E. o. eiselti* and *E. o.* cf. *hellenica* from the Aegean coast. An intergradation between *E. o.* cf. *hellenica* and *E. o. eiselti* in the areas neighbouring the Gulf of İskenderun would be easily explained as the result of the repeated Pleistocene low sea level connections between the Göksu delta near Silifke, the Çukurova delta, and the Orontes mouth. During these phases an intensive exchange of freshwater biota of the involved river systems occurred (e.g. Kosswig 1965, Kinzelbach 1987).

In colouration, the specimens from the Çukurova delta resemble *E. o.* cf. *hellenica* more than the two turtles from the Orontes and Antakya area. The latter are very dark in general appearance, the reason why Fritz (1993) took the sole specimen available to him (now MTKD 39470) for a representative of his subspecies "D". However, this turtle, as well as the one from the Amik plain, has distinctly longer gulars compared with *E. o. eiselti* (fig. 6), and in ZDEU 68/1974 the shell colouration is not so dark as in *E. o. eiselti*. Nevertheless, in overall appearance ZDEU 68/1974 and MTKD 39470 are similar to *E. o. eiselti*. The most probable explanation for the characters not "fitting" this subspecies is that the Orontes population has some influence of the more western populations of *E. orbicularis*. They are lighter coloured and have longer gulars than *E. o. eiselti*.

On the other hand, the specimens from the Çukurova delta, generally similar to *E. o.* cf. *hellenica* by their yellow throat and overall quite light colouration, have some characters similar to *E. o. eiselti*, namely a dark plastron, sometimes with a mottled pattern (MZUF 29770) similar to representatives of the *orbicularis* group, and the reddish iris of the male photographed by H. Nijmeijer in 1990. Interestingly, a male with a heavily eroded shell and quite yellow soft parts from the Göksu mouth (colour slide by S. Bogaerts, 11.IV.1991), about 150 km to the west of the Çukurova delta, has a yellowish iris. A hatchling from the Göksu delta, photographed by S. Bogaerts on 23rd May 1991, shows large yellow crescents on the marginals, a character well known from Southeast European *E. o. hellenica* (Fritz 1992). Therefore, this population belongs perhaps already to *E. o.* cf. *hellenica*. The same could be true for the two adults photographed by J. Maier in May 1993 among hundreds of *Mauremys rivulata* in the moat of Anamur castle. That the specimens at this touristic attraction point belong most probably to a natural population is supported by the observation of a subadult specimen some distance to Anamur by J. van der Winden on 19.V.1991. The carapace length of the Göksu delta male is 125.5 mm, of a female of the same locality measures 138.1 mm (van der Winden & Bogaerts 1992: 91).

Remarkably, *E. orbicularis* was mentioned for the Litani drainage system in Lebanon by Festa (1894: 18, 29), a record never confirmed. If Festa's identification is correct, it would be interesting to know more of this population. It should be very close to the European pond turtles found in the Orontes. A correct determination seems probable because Festa explicitely mentions "*Emys europea* ed *Emys caspica*", which implies that he was able to distinguish between both species.

Emys orbicularis colchica sensu lato

Specimens examined: 18 males, 6 females, 2 juv.
5 km SE of Samsun, Vilayet Samsun: RMNH 24108, 1 female (fig. 4 in Fritz 1989); environs of Bafra (35.56'E, 41.32'N), Vilayet Samsun: MHNG 2006.54-55,

2006.58, 1 male, 1 female, 1 juv.; Kızılırmak mouth,Vilayet Samsun: HLMD without catalogue numbers, 8 males, 2 females; Terme, Vilayet Samsun: 1 male (studied alive, colour slides deposited in the MTKD collection, fig. 10 in Fritz 1993); environs of Fatsa, 64 km W Ordu, Vilayet Ordu: NMW 19000:2, 1 male; central Black Sea coast of Turkey: MTKD 32537, 1 female; Batumi, Georgia: ZIN 9110:a (holotype of *E. o. colchica*), ZIN 9110:b, 2 males; Čochatauri, Georgia (locality in Nikolsky 1915 given as "Gudaut, prov. Kutais"): ZIN 10829, 1 male (badly preserved); Gagra, Georgia: ZIN 11302, head and foreleg of male; Suchumi, Georgia: SMF 51896, 1 juv. (shell); between Sarıkamış and Karakurt (42.36'E, 40.15'N), Vilayet Kars: MHNG 2006.57, 1 male; southeastern Turkey: NMW 19000:3, 1 male; Bismil, Vilayet Diyarbakır: BMNH 1888.4.24.4-5, 1 male, 1 female.

Photo record: 1 male.

Kızılırmak mouth,Vilayet Samsun: 1 male (N. Noordhof, 1992).

E. o. colchica Fritz, 1994 was founded on 15 specimens from eastern Turkey and the adjacent part of the western Caucasus. It is morphologically very close to *E. o. orbicularis* from which it differs mainly by the smaller size and somewhat lighter colouration. However, a few of the original specimens were incomplete or juveniles, others thought to be intermediates with *E. o. luteofusca*. Hence, this subspecies was based on a quite small sample. An additional series of eight males and two females, collected by R. Kinzelbach near the mouth of the Kızılırmak River on the eastern Turkish Black Sea coast (now in the collection of the Hessisches Landesmuseum Darmstadt) and an additional female from the collection of the Staatliches Museum für Tierkunde in Dresden are used here to present some new details about this taxon.

Compared with *E. o. luteofusca* and the Kayseri turtles, *E. o. colchica* possesses a distinctly larger head, the differences between the means are statistically significant at the 0.1 % level (fig. 5), and is clearly darker coloured. The shell of *E. o. colchica* is generally dark, especially the carapace (fig. 3, 8). Only one female (RMNH 24108) exhibits a colouration of the *maculosa* type, another one (MHNG 2006.55) a somewhat darker colouration, as defined as intermediate to the so-called *orbicularis* colouration. It is difficult to decide whether the light shells of these two females are indeed a result of an genetic influence of *E. o. luteofusca*, as assumed in Fritz (1989, 1993, 1994). This seems still reasonable because both were collected near the mouth of the Kızılırmak, a river connecting Central Anatolia, where *E. o. luteofusca* occurs, with the Black Sea coast over the barrier of the Pontic mountain chain. By this way another element of the Central Anatolian fauna, *Mauremys c. caspica*, reaches the Black Sea coast (Fritz & Wischuf 1997). However, since the papers by Fritz (1989, 1993, 1994) were written, it turned out that certain subspecies of *E. orbicularis* exhibit a colour polymorphism (e.g. Fritz 1995, Fritz et al. 1996), especially in carapace colouration. Hence, it may be speculated as an alternative hypothesis that the light coloured female RMNH 24108 is a pure *E. o. colchica* and represents simply a lighter colour variant.

Despite the new data, *E. o. colchica* remains a highly problematic taxon. For example, Lenk et al. (1998) found that the single specimen studied genetically possesses the same mitochondrial haplotype as the eastern variant of *E. o. orbicularis*. Most reasonably, *E. o. colchica* is best understood as a wastebasket for all populations from eastern Turkey and the Colchis area which are too small and too light coloured to be included in the nominate subspecies. However, it could

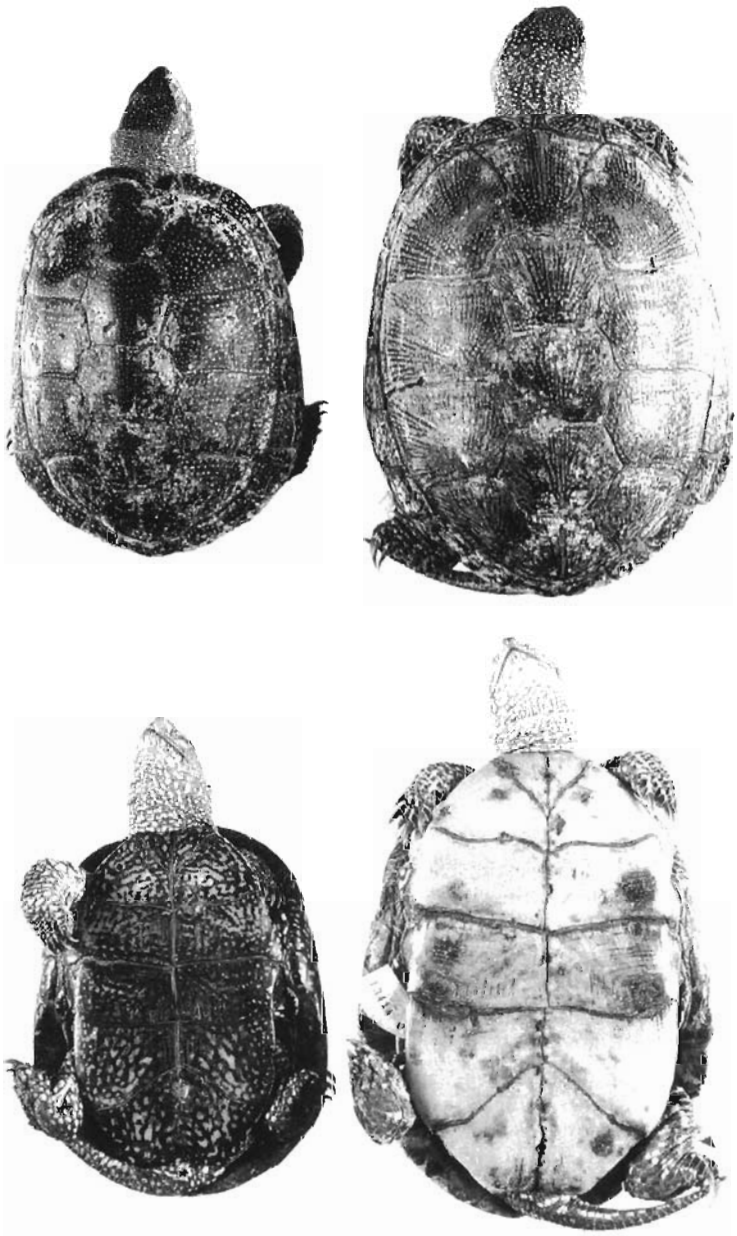


Fig. 8. Dorsal (above) and ventral view (below) of *Emys orbicularis colchica* sensu lato. Left: dark coloured male (MHNG 2006.54), right: light coloured female (MHNG 2006.55), both from the environs of Bafra, Vilayet Samsun.

Dorsal- (oben) und Ventralansicht (unten) von *Emys orbicularis colchica* sensu lato. Links: dunkel gefärbtes Männchen (MHNG 2006.54), rechts: hell gefärbtes Weibchen (MHNG 2006.55), beide aus der Umgebung von Bafra, Vilayet Samsun.

easily be that several evolutionary units are lumped together here, perhaps including even some populations of *E. o. orbicularis* proper. This speculation is corroborated by the manifold physiogeographic barriers, widely separating, for example, the population near Bismil from the Colchis population. More investigations of this taxon are needed in this relatively inaccessible area. Hence, we suggest for all populations attributed to *E. o. colchica* in future using the epithet "sensu lato" to express the provisional character of this taxon.

Of special interest in this context is whether the old and often overlooked records of *E. orbicularis* for the Zanga River near Erevan (Armenia) and Ordubat (Nakhichevan, LYAISTER 1912, see CHERNOV 1939), both in the catchment basin of the Araks River, belong to *E. o. colchica* sensu lato or to *E. o. iberica*.

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