

A REVIEW OF GENUS *OMOPHRON* LATREILLE, 1802 (COLEOPTERA: CARABIDAE) MEDITERRANEAN FAUNA AND DISTRIBUTION

Uldis Valainis

Valainis U. 2009. A review of genus *Omophron* Latreille, 1802 (Coleoptera: Carabidae) Mediterranean fauna and distribution. *Acta Biol. Univ. Daugavp.*, 9(1): 63 - 72.

In the article information about ground beetles of genus *Omophron* Latr. (Coleoptera: Carabidae), distributed in Mediterranean region, has been gathered. On the basis of processed literature data and materials of collections a list of determination keys for *Omophron* Latr. species from Mediterranean region has been made. A list of species has been developed, general description, information about species distribution, data about processed material and the most significant literature sources have been given for each of species traced in Mediterranean region. Altogether 4 species – *Omophron limbatum* (F.), *O. rotundatum* Chaud., *Phrator multiguttatum* Chaud. and *P. variegatum* (Ol.) have been indicated for Mediterranean region.

Key words: *Omophron*, Mediterranean, fauna, distribution

Uldis Valainis. Institute of Systematic Biology, Daugavpils University, Vienības Str. 13 - 229, Daugavpils, LV-5401, Latvia, uldis.valainis@biology.lv

INTRODUCTION

Ground beetles of the genus *Omophron* (Coleoptera: Carabidae) are conspicuous due to their oval body outline, hidden mesosternum, concealed scutellum, multi-striate elytra, and peculiar burrowing habits. In world fauna 65 (Lorenz, 2005) species of the genus *Omophron* Latr. ground beetles are known. The southern border of the prevalence area of the genus *Omophron* Latr. goes through South Africa, Madagascar, Malaya, the Philippines, Guatemala and Saint Domingo; the northern border reaches the Arctic Circle in some places.

Currently researches of the genus *Omophron* Latr. in the Mediterranean region are considered to be very incomplete, because only several

publications about this genus of ground beetles can be found in literature. Though there have been attempts to make world fauna review (Chaudoir, 1868; Bänninger, 1921) the list and descriptions of species given in them are considered to be incomplete, furthermore many taxons nowadays are synonyms for other species. Larvae of the genus *Omophron* Latr. have been investigated quite rarely. Researches at larval stage (Beutel, 1991; Luff, 1978) have been done for two species of the genus *Omophron* Latr., which can be found in Mediterranean region - *O. limbatum* F., *P. variegatum variegatum* Oliv.

Looking at *Omophron* Latr. ground beetles in the scope of genus it can be concluded that generally species have similar characteristics. Though several authors (Semenov, 1922; Lutshnik, 1933

u.c.) have tried to divide this taxon in separate genera majority of these attempts were unsuccessful. As an example we can mention Semenov-Tian-Shanskij (1922), who divided Omophronini Bonelli, 1810 triba into 10 separate genera, however majority of given diveregncies are too small to assign the newly described taxons a status of genus. Only one of genera (*Phrator*) described by him has gained status of independent taxon, which is currently used as a title of one of sub-genera of genus *Omophron* Latr. Two species of this sub-genus can be traced in the Mediterranean region as well.

MATERIAL AND METHODS

The material used for this study is deposited in the following collections: Switzerland, Zurich, Erdgenössische Technische Hochschule-Zentrum (ETHZ); Belgium, Brussel, Institut Royal des Sciences Naturelles de Belgique (ISNB); Museum of Zoology, Barcelona, Spain (MZBS); Russia, St. Petersburg, Russian Academy of Sciences, Zoological Institute (ZIN); Museum of Zoology, Institute of Zoologic Taxonomy, Amsterdam University, Netherland (ZMAN); Zoological Museum, University of Copenhagen, Denmark (ZMUC); Russia, Moscow, Moscow State University (ZMUM);

Figures are made by a stereomicroscope *Zeiss SteREO Lumar V12* and *Axiocam* digital camera. They have been processed and the morphometrical measurements were taken by *Axioview 4.4* software. Total body length is measured from the tip of the labrum to the apex of the right elytron; the width of the head (HW) as the maximum linear distance across the head, including the compound eyes; the length of the pronotum (PL) from the anterior to the posterior margin along the midline; the length of the elytra (EL) from the basal margin to the apex of the elytron; the width of the pronotum (PW) and elytra (EW) at their broadest point.

RESULTS AND DISCUSSION

In the Mediterranean region the genus *Omophron* Latr. (Coleoptera: Carabidae) is represented by 4 species, which belong to two sub-genera – *Omophron* Latr. and *Phrator* Sem. One of the species which occurs in the region (*P. variegatum* Oliv.) is endemic for Mediterranean basin. Nowadays it is used to outline four *P. variegatum* Oliv. sub-species – *P. variegatum variegatum* Oliv., *P. variegatum sardoum* Reitt., *P. variegatum boiteli* Alluaud and *P. variegatum seurati* Alluaud. *P. variegatum variegatum* Oliv. is distributed in Iberian Peninsula. *P. variegatum sardoum* Reitt. can be traced only in Sardinia, *P. variegatum boiteli* Alluaud is known from Northern Tunisia, but *P. variegatum seurati* Alluaud. from Southern Tunisia.

Afro-tropical area (Somalian and Eastafrican regions) is basic area of distribution for one of the species, which occur in Mediterranean region (*P. multiguttatum* Chaud.). In Northern Africa and Mediterranean region this species can be traced only in Nilotic delta. *O. limbatum* (F.) is the species which has the widest area of distribution in the Mediterranean region and whole Palearctic. Area of distribution of this species occupies Euro-Siberian, Mediterranean and Central Asian regions. In Mediterranean region this species occurs in whole European part, in the Asian part the species is known from East Turkey, Israel, but in the African part – from Algeria and Tunisia.

On the basis of processed literature data and materials of collections a list of determination keys for *Omophron* Latr. species from Mediterranean region has been made. A list of species has been developed, general description, information about species distribution, data about processed material and the most significant literature sources have been given for each of species traced in Mediterranean region. Data on variation in some values among the *Omophron* species are given in Table 1.

**DETERMINATION KEYS FOR THE
MEDITERRANEAN *OMOPHRON*
SPECIES**

1 (4) Mandibles shorter, their outward margin without wedge-shaped extension. Sides of the 1st sternite at least with insignificant puncture. Base of pronotum with one uninterrupted pattern. Total length generally less than 7 mm
.....*Omophron* Latr.

2 (3) Elytral pattern more developed (Fig. 2), the middle band of elytral pattern mainly uninterrupted. Pronotal pattern bigger and lighter. Elytral intervals more convex. Aedeagus like in Fig. 1.1.
.....*O. limbatum* (F.)

3 (2) Elytral pattern less developed (Fig. 3), the middle band of elytral pattern mainly interrupted. Pronotal pattern smaller and darker. Elytral intervals less convex. Aedeagus like in Fig. 1.2.
.....*O. rotundatum* Chaud.

4 (1) Mandibles longer, their outward margin with wedge-shaped extension. Sides of the 1st sternite without insignificant puncture. Dark pattern on pronotum base with interruption. Total length generally more than 7 mm
.....*Phrator* Sem.

5 (6) Pronotum above the base with impression. Pattern on elytra more developed. Aedeagus like in Fig. 1.3.
.....*P. multiguttatum* Chaud.

6 (5) Pronotum above the base without impression. Pattern on elytra less developed or reduced. Aedeagus like in Fig. 1.4.
.....*P. variegatum* Ol.

7 (10) Green pattern on pronotum developed.

8 (9) Elytral pattern with marked metallic green shine. Pronotal pattern with soft borders,

the sub-species endemic for Sardinia.....
.....*P. variegatum sardoum* Reitt.

9 (8) Elytral pattern with less marked metallic green shine. The pronotal pattern with clear-cut borders. The sub-species distributed in Spain and Portugal.....
.....*P. variegatum variegatum* Ol.

10 (7) Green pronotal pattern undeveloped or reduced.

11 (12). Elytral pattern remained only as separate points. Green pronotal pattern completely reduced. Fig. 5.....
.....*P. variegatum boiteli* Alluaud

12 (11) The first two bands of the elytral pattern well developed. The green pronotal pattern consists of three parts.
.....*P. variegatum seurati* Alluaud

**LIST OF SPECIES OF GENUS
OMOPHRON LATR. TRACED IN THE
MEDITERRANEAN REGION**

OMOPHRON LIMBATUM (FABRICIUS, 1777)

=*dubium* (Herbst, 1779) (*Carabus*);
coccinelloides (Petagna, 1819) (*Nitidula*); *ab. disjunctum* Dalla Torre, 1877; *kanalense* Fauvel, 1882; *maculipenne* (Pic, 1901); *corcyreum* Sahlberg, 1903; *sokolari* Roubal, 1909; *baenningeri* Krausse, 1915 nec Dupuis, 1912; *solskyi* Zaitzev, 1916; *confluens* Chobaut, 1923; *ab. kraussei* Csiki, 1927

Description: Species with features of genus. The green pattern on pronotum and elytra with much variations. The colour variations of the pattern have received various titles, however they have not been given the status of classification. Pattern on pronotum and sides of abdomen and micro sculpture on elytra differ very much in the same way as pattern of body surface. Frons and clypeus, which also have micro sculpture, can be folded lengthwise. Usually the folds are characteristic for *O. limbatum* F. specimens from

Table 1. Data on variation in some values among the *Omophron* species

Species	ex	BL (mm)	HW (mm)	PL (mm)	PW (mm)	EL (mm)	EW (mm)
<i>O. limbatum</i> F.							
?	5	5.81-6.19	1.94-2.10	1.50-1.67	3.00-3.25	3.43-3.68	3.66-4.03
?	5	5.90-6.38	1.95-2.15	1.62-1.77	3.06-3.39	3.69-3.81	3.75-4.25
<i>O. rotundatum</i> Chaud.							
?	5	6.00-6.49	1.95-2.08	1.56-1.69	3.06-3.24	3.49-3.64	3.71-4.02
?	5	6.12-6.51	1.96-2.11	1.62-1.78	3.09-3.35	3.58-3.79	3.74-4.21
<i>P. multiguttatum</i> Chaud.							
?	5	7.16-8.35	2.28-2.47	1.83-2.20	3.24-3.64	4.51-5.12	4.35-4.93
?	5	7.59-8.45	2.39-2.56	1.96-2.32	3.54-3.70	5.10-5.45	4.48-4.95
<i>P. variegatum variegatum</i> Oliv.							
?	5	7.65-8.49	2.35-2.49	1.94-2.23	3.31-3.65	4.67-5.52	4.30-5.04
?	5	7.83-8.76	2.43-2.59	2.10-2.34	3.44-3.73	5.18-5.55	4.63-5.10
<i>P. variegatum sardoum</i> Reitt.							
?	5	7.86-8.51	2.36-2.58	1.85-2.29	3.31-3.66	4.51-5.43	4.32-4.96
?	5	7.83-8.76	2.46-2.64	2.11-2.41	3.39-3.74	5.06-5.51	4.66-5.01
<i>P. variegatum boiteli</i> Alluaud							
?	2	7.55-8.12	2.43-2.52	1.87-1.97	3.28-3.45	4.49-5.24	4.21-4.36
?	3	7.64-8.46	2.35-2.57	1.93-2.13	3.40-3.68	5.05-5.29	4.59-4.99
<i>P. variegatum seurati</i> Alluaud							
?	1	7.38	2.37	1.87	3.24	4.44	4.28

Central Asia regions. The specimens are usually featured by not very frequent and smoothed punch on abdomen base sternite and many other peculiarities.

In major cases according to shape and structure peculiarities *O. limbatum* F. differs from the other *Omophron* Sem. sub-genus' species *O. rotundatum* Chaud., distribution area of which enters eastern part of Asia Minor. *O. limbatum* (F.) resembles Far East species *O. aequale* Mor.. Both these species can be definitely determined by the shape of aedeagus. For *O. limbatum* (F.) the shape of aedeagus is like in Fig. 1.1.

Distribution: The species is distributed in the major part of Europe. The northern border of the prevalence area in Europe reaches Denmark, Southern Sweden and Estonia. In the western part of area the species can be traced up to Southern part of Great Britain. It is distributed in other countries of Western, Central and Eastern Europe as well. The southern border of area of prevalence reaches Mediterranean region and Northern Africa. *O. limbatum* (F.) is wide-spread in Asia as well: Ukrainian Carpathians and Transcarpathia, North Russia Plain, Middle

Stretch of Russian Plain, Southern Russian Plain, Caucasus, Southern West Siberia, Plain areas of Kazakhstan, Tian-Shan; Turkey; Syria; NW Iran, N Afghanistan.

In the Mediterranean region the species is known from Albania, Algeria, Bosnia and Herzegovina, Bulgaria, Croatia, France, Greece (incl. Crete), Italy (incl. Corsica and Sicily), Montenegro, Serbia, Slovenia, Spain, Tunisia, Turkey.

Processed material: ETHZ - Bulgaria: Sofia (1 B&); **Italy:** Calabria, Sta. Eumetia (1 B&, Paganetti leg.); **France:** Carcassonne (1 B&); **Tunisia:** Ain Draham (1 B&, Bodemeyer leg.); **France:** Bord de l'Ardèche, Arbas (2 @&, Negre leg.); **Spain:** Andalusia, Cadiz, San Roque, (2 @&, J. De Ferrer leg.); Barcelona, Circa, 26.03.1905 (1 @&, Mas de Xaxars leg.), Catalonia, Guillerics, 06.07.1929 (1 @&, Villarubia leg.); Catalonia, Balenya, 17. VIII 1926 (1 B&, Vilarrubia leg.); Catalonia, Mollet, Girona, Sant Pere Pescador (1 @&, De Grigorio leg.), San Hilario de Sacalm, VII 1945 (2 B&, Bvltler leg.), Srra. De Cazorla, V 1953 (1 B&, 2 @&); Barna, Llobregat 17.05.1926 (1 @&); **ZIN: Greece:** Rinistere (3), Corfu, Potomos (6) (determined as *O. corcyreum* Sahlb.); **France:** France Mid.



Fig. 1. Differences of aedeagus shape for ground beetles of genus *Omophron* Latr. Mediterranean species. 1. *O. limbatum* (F.) 2. *O. rotundatum* Chaud. 3. *P. Multiguttatum* Chaud. 4. *P. variegatum sardoum* Reitt.

(1); **Italy**: Lombardy, Cremom, 01.06.1846 (1 B&, Schrent L. leg.); **Turkey**: (1); **ZMUC – Italy**: Sicily, Messina (1 B&); **Greece**: Crete, Zebe (4 B&, 3 @&).

Petagna, 1819; Pic, 1901; Roubal, 1909; Sahlberg, 1903; Semenov-Tian-Shanskij, 1922; Semenov-Tian-Shanskij, 1926; Serrano et. al. 2003; Zaitzev, 1916

References: Bänninger, 1915; Bänninger, 1918; Bänninger, 1956; Csiki, 1927; Fauvel, 1882; Gestro, 1892; Gueorguiev & Guerguiev, 1995; Guerguiev, 2007; Herbst, 1779; Hurka, 2003; Krausse, 1915; Kryzhanovskij, 1982; Luff, 1978;

OMOPHRON ROTUNDATUM CHAUDOIR, 1852

= *rotundatum* (Bänninger, 1915)



Fig. 2. *Omophron limbatum* (F.)



Fig. 3. *Omophron rotundatum* Chaud.

Description: Spots on the pronotum usually do not reach the basic side, but in direction to apex it slightly overlooks the middle part. The spots on the basic side of elytra are small, they reach only 8th–9th elytral stria, sometimes they are hard to see or completely reduced. The middle band of the elytral pattern is interrupted or (more rarely) narrowed in the area of the 7th–9th elytral stria; the apex band is shortened and stretches till the 7th, 8th elytral stria. Specimens with elytral pattern similar to *O. limbatum* (F.) can be traced very rarely. Elytral interval between elytral stria usually moderately curved in the basic part. The vertex has marked lengthwise folds between points. Puncture on sides of the 1st and 2nd sternites sparse, sometimes hard to see, however it never disappears (contrary to data given by Bänninger (1956)).

In comparison with the other *Omophron* Latr. sub-genus' species (*O. limbatum* (F.)), which can be found in the Mediterranean region, *O. rotundatum* Chaud. has less developed dark elytral pattern and mainly rougher microsculpture of the surface than *O. limbatum* (F.), especially @&. A typical peculiarity is comparatively smaller and darker pronotal pattern as well. However separate *O. rotundatum* Chaud. specimens, which have surface pattern resembling *O. limbatum* (F.), have been observed. Sharp divergences are observed in the structure of aedeagus. *O. rotundatum* Chaud. resembles *O. axillare* Chaud., but the basic area of prevalence for this species is Himalaya and mountain chains laying next to them – in the Mediterranean region this species is not found. Form of aedeagus of *O. rotundatum* Chaud. is like in Fig. 1.2.

Distribution: Southern Kazakhstan and Plain areas of Kazakhstan, Plain Parts of Transcaucasia, Transcaspian Plateau, Turkmenistan, Uzbekistan, Fergana Valley, Clayey and gypsum deserts of SW Tajikistan, Mountains of SE Middle Asia; Turkey, Palestine, Iraq, Pakistan, Iran, Afghanistan, Israel, Syria, North India; China: Himachal Pradesh, Xinjiang, Hainan Province; Vietnam

In the Mediterranean region it is known from East Turkey, Syria, Israel (known only from same old localities), and Lebanon (new locality).

Processed material: ETHZ - Lebanon: Beirut, U. Sahlb. (1B&) (new locality).

References: Bänninger, 1915; Bänninger, 1918; Bänninger, 1956; Chaudoir, 1852; Chaudoir, 1868; Gestro, 1892; Hurka, 2003; Kryzhanovskij, 1982; Semenov-Tian-Shanskij, 1926; Zaitzev, 1916;

PHRATOR MULTIGUTTATUM CHAUDOIR, 1850

= *tessellatum* Dejean, 1826; *somaticum* Alluaud, 1935

Description: The body longish oval, extended. Mandibles markedly outstretched, their upper side corner is widened. Elytra with 14 elytral stria, spots are shallow; the intervals between elytral stria have micro sculpture. The surface of pronotum is folded, front and back sides have dense and quite rough puncture. Legs are long, metatarses are not more than 1,5 times shorter than elytra. The lower side of the body and legs are lightly yellowish brown. The surface of the body has dark green-brown rambling pattern. The spot on the pronotum stretches from front till basic side. The spot interrupted in V-shape in the area of elytral suture at the basic side. Elytral pattern like in Fig. 4.

O. multiguttatum Chaud. resembles *O. variegatum* Oliv., however its form of elytra is less rounded. In the basic part of pronotum *O. multiguttatum* Chaud. has characteristic imprint, which has not been observed for *O. variegatum* Oliv. Certain differences can be observed in the patterns on elytra and pronotum as well.

Distribution: Egypt, Sudan, Eritrea, Etiopia, Somalia, Kongo, Zaira, Tanzania

Processed material: ZMUC: Egypt: Mus. Schio (1 @&); **ZIN: Egypt:** Luxor, 1895 (5, P. N. Semenov leg.); Egypt (18 B&, 7 @&); **ZMAN: Egypt** (2 B&; 1 @&); Luxor (1 B&); **ZMAN:** "Algeria, Jordan"

(1 B&, D. v. d. Hoop leg.) (precise locality unknown) = *heydeni* Krausse, 1915

References: Alluaud, 1935; Bänninger, 1918; Chaudoir, 1850; Chaudoir, 1868; Gestro, 1892; Hurka, 2003; Dejean, 1826; Deleve, 1924; Say, 1823

PHRATOR VARIEGATUM OLIEVIER, 1811

Description: The body longish oval, sides of pronotum and elytral shoulders form blunt angle. Mandibles are markedly outstretched, their upper side corner is widened. Elytra have 14 deep elytral stray, the spots are shallow, intervals between elytral stria are superseded. The pronotal surface slightly folded, front and back borders have dense puncture. The borders of the 1st and 2nd sternites have no puncture. Legs are long, metatarse are not more than 1,5 times shorter than elytra. The lower side of the body and legs are lightly yellowish brown. The surface of the body has dark green metallic pattern, which has marked divergencies on the level of sub-species.

Nowadays it is used to outline four *P. variegatum* Oliv. Sub-species, which differ mainly according to shape and colour of the pattern on the surface.

Phrator variegatum variegatum Olivier, 1811



Fig. 4. *Phrator multiguttatum* Chaud.

Description: Elytral pattern has less marked metallic green gloss than *O. variegatum sardoum* Reitt.. Pronotum has three-piece spot. The surface of the body and legs are brown. Mainly the colour of the body is lighter than for *O. variegatum sardoum* Reitt., however separate specimens from Spain may have darker colouring of the body. The green spot on the vertex has two parts, the both parts converge opposite to the centre line of pronotum at the base of the head. Elytral pattern like in Fig. 6.

Distribution: Spain, Portugal

Processed material: MZBS: Portugal: 1 @&, Muller leg.); El pardo, Arias, VI 1908 (1 B&, A. Codina leg.); **Spain:** San Raques (Cadiz), 1972 (2 B&, J. de Ferur leg.); Madrid, Martorell, Martmera river (1 B&, 1 @&, I. Peña leg.); Madrid (2 B&, 4 @&, Låverndal leg.); Catalonia, Balenya, 17. VIII 1986 (1 B&, Vilarrubia leg.); St. Pere Pescador (1 @&, De Gregorio leg.); Hilario de Secalm, VII 1945 (2 B&, Bvtlert leg.); Srra. Cazorla, V 1953 (1 B&, 2 @&); **ZMAN: Spain:** (1 B&, H. Vesn leg.); (1 B&, L. Miller leg.); 1960 (1 B&, 1 @&); **Portugal:** (1 B&, Schauf. leg.); **ZIN: Spain:** Madrid (6); Madrid (1, G. Carrasco leg.); Andalusia (1); Extremadura (2); **Portugal:** (2)

References: Alluaud, 1935; Beutel, 1991; Gestro, 1892; Hurka, 2003; Krausse, 1915; Olivier, 1811; Serrano et. al. 2003

Phrator variegatum sardoum Reitter, 1907

Description: Elytral pattern has marked green gloss, it is formed from three bands. The surface of the body and legs are brown. The three-piece spot on pronotum has clear borders and angles with marked sides. The green spot on the vertex has two parts, the both parts almost converge opposite to the centre line of pronotum at the base of the head. Clypeus has markedly convex base.

Distribution: The sub-species is known only from the isle of Sardinia.

Processed material: ETHZ: Italy: Sardinia, Oristano, Asuni (3); Sardinia, Oristano (12); Sardinia, Dargali (2); ISNB: Italy: Sardinia (2B&, 1@&); Sardinia, Oristano (8B&, 11@&) ZIN: Italy: Sardinia, Oristano (3); Sardinia, Oristano, 22.09.1908 (3, Krausse leg.); Sardinia (1); ZMUC: Italy: Sardinia, Rio Sa Picocez, 29.V 1974 (1 @&, Bumarelli leg.); ZMUM: Italy: Sardinia (1)

References: Bänninger, 1915; Hurka, 2003; Krausse, 1915; Reitter, 1907

Description: Elytral pattern is soft, almost reduced. It has remained as longed spots in the middle part of elytra and vertex area and as dark line in width of one interval in the area of elytral suture. In the basic part of elytra the band is markedly thin and soft. Spot on pronotum (Fig. 5) is more marked than for *P. variegatum seurati* Alluaud. Intervals between elytral stria are markedly smooth. Clypeus has markedly convex basic side. The surface of the body and legs are lightly brown, almost yellow.

Phrator variegatum boiteli Alluaud, 1935

Distribution: East Tunis



Fig. 5. *Phrator variegatum boiteli* Alluaud



Fig. 7. *Phrator variegatum seurati* Alluaud



Fig. 6. *Phrator variegatum variegatum* Oliv.



Fig. 8. *Phrator variegatum sardoum* Reitt.

Processed material: ZMUC: Tunisia: Bizerte, 18.08.1932 (1@&, Boitel leg.) (holotype); **ISNB: Tunisia:** Bizerte (1B&); Bizerte, 08.1932 (1B&, 2@&, Boitel leg.)

References: Alluaud, 1935; Hurka, 2003

Phrator variegatum seurati Alluaud, 1935

Description: Elytral pattern has marked base and middle bands, which stretch unbroken at least till the 13th interval. Vertex band has remained only as separate longed spots. Elytral pattern as in Fig. 7. In comparison with *P. variegatum boiteli* Alluaud transversal brown spot on pronotum is less marked and clypeus less convex in the basic part.

Distribution: West Tunis.

Processed material: ISNB: Tunisia: Ouchtata, 06.1946 (1B&, Demofly leg.)

References: Alluaud, 1935; Hurka, 2003

ACKNOWLEDGEMENTS

The author thanks the curators of the collections, especially Alain Drumont (ISNB), Franziska Schmid (ETHZ), Ben Brugge (ZMAN), Boris Kataev (ZIN) a.o., for the material given for the research. The authors thanks Aleksander Anichtchenko and Arvīds Barševskis - researchers of DU Institute of systematic Biology, for valuable advices and comments.

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Received: 01.06.2009.

Accepted: 20.06.2009.