Bats (Mammalia: Chiroptera) of the Eastern Mediterranean. Part 1. Review of distribution and taxonomy of bats in Turkey

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Abstract. A complete list of all bat records up to now available from Turkey was compiled based on both the literary references and the original data. It is supplemented with distribution maps and brief summary of distributional and taxonomic status of each species. In total it covers 859 locality records of 31 chiropteran species: viz. Roussettus aegyptiacus (14 records), Rhinolophus ferrumequinum (104), R. hipposideros (65), R. euryale (47), R. mehelyi (24), R. blasii (29), Myotis mystacinus (37), M. kuhlii (82), M. lechriotis (5), M. nattereri (59), M. emarginatus (19), M. mystacinus (28), M. brandti (2), M. dasibartusi (5), M. rapacissimus (22), Vespertilio murinus (3), Pigrescus severtzovii (40), E. isanica (38), Hesperugo savii (38), Pipistrellus pipistrellus (72), Pipistrellus nathusii (6), P. kuhlii (15), Nyctalus noctula (6), Myotis helveticus (6), N. kavonou (1), Otomysrex kempfichi (5), Barbastella barbastellus s. l. (8), Plecotus auritus (17), P. austriacus (11), Miniopterus schreibersi (58), and Trachops teclidus (26). Several other species, such as Taphozous melba, Atelea tridens, Myotis schreiberi, and Epispris helveticus, were recorded in closest neighbourhood of the Turkish territory and are looked upon as hot candidates to the Turkish fauna. In some species, a taxonomic inhomogeneity (expressed e.g. with appearance of different subspecies) over the Turkish territory was demonstrated. Based on structural differences in bat fauna, the territory of Turkey was subdivided into three major faunal regions: 1) humid coastal region (northern, western and southwestern coast), 2) arid region of Central Anatolia, Armenian Highlands and Kurdistan, and 3) southern region of Cilician lowland, Turan and Mesopotamia (that represents a borderline between a fauna of the West-Paleartic arboreal type and that of the Saharo-Sindian element).

Zoogeography, distribution, taxonomy Chiroptera, Turkey, the Balkans, Middle East Paleartic region

INTRODUCTION

Biogeography of the Mediterranean region is traditionally understood to be a very attractive topics not only because of actual complexity and greatly variegated specificities of different areas of that region but also as a refugial zone for whole biota of the Western Paleartic, and, consequently, as a key region for understanding to history and evolutionary paths governing the past development of contemporary communities of the Central Europe.

The territory of Turkey (Figs 1, 2) can be supposed to play a top role in these connections. With its square of 779 452 km², it covers as well the southern part of the Balkans, humid Pontic region and Armenian Highlands as the severe rocky-desert steppes in the Central Anatolia, the largest shoreline among the Mediterranean countries and correspondingly extensive coastal regions. It interconnects the southern offshoots of the Paleartic arboreal in the Balkans with that in Transcaucasia as well as with the steppe and deserts of the Mesopotamian lowlands. It is a region in which the earliest agricultural civilisation of the West arose and which was exposed during whole the Holocene
to an impact of human civilisation. Apparently, all these factors have had to reflect also in biota of this country what makes it one of the most important region also from the zoogeographic point of view. Nevertheless, in contrast to the Levant region of the Eastern Mediterranean for which mammal fauna several extensive summaries are available (Harrison 1964, Atallah 1977, Harrison & Bates 1991, Qumsiyeh 1996), only little is available for the territory of Turkey. The present paper is hence intended to provide a basic summary of the current state of knowledge on just one group of mammals of this country. It results of an international research project conducted by the Charles University Prague (Czech Republic) in cooperation with the Slovenian Natural History Museum Ljubljana (Slovenia) and the Trabzon University Edime (Turkey).

Introductory exposition on chiropteran biogeography of the Eastern Mediterranean, summarizing also the data obtained from the other countries of that region and providing a contextual framework to the present paper was already presented in our earlier contribution (Horváth et al. 1998).

Bat research in Turkey
Bat fauna of recent territory of the Republic of Turkey (Figs 1, 2) remained for long only poorly known. Until 1950's, all information was limited onto several occassional records mentioned in frame of general surveys or dealing with other than bat and/or Turkish topics (e. g., Danford & Alston 1877, 1880, Dobson 1878, Doria 1887, Saturnin 1913, Wettstein 1926). The popularizing article by Şadoglu (1933) represents perhaps the first Turkish paper that concerns, though in general, just bats. At the beginning of sixties, Metehat Çağlar (Istanbul) and Hermann Kahmann (Munich) started a regular field study of Turkish bats which resulted in a series of papers (Çağlar 1961a, b, c, Kahmann 1962, Kahmann & Çağlar 1960) later extended in the complete lists of bat records to date available from Turkey (Çağlar 1965, 1968, 1969). In 60's and 70's, an ornithologist Hans Kummerlohe (Bohn) undertook several research trips in Turkey at which he also collected an extensive material of mammals including bats. His records were published either by him or in cooperation with Ernst von Lehmann (Kummerlohe 1975, Lehmann 1966, 1969). Later, Kummerlohe (1975) compiled a very important comprehensive monograph on Turkish mammals that listed also all references and previous research efforts concerning that topic. Since the beginning of sixties, knowledge on Turkish mammals has continuously been supplemented with results of research trips undertaken by German and Austrian zoologists Heinz Felten, Gerhard Storch, Dieter Kock (Frankfurt a. M.), Friederike Spitzenberger and Hans M. Steiner (Viena), some of which spent even several years in Turkey. Several of the papers resulting of their study were focused just to distribution and systematics of bats (Felten 1971, Felten et al. 1977, Kock et al. 1972, Spitzenberger 1994, 1996, Steiner & Gaistler 1994). Since beginning of 80's, the knowledge on Turkish bats has become essentially contributed by a new generation of Turkish zoologists, particularly by Irfan Alpayrak (Ankara). His papers survey primarily a number of new records he obtained even from the regions which bat fauna was practically unknown (Alpayrak 1985, 1987, 1988, 1990, 1990a, 1991, 1991a, 1993, 1993a). The above mentioned list is to be supplemented with the records obtained during short term research trips by several other zoologists (Bülow 1997, Corbet & Morris 1967, Crucitti 1988, Helversen 1989, Kinzelbach 1986, Nadachowski et al. 1990, Osborn 1963, Srinati 1959, van Winden 1988) as well as with data dispersed in the papers dealing with bat parasites (Hürka 1972, Kock 1974, 1989, Peterson et al. 1976, Peus 1976, 1978, a, b, Theodor 1987).

Although the number of publications devoted to Turkish bats may seem large, in contrast to neighbouring countries, there is only one chiropteran taxon described from today Turkish territory, viz. Episcias anatolica Felten, 1971. This is surprisingly few even in comparison with other mammalian orders (cf. Kummerlohe 1975), viz. Insectivora – 9 descriptions (of which 6 names are in use even nowadays), Rodentia – 54 (36), Carnivora – 7 (5), Artiodactyla – 10 (4).
As evident of the above survey, the number of bat records obtained from the recent territory of Turkey grows large which calls for a complete survey of all the available records. The previous attempts in that direction are either outdated viz. Çağlar (1965, or 1968 and 1969); Kurnertoeve (1975), or apparently incomplete – Dogramaci (1989) mentioned 13 bat species only. The summaries provided by Albayrak (1990, 1993) concern unfortunately his own records only. Moreover, it is to be taken in account that in addition to the records yet published, there is a large number of unpublished occasional records including the museum specimens collected by various visitors in frame of the trips focused to other than bat topics.

Fig. 1. A general map of Turkey, main features mentioned in text; dashed area denote territory up 1500 m a.s.l.

Fig. 2. A general map of Turkey, main historical regions as understood in this paper.
The present paper is intended to survey all the available records both published and unpublished including the records dispersed in various collections, kindly provided by their curators, and, in particular, the yet unrecorded records obtained during our own research trips in Turkey undertaken in the years 1990–1998. Most of them were undertaken in frame of the project "Evolutionary relations between mammals of Central Europe and those of the Mediterranean" (GACR 206/93/0531) in a joint cooperation with Slovene National History Museum Ljubljana and Department of Biology, Thracian University Edirne.

Locality names were prefixed with respect to allow an easy later confirmation according to a map atlas Turkey, Euro-VisaAtlas 1 800 000 Berlin-Gutersloh-München-Stuttgart RV Reise- und Verkehrverlag GmbH, 95 pp., 1997.

The list of records (arranged in alphabetical, and chronological order respectively) include for each item the following information: the name of the district (province) (in spaced types), the name of the locality (in brackets), number of the locality from the map, in tables those not indicated in a map, and/or description of record site, date, number of recorded animals with a sex indication (m = male, f = female, s = sex undefined), age (juvenile, adult, a = adult), and physiological condition (G = pregnant, L = lactation), and, in some instances, a collection of museum material deposition (CUP = Department of Zoology, Charles University, Prague, Czech Republic, NMP = National Museum Prague, Czech Republic, NMW = Natural History Museum Vienna, Austria, PMSL = Slovene Natural History Museum, Ljubljana, Slovenia, SMF = Senckenberg Museum Frankfurt, Germany, SNMB = Slovak National Museum, Bratislava, Slovakia, TUE = Thracian University Edirne, Turkey, ZIN = Zoological Institute of Russian Academy of Sciences, St. Petersburg, Russia).

The data adopted from literature and/or museum collections include a reference to an original author. For technical reasons, some of the letters used in Turkish alphabet were printed without the specific accents, thus, in the following text, g is uses instead of ğ, as well as ş instead ş.

For purpose of biogeographic comparisons in frame of the present paper, the territory of Turkey was subdivided into six main units (Fig. 5, Tab 1) dealt with respect to the hydrogeological subdivision of the Middle East by Zohary (1973): (1) Northern forests. Region of eurasion and sub-eurasion evergreen deciduous and mixed forest (1a Thrace, 1b Western Pontus, 1c Eastern Pontus), (2) Mediterranean woodland Region of Mediterranean woodland climate, incl. subalpine forests of Cedrus libani (2a Aegean coast, incl. Dardanelles, Lydda and Cairo, 2b Western

LIST OF SPECIES

Rousettus aegyptiacus (Geoffroy, 1810)


DISTRIBUTIONAL STATUS (Fig. 4) In the territory of Turkey, R. aegyptiacus reaches the northern margin of its World distribution range. The records come from the South-Anatolian coast and from Hatay. The Turkish population (similarly like that in Cyprus) is to be looked upon as quite isolated as the distribution range is, based on the present knowledge, apparently discontinuous over the East-Mediterranean region. Namely, this species has not been reported either from the Syrian part of Orontes valley neighbouring the Turkish range, and, surprisingly, from Syria at all (Harrison &

Fig. 4. Records of Rousettus aegyptiacus in Turkey. Squares denote the osteological finds, asterisks the records of nursery colonies and circles the all other records.
This fact is especially noteworthy because this species is known common in Jordan and Israel, where (e.g. in the Jordan River valley) it was even considered a serious agricultural pest. The discontinuity of distributional data in the Levant may result of a lack of field data, of course, and of generally poor knowledge on bat fauna of Syria (cf. Benda 1996). Nevertheless, against expectancy this species was not recorded even during our recent expeditions in Syria. The biogeographic interpretation of the population of *Roussettus aegyptiacus* from the Northern Levant remains, hence, an open question.

**Taxonomic status**

Eisenhart (1959) who analyzed the material from all sides of the distribution range (including specimens from Turkey) arranged the Turkish sample under the nomenclature subspecies *R. aegyptiacus* (Geoffroy, 1810) (terra typica: Giza, Egypt). In general, the western part of the species range, north of Saharan, is colonized by two forms which may be looked upon as separate subspecies (Harrison & Bates 1991, Hayman & Hill 1971, Nader 1975), viz. *R. a. aegyptiacus* (Turkey, the Levant, Cyprus, and Egypt to the Middle Arabia) and *R. a. arabicus* Anderson et de Winton, 1902 (t. aden, Yemen) (Southern Arabia to Pakistan).

**Rhinolophus ferrumequinum** (Schreber, 1774)

Recent: Original data: Burdur at Buzak [1], Susuz Han, small cave near ruins, 25 March 1982. If (leg. Zulkal)


Fig. 5 Records of Rhi coldophus ferrumequinum in Turkey. For symbol explanations see Fig. 4.
DISTRIBUTIONAL STATUS (Fig. 5). This species occurs in all regions of Turkey and belongs here among the most common bat species (Tab. 1). Similarly as in the northern part of its distribution range (Horacek 1984) even in Turkey this species tend to occupy synanthropic habitats (cf. the record No. 12) in addition to caves which yielded a great majority of its records. Hibernating colonies in caves are formed at least from the beginning of November to the end of March. As in other species, continuous data on course of hibernation in Turkey still absent, of course.

TAXONOMIC STATUS. Turkish population of this species was first taxonomically evaluated by Kumerlovice (1975) who expected a nominotypic subspecies R. ferrumequinum ferrumequinum (Schreiber, 1774) (terra typica: France) in Thrace while for the Eastern Anatolia he expected the form R. f. iran. Cheesman, 1921 (t. t.: Shiraz, Iran). This decision followed a concept proposed by Aellen (1959) but, unfortunately, no one of these authors keyed the forms by metrical and/or morphological characters except for an index LCA/LAT. Fellen et al. (1977) suggested that whole territory of Turkey (including the Eastern Anatolia) as well as the Levant is colonized by a nominotypic form while this does not concern of Afghanistan and Iran that, according to the Aellen's (1959) character, belong to R. f. iran. Fellen et al. (1977) pointed out also a specific situation with the samples from (FYR) Macedonia, the Northern Greece and Sicily for which they proposed the name R. f. martini Petrov, 1941 (t. t.: Trinovnicevo, Macedonia) and discussed a possible synonymy of R. f. iran and R. f. proximus Andersen, 1905 (t. t.: Gilgit, Kashmir). The latter question has also been discussed by Strelkov et al. (1978) who show that the characters discriminating both the forms as suggested by previous authors largely are not valid for the Turkmen specimens which moreover are generally smaller than those from Iran and Afghanistan. DeBlase (1980) reports R. f. iran also from the Eastern Turkey and Nader & Kock (1983) from Iraq including the higher altitudes of that country. Koopman (1994) considers the form R. f. iran a younger synonym of R. f. proximus which range he states as "Southwestern Asia east to Kashmir".

Variation in the South Eastern Europe was investigated in details by Kryštufek (1993) who described here a cline trend in metrical characters for which he doubts separate status of R. f. martini that is thus considered to be synonymous with the nominotypic subspecies. Before cline variation in size within the Western Palaeartic range has also been demonstrated by DePaz (1995) who discusses it from the ecological point of view without suggesting any taxonomical inferences. Analyzing the sample from the Northeastern Turkey with aid of the Aellen's index, Steiner & Gaissler (1994) found it to belong to R. f. ferrumequinum. The same conclusions can be preliminary drawn also based on our own material most of which come just from the Northeastern Turkey (LCA/LAT 0.63-0.84, X=0.703, n=12).

In conclusion, the data mentioned above indicate that there may be a slight cline increase in size from the west to the east over territory of Turkey but to which degree it is combined with shifts in other characters and/or with variation of a categorial type, it remains a task of further study.

Rhinolophus hipposideros (Bechstein, 1800)

Fig. 6 Records of *Rhinolophus hipposideros* in Turkey. For symbol explanations see Fig. 4.

DISTINGUISHABLE STATUS (Fig. 6). This species belongs among those which records in Turkey are quite frequent. Although found in all biogeographic regions (except for the Upper Mesopotamia), it seems rare in the Central Anatolian plateau (Tab. 1).

TAXONOMIC STATUS. Aellen (1959) suggests that the region of the Eastern Caucasus Mts. and the Northwestern Iran (and hence also the Eastern Turkey) is colonized by the monotypic subspecies inhabiting also most of the European range, i.e. R. hippocastanum hippocastanum (Bechstein, 1800) (taxa type: France), while the Eastern part of the range, Turkmenistan and Afghanistan is colonized with a different form, R. h. midas Anderesen, 1905 (type: Jask, Persian Gulf), Behmann (1955), without quoting details, reports from Adana (Southern Turkey) R. h. minimus Heuglin, 1861 (type: Kerk, Eratma). Saint-Girons & Cauber (1956) demonstrated a close in size over Europe, from the west to the east onwards, while the populations from the Southeast Europe and the Mediterranean they consider to separate subspecies, R. h. minimus. Correspondingly, Hayman & Hill (1971) consider that the Mediterranean populations and populations of the Eastern Africa from Ethiopia to Egypt) differ from those of the continental Europe, and except for Morocco inhabited by a subspecies R. h. escalarum Anderesen, 1918 (type: Mogador, Morocco), they arranged them under the form R. h. minimus. The taxon was renounced in details by Felten et al. (1977), who subdivided the Mediterranean material in four groups based on morphology of infraorbital region, position of minute pramolars and size. The geographic ranges of these groups coalesced with the above mentioned subspecies were as follows: R. h. hippuinosus continental Europe from Portugal to Greece and Israel, R. h. minimus Ethiopia (Eritrea, i.e. terra typica) and Crete. R. h. midas the northeastern Anatolia, Afghanistan, R. h. escalarum the Northwestern Africa, Malta, Sicily, Pantelleria and the Western Anatolia (in the last area perhaps an undescribed form, eventually). Though such a result may look obscure from the zoogeographic point of view, it undoubtedly demonstrates that just in Turkey the situation with the species in question is indeed a very complicated.

Corbet (1978) simplifies the view by accepting two subspecies only, viz. R. h. midas (from Iraq to Kashmir) and R. h. hippocastanum (remaining part of the Palearctic range, including Turkey). Deblase (1980) synonymizes his R. h. hippocastanum Deblase, 1975 (type: Ers, Iran) with R. h. midas, extends the range of R. h. midas to the Eastern Turkey although he tentatively considers there also R. h. hippocastanum. Quinsey (1985) reports for Samsa R. h. minimus similarly as do Harrison & Bates (1954) for whole the Western Arabia (except for Syria), and in contrast to Iraq for which they report R. h. midas. Koopman (1994) recognizes 7 subspecies, judging of his brief characteristics of ranges, he may expect R. h. minimus for Turkey. Steiner & Gaisler (1994) identified (based on criteria by Felten et al. 1977) their sample from the province of Rize as R. h. midas and tentatively excluded all remaining three subspecies mentioned by Felten et al. (1977), including R. h. hippocastanum.

Already the above mentioned survey illustrates well how complicated the systematics of Rhinolophus hippocastanum in Turkey actually may be. In cannot be excluded that just here we meet at
least one or two zones of step-like shifts in phenotypic variation, i.e. the boundaries delineating taxonomically separated populations that can be recognized as subspecies, eventually. In these connections, the results of karyological studies are particularly worth of mentioning (Zima et al. 1992, Horňáček & Zima 1996). While 2n=56 karyotype was found in Europe, the Caucasus Mts. and in the Balkans (Greece and Bulgaria), in Jordan (Qumsiyeh et al. 1986), Asia Minor (the records Nos 7 and 11, cf. Horňáček & Zima 1996), in the Central Iran and Syria (own unpublished results) 2n=58, and in Kirghizia 2n=62 (Zima et al. 1991; the Kirghiz form probably represents a separate species, cf. Horňáček & Zima 1996). The taxonomic meaning of these differences as well as their correspondence with variation pattern in other characters are just one of the topics that are to be carefully reexamined to achieve a real comprehension to systematics of R. hippodoros in Turkey.

**Rhinolophus euryale** Blasius, 1853

**RECORDS**

1. **Original data.** Kirklatelir Iğneada, Longoz, Beyazgan magarası cave [1], 22 June 1994, net 3m, 21, CUP. – Iğneada, Longoz, Memer magarası cave [2], 9 May 1992, obs. several hundred ind. (leg Renter, Ardalan & Sadra). – Snuphare, Divnarı magarası cave [3], 16 Oct. 1993, net 1m, CUP. – small cave in a quarry n. Safa yayasi spring (3 km NW Sergen) [4], 1 Sept. 1996, net 3m, ima, 1 fs, coll 2m, 1 fs, NMP (spec. Nos 47931, 47953) – **Eräbön Maçka** [5], a cave 6 km SW, 26 Oct. 1993, traces of a colony, 1 part skeleton, CUP.

DISTRIBUTIONAL STATUS (Fig. 7). There is a relatively large number of records (Tab. 1) which supposedly provides a realistic picture on distribution of this species. The record suggests there may be a considerable hiatus, comprising over 500 km, between the Thracean and West-Anatolian populations and that of the Eastern Anatolia. In contrast to the hiatus in the Central Anatolia, the distribution seems continuous both in the other directions, i.e. with that in the Balkans in the western part (Mitchell-Jones et al., in press) and that in the Zagros Mts. and Tauruscaucasia in the eastern part, respectively (DeBaise 1980, Vereczi\'g 1959).

TAXONOMIC STATUS. Most of the recent authors discussing geographic variation in R. euryale (DeBaise 1980, Corbet 1978, Kooman 1994) consider it to be a monotypic taxon, i.e. R. euryale euryale. Blasius, 1853 (terra typica: Milan, Italy) Hayman & Hill (1971) and Harrison & Bates (1991) arranged the Arabian sample provisionally under the name R. e. judaicus Andersen et Matschke, 1904 (t. i. Jerusalem, Palestine) although they expect that "further research may show it to be a synonym of R. e. euryale". R. e. judaicus is reported from Iraq by Nizami (1976). Felten et al. (1977) arranged provisionally all the European and Persian samples under R. e. euryale, those from the Eastern Mediterranean and the Levant to R. e. judaicus, and those from the North-western Africa to R. e. barbara. Andersen et Matschke, 1904 (t. i. Tangiers, Morocco). DeBaise (1980) expects that the whole of the region of the Middle East is colonized by R. e. euryale while R. e. judaicus and R. e. nordmanni Satunin, 1911 (t. i. Pavlosk, Georgia) are not to be considered as valid subspecies. Analyzing the materials from Erzurum and Trabzon provinces of Turkey, Steiner & Gaisal (1994) resonate to identify it as to a subspecific status.

In summary, the subspecific variation in R. euryale is still only poorly known and it remains a task of future research. In respect to a specific distributional situation (see above), it is just the Turkish material that for such a study can be of a key role.

Rhinolophus mehelyi Matschke, 1901

Fig 8 Records of Rhinolophus mehelyi in Turkey. For symbol explanations see Fig 4.


DISTRIBUTIONAL STATUS. (Fig 8) The number of records (24 localities) is not sufficient for a detailed distributional analyses. The records are dispersed almost regularly over the whole country.

TAXONOMIC STATUS. Most authors consider this species monotypic, i.e. as R mehelyi mehelyi Matschie, 1901 (terra typica Bucharest, Romania). In respect to materials from the Middle East this holds true of DeBlase (1972, 1800), Felten et al (1977), Harrison & Bates (1991), Koopman (1994), Steiner & Gusler (1994). Some other authors (Covert 1978, Hayman & Hill 1971) suggest the populations from Morocco and/or whole the North-Western Africa to be considered as a separate West-Mediterranean subspecies R m. carpentanus Cabrera, 1904 (t. Madrid, Spain).

Rhinolophus blasii Peters, 1866


Rhinolophus blasin / curvicae


DISTRIBUTIONAL STATUS (Fig 9) R. blasin has been recorded only from the western and southern part of Turkey. Considering, that this species is distributed in Transcaucasia as well as in almost whole territory of Iran and Afghanistan (Bobrensky et al. 1965, DeBlase 1980, Feltén et al. 1977), it can be assumed that possible it may come in account in the Eastern Anatolia, too.

TAXONOMIC STATUS: Many authors (Aclan 1959, Corbet 1978, DeBlase 1980, Harrison & Bates 1991, Hayman & Hill 1971, Koepman 1994, etc.) consider this species monotypic in whole range of its distribution. e.g. as R. blasin blasin Peters, 1866 (terra typica: Italy) Feltén et al. (1977) found a considerable difference between the European and West-Anatolian samples (belonging to R. blasin), and a bigger form from Iran and Afghanistan he consequently described as R. blasin mevoroebi Feltén, 1977 (1 t Pashtunkan, Afghanistan). The later authors (see above) however, consider

Fig. 9. Records of Rhinolophus blasin in Turkey. For symbol explanations see Fig. 4, open symbols denote records of unidentified medium-sized bats of genus Rhinolophus (see text).
Myotis myotis (Borkhousen, 1797)

Record: Original data Bula Çeşme [1], travertine, remains of l ind m pellets of Bufo bufo – Kırklareli Sarıdere, Dupnita magaraş cave [2], 16 Oct 1933, et 2m, 2t, CUP, Summer 1935, PMSL (Ing Kryštufek – Tünenśli blind train tunned in the auchrurus river valley n Derbisk village [3], 27 Oct 1933 col1 m, 1C, 14 Sep 1933, et 1m, 13C, 2 July 1934, et 2m, 3C, 36m inside the cave – only 2 m – P. b. blasius (cf e.g. Koopman 1994) Anyhow, at least in respect to the African populations, the taxonomic situation of R. blasius is far from being clear and calls for a detailed revision.

DISTRIBUTIONAL STATUS (Fig. 10). In the Eastern Turkey, M. myotis reaches the eastern margin of its distribution range. The records from Armenian Highlands and Caucasus Mts. reported by Satunin (1913) were reidentified as belonging to Myotis oxygnathus omart Thomas, 1906 (i.e. M. blythii omart) by Kusakin (1935). Vereščagin (1959) described all the recent and subrecent Caucasian records of the a large-sized Myotis as the only species, M. blythi (not M. myotis). This conclusion has been confirmed also by other Russian authors (Bobrinskiy et al. 1965, Strelkov 1972, Pavlov et al. 1995). With an exception of Armenian Highlands and Mesopotamia, M. myotis occurs quite abundant throughout the whole western part of Turkey (63 records).

TAXONOMIC STATUS. Turkish population of Myotis myotis has been many times taxonomically evaluated and analyzed in details. Strelkov (1972) suggested that the area of the Levant and Asia Minor is colonized by the form M. myotis macrocephalus Harrison et Lewis, 1961 (terra typica: Amchite, Lebanon), the form described based on the metric skull differences in the material obtained from Syria and Lebanon by Harrison & Lewis (1961). In the area of the Balkans and Asia Minor, these authors expected an intermediate form between M. m. myotis (Borkhausen, 1797) (i.e. Thuringia, Germany) and M. m. macrocephalus. M. m. macrocephalus was also mentioned from the Cilician Taurus Mts. by Kumerloev (1975). Corbet (1978) refers M. m. myotis to the European range (incl. the Balkans), M. m. macrocephalus to Lebanon and Palestine, but he give no mention about bats of the Asian part of Turkey (Anatolia). Feltens et al. (1977) described a cline increase in metrical characters from the Western to the Eastern Turkey, and therefore, discussed the existence of sub-species M. m. macrocephalus in the Levant. The West-Turkish sample he ranked among nominate form of M. m. myotis. Harrison & Bates (1991) and Koopman (1994) mentioned from Turkey both the forms, M. m. myotis and M. m. macrocephalus. However, Steiner & Gausler (1994) and Henda (1993) who analyzed the material from Trabzon and Erzurum province, arranged it under the subspecies M. m. myotis. The latter author also described cline increase in size throughout the
Myotis blythii (Tomes, 1857)

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DISTRIBUTIONAL STATUS (Fig. 11). *M. blythii* has been found in whole Turkey, also in arid areas, with an exception of the Upper Mesopotamia. It is the second most frequent bat species in Turkey, just after *R. ferrumequinum* (Tab. 1).

TAXONOMIC STATUS. The Persian form *M. myotis omari* Thomas, 1906 (terra typica: Derbent, Iran) was reassigned under the species *M. blythii* by Kuzajkin (1935; comp. Kuzajkin 1934), Harrison & Lewis (1961) synonymized *M. myotis risorius* Cheesman, 1921 (t. t.: Shiraz, Iran) with *M. m. omari* and also confirmed their belonging to *M. blythii* (they considered *M. blythii omari* as a subspecies distributed over the whole Middle East). Hayman & Hill (1971) considered *M. blythii oxygnathus* (Monticelli, 1885) (t. t.: Basilicata, Italy), the form first assigned to *M. blythii* by Ellerman & Morrison-Scott (1951), as a subspecies inhabiting a large territory, from Morocco, through the Southern Europe, the Middle East to the Central Asia. Topal (1971) confirmed the synonymy of Indian *M. blythii blythii* (Tomes, 1857) with *M. dobsonii* Trouessart, 1879, and also the synonymy of *M. b. risorius* and *M. b. omari*, which range is hence from Crete, through Asia Minor, Caucasus Mts. and Transcaucasia to the Persian mountains incl. Kopetdag Mts., i.e. the southeastern to *M. b. oxygnathus* inhabiting Europe up to Crimea. The first, who analyzed the geographic variation of *M. blythii* over whole range of its distribution was Strelov (1972). He has considered the subspecies *M. b. oxygnathus* distributed in continental Europe from Spain to Crimea (incl. Turkish Thrace), and *M. b. omari* inhabiting Caucasus Mts. and Transcaucasia, Asia Minor, the Western Turkmens and the whole Middle East, the Mediterranean islands and the Northern Africa. Corbet (1978) inclined to this opinion (without mentioning Anatolian populations). Felten et al. (1977) subdivided the Anatolian population into two groups, corresponding to subspecies: *M. b. oxygnathus* (continental Europe and the Western Anatolia) and *M. b. omari* (Eastern Anatolia, eastward of
Hatay, and in the whole rest of range in the whole Middle East), the opinion which, at least as Turkey is considered, was adopted also by DeBlase (1980), Harrison & Bates (1991) and Koopman (1994). Surner & Gansler (1994) resigned to classify the subspecific status of their samples from provinces of Balikesir, Kars and Erzurum.

Benda & Horáček (1995a, b) found a cline increase in merical characters from the west to the east throughout whole the Mediteranean terminating in Transcaucasia and Iran, with a step shift in Asia Minor that separates *M. b. oxygnathus* from *M. b. omari* (which can thus be expect also in the Eastern Turkey). Spitzenberger (1996) describes the same trend in Anatolia from the west to the east, though she does not distinguish individual subspecies.

In the context of taxonomical status of *M. blythi* in Turkey it is important to give a note on *M. blythi lesiuca* Iliopoulou, 1984, a form described from the Lesbos (= Midimi) island, Greece (Iliopoulou-Georgoudaka 1984), ca 10 kilometers distant from the Turkish coast. This description was based on differences of the island form from both that of Peloponnesse (as a sample of “continental” *M. b. oxygnathus*) and of Crete (*M. b. omari*). *M. blythi lesiuca* was proposed as intermediate form between both of the subspecies. However, subspecific status of that form is doubted by later authors (Benda & Horáček 1995b, Arlettaz et al. 1997) though accepted by Koopman (1994).

In conclusions, *M. blythii* is to be looked upon as a taxon which, in the Mediterranean region, exhibits a considerable morphometric variation. Its general pattern includes: (a) cline increase in size from the west to the east and (b) supposedly stepped shift in the region of Middle East that terminates with the largest form of the species, *M. b. omari*. The Northwest-African population (*paucus*) belongs rather to *M. myons* than to *M. blythii* (cf. Benda & Horáček 1995a, b, Arlettaz et al. 1997 for details).

*Myotis bechsteinii* (Kuhl, 1817)

**Rhinocoruala** *Original data* Kırklareli Sarıdere, Dilovası magarası cove [1], 16 Oct 1993 net 1m, CUP, 17 Oct 1993 net 1m, PMSL, - Veliká kópravá bridge (8 km SW of Děrnykoy) [2], 5 May 1992 net 1 ind (leg Reiter; Andreas & Sadilova) - **Literary data** Antalya Koprulu İrmaga (N of Beşkonak) [3], gorge, 1m
Fig. 12. Records of Moschus beechsteinii in Turkey. For symbol explanations see Fig. 4

(Helversen 1989a) - Artvin, Yumurtalı, Kalkıştayak batuš (4), 1 nd. (Albayrak 1990) - İstanbul Belgrad forest (5), tree hollow, 23 June (year not given) 1 ln (Kahlmann 1962).

DISTRIBUTIONAL STATUS (Fig. 12). More records of this rare species are available only from Thrace. One East Pontic record (No. 4) may refer to the southeastern part of distribution range that covers Caucasian Mts., Transcaucasia and Kupetdag (DeBlase 1980, Veroščagin 1959). The Pamphylia record (No. 3) is the southernmost record of this species in the whole distribution range (cf. Corbet 1978, Mitchell-Jones et al. in press). It suggests that M. beechsteinii may occur even in the region where it was not expected.

TAXONOMIC STATUS. Because of quite a restricted number of records (except for Central Europe), the geographic variation of M. beechsteinii has not yet been described. The population of the whole distribution range is generally arranged under nominotypic form M. beechsteinii beechsteinii (Kuhl, 1817) (terra typica: Hanau, Germany) (Corbet 1978, DeBlase 1980, Koopman 1994).

Myotis nattereri (Kuhl, 1817)

RECORDS

DISTRIBUTIONAL STATUS (Fig. 13). According to new data, *M. nattereri* inhabits Turkey in two distinct populations, the western population occurring in Thrace and in the Mediterranean coast, and the eastern one that extends the population of Transcaucasia and the Northern Iran.

**Taxonomic Status.** Corbet (1978) reported four subspecies. *M. nattereri nattereri* (Kuhl, 1817) (type: Hanau, Germany) from the European territory. *M. n. araxensis* Dahl, 1947 (type: Araxes River valley, Armenia) from Armenia and the Northwestern Iran, *M. n. tschulliensis* Kusakin, 1935 (type: Chelt, Kopetdag Mts., Turkmenistan) from Kopetdag Mts., and *M. n. hoveli* Harrison, 1964 (type: Aquab Bella, Palestine) from Palestine. At that time, there was no record of *M. nattereri* in Asian part of Turkey (cf. Kuncel 1975). Strelkov et al. (1978) confirmed that *M. n. tschulliensis* from Turkmenistan and Transcaucasia is larger in cranial measurements than members of the European populations, Rzehik-Kowalska et al. (1978) reported *M. nattereri* from the Northern Iraq, and pointed out its differences from the nominotypical form.

Horáček & Halák (1984) in respect to sympatric occurrence distinguished a small and a big form of the *M. nattereri-group* in Armenian Highlands of Armenia and Iran (cf. also Harrison 1963) as separate species: *M. shandari araxensis* and *M. nattereri*. The differences among the local populations of the latter species in the Middle East were found to substantiate their subdivision in two subspecies, i.e., *M. n. tschulliensis* (Kopetdag Mts., Transcaucasia, Northern Iraq and the Northern Iran) and *M. n. nattereri* (Europe, from Spain to Ural Mts., the Western Turkey up to Israel, and the Northwestern Africa). Helversen (1989a) found all his Turkish material (incl. that from province of Artvin) to fall in variation range of *M. n. nattereri*. Alpayrak (1993a) arranged all his West-Turkish samples under the form *M. n. hovelli*, according to the criteria of Horáček & Halák (1984) who, of course, found the differences between *M. n. hovelli* and *M. n. nattereri* much less apparent than those between *M. n. nattereri* and *M. n. tschulliensis* and included *M. n. hovelli* in synonymy of *M. n. nattereri*, a view adopted also by Koopman (1994). Benda & Horáček (1995a) described a cline shift in metrical characters in the whole areal of distribution, from the west to the east, and accepted the conclusions mentioned above.
Fig. 14. Records of *Myotis emarginatus* in Turkey. For symbol explanations see Fig. 4

Consequently, most of the territory of Turkey is inhabited by a nominotypic subspecies *M. n. nattereri* that exhibits here the characters approaching the state in its southernmost populations ("howellii"). Besides it, however, *M. n. tschultenius* can be predicted for the territory of the Eastern Turkey and, in the Armenian Highlands and/or Turkish Kurdistan, also *M. schaubi araxenus* can be expected.

*Mystus emarginatus* (Geoffroy, 1806)


Distributional status (Fig. 14): *M. emarginatus* occurs in relatively humid regions of Turkish coast and of the Euphrates River valley (cf. Benda 1996).

Taxonomic status. Geographic variation over whole the range of distribution has as yet not been studied in *M. emarginatus* (Topal in press). Kumerlooeve (1975) considered the samples from Thrace to belong to the nominotypic form *M. emarginatus emarginatus* (Geoffroy, 1806) (terra typica: Charlemont, France). Corbet (1978) reported subspecies *M. e. emarginatus* for the European range,
and M. e. desertorum (Dobson, 1875) (tē Ṭalq, Baluchistan) for Iran and the Central Asia. At the
time, no records were available from Asia Minor (cf. Kumerloev, 1975). Based on differences in
colouration, Strelkov et al. (1978) distinguished the sample from Turkmenistan, two different
forms, viz. M. e. desertorum in Kopetdag Mts and in the valley of Murghab River, and M. e.
saturated Kuzgukan, 1934 (tē Ṭavkhent, Uzbekistan) in the Kuttanglan range (Eastern Turkmen-
attributed the same name to the Arabian population (with an exception of Oman). The same
opinion was presented also by Koopman (1994).
Topal (in press) tends to suppose that Europe up to Caucasus Mts is inhabited by M. e. emargi-
atus, and Caucasus Mts, (the Great Auchu and Kopetdag Mts by the form M. e. turcomanicus
Bobrinski, 1925 (tē Murghab River valley, Turkmenistan) The form M. e. desertorum could
occur in Baluchistan and Oman, and M. e. satuiratus in the Central Asia

*Myotis mystacinus* (Kuhl, 1817)

**Records Original data** Bōlu Čepni [1], traverse, remains of 1 ind. in pellets of *Bubu bubu* - Īgāl
Northwest [2] 29 Oct 1993 remain of 1 ind. in pellets of *Sten alulae* - Kārāū Aparāz (Arāzī)[3] 2m,
21, 2 in. ZIN (spec. Nov. 9082 – 9089) 3011–3013 (IG. Satorin, ev. Bendca, cf. Strelkov 1983b), - 5 km N of
Sebzan [4], small tunnel under railway, 10 Sep 1995 not 2m, NMP (spec. Nos 48094, 48095) - Kīrkīlāči
Samandarı Depoýa maqarist as cave [5], Summer 1995, FMSL (IG. Kryukov) - Vān Castle of Van [6] 28 July
1992 not 4m, NMP (spec. Nos 47912–47915) Literary data Adıyaman Karadat [7], cave, 7 June 1992
1 ind. (from owl's pellets) (Obuch 1994) - Aνκαρα Kirmir Cayı (S of Kızılıkamız) [8], over a river, 17–19
June 1986 2m. 21 (Havelersen 1986b) - Antalya Beşikbasi [9], valley, 10 Oct 1984 11 (Havelersen 1986b)
- bridge over the Manavgat river (in Brada) [10], 28 June 1986 1 immature (Havelersen 1989b) - Būtūs Taşlı
[11], Karşıyaka mahallesi 20 July 1977 1m, 8 km, 16 (Albayrak 1980, 1990) - Būrās Nafur Cayı (S of
Uludağ) [12], 21–22 July 1983 4m (Havelersen 1989b) - Çankırı Devçe Cayı (in Ilgaz) [13] under a bridge, 15
August 1983 1m (Havelersen 1989b) - Erzurum Corah valley between Ispir and Yesilce [16], 5 August 1983
1m (Havelersen 1989b) - NW of Ispir [15], 4 August 1983 1m (Havelersen 1989b). Sevan Dört [16], a rocky
valley, 7 August 1983 2m 41 (Havelersen 1989b) - İcel n. Meran [17], 8 Nov 1983 1m (Kumerloev 1975) -
İzmir Seferihisar [18] Daganboy Burnu, 10 June 1985 3m, 25 (Albayrak 1990, 1991), - Şreve (near İzmir)
[19] 1870. 2 ind. (Darula 1887) - Kīrkīlāči 3 km W of İnegöl [20], 13 May 1967 (Hürka 1972) - Konya Uğular (SW of İzmit) [21], 29 June 1986 1m, 11 (Havelersen 1989b) - M uğ Aşgabat DūC (=
state form) [22], 8 July 1979 1m, 1m, 10 km (Albayrak 1990, 1991) - Reş Aryan (Fort Otek) (Caglar 1969)
- Çat (n. Çaylakç pendant) 4 13 August 1967 nursery colony (Pens 1976) - this metapopulation was re-examined by
Stevens & Gerson, 1990 as *Myotis brandti* (see below) - Vān Castle of Van [6], 27 July 1977 1m, 11 (Albayrak 1990
1991) - NE Anadolu (no exact loc.), ind. in Russian collections (Caglar 1965, see above [5], resp. Strelkov
1983b)

*Myotis mystacinus*

**Records Original data** Artvin Mangul, Damaz [23], in the village. 3 Sept 1995 det. min 10 ind. - Būrās
Uludağ, 1592 m [24], 29 July 1994 det. 1 ind. - Uludağ, 1750 m [25], 28 July 1994 det. 1 ind. - Īstanbul
Yalova Tınalı [26], over a break below a dam 24 June 1990 det. 1 ind. - Kızıldık Fevziye [27], 4 km S of
Alişova, 23 June 1990 det. - Trabzon Samucus [28], 25 Oct 1993 det. min. 1 ind

**Distributional data** (Fig. 15) M. mystacinus inhabits all regions of Turkey except for Central
Anatolian steppes in the middle part of Asia Minor, and it belongs there, as in the Balkans, among
the most common bat species (Tab. 1). The Turkey is the southern margin of its Mediterranean
distribution range, that pass then through Persia, Azerbaijan, Dagastan, Elborz and Kopetdag Mts
into the Central Asia (DeBlase 1980, Kock 1996, Strelkov 1983a, b) Dobson (1978) reported a
specimen of M. mystacinus coming from a southern region (Syria) in the collection of British
Museum but Harrison (1964) and Harrison & Bates (1991) do not confirm this specimen and do not
consider this species to be a member of Arabian fauna (but cf. Quamri, 1996).

**Taxonomic status** Taxonomy of M. mystacinus-group was several times discussed, supplemented
and revised (Harrison 1965, Kuzgukan 1950, Topal 1958). Among other, these studies resulted in exh-
sion of the form *Myotis brandtii* (Eversmann, 1845) from context of the species *M. mystacinus* (Gaukler & Kraus 1970, Hanak 1970) and revision of the European findings of *M. skrjabinii* Ognev, 1912 (terricypa, Ussuri River valley, Russian Far East) (viz. Abelevcev et al. 1956, Kvar-ternikov 1957), that were included into *M. mystacinus* (Hanak 1965) Stubb & Chotodelu (1968) proposed an overall classification of Palearctic populations of *M. mystacinus* (within the species concept sensu Ellerman & Morrison-Scott 1951) but they did not include Caucasian and Turkish populations. Corbet (1978) distinguished several subspecies in the whole range of distribution *M. mystacinus mystacinus* (Kuhl, 1817) (t. t. Germany) in Europe and the Western Asia (incl. Turkey and Caucasus Mts.), *M. m. transcaucasicus* Ognev et Heptner, 1928 (t. t. Mikhailovsky, Kopetdag Mts., Turkmenistan) in Kopetdag Mts. and Central Asia, *M. m. przewalski* Bobritskoj, 1926 (t. t. Moldja River valley, Eastern Turkestan, China) in the Western China and Mongolia, *M. m. men-"ehtsokhen" Thomas, 1926 (t. t. Ladak, Kashmir) in Himalayas and Pamir Mts. and *M. m. sogdianus* Kurtzkan, 1934 (t. t. Tashkent, Uzbekistan) in the Central Asia. The most extensive revision was published by Strelkov (1983a). He analyzed the population of the Eastern Europe and the Northern Asia and subdivided it in four subspecies: *M. m. mystacinus* inhabiting the forest zone of Europe and of the Southwestern Siberia, *M. m. popovi* Strelkov, 1983 (t. t. Crimea, Ukraine), occurring in Moldavia, in the Southern Ukraine and in Caucasus, so mostly in steppe areas, *M. m. auriculatus* Kuyak, 1935 (t. t. Vladikavkaz, Southern Russia) inhabiting the forest zone of Caucasus Mts., *M. m. przewalski*, that occurs in the Middle Asia, Mongolia and the Western China (in two subspecies: *M. m. przewalski* and *M. m. davidii* Peters, 1869) (t. t. Peking, China) in addition to *M. m. przewalski* mentioned to that region by Strelkov (1983). Recently, based on the Strelkov's (1983a) proposal, was described a new subspecies, *M. m. mongolicus* Kruskop et Borissenko, 1996 (t. t. Barun-Torey Lake, Russia).

The above list of opinions illustrates well the fact that taxonomy of *M. mystacinus* and present classification of individual populations are quite confused. Nevertheless, the population of boreal zones incl. the Central and the Northern Europe, and Northern Asia seems to be relatively homogeneous in morphometrical respect and can be tentatively classified as belonging to the nominate type subspecies *M. m. mystacinus*.

The diurnality in evaluation concerns in particular "the southern" populations of *M. mystacinus* s. s. 1, inhabiting the Southern Palearctic in the range from Balkans to China, so Turkey including. In agreement with experience of other students, Helversen (1989a, b) reports that in the territory of the Balkans and Turkey (and further to the east), there are still two other species, not yet distinguished from true *M. mystacinus*. So, the group should consist of three species: (a) a small-sized form with the forearm length up to 32 mm, with short and pale auricles and legs that slightly exceed breaking of the posterior ear margin (tentatively conspecific with *M. skrjabinii* or yet undescribed form), (b) a large form that Helversen (1989a) conspecific with the Central European *M. mystacinus*, and (c) a form temporarily called *M. przewalski*, that should be extremely well-built, with massive baculum, strongly reduced P and P, and unspecified differences in skull, chromosomes and ecology. Concerning the Turkish population, Helversen (1989b) found that individuals of "M. mystacinus" przewalski from the province of Erzurum have longer foemarms (35–36 mm, n=6), than those from the Western Anatolia (32.5–34.5 mm, n=13). The name *M. przewalski* and the name for the "new" species, Helversen (1989a) infers from an older study by Stubb & Chotodelu (1968) They showed the variation of *M. mystacinus* in the whole area of distribution, and suggested its taxonomic status, but they did not exclude the form *M. brandtii* as a species. It is important to note that the closest verified records of *M. skrjabinii* come from the Western Altais, the Eastern Kazakh-
Fig 15: Records of Mystacina mystacinus in Turkey. For symbol explanations see Fig. 4, open symbols denote bat detector records of Mystacina mystacinus (see text).

stan (Strelkov & Sajmardanov 1983), i.e. from the area of sympatry with M. mystacinus and also M. brandti. Anyhow, Strelkov (1983a) reported from the northern part of Caucasus Mts. finding of a bat corresponding in size with M. ikonnikov (LCR 12.2 mm) from the Far East. Volleth (1987) with aid of NOR chromosome staining, distinguished two forms of M. mystacinus group in the Balkans, differing from the Central-European population of M. mystacinus and M. brandti in NORs localisation ("Mystacina sp. A" and "Mystacina sp. B")

There are two descriptions available from the Eastern Mediterranean: M. mystacinus bulgaricus Heinrich, 1936 (t. i.: E of Plovdiv, Bulgaria), now considered as a synonym of the nominotypic subspecies (cf. Corbet 1978, Hanák 1965), and M. mystacinus haustatanicus Argyropulo, 1939 (t. i.: E of Sevan Lake, Armenia), the form, that has been, according to absolutely largest size, relatively long tail, and cranial characters, distinguished by Argyropulo (1939) from M. m. brandti, M. m. transcaucasicus, M. m. kokanorienensis and M. m. przewalskii. Hanák (1965) has considered M. m. haustatanicus as a valid subspecies, and besides the type series ranks there also the finding of Harrison (1963) from Gutur-Su (Northwestern Iran). Strelkov (1983a) who reexamined the type series considered the description of M. m. haustatanicus as incorrect, but he has not provided a conclusion on the status of the population from the Lesser Caucasus Mts. and the Armenian Highlands. Albayrak (1991) who studied Turkish populations of M. mystacinus, and compared them with literary data (i.e., Hanák 1970, Gauckler & Kraus 1970), has claimed the nominotypic subspecies does not occur in the territory of Turkey and attributed all his records to M. m. haustatanicus (refusing the opinion on its synonymy with M. m. mystacinus by Gauckler & Kraus 1970).

In conclusion, a question of phyletic diversification and actual content of M. mystacinus group is among the most complicated tasks of contemporary chiropteran systematics. M. mystacinus-like bats represent one of the target phenotypes into which phylogenetic divergence of vesperilionid bats tends to canalize. There is an extremely large variation in frame of this principaly generalized phenotype. It may include as well a temporary divergence of local populations, a cline variation as it may result of a parallel variation in supposedly quite a distant lineages. To distinguish
in each region and each sample which kind of variation does here play a role is almost beyond scope of standard morphometric techniques. The topics call for a profound revision of all available material in the Palearctic range (including type material of all taxa named within this group) using a combined application of both the traditional and new taxonomic approaches. In any case, for the moment, it seems clear that just in the territory of Turkey at least three different forms do occur. Which is their actual status and actual distribution pattern remains a task of further study.

*Myotis brandti* (Eversmann, 1845)


**Distributional status.** (Fig. 16). All Turkish records of *M. brandti* come from one restricted area in the Easternmost Pontus, and most probably belong to an isolated population inhabiting also Caucasian Mts. and Transcaucasia (Strelkov et al. 1978, Strelkov 1983a, Ilyin et al. 1998). In the Eastern Turkey, the occurrence of *M. brandti* has been expected already by Kummerlohe (1975). The other area where it may possibly occur is the mountain part of Thrace (Istranca Mts.) neighbouring the Bulgarian mountains where this species has been already found (Horáček et al. 1974, Ivanova 1998, Pardurska & Beshkov 1998). The question whether these two populations are interconnected through the Pontic mountain ranges remains still open, of course.

**Taxonomic status.** Geographic variation in the East-European and the Asian parts of distribution range of *Myotis brandti* has been revised by Strelkov (1983). He reported two subspecies: *M. brandti* gracilic N. Ognev, 1927 (type locality: Vladivostok, Russian Far East), that occurs in Far East and the Eastern Siberia, and *M. b. brandti* (Eversmann, 1845) (i.e. Spassk, Southern Ural Mts., Russia) inhabiting the rest of the distribution range, with exception of a supposedly isolated population in Caucasian Mts. and Transcaucasia (i.e. incl. the Eastern Turkey), which taxonomic status Strelkov (1983a) kept as unclear. Turkish material coming from one and the same locality was studied by Albayrak (1991) and Steiner & Gatisler (1994) who found no essential differences from the morphometrical diagnosis of the species as understood based on the European samples.

*Myotis daubentoni* (Kuhl, 1817)

**Records.** Original data: Bolu, Lake Göl [1], S bank of the lake; 13 June 1998 det. ma. 3 m. – Kirkirali: Longoz, Longoz (1); 22 June 1974 det. ma. 3 m. (leg. Reiter, Andreas & Sadlovsé), 22 June 1994 det. 1 m, 1F, CUP, – Sandere, Durgitas magarasi cave (3), 16 Oct 1993 det. 2m, 1F, CUP, – Velika Kaprusi bridge (6 km SW of Domirkoy) (4), 5 May 1992, det. 2 m (leg. Reiter, Andreas & Sadlovsé), 30 August 1990, det. 2m, NMP (spec. Nos. 47944, 47945), – Literary data: Bolu (10 km W of Madura (= "Madura yolu") (5), 1 Sept 1988 5m, 1F (Albayrak 1988, 1993). – Bursa: Çaylıçay (5 of Buladag Mts) (6), Nifafar Çayı creek, 22 July 1983 3m (Helferren 1983a) – Samanlı Tazkay (20 km S of Bafra) (7), small river, 30 July 1983 3m (Helferren 1983b), – Turkey (no exact loc.) (Theodor 1967).

**Distributional status.** (Fig. 16). An occurrence of *M. daubentoni* in Thrace and Western Pontus evidently extends its Balkan range. There is no evidence of this species in Caucasian Mts. and Transcaucasia. In the Northwestern Turkey, this species reaches the southernmost margin of its distributional range in the Eastern Mediterranean (viz. Bogdanoowicz 1994, Mitchell-Jones et al. in press).

**Taxonomic status.** Corbet (1978) reported the nominotypic subspecies *M. daubentoni daubentoni* (Kuhl, 1817) (terra typica: Hanau, Germany) only from the whole range of distribution. Hanák &
Hordáček (1984) proposed three well (in metrical characters) defined subspecies inhabiting the Western Palearctic: *M. d. nathalinae* Tupini, 1977 (t. t.: Cabezzarrubias, Spain) for the Iberian peninsula, *M. d. daubentoni* for the Central Europe and *M. d. vulgensis* (Eversmann, 1840) (t. t.: Ural Mts., Russia) in the Eastern Europe and Siberia. However, they did not mention the Balkan and Ciscaucasan populations (the Turkish samples were not evaluated). Albayrak (1988), who first reported this species for Turkey, claimed that in size his specimens are smaller in comparison with data by Hanák & Hordáček (1984). Also Helversen (1989b) noticed the differences. He reported, that the specimens from Uludag Mts. are smaller and more reddish than those from Samsun province where the bats are bigger and dark brown-grey (the similar observation he reported also for Greece: bats in the Prespa Lake are bigger than those from Chalkidiki peninsula). Bogdanowicz (1990, 1994), based on taxonomical comparison of the material from whole Europe, arranged both the Siberian and European populations to the nominotypic subspecies. He also stated cline shift of metrical characters in agreement with the Bergmann’s rule, just with the exception of the marginal southernmost populations (Southern Portugal and Macedonia). Thus, the geographic variation in *M. daubentoni* can be characterised by cline increase in size either from the west to the east, and from the south to the north. It is still an open question, however, whether the specificity of the southernmost population in the Eastern Mediterranean (i.e., those from Turkey) are indeed so large that would be worth of a nomenclatoric separation at the level of subspecies.

**Myotis capaccinii** (Bonaparte, 1837)

Records: Original data: Antalya Kas [8], 10 June 1966. 6 ind (Kock 1974); Manavgat [9], ancient aqueduct, 13

**Distributional Status:** (Fig. 17). *M. capaccinii* is known only from the coastal areas of the Western and the Southern Turkey. The Turkish records delimit the eastern margin of the distribution range of this species, which continues to the south through the Levant into the Southeastern Mesopotamia and the Southern Iran (DeBlase 1980, Harrison & Bates 1991).

**Taxonomic Status.** Kumerjoeve (1975) supposed that subspecies *M. capaccinii bureschi* (Heinrich, 1936) (terra typica: Karamerk, Stranja [= Istranca] Mt., Bulgaria) occurred in Thrace. Except for Corbet (1978) who doubted its validity and reported the nominotypical subspecies *M. c. capaccinii* (Bonaparte, 1837) (t. t.: Sicily, Italy) only, many authors (DeBlase 1980, Harrison & Bates 1991, Kocman 1994) accepted the Kumerjoeve’s conclusion that the Turkish range is inhabited by subspecies *M. c. bureschi*. The Turkish sample was factually evaluated by Albayrak (1990a) who considered Turkish populations to belong to the subspecies *M. c. capaccinii* (although he supposed that populations from Israel and Iran differ from the others in some cranial characters).

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**Fig. 17** Records of *Myotis capaccinii* in Turkey. For symbol explanations see Fig. 4.

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Vesperitio murinus Linnaeus, 1758

Records: Original data Bolu Abant Golu lake [1], 24 June 1964 det 1 ind., 26 June 1964 det 1 ind. – Elazig Harput [2], Burzik mangrazi cave 27 Oct. 1993 1 ind. in a subfossil deposit – Literary datum Adiyaman Karabul [3], cave, 7 June 1992 1 ind. (from owl’s pellets) (Ozcan 1994)

Distributional status (Fig. 18) There are only three findings of V. murinus in Turkey. They make the southern margin of its distribution range in the Eastern Mediterranean Strelkov (1997a, b) has supposed that Mediterranean does not belong to the range of reproduction of V. murinus (e.g. region of nursery colonies) but to the area of seasonal migrations only. Taxonomic status Cobet (1987) reported nominotype subspecies V. m. murinus Linnaeus, 1758 (terra typica: Sweden) for the area from Europe to the Amur region. Many other authors (DeBlase 1980, Koopman 1994, Strelkov et al. 1978) consent to this statement.

Eptesicus serotinus (Schreber, 1774)

Fig. 19. Records of *E. serotinus* in Turkey. For symbol explanations see Fig. 4.

1989) - Yuushiyuk (= Gordon) [20], 25 July 1983 det (Helversen 1989b) - Antalya 9 km NW of Gazipasa [21] obs (Spitzenberger 1994) - Alanya [22], 16 August 1986 obs group of ca 50 ind. 4 single ind. 4 couple of ind. group of 3 and 2 ind. (call 2m, 70) (Spitzenberger 1994) - Bézkonał [23], 20 June 1986 2f (Helversen 1989b) - Bridge over Manavgat river (in Brada) [24], 28 June 1986 det. (Helversen 1989b) - Castle of Alanya [25] obs (Spitzenberger 1994) - Finike [26], Cliff Camsi, summer 1965 1 male (Corbett & Morris 1967) - Side [27], amphitheatre, 30 June 1986 1m (Helversen 1989b) - Arıvin gorge below Arasun [28], 12 August 1983 1f (Helversen 1989b) - Çankırı: Deresi Çayı creek (in Ilgaz) [29], 15 August 1983 5f (Helversen 1989b) - Diyarbakır Briklik mahalleli cave (n. Lure) [30], 27 July 1984 1 ind fur (Spitzenberger 1994) - Giresun Kendalıye köy village [31], schoolhouse, 10 ind (Albayrak 1996) - mountain forest btw Kumbet and Tandere [32], 1 August 1983 det (Helversen 1989b) - İzmir (no exact loc) [33] (Çağlar 1965) - Kars, Araklı-Beyaz (vicinity of Araklı) [34] (Satsum 1913) - "das Plateau von Kars" (Satsum 1913) - Rize Şenyava (S of Camilisaran) [35], house, 24 August 1967 1m (Stevens & Gaisler 1968) - Sakarya Ispahalıdere köy village (n. Adamkaya) [36], behind the windon, 15 August 1983 1f (Çağlar 1965, 1969) - Samsun: Kanuniye Pest Control (Research Institute) [37], 4 ind (Albayrak 1996) - Tokat (20 km S of Bayza) [38], 30 July 1983 1m, 1f (Helversen 1989b) - Tiberias Vakilče (39), Bşkacamli baching, Takab: Köya village, 14 ind (Albayrak 1996) - Yozgat: Tse-fâkîr [40], 1m, 1f (Dawson & Alston 1877) - Isfâkar (Dobson 1878) - İsfâkar (Çağlar 1965) - İsfâkar (Spitzenberger 1994)

**DISTRIBUTIONAL STATUS (Fig. 19).** Altogether 40 records of *E. serotinus* cover, similarly to some of above mention species (i.e. *R. hypposideros, M. blythii*), almost the whole area of Turkey, i.e. all biogeographic units, except for the region of Mesopotamian steppes (Tab. 1).

**Taxonomic Status.** According to Corbett (1978) whole Europe up to Caucasus Mts. is inhabited by the nominotypic subspecies *E. serotinus serotinus* (Schreber, 1774) (terra typica: France), the Southwestern Iran by *E. s. shiraziensis* (Dobson, 1871) (t. t.: Shwarz, Iran), Kopetdag Mts. and Central Asia by *E. s. turcoanus* (Eversmann, 1840) (t. t.: between Caspian and Aral Lakes), and some other forms occur in Afghanistan and in the eastern part of the range (*E. s. pachyomus* (Tomes, 1857), *E. s. pashinnus* Gaisler, 1970, etc.). Stelkovek et al. (1978) have reported *E. s. serotinus* from higher altitudes of the Western and Central Kopetdag Mts. and *E. s. turcoanus* from the Eastern Kopetdag Mts. and deserts north of it. Gaisler (1970), Harrison & Bates (1991) and Koopman (1994) consider territory of Asia Minor as part of the range of *E. s. serotinus*. DeBlase (1980) arranged the samples from Transcaucasia and Kurdistan up to the Kopetdag Mts. to *E. s. serotinus,*
while that from the Southern Zagros Mts. to E. s. shiraziensis, Steiner & Gaisler (1994) did not find any differences between the East-Turkish sample and E. s. serotinus from Central Europe.

A detailed analysis of the Turkish material of E. serotinus was undertaken by Spitzenberger (1994). She has assumed that nominotypic subspecies is dispersed from Europe (incl. the Balkans), through the Pontic Mts., Transcaucasia and the Southern Caspian coast up to Kopetdag Mts. In contrast, her samples from the Southern Anatolia differed at a subspecific level (exhibiting the same colouration as E. s. turcomanica, and the same size as E. s. shiraziensis) though their subspecific status was not formally specified because of scarcity of prerequisite comparative material.

Consequently, it seems possible to conclude that territory of Turkey may be a zone of transition between two forms differing at a subspecific level, i.e. E. s. serotinus (Northern Turkey), and the southern one, that can tentatively be identified with E. s. shiraziensis.

**Eptesicus bottae (Peters, 1869)**


**DISTRIBUTIONAL STATUS** (Fig. 20). E. bottae has been recorded only in the southern part of Asia Minor (E. bottae anatolicus). There may be a continual extension of its range to the south (al-

![Fig 20: Records of Eptesicus bottae (closed symbols) and Myotis impressus (open symbols) in Turkey. For symbol explanations see Fig 4](image-url)
though no Syrian records is available as yet) to the Northern Iraq (Harrison 1956) and the Persian Zagros Mts. (DeBlase 1980, own data), and it was found also in Greek island of Rhodes (Spitzenberger in litt.). Of course, this species (E. bottae ognevi) is also known from Transcaucasia (Georgia, Azerbaijan) and Persian Azerbaijan (DeBlase 1980, Hanák & Gašler 1971, Nader & Kock 1990); from Nakhichevan (Naxçıvan) where it was found even in the Araxes River valley, just bordering the Northwestern Turkey. Thus, appearance of another population in the Armenian Highlands and the Eastern Pontus, E. bottae ognevi, can be more than expected (cf. Koopman 1994).

**Taxonomic Status.** The first record of E. bottae from Turkey was obtained by Felten (1971) in Alanya (Antalya Province). He described it as a new species E. anatolicus Felten, 1971, and distinguished it from E. bottae kingstown Thomas, 1919 (terra typica: Baghdad, Iraq) according to metrical characters. This becomes the only description of a bat species from today Turkish territory. Harrison (1975) reexamined the Armanian material of E. bottae, and included Felten's description in E. bottae, as an independent subspecies E. bottae anatolicus Felten, 1971. This solution was confirmed by many other authors (Corbet 1978, DeBlase 1980, Harrison & Bates 1991, Nader & Kock 1990, Spitzenberger 1994).

Hanák & Gašler (1971) arranged originally independent species E. ognevi (Bobrianski, 1918) (t. t.: Bukhara, Uzbekistan) under E. bottae which have been accepted also by Nader & Kock (1990) and Koopman (1993, 1994).

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**Hypsugo savii (Bonaparte, 1837)**


**Distributional Status** (Fig. 21). Although actual record in Turkey is far not rich, in analogy with neighbouring regions it seem possible to expect that H. savii inhabits probably almost the whole territory of Turkey. Surprisingly, this species has not been found on the Aegean coast of Asia Minor and in Thrace though, according to the findings from the Balkan peninsula (see Mitchell-Jones et al. in press), it seems to be very common in all neighbouring areas, including the islands. Incidentally, this species was also very rarely recorded in Iran (DeBlase 1980).

**Taxonomic Status** Corbet (1978) showed the form H. savii savii (Bonaparte, 1837) (terra typica: Pisa, Italy) in Europe and the Northern Africa, H. s. caucasicus (Satunin, 1901) (t. t.: Tbilisi, Georgia) in Caucasus Mts. up to the Western China. Harrison (1964) reported the form H. s. caucasicus for the Aranbas part of range of distribution and (the Southern Turkey). Similar identification was proposed also for a sample from Tarsus Mts. by Kumerloev (1975) and for other regions of the Southwestern Asia by many other authors (Bekenov et al. 1985, DeBlase 1980, Harrison & Bates 1991, Streichov et al. 1978).
Horáček & Hanák (1986), who revised the material from the whole range of distribution, stated that the form *H. s. caucasicus* is distributed from Crimea, Turkey, Cyprus and Lebanon to Central Asia, while Europe, incl. the Balkans, is inhabited by *H. s. savii*. In contrast to Corbet (1978), they respected subspecific status of the Spanish and the North-African populations, *H. s. ochromus* (Cabrer, 1904) (t. t. Madrid, Spain). Helversen (1989) noticed in more detail the colouration of the Turkish population: in Anatolia there are individuals with "sandy-golden back with long silvery fur contrasting with black ears and muzzle", similar as in populations in the Aegean islands what contrasts with the dark individuals from the Greek mainland. These findings could correspond with the geographic separation suggested by Horáček & Hanák (1986). Anyhow, *H. savii* is extremely variegated in colouration (Dušić 1978) and the taxonomical meaning of that character was doubted also by Arlettaz et al. (1993). Nevertheless, the mean population state of that character undoubtedly shows a considerable geographic differences and it is worth to be taken in account.

**Pipistrellus pipistrellus** (Schreber, 1774)


Literary data Adana: Haranye [19], 1953 (Kümeleeve 1975) – Karasah [20]

**DISTRIBUTIONAL STATUS** (Fig. 22) *P. pipistrellus* is the third most common bat species in Turkey (Tab 1). It is particularly common in the coastal regions where number of records is much smaller in inland areas of the Central and Eastern Anatolia.

**TAXONOMIC STATUS** The first who mentioned taxonomical status of the Turkish population of *P. pipistrellus* was Hanik (in Lohmann 1966). He attributed the whole Mediterranean population to *P. pipistrellus mediterraneans* Cabrera, 1904 (terra typica Valencia, Spain) The other taxa that come in account, viz *P. p. bacanica* Saussure, 1905 (to Tedzen, Turkmenistan) and *P. p. aladina* Thomas, 1905 (to Iran) were studied by Neuhauer & DeBlase (1971), who considered them synonymous (with the prior name *P. p. aladina*) and delimited the distribution range of this form from Lake Van and Zagros Mts to Central Asia and China. Moreover, Corbet (1978) suggested that the populations of Europe, Asia Minor and Palestine belong to the form *P. p. pipistrellus* (Schreber, 1774) (to France) to which he synonymized also the form *P. p. mediterraneans* while the populations from Iran, Central Asia and Afghanistan lie arranged under *P. p. aladina* (sensu Neuhauer & DeBlase 1971). This view was adopted also by Harrison & Bates (1991), Knopman (1994) and DeBlase (1980) who contributed to it with records of *P. p. pipistrellus* from Transcaucasus and Elbow Mts, while, at the same time, those from Kurdistan and Zagros Mts. who identified with *P. p. aladina* Strelkov et al. (1978) the Turkmen populations under *P. p. bacanica* that he kept separate.
ed from *P. p. aladdin*. The Turkish sample has been evaluated by Albayrak (1987) and Steiner & Gaslier (1994). Albayrak (1987) attributed the samples from the Northern and Western Turkey to *P. p. pipistrellus* while those from the Turkish Kurdistan to *P. p. aladdin*. Between these two regions he expected a broad zone of transition (that was however doubted by the Cilician findings). On the contrary, Steiner & Gaslier (1994) attributed their sample from the Rize province (and proposed for whole Asia Minor) to the form *P. p. mediterraneus*, so they refused its synonymy with the nominate form.

Anyhow, systematics of *P. pipistrellus* has recently been considerably contributed with discovery of two clades differing both in echolocation and some genetic markers (Barnatt et al. 1997, Jones & Pärjis 1993 etc.). Already the uncertainties with morphological discrimination between these two, genetically quite distant forms, suggest that *P. pipistrellus* may be just a taxon that include a considerable spectrum of hidden phyletic diversity and this may concern just of the “southern” forms we meet in Turkey.

**Pipistrellus nathusii** (Keyserling et Blasius, 1839)


**Distributional status** (Fig. 18). There are only five records of *P. nathusii* from Turkey, all representing marginal points of the species’ distribution range (comp. Mitchell-Jones et al. in press, Strelkov 1997a, b). As shown by Strelkov (1997a, b) and Horáček et al. (1998) a great majority of records of *P. nathusii* refers to individual bats at time of seasonal migrations without any nursery colony having been recorded.
**Pipistrellus kuhlii** (Kuhl, 1817)

**Records**


**Distributional Status** (Fig. 23) *P. kuhlii* is a eustatal element of Turkish bat fauna. It occurs in all biogeographic regions of Turkey (which otherwise holds true for *R. ferrumequinum* only). In the Cilician coast and Mesopotamia, it is even the most common species at all (Tab 1). The same holds true also for neighbouring southern regions, i.e. the Syriac and Iraq Mesopotamia and the Levant (Harrison & Butes 1991) while it is not the case with those neighbouring Turkey in the North, since in most of the Balkans this species is fairly rare and/or absent at all (Mitchel-Jones et al. in press).

**Taxonomic Status** Already Lewis & Harrison (1962) noted that in the Mediterranean region, the populations of *P. kuhlii* exhibit considerable cline variation in pelage colouration, those from the southern regions being much paler than those in the European part of the region. The paler forms
were traditionally distinguished from the nominotypic form, *P. kuhlii kuhlii* (Kuhl, 1817) (terra typica: Terst, Italy), as separate subspecies. At least three names come here in account, viz. *P. k. lepidus* Blyth, 1845 (t. t.: Kandahar, Afghanistan), *P. k. ikhwanus* Cheesman et Hinton, 1924 (t. t.: Hefuf, Hesa, Saudi Arabia) and *P. k. marginatus* (Cretzschmar, 1830) (t. t.: Arabia Petraea). It is not clear, however, to which degree (and by which characters) these pale southern forms differ each from the other. Hence, some authors proposed their synonymy. Kock et al. (1972), who evaluated the East-Anatolian *P. kuhlii* in details, found it to be distinctly paler that both from the European Mediterranean but resituated to decide whether it is to be identified as *P. k. lepidus* or *P. k. ikhwanus*. Gaissler (1970) evaluated the Afghan sample and concluded that the name *P. k. lepidus* is an older synonym of *P. k. ikhwanus*. Kumarloeve (1975) suggested, according to Harrison (1964), that Turkey is colonized by the southern form *P. k. ikhwanus*. Corbet (1978) reported only the nominotypic form for the whole area of distribution of this species, perhaps in account of that the differences among populations are not stepped but gradual. Strejlov et al. (1978) and DeBlase (1980) with reference to Gaissler (1970), reported the form *P. k. lepidus* from Kopetdag Mts. and the whole Iran. DeBlase (1980) also supposed, that the name *P. k. lepidus* could be a younger synonym of the name *P. k. marginatus* and Qurumseh (1985), though noted the differences between the extremely pale form inhabiting Egypt and Palestine and the darker one from Lebanon, Syria and Turkey synonymized them all, i.e. at least *P. k. ikhwanus* (and supposedly also *lepidus*) with *P. k. marginatus*. Nader & Kock (1983) suggested that the Mediterranean populations are an intermediate form between *P. k. kuhlii* and *P. k. ikhwanus*. Harrison & Bates (1991) distinguished in Arabia the northwestern form under the name *P. k. kuhlii*, and the southern desert form under the name *P. k. ikhwanus*, but they described also an intermediate (in colouration) form of the Levant. Steiner & Gaissler (1994) mentioned from the Northern Iran intermediate forms (both in merical and colouration characters) between *P. k. kuhlii* and *P. k. marginatus* (sensu Qurumseh 1985). Summing all this up, it seem possible to conclude that over the Eastern Mediterranean there is a gradual transition between a paler form in south and a darker one that can be coidentified with the nominotypic form. Whether at least in some parts of this region that clime approaches a pattern of a categorial
variation (which then would substantiate different subspecific status of the respective population) remains a task of a further comparative study.

Unfortunately, although *P. kuhlii* represents a common species throughout the Mediterranean (being even one of the index species of that region), and in some areas it has even expanded its range during last decades (cf. Rakhmatulina 1989, 1996, Bauer 1996, Strelkov & Il'in 1990), a detailed study of its geographic variation is still missing.

**Nyctalus noctula** (Schreber, 1774)

**Records**


**Distributional status** (Fig. 24). A limited number of records available from Turkey come from two regions: the woodland region of Thrace (Istranea Mts.) neighbouring the records in Bulgarian and Greek mountains (cf. Mitchell-Jones et al. in press), and the Southern Anatolia near to those in the Levant region (viz. Harrison 1962, Harrison & Bates 1991). Although a great deal of the Mediterranean records of *N. noctula* comes from the transient period and may concern migrants of the northern populations (Strelkov 1997a, b), it is apparently not the case at least with those from the Levant region (cf. Harrison 1962) and supposedly also those from the Southern Anatolia.

**Taxonomic status**. Harrison (1962) based on the simple from Lebanon described a new subspecies *N. noctula lebanonicus* Harrison, 1962 (terra typica: Natural Bridge, Lebanon) distinguished from the nominotypical form *N. n. noctula* (Schreber, 1774) (t. l.: France) by a dark colour of pelage. He compared it with the Central Asian form *N. n. mstekburezvi* Kuzjakin, 1934 (t. l.: Tashkent, Uzbekistan) which is considered to be very pale, and with the East-Asian forms generally dark coloured but metrically different. He also mentioned the Persian examples of the nominotypical subspecies. Corbet (1978) reported *N. n. noctula* for Europe (incl. the Balkans), *N. n. lebanonicus* for the Levant, and *N. n. mstekburezvi* for the Central Asia. Records from Transcaucasia and Iran has been attributed to the nominotypical form only (DeBaise 1980, Strelkov et al. 1978).

As mentioned above, Strelkov (1997a, b) has supposed that all findings of *N. noctula* in the Mediterranean are just examples of migrating individuals which areas of reproduction lies northern of ca 45°N (except for Caucasus Mts. and Transcaucasia). It seems quite probable, of course, that besides of them there exist even in that region a resident, supposedly non-migrating population, more or less isolated from those of the nominotypical form. This is the case of the Levant population and most probably it concerns also that of the Southern Anatolia. Unfortunately, the record is still so scarce that it is quite impossible to draw any definite opinion.

**Nyctalus leisleri** (Kuhl, 1817)

**Records**


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DISTRIBUTIONAL STATUS (Fig. 24). Few Turkish records represent the southern marginal points of the Eastern Mediterranean distribution range of *N. leisleri* (Corbet 1978, Mitchell-Jones et al. in press). A great majority of the East-Mediterranean records of this species come from the spring and/or autumn transient period and concerns not a resident population but migrants (Horáček et al. 1998).

TAXONOMIC STATUS. Corbet (1978) and Koopman (1994) has supposed that except for populations from the Atlantic islands (Madeira and Azores), *N. leisleri* (Kuhl. 1817) (terra typica: Hanau, Germany) exists in just one monotypic form. This opinion is consistent also with that by DeBlase (1980) who evaluated the sample from Iran and Palmeirim (1991) who studied variation in the westernmost range of the species. Steiner & Gaisler (1994) with reference to them include their Turkish records in *N. l. leisleri* what because of the above mentioned distributional reason is undoubtedly a very substantiated. A question is, however, whether a lack of geographic variation concerns also the Central-Asian part of the range colonized with mutually quite isolated and supposedly non-migrating local population (cf. Rybin et al. 1989).

**Nyctalus lasiopterus** (Schreber, 1780)

**Record Literary datum**. Bursa Mustafakemalpaşa distr. [1]. tree hollow (Kahmann 1962)

DISTRIBUTIONAL STATUS (Fig. 24). Until now, *N. lasiopterus* has been from Turkey reported only once, probably at time of its migration period. Ten records are available from Caucasus Mts. and Transcaucasia (cf. Tsytulina 1998), and, hence, this species can be expected also in the Northeastern Anatolia.

TAXONOMIC STATUS. Corbet (1978), DeBlase (1980) and Koopman (1994) considered this species monotypic and all its populations arranged under *N. lasiopterus lasiopterus* (Schreber, 1780) (terra typica: Italy).
**Otonycteris hemprichi** Peters, 1859

**Distributional Status** (Fig. 25). The only record of *O. hemprichi* from Turkey represents the northwestern marginal point of its distribution range in the Middle East (viz. Horáček 1992; Nader & Kock 1983). The distributional pattern of this species is conform with that characterising the Saharo-Sindian Desert Mammals in the sense of Harrison (1964) which reach the northern margins of their distribution in Turkish part of Upper Mesopotamia.

**Taxonomic Status**. Corbet (1978) reported for Israel and Arabia a subspecies *O. hemprichi* jin Cheesman et Hinton, 1924 (terrapica: Hufuf, Saudi Arabia), for Iraq *O. h. petersi* Anderson et de Winton, 1902 (t. l. Faq, Persian Gulf, Iraq), and for Northeastern Iran *O. h. cinebra* Satunin, 1909 (t. t.: Bamen, Khorasan, Northeastern Iran). The Turkish population apparently belongs to that inhabiting the Syrian desert and Palestine, where Qumsiyeh (1985) located the form *O. h. jin*, the view adopted also by Koopman (1994). In contrary, Harrison & Bates (1991) has proposed that the form inhabiting the Syrian desert and Iraq should be classified as *O. h. petersi* whereas *O. h. jin* inhabits the area more to the south. Horáček (1991) found a cline variation in size and pelage colouration from Maghreb through Egypt up to the Central Asia and doubted a reality of subspecies within this species at all.

**Barbastella Gray, 1821**


**Distributional Status** (Fig. 25). Few records of *Barbastella* in Turkey come from three quite separated geographic regions: (a) Istranca Mts. in Thrace, (b) the Easternmost Pontus, and (c) steppes of Central Anatolia. While the former two are among just the best developed patches of humid woodland habitats in Turkey and both neighbour the non-Turkish regions from which more records of *B. barbastellus* are available (cf. e.g. Mitchell-Jones et al. in press, Bobrinskij et al. 1965), the region (c) differs quite a much. It is characterized with a dry and climatically quite severe rocky steppes of Central Anatolia almost without any woodland vegetation. Both the records in that region (Nos 2 and 3) are quite isolated as well from the former ones (that can be looked upon as offshoots of more or less continuous distribution of *B. barbastellus*) as from the other nearest records of this genus which are available from central Iran (DeBlase 1980) and Israel (Harrison & Makin 1988, Harrison & Bates 1991).

**Taxonomic Status**. The genus is considered to consist of two species, both coming in account also in the Eastern Mediterranean and the Middle East (Bobrinskij et al. 1965, Corbet 1978, DeBlase 1980, Koopman 1993, 1994, Kusakbin 1950, Veračić 1959, Pavlinov et al. 1995 et al.). *B. barbastellus* (Schreber, 1779) (terraspica: Burgundy, France) distributed in the northwestern part of Palearctic region (European temperate forests up to Caucasus Mts.) and *B. telemelas* (Cretzschmar, 1826) (t. t.: Arabia Petraea [= Sinai]) in the major part of the Middle East (from the Northeastern Africa and Arabia to Central Asia). *B. telemelas* consists of two subspecies, nominotypical *B. t. telemelas*, and *B. t. danyeelingensis* (Hodgson, 1855) (t. a.: Darjeeling, Northeastern India), the population of the Middle East being arranged under the nominotypical species (Corbet 1978, DeBlase 1980, 1982).

Both the species are discriminated particularly based on differences in shape of auricle, namely by a presence of a distinct lobe at the outer margin of pinnae in B. barbastellus and its absence in B. leucometas. As shown e.g. by Hackethal et al. (1988), both these character states occur even in a Mid-European population of B. barbastellus and, hence, its validity for species diagnosis is doubtful. Hackethal et al. (1988) demonstrated, moreover, that in the southern part of Central Europe, the frequency of "leucometas" morphotype is higher than in the Northeastern Europe. Neither the other characters discriminating both the species (cf. Harrison & Makin 1988) are more impressive. These concern mainly bigger size and somewhat paler coloration in "leucometas". According to Kuzjakin (1950) and Bobrinsky et al. (1965), the forearm length of the morphotype "barbastellus" is 36–41 mm, of the morphotype "leucometas", it is 41.2–45 mm. Koopman (1994) reported 36–41, 38–45 mm respectively. DeBlase (1980) reported for B. leucometas from Iran the forearm length 42.0–42.8 mm (n=3). There is no zone of sympatry except for southern Transcaucasia which is, of course, factually based on simultaneous appearance of the two auricle morphotypes only (Rahmatulina in litt.).

The individuals caught in humid woodland regions of Eastern Pontus and Thrace correspond in auricle characters to "barbastellus" morphotype (Helversen 1989b, Steurer & Gisler 1994). The bat caught in Cappadoxia was unusually big (forearm length 43.0 mm) and, unfortunately, it was letted free without its auricle morphotype was examined. Its size would fit rather to a variation range of "leucometas" than "barbastellus" but neither this character is indeed discriminating (note a variation span of the forearm length in a sample of 405 individuals of B. barbastellus noted in one South-Moravian locality (Czech Rep.): 36.8–43.2 mm with a mean 39.5 mm, one individual over 43 mm and 6 over 44 mm).
Summing up, there are several critical moments in taxonomy of this genus. It is doubtful that the southern part of the range is colonized continuously as it is the case in the northern form, *B. barbastellus*. The more probable is that it is split in mutually isolated and quite abundant vicariant populations which share the characters that, in frame of the genus, are apparently pleisiomorphic (e.g. auricle without a lobule, less developed incral crest, less contrasting colouration etc.). Mutual relations between the eastern group of these populations (i.e. *B. l. darjelingsis*) and the *B. leucomelas* s. str. seem to be even less apparent than the similarities between *leucomelas* and "barbastellus". The lectotype specimen of *B. leucomelas* (SMF No. 4737) is moreover of a small size (CM 4.6 mm, CM. 5.0 mm) and falls largely in variation range of "barbastellus" morphotype (cf. also Kock 1969) in almost all regions, *B. leucomelas*. It is quite a rare species and, hence, the realistic data on actual variation pattern within individual populations, that are prerequisite to any taxonomic conclusion, are largely not available. Consequently, since the characters discriminating the respective named taxa are faint only and there is no clear prove of sympathy between any of them, it seems reasonable to consider them, for the moment, as vicariant elements of a sole polytypic species rather than a couple of distinct species. This concept is preferred at least because it calls for a careful analysis of an overall pattern of geographic variation within whole the genus than for a search for seemingly reliable discriminating criteria established just with aid of a very limited comparative samples, as a rule.

**Plecotus auritus** (Linnaeus, 1758)


**Distributional status** (Fig. 36). *P. auritus* reaches in Turkey the southern margin of its distribution range (Mitchell-Jones et al. in press; Strelkov 1988). Besides of the Thracian and East-Pontic woodlands regions where this species can well be expected (cf. also *B. barbastellus*), a more than a half of its records come from two other regions with quite a different vegetation pattern. The two Thracian regions continue those from the Bulgarian mountains, 6 records in the Pontic region can be similarly related to the Transcaucassian records (Strelkov 1988), but it is undoubtedly not the case either with five records from Central Anatolia by Albayrak (1991a, 1993) and three from the province of Hatay. Those from Hatay were doubted already by Harrison (1964) who considered the sample reported by Kalmann & Caglar (1960) as *P. auritius* (see Kumerloev 1973, Nader & Kock 1983). In any case, it does not seem probable that distribution range is continuous in Turkey. The recent data suggests a vicariant situation, at least as concern: "the northern" (Thrace and Pontus) and "the southern" (Anatolian steppes and Hatay) populations.

**Taxonomic status**: Taxonomic status of the Turkish populations of *Plecotus auritus* has not yet been evaluated. More authors (Corbet 1978, Hanák 1966, Koopman 1994, Strelkov 1988) recognized in the Western Palearctics (from Caucasus Mts. to the west) just one subspecies *P. auritus*.
auritus (Linnaeus, 1758) (t. typica: Sweden). For Turkish material this opinion was adopted also by Helversen (1989) and Steiner & Gaissler (1994). Anyhow, an appearance of both the West-Palaearctic species of the genus Plecotus, a smaller Plecotus auritus (Linnaeus, 1758) and a bigger P. australacicus (Fischer, 1829), in Turkey was mentioned by many authors (i. e., Kemerloeeve 1975, Nader & Kock 1983, Helversen 1990). However, a larger sample was first collected by Albayrak (1991a) who used a shape of baculum as the diagnostic character to discriminate these species. Based on it (and perhaps also according to some metric characters) he classified all his sample from Asia Minor as P. auritus, and a small sample from Thrace as P. australacicus. He also claimed that the other characters, i.e. cranial and dental ones, are for the Turkish populations not sufficiently specific. His results are in contrasts with the traditional opinions according to which all bats of the genus Plecotus in the Middle East belong to Plecotus australacicus that is represented there with a subspecies P. a. cristatus Grey, 1838 (DeBlase 1980, Hanák 1966, Hanák & Elgadi 1984, Harrison 1964, Harrison & Bates 1991, Qumsiyeh 1985) characterised by a smaller body size but sharing with P. australacicus large bullae tympanicae. Also colouration in this form is paler and do not fit to the state in European P. australacicus. Albayrak (1991a) has identified whole his Anatolian material as P. auritus what sounds strange at least in respect to habitat requirements of P. auritus which in other regions are strictly linked to a woodland vegetation (cf. e. g. Hanák 1969).

Anyhow, the set of morphological characters by which Albayrak identify the South-Anatolian sample is undoubtedly valid and indeed differs considerably from that characterizing the homotypic subspecies of P. australacicus. This situation reminds that described by Ibañez & Fernandez (1983) in their comparison of Plecotus bats from Canary Islands and Iberian peninsula. The bats from Canary Islands which correspond in body size to P. australacicus while in phenetic characters (shape of baculum, size of canines, shape of processus angularis and namely the length of thumb) they remind rather P. auritus, were evaluated as an independent species Plecotus teneriffae Barrett-Hamilton, 1907 (t. t.: Orotava, Teneriffe I.). Such a "mixture" of characters of both the "standard" Palaearctic species is moreover typical also for Central-Asian populations which are usually,
according to a standard classification scheme of the genus established by Hanák (1966), classified within *P. australis* (Steelkov 1988, Rybin et al. 1989). Simply said, it seems that in frame of the whole Palaeartic region, the taxonomic situation of the genus *Plectus* is perhaps much more intricate than it was expected and, undoubtedly, it calls for a new comprehensive revision. The situation revealed just in context of the Turkish *P. australis* illustrates it quite a well. For the moment, we tentatively conclude that (a) the populations from the northern arboreal zone of Turkey most probably indeed belong to *P. australis* s. str. while (b) the taxonomic status of those from the Central Anatolia and Hatay is to be kept uncertain until a detailed revision of the genus in frame of whole the Middle East is as to be expected.

**Plectus australis** (Fischer, 1829)


**Distributional status** (Fig. 26). The situation concerning this species is not completely clear because of the reasons mentioned in the previous species. On the base of known records, it can be assumed that the distribution of *P. australis* in Turkey covers the distribution pattern discussed in the frame of the previous species. Both in Balkans neighboring the Thracean Turkish records and in Transcaucasia connected with those from the Eastern Pontus, *P. australis* ranks among relatively common species and more records are reported also from the Levant (Harrison & Bates 1991). Relations among the populations of these regions remain, even in respect to the Turkish record, unclear, of course. A lack of records in the Northern Anatolia as well as in the Western Anatolia is also worth of attention.

**Taxonomic status.** The major problems concerning the Turkish *P. australis* have already been discussed in context of the previous species. Anyhow, even in frame of a traditional concept the situation is far from being easy. The European range is attributed to the nominotypical subspecies *P. australis australis* (Fischer, 1829) (terra typica: Vienna, Austria) while the population in the Adriatic islands were described as a separate subspecies *P. a. kolomokiou* Dulčić, 1980 (t. a.: Žrnovo, Korčula I., Croatia) that tentatively was accepted by other authors (Horáček et al. in press, Koopman 1994, Strelkov 1988). In the Middle East region, there are, of course three to four other named forms that come here in account, viz. *P. a. christiei* Gray, 1838 (t. a.: Northern Africa — Sinaï), *P. a. wardi* Thomas, 1911 (t. a.: Ladik, Kazakhstan), *P. a. macrobullaris* Kuz’nikov, 1965 (t. a.: Vladikavkaz, Caucasus Mts., Southern Russia), and *P. a. turkmenicus* Strelkov, 1985 (t. a.: Mangysłak, Western Usturt, Turkmenistan). Hanák (1966) named subspecies *P. a. australis* in European range, incl. Caucasus Ms., *P. a. wardii* in the Central Asia, and *P. a. christiei* in the Northern Africa. Hanák’s opinion was generally accepted and shared also by Corbet (1978) and Koopman (1994) who supplements it with the Caucasian subspecies *P. a. macrobullaris*. DeBlase (1980) preliminary arranged the Persian population under the subspecies *P. a. wardi*. The last and the most detailed revision was published by Strelkov (1988). He analysed the population of the Eastern-European and Asian range and draw for it the following subspecific arrangement: *P. a. australis* (Europe to the Southern Ukraine), *P. a. wardi* (Caucasus Ms., Transcaucasia, Asia Minor, Iran and the moun...
of the Central Asia), *P. a. turkeaniceps* (Kopetdag Mts and the Northwestern Karakum desert), *P. a. kazaksovi* Bohunskoj, 1926 (1 Barun Zasuk, Eastern Tsayam, China) in the Central Asia (Mongolia and the Eastern Turkestan) and *P. a. chisleti* from the Northern Africa. As the Turkish material is concerned, Helmern (1989b) described his material as a typical *P. australus* but differing in colouration from the Central-European samples, and our own experiences fit these observations too.

**Miniopterus schreibersii** (Kuhl, 1817)

[30] (Caglar 1969) - Harrhybe magarsa cave [31], 2 ind (Albayrak 1990), Harrhybe, cave, 23 Feb 1960 1m 19 May 1960 9m (Caglar 1965), - Nafishey koyu village [32], cave, 19 Feb 1960 2m, 2f (Kahmann & Caglar 1960 Caglar 1965, 1969) Kamarlak magarsa cave, 3 ind (Albayrak 1990) - Telci Aisnur [33], runs, 18 Feb 1961 1f (Caglar 1965 1969), - Kulsikoy village [34], abandoned house, Spring 1967 obs 2 ind (van Woud 1988) - Karpata Akku (Anamasa) [35], Zindin magarsa cave, 6 ind (Albayrak 1993) - Istanbul 10 km W of Site 36), Sarzmal magarsa cave, 29 April 1955 4 ind (Simons 1959) - Belgrad: Orman [37], 23 May and 25 June 1966 (Harks 1972) - tower of Fort Rammel Hilir [38], 1 Sept 1953 13m, 1f (De Blass & Martin 1973), - Gokceci (n Catalca) [39], cave, 26 May 1960 6m, 6f (Caglar 1965, 1969), - Kuçukuşkemene [40] (Caglar 1969), Hetlikali, 13 May 1971 19m, 9f (De Blass & Martin 1973, Peterson et al 1976) - Yumurtbagg [41], cave, 22 April 1959 2m, 2f 19 May 1960 1m (Caglar 1965) - I. m. r. betww Cimino and Uula [42], street, 14 April 1969 1 ind (Kock 1974), Gumbgud [43], Incilti pit, 1 ind (Albayrak 1993) - Zeytinik koyu village [44], cave, 20 April 1963 2m (Caglar 1965 1969) - Karan Aral, Kuçük Agri Bagu (Lesser Aranit MI) [45], Suralpahkaylasi, 15 ind (Albayrak 1999) - Kirklarcleri DEMIRKOY [46], cave, 17 July 1961 6m, 1f (Caglar 1965, 1969), - Demirkooy, Samardere (= Sarpce) koyu village, Kaz magarsa cave [47], 2 ind (Albayrak 1993) - Ignacda [48], Temper magarsa cave 3 ind (Albayrak 1993) - Kocakli Ayruna koyu village (n Kar visual) [49], cave, 20 Dec 1959 1f (Caglar 1965, 1969) - Konya Soma koyu village [50], Koyre magarsa cave 3 ind (Albayrak 1993) - Mugla Fethiye koyu village (n Bodrum) [51], cave, 2 April 1964 11m, 1f (Caglar 1965, 1969) - Nigde Gumesler [52], Etirik magarsa cave, 2 ind (Albayrak 1993) - Ordu Yarici koyu village [53], 40 ind (Albayrak 1996), - Sirti Sagirian (Bosphorus) koyu village [54], 3 ind (Albayrak 1996) - Tokat Turali, Pozar (Alaycin) koyu village [55], Indera mokha, 3 ind (Albayrak 1990) - Trabzon Akgabat [56], cave, 12 Sept 1961 3m, 10f (Caglar 1965, 1969), 20 Sept 1967 2m, 2f 4 April 1969 6m, 6f (Steiner & Gassler 1994) - Kirchame [57], cave, 21 June 1960 1m (Caglar 1965, 1969), - Mugla, Baglari (= Bursa) koyu village [58], 8 ind (Albayrak 1999) - Zonguldak Yenice (n Karabuk) [6], cave, 4 Jan 1960 8m, 3f (Caglar 1965, 1969)

**Distributional Status** (Fig. 27) _M. schrebersi_ has been recorded in all biogeographic regions of Turkey (Tab 1), except for the Mesoamerican Steppes. The most records come from the coastal regions.

**Taxonomic Status** Corbet (1978) has identified whole the European population with _M. s. schrebersii_ (Kuhl, 1817) (terra typica Banat, Hungary), those from Asia Minor and Caucasus Mts up to Kopetdag Mts with _M. s. pallidus_ Thomas, 1907 (t shore of Caspian Sea, Iran) while the Eastern ones from India to Japan with _M. s. fuliginosus_ Hodgson, 1835 (t Nepal). The differences between the nominate type form and _M. s. pallidus_ lie in a paler colouration of the latter, and in this respect, many authors (De Blass & Martin 1980, Harrison & Bates 1981, Koopman 1984, Nader & Kock 1987, Steckov et al. 1978) confirmed that concept of subspecific subdivision which attributed the territory of Asia Minor to _M. s. pallidus_. The Turkish material was actually analyzed only by Steiner & Gassler (1994) who identified _M. s. schrebersii_ in the Western Anatoia (record No 14) and _M. s. pallidus_ in the Eastern Anatolia (provinces of Trabzon and Erzurum).

**Tadarida teniotis** (Rafinesque, 1814)

Fig. 28. Records of *T. teniotis* in Turkey. For symbol explanations see Fig. 4. Open symbols denote but detector records.


**Distributional Status** (Fig. 28). In comparison with the last survey of distribution of this species in the Mediterranean region (Kock & Nader 1984) which reported only two records of *T. teniotis* in the Southern Anatolia and one from Erzurum (Northwestern Anatolia), the picture of this topics has radically changed. The recent records suggest that *T. teniotis* is distributed probably over almost the whole Asian part of Turkey.

**Taxonomic status.** The first, who noticed the Turkish population of *T. teniotis* was Lehmann (1966). He attributed the findings from Birecik to the nominotypical form *T. t. teniotis* (Rafinesque, 1814) (type locality: Sicily, Italy). Hayman & Hill (1971) supposed, that populations living in Egypt, in Maghreb and in the Middle East belong to the form *T. t. rupeppeli* (Temminck, 1826) (t.: Egypt). Corbet (1978) considered this name as a synonym of the nominotypical which he applied for the whole Western Palearchica. Kock & Nader (1984), who revised the material and the distribution of this species, considered the Turkish population as a part of the Middle Eastern population that should, according to them, belong to the colour different *T. t. rupeppeli*, the view adopted also by some other authors (Harrison & Bates 1991, Qumsiyeh 1985). DeBlase (1980) respects both subspecies but the finding from Elborz Mts. (Northern Iran) he arranges under the form *T. t. teniotis*. The form *T. t. rupeppeli* he shows just from the coast of the Persian Gulf.

Similarly as in many other species, also in the case of *T. teniotis*, it holds that without geographic variation over whole species range is comprehended, the taxonomic status of the Turkish population cannot be established for sure.
DISCUSSION AND CONCLUSIONS

Until present, the bat fauna of Turkey consists of 31 species (see Tab. 1). Except for two (Myotis dasycneme, Eptesicus nilssonii) it includes all species composing the European continental bat fauna (sensu Mitchell-Jones et al. in press), what means 29 species and 94% of the European species. On contrary, the Turkish bat fauna is richer by Rousettus aegyptiacus and Otomys cervicapra that absent in Europe. Out of 44 species composing the Middle East bat fauna (in sense of DeBlase 1980, Harrison & Bates 1991, Horlick & Handž 1984, and Steiner & Gatsler 1994 the Tropical Ethiopian Mammals in sense of Harrison 1964 being excluded), 27 species, i. e. 61% were found also in Turkey. In general, Turkish bat fauna exhibits maximum resemblance to the West-Palaearctic arboreal. Most of the elements characteristic of the Arabian South Palaearctic premial (i. e. Rhinolophus clivosus, Tadarida aegyptiaca, Eptesicus nasutus, Hypsugo ariel (incl. H. badenhammeri and H. arcticus), Pipistrellus rupPELLi, as well as the families Rhinopomatidae, Emballonuridae, Nectaridae, and Hippopodridae) do not reach the territory of Turkey and/or are represented with quite exceptional marginal records (Otomys cervicapra, Rousettus aegyptiacus). The only two species of such a character occur here more regularly, viz. Pipistrellus kuhlii and Eptesicus bottae, both attaining maximum abundance in the South-Anatolian coast regions.

However, only a few species inhabit the whole Turkish territory (i. e. all biogeographic regions) and only two were actually found in all biogeographic zones, viz. Rhinolophus ferrumequinum and Pipistrellus kuhlii. Both the species are distributed as well in most of the Mediterranean as in the regions of the Levant and Mesopotamia (Harrison & Bates 1991).

In Turkey, many species reach the southern and/or the southeastern margin of their World distribution. This is characteristic of the elements of the West-Palaearctic arboreal that are distributed mainly in the zone of temperate forests and reach maximum density in continental Europe and Siberia. The following members of the Turkish fauna belong in this group: Myotis bechsteinii, M. mystacinus, M. brandtii, M. daubenii, V. marinus, P. nathusi, N. leisleri, N. lasiopterus, B. barbastellus (s. s.) and P. auritus. These species do not live more to the south, i. e. in Arabia sensu Harrison (1964), some of them, however, appear in the fauna of Iran (DeBlase 1980, Steiner & Gatsler 1994). M. myotis, and also M. capaccini, reach in Turkey the eastern margin of their distribution range. M. myotis occurs also in the coastal areas of the Levant up to the Central Israel (Harrison & Bates 1991) but it does not live to the east from the Rize–Erzurum–Diyarbakir–Antakya line in Turkey (see Fig. 10). M. capaccini inhabits only the Aegean and Levantine coastal areas from Thrace up to Hatay (see Fig. 17) and Israel, respectively (similarly as M. myotis), i. e. a relatively humid areas but also reaches, of course, the lower Mesopotamia and the Southern Iran (DeBlase 1980, Harrison & Bates 1991, own data).

The next group of species consists of those which are distributed in almost whole territory of Turkey except for Mesopotamia. These forms belonging to a group of "Boreal Eurasian Mammals" in the sense of Harrison (1964: Fig. 1) are distributed also in all neighbouring regions except for just the Mesopotamian steppes, i. e. in the Levantine coast, in a region north of Dead Sea, Zagros Mts. and in the Northern Iran up to Kopetdag Mts. (DeBlase's 1980 "Northern" species). Such a distributional pattern can be observed in R. euryale, M. blythii, M. emarginatus, E. serotinus, H. savii, and P. pipistrellus, and probably also in M. nattereri. To a considerable degree it fits also to a situation revealed in R. hipposideros, R. blasii, P. austrinus, and M. schreibersii which ranges continue much far in the south.

The last group consists of species which reach just in Turkey the northern and/or the northwestern margin of their distributional range (Fig. 30). This group consists of R. aegyptiacus, E. bottae, and O. hemprichii, in the moment, although its enrichment with extralimital records of some other species can be expected. First, this may concern of Taphozous nudiventris Cretzschmar, 1830,
### Tab 1: Number of records in individual biogeographic units (see text and Fig. 3)

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<td><em>Micropterus scheindeeri</em></td>
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<td><em>Tadarida teniotis</em></td>
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Total (no records) 115 128 91 334 86 167 127 320 91 74 40 10 869

Total (no species) 23 20 20 28 18 22 21 24 17 20 11 3 31

records per species 5 6 4 4 11 9 4 4 9 6 9 3 5 2.7 2.6 3.6 28.9

that is widely distributed in Mesopotamia almost up to Mosul (the nearest ca 150 km from the Turkish border) (Harrison & Bates 1991, own data). However the closest (ca 60 km from the Turkish border) is a site in Basset Mts., on the western bank of the Urumiyah Lake, Northwestern Iran, that repeatedly provided in total 36 specimens (DeBlase 1980, Lay 1967). Another species that can be expected in the Turkish territory, is *Aselliella trodon* (Geoffroy, 1813). The northern margin of its distributional range runs through the Central Syria, Mesopotamia and Zagros Mts. (DeBlase 1980, Harrison & Bates 1991). The closest finding has been reported by Wettstein (1913): 49 specimens from Mosul (Northern Iraq), so ca 100 km to the south from the Turkish border. A distribution pattern similar to *O. hampsoni* exhibits also *Rhynopoma microphylhum* (Brunnerich, 1782) and *R. hardwickii* Gray, 1831 (viz. van Cakenberghe & de Vree 1994). Although they are not known from Syria, this does not mean too much because of almost a complete lack of knowledge on bats of that country (cf. Benda 1996). Out of "the southern" species, known from the Lower Mesopotamia and/or the Southern Levant (sensu DeBlase 1980, Harrison & Bates 1991), also *Eptesicus nasutus* (Dobson, 1877) and *Pipistrellus rupepieli* (Fischer, 1829) may come into account, eventually. Their
closest records (cf. Harrison & Bates 1991) are, of course, already fairly distant from the Turkish border.

Although it is greatly probable that there will be more addition to a list of Turkish bat fauna, it seems less probable that it will be due to the species which mainly ranges lie northeastern and/or northwestern of the Turkish territory, i.e. those inhabiting the Balkans and/or Transcaucasia. One of such species is *Epitesicus nilssoni* (Keyserling et Hissius, 1847) is known both from Transcaucasia (Azerbaijan, Georgia) and the Northern Iran, and from Bulgaria (DeBlase 1980, Hanák & Horáček 1986). All its records from these regions are quite exceptional, of course, and are related to patches of boreal woodlands, mutually quite isolated. If it is so, then it cannot be excluded that such an isolated population could inhabit also the higher altitudes of the Northern Turkey, like Istranca Mts., Armenian Highlands or the Eastern Pontic Mts. Similarly, *M. bravaii* also announced so far only from the Eastern Pontus, can be found in Istranca Mts. since in the Southern Bulgaria it has already been recorded (Horáček et al. 1974). The other forms unknown from Turkey, as yet, are *Myotis schauderi* Kormos, 1934, and *Epitesicus bottae ognevi* (Bobrinskii, 1918) reported from Transcaucasia and from the Northern Iran. In the Nakhtchevan (= Xaxçivan) part of the Araxes River valley they were recorded directly from the Turkish border (viz. Horáček & Hanák 1984, Nader & Kock 1990). Therefore they can probably live also on the Turkish site of this valley, and maybe even further to the north-west (cf. Koopman 1994).

The structure of chiropteran records obtained from individual biogeographic units (Tab. 1) was examined with aid of parametric correlation and UPGMA cluster analysis. The results (Fig. 29) splitted whole the region in three areas exhibiting a corresponding degree of faunal similarity, viz. (1) the humid western and coastal northern part of Turkey, (2) the arid regions of the Central and Eastern Anatolia, and (3) the southern parts (East-Levantine coast, Mesopotamia) which fauna is the most distant from all. Worth mentioning is also the pattern of relations among the areas of the group (1). A compact group of the Thrace, exhibiting the Balkan faunal pattern and the region of Northwestern Anatolia is faunally closely related to the western coast of Anatolia, apparently influenced also with effect of the Aegean archipelago. The most relative to them is fauna of

![Fig. 29 Results of UPGMA cluster analysis on correlations among biogeographic units based on the data summarized in Tab. 1 (see also Fig. 3)](image-url)
the Eastern Pontus, close to Transcaucasia. As well in the case of the former group as with Pontus the most characteristic feature is a considerable representation of the elements of the European Boreal type (cf: Tab 1).

The analysis confirmed that the major difference in faunal structure are between the Northwestern and the Southeastern Turkey: the territory of the Upper Mesopotamia and Hatay is either poor in the boreal elements and it contains the forms that do not appear in any other regions (namely those representing a group of Saharo-Sindian Desert Mammals in sense of Harrison 1964). The Central and Eastern Anatolian plateau are inhabited by the transient type of fauna, that neither can be coidentified with the Boreal pattern of the Northwestern region nor with the afro-eremial aspects of the Southeastern zone. It is relatively poor, and in contrast both with the other major groups, without any forms that would be exclusive just for this region. Worth mentioning is, that in more species it seems possible to correlate the borderlines between the above mentioned major zoogeographic regions with the transitional zones among phenotypically different populations (that may be considered as different subspecies, eventually). The following taxa may serve as examples: *R. ferrumequinum* (*R. f. ferrumequinum* in the west, *R. f. irani* in the east), *M. myotis* (*M. m. myotis* and *M. m. macrocephalicus*), *M. myotis* (*M. b. oxygnathus* and *M. b. omari*), *M. nattereri* (*M. n. nattereri* and *M. n. tschulensis*), *M. emarginatus* (*M. e. emarginatus* and *M. e. turcomanicus*),
Hypsugo savii (H. s. savii and H. s. caucasicus), Miniopterus schreibersii (M. s. schreibersii and M. s. pallidus) and probably it may concern also the other species. Another type of geographic variation, the differences between the North-Turkish populations (so Pontic) and the South-Turkish populations (Taurus Mts.) probably exists in bats of the genus Eptesicus. The northern part of Turkey is inhabited by E. serotinus serotinus, the southern parts by E. s. shirazensis, or some other subspecies. Similarly, in contrast to E. bottae anatolicus, another subspecies, E. b. ognevii inhabits Transcaucasia and probably also the Northeastern Turkey. In respect to the categorical-like shifts in geographic variation in all the above mentioned species, the most significant transitional zone is apparently that which connects the Cilician coast, the northern margins of the Mesopotamia and the Van region, in Turkey.

As demonstrated earlier (Benda & Horáček 1995a), and as indicated by the above results, it is particularly just the region of Eastern Turkey that represents the most significant intergradation zone between different faunal and taxonomical units which apparently had to respond to different ecological and historical condition. In other words, it seems symptomatical that the region of Kurdistan is a hot spot not only in ethnical, political, cultural or geological contexts but, apparently, also as the faunal history and phylogenetic dynamics are concerned. Just that region can be looked upon as an organization knot by which the faunal history of the Eastern Mediterranean has always been modified, and in general it concerns the territory of Turkey at all. Already the exciting fact that 22 of 31 species composing the Turkish bat fauna reach here margins of their distribution illustrates quite a well that just the territory of Turkey represents one of the most important border zone within the whole Western Palearctic. Lastly but not least, as shown above, the region of the Middle East and the Turkish territory is of a crucial significance also for comprehension to taxonomy, phylogenetic dynamics and classification of more chiropteran species and/or species groups. Just here do arise as urgent problems the questions of species content of the groups which in other regions look like seemingly monotypic taxa. In particular this concerns Myotis mystacinus-group, bats of the genus Plecotus and Vespertilia, and, at the level of subspecific variation, also Eptesicus spp., Rhinolophus hipposideros, Myotis emarginatus, Pipistrellus pipistrellus, P. kuhlii, Otonycteris hemprichi, Miniopterus schreibersii, Tadarida teniotis and probably some others. All these topics call for a profound analyses which results could largely extent current understanding not only to the chiropteran taxonomy but to general patterns of phylogenetic and distributional dynamic in the region where the geological, climatic and environmental history have, for more than ten thousands years, continuously combined with a multistaged impact of human civilisation.

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REFERENCES


ALBAZKOV I 1988 The presence of Myotis daubentonii (Kuhl, 1819) in Turkey Mammalia 52 415-418


ALBAZKOV I 1990a The long-fingered bat (Myotis capaccini) from Turkey: Dogu – Turk. J. Zool. 14 150-155

ALBAZKOV I 1991 Studies on Myotis mystacinus and Myotis brandti (Mammalia, Chiroptera) in Turkey Mammalia 55 113-120


ALBAZKOV I 1993a Natterer's bat Myotis nattereri (Kuhl, 1816) (Mammalia, Chiroptera) in Turkey Mammalia 57 49-54

ANDREassed K 1905 On some bats of the genus Rhinolophus with remarks on their mutual affinities, and descriptions of twenty-six new forms Proc. Zool. Soc. Lond. 1905(2) 75-145


BENDA P 1993 Morfometricka promenlivost zapadnokarpatských form podrodu Myotis [Morphometric variation of West-Palaeartic forms of the subgenus Myotis]. Diploma thesis, Department of Zoology, Faculty of Sciences, Charles University, Prague, 153 pp (in Czech)

BENDA P 1996 Distribution of Cecottoy's bat Myotis emarginatus (Chiroptera, Vespertilionidae), in the Levant region Bela Zool. 45 193-199
Bobrinski N A, Kuznetsov B A & Klein A P 1965 Определитель млекопитающих СССР [Key of mammals of the USSR], Moscow Izdatelstvo Prosveshenie, 383 pp. (in Russian)
Bodelanovice K 1990 Geographic variation and taxonomy of Daubenton’s bat, Myotis daubentoni, in Europe. J Mammal 71 205-218
Bodelanovice K 1994 Myotis daubentoni Mamm Species 475 1-9
Bulow J 1977 Egyptian Flampionship (Roussetta aegyptius) in der Sud-Turkei. Sana Search 12 326-327
Caglar M 1996a [About lesser horseshoe bat (Rhinolophus hipposideros)] Turk Biol Derg 11(1) 11-13 (in Turkish)
Caglar M 1996b [About long-fingered bat, Myotis (Myotis capaccinii)] Turk Biol Derg 11(2) 35-37 (in Turkish)
Caglar M 1996c Myotis e. eximianus (Geoffroy, 1826), in der europaeischen Turkei Istanbul Univ Fen Fak. Mec., Ser. B 30(3 4) 125-134
Crawford G B 1978 The Mammals of the Palaearctic Region: a taxonomic review. London: British Museum (Natural History) and Cornell Univ. Press, 314 pp
Crawford G B & Moseley P A 1987 A collection of recent and subfossil mammals from southern Turkey (Asia Minor), including the dominoao Myomys micrurus personatus. J Nat Hist 21 561-569
Crotti F 1998 Chiroptera della Toscana e dell’Isola di Capo Ferro Att Soc Ital Sci Natur 130 129-139
Dawson C G & Alston E R 1880 On the mammals of Asia Minor Part II Proc Zool Soc Lond 1880 55-64
Deblase A P 1972 Rhinolophus euryale and R. mehelyi (Chiroptera: Rhinolophidae) in Egypt and Southwest Asia Proc J Biol Zool 21 1-12
Deblase A P 1980 The bats of Yemen, systematics, distribution, ecology Fedkiana Zool 4 412-424
Deblase A P & Martin R L 1973 Distributional notes on bats (Chiroptera: Rhinolophidae) from Turkey Mammalia 37 598-602
DePauw O 1995 Geographic variation of the Greater horseshoe bat (Rhinolophus ferrumequinum) in the Western Palaearctic Region. Myotis 32-33 33-44
Dorson G L 1878 Catalogue of the Chiroptera in the Collection of the British Museum (Natural History), 567 pp
Douglass S 1899 Mammalian Fauna of Turkey Ondokuz Mayis Univ Fen Fak Derg 1 107-136 (in Turkish, English abstract)
Douglass G 1887 The chiroptera of the afar region in Ethiopia Ann Mese Civ Star Natur Genova S 2 4(1888) 351-474
Ellerman J R & Morrison-Scott S C S 1951 Checklist of Palaearctic and Indian Mammals London British Museum Natural History, 810 pp
Flaher J 1971 Eine neue Art der Federmus-Gattung Epitrix aus Kleinasiens (Chiroptera: Vespertilionidae) Senckenbergiana Bd 52 371-376
Garler J 1979 The bats (Chiroptera) collected in Afghanistan by the Czechoslovak expeditions of 1965-1967 Acta Soc Natu Brno 46(1) 1-56
Garzaker A & Kraus M 1979 Krenzuchen und Verbreitung von Myotus brandti (Eversmann, 1845) Zbcher Senckenberg 35 113-124
Nazzi A D 1976 On the Mediterranean Horseshoe bat from Iraq Bull Natur Histor Res Center (Baghdad) 7(1) 157-176

Olubu J 1994 On the food of Eagle owl (Bubo bubo) and Tawny owl (Strix aluco) in the Eastern part of Turkey Tichodroma braslava 7 7-16 (in Slovak, Engl summary)

Palmirim J M 1991 A morphometric assessment of the systematic position of the Nyctalus from Azores and Madeira (Mammalia Chiroptera) Mammalia 55 381-388

Parker R S & Beshkov V A 1998 Species diversity of bats in underground roosts of Western Sura Planina Mts (Bulgaria) Vespertilionidae in press


Peterson B V, Martin R L & Beerling F W Jr 1976 A record of some bat flies (Diptera Nematocera) from Turkey Entomol News 87 239-242


Pek F 1976a Floehe aus dem Mittelmeergebiet (Insecta, Siphonaptera) IX Tharaka Folia Parasitol (Praha) 25 49-60

Pek F 1976b Floehe aus Afghanistan und dem Iran Ann Naturhistor Mus Wien 81 507-516

Qureshi M B 1983 The bats of Egypt Spec Publ Min Texas Tech Univ 23 7-102


Rakhrmatulla I K 1996 On the history of study and tendency of changes of the Eastern Transcaucassian bat fauna Myoxus 34 59-70


Sakuljic P 1953 Myotis yemeni Yamashiro in Yugoslavia Entomologica Bulg 13 12-17 (in Turkish)

Saint-Girons M C & Cauller B 1966 Notes sur les mammifères de France V Sur le repartition de Rhinolophus hipposideros et Hipposideros hipposideros minima France 1861 Mammalia 30 308-326

Sahmin K 1913 Uber die zoogeographischen Grenzen des Katakuskorallen Meerziegel in Mittel- und Osteuropa Zool Ann 70 56-106


Spitzenberger F 1994 The genus Euphicsis (Mammalia, Chiroptera) in Southern Anatolia Folia Zool 43 437-454


Steiner H M & Gasler J 1994 On a collection of bats (Chiroptera) from NE Turkey and N Iran Acta Sci Naturae Brno 28(1) 1-37

Strelkov P P 1959 Migratory and stationary bats (Chiroptera) of the European part of the Soviet Union Acta Zool Cracov 16 293-440


Strelkov P P 1986a Myotis mystacinus and Myotis brandti in the USSR and interrelations of these species Part 2 Zool Zurnal 62 229-237 (in Russian, Engl summary)

Strelkov P P 19813c [Record localities of Myotis brandti von Drahm 1845 and Myotis mystacinus Kuhl, 1819 (Chiroptera Vespertilionidae) based on collections from museums of the USSR] Trudy Zool Inst AN SSSR 119 38-42 (in Russian)

Strelkov P P 1988 Brown (Plecotus auritus) and Gray (P. austriacus) long eared bats (Chiroptera, Vespertilionidae) in the USSR Communication 1 Zool Zurnal 67 10-20 (in Russian, Engl summary)
(40° 42' N, 29° 52' E) and Peisaye (n. Almany [Kocoğlu]) (40° 40' N, 29° 31' E) – 15 Hercce (Kocoğlu) (40° 46' N, 29° 37' E) – 16 Demizköy (Sakarya) (41° 8' N, 30° 35' E) – 17 Hanyzitik (Sakarya) (40° 33' N, 30° 18' E) – 18 a rocky massif 19 km NE of Sivrihisar (Erkânehir) (39° 31' N, 31° 39' E) – 19 Abant Golu Lake (Bolu) (40° 38' N, 31° 16' E) – 20 Çevre (Bolu) (40° 39' N, 31° 31' E) – 21 Bolu (Bolu) (40° 45' N, 31° 37' E) – 22 Çaycaş, Çayköy Mecidiyekent cave (Çengelkale) (41° 27' N, 32° 02' E) – 23 Yenice (Çengelkale), village (41° 11' N, 32° 19' E) and a large cave on the railway (41° 13' N, 32° 20' E) – 24 Yalmanca (Çengelkale) (41° 9' N, 32° 33' E) – 25 Karabük (Çengelkale) (41° 12' N, 32° 58' E) – 26 Sapanbolu, Meneler (= Meneler) Mecidiyekent cave (Çengelkale) (41° 17' N, 32° 41' E) – 27 Kayabı (n. Fethiye) (Mugla) (36° 55' N, 29° 5' E) – 28 Kınık (Antalya) (36° 21' N, 30° 20' E) – 29 Olympos (Antalya) (36° 25' N, 30° 30' E) – 30 Taşkışla, Bayramlar Mecidiyekent cave (Burdur) (37° 41' N, 30° 24' E) – 31 Belkiz, Susuz Han (Burdur) (37° 24' N, 30° 53' E) – 32 Šahin (Antalya) (36° 47' N, 31° 25' E) – 33 İmirzale Mecidiyekent caves (n. Basköy) (Konya) (37° 4' N, 32° 01' E) – 34 Boztagay, Yalda Dunya Mecidiyekent cave (İzmir) (36° 18' N, 33° 25' E) – 35 Sultvice, Castle of Süleyke (İzmir) (36° 24' N, 33° 57' E) – 36 Nartikoy (İzmir) (36° 27' N, 34° 7' E) – 37 Narlikuyu, Cemmet and Cehennem caves (İzmir) (36° 29' N, 34° 8' E) – 38 Devencucağı (Adana) (36° 47' N, 35° 38' E) – 39 Izkenderen (Hatay) (36° 36' N, 36° 10' E) – 40 Kınık (Hatay) (36° 19' N, 36° 49' E) – 41 Çevik (Hatay) (36° 6' N, 35° 56' E) – 42 Antakya (Hatay) (36° 15' N, 36° 08' E) – 43 Birecik (Sanlı Urfas) (37° 3' N, 37° 59' E) – 44 Harran (= Tishnabash) (Sanlı Urfas) (37° 51' N, 39° 2' E) – 45 Akköy (Kayseri) (38° 22' N, 35° 04' E) – 46 Heniza, Nargolu (Niğde) (38° 23' N, 34° 29' E) – 47 Göreme (Nevşehir) (38° 40' N, 34° 50' E) – 48 Kurulhaltepe (Ankara) (38° 34' N, 33° 27' E) – 49 Harran (Şanlı Urfas) (40° 1' N, 34° 38' E) – 50 Vakkary-Kabah (Sinop) (41° 52' N, 35° 6' E) – 51 Külliye (Sarım) (41° 42' N, 36° 1' E) – 52 Castle of Tokat (Tokat) (40° 38' N, 36° 13' E) – 53 Gümüş (n. Şirinkaya) (Silvan) (39° 27' N, 36° 33' E) – 54 Zara, Demiryard (Silvan) (39° 55' N, 37° 45' E) – 55 a cave 6 km SW of Maşka (Trabzon) (40° 47' N, 39° 35' E) – 56 Sumbul (Trabzon) (40° 42' N, 39° 40' E) – 57 Harput, Bazluk Mecidiyekent cave (Elazığ) (38° 41' N, 39° 16' E) – 58 Güzelyurt, a mountain pass 2300 m (Gümüşhane) (39° 54' N, 39° 24' E) – 59 Ünye (a town near Derebey (Tunceli) (59° 35' N, 39° 55' E) – 60 Tercan (Erzurum) (39° 17' N, 40° 22' E) – 61 İnov (Erzurum) (39° 41' N, 41° 82' E) – 62 Alan Han (Bitlis) (38° 28' N, 42° 12' E) – 63 Cevle of Van (Van) (38° 30' N, 43° 20' E) – 64 Marmaralı cave (Van) (39° 2' N, 43° 44' E) – 65 Arhak (Kars) (39° 52' N, 44° 31' E) – 66 Turice (Kars) (40° 3' N, 43° 40' E) – 67 An, town of Armenian town (Kars) (40° 31' N, 43° 34' E) – 68 Kaygizan (Kars) (40° 10' N, 43° 08' E) – 69 Bogazkale (Kars) (40° 06' N, 42° 29' E) – 70 Horasan (Erzurum) (40° 3' N, 42° 10' E) – 71 town 5 km N of Sırıhan (Kars) (40° 19' N, 42° 20' E) – 72 ruins of a castle near Kupruhisar (Erzurum) (40° 37' N, 42° 17' E) – 73 tunnel 5 km W of Sırıhan (Kars) (40° 19' N, 42° 33' E) – 74 canyon 10 km SW of Aydogu (Erzurum) (40° 40' N, 42° 25' E) – 75 Murgul, Damar village (Artvin) (41° 15' N, 41° 35' E)
BOOK REVIEW


During just ten years, biology and evolution of shrews has been addressed with an increasing amount of contributions including even the extensive volumes such as the proceedings of special symposia devoted just to shrew topics (Hanski et al 1990, Hausser 1991, Zima et al 1994, Frick & Searle 1996), in particular that of the symposium "Advances in the Biology of Shrews" (Moritz et al 1994). All this demonstrated shrews as a group extremely attractive from ecological, phylogenetic and evolutionary points of view. What is more, shrews proved to be an ideal model for study general aspects of these subjects. Nevertheless, though demonstrated actual content of the matter, no of these volumes provided an overall review of shrew topics that would respond as well a need of a comprehensive summary of current state of knowledge respecting the whole of the primary evidence and topical extensions of shrew topics as a need of a reliable introduction of the group as a phylotaxonomic unit to everyone whomever it may concern.

The editors of "Evolution of Shrews" decided to respond just these claims. The book was published in the Mammal Research Institute PAS in Bialowezia, founded by the pioneer of modern research in shrew biology, the late Augusto Dohrn, a laboratory in which shrews have continuously been studied for half a century, last but not least thanks to its past director, Professor Jozef Piskiewicz, to whom the book is dedicated. The book is composed of 13 chapters written by 21 authors, mostly the leading specialists of the group. Almost one third of the book is devoted to fossil record of the group, the other third to the chronological evolution and/or to biochemistry and molecular approaches to the topic, the remaining third deals with evolution of energetic strategies, social and mating systems. The book is supplemented with an appendix providing a list of living shrew species (by M. Wolsan and R. Hunter) and a detailed taxonomic index.

The Chapter 1 (A Classification of the Fossil and Recent Shrews) by Jozef Piskiewicz provides a brief review of major classifications of the group (unfortunately without quelling e. g. those by Van Valen (1967) and Gurtew (1979) by which eutaxon generic taxa has not been included here - e. g. Nectogalina Gurtew, 1979), establishes in short but in quite an excellent way diagnostic characters of major clades, and last but not least proposes a revised scheme of suprageneric classification of the family (The Chapter 2 (Fossil History of Shrews in Europe) by J. Piskiewicz and J. Hausser provides a series of 150 pages nearly a complete list of European fossil records reported for all the named species, summarized into a brief account of fossil evolution. The reader may would appreciated here a more detailed information (true shifts in fossil structure, arid trends in particular clades, phylogenetic inference of the fossil record etc.) but it apparently was not the major goal of this, otherwise quite excellent, survey. Fossil history of shrews is concerned also within next three chapters summarizing it for Asia (G. Storch, Z. Puc, V. Z. Zarhinski), Africa (P. M. Butler) and North America (A. H. Haven) (Chapter 6 "Dental Adaptations in Shrews" by E. D. Mathews gives a detailed description of dental specializations in major part of shrew genera). Unfortunately, this is the only chapter devoted to morphology, and neither it analyses functional aspects and evolutionary consequences related to the major morphotype of the clade, the elodonty mandibular point.

The chapters 7 and 8 deal with chronosomal evolution in shrews. The former one by J. Zima, L. Lukesova and M. Machova surveys all the data available for the family of Soricidae and analyses the chromosome specializations in particular species groups. The latter one (J. B. Searle, J. M. Wojcik) discusses in details the case of Sorex araneus, e. g. the top current by which shrews became a top model for study of hybridization dynamics and microevolutionary processes. The following two chapters (9 Protein Evolution by M. Rael, 10 Mitochondrial DNA Evolution by J. Hausser, J. Piskiewicz and P. Tabert) supplement that topic with further background discussions by which the picture of evolutionary dynamics of shrews is getting even more photon.

Chapter 11 by J. R. Taylor (Evolution of Energetic Strategies) concerns general aspects of ecological physiology, optimization of energetic budget under natural conditions and for cost of reproductions. The next chapter (12 Evolution of Social Systems) by L. Ryckie, provides on almost 50 pages a very comprehensive survey of social organization and spatial structure of shrew populations during life cycle, distinguishes major types of social systems and discusses aspects of their evolution. The last chapter of the volume (by P. Stockdale and J. B. Searle) briefly summarizes data on mating system and related dynamics of reproduction strategies. The book is undoubtedly the most comprehensive monograph concerning shrews that ever appeared. Everyone who interested in up to date information on that topics will be entirely satisfied not only from complexity of individual review articles but also from extraordinary rich information on primary sources. The reference section is the book cover more than 92 pages with about 1500 references, there is a number of tabular surveys of primary data for each topic such as the karyotype characteristics, metabolic parameters, data on social organization, lists of fossil records etc. The only what a reader may miss is a general summary - e. g. chapter explaining in short what it is a shrew, what does make that clade well defined evolutionary unit, which have been the essential qualities and constitutional constraints establishing it and what designed the specific patterns of its phylogenetic strategy and its prospects in natural communities. Anywehow, already in this, the book opens to perspectives for further research and with its extraordinary qualities it has provided to is a very reliable platform.

To the editors of the book as well as to all its authors I wish to express my sincere congratulations.

Ivan Horodek
Lectotype designations in the Palaearctic and Oriental Agritus species (Coloecoptera: Buprestidae) of the Oberthür's collection in the Muséum national d'Histoire naturelle, Paris

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Abstract. List of type material of the Palaearctic and Oriental Agritus Curtis, 1825 species in the collection of René Oberthür, Muséum national d'Histoire naturelle, Paris is provided. Lectotypes from Dayrolle, Eschscholtz, Fairmaire, Gebler, Gory, Gory et Laporte and Marseul type material are designated.

Lectotype designations, Coleoptera, Buprestidae, Agritus, Palaearctic region, Oriental region

INTRODUCTION

During a study of the type material of the genus Agritus Curtis, 1825 in Museum national d'Histoire naturelle in Paris I also took an opportunity to examine material in the collection of René Oberthür. This collection comprises besides complete type material of all Oriental Agritus species described by Dayrolle, moreover several Oriental and Palaearctic types of Eschscholtz, Fairmaire, Gebler, Gory, Gory et Laporte and Marseul as well. The state of collection however, disallowed any handling with material. A major part of material was unlabelled except for a separate label, attached on the bottom of the box on the left side of a specimen or specimens. Into the collection have been added successively and inconsistently further specimens until the boxes were fully stuffed. Handling the material was complicated by corroded pins firmly fixed in the bottom of the box. Serious examination of the type material was impossible in the given conditions. Due to the kindness of J-J Memier I was allowed to perform several modifications in the Palaearctic and Oriental part of the genus Agritus of the Oberthür's collection.

MATERIAL AND METHODS

All specimens originally stored in two boxes were placed into new boxes and provided with yellow printed labels "MUSEUM PARIS 1952 COLL. R. OBERTHÜR". The successively included, non-type material was placed in a separate box. The original material was replaced along with corresponding labels and ordered as in the original boxes. The data from corresponding labels attached originally on the bottom of the box were rewritten by hand with black ink on the pre-printed label with the inscription "TRANSCRIPTION" in black border and attached to each specimen. The type material was finally labelled with red printed labels as follows: "LECTOTYPE" or "PARALLECTOTYPE" or "HOLOTYPE by monotypy", followed with unabbreviated species name (in original combination and original spelling), author or authors name, year of the publication and inscription "E. Jenek design 1997".

Present paper represents list of type material of the Palaearctic and Oriental Agritus species stored in the Oberthür's collection. The list includes formal designation of lectotypes and number of parallectotypes (if exist). The first line gives the available correctly spelled species name in recent generic combination, despite it is valid or not, followed by author and year of publication. Synonymy of a single species is not given as exceed scope of this.
LIST OF SPECIES

_Agrilus adonis_ Deyrolle, 1864

A[grilus] _Adonis_ Deyrolle, 1864 139, 171–172
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Adonis Deyr SIngapour [h]” Paralectotype, 1 specimen, sex not examined, labelled as lectotype. Number of syntypes unknown

_Agrilus aeneipennis_ Deyrolle, 1864

Lectotype, by present designation, male “Ceram [h]”. Paralectotype, 1 specimen, sex not examined “Ambone [b]”. Number of syntypes unknown, but more specimens are indicated by male and female characters listed in original description

_Agrilus aeneolus_ Deyrolle, 1864

A[grilus] _Aeneolus_ Deyrolle, 1864 145, 197
Lectotype, by present designation, sex not examined “Florès [h]”. Paralectotype, 1 specimen, sex not examined “TRANSCRIPTIO [p] Aeneolus HDeyr Ceram, Florès [h]”. Number of syntypes unknown

_Agrilus aeneomaculatus_ Deyrolle, 1864

A[grilus] _Aeneomaculata_ Deyrolle, 1864 140, 177
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Aeneo-maculatus HDeyr Florès [h]”. Number of syntypes unknown

_Agrilus agrestis_ Deyrolle, 1864

A[grilus] _Agrestis_ Deyrolle, 1864 147, 206–207
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Agrestis Deyr Borneo [h]”. Number of syntypes unknown

_Agrilus albogaster_ Deyrolle, 1864

A[grilus] _Albogaster_ Deyrolle, 1864 140, 175–176
Lectotype, by present designation, sex not examined “Singapour [h]”. Paralectotypes, 2 specimens, sex not examined “TRANSCRIPTIO [p] Albogaster HDeyr Borneo, Singapour [h]”. Number of syntypes unknown

_Agrilus albogularis_ Gory, 1841

Lectotype, by present designation, sex not examined “Type Gory [h]”. Number of syntypes unknown
Agrilus albogularis var. gallii Marseul, 1866

[Agrilus albogularis] Var. Gallii Marseul, 1866 482
Lectotype, by present designation, sex not examined “var Gallia Dej. Auroche [h]” Number of syntypes unknown

Agrilus albolatus Deyrolle, 1864

Agrilus] Albolatus Deyrolle, 1864 145, 195
Lectotype, by present designation, male "TRANSCRIPTIO [p] Albolatus HDeyr Singapoor [h]" Paralectotype, 1 male, labelled as lectotype Number of syntypes unknown

Agrilus albopunctatus Deyrolle, 1864

Agrilus] Albopunctatus Deyrolle, 1864 139, 166
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Albopunctatus HDeyr Singapoor [h]” Number of syntypes unknown

Agrilus amabilis Gory et Laporte, 1837

Agrilus Amabilis Gory et Laporte, 1837 52–53
Lectotype, by present designation, male "TRANSCRIPTIO [p] var Amabilis Gory Typ Saxe [h]" Parallectotype, 1 specimen, sex not examined, labelled at lectotype Number of syntypes unknown

Agrilus amethysticollis Deyrolle, 1864

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Amethysticollis HDeyr N. Guinee [h]” Number of syntypes unknown

Agrilus amicus Deyrolle, 1864

Agrilus] Amicus Deyrolle, 1864 138, 161
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Amicus Deyr Singapoor [h]” Number of syntypes unknown

Agrilus anthracinus Deyrolle, 1864

Agrilus] Anthracinus Deyrolle, 1864 142, 186
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Anthracinus HDeyr Mysolo [h]” Number of syntypes unknown

Agrilus ascanius Deyrolle, 1864

Agrilus] Ascanius Deyrolle, 1864 138, 159
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Ascanius HDeyr Ceram [h]” Number of syntypes unknown

Agrilus asperinus Marseul, 1866

[Agrilus] Asperinus Marseul, 1866 437, 492–493
Lectotype, by present designation, sex not examined. "Asparrimus (Laferte) type Mars[ad] Italie [h]"

*Agrillus abei* Gory et Laporte, 1837

*Agrillus* Aubei Gory et Laporte, 1837 44–45
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] var. Aubei Gory Type Paria [h]"
Paralectotype, 1 specimen, one without abdomen, sex not examined, labelled as lectotype. Number of syntypes unknown

*Agrillus auratus* Deyrolle, 1864

*Agrillus* Auratus Deyrolle, 1864 147, 209–210
Lectotype, by present designation, male. "TRANSCRIPTIO [p] Auratus Hdeyr. Borneo [h]" Number of syntypes unknown

**Type Locality.** Bornéo (corrected statement of the type locality)

**Remarks.** Deyrolle's (1864) statement of type locality "I Arrow" differs from that on lectotype's label.

*Agrillus auripennis* Gory et Laporte, 1837

*Agrillus Auripennis* Gory et Laporte, 1837 46–47
Holotype by monotypy, sex not examined. "TRANSCRIPTIO [p] Auripennis Gory Type France Mer [h]"

*Agrillus auripes* Deyrolle, 1864

*Agrillus* Auripes Deyrolle, 1864 141, 180
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Auripes Hdeyr. Mysole [h]" Number of syntypes unknown

*Agrillus auripilis* Deyrolle, 1864

*Agrillus Auripilis* Deyrolle, 1864 139, 167
Paralectotype, 1 specimen, sex not examined, labelled as lectotype. Number of syntypes unknown

*Agrillus bihamatus* Deyrolle, 1864

*Agrillus Bihamatus* Deyrolle, 1864 143, 189–190
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Bihamatus Hdeyr. Borneo [h]" Number of syntypes unknown

*Agrillus campestris* Deyrolle, 1864

*Agrillus Campestris* Deyrolle, 1864 147, 205–206
Lectotype, by present designation, sex not examined. "Camem [h]" Paralectotype, 1 specimen, sex not examined. "Ambroise [h]" Number of syntypes unknown

*Agrillus capitatus* Deyrolle, 1864

*Agrillus Capitatus* Deyrolle, 1864 141, 179

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**Agrilus carbonarius** Deyrolle, 1864

Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Capitatus [H]Deyr Singapour [h]"
Number of syntypes unknown.

**Agrilus celebensis** Deyrolle, 1864

Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Carbonarius [H]Deyr Céram [h]"
Number of syntypes unknown

**Agrilus chalybeus** Deyrolle, 1864

Number of syntypes unknown.

**Agrilus chrusciollis** Deyrolle, 1864

Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Chrusciollis [H]Deyr Batchian [h]"
Paratypotypes, 3 specimens, sex not examined, labelled as lectotype. Number of syntypes unknown

**Agrilus chrysochloris** Deyrolle, 1864

Lectotype, by present designation, male. "TRANSCRIPTIO [p] Chrysochloris [H]Deyr Boureu [h]" Paratypotype, 1 specimen, sex not examined, labelled as lectotype. Number of syntypes unknown.

**Agrilus ciliaipes** Deyrolle, 1864

Lectotype, by present designation, male. "TRANSCRIPTIO [p] Ciliaipes [H]Deyr Singapour [h]"
Number of syntypes unknown

**Agrilus coelestis** Deyrolle, 1864

Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Coelestis [H]Deyr Flores [h]"
Paratypotypes, sex not examined, 2 specimens labelled as lectotype, 1 specimen. "Flores [p]"
Number of syntypes unknown

**Agrilus concavus** Deyrolle, 1864

Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Concavus [H]Deyr [h]"
Number of syntypes unknown

319
Lectotype, by present designation, sex not examined: "TRANSCRIPTIO [p] Concavus HDeyr N. Guinea [h]". Number of syntypes unknown.

*Agrilus cuneiformis* Deyrolle, 1864

*A. cuneiformis* Deyrolle, 1864. 143, 187–188
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Cuneiformis HDeyr Mysolo [h]". Number of syntypes unknown.

*Agrilus cupreoviolaceus* Deyrolle, 1864

*A. cupreoviolaceus* Deyrolle, 1864. 139, 169

*Agrilus cuprifrons* Deyrolle, 1864

*A. cuprifrons* Deyrolle, 1864. 138, 159–160
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Cuprifrons HDeyr Ceolbas Monalo [h]". Number of syntypes unknown.

*Agrilus cupripes* Deyrolle, 1864

*A. cupripes* Deyrolle, 1864. 136, 149–150
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Cupripes HDeyr Céram [h]". Number of syntypes unknown.

*Agrilus cyanicollis* Deyrolle, 1864

*A. cyanicollis* Deyrolle, 1864. 140, 174–175

*Agrilus cyanipennis* Gory et Laporte, 1837

*A. cyanipennis* Gory et Laporte, 1837: 18

*Agrilus dentipes* Deyrolle, 1864

*A. dentipes* Deyrolle, 1864. 137, 153
Lectotype, by present designation, sex not examined. "Batchian [h]". Paralectotype, 1 specimen, sex not examined. "Wingate [h]". Number of syntypes unknown.

*Agrilus didaema* Deyrolle, 1864

*A. didaema* Deyrolle, 1864: 138, 163
Lectotype, by present designation, sex not examined, abdomen missing. "TRANSCRIPTIO [p] Dendoma HDeyr Borneo [h]" Number of syntypes unknown

*Agrilus discicollis* Deyrolle, 1864

* Agrilus* Discicollis Deyrolle, 1864: 143, 189

Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Discicollis HDeyr Borneo [h]" Number of syntypes unknown

*Agrilus distinctus* Deyrolle, 1864

* Agrilus* Distinctus Deyrolle, 1864: 146, 200

Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Distinctus HDeyr Borneo [h]" Number of syntypes unknown

*Agrilus distinguendus* Gory et Laporte, 1837

* Agrilus* Distinguendus Gory et Laporte, 1837: 44

Lectotype, by present designation, sex not examined. "male [h] \ TRANSCRIPTIO [p] var Distinguendus Gory Type Paris France m [h]" Parallectotype, 1 specimen, sex not examined, labelled as lectotype. Number of syntypes unknown

*Agrilus dorsalis* Deyrolle, 1864

* Agrilus* Dorsalis Deyrolle, 1864: 141, 180–182

Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Dorsalis HDeyr Mysol [h]" Number of syntypes unknown

*Agrilus ecarinatus* Marsuel, 1866

* Agrilus* Ecarinatus Marsuel, 1866: 439, 484–485

Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Ecarinatus Mars Type Siemre or [h]" Parallectotype. 1 specimen, sex not examined, labelled as lectotype. Number of syntypes unknown

*Agrilus elongatus* Deyrolle, 1864

* Agrilus* Elongatus Deyrolle, 1864: 136, 151–152

Lectotype, by present designation, male "N Guinea [h]" Parallectotypes, 1 female "Wangou [h]", 1 female "Arrow [h]" Number of syntypes unknown

*Agrilus evinatus* Gory et Laporte, 1837

* Agrilus* Evinatus Gory et Laporte, 1837: 30


REMARKS. Lectotype designated and type locality corrected by Descarpentries & Villiers (1963)
Agrilus faldermanni Gory et Laporte, 1837

*Agrilus* Faldemarni Gory et Laporte, 1837. 42-43

Lectotype, by present designation, male: "TRANSCRIPTO [p] Mendax Mannorf Faldermann C' Gory typ Russie [h]". Paratypes, 3 specimens, sex not examined, labelled as lectotype. Number of synotypes unknown.

*Agrilus frater* Deyrolle, 1864

*Agrilus* Frater Deyrolle, 1854 137, 155-156.

Holotype by monotypy, sex not examined. "TRANSCRIPTO [p] Frater H.Deyr Makia [h]"

*Agrilus funebris* Deyrolle, 1864

*Agrilus* Funebris Deyrolle, 1864 143, 188

Lectotype, by present designation, male: "TRANSCRIPTO [p] Funebris H.Deyr N. Guiney Arrow [h]". Paratypes, 1 specimen, sex not examined. "Dorey [h] // TRANSCRIPTO [p] Funebris H.Deyr N. Guinea Arrow [h]", Number of synotypes unknown, but more specimens are indicated by male and female characters listed in original description.

*Agrilus gentilis* Deyrolle, 1864

*Agrilus* Gentilis Deyrolle, 1864 142, 185-186.


*Agrilus gracilis* Deyrolle, 1864

*Agrilus* Gracilis Deyrolle, 1864 145, 197-198


*Agrilus graminis* Gory et Laporte, 1837

*Agrilus* Graminis Gory et Laporte, 1837 51

Lectotype, by present designation, male: "TRANSCRIPTO [p] Graminis Gory Type non Paez [lyric] [h]". Paratypes, 1 male, 1 female, labelled as lectotype. Number of synotypes unknown.

Remarks. Gory et Laporte (1837) in their work misidentified *Buprestis graminis* Panzer, 1799 with a new species and they simultaneously used first time the combination of the specific epithet *graminis* with the generic *Agrilus*. *Buprestis graminis* Panzer refers recently to *Melithoeus graminis* (Panzer) and has nothing in common with *Agrilus graminis* Panzer sensu Gory et Laporte. According to the rules of ICZN (1985), Article 49 such a name must be replaced. Nevertheless *Agrilus graminis* Panzer sensu Gory et Laporte represents good, generally accepted and common species, with authorship given to Gory et Laporte, therefore this nomenclatorial problem should be solved by the Commission.

*Agrilus gratiosus* Deyrolle, 1864

*Agrilus* Gratiosus Deyrolle, 1864 146, 202-203
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Grisescens HDeyr Borneo [h]”
Number of syntypes unknown

*Agriulus griseascens* Deyrolle, 1864

*Agriulus* Grisescens Deyrolle, 1864 142, 184-185
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Grisescens HDeyr Makian [h]”
Number of syntypes unknown

*Agriulus guttulatus* Deyrolle, 1864

*Agriulus* Guttulatus Deyrolle, 1864 143, 190
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Guttulatus HDeyr Batchian [h]”
Number of syntypes unknown

*Agriulus hirsutulus* Deyrolle, 1864

*Agriulus* Hirsutulus Deyrolle, 1864 147, 210
Lectotype, by present designation, sex not examined “Batchian [h]” Paralectotype, 1 specimen, sex not examined “Wagiou [h]”
Number of syntypes unknown

*Agriulus hypocritus* Deyrolle, 1864

*Agriulus* Hypocritus Deyrolle, 1864 143, 198-199
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Hypocritus HDeyr Batchian [h]”
Paralectotype, 1 specimen, sex not examined, labelled as lectotype. Number of syntypes unknown, but more specimens are indicated by male and female characters listed in original description

*Agriulus ignicolles* Deyrolle, 1864

*Agriulus* Ignicolles Deyrolle, 1864 137, 156
Lectotype, by present designation, sex not examined “Flores [h]” Paralectotypes, sex not examined, 1 specimen “Timor [h]”, 2 specimens “TRANSCRIPTIO [p] Ignicolles HDeyr Flores Timor [h]”
Number of syntypes unknown

*Agriulus ignifrons* Deyrolle, 1864

*Agriulus* Ignifrons Deyrolle, 1864 136, 150
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Ignifrons HDeyr Bourou [h]”
Number of syntypes unknown

*Agriulus impopularis* Deyrolle, 1864

*Agriulus* Impopularis Deyrolle, 1864 146, 199-200
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Impopularis HDeyr Borneo [h]”
Number of syntypes unknown

*Agriulus impressicollis* Marseul, 1866

*Agriulus* Impressicollis Marseul, 1866 456, 454-455
Agrilus incerticolor Deyrolle, 1864

*Agrilus* incerticolor Deyrolle, 1864 139, 170–171


*Agrilus incertus* Deyrolle, 1864

*Agrilus* incertus Deyrolle, 1864 141, 182

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Incertus HDeyr Homen [h]” Number of syntypes unknown

*Agrilus indigaceus* Deyrolle, 1864

*Agrilus* indigaceus Deyrolle, 1864 138, 161

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Indigaceus HDeyr Gilolo [h]” Number of syntypes unknown

*Agrilus indiginus* Fairmaire, 1849

*Agrilus* indiginus Fairmaire, 1849 35–36

Lectotype, by present designation, sex not examined “Agrilus indiginus Fairm. Taiti [by Fairmaire’s hand] / indigins Fairmaire Type [by Kerremans’ hand]” Paratype, 1 specimen, sex not examined “TRANSCRIPTIO [p] Indiginus Fairmaire Taiti [h]” Number of syntypes unknown

**Remarks:** There are also 2 paratypes from Taiti preserved in the Natural History Museum, London, which I have not studied.

*Agrilus insipidus* Deyrolle, 1864

*Agrilus* insipidus Deyrolle, 1864 138, 162

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Insipidus HDeyr Singapore [h]” Number of syntypes unknown

*Agrilus insularis* Deyrolle, 1864

*Agrilus* insularis Deyrolle, 1864 140, 173

Lectotype, by present designation, male “Simatua [h]” Paratypes, 1 male “Makan [h]”, 1 male “Singapore [h]”, 2 females “TRANSCRIPTIO [p] Insularis HDeyr Born Sumat Makan [h]” Number of syntypes unknown

*Agrilus lanceifer* Deyrolle, 1864

*Agrilus* lanceifer Deyrolle, 1864 139, 169–170

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Lanceifer HDeyr Bornéo [h]” Number of syntypes unknown
Agrius maculiventris Deyrolle, 1864

Agrius [Maculiventris Deyrolle, 1864: 138, 158.
Number of syntypes unknown

Agrius marmoreus Deyrolle, 1864

Agrius [Marmoreus Deyrolle, 1864: 146, 201–202
Lectotype, by present designation, sex not examined. "Batchan [h]". Paralectotype, 1 specimen, sex not examined. "Myace [h]"
Number of syntypes unknown

Agrius melanarius Deyrolle, 1864

Agrius [Melanarius Deyrolle, 1864: 147, 207–208
Number of syntypes unknown

Agrius meticulosus Deyrolle, 1864

Agrius [Meticulosus Deyrolle, 1864: 142, 185.
Number of syntypes unknown

Agrius minor Deyrolle, 1864

Agrius [Minor Deyrolle, 1864: 139, 171.

Agrius minus Deyrolle, 1864

Agrius [Minus Deyrolle, 1864: 139, 168

Agrius minusculus Marseul, 1866

Lectotype, by present designation, male. "TRANSCRIPTIO [p] Minusculus Mars. type Auiriche [h]". Number of syntypes unknown

Agrius miserabilis Deyrolle, 1864

Agrius [Miserabilis Deyrolle, 1864: 144, 193
Number of syntypes unknown

Agrius nigerrimus Deyrolle, 1864

Agrius [Nigerrimus Deyrolle, 1864: 147, 204–205

325
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Nigromus HDeyr Mystol [h]"
Number of syntypes unknown.

_Agrilus nigroaeneus_ Deyrolle, 1864

_Agrilus_. Nigro-aeneus Deyrolle, 1864 140, 176
Lectotype, by present designation, male. "Wagays [h]." Paralectotype, 1 male. "TRANSCRIPTIO [p] Nigro-
aeneus HDeyr Mystol Wagay [h]." Number of syntypes unknown.

_Agrilus nigrocyaneus_ Deyrolle, 1864

_Agrilus_. Nigro-cyaneus Deyrolle, 1864 140, 172
Lectotype, by present designation, male. "TRANSCRIPTIO [p] Nigro-cyaneus HDeyr Bornéo [h]." Para-
lectotype, 1 female, labelled as lectotype. Number of syntypes unknown.

_Agrilus nigrovioleacaus_ Deyrolle, 1864

_Agrilus_. Nigro-violetacus Deyrolle, 1864. 145, 195–196
Lectotype, by present designation, male. "Arrow [h]." Paralectotype, 1 female. "Wagays [h]." Number of
syntypes unknown.

_Agrilus obscurus_ Deyrolle, 1864

_Agrilus_. Obscurus Deyrolle, 1864 144, 193
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Obscurus HDeyr Bancean [h]"
Paralectotype, 1 specimen, sex not examined, labelled as lectotype. Number of syntypes unknown.

_Agrilus occipitalis_ (Eschsoltz, 1822)

_Buprestis occipitalis_ Eschsoltz, 1822 79
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Oecipitalis Gory Type Manille [h]"
Paralectotype, 1 specimen, sex not examined, labelled as lectotype. Number of syntypes unknown.

_Agrilus occipitalis_ Gory, 1841

_Agrilus_. Occipitalis Gory, 1841 222–223.
The same as at _Agrilus occipitalis_ (Eschsoltz, 1822).

_REMARKS_. Gory (1841) described new species from Eschsoltz's collection, coming from the type
series of _Agrilus occipitalis_ (Eschsoltz), knowing nothing about valid description of Eschsoltz
(1822) under the same specific name _occipitalis_. _Agrilus occipitalis_ Gory is based on the same
name-bearing type as _Agrilus occipitalis_ (Eschsoltz, 1822), and represents junior objective
synonym of _Agrilus occipitalis_ (Eschsoltz, 1822).

_Agrilus ocularis_ Deyrolle, 1864

_Agrilus_. Ocularis Deyrolle, 1864 141, 179.
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Oculan HDeyr Bornéo [h]." Number
of syntypes unknown.
Agrilus oedipus Deyrolle, 1864

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] OEdipus HDeyr Borneo [h]”
Paralectotype, 1 specimen, sex not examined, labelled as lectotype Number of syntypes unknown

Agrilus olympicus Deyrolle, 1864

Lectotype, by present designation, female “TRANSCRIPTIO [p] Olympicus HDeyr Mysol [h]” Number of syntypes unknown

Agrilus ornatus Deyrolle, 1864

Lectotype, by present designation, sex not examined “Ambione [h]” Paralectotypes, sex not examined, 1 specimen “Ambione [h]”, 1 specimen “Arrow [h]”, 1 specimen “Caram [h]”, 1 specimen “N Guinea [h]”, 1 specimen “Malaya[r] [h]”, 2 specimens “TRANSCRIPTIO [p] Ornatus HDeyr Maliaque [h]” Number of syntypes unknown

Agrilus paganus Deyrolle, 1864

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Paganus HDeyr Borneo [h]” Number of syntypes unknown

Agrilus paralleus Deyrolle, 1864

Lectotype, by present designation, sex not examined, apical part of left elytron missing “TRANSCRIPTIO [p] Paralelus HDeyr Motry [h]” Number of syntypes unknown

Agrilus parvulus Deyrolle, 1864

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Parvulus HDeyr Borneo [h]” Number of syntypes unknown

Agrilus pauper Deyrolle, 1864

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Pauper HDeyr Motry [h]” Number of syntypes unknown

Agrilus perniciosus Deyrolle, 1864

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Perniciosus HDeyr Borneo [h]” Number of syntypes unknown
Agriulus piliventris Deyrolle, 1864

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Piliventris HDeyr Borneo [h]”
Number of syntypes unknown

Agriulus plebejus Deyrolle, 1864

A[grilus] Plebejus Deyrolle 1864 145, 196
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Plebejus HDeyr Sumatra [h]”
Number of syntypes unknown

Agriulus pretiosus Deyrolle, 1864

A[grilus] Pretiosus Deyrolle, 1854 146, 203-204
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Pretiosus HDeyr Batakan [h]”
Paralectotype, 1 specimen, sex not examined, labelled as lectotype Number of syntypes unknown

Agriulus puberulus Deyrolle, 1864

A[grilus] Puberulus Deyrolle, 1864 147, 209
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Puberulus HDeyr Borneo [h]”
Number of syntypes unknown

Agriulus punctifrons Deyrolle, 1864

A[grilus] Punctifrons Deyrolle, 1864 136, 149
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Punctifrons HDeyr Borneo [h]”
Number of syntypes unknown

Agriulus papillus Deyrolle, 1864

A[grilus] Papillus Deyrolle, 1864 145, 198
Lectotype, by present designation, female “TRANSCRIPTIO [p] Papillus HDeyr Flores [h]” Number of syntypes unknown

Agriulus purpurifrons Deyrolle, 1864

Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Purpurifrons HDeyr Borneo [h]”
Paralectotype, 1 male, labelled as lectotype Number of syntypes unknown

Agriulus quadricolor Deyrolle, 1864

A[grilus] Quadricolor Deyrolle, 1864 138, 164-165
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Quadricolor HDeyr Sumatra [h]”
Number of syntypes unknown

Agriulus quadripunctatus Deyrolle, 1864

A[grilus] Quadripunctatus Deyrolle, 1864 139, 165-166

328
Lectotype, by present designation, sex not examined "Sumatra [h]" Paratypoe, 1 specimen without abdomen, sex not examined "TRANSCRIPTIO [p] Quadrupunctatus HDeyr. Bornéo Sumatra [h]". Number of syntypes unknown

_Agrilus quadrisignatus_ Marseul, 1866

_Agrilus_ quadrisignatus Marseul, 1866: 434, 444-445
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Quadrisignatus (Manh.) Marx. Type Sibœre [h]" Number of syntypes unknown

_Agrilus rectus_ Deyrolle, 1864

_Agrilus_ rectus Deyrolle, 1864: 136, 152.
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Rectus HDeyr. Ambon [h]" Number of syntypes unknown

_Agrilus rubifrons_ Deyrolle, 1864

_Agrilus_ rubifrons Deyrolle, 1864: 138, 164.
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Rubifrons HDeyr. Bornéo [h]" Number of syntypes unknown

_Agrilus scutellaris_ Deyrolle, 1864

_Agrilus_ scutellaris Deyrolle, 1864: 135, 148.
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Scutellaris HDeyr. Bornéo [h]" Number of syntypes unknown

_Agrilus semiaeneus_ Deyrolle, 1864

_Agrilus_ semiaeneus Deyrolle, 1864: 137, 157
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Semiaeneus HDeyr. Bornéo [h]" Number of syntypes unknown

_Agrilus sepulchralis_ Deyrolle, 1864

_Agrilus_ sepulchralis Deyrolle, 1864: 142, 186.
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Sepulchralis HDeyr. Celebes Mynado [h]" Number of syntypes unknown

_Agrilus sexpunctatus_ Deyrolle, 1864

_Agrilus_ sextpunctatus Deyrolle, 1864: 139, 166-167.
Lectotype, by present designation, sex not examined. "TRANSCRIPTIO [p] Sexpunctatus HDeyr. Bornéo [h]" Paratypoe, 1 specimen, sex not examined. labelled as lectotype. Number of syntypes unknown

_Agrilus spinipes_ Deyrolle, 1864

_Agrilus_ spinipes Deyrolle, 1864: 137, 153-154

329
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Sputares HDeyr Mysole [h]” Number of syntypes unknown

*Agrilus subauratus* (Gebler, 1833)
*Buprestis* subaurata Gebler, 1833 277–278
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Subauratus Gebl Typ Siberic [h]” Parallectotype 1 specimen, sex not examined, labelled as lectotype Number of syntypes unknown, but range of length in original description indicates more syntypes

*Agrilus subcornutus* Deyrolle, 1864
*Agrilus* Subcornutus Deyrolle, 1864 142, 182–183
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Subcornutus HDeyr Singapore [h]” Number of syntypes unknown

*Agrilus subtrifasciatus* Deyrolle, 1864
*Agrilus* Sub-trifasciatus Deyrolle, 1864 144, 191–192
Lectotype by present designation, male “N Guinee [h]” Paralectotype, 1 male “Mysole [h]” Number of syntypes unknown

*Agrilus subvescius* Deyrolle, 1864
*Agrilus* Subvescius Deyrolle, 1864 136, 150
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Subvescius HDeyr Makan [h]” Number of syntypes unknown

*Agrilus suturalba* Deyrolle, 1864
*Agrilus* Suturalba Deyrolle, 1864 139, 168–169
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Suturalba HDeyr Borneo [h]” Number of syntypes unknown

*Agrilus suturalis* Deyrolle, 1864
*Agrilus* Suturalis Deyrolle, 1864 147, 205
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Suturalis HDeyr Borneo [h]” Number of syntypes unknown

*Agrilus sylvestris* Deyrolle, 1864
*Agrilus* Sylvestris Deyrolle, 1864 147, 206
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Sylvestris HDeyr Mysole [h]” Number of syntypes unknown

*Agrilus taciturnus* Deyrolle, 1864
*Agrilus* Taciturnus Deyrolle, 1864 141, 182
Lectotype, by present designation, sex not examined, right side of abdomen damaged: "TRANSCRIPTIO [p] Thaumus HDeyr Batchan [h]" Number of syntypes unknown

_Agrilus thalassinus_ Deyrolle, 1864

_A[grilus] Thaumus_ Deyrolle, 1864 141, 179–180

Lectotype, by present designation, sex not examined: "TRANSCRIPTIO [p] Thaumus HDeyr Borneo [h]" Number of syntypes unknown

_Agrilus tricolor_ Deyrolle, 1864

_A[grilus] Tricolor_ Deyrolle, 1864 144, 194

Lectotype, by present designation, sex not examined: "TRANSCRIPTIO [p] Tricolor HDeyr Mysore [h]" Number of syntypes unknown

_Agrilus tripartitus_ Deyrolle, 1864

_A[grilus] Triparitus_ Deyrolle, 1864 141, 181

Lectotype, by present designation, sex not examined: "TRANSCRIPTIO [p] Tripartitus HDeyr Borneo [h]" Number of syntypes unknown

_Agrilus tristis_ Deyrolle, 1864

_A[grilus] Tris_ Deyrolle, 1864 143, 187

Lectotype, by present designation, sex not examined: "TRANSCRIPTIO [p] Tristis HDeyr Singapoor [h]" Number of syntypes unknown

_Agrilus trito_ Deyrolle, 1864

_A[grilus] Trito_ Deyrolle, 1864 148, 182

Lectotype, by present designation, sex not examined: "TRANSCRIPTIO [p] Trito HDeyr Singapoor [h]" Number of syntypes unknown

_Agrilus tuberculiventris_ Deyrolle, 1864


Lectotype, by present designation, male: "Kava [sic'] [h]" Paralectotype, 1 female: "TRANSCRIPTIO [p] Tuberculiventris HDeyr Batchan Kava [sic'] [h]" Number of syntypes unknown

_Agrilus turcicus_ Marseul, 1866

_Agrilus_ Turcicus Marseul, 1866 467–468


REMARKS: I failed to find any publication in which such a designation has been formally made by Magnani.
Agrilus ultramarinus Deyrolle, 1864
Agrilus Ultramarina Deyrolle, 1864 147, 208
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Ultramarina HDeyr Bourou, Ma-
lurca [h]” Paralecototype, 1 specimen, sex not examined, labelled as lectotype Number of syntypes unknown

Agrilus validus Deyrolle, 1864
Agrilus Valdivas Deyrolle, 1864 144, 192-193
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Valdivas HDeyr Celebes Metado [h]
Number of syntypes unknown

Agrilus vestitus Deyrolle, 1864
Agrilus Vestitus Deyrolle, 1864 137, 154
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Vestitus HDeyr Ambone [h]”
Number of syntypes unknown

Agrilus viridiaeneus Deyrolle, 1864
Agrilus Viridiaeneus Deyrolle, 1864 140, 177-178
Lectotype by present designation, sex not examined “Baunou [h]” Paralecototypes, sex not examined, 1 speci-
men “Ambone [h]”, 1 specimen “Ceram [h]”, 1 specimen “Salwatti [h]” Number of syntypes unknown

Agrilus viridipennis Gory et Laporte, 1837
Agrilus Viridipennis Gory et Laporte, 1837 45-46
Lectotype, by present designation, sex not examined “Type Gory [h] \\ TRANSCRIPTIO [p] Viridipennis Gory type Para Europe [h]” Number of syntypes unknown

Agrilus vitatus Deyrolle, 1864
Agrilus Vitatus Deyrolle, 1864 155, 151
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Vitatus HDeyr Makassar [h]”
Number of syntypes unknown

Agrilus vulcanus Deyrolle, 1864
Agrilus Vulcanus Deyrolle, 1864 140, 176
Lectotype, by present designation, sex not examined “TRANSCRIPTIO [p] Vulcanus HDeyr Mysole [h]”
Number of syntypes unknown

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REFERENCES

Descarpentries A & Villeirs A 1963 Catalogue raisonné des Buprestidae d’Indochine II Agrilus, genre Agrilus
(2e partie) Rev Fr Entomol 30 104-119

332
DEVROELE H 1864 Description des Buprestides de la Malaisie recueillie par M. Wallace Ann Soc Entomol Belg 8 1-272, 305-312

LIENSCHIOLZ J F 1822 Entomographien Berl реммер 128 pp & 3 pp, 2 col pls

FARMER M L 1849 Insectes de Tant de Tant des Mares et des îles voisines Rev Mag Zool 1 34-56


GORY H L & LAFONT E L de 1837 Histoire naturelle et iconographie des insectes coléopteres, publice par monographies separées Suite aux buprestides Tome II, Livrains 12-16, P Dumont, Paris [genera Cotobagaster, Chrysobothris, Agrilus]


MARSEAU S A de 1865 Monographie des buprestides d’Europe, du nord de l’Afrique et de l’Asie L’Abellé Mem Entomol 2 397-540

PANNET G W P 1799 Famie Insectorum Germaniae mensa oder Deutschlands Insecten Sechster Jahrgang LXI-LXXII Heft Nürnberg Fieheckerachen Buchhandlung [ helets separately paginated]
BOOK REVIEW


The Czech Zoological Society was founded as The Czechoslovak Zoological Society in Prague on May 7th, 1927, having been incited by several university teachers. The first committee included 19 members with Professor F Vojdovský as the President. The purpose was to contribute to the development of zoology in Czechoslovakia of that time, to keep and improve all branches of this science, to organize lectures, courses, excursions and to convene Congresses, to edit professional publications, both periodical and post-periodical, the name of which also changed several times in 1990 into Acta Societatis Zoologicae Bohemoslovenae and in 1992 into Acta Societatis Zoologicae Bohemoslovacae. Contributions on general, applied and systematic zoology were written in Czech and since 1990 all contributions have been written in English, French or Spanish. The 61st Volume of this Journal came out in 1997. At present, the journal is published with 250 scientific societies and organizations in foreign countries. From these scientific publications, the library of our Society has been built up to include 880 periodicals mainly of foreign origin.


In 1927, at the time of foundation, 60 prominent zoologists, living in Bohemia, Moravia, Slovakia and also in Germany, applied for membership of the Society. In 1934 100 zoologists were registered in the list of members, in 1968 111 and in 1990 even 730 zoologists were included in such lists of members. At present (31.12.1997) 323 zoologists are members of the Society. The members usually meet at sessions or meetings of branches in Brno, Praha, České Budějovice and Ostrava or in professional sections. Since 1964 12 such professional sections were founded, viz. in 1963 the section of invertebrate zoology, 1967 the section of ichthyology, 1968 the section of ornithology and the section of herpetology, 1972 the section of herpetology and the section of reptiles, 1974 the sections of zoological and entomological research, 1976 the section of the history of the Czechoslovak Zoological Society, 1981 the section of protection of fauna, 1984 the section of soil zoology and 1999 the section of pedology. Some of sections became independent societies, some sections ceased their activities. At present two sections are working very actively. viz. the section of ichthyology and the section of soil zoology.


In 1969–1997 a series of meetings called “Zoologické dny v Brně” (The Zoological Days in Brno) took place regularly in autumn of each year with the exceptions of such years when the congress was held. Members of our Society, together with members of other scientific societies and natural historical clubs, acquainted themselves with actual problems and progress of research and investigations.

Since 1971 the Society has been editing, unregularly and only in Czech, the publication Zprávy Československé (Czech) zoologické společnosti (Reports of the Czechoslovak (Czech) Zoological Society) where lectures, resolutions or contributions of zoological congresses have been published, and since 1992 also a small publication called Informační vypověď (Information Report), edited in Czech, usually twice a year, where members are informed about all activities of the Society in the past year and about intended actions in the coming year.

Marcela Škůdravá
A new parrot (Aves: Psittacidae) from the early Miocene of the Czech Republic

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Abstract. A new parrot, Xenopsitta jeffari gen. n. et sp. n., is described from the early Miocene (MN 3) of Merkur in the Czech Republic. It is the oldest member of the Psittacini known so far. Other taxonomic conclusions are as follows. Archaeopsittacus verreauxi (Milne-Edwards, 1871) from the early Miocene of France is not related to the Psittacini, and belongs in the Psittaculinae. Psittacus verreauxi Milne-Edwards, 1870 as nom. nudum. Syntypes of Paranalis dugesii (Milne-Edwards, 1869) from the middle Miocene of France were identified, and it was shown, that the name cannot be applied to a parrot. A summary of the Tertiary records of the Psittacidae is presented in Europe, the scanty fossil record of the family is limited to the early and middle Miocene.

Taxonomy, Aves, Psittacidae, Xenopsitta jeffari gen. n. et sp. n., Miocene, Europe

INTRODUCTION

Parrots (family Psittacidae) are a well defined group of small to medium sized, primarily arboreal birds, which inhabit the tropics and sub tropics of the whole world (Forsman 1977). The fossil record of parrots is extremely scarce, with very few Tertiary forms known so far (see below).

In the present paper I will describe a new parrot from the early Miocene deposits of Merkur in western Bohemia and comment on the nomenclatural and taxonomic identity of some other Tertiary parrots. The stratigraphy follows Mein (1990). Mein's Mammal Neogene zones are abbreviated as MN. The classification of parrots follows Smith (1975).

SYSTEMATIC PALEONTOLOGY

Order Psittaciformes Wagler, 1830
Family Psittacidae Illiger, 1811
Genus Xenopsitta gen. n.

Type species. Xenopsitta jeffari sp. n.

Diagnosis. Small parrot with short and robust tarsometatarsus, generally resembling the tarsometatarsus of large African parrots (Psittacus Linnaeus, 1758, Psittacus Swainson, 1837, and Coracopsis Wagler, 1832). Anterior-medial metatarsal groove on tarsometatarsus more broad and long, proximal end of tarsometatarsus narrower than in the latter three genera.

Comparison. The tarsometatarsus resembles the same element of large African parrots of the modern genera Psittacus, Psittanus, and Coracopsis (which form the tribe Psittacini sensu Smith 1975) in its general shape, and in lacking the outer proximal foramen. It differs from the tarsometatarsus...
urus of all these genera in having (1) proximal end more narrow anterior-posteriorly, (2) antero-medial metatarsal groove more broad and long, and (3) trochlea for digit 4 differently shaped (in lateral view). The tarsometatarsus of Xenopsitta gen. n. differs from the same element of Archaeopsittacus Lambrecht, 1933 in having (1) antero-medial metatarsal groove more broad and long, and (2) in lacking perforated shaft at the insertion point of the hind toe.

The humerus of Xenopsitta gen. n. differs from the same element of Poicephalus, and agrees with that of Psittacus in having the attachment of anterior articular ligament short.

Etymology. Formed from the Greek ἔρεως, strange, foreign, and psitta, diminutive of the Latin psittacus, parrot. Selected in allusion of the apparent scarcity of parrots in the Miocene of Europe. The name is feminine in gender.

Remarks. Xenopsitta gen. n. is closely related to the modern genera Psittacus, Poicephalus, and Coracopsis, and belongs in the tribe Psittacini (sensu Smith 1975). This tribe is currently limited to the Afrotopical region. Xenopsitta gen. n. represents the earliest record for the tribe, and also the only record of the tribe outside of Africa.

Xenopsitta fejfarri sp. n.
(Fig. 1)

Holotype. Right tarsometatarsus, damaged on both ends, coll. Fejfar (Práha), uncatalogued.

Material. Right tarsometatarsus (holotype), distal part of left humerus, and proximal part of right humerus; coll. Fejfar (Práha), uncatalogued. All these bones were collected by O. Fejfar in the 1990s (his field-number 7408).

Age and locality. Early Miocene (MN 3) of Merkur, Cheb County, West Bohemia, Czech Republic (Fejfar & Kváček 1993, Milkovský 1996a).

Diagnosis. As for the genus.

Measurements. Tarsometatarsus (holotype) length = 16–17 mm (estimated), distal width = 7.0 mm, minimum width of shaft = 2.5 mm, depth of shaft at the same place = 1.6 mm, humerus: distal width = 6.6 mm, distal depth = 4.5 mm, minimum width of shaft = 4.4 mm, depth of shaft at the same place = 2.7 mm.

Etymology. After Oldrich Fejfar (Práha), who collected the fossil, in recognition of his palaeontological work on Cenozoic mammals.

Remarks. Previously, this parrot was provisionally listed as “Archaeopsittacus” by Milkovský (1996a, b).

Comments on some other fossil parrots
The previously known Tertiary record of the family Psittacidae was limited to the early Miocene of Queensland in Australia (Boles 1993), early Miocene of France (Milne-Edwards 1869, Lambrecht 1913), early Miocene of Nebraska (Wetmore 1926), middle Miocene of France (Cheneval in press), and Germany (Hilzheimer & Hesse 1995), and late Pliocene of Kansas (Becker 1987). An alleged record was reported also from the early Eocene of England (Harrison 1982). Below, I will comment on some of these taxa.

Archaeopsittacus verreauxii (Milne-Edwards, 1871)

The first Tertiary parrot ever described was Psittacus verreauxii from the early Miocene (MN 2a) of Saint-Gérard-de-Puy in France. Milne-Edwards (1871: 523), Lydekker (1891: 12), Paris (1912: 286), Lambrecht (1921: 88, 1933: 609), Brodkorb (1971: 210), and Bocheni (1997: 319) stated, that the species was described by Milne-Edwards (1870: 558; page 557 erroneously given by Brodkorb).
The name indeed appears in that work and on that page, but there is no description or indication of the species in that paper. Hence Psittacus verreauxi Milne-Edwards, 1870 is nomen nudum, and the name must be credited to Milne-Edwards (1871: 525). The holotype of the species is a tarsometatarsus, figured by Milne-Edwards (1871, pl. 200, fig. 1–6), and probably deposited in the Muséum National d'Histoire Naturelle in Paris, France.

Milne-Edwards (1871) observed, that the holotypical tarsometatarsus of Psittacus verreauxi is more similar to the same element of larger African parrots (Psittacini sensu Smith 1975), than to the same element of American parrots (Arini sensu Smith 1975). While the bird indeed seems to belong to the group of the Old World parrots (New World parrots seem to be distinct within the family – Smith 1975), its tarsometatarsus significantly differs from the same bone of the Psittacini (Psittacus, Poicephalus, Coracopsis), Cacatunia (Cacatua Viellot, 1817), and Platycercini (Platycercus Vigors, 1825, Psophotus Gould, 1845) in possessing the outer proximal foramen. In the latter character, Psittacus verreauxi agrees with the Lorini (Eos Wagler, 1832, Trichoglossus Vigors et Horsfield, 1826), and Psittaculini (Agapornis Selby, 1836, Altisterus Mathews, 1911).

Fig. 1. Holotypical tarsometatarsus of Xenopetsa foarfis gen. n. et sp. n. (Aves, Psittacidae) from the early Miocene of Merkur in the Czech Republic: a – anterior view, b – plantar view, c – dorsal view.
The tarsometatarsus of *Psittacus verreauxi* differs from the Lorini in having hypotarsus with free calcaneal ridges. In all studied members of the Lorini (see Appendix), hypotarsus is highly modified, and forms a single bony ring (in proximal view). I found similar condition also in some Old World genera of parrots, placed by Smith (1975) in other tribes, particularly in *Melopsittacus* Gould, 1840, *Eunymphicus* Peters, 1937, and *Cyannorhamphus* Bonaparte, 1854 (*Platycecinus*), *Nymphicus* Wagler, 1832 (*Cacatuina*), *Psitrichus* Lesson, 1831 (*Psitrichasini*), *Loriculus* Blyth, 1850, *Agapornis*, and *Babehopsittacus* Salvadori, 1891 (*Psittaculini*), and also in all New World parrots (*Arini* — see Appendix). Ring-shaped hypotarsus was also almost formed in *Psittaculirostris* Gray et Gray, 1859 (*Psittaculirostrini*), *Micropsitta* Lesson, 1831 (*Micropsittini*), and in *Psittimus* Blyth, 1842 (*Psittaculini*). This condition was rather similar in these three less known genera, which may indicate, that they are closer related to each other, than previously assumed. All other genera of Old World parrots, listed in Appendix, had ridged hypotarsus, although the ridges tended to be coarsified to some degree.

Summarizing this evidence, it is probable, that *Psittacus verreauxii* belongs in the Psittaculini. Until the taxonomic position of this parrot within the tribe is solved, the bird should be placed in the monotypic genus *Archaopsittacus*, created by Lambrecht (1933: 609).

**Pararallus dispar** (Milne-Edwards, 1869)

Milne-Edwards (1869: 155) described from the middle Miocene (MN 6) of Sansan in France under the name *Rallus dispar* a rail species, to which he assigned four bones: proximal part of a tarsometatarsus (his pl. 105, fig. 17-21), distal part of a tarsometatarsus (pl. 105, fig. 17-20, 22), distal part of a tibiotarsus (pl. 105, fig. 27-30), and distal part of a humerus (pl. 105, fig. 23-26; also figured in Cracraft 1973, fig. 15A, B). Lambrecht (1933: 466), Broukoff (1967: 120), and Cracraft (1973: 33) believed, that these bones form a syntypical series. This led Cracraft (1973: 120) to select the partial humerus (Muséum National d'Histoire Naturelle, Paris, Sa 1201) as the lectotype of the species.

Nevertheless, Milne-Edwards (1869) based his *Rallus dispar* solely on the two tarsometatarsal fragments (as correctly observed already by Lydekker 1891: 144), while he just assigned the other two fragments to the species. Hence, the partial humerus cannot be selected as a lectotype of *Rallus dispar*, and Cracraft's (1973) action is thus not valid from the point of view of the zoological nomenclature (ICZN 1985). Milne-Edwards (1869-1871) apparently believed, that the two tarsometatarsal fragments originated from a single bone. However, Lambrecht (1933: 466) observed, that the distal portion is from the right side of the body, while the proximal end is from the left side of the body. This certainly applies to the figures in Milne-Edwards (1869), but there is no evidence, that one of the figures was not side-reversed by the draughtsman. At least, this seems to apply to the "lectotypical" humerus fragment. The stereophotograph in Cracraft (1973, fig. 15A, B) shows a left humerus (as correctly stated by Cracraft), while the figure in Milne-Edwards (1869-1871, pl. 105, fig. 22-26) shows a right humerus. Morphological details allow to conclude, that all these figures were based on a single specimen. Without respect to this, it is obvious that no evidence is available, that the two tarsometatarsal fragments, upon which Milne-Edwards (1869) based *Rallus dispar*, originated from a single bone. Hence, these two fragments should be deemed to be the syntypes of *Rallus dispar* Milne-Edwards, 1869.

Cheneval (in press) observed, that the supposedly lectotypical fragment of humerus does not belong to a rail (family Rallidae), but to a parrot (family Psittacidae). In belief, that this bone is the name-bearer of *Rallus dispar*, he moved the species from the Rallidae to the Psittacidae. The same applies to the genus *Pararallus*, created by Lambrecht (1933: 466) for *Rallus dispar* Milne-Edwards, 1869 (see also Cheneval 1996). This information was accepted by Milkovský (1996b). While
a parrot indeed did exist in Sansan, neither the species name *Rallus dispar* Milne-Edwards, 1869, nor the genus name *Pararallus* Lambrecht, 1933 can be applied to it. The form thus remains unnamed. During the last minutes of proof-reading, Milkovský (in Milkovský & Hesse 1996) erroneously extended the supposed parrot affinities of *Pararallus* to *Pararallus hasseki* Martini, 1967 from the early Oligocene of Steblos in Germany. While the affinities of the latter species are not clear, the remains certainly did not belong to a parrot. There is no evidence, that a parrot was found in Steblos.

*Palaeopittacus georgei* Harrison, 1982

Harrison (1982: 205) described from the early Eocene of Walton-on-the-Naze in England a new species of a bird, considered by himself to be the earliest parrot. Olson (1985) questioned the referral of this species to the Psittacidae, and Moure-Chaviré (1992) transferred it to the Quercypitidae, created by herself for *Quercypitius* Moure-Chaviré, 1992 from the late Eocene of La Bouffle in France. According to my re-study of available illustrations, *Quercypitius* shows many similarities to the Sandcoleiidae Houde et Olson, 1992 from the middle Eocene of Wyoming. Generally, the fossils show a mixture of characters of the Psittacidae and the Coliidae. Whether they were primitive parrots (Moure-Chaviré 1992), or their similarities to parrots are a result of convergent evolution (Houde & Olson 1992), these birds certainly did not belong in the family Psittacidae.

**DISCUSSION**

The earliest true parrots were found in the early Miocene of Australia (Bolus 1995), Europe (Milne-Edwards 1871, Milkovský this paper), and North America (Wei 1926). Considering Smith’s (1975) classification of the Psittacidae, this record applies to four tribes, incl. the Cacatuini (Australia), Psittacini (Europe), Psittaculini (Europe), and Arini (North America). This means, that parrots were already widespread and diversified in the early Miocene, but the data have little bearing on the phylogenetic history of the family.

In Europe, the Psittacidae were recorded from the early Miocene (MN 2a) of Saint-Gérard-le-Puy in France (*Archaeopitacus vereauxii*; Milne-Edwards 1871, Milkovský this paper), in the early Miocene (MN 3) of Merkur in the Czech Republic (*Xenopitius fejari* gen. n. et sp. n.), in the middle Miocene (MN 6) of Sansan in France (unnamed form, Cheneval in press, Milkovský this paper), in the middle Miocene (MN 6) of Nördlinger Ries in Germany (unnamed form, Heizmann & Hesse 1995), and in the middle Miocene (MN 7) of Steinheim in Germany (unnamed form, Heizmann & Hesse 1995). There is no evidence for the existence of parrots in Europe in the late Miocene and Pliocene (Milkovský 1996b).

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Oldřich Fejfar (Praha) and Zdeněk Dvoreček (Blíma, Czech Republic) placed the fossils from Merkur at my disposal. Storr L. Olson (Washington, D. C.) allowed me to use the comparative collection of avian skeletons under his care. The drawings were kindly prepared by Oldřich Fejfar. I am obliged to all of the named persons. This work was largely done, when I was short-term fellow of the Smithsonian Institution in Washington, D. C., in January/February 1997.

**REFERENCES**


339
Boles W 1993 A new cockatoo (Pattaciformes, Cacatuidae) from the Tertiary of Riversleigh, northwestern Queensland, and an evaluation of rostral characters in the systematics of parrots Bus 135 8–18
Brockman P 1971 Catalogue of fossil birds Part 4 (Columbiformes through Pavonisimorphs) Bull Florida State Mus (Biol Sci) 15 163–266
Cheniova J 1996 Moescue avian localities of France in MIROKOVSKY J (ed.) Tertiary avian localities of Europe Acta Univ Carol (Geol) 39 595–611
Cracraft J 1973 Systematics and evolution of the Gruiformes (class Aves) 3 Phylogeny of the suborder Grus Bull Amer Mus Nat Hist 151 1–128
Pepark O & Kvaček Z 1993 Tertiary fauna in northwest Bohemia Praha Univerzita Karlova & Česka geologiecke spolecnosti. 35 pp
Forshaw J M 1977 Parrots of the world 2nd rev ed Neupr City THF Publications, 584 pp
Harrision C J O 1982 The earliest parrot a new species from the British Eocene Bus 124 203–210
Lambrecht K 1933 Handbuch der Palaeontologie Berlin Gebr. Borntraeger, 1024 pp
Lydekker R 1891 Catalogue of the fossil birds in the British Museum (Natural History) London British Museum (Natural History), ix + 366 pp
Melke-Edward A 1870 Observations sur la faune entomologique du Bourbonnais pendant la periodes tertiaire moyenne C R Hebdo Sciences Acad Sci (Paris) 70 557–559
Milikovsky J 1996a Tertiary avian localities of the Czech Republic In MILOKOVSKY J (ed.) Tertiary avian localities of Europe Acta Univ Carol (Geol) 39 551–557
Milikovsky J 1996b Tertiary avian faunas of Europe In MILOKOVSKY J (ed.) Tertiary avian localities of Europe Acta Univ Carol (Geol) 39 777–818
Milikovsky J & Hess A 1996 Tertiary avian localities of Germany In MILOKOVSKY J (ed.) Tertiary avian localities of Europe Acta Univ Carol (Geol) 39 619–647
Morlon-Chauvin C 1992 Une nouvelle famille de perroquets (Aves, Psittacoformes) dans l'Eocene superieur des Pyrénées du Quercy, France Geobios 15 169–177
Smith G A 1975 Systematics of parrots Nat Hist Mus 117 15–68
Weber A 1926 Descriptions of additional fossil birds from the Miocene of Nebraska Amer Mus Nat Hist 211 1–5

APPENDIX

List of examined species
Skeletons of modern parrots were studied in the collections of the United States National Museum in Washington, D. C., and in the author’s collection in Prague. In the following list, the superspecific classification follows Smith (1975) Representatives of all tribes were available for study. Usually, only one specimen per species was examined. Higher numbers are given in parentheses
Erratum

In an article by J. Miklošiovský (Early Pleistocene birds of Deutsch-Altenburg, Austria Acta Soc. Zool. Bohem 62 135-141, 1998) a right carpo-metacarpus from Deutsch-Altenburg 4B was erroneously listed as belonging to Platanepithecus donncanus. In fact, the bone belongs to Perids perdid. By this, the overall number of bird species from Deutsch-Altenburg is increased to 15, and the minimum number of individuals from Deutsch-Altenburg 4B to 22. Proportion of MNI’s in the Table 1 in Miklošiovský (1998) must be changed accordingly. The carpo-metacarpus of Perids perdid was originally identified as belonging to Franciscanus capata by Jančin (1961), and remains unfigured.
Results of the Czech Biological Expedition to Iran. 
Part 3: Coleoptera: Gliophyridae and Scarabaeidae: Sericininae

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Abstract Distribution data for 14 species of Gliophyridae and 3 species of Scarabaeidae Sericininae, collected during the Czech Biological Expedition Iran 1996, are presented. Pygopleurus zeynozais sp. n. (Gliophyridae) and Maculeila (Maculeila) levelloana sp. n. (Scarabaeidae, Sericininae) both from the Boyer Ahmad-e-Kuhgiluyeh province are described and compared with related species; differential diagnosis of new species is based predominantly on morphology of male gonites and female gonocoxites in the latter species. Female of Pygopleurus mardiaza sp. n. (Sericininae) is new for Iran.

Taxonomy, new species, distribution, Coleoptera, Scarabaeoidea, Gliophyridae, Sericininae, Palaeartic region

INTRODUCTION

Distribution and taxonomy of Iranian Gliophyridae and Sericininae is only poorly understood so far. Only a restricted number of more or less extensive publications providing alpha-taxonomical and distributional data of these scarabaeoid groups is available (e.g., Baraud 1965, 1968, 1971, 1989, 1990a, b, Medvedev 1952, 1960, Petrovitz 1965, 1969, 1971, 1980, Reitter 1903).

Thanks to organizational efforts of Dr Zdena Hodkova of Prague, the Czech Biological Expedition Iran 1996 took place between April 20 and May 20, 1996 (for details see Frynta et al. 1997). The present paper is the 3rd part of papers dealing with data resulting from collecting endeavour of members of this expedition. Two previous parts are devoted to amphibians and reptiles (Frynta et al. 1997) and to scorpions (Kovalik 1997).

MATERIAL AND METHODS

The material is deposited in the collections of David Král (DKCP), Milan Nikodym (MNCP) and the Museum d'Histoire naturelle, Genève, Suisse (MHNG). Exact label data are cited for all material. Taxon identification of localities names was adopted from Sheehan (1995) for detailed identification of localities including map and habitat descriptions see Frynta et al. 1997. Specimens of newly described species are provided with one red printed label: "Name of a taxon sp. n.; HOLOTYPE; ALLOTYPE or PARATYPE with No and sex symbol for male or female, Milan Nikodym & David Král det. 1998".

Authors' remarks and complementations are found in square brackets, x/y - number of males/females collected.

SPECIES ACCOUNT

Glaphyrocaceae

_Eulasia (Eulasia) naviauxi_ (Baraud, 1971)

**Material examined** IRAN, prov. Fars, 8 km SW QADER ABAD vill by road [30°14'N 52°12'E], ca 2100 m 28–29.4 1996, David Král lgt., 1/0 collected from under stone on open pasture (DKCP) IRAN, prov. Fars, Pasargad env [30°12'N 53°10'E], ca 1800 m, 26–4 1996, David Král lgt., 1/2/1 specimens collected from yellow flowers of _Asteraceae_ (13/17 DKCP, 2/2 MHN, 2/2 MNCP)

**Distribution** Only the type series from Shiraz (SZ Iran) was so far known (Baraud 1971, 1990a)

_Eulasia (Eulasia) miidinizus_ Baraud, 1990

**Material examined** IRAN, pr. Lorestan, Zagros mts., 30 km W Khorram Abad, GHOLAMAN vill env [33°25'N 48°12'E], 1000 m, 6–7 5 1996, David Král lgt., 6/38 collected from various flowers (Asteraceae, Apiaceae, Papaver sp., etc.) in a clear oak forest (5/27 DKCP, 1/3 MHN, 1/1 MNCP)

**Distribution** Only the holotype labelled “Iran, Sultaneh, Zandjan–Teheran, 16 VI” (Baraud 1990a) was so far known. First record from the Lorestan province

_Eulasia (Rudeulasia) carinata_ Baraud, 1990

**Material examined** IRAN, prov. Fars, Zagros mts., ca 1000 m, AHSHAR vill env [30°23'N 51°36'E], 2–3 5 1996, David Král lgt., 4/5 collected from _Papaver sp._ open habitat (field margin) (2/3 DKCP, 1/1 MHN, 1/1 MNCP)

**Distribution** Only the holotype labelled “Persia, Ben Laan, Escalera IV–1899” (Baraud 1990) was so far known. The type locality, probably correctly “Ben Lami” region (Andrees Handatlas 1896), is situated along the border between Iran and the Iranian province Ilam. First record from the Fars province.

**Remarks** The species was collected syntopic with the closely related _A. (R.) genei_

_Eulasia (Rudeulasia) genei_ Truqui, 1848

**Material examined** IRAN, prov. Fars, Zagros mts., ca 1000 m, AHSHAR vill env [30°23'N 51°30'E], 2–3 5 1996, David Král lgt., 4/0 collected from _Papaver sp._ open habitat (field margin) (DKCP) IRAN, pr. Lorestan, Zagros mts., 30 km W Khorram Abad, GHOLAMAN vill env [33°25'N 48°12'E], 1000 m, 6–7 5 1996, David Král lgt., 5/7 collected from various flowers (Asteraceae, Papaver sp.) in clear oak forest (2/4 DKCP, 1/1 MHN, 2/2 MNCP)

**Distribution** E Mediterranean. Broadly distributed species in Syria, Jordan, Israel, Palestine, Iran (Baraud 1990a, Giachino 1982)

_Eulasia (Rudeulasia) pulchra_ (Reitter, 1890)

**Material examined** IRAN, pr. Lorestan, Zagros mts., 30 km W Khorram Abad, GHOLAMAN vill env [33°25'N 48°12'E], 1000 m, 6–7 5 1996, David Král lgt., 11/14 collected from various flowers (Asteraceae, Apiaceae, Papaver sp., etc.) in clear oak forest (7/10 DKCP, 2/2 MHN, 2/2 MNCP)

**Distribution** E Mediterranean. Rarely collected species in E Turkey and W Iran (Baraud 1990a)
**Eulasia (Rudeteliasia) straussi** (Ganglbauer, 1905)

**Material examined.** IRAN, prov. Khorasan, Chahak, 15 km NW Bandar-e-Gorveh, Chahak vll. env. [32°50'N 50°25'E], ca 50 m. 5–7.5.1996, David Král lgt. 0.5 collected from flowers of thistles (0.5 DKCP, 0.5 MNCP).

**Distribution.** E Mediterranean; E Turkey, Iraq, Iran (Batraud 1990a). Rarely collected species, probably vagrant to the closely related and more to the west and the south distributed *E. (R.) fastuosa* (Reitter, 1889).

**Gaphyurus festivus** Ménétr.és, 1836

**Material examined.** IRAN, prov. Khorasan, Chahak, 15 km NW Bandar-e-Gorveh, Chahak vll. env. [32°50'N 50°25'E], ca 50 m. 5–7.5.1996, David Král lgt. 0.5 collected from flowers of thistles (0.5 DKCP, 0.5 MNCP).

**Distribution.** Armenia, Nakhichevan, E Turkey, NW Iran (Medvedev 1960).

**Gaphyurus onopordi** Reitter, 1903

**Material examined.** IRAN, prov. South Khorasan, CHOQA-ZANGIL env. (zakurat) [32°00'N 48°31'E], ca 100 m. 5–6.5.1996, David Král lgt. 31/ collected from flowers of thistles together with preceding species (2/5 DKCP, 1/1 MNCP).

**Distribution.** Iran (Medvedev 1960), so far only few records, very rarely collected species.

**Gaphyurus sp. 1**

**Material examined.** IRAN, prov. Khorasan, Chahak, 15 km NW Bandar-e-Gorveh, Chahak vll. env. [32°50'N 50°25'E], ca 50 m. 5–6.5.1996, David Král lgt. 31/ collected from flowers of thistles together with preceding species (2/5 DKCP, 1/1 MNCP).

**Remarks.** Related to *Gaphyurus micans* Faldermann, 1835 (metallic coloured species, antennal club shorter than antennomeres II–VII combined, setation of pronotum and head short and light, lateral pronotal margin bordered only near posterior angles, smooth impunctate pronotal areas present, prothorax in basal half externally remarkably serrate, ventral setae of metatibiae yellow). Four other species, probably closely related to *G. micans*, were described from Iran: *G. lauffei* Reitter 1903, 152 based on two males from "Baktiar (Tombol)"; *G. persicus* Pic, 1947a, 5 based on a single female from "Perse"; and *G. incertus* (single female) and *G. purpureus* (single male), both described by Pic, 1947b. 2 also from "Perse". Unfortunately descriptions of these four species are very short and totally insufficient. Therefore it is necessary to study Reitter’s and Pic’s type material for correct identification of the material under study.

**Gaphyurus sp. 2**

**Material examined.** IRAN, prov. Khorasan, Chahak, 15 km NW Bandar-e-Gorveh, Chahak vll. env. [32°50'N 50°25'E], ca 50 m. 5–6.5.1996, David Král lgt. 0.5 collected from flowers of thistles (0.5 DKCP, 0.5 MNCP).

**Remarks.** See remarks under *Gaphyurus* sp. 1.

**Pygopleurus cyanescens** (Reitter, 1890)

**Material examined.** IRAN, prov. Zanjan, 50 km NNE of AVAJ by road to Takestan [35°40'N 48°45'E], ca 1800 m. 8–5.1996, David Král lgt. 0.1 collected from Papaver sp., open pasture along a stream (DKCP).
**Pygopleurus maradiensis Baraud, 1989**
(Figs 6–7)

**Material examined.** IRAN, prov. Mazandaran, Alborz mts., N slopes, VALI ABAD vill. env. [36°14'N 51°18'E], 1800-2500 m, 8–10 J 1996, David Král lgt., 100 on various flowers, open habitat (DKCP). IRAN, prov. Mazandaran, Alborz mts., N slopes. CHALUS env. [36°22'N 51°24'E], 800-400 m, 10.5.1996, David Král lgt., 3/2 on various flowers, open habitat (3/2 DKCP, 1/1 MNCP).

**Diagnostic characters of female.** Body length 13–14 mm. Head and pronotum green-cuprous, with almost black and light brown setae. Elytron unicolorous brown with darkened, green lustrous external margin; setation consisting of recumbent and erected, black and light brown setae. Legs dark with green lustrue, tibiae and tarsi only with light setation. Propygidium and pygidium black with light brown setation. Clypeus with rounded anterior angles and rounded lateral contours and with distinct longitudinal keel. Pronotum with anterior and posterior angles rounded; surface covered with distinct and regularly spaced verruculcwr wrinkles. Sutural angle of elytron obtuse but distinct, posteolateral angle simples arcuate. Protarsal claw short, strongly curved. For genital valves see Figs 6–7.

**Distribution.** So far known only from the type series (2 males) collected in the Mazandaran province (Iran) (Baraud 1989). Distribution probably restricted to the Hyrcanian zoogeographical region.

**Pygopleurus psilotrichius** (Faldermann, 1835)

**Material examined.** IRAN, prov. Mazandaran, Alborz mts., N slopes, CHALUS env. [36°28'N 51°24'E], 800–0 m, 10.5.1996, David Král lgt., 7/6 on various flowers, open habitat (3/2 DKCP, 2/2 MHNCP, 2/2 MNCP).


**Pygopleuruszagrosensis** sp. n.
(Figs 1–5)

**Type material.** Holotype (male), allotype (female) and 10 paratypes (No 1–7 males, Nos 8–10 females), labelled IRAN, Zagros mts., 1800–2500 m, pr. Boyerakhdouz-va-Kuhplouyeh, Kaul-e-Damar ridge, 10 km N of YASUJ [30°39'N 51°36'E]. D. Král lgt. 1-25 1996. Holotype, allotype and paratypes Nos 1–3 and 8 in MNCP, Nos 4, 6 and 9 in DKCP and Nos 7 and 10 in MHNCP.

**Description.** Body length 10–11 mm (holotype – 10 mm, allotype – 11 mm). Male. Head, pronotum and scutellum green to cuprous with golden lustrue; setation consisting of white-grey and black setae. Elytron light brown, lateral and sutural margin black-green, without purple lustrue, recumbent setae in the anterior half almost completely black, posteriorly gradually becoming yellow-black, apically only yellow; erect setae mostly black, posteriorly in sutural area yellow. Propygidium basally dark, anterior third yellow-red as in pygidium, dark area of propygidium with dark setation; yellow-red areas of both pygidium and propygidium with yellow setation. Femora and tibiae black, with strong green lustrue, covered with yellow setae; tarsi black, with green lustrue, setation consisting of light and dark setae. Abdominal sternites with dense grey setation.
Labrum anteriorly slightly emarginate. Anterior margin of clypeus straight, anterior angles and lateral margin rounded; surface covered with coarse and dense punctures except for medial gibbosity; longitudinal keel absent. Pronotum with broadly rounded anterior and posterior angles, broadest in posterior third; basal margin straight medially; surface covered with fine in some areas rather indistinct verricular wrinkles. Elytron apically cut off, sutural angle obtuse but distinct, posterolateral angle rounded. Protarsal claw short and strongly curved.

Aedeagus as in Figs 1–3.

Female differs from male as follows: head, pronotum and scutellum green-purple; elytron in basal third brown, two apical thirds black, humeral umbones darkened; longitudinal keel of clypeus present; elytron apically, with sutural denticle. For genital valvules see Figs 4–5.

Collection circumstances. All specimens were collected from yellow flowers of Asteraceae in a clear oak forest.

Name derivation. Derivate from its occurrence in the Zagros Mts. Iran.

Differential diagnosis. According to Baraud (1989) pronotum covered with verricular wrinkles, apex of elytron in both sexes cut off and with sutural denticle in female classify the new species as a member of species group II of Pygopleurus Motschusly, 1859. Similar shape of aedeagus to the new species (Figs 1–3) can be found in P. besucheti Baraud, 1989 (Baraud 1989: fig. 20) and in P. cinctus (Petrovitz, 1957) (Baraud 1989: fig. 11). But the former species exhibits elytral apex regularly rounded and it is known from Israel, the latter have pronotum entirely shagreened, without verricular wrinkles and it is described from Iraq. P. zagrosensis sp. n. can be distinguished from other known species of the species group II according to the following modified key by Baraud (1989):

Figs 1–9 Pygopleurus zagrosensis sp. n., holotype (1–3), allotype (4–5). P. mardehensis Baraud (Iran, Chalus area) (6–7). Metallura (Aurelia) kurdiana sp. n., holotype (8–9). Left paramere (1–3, 9); dorsal sclerite of left genital valvule (4, 6); ventral sclerite of the same (5, 7), right paramere (8). Dorsal view (2, 4–7), lateral view (1, 8–9), frontal view (3)
Key to males of *Pygopleurus* species group II

1 (2) Prosternal claw long and only finely curved, W Turkey ........................................... *P. labaumel* (Petrovitz, 1971)
2 (1) Prosternal claw short and strongly curved
3 (4) Clypeus finely punctate, S Turkey ........................................... *P. monticola* (Petrovitz, 1964)
4 (3) Punctuation of clypeus dense and more coarse
5 (6) Apex of elytron obliquely cut off, sutural denticle present, Greece ........................................... *P. apicalis* (Drullé, 1832)
6 (5) Apex of elytron straightly cut off, sutural denticle absent
7 (8) Apex of elytron with distinct sutural denticle, Balkan Peninsula, W Turkey ........................................... *P. kretsen* (Brühl, 1832)
8 (7) Sutural denticle absent
9 (10) Elytron brown with black apex, Turkey (Hatay), Syria ........................................... *P. reissi* (Petrovitz, 1963)
10 (9) Elytron entirely brown
11 (12) Labrum anteriorly straight, pronotum distinctly coarsely wrinkled, Setae of metasternum consisting of pale and dark setae, Body length 15 mm. Caucasus ........................................... *P. transcaucasicus* (Petrovitz, 1962)
12 (11) Labrum anteriorly slightly emarginate, pronotum finely and in some specimens only indistinctly wrinkled, Setae of metasternum only pale, Body length 10–11 mm. Iran (Zagros Mts.). ........................................... *P. zugmayeri* sp. n.

Key to females of *Pygopleurus* species group II

1 (2) Apex of elytron strongly angulate, Syria, Israel, Iraq, Jordan ........................................... *P. syriacus* (Lunaeus, 1758)
2 (1) Apex of elytron only slightly angulate
3 (4) Pronotum reddish-capaceous, elytron unicolorous with indicated blue-black spot apically, S Turkey ........................................... *P. monticola*
4 (3) Pronotum opaque or slightly shiny, of different color.
5 (6) Elytron unicolorously brown, rarely with blue-green sutural stripe or with blackish apex, Balkan Peninsula, W Turkey ........................................... *P. kretsen*
6 (5) Elytron unicolorously brown, with blue-green sutural stripe or with blackish apex
7 (8) Clypeal sides parallel posteriorly, pronotum violet, elytron black-green with large light humeral area (male unknown), Syria ........................................... *P. stramineus* (Redtenbacher, 1850)
8 (7) Clypeal sides rounded, pronotum of different color, at least anterior third of elytron brown
9 (10) Basal margin of pronotum medially (against scutellum) slightly emarginate, pronotal setation yellow-intermixed with several black setae, posterior third of elytron black-green, prosternal claw long, only slightly curved, Body length 12–14 mm. Turkey (Hatay), Syria ........................................... *P. reissi*
10 (9) Basal margin of pronotum medially (against scutellum) straight, pronotal setation consisting of white-grey setae intermixed with black ones, humeral emargines darkened, more than posterior elytral third black, prosternal claw short, strongly curved, Body length 10–11 mm. Iran (Zagros Mts.). ........................................... *P. zugmayeri* sp. n.

Scarabaeidae: Sericiniae

*Maladera (Aserica) hodkowae* sp. n.

(Figs 8–9)

**Type material.** Holotype (male), allotype and 2 paratypes (No 1 — male, No 2 — female), labelled: IRAN, Zagros mts., 1800–2500 m, pr. Boyerabad–ve-Kuhgeluchs, Kuh-e-Diner ridge, 10 km NE of YASIJ [30°52'N 51°36'E], D. Kral, leg. 1–29 1986. Holotype and allotype in DZCP, paratypes in MNCP.

**Description.** Body length 7.5–7.7 mm (holotype — 7.5 mm, allotype — 7.7 mm). Oval, remarkably convex and shiny species, colour of dorsal surface dark brown to black with reddish contours, antennae light yellow-brown, legs and ventral surface dark red-brown, setation yellowish.

Head. Clypeus anteriorly deeply emarginate, anterior angles rounded, sides straight and divergent posteriorly, surface finely shagreened, covered with large, shallow, often fused punctures with indistinct margins and dense fine punctures indicated only anteriorly, several punctures (6–8)
along anterior margin remarkably coarser bearing long erect setae. Frontoclypeal suture finely but distinctly impressed, sinuate. Frons relatively finely and sparsely punctate than clypeus, laterally with several remarkably coarser punctures bearing long erect setae. Eye canthus with evenly arcuate and bordered contour, finely rugose, in postero-lateral angle bearing single erect seta. Antenna with 10 antennomeres, antennomere I with long setae, trimerous antennal club as long as antennomeres II–VII combined.

Pronotum strongly convex, transversal, 1.7 times broader than long, broadest basally; anterior angles tapered remarkably over anterior margin, acute-angular with rounded apex, posterior angles obtuse-rounded with rounded apex, anterior and lateral margins bordered, basal border indicated only medially, punctuation double consisting of dense, very fine and almost regularly distributed punctures, mixed with coarse umbilicate, sparser distributed (separated by 3–4 their diameters), almost regularly distributed punctures, head of anterior angles with several long erect setae.

Scutellum trapezoidal with rounded apex, basally with several coarse (remarkably coarser than on pronotum), densely spaced punctures, apical third smooth.

Elytron convex, with continuous narrow external membranous margin. Epipleuron extended to obtuse-rounded posterior angle, apex broadly truncate. Striae subobsolete (indicated laterally and apically), intervals flat, surface covered with double punctuation, consisting of dense, very fine and almost regularly distributed punctures, mixed with coarse, umbilicate punctures, associated in irregular strips. Epipleuron with row of long, semierect setae.

Metalemma with two transversal rows of setiferous punctures, discally bare and shiny. Protibia distinctly bifurcate, with remarkably developed inferior apical spur. External apical spur of metatibia hardly longer than protetatarsome.

Abdominal sternites finely shagreened, with transversal row of long, recumbent setae. Punctuation of pygidium consisting of dense, coarse, umbilicate, irregularly distributed punctures, apically with several semierect setae.

Aedeagus as in Figs 8–9.

Differential diagnosis. Almost 30 species of the subgenus Aserica Lewis, 1895 are currently known from the Eastern Mediterranean and Iran (Baraud 1990, 1992, Keith 1998, Petrovitz 1969, 1971, 1980, Sabatinielli 1977a, b). Their external morphology seems to be considerably uniform and differential diagnoses are mainly based on remarkably different shape of parameres exhibited in every species. Four species, including the new, are known from Iran so far. Maladera (Aserica) punctatissimaria Proboscis restricted to the Hircanian zoogeographical region and M. (A.) baluchestonica Petrovitz, 1971 is based on a single male from the Baluchestan-va-Sistan province (SE Iran). From both these species, M. (A.) hodkovaiae sp. n., is distinguished in distinctly different shape of parameres (see Figs 8, 9; Petrovitz 1969: figs 4a, b, 1971: figs 4a, b). Third species, M. (A.) farsensis Petrovitz, 1980, is based on a single female from “Kazeroun” [= Kazerun in the Fars province] and differs from the new species to possess uniformly finely shagreened alutaceous dorsal surface (unique feature within the frame of all so far known Aserica species of the Eastern Mediterranean and Iran). Collection circumstances. All specimens were collected from under stones in clear oak forest.

Name derivation. Matronymic, dedicated to Zdena Hodkova of Prague, well-known Czech traveler.

Maladera (Aserica) punctatissimaria (Paldernmann, 1895)

Material examined. IRAN, prov. Mazandaran, Alborz Mts., 800–900 m, A slopes, Chalus env [36°38'N 51°25'E], 10.5.1996, David Král Igt., 100 swept from shrubs on open pasture near a stream (DKCP) IRAN, prov. Mazandaran, Alborz Mts., N slopes, ca 500 m, 10 km NNE Chorus by road [36°46'N 59°30'E], 10–11.5.1996, David Král Igt., 0/2 collected from under stones in the Hircanian forest (DKCP).
DISTRIBUTION Known from northern provinces of Iran (Gilan, Mazandaran, and Khorasan) and Turkey (Petrovitz 1969), record from Crete is according to Baraud (1992) doubtful.

*Omaloplia (Acarina) labrata* (Burmeister, 1884)

**Material Examined** Iran, prov. Fars, Zagros mts., ca. 1000 m, ABISHAR vll. civ. [30°22'30"N 51°30'E]. 2-3.5.1996, David Kral & Igi, 3/4 swept from shrubs of young oaks (2/5 DKCP, 1/1 MNCP).

**Distribution** Eastern Mediterranean Turkey, Syria and Iraq (Mosul) (Baraud 1965). First record from Iran.

**Acknowledgements**

The junior author thanks all the participants of the expedition who provided him with part of above material.

**References**


Baraud J 1971 Amphicola (Eulassa) navouria, nouvelle especies d'Iran *Novy Rev Entomol* 1 42-44.


Kovàřek F 1997 Results of the Czech Biological Expedition to Iran Part 2 Arachnida: Scorpionida, with descriptions of *Eratobuthus krali* gen. n. et sp. n. and *Holotantula zagrosensis* sp. n. (Buthidae) *Acta Soc Zool Bohem* 61 39-52.


Nikolaev G V 1982 Plastichactidiidae zhaki (Coleoptera: Scarabaeidae) Kazakhstana s Srednie Asii *Zooluch* (Coleoptera) of Kazakhstani and Middle Asia. Iss. Nauka KazSSR, 156 pp (in Russian).

Petrovitz K 1965 Österreichische entomologische Expeditionen nach Persien und Afghanistan Beiträge zur Coleopteram *Zooluch* 68 671-694.
Sabbatelli G 1977a Note su alcuni Lucanidae and Scarabaeidae Risucoli di Turchia, con descriptione di due nuove specie (Coleoptera) Fragm Entomol 13: 71–96
Shonasi G 1995 Iran Today Tehran Gita Shonasi Cartographie & Geographic Organization, 176 pp
BOOK REVIEW


This zoological dictionary appeared in print in the collection Uni-Taschenbcher - UTB für Wissenschaft which joins 13 publishing houses in German-speaking countries Germany, Austria and Switzerland. First author is professor affiliated with the Friedrich Schiller University in Jena, the second author is university educationalist for agrarian and medical didactics in Berlin. First edition of this publication appeared in print 20 years ago (1976). As emphasized in the preface, students, teachers and practitioners in various branches of applied zoology may be confronted with zoological or biological terms. The definitions and explanation of which are easily accessible neither to corresponding textbooks and today's professional journals and references, nor particularly through verbal communication (lectures and the like). Therefore, this word book offers quick and relevant illumination with regard to up-to-day terms.

The preface and contents are followed by instructions for the easy use of this publication.

Chapter 1 provides introduction to terminology and nomenclature. Particular subchapters focus on arrangement of zoological disciplines and on origin and evolution of scientific names of animals. Following subchapters discuss phonetics, transcription and style of writing, pronunciation, intonation, syllabification, binding vowels and prefixes and suffixes in compound words, principles of taxonomy, concepts and functions of zoological nomenclature, and an overview of systematic categories and their names. In addition, there are 30 summary-type tables giving in-depth explanation and overviews of topics discussed above.

Chapter 2 incorporates the basic lexical part: explanation of zoological names including biological, anatomical and physiological terms. Arranged in alphabetical order, introduced are German and Latin names of diverse zoological taxa, brief biography and bibliography of important zoologists, anatomists and physiologists not omitting distinguished antique physicians. Moreover, introduced are terms used in general biology, comparative anatomy, embryology, histology, cytology, genetics, biochemistry, zoogeography, breeding and parasitology including zoological terms and some selected drugs. Incorporated are about 15 500 entries covering zoological basics of scientific terms and their origin in Greek or Latin.

Chapter 3 offers a list of authors names Here names of about 1500 scientists who have given descriptions of zoological taxa (genera, species and subspecies) have been situated — together with characterizations of their fields of activity and brief biographical data. This list includes zoologists, parasitologists, anatomists, physiologists, chemists, further on bacteriologists, ecologists, artists and other investigators.

Chapter 4 presents an overview of the classification system of the kingdom Animalia. As stated here, this system has been reduced for didactic and space saving reasons — without introducing orders, classes or intermediate taxonomic levels. Presented overview leaves upon the classification scheme promoted by Remane, Streit and Weidmann (Kurze Leitfaden der Zoologie, Gustav Fischer Verlag, Stuttgart, 1980).

Chapter 5 provides access to literature: a comprehensive list of basic textbooks and monographs, to a lesser extent also journal quotations. In conclusion, there is an index of abbreviations and symbols used in this work, and a tabular overview of occurrence of important animal groups in divisions of geologic time.

This word book presents a practical pocket-sized manual for pregraduate and postgraduate life and health sciences students and teachers alike.

Jindrich Jirsa
Development of thorax in chick embryos with the experimentally produced thoracic ectopia cordis

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Abstract: Thoracic ectopia cordis (TEC) was produced in chick embryos on day 3.5 to 4 by a microsurgical implantation of the continuity of the membrana ruminans (MR). To follow the topographic movements of the prospective thoracic mesenchyme (PM), the method permitting formation of lines of India ink particles in living embryonic tissues were used. Long before the formation of thorax the heart reaches a considerable size. PM of the thoracic wall components from both sides has to move over it, to meet and fuse in the midline. It was found, that the essential morphogenetic movements of the PM (medial and cranial) proceed in embryos with the developing TEC similar to those, observed in normal embryos. But the PM movements in normal development have to undergo some but crucial ventrolateral deviation around the heart margins. The MR, bridging across the onset of its apposition the bulging heart, gives the support and guidance to PM, to cope with the ventrolateral deviation. In embryos with the experimentally torn TEC is the ventrolateral deviation of PM movement due to the absence of the mentioned MR function prevented. As a result, the heart is gradually displaced ventrally and kept outside the closing thorax. Depending on the size and location of the MR defect, different types of TEC develop. Particulars concerning the morphogenetic movements of PM are discussed.

Ectopia cordis, thorax, morphogenetic tissue movements, chick embryo, marking

INTRODUCTION

In the range of the 5th to 9th day of the embryonic development (e. d.) of the chick, the anterior body wall quickly differentiates. The bilateral mesenchymal anlagen of the essential thoracic wall components (furcula, coracoid, sternum plate) are approaching each other to fuse in the anterior midline, overlapping the heart (for review see Commin 1925, Portmann 1948, Hamilton 1952, Romanoff 1960, Carlson 1988). Exceptionally the closing parts of the thorax catch the heart outside their place of convergence what results in the development of the TEC.

Whether the primary disturbance is the abnormal development of the heart, the abnormal growth pattern of the body wall or some other factor remains unknown. The greater part of the available literature on TEC consists of casuistic reports or reports of surgeons, attempting to save life of maldeveloped newborns. The latter deal, first of all, with the surgical techniques used, describe the range and anatomy of the particular congenital defect and some of them give the up to date statistics of incidence (Milhoue & Joo, 1959, Kaplan et al. 1985, and others). As to the genesis of TEC, conclusions offered by classic monographs are mentioned in discussions which indicate that: "TEC represents an arrest in the development, when heart fails to complete its descent into the thorax" (Gaussig 1947), "conditions for the ectopia cordis (EC) development, has to be established very early, when the demarcation between intra- and extraembryonic coelom is being established".

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by the folding of the body" (Patten 1953), "TEC results from faulty development of sternum and pericardium because of failure of the complete fusion of the lateral folds in the formation of the thoracic wall" (Moore & Persaud 1998).

EC appears, besides other malformations by accident, in experimentally treated chick embryos (Männer et al. 1995, Seidel & Steding 1995, our unpublished observations). Such embryos are usually eliminated from further evaluations. They are only seldom mentioned in results and/or the possible causality of their appearance is rarely analyzed. Jaffe & Jaffe (1997) suppose that the "movements of fluids, brought about by the withdrawal of amnion from eggs, and the subsequent effects of such movements on the positioning of embryos may be the most important factor in the EC genesis". The same authors discuss the possibility of hypoxia-induced osmotic changes to be responsible of EC development. The involvement of the extraembryonic membranes in the development of EC due to a mechanical factor (early rupture of chorion and/or yolk sac, amniotic bands) is suggested by Kaplan et al. (1985).

In our studies concerning the thorax development (Seichert & Seichertová 1996) some embryos developed TEC. According to our suspicion the TEC was induced by unwilling damage to the membranes reunions (MR - the term introduced by Rathke (1838) and used in some monographs (Corning 1925) for the fine membrane, developed ventral to the heart loop by the descending head fold, when the embryonic body is folded off from the extraembryonic membranes (see discussion). To test the idea, we decided to develop TEC experimentally under standard conditions by a microsurgical impairment of the continuity of the MR and to study its development.

MATERIAL AND METHODS

Random-bred Brown Leghorns chick embryos (Dobrovice farm, Czech Republic), ranging from the 5th to 10th c.d. were used. The standard incubation and window technique were used. TEC was produced on e. o. 3.5 to 4 under the stereomicroscope.

- The MR was torn by means of microforceps ventrolateral to the heart as shown in Fig. 1. The size of MR defect corresponded approximately to the size of right atrium. MR was approached either through the incision of the uninion - GROUP I, or after the complete opening and reflection of the amnion - GROUP II

- Some of the treated embryos were marked, to follow the topogenetic movements of the PM - GROUP III. The method, permitting formation of lines of India ink particles in living embryonic tissues were used (for details see Seichert 1980). Marks were introduced oblique into the swelling of the anterior body fold and slightly above the wing bud level (Fig. 2). Location of each mark was documented (see below) with comment concerning details (length of the mark, depth of its introduction, if and when the glass marker was removed). Topogenetic movements of tissues were deduced from deformations and shifts of the originally rectilinear marks and from dispersion of the mark components. Results were compared to similarly marked untreated embryos (with intact MR).

After the procedure, windows in the shells were covered with glass, sealed with paraffin and replaced in the incubator. Treated embryos were controlled first two days after. Selected embryos were sampled either immediately after treatment or in about 13–24 hours intervals of further incubation and treated as follows:

Tab I. The incidence of TEC in embryos with experimentally torn MR. Group I – MR approached through the incision of the amnion. Group II – MR torn after reflection of the opened amnion. Group III – Embryos treated as group I and marked. TEC – Thoracic ectopia cordis. N – Normal closure of the thorax with the heart inside. E – Eliminated embryos, either died before 24 hours after the MR incision or died short after the marking.

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEC</td>
<td>43 (86%)</td>
<td>24 (79.9%)</td>
<td>56 (70%)</td>
</tr>
<tr>
<td>N</td>
<td>4 (8%)</td>
<td>4 (13.3%)</td>
<td>7 (8.75%)</td>
</tr>
<tr>
<td>E</td>
<td>3 (6%)</td>
<td>2 (6.5%)</td>
<td>17 (21.25%)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100%)</td>
<td>30 (100%)</td>
<td>80 (100%)</td>
</tr>
</tbody>
</table>
Fig. 1 Schematic drawing showing the creation of MR defect and its location. A - sternum, W - wing bud

- Fixed in 4% Formaldehyde, macrodissected and examined under stereomicroscope (marked treated embryos and marked controls)
- To minimize the developing skeleton, embryos were fixed for 4-5 days in 70% Ethanol, stained with Alcian Blue, cleared in 1% KOH and mounted in glycerol (modified technique of Lundvall 1977)
- Detection of dead cells in the thoracic wall of the untreated embryos was performed at 12 hrs intervals using vital staining with Neutral Red in Ringer saline (1000 applied intramonomitally (c. d 5-6) or supramitally (c. d 7-8))

Parts of the anterior body wall of the embryos selected for electron microscopy (EM) examination were fixed in double fixation procedure, using a buffered 3.25% Glutaraldehyde solution followed by buffered 2% Osmium tetroxide and embedded in LR White or Durcupan-Epon mixture. Ultrathin sections were examined under the transmission electron microscope TESLA BS 500 at 60 kV. Sections were stained with 1% Toluidine Blue for topographic orientation and for selection of material for EM investigation.

Morphology of the skeleton, distribution of marks and distribution of dead cells were recorded either by photography or using the camera lucida drawings.

Some complementary material and results from our previous studies of the normal thorax development (Seehart & Knapp 1992, Seehart & Seichertova 1996) was used (see Fig. 10)

RESULTS

The incidence of TEC in embryos with experimentally torn MR was high and was not influenced by the approach to the MR (Table 1)

Fig. 2 Schematic drawing showing the location of marks (m) introduced oblique into the swelling of the anterior body wall. A, A and B, B indicates the approximate extent of the marked body wall mesenchyme in the appropriate transversal section (black fields)
The topography of skeletal components of thorax and shoulder, relative to the heart in embryos with TEC is shown in Fig. 3 and is to be compared with the normal conditions shown in Fig. 4.

- The essential difference is in the intra- or extrathoracal location of the heart.
- Positions of the shoulder relative to the vertebral segments do not differ (about the 14th segment in both the malformed and normal embryos).
- Anlagen of the medial extremity of coracoid and of the related part of sternal plate are located behind the lateral heart margin on days 4 and 5 (Fig. 4).
- In embryos with developed TEC the main vessels passing in or out of the heart form the vascular stalk connecting the heart with the interior of the closed thorax.
- Variable scale of the complete TEC, as to the location of the opening through which the vascular stalk enter the thorax were observed. Among them three distinctive types were identified (Figs 3A, B, C).
  - A – TEC superior, in which the heart was located outside the thorax and the vascular stalk of the heart enters the closed thorax in the midline, cranial to the sternal closure. In such embryos sampled at later developmental stages the umbilical opening for the vascular stalk was very narrow and difficult to identify in cleared specimen stained for the cartilage.
  - B – TEC media. The vascular stalk of outside located heart entered the thorax through the opening in the central part of the sternum. Seldom developing type, observed in perfection twice only.
  - C – TEC inferior. Thorax was closed above the outside located heart. In some of such cases the heart was followed by the part of liver.
- In the majority of malformed embryos transitory TEC types were observed, differing in the size of the thoracic wall opening and in the extent of outside protruded parts of the heart.
- Contrary to the caudal pointing apex cords in normal embryos, in embryos with TEC, the apex cords was always turned cranial or at least ventral.

Marking experiments of the Group III embryos and the similar markings of untreated embryos (Figs 5–8).
- In general, marks shift medial and cranial, approaching by their ventrocaudal section the midline, or reaching (in treated embryos) the margin of the thoracic wall opening (Figs 5–7).

![Fig. 3: Topography of skeletal components of thorax and shoulder relative to the heart in embryos with TEC.](image-url)

Fig. 4. Topography of the skeletal components of thorax and shoulder relative to the heart in the normal embryos. Arrows indicate the location of anlagen of the medial extremity of scapula and of the related part of sternal plate behind the lateral heart margins. Arrowheads = the fourteenth vertebra. For further legend see Fig. 3.

- The original obliquity of marks undergone distinct horizontalisation in their ventrocaudal section (Figs 5A–C and 6C).
- Medial shift is minimal in the cranial section of marks, where dominates the cranial shift (appearance of the neck, see discussion).
- Deformation of the originally rectilinear mark differed in particular cases, depending on the depth into which the mark was introduced: mark components located in the ectoderm and the closely related mesenchyme (the place, where the mark was pricked into the body wall or penetrated through it caudally), undergo higher ascent, than its deeply located components (arrows in Figs 5B, C, 6C and 7A–C).
- The zone of fusion of both parts of the thoracic wall components exhibit
  - the linear thickening of the ectoderm, visible in the range from the 7th to the 9th e. d. as a white, more or less protruding line – "raphe" (Figs 8A, B).
- The raphe was underlayed by the more condensed strip of mesenchyme, containing higher quantity of phagocytes (Figs 8C and 9), was intensively stained with Neutral Red (Fig. 8C) and contained apoptotic cells (Figs 9A, B).

**DISCUSSION**

- Membrana reuniens: On days 4–5 the heart is covered by the membrane, formed by the internal layer of the descended causal margin of the head fold. The membrane is continuous with both the somatopleure and amnion, reaching caudally the anterior intestinal portal and Rathke (1838) introduced for the membrane the above used term MR (Verenigungshaut), which suits perfectly to the functional meaning of the structure. In the sense of the study of Steding & Kiemeyer (1969) and
Münner et al. (1995), the membrane corresponds to the internal layer of the pericardial fold, secondarily forming the ventral thoracic wall.

- Morphogenetic movements of the thoracic PM are indicated by the deformation, shift, and dispersion of marks (Figs 6, 7 and 10):
  - The medial shift of the thoracic PM in the normal development is obvious and generally accepted in all textbooks. Marks, found either near the line of fusion or reaching the margin of the thoracic wall opening (Fig. 6) confirmed the similar shift even in embryos with TEC.
  - The cranial shift of the thoracic PM in normal development was documented in our earlier reports (see the legend and diagrammatic summarisation in Fig. 10). The result was confirmed by markings of untreated embryos (see the cranially bent anterior segment of the mark in Fig. 5A). In embryos with TEC the shift corresponds with the shift observed in untreated embryos and could be either:
    - deduced from the horizontalisation of the anterior segments of marks, introduced oblique into the swelling of PM (Fig. 5B and C).
    - deduced from the cranially turned apex cordis in TEC superior and from anterior oriented apex cordis in both other TEC types (Figs 3, 5B, 5C, 5A and C). The cranial pressure exerted on the apex cordis by ascending thoracic PM is the supposed mechanism.
    - interpolated from the similar position of skeletal parts of the shoulder and thorax skeleton relative to spine segments both in treated and untreated embryos (compare Fig. 3 and Fig. 4). The cranial shift of the shoulder and the thoracic PM in normal embryos has been documented in an earlier report (Seuchert & Knospe 1992).
- The ventral shift of the thoracic PM in normal embryos is obvious, as was the medial one. But the realisation of the shift is conditioned by the necessary ventralateral deviation evident from the location of anlagen of the mediastinal extremity of cornoid and of the related part of sternal plate behind the lateral heart margins (see Fig. 4). The MR, bridging since the onset of its appearance the bulging heart, gives the support and guidance to PM to undergo the ventralateral deviation in the normal development. In embryos with the experimentally torn TEC the ventral shift was prevented, due to the absence of the mentioned MR functions.

Figs 5-8. Fig. 5 (above) A. Normal embryo marked on d 4, sampled three days later and stained for cartilage. The length and location of the mark shown on the schematic drawing (the caudal end of the mark did not reach the octoderm). The original obliquity of the mark undergone distinct horizontalisation. B, C - Embryos of the Group III, marked and treated further as the embryo shown in A. The glass carver in B (thick arrow) was left in the horizontalisation of the mark in B is obvious, in C the horizontalisation is indicated by the bent ventrectal part of the mark (thick arrow). See the upward-related apex cordis in B and C (arrowheads). The embryo was partly macrodissected. Thin arrows indicates, where marks were picked into the body wall. Fig. 6 (middle above). Embryos of the Group III, marked as the embryo shown in Fig. 5A. A - Embryo sampled three days after the treatment, B, C - Embryo sampled five days after the treatment, stained for the cartilage and partly macrodissected. The marks (arrowheads) reach the margins of the thoracic wall opening. Fig. 7 (middle below). A. Normal embryo, marked on d 4.5. The mark was introduced oblique into the swelling of the anterior body wall, level with the Cuvier duct (arrow) and posteriorly the body wall ventrectally in the wing bud level (W). B. The same embryo, sampled four days later and partly macrodissected. The heart was pulled slightly to the left to show the deeper located segments of the mark. The point, where the mark was picked into the body wall appears in the hinge of the neck (thin arrow). The deepest segments of the mark (arrowheads) are located medial to the distal end of cornoid and entered the septum transversum (compare with C). The caudal segments of the mark bent over the bulging heart, shifting transversally and mediad. C - Transversal section of the embryo, marked and sampled as the embryo shown in B. Arrowheads indicate the mark located in the septum transversum. Fig. 8 (below). A. Normal embryo, sampled at the 8th d. The thickening of the octoderm in the anterior midline "raphé" is distinct. B - Embryo with the developed TEC, sampled at the 8th d. C - Normal embryo, sampled at the 7th d. The "raphé" is visualized by the Neutral Red staining.
Fig. 10 A - Diagramatic summarisation of the morphogenetic shifts involved in the formation of the external shape of the embryonic body (day 7), discussed in the article. The diagram is based on studies by Schatz & Knaake (1992), Schatz & Schacht (1996) and Schatz & Rychter (1997). The approximate location of particular marks (m₁ – m₄) introduced on the 4th day in transversal planes (sections Sm₁ – Sm₄) is shown in B. H – hep., L – lung, O – oesophagus, P – primitive pharynx, T – trachea, z – lines z indicate the length and direction of the shift of axial organs (represented by the spine) relative to the more ventral located organs. The caudal oriented line indicates the cranial shift and the cranial oriented line indicates the caudal oriented shift of the spine. The longer line is the line – z – the longer is the shift of the particular spine segment.

The zone of fusion of the bilateral thoracic wall components is submitted to further study. The presence of numerous dying cells and phagocytes (both in the thickened ectoderm and in the related strip of condensed mesenchyme) indicates, that the physiological cell death (Saunders et al. 1982) eliminates superimposed cells approaching each other from both sides and mingling in the midline.

Acknowledgements
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Fig. 9 A – Schematic transversal section of the anterior body wall (e.d. 8) in the level of the “raphe”. B – Electron micrograph of the mesenchyme in the level of the “raphe”. C – Electron micrograph of the phagocyte containing the apoptotic cell.
REFERENCES

CORKING H K 1925 Lehrbuch der Entwicklungsgeschichte des Menschen Munchen J F Bergmann, 696 pp
HAMILTON H L 1952 Lifiting development of the chick Halt Rhinehart Winston New York
JAFFEE O C & JAFFEE A 1989 Ectopia cordis in the chick embryo heart. An experimental study Teratol 41 737-742
LUNDVALL H 1927 Farbung des Skelettes in Durchlichtungs-Weichteilen Anat Anz 62 353-373
MAHLER J, SEIDL W & STEIDING G 1995 The role of extracardiac factors in normal and abnormal development of the chick embryo heart cranial flexure and ventral thoracic wall Anat Embryol 191 61-72
PETRITSCH A 1948 Einführung in die vergleichende Morphologie der Wirbeltiere Basel Schwabe Co., 343 pp
RETKE H 1928 Zur Entwicklungsgeschichte der Thorax, eine Darstellung Arch Anat Physiol 1938 361-386
ROMANOVA A I 1960 The avian embryo (Structural and Functional Development) New York Macmillan 1600 pp
SEICHERT V 1988 Significance of the differential growth, relative tissue shifts and the vascular bud in limb morphogenesis Acta Univ Carol Med. Monographia 125 1-160 pp
SEICHERT V & KNOSTE C 1992 The rearrangement of the cranial part of embryonal body in chick studied by linear marking II. Relations of the neck, thorax and shoulder Functional Develop Morphol (Prague) 2 201-207
SEICHERT V & SEICHERTOVA A 1995 The closure of thorax in the chick embryo 37th Congress Czech Annt Assoc Brno Czech Rep Abstract
SEDEL W & STEIDING G 1995 The role of extracardiac factors in normal and abnormal development of the chick embryo heart cranial flexure and ventral thoracic wall Anat Embryol 191 61-72
SEINO T 1961 An experimental study on the formation of the body wall in the chick Acta Anni 45 69-82
TASSOIS J H B 1947 Congenital malformations of the heart. New York The Commonwealth Found, 618 pp

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The first record of *Eremobella geographic* (Acari: Oribatida) in the Czech Republic with notes on the oribatid communities of selected meadows in southern Moravia

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Abstract. *Eremobella geographic*. Berlese, 1908 was found in three meadows in southern Moravia. This is the first record of this genus in the Czech Republic. The biotopes and the oribatid communities inhabiting them are discussed.

Fauvnistic, ecology, oribatid communities, meadows, *Eremobella geographic*, Czech Republic

INTRODUCTION


Subias et al. (1990) described the second European species (*E. longisetosa*) from Andalusia (Spain). *E. geographic* has been recorded in the monographs (Kunst: 1969, Krivoluckij 1975) as *E. cf. geographic*. Its characteristics, however, seem to be clear (i.e., ornamental configuration of the notogastral tubercles, thin, threadlike sensillus and notogastral chaetotaxy), and distinct from all congeners. *E. longisetosa*, as indicated by its name, possesses very long notogastral setae and, as with many other species, lacks a tubercular network on the notogaster.

In other European finds *E. geographic* has been reported by Balogh (1943) from Hungary and by Olszanowski et al. (1996) from Poland. Krivoluckij (1975) reported it from the Crimea.

This paper reports the first record of *E. geographic* in the Czech Republic, on the biotopes inhabited by this species and on their overall oribatid communities at all.

MATERIAL AND METHODS

Soil cores (approx. 500 cm²) were randomly sampled during investigations of several meadows in southern Moravia (December 1996). They were extracted in Berlese-Tullgren funnels into 80% ethyl alcohol.
Several studied meadows were moist, some of them partially inundated. Three of them, however, were drier (see below, items 2-4). The phytoecological characteristics of meadows have been by Tesařová & Pilař (1997).

1. Košárska meadow near Lamžhot village – alliance Carex grisea, with Phleum annulatum dominant, on clay loam. This moist meadow differs from the following meadows (items 2-4) in a model of moist meadows in the region investigated.

2. Košárska meadow near Lamžhot village – alliance Carex venosa, with Alopecurus pratensis dominant, on sandy loam dry.

3. Nenčeka meadows near Lednice town – alliance Carex venosa, with Carex canescens dominant, on clay loam, moderately dry.

4. Obelák meadow near Lednice village – alliance Molinio, with Serratula tinctoria dominant, on clay loam, dry.

RESULTS

The orbited communities in the most meadows were moderately diversified (e.g. 7 orbited taxa – Tab 1) and consisted of common grassland dwellers. On the other hand, the soil fauna of the drier sites included both common meadow soil orbibats as well as some rare species (Tabs 2-4). The meadow dominated by Serratula tinctoria represented the most interesting and diversified (17 orbited species) biotope and contained several rare orbibats, e.g. Podoribates gratus and Heterozetes palustris (Tab 4).

In the microecological communities, some trends to thermotolerance are indicated in these three drier meadows. The fungus Hormogonum aspergillata occurred conspicuously in all three meadows. This is the first record from Czech Republic (Marvanová, personal communication, and Marvanova 1997).

Erembelba geographica inhabited the three drier meadows in spite of their different plantations characteristics. Its abundances were low (1-5 mites per one sample).

Tab: 2. The orbited species sampled from the dry meadow (Košárska meadow – alliance Carex venosa dominated by Alopecurus pratensis) (abbreviation used: ED = edominant, D = dominant, J = juvenile, the species are ordered according to their dominance)

<table>
<thead>
<tr>
<th>Species</th>
<th>Dominance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akrepiteria castropilata</td>
<td>ED</td>
</tr>
<tr>
<td>Carexella mascula var. Berlese, 1908</td>
<td>ED</td>
</tr>
<tr>
<td>Scheloribates laevigatus</td>
<td>J</td>
</tr>
<tr>
<td>Nidus sp</td>
<td></td>
</tr>
<tr>
<td>Panzeriaста pavesa (Oudemans, 1913)</td>
<td></td>
</tr>
<tr>
<td>Hemionula ustulata Berlese, 1909</td>
<td></td>
</tr>
<tr>
<td>Erembelba geographica Berlese, 1908</td>
<td></td>
</tr>
</tbody>
</table>
Tab 3 The orchid species sampled from the moderately dry meadow (Ledečno village – Nejdké meadows – alliance Orido-Caricion, seroae dominated by Carium camum). (abbreviation used: ED – cedominant, D – dominant, J – juvenile, the species are ordered according to their dominance)

<table>
<thead>
<tr>
<th>Species</th>
<th>Dominance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaumannia elata (C. L. Koch, 1841)</td>
<td>ED</td>
</tr>
<tr>
<td>Achillea colongrata (Lam., 1758)</td>
<td>ED</td>
</tr>
<tr>
<td>Schelorhiza lacustris (C. L. Koch, 1836)</td>
<td>ED</td>
</tr>
<tr>
<td>Nankevillia minima (Nicolet, 1855)</td>
<td>ED</td>
</tr>
<tr>
<td>Testacanthus velatus (Michael, 1880)</td>
<td>ED</td>
</tr>
<tr>
<td>Statuadens verticillata (Nicolet, 1855)</td>
<td>ED</td>
</tr>
<tr>
<td>Opunia sp.</td>
<td></td>
</tr>
<tr>
<td>Humulus modestus (Berlese, 1905)</td>
<td></td>
</tr>
<tr>
<td>Ceratozizus midnecus Berlese, 1908</td>
<td></td>
</tr>
<tr>
<td>Anthericum erinaceum (Schuster, 1958)</td>
<td></td>
</tr>
<tr>
<td>Eremobella geographica Berlese, 1908</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

The genus Eremobella has generally a rather tropical distribution (see Introduction). Only two species (E. geographica and E. longiseta) occur in Europe, described from its southern parts. E. geographica seems to have expanded northwards (Balogh 1943, Olszanowski et al. 1996) in recent years. Its rare records probably result from its type of distribution or its low abundances in biotopes.

The characteristics of these six meadows inhabited by this species appear to confirm its affinity for the moderately dry or dry and warm biotopes, i.e. its xerothermality. The first record of this mite from the Czech Republic also seems to accord with the first record of Hormographis aspergilloides in the same biotopes (Marvanová, pers. comm., Marvanová 1997).

Although both adjacent meadows (items 1 and 2) were inhabited by common orchids, Eremobella geographica occurred in the dry one (dominant Allopecurus pratensis) only. The other dry

Tab 4 The orchid species sampled from the dry meadow (Ledečno village – Obelík meadow – alliance Molinion dominated by Serapias montana) (abbreviation used: ED – cedominant, D – dominant, J – juvenile, the species are ordered according to their dominance)

<table>
<thead>
<tr>
<th>Species</th>
<th>Dominance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puncturhantes punctum (C. L. Koch, 1839)</td>
<td>ED</td>
</tr>
<tr>
<td>Ceratozizus midnecus Berlese, 1908</td>
<td>ED</td>
</tr>
<tr>
<td>Brachyzygmys sp.</td>
<td>ED</td>
</tr>
<tr>
<td>Schelorhiza lacustris (C. L. Koch, 1836)</td>
<td>D</td>
</tr>
<tr>
<td>Malaxostomus gracilius Hammen, 1952</td>
<td></td>
</tr>
<tr>
<td>Pontezygmys pulchri (Oedemars, 1915)</td>
<td></td>
</tr>
<tr>
<td>Opunia sp.</td>
<td></td>
</tr>
<tr>
<td>Belba pseudostrigosa Märknel &amp; Mayer, 1960</td>
<td></td>
</tr>
<tr>
<td>Statuadens verticillata (Nicolet, 1855)</td>
<td></td>
</tr>
<tr>
<td>Guastavia lanata (C. L. Koch, 1841)</td>
<td>J</td>
</tr>
<tr>
<td>Testacanthus velatus (Michael, 1880)</td>
<td></td>
</tr>
<tr>
<td>Pediocrella festu (Sellnick, 1921)</td>
<td></td>
</tr>
<tr>
<td>Ceratozizus midnecus Berlese, 1908</td>
<td></td>
</tr>
<tr>
<td>Hieracozizus palustris Willmann, 1917</td>
<td></td>
</tr>
<tr>
<td>Trichorhiza triacutata (Krantz, 1896)</td>
<td></td>
</tr>
<tr>
<td>Trichorhiza triloculata (C. L Koch, 1836)</td>
<td></td>
</tr>
<tr>
<td>Gaumannia elata (C. L. Koch, 1841)</td>
<td></td>
</tr>
<tr>
<td>Eremobella geographica Berlese, 1908</td>
<td></td>
</tr>
</tbody>
</table>

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meadow (item 4 - Obelisk) included in their community structure common grassland orchids as well as Eremobela geographica and several other interesting orchid species (e.g. Anorhabditella ornata, Podoribates gratus and Heterozetes palustris).

Characteristics such as moisture and vegetation seem to be the most important factors for Eremobela geographica occurrence. An outstanding feature of these meadows is variety of their orchid species and the structure of their communities. Therefore, the protection of these meadows seems to be priority.

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I wish to thank Dr Malcolm Lutton, National Museum of Wales for his kind linguistic and stylistic review of this paper and for very useful comments. I am grateful to Dr H. Marvanova, Masaryk University, Brno for her very kind and useful information on the microorganisms from the meadow studied. This study was supported by grant GAČR 526/96/0250 (laboratory part) and by Programme GEF - Biodiversity Protection in the Czech Republic (field part).

REFERENCES

Balogh J 1943 Magyarorszag pancoraatai (Conspectus orchidacearum Hungaricae) Budapest Magyar Tudomanyos Akademia Kiadasa, 202 pp (in Hungarian)

Herles A 1968 Elenco di generi e specie nuove di Acan. Raffa 5: 1-35


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