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Cassida inopinata, a new species from Italy and Balkan Region (Coleoptera: Chrysomelidae: Cassidinae)

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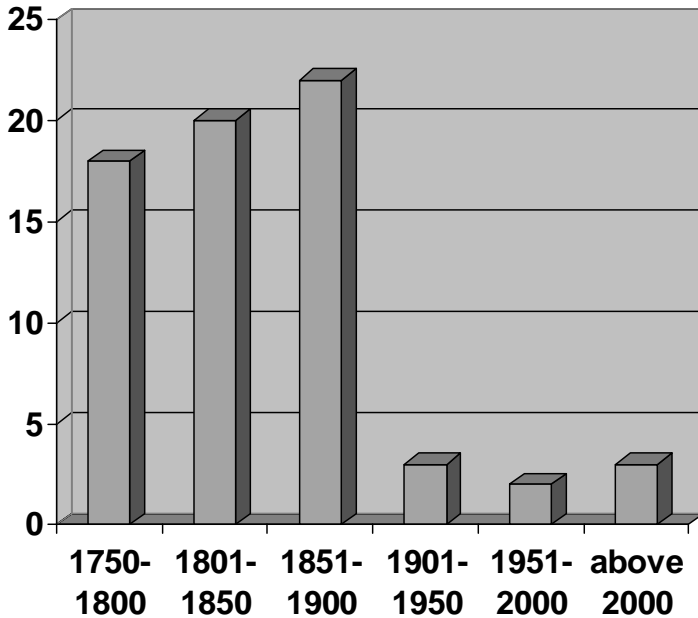
ABSTRACT. *Cassida inopinata* is described from Italy, Croatia, Slovenia, and Greece. It belongs to the *Cassida vibex* group, characterised by green elytra with a large median, reddish, longitudinal stripe. Phylogenetic and biogeographic remarks on *C. vibex* group of species are given. *Cassida veselyi* GÜNTHER, 1958 is synonymised with *Cassida pusilla* WALTL, 1839.

Key words: entomology, taxonomy, new species, new synonymy, Coleoptera, Chrysomelidae, Cassidinae, *Cassida*, Italy, Balkans, phylogenetic remarks, biogeographic remarks.

From Europe (including Caucasus, Cyprus, Turkey, Armenia, and Georgia) 68 species of the tribe Cassidini have been recorded hitherto (AUDISIO 2004; SEKERKA 2005, 2006), 58 of them belonging to the genus *Cassida* Linnaeus, 1758. One species, *Cassida veselyi* GÜNTHER, 1958, according to the type series preserved in Prague Museum, and studied by junior author, is a junior synonym of *Cassida pusilla* WALTL, 1839, **new synonymy**. Moreover, two subspecies, both occurring in the eastern part of Europe, have been described for *C. sanguinolenta* MÜLLER, 1776 and *C. margaritacea* SCHALLER, 1783, but their taxonomical status needs revision.

Most taxonomic studies on Cassidinae, including European, based only on external morphology and feeding preferences, ignored morphology of genitalia. Structure of both male and female genitalia in many groups of cassids is very

uniform and various authors suggested that they are not useful in determining species and in systematic studies. The outcome of this rather old fashioned systematic approach was to fail in pointing out possible scarcely differentiated local forms with quite restricted range, confined within the area of widely distributed related taxa. That partly explains the long stasis in the growth of the knowledge of European Cassidinae (Fig. 1). Only few new species were described since 1926, the date of publication of a key to the all Palaearctic species (SPAETH & REITTER 1926), and due to the works of BORDY (1995a, b) and SEKERKA (2005, 2006) just springing from studies of genitalia.



1. Number of European Cassidinae species and subspecies described up to today subdivided in periods of fifty years

The taxonomic and phylogenetic importance of Cassidinae internal anatomy have been recently considered by a growing amount of scientific works (BORDY & DOGUET 1987, BORDY 2000; BOROWIEC and ŚWIĘTOJAŃSKA 2001; ŚWIĘTOJAŃSKA 2001; BOROWIEC and SKUZA 2004). Therefore, it is to be expected that the use of these new traits reserves interesting novelties even within species groups whose knowledge has been up to today considered exhaustive.

In confirmation of these remarks, on the basis of clear differences in genitalia morphology we have recently detected several specimens of an unexpected new taxon among European exemplars formerly attributed to the well known and widespread *Cassida vibex*. Description of this new species is given below.

Abbreviations used in this paper:

- DSPC Davide SASSI personal collection;
 FAPC Fernando ANGELINI personal collection;
 DBET Department of Biodiversity and Evolutionary Taxonomy, University of Wrocław, Poland;
 FFPC Frank FRITZLAR personal collection;
 HZPC H. ZIEGLER personal collection;
 LDPC Luciano DIOTTI personal collection;
 MBPC Maurizio BIONDI personal collection;
 MNHG Museo Civico di Storia naturale, Genova;
 MNHM Museo Civico di Storia naturale, Milano.

Cassida inopinata n. sp.

ETYMOLOGY

Latin “*inopinatus*” means unexpected. The name underlines the unexpected discover of this new taxon within the well known *Cassida vibex* group of species.

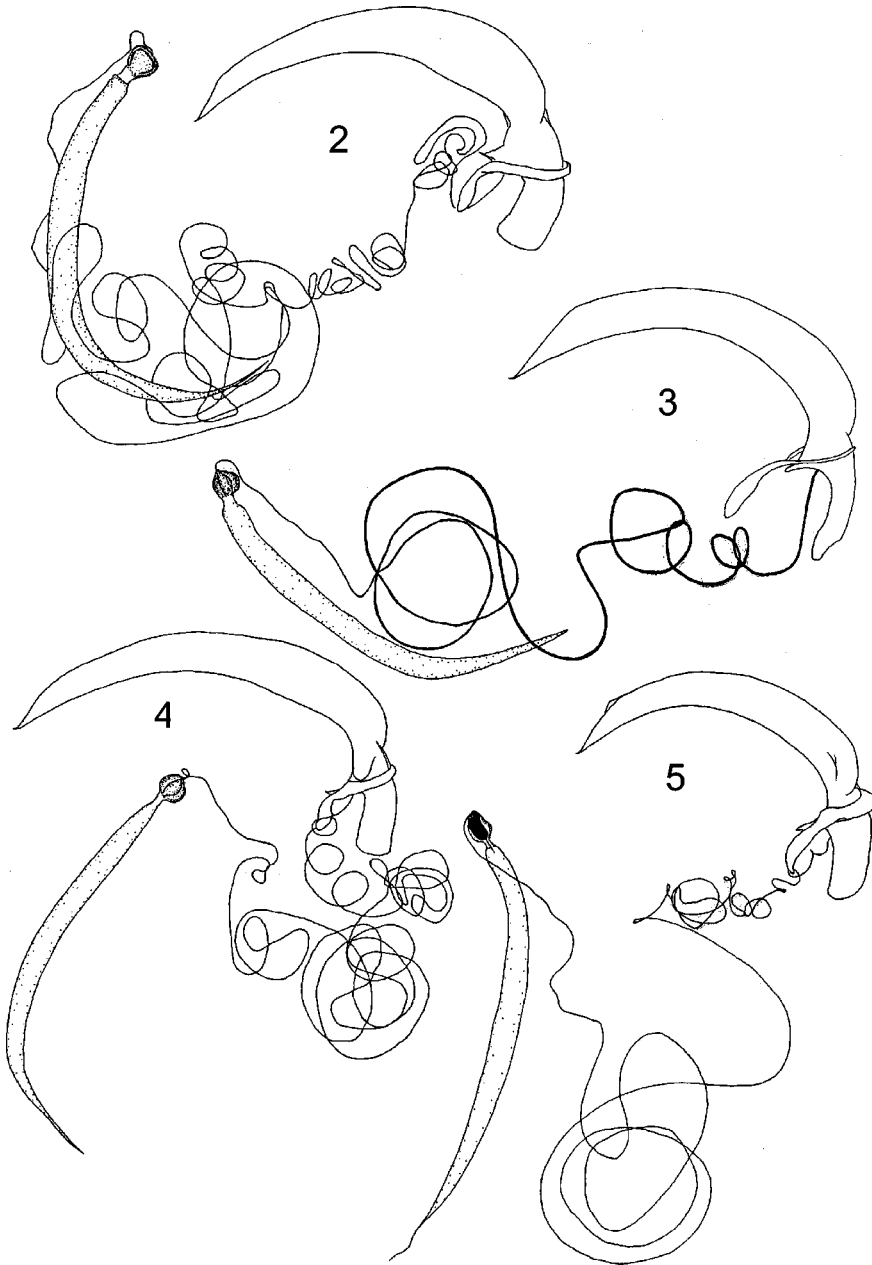
DIAGNOSIS

The new species belongs to the *Cassida vibex* group, characterized by green elytra with a great reddish to brown band extending along the suture from basal margin to the apex and progressively tapered. The new species is very close to *Cassida vibex* LINNAEUS 1767, *C. bergeali* BORDY, 1995 and *C. pannonica* SUFFRIAN 1844. It differs from *C. vibex* in having femora black only in the basal half (in *C. vibex* black pattern extending to about 2/3 length of femora), and in ejaculatory and spermathecal ducts, both slender and longer (Figs. 2, 3, 15, 17). It differs from *C. bergeali* in spermathecal duct longer, with thickener and looser basal trait (Figs. 15, 19). Males of *Cassida bergeali* have the apodeme of ejaculatory sac lengthened (Fig. 13) and not rounded as in the new species (Fig. 10). *Cassida pannonica* differs from *C. inopinata* in completely yellow femora. Median lobe of aedeagus in all species is uniform and does not offer good diagnostic characters (Figs. 6-9).

DESCRIPTION

Length: 6.44-6.85 mm, width: 4.50-4.69 mm, length of pronotum: 2.35-2.39 mm, width of pronotum: 4.0-4.1 mm, length/width ratio: 1.43-1.46, width/length of pronotum ratio: 1.70-1.71. Body short oval (Figs. 23, 24).

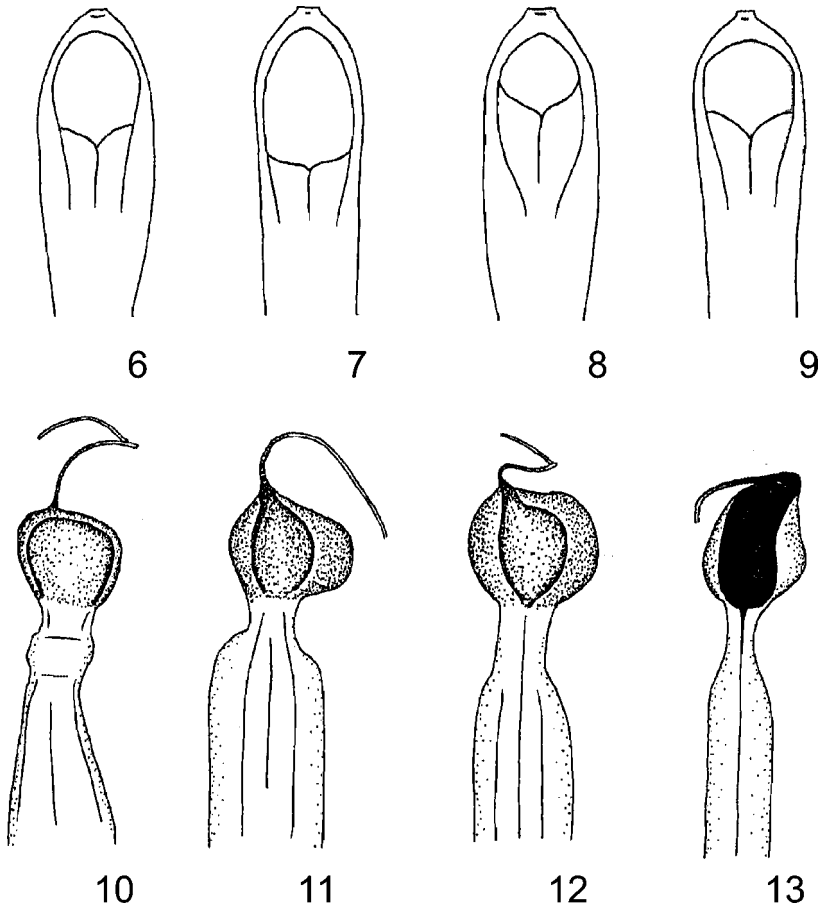
Pronotum and scutellum green, elytra green with brownish pattern: irregular band along suture, more expanded at base, usually extending to humeral calli and tapered towards apex, sometimes one irregular, little spot on the disc, slightly behind the half of its length and close to the elytral margin. Clypeus and thorax black. Abdomen black with yellowish margins. Trochanters yellowish, femora in



2–5. Aedeagus and ejaculatory duct: 2 - *Cassida inopinata* n. sp. (Mt. Barro, Italy, holotype), 3 - *C. vibex* (Grisolia, Italy), 4 - *C. pannonica* (Garni-Geghard, Armenia), 5 - *C. bergeali* (Haute Saône, France)

basal 48% (on average, 10 specimens measured) black and apices yellow, tibiae yellow, in the middle often infuscate. Tarsi yellowish. Antennal segments 1-6 yellow, 7-11 brownish to black, ventrally paler in the middle.

Pronotum semicircular, maximum width at posterior angles, disc only slightly convex, not at all or indistinctly separated from margins. Punctuation moderately and sparsely impressed on the disc, explanate margin coarsely and densely punctate. Scutellum triangular, with slightly irregular surface. Base of elytra as wide as or slightly wider than pronotum. Elytral disc regularly convex, with sparse short erect setae, generally more visible on slope. Postscutellar impression very shallow. Punctuation moderately impressed, arranged in quite regular rows anterad, more scattered on slope. Intervals about 1,5 wider than rows. Punctures in



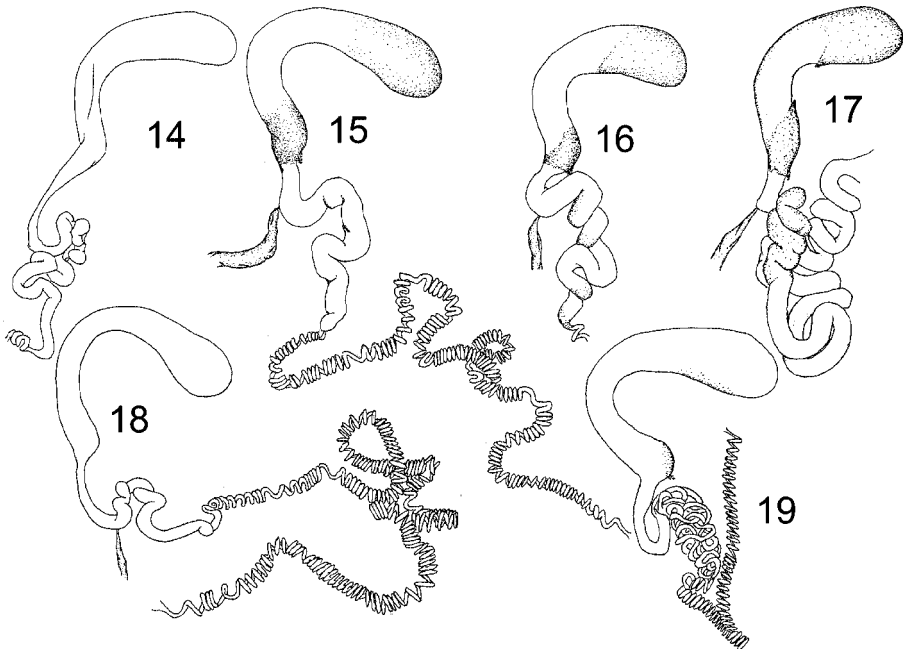
6-9. Apex of aedeagus in dorsal view: 6 - *Cassida inopinata* n. sp. (Mt. Barro, Italy), 7 - *C. vibex* (Crezzo, Italy), 8 - *C. pannonica* (Iznik, Turkey), 9 - *C. bergeali* (Ruma, Croatia). 10-13. Apodeme of ejaculatory sac: 10 - *Cassida inopinata* n. sp. (Isonzo San Pietro, Italy), 11 - *C. vibex* (Grisolia, Italy), 12 - *C. pannonica* (Garni-Geghard, Armenia), 13 - *C. bergeali* (Haute Saône, France)

marginal row distinctly coarser than in central rows, marginal interval about 1,5 wider than submarginal. Explanate margin as large as in most related species, surface finer but more densely and shallowly punctate than the disc. Apex of elytral epipleura bare.

Clypeus flat, about 1.25 times as wide as long, matt, with scattered semi-erect setae, microreticulate, coarsely punctate. Clypeal grooves fine, converging in arch (in some specimens clypeal grooves are barely visible). Labrum c. 2.3-2.4 times as wide as long, very shallowly emarginate. Prosternal process quite slender between coxae, moderately expanded on the apex, surface shiny, irregular, sometimes with setae. Antennae stout, the length ratio of antennal segments: 100:48:78:57:48:42:50:55:57:60:111. Segment 3 c. 1.6 times as long as segment 2 and 1.4 times as long as segment 4. Claws simple.

Male genitalia (Figs. 2-6-10): aedeagus slim, regularly curved ventrad, slightly widened apically, apex with small, truncate apical process. Ejaculatory apodeme quite small, short, obtuse apically and slightly asymmetric. Ejaculatory duct fine and long, total length more than 25 mm on the average.

Female genitalia (Figs. 14-15-16): the vasculum of spermatheca sickle-shaped, with apical part elongate, distinctly broader than basal half; in well sclerotized specimens pigmentation on the apex and base fairly marked. Ampulla longer than



14-19. Spermatheca: 14-16 - *Cassida inopinata* n. sp. (14 - Mt Barro, Italy, immature specimen; 15 - Mt.Barro, Italy; 16 - Zaule, Italy), 17 - *C. vibex* (Crezzo, Italy), 18 - *C. pannonica* (Kosov res., Armenia), 19 - *C. bergeali* (Haute Saône, France); in figs. 14 and 16 ductus spermathecae not figured

vasculum, very broad in mature specimens, at the base forming a sharp bend, concave ventrad, followed by some more or less compact spiral windings. Ductus long, very tightly spiral. In immature specimens spermathecal pigmentation is often missing and ampulla may appear very thin (Fig. 14).

TYPES

Holotype: Lombardia, CO, M.te Barro 4, 16.9.1991, D. Sassi lg., male, D. Sassi & L. Borowiec des. 2006, HOLOTYPE, (MNHM).

Paratypes: PIEMONTE: Piemonte, Valle Susa, Oulx (TO), 1100 m, 1.VI.2000, leg. F. Angelini, (DSPC), 1 ex.; Piemonte, AL, Riserva Capanne di Marcarolo, 700m, 1.8.1996, D. Sassi, (DSPC), 1 ex.; Piemonte, str. Viozene-Piano Rosso (CN), 1260-1520m, 30.V.99, leg. Angelini, (FAPC), 1 ex.; Piemonte, Valle Pesio, Certosa di Pesio (CN), 15.V.2000, 900m, leg. F. Angelini, (FAPC), 1 ex.; Varinella, Val Scrivia, V.1930, C. Mancini, (MNHG), 2 exx.; Piemonte, Val Sesia, Scopello, 5-VIII-88, IX-90, lg. Pescarolo, (DBET), 2 exx. LOMBARDIA: Lombardia, M. Barro 1, 24.6.1990, D. Sassi, (DSPC), 1 ex.; Lombardia, M. Barro 1, 8.7.1990, D. Sassi, (DSPC), 3 exx.; M. Barro 3, 24.5.89, lg.Sassi, (DSPC), 1 ex.; M. Barro 4, 2.VIII.89, lg. Sassi, (DSPC), 1 ex.; Lombardia, M. Barro 1, 20.7.1990, D. Sassi, (DSPC), 1 ex.; Lombardia, M. Barro, 3.IV. 1991, Stazione 9, C. Leonardi, (DSPC), 1 ex.;M. Barro 3, 1.5.89, lg.Sassi, (DSPC), 1 ex.; M. Barro 1, 17.VI.89, lg. Sassi, (DSPC), 1 ex.;M. Barro 1, 24.VI.89, lg.Sassi, (DSPC), 1 ex.;Lombardia, M. Barro 3, 30.5.1990, D. Sassi, (DSPC), 1 ex.; Lombardia, M. Barro 4, 9.5.1990, D. Sassi, (DSPC), 2 exx.; M. Barro 4, 27.V.89, lg.Sassi, (DSPC), 2 exx.; M. Barro 4, 24.V.89, lg. Sassi, (DSPC), 2 exx.; M. Barro 4, 18.VI.89, lg.Sassi, (DSPC), 2 exx.; Lombardia, CO, M.te Barro 4, 16.9.1991, D. Sassi lg., 4 exx.; M. Barro 4, 15.VI.89, lg. Sassi, (DSPC), 2 exx.; Lombardia, M.te Barro 4b, 12.7.1991, D. Sassi, (DSPC), 1 ex.; Lombardia, M. Barro 7, 9.6.91, D. Sassi, (DSPC), 1 ex.; Lombardia, M. Barro 8, 6.7.1990, D. Sassi, (DSPC), 1 ex.; Lombardia, CO, M.te Barro 8, 19.5.1992, D. Sassi, (DSPC), 1 ex.; M. Barro 8, 27.VI.89, lg. Sassi, (DSPC), 2 exx.; M. Barro 8, 8.V.89, lg. Sassi, (DSPC), 2 exx.; M. Barro 8, 8.V.89, lg. Sassi, (DSPC), 2 exx.; Lombardia, Barro 21, 30.V.90, D. Sassi, (DSPC), 1 ex.; Lombardia, M. Barro, 15.VI. 1990, Stazione 4, C. Leonardi, (MNHM), 4 exx.; Lombardia, M. Barro, 30.V. 1991, Stazione 1bis, C. Leonardi, (MNHM), 1 ex.; Lombardia, M. Barro, 19.V. 1991, Stazione 4bis, C. Leonardi, (MNHM), 1 ex.; Lombardia, M. Barro, 19.V. 1991, Stazione 4, C. Leonardi, (MNHM), 1 ex.; Lombardia, M. Barro, 19.V. 1991, Stazione 3, C. Leonardi, (MNHM), 1 ex.; Lombardia, M. Barro, 15.VI. 1990, Stazione 3, C. Leonardi, (MNHM), 1 ex.; Lombardia, M. Barro, 19.V. 1991, Stazione 4, C. Leonardi, (MNHM), 1 ex.; Lombardia, CO, M.te Cornizzolo, 975m, prato arido a monte della strada, 11.vi.2002, leg. D. Sassi, (DSPC), 3 exx.; Lombardia, CO, M. Cornizzolo, vers. SW, 500m, 29.V.1993 lg. D. Sassi, (DSPC), 3 exx.; Lombardia, CO, M. Cornizzolo, Campora , 500m, 2.v.1997, lg. D. Sassi, (DSPC), 1 ex.;Lombardia, CO, M. Cornizzolo, Campora , 500m, 12.v.2000, lg. D. Sassi,

(DSPC), 1 ex.; Lombardia, CO, M. Cornizzolo, Campora, 500m, 26.V.2005, lg. D. Sassi, (DSPC), 10 exx.; Lombardia, CO, M. Cornizzolo, tra Campora e A. Carella, 530m, 13.vi.1997, Sassi, (DSPC), 1 ex.; Lombardia, CO, Asso, P. Dorella, 830m, 23.VI.2005, leg. D. Sassi, (DSPC), 1 ex.; Lombardia, CO, M.te S. Primo, 1150-1250m, 21.VI.1992, lg. D. Sassi, (DSPC), 1 ex.; Lombardia, CO, Castelmarte, 400m, 26.iv.1992, leg. D. Sassi, (DSPC), 1 ex.; Lombardia, CO, Veleso, tra M. Erno e M. Colmenaccio, 1100-1280m, 29.VI.2001, leg. D. Sassi, (DSPC), 1 ex.; Lombardia, CO, dint. Lasnigo, Conca Crezzo, 700m, 24.5.96, D. Sassi, (DSPC), 1 ex.; Lombardia, LC, M. Moregallo, da Sasso Preguda a Cresta Occ., 647-880m; 15.vi.2004, lg. D. Sassi, (DSPC), 1 ex.; Quarcino, 25.6.36, G. Pozzi (MNHM), 2 exx.; Cardina, 10.8.36, G. Pozzi Como, (MNHM), 1 ex. Boletto, 20.6.36, G. Pozzi, Como, (MNHM), 1 ex.; LO. Valsassina, Barzio, 14.VI.1936, (MNHG), 1 ex.; Gruppo Grigne, Ballabio sup., 4.5.1930, G. Binaghi, (MNHG), 1 ex.; Lombardia, CO, Grigna S. tra Cainallo e P. Pradal 1500/1700m, 2.VI.96, (DSPC), 1 ex.; S. Martino, Lombardia, 21.5.26, Schatzmayr, Museo Rossi, Duino, *vibex* det J. Muller, (MNHM), 1 ex.; Valle Quiete, Villanuova, 20.5.23, Schatzmayr, Cass. spec.?, *ferruginea* det. Burlini 1969 (MNHM), 1 ex. TRENTINO ALTO ADIGE: S. Tir., Brixen, Tschubcheetteide, 13.vi.65, (MNHM), 1ex. FRIULI VENEZIA GIULIA: Staz. Carnia, 7.5.59, Springer, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Isonzo, S. Pietro, 13.7.47, Springer, (MNHM), 1 ex.; Trieste, Rozzol, 9.7.44, Springer, (MNHM), 1 ex.; Trieste, Zaule, A.Sazmier, *vibex*, Det. Burlini 1969, (MNHM), 1 ex.; Tricesimo, 21.5.50, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Staz. Carnia, 21.6.53, Rio Lavarii, Springer, (MNHM), 1 ex.; Staz. Carnia, 3.5.61, Springer, (MNHM), 1 ex.; Staz. Carnia, 14.7.57, Springer, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Staz. Carnia, 12.6.65, Springer, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Staz. Carnia, P.d. Tortolaus, 800m, 11.7.54, Springer, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Staz. Carnia, 19.6.55, Springer, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Staz. Carnia, Rio Togliazzo, 11.5.58, Springer, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Staz. Carnia, 14.8.55, Rio Togliazzo, Springer, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Staz. Carnia, 8.5.960, Rio Togliazzo, Springer, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Staz. Carnia, 17.6.54, Rio Togliazzo, Springer, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Belvedere di Grado, 5.6.49, Centenara, Springer, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Grop. [Gropada, Friuli], 10.5.24, *vibex* Spaeth det., (MNHM), 1 ex. LIGURIA: Liguria, SV, dint. Andora, Stellanello, 250-350m, 3.VII.1997, leg. D. Sassi (DSPC), 1 ex.; Liguria, Melogno, SV, Colle del Melogno, 1028m, 28.V.1999, lg. Angelini, (DSPC), 1 ex.; Savona, 6.27, Naldi [leg.], Collez. Alzona, (MNHM), 1 ex.; Alassio, Lig. occ., 2.vi.1943, F. Solari, *vibex*, det. Burlini 1963, (MNHM), 1 ex.; Genova, F. Castellaccio, 15.V.1942, F. Solari, *vibex* det. Burlini 1963, (MNHM), 1 ex.; Monte Antola, Apennino ligure, 6.6.1940, Solari, *vibex* det. Burlini 1963, (MNHM), 1 ex.; Italy, Liguria, Alpi Liguri, Monte Carmo, n. Loano, 1000-1300m, 2.VI.2001, L. Borowiec, (DBET), 1 ex.; Liguria, (SP), Passo del Bracco, 21.VII.04, L. Diotti, (LDPC), 2 exx.; Sassello (SV), Monte

Beigua, 10.VIII.04, L. Diotti, (LDPC), 2 exx.; Dint. di Genova, Bavari, V.1932, C. Mancini, (MNHG), 2 exx.; M. Antola, Appen. Ligure, C. Mancini (MNHG), 1 ex.; Perti, Liguria Occid., VI.1932, C. Mancini, (MNHG), 2 exx.; Genova, V.08, C. Mancini, *vibex*, (MNHG), 1 ex.; Apparizione, Ge., 16.VI.54, G. Bartoli, (MNHG), 1 ex.; Genova, Camaldoli, VI.1993, S. Gallina, *Cassida vibex*, (MNHG), 1 ex.; M. Aiona, Chiavari, VI.930, C. Mancini, (MNHG), 1 ex.; Liguria (SP), Passo del Bracco, 8.VI.05, L. Diotti, (LDPC), 2 exx.; Framura (SP), M. Guaitarola, 8.VI.05, L. Diotti, (LDPC), 1 ex.; Casella, valle Scrivia, VII-IX. 1932, C. Mancini, (MNHG), 1 ex. EMILIA ROMAGNA: Emilia Romagna, Casalecchi di Reno-Tizzano, Bologna, 02.VI.2005, Leg. Colacurcio L., (DSPC), 1 ex. TOSCANA: Toscana, Vallombrosa, VI.1923, M. Lombardi (MNHM), 1 ex.; Toscana, Minucciano (LU), L. Gramolazzo, 680m., 20.V.98, leg. Angelini, (FAPC), 1 ex. UMBRIA: Perugia, Umbria, IV.1953, C. Mancini, (MNHG), 1 ex.; Perugia, Umbria, V.1943, C. Mancini, (MNHG), 3 exx. MARCHE: Italia, Marche, PU, M. Nerone, m.900/1100, G. Sama leg. 8.6.2004, (DSPC), 2 exx. ABRUZZO: Abruzzo, AQ, Parco Regionale Sirente-Velino, Altopiano delle Rocche, 1300m, 14.III.2001, G.B.Osella Leg., *Cassida prope vibex*, (MBPC), 1 ex.; Abruzzo, AQ, Parco Regionale Sirente-Velino, Rocca di Mezzo, Altopiano delle Rocche, 1270m, 13.VI.2003, P. D'Alessandro leg., (MBPC), 1 ex.; Abruzzo, Parco Naz., Opi (AQ), F. Sangro, 3.VIII.2002, 1200m, Leg. F. Angelini, (DSPC), 1 ex. PUGLIA: Puglia, Foresta Umbra, FG,m. 800, 3-12.VII.83, leg. F. Angelini, (MNHM), 1 ex. BASILICATA: Basilicata, Policoro (MT), 4.VII.1999, leg. F. Angelini, (FAPC), 1 ex.; Lucania, Pollino, Timpa del Demonio (PZ), 1300m, 7.VI.1987, leg. F. Angelini, (FAPC), 1 ex.; Basilicata (PZ), m.770, Oasi WWF Lago Pantano di Pignola, 30.V.1991, st.5, leg. Angelini, (FAPC), 1 ex.

CROATIA: Istrien, Rabac, 11.7.1977, leg. U. Schmidt, (FF), 2 exx.; Istrien, Umag umgeb., 3 VI 2000, leg. G. Strauss, (HZ), 1 ex.; Umag, env. Crveni Vrh, 16.6.2003, leg. G. Strauss, (HZ), 1 ex.; Pola, Istr., Fr. Lang, ex Winkler acquist 1991, (MNHG), 1 ex.;

SLOVENIA: Aidussina, 5.5.27, Schatzmayr, *vibex* det. Burlini 1969, (MNHM), 1 ex.; Slovenia, Sezana, Brje, 23.V.1996, H. Ziegler, (DBET), 2 exx.

GREECE: Grecia, Ilia, Kfmbos, 3.V.2005, leg. Angelini, (FAPC), 1 ex.; GR-Peloponissos, 12 km NWW Sparti, 26-27.IV.2005., J. Halada leg., (DBET), 1 ex..

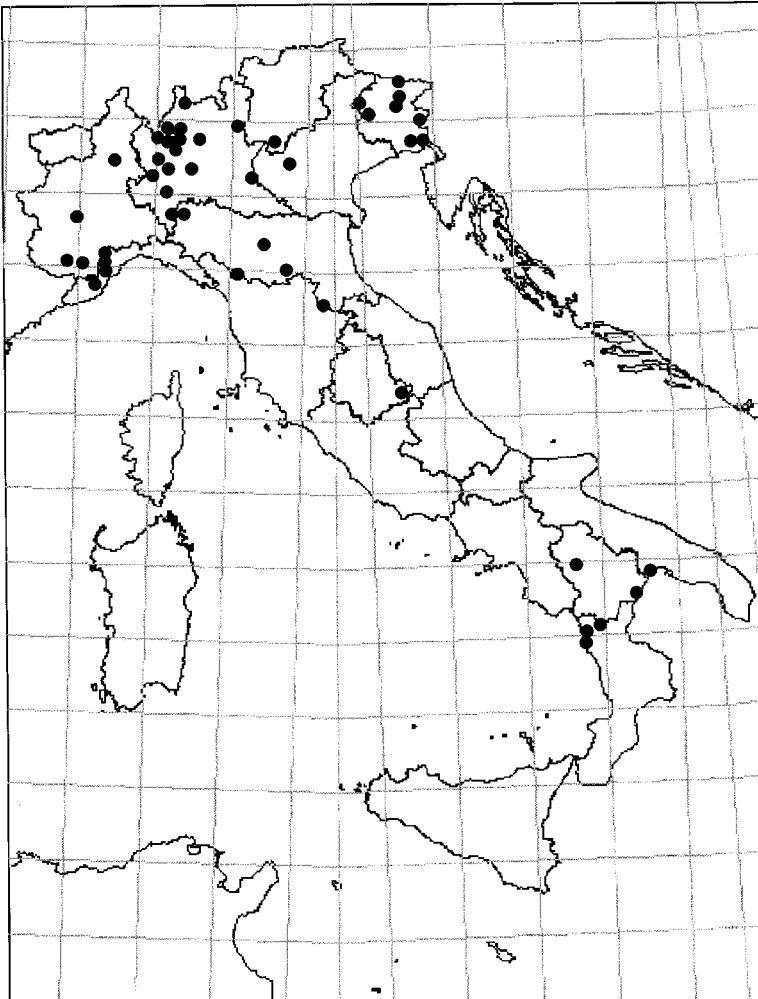
Altogether 152 paratypes have been designated. All paratypes bear a red label (printed): *Cassida inopinata* n. sp. D. Sassi & L. Borowiec des. 2006, PARATYPE.

BIOGEOGRAPHIC REMARKS

Cassida inopinata is very similar to *C. vibex*, and the two species are largely sympatric. In Italy, they are both distributed along the whole peninsula (Figs. 20 and 21). There might be some distributional differences in Western Liguria, where at present only *C. inopinata* has been recorded, and in Padan Plane, where we checked the sole *C. vibex*. However, in the meadow sites near the village of Asso (Como, Italy) they were collected together by the senior author. Neverthe-

less the analysis of the internal characters suggests that the new taxon is more strictly related to *C. pannonica*, whose presence in Italy is at present very doubtful. In Slovenia, both *C. inopinata* and *C. pannonica* are present, but we have no information suggesting an actual sympatry.

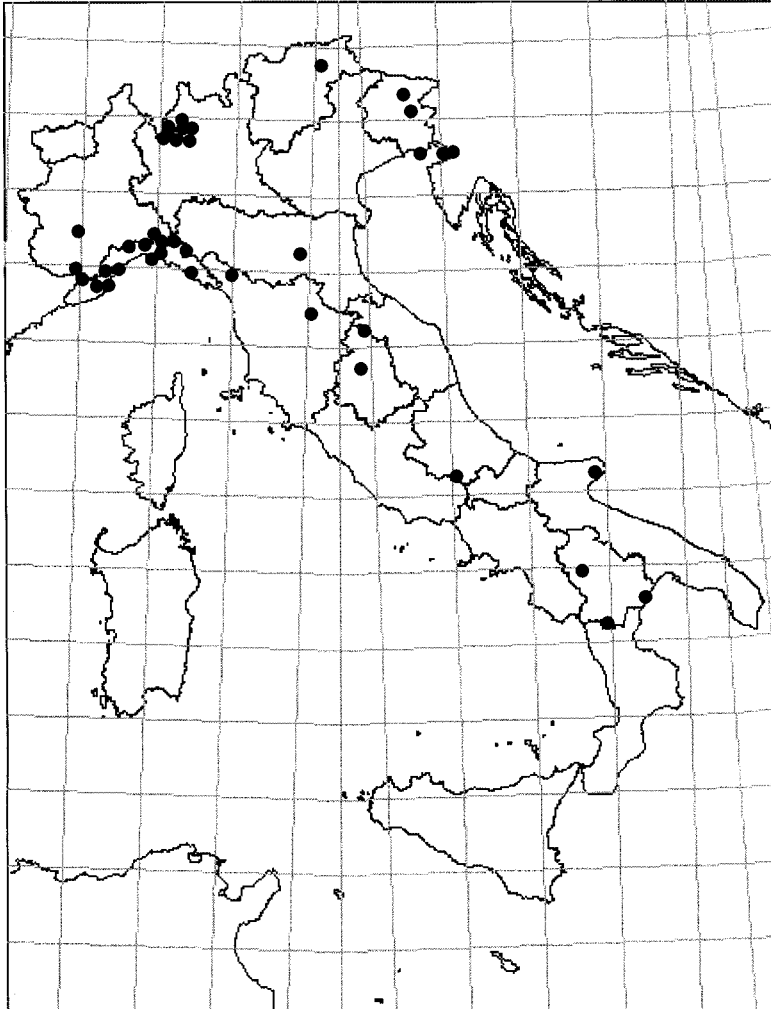
In the end, available data allows to hypothesise that *Cassida inopinata* is the sister species of *C. pannonica* which arose by vicariancy from isolated Italian populations during the ebb and flow of the Pleistocene glacial periods. Afterwards, *C. inopinata* could have spread towards the Balkans (dispersal) where a marginal overlapping with *C. pannonica* cannot be excluded.



20. Checked Italian range of *Cassida vibex*

This scenario appears to be consistent with the principles of allopatric speciation (see for instance CROIZAT et al. 1974) in which vicariant patterns are generally shown by more closely related taxa (*Cassida inopinata* and *C. pannonica*) because the geographical subdivision has occurred recently. Sympatry between less strictly related species of a monophyletic group (*C. inopinata* and *C. vibex*) could have been caused by dispersal allowed by relatively older speciation processes.

It is interesting that we found two specimens of the new species in materials from southern Greece. From disjunctive area between these localities and area of



21. Checked Italian range of *Cassida inopinata*

regular distribution in Croatia, Slovenia and Italy we have examined only specimens of *Cassida vibex*. It suggests that the occurrence of the new species in Greece is an effect of sporadic introduction or a local invasion in a new site.

PHYLOGENETIC REMARKS

MATIS (1973) proposed *Cassida seladonia* group which comprises the following species: *C. seladonia* GYLLENHAL, 1827, *C. vibex*, *C. pannonica*, *C. fausti* SPAETH & REITTER, 1926, *C. elongata* WEISE, 1893, *C. mandli* SPAETH, 1921, and *C. humeralis* KRAATZ, 1874. The complex was established on the basis of some morphological characters - chromatic pattern, elytral punctation and elytral pubescence - of scarce phylogenetic significance in our opinion. Under the circumstances, the morphology of the spermatheca seems to be more effective in delimiting a natural group. In particular, the shape of ampulla is really distinctive in some of the above species (figs. 14-19), keeping them apart from all the Palaearctic species examined by us. It shows a long proximal trait, curved in a marked bend whose concavity is directed towards the vasculum. This first trait is followed by a lengthened distal part, merely wavy in some species and forming a more or less compact spiral in the remainders. This distal part pursues in a normally coiled spermathecal duct. We think that this character could represent an important shared, derived trait with a fair phylogenetic significance.

Among the species gathered by MATIS in *Cassida seladonia* complex, the spermathecal pattern described above is shown by *C. vibex*, *C. humeralis*, *C. fausti*, *C. elongata* and *C. pannonica* only.

Besides, *C. major* KRAATZ, 1874 - recently revived from synonymy by BORDY (1996) with *C. humeralis* - *C. bergeali* BORDY, 1995 and *C. inopinata* n. sp should be included in the group. On the other hand, the species *C. mandli* and *C. seladonia* have a very differently shaped spermatheca, revealing that they do not belong to the same species group of the taxa mentioned above, in spite of some feeble similarities underlined by MATIS.

All the above species have a similar external look, with a large elytral brownish vitta, more or less marked, extending along suture from anterior margin toward the apex.

A comparative study of the examined species, taking into account the morphology of genitalia in particular, has allowed us to select some traits, useful in our opinion in detecting the phylogenetic relationships within the monophylum. The selected characters are as follows:

1=elytral reddish pattern marked (0) / faint (1); 2=femora partly blackish (0) / entirely yellow (1); 3=anterior elytral margin normally shaped (0) / distinctly notched at humera, with blackish denticles (1); 4=ejaculatory duct short or moderately elongate (0) / distinctly elongate (1); 5=ductus spermathecae short (0) / long (1); 6=distal part of ampulla coiled in more or less close windings (0) / elongate but not coiled, only wavy (1).

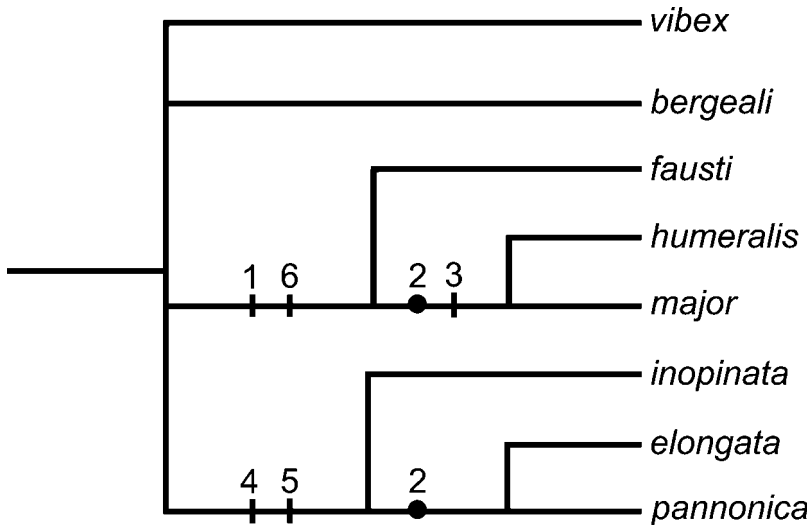
The distribution of the character states is reported in the following matrix:

	123456
<i>VIBEX</i>	000000
<i>HUMER</i>	111001
<i>MAJOR</i>	111001
<i>BERGE</i>	000000
<i>INOPI</i>	000110
<i>ELONG</i>	0101??
<i>PANNO</i>	010110
<i>FAUST</i>	100001

Data have been analysed with PAUP vers. 4.0b10, all characters processed as “unord” and equally weighted using the *branch and bound* search.

A unique most parsimonious tree has been obtained (Fig. 21), whose statistic parameters were the following: Tree length = 7; Consistency index (CI) = 0.8571; Homoplasy index (HI) = 0.1429; Retention index (RI) = 0.9091; Rescaled consistency index (RC) = 0.7792.

In fig. 22 characters have been optimised on the internodes of the tree.



22. Most parsimonious tree of *C. vibex* complex

The sole trait that shows partial homoplasy is the colour of femora (2, highlighted with a black circle). As a matter of fact, chromatic traits are generally considered to have low information contents. Under the circumstances this trait contribute to reveal two very likely sister group relationships (*humeralis* + *major* and *elongata* + *pannonica*) distinguished by good biogeographic congruence.

Other examined characters have a fair diagnostic value, but scarce phylogenetic significance because occurring in single terminal taxa: distal part of ampulla very closely coiled and the apodeme of ejaculatory sac elongate (*Cassida bergeali*), pronounced elytral pubescence (*C. fausti*), spermathecal duct short and thick (*C. vibex*). All these traits must be considered putative autapomorphies, in our opinion.

Our analysis leads to outline the following phylogenetic scenario. From an ancestral taxon, widely distributed in the Palearctic region, there were three independent speciation events in the Western part of the range, presumably as a consequence of Pleistocenic climatic fluctuations. 1) A “southern” clade (*fausti*, *humeralis*, *major*), occurring from Turkey to Iberian Peninsula via Northern Africa and Sicily, with a postulated northerly directed expansion (*humeralis*) during a warmer climatic shift. 2) A “central” clade (*inopinata*, *elongata*, *pannonica*), ranging from Northern China to France. 3) A “western” clade, constituted by the sole *Cassida bergeali*, the more apomorphic taxon owing to its marginal position within the range of the whole monophylum.

However, relationships within these groups are unresolved (polytomy), but the tree topology could represent the real phylogenetic pattern of the complex. As a matter of fact, we can assume that in distinct peripheral areas of the distribution



23, 24. *Cassida inopinata*, habitus: 23 - paratype male from Greece (Peloponnese), 24 - paratype female from Italy (Piemonte, Scopelo)

range populations diverged independently from each other, originating several species which have a single common ancestor. Since derived traits are not shared between populations under these circumstances, the sequence of single speciation events cannot be resolved. This mode of speciation has been reported in literature as *allopatric speciation mode II*, or *peripheral isolates allopatric speciation* or *peripatric speciation* (BROOKS & McLENNAN 1991).

According to the Hennigian “deviation rule”, because of the homeostatic constraints of large-scale gene flow, we could expect that *Cassida vibex* descended from the larger central population of the ancestral species, so it should exhibit less autapomorphic traits than the peripheral populations from which the other species arised. Notwithstanding this, the more expressive diagnostic traits of *C. vibex* (shape of spermathecal duct and robustness of ejaculatory duct) seem to be autapomorphic compared with the “usual” trend in Palaearctic species.

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