

Preliminary linguistic classification of Latin specific epithets for beetles (Insecta: Coleoptera) from Eocene amber of Central Europe

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A preliminary classification of Latin species-group names for Central European amber beetles (Coleoptera) is composed. The analysis of linguistic groups and subgroups is performed. Two generalized semantic groups (substantive anthroponymic epithets; adjectives and participles of modern biological Latin) are found to strongly predominate the material. The most banal and repetitive species names (*balticus*, *ambericus*, *electricus*) are recommended to be avoided in future publications.

Sudaryta preliminarini Vidurio Europos gintare aptinkamų vabalų (Coleoptera) rūšių grupių lotyniškų pavadinimų klasifikacija, išanalizuotos jų lingvistinės grupės ir pogrupiai. Nustatyta, kad gintare randamų vabalų rūšių lotyniškuose pavadinimuose dominuoja dvi bendros semantinės grupės (daiktavardiniai antroponiminiai epitetai ir šiuolaikinės lotynų kalbos biologinės leksikos būdvardžiai bei dalyviai). Rekomenduojama vengti dažniausiai pasikartojančių *balticus*, *ambericus*, *electricus* žodžių rūšies pavadinime.

Keywords: linguistics; nomenclature; fossils; scientific naming; etymology; lexical analysis

Introduction

Almost any substantive or an easy-to-use combination of Latin letters can be used to form a specific epithet for new animal species according to the descriptive process (ICZN 1999). But specific names for representatives of the order Coleoptera from Central European amber are comparatively generic, unimaginative and repetitive. The estimated species diversity of beetles in Baltic amber includes at least 1000 species (Alekseev 2013) and this number is probably an underestimate because amber from Rovno, Bitterfeld and other outcrops of Central Europe is not included. The intensive descriptive process of fossil beetles in the last few decades together with the current disregard for name diversity could cause confusion and make interpretation of paleontological data difficult in future. The aim of the current study was to carry out a revision of species-group names of the currently described amber beetles from Central Europe and to classify the names used in lexis of this branch of biological science in accordance with etymological authenticity and preferred word formation.

Materials and methods

Latin specific epithets used in the description of Baltic, Rovno (Ukrainian) and Bitterfeld (Saxon) amber beetles were collected from currently published literature, sorted and analysed. This group of beetles comprises 504 described species from Baltic amber, 8 – from Bitterfeld amber and 22 – from Rovno amber (state of 30 June

2015), that is a total of 534 species-group names (lexemes) underwent linguistic analysis in this study. Gender and generic endings of Latin adjectives and participles were not taken into account when listing specific epithets, that is the names such as *balticus*, *baltica* or *balticum* (and also such as *niger/nigra/nigrum* that is with the alteration in the root) were considered identical and listed once in an arbitrary form of the nominative singular. Some Latin or latinized words with two variants of spelling (*oligocoenica* and *oligocenicus*, *rovnoensis* and *rovnense*, *rasnitsyni* and *rasnitzyni*, etc.) were also considered identical and listed once. The names of authors (except examples in 1.1.2), generic attribution as well as the native language of the name-giving person, were not considered and all species epithets were treated anonymously. Anthroponymic epithets (group 1.1.1 and 2.3) are listed thoroughly, whereas lexemes used as specific names in other numerous groups (1.3, 2.1 and 2.2) are presented only as examples. The explanation of the terminology used is provided in the text. All species names listed within each group are arranged alphabetically.

The composed and presented classification is based firstly on parts of speech and secondly on the generalized semantic analysis of the names. The classification is formalized and arranged for convenience into groups and subgroups. All specific epithets under study were divided into three main formal groups: (1) noun/substantive or fusion of two nouns/substantives; (2) adjectives and participles; and (3) parts of a phrase. Names were also subsequently divided into series of semantic subgroups

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(16 main and 9 subordinate). Theoretically, the first and third groups can be united, because both of them do not agree with the generic name grammatically, while the second group could be further subdivided into two separate ones (adjectives and participles). The number of semantic subgroups depends on the material analysed and degree of subdivision. A three-layer hierarchy was applied, but further subdivision is possible (for example, separation of real toponyms from mythological ones and separation of patronyms from matronyms). Given the possibility of classifying epithets based on different criteria, great importance was attached to semantic originality. Thus, the given subdivision is not always formally logical or completely indisputable.

Results and discussion

The composed classification is as follows:

1. Epithets including one or two nouns

1.1. Patronymic (male) and matronymic (female) epithets: names in honour of people – based on the first name (e.g. *christelae, pauli*), the last name (e.g. *crowsoni, bercioi*) or fusion of the first and last names (e.g. *carstengroehni*). This type of naming was especially popular in paleoentomology in the twenty to twenty-first centuries.

1.1.1. Anthroponymic (patronymic and matronymic) epithets derived from proper nouns, that is names of real people (collectors, scientists and researchers, historical personalities, cultural workers, friends and relations of the descriptor). Examples of anthroponymic epithets are as follows: *adrianae, alberti, alexagrestis, alexandri, alexeevi, alleni, anastasiae, andreei, anderseni, bachofeni, backeri, barovskyi, baumeisteri, bedovoyi, bercioi, berendti, blumenbachi, borisjaki, brunni, bukejsi, burukovskiyi, carstengroehni, ceranowiczae, christelae, crowsoni, danieli, doeberli, doenitzi, dokhturovi, ebersini, emmi, friederichi, fritschi, gebleri, geistautsi, germari, goeckei, gorskii, gratschevi, groehni, hagedorni, helmi, henningseni, henricusmontemini, hermenau, hertae, hoffeinsorum, horaki, igori, irinae, jacquelinae, jaekei, keilbachi, kerneggeri, khnzoriani, kirejtshuki, klebsi, kolbei, komissari, korschefskiyi, kotejai, kozhantshikovi, krali, kuehli, kuenowi, kulickae, kuntzeni, krynickiyi, kryshstofovich, kusheli, larssoni, macleani, marshalli, martynovi, motschulskiyi, mozarti, mozolevskae, mroczkowskii, nathani, naumanni, nielseni, nikitskiy, olgae, orlovi, pallasi, pauli, perkovskiy, pici, plavilshchikovi, poinari, ponomarenkoi, popovi, puetzi, rakovici, rasnitsyni, rehi, reichardt, rohdendorfi, rugiae, rueckeri, sabathi, sakhnovi, schaufussi, scheelei, schellwiene, semenovi, serafini, sergeli, shevyrevi, simoni, simukovi, skwarrae, solskiy, sosnovski, stackelbergi, succinokotejai, svetlanae, takhtajani, telnovi, theryi, tschitscherini, turkini, ulrikae, usovae, voigti, vossi, wachтели, wanati, warchalowskii, weingangae, weitschati, whitei, wichardi, wolffi, wolfschwenningerae, wunderlichi, yatsenkohmelevskiy, zachvatkini, zangi, zherikhini, znojko, zubkovi.*

1.1.2. Anthroponymic epithets derived from proper nouns, that is names of mythological characters found in: (1) R. Wagner's tetralogy "Der Ring des Nibelungen" (Muona 1993) – *brunhildae, fafneri, fasolti, freiae, fricka, guntheri, hageni, hundingi, mimae, siegmundi, woglinda, wotani*, etc.; (2) J.R.R. Tolkien's novel "The Lord of the Rings" (Kolibáč 1997) – *gandalf, sauron, glum, thingol*; (3) the Bible (Puthz 2010) – *abraham, ketura, methusalem, noach*.

1.2. Teonymic (or mythonymic) epithets derived from names of various pagan gods and deities: Greek (*aphroditae, elpis, prometheus*) and Old Prussian (*mara*). This group of epithets can be sometimes close to group 1.1.2 because such names as *freiae, wotani* are primarily derived from gods of Scandinavian mythology.

1.3. Electronymic epithets based on different names of amber: used as nouns in apposition (*electron, jantar*); used with the ending of the genitive case: *glaes, succini*; used as a noun in apposition with the formant – cola: *succinicola*.

1.4. Common nouns of Latin and Greek (traditional languages of nomenclature) used as epithets in apposition (mostly meaning a relationship to another taxon, morphological character or indicating age): *archetypus, cerambyx, conciliator, cursor, incola, pater, progenitor, simulator, sobrinus, soror, spectrum*, etc.

1.5. Substantive epithets of all other languages used as nouns in apposition: Old Prussian (*waldwico, criwecriwayto*), Slav (*nejstota, varang*) or literary neologisms (*helcaraxe, palantir*).

1.6. Toponymic epithets derived from geographical names:

1.6.1. Astionymic epithets derived from settlement names: *gedanicola, yantarnyi*.

1.6.2. Hydronymic epithets derived from names of water bodies: *marisbaltici*.

1.7. Ethnonymic epithets derived from names of different nations: *aestiorum, rugiorum*.

2. Epithets consisting of an adjective or a participle

2.1. Adjectives or participles of the classical Latin and Greek languages usually with an emotional tinge or estimation referring to preservation, visibility, habitus or relationship (*assimilis, bella, dubius, egregia, elegans, insignis, liquidus macellus, mirabilis, notha, typicus, unicus, vivax*, etc.) connected with age or primitiveness (*antiquus, atavus, avula, avus, patrius, patruelis, primaeus, primigenius, pristinus, redivivus, veterum, vetustus*, etc.) or developmental stage (*immaturus, larvalis*).

2.2. Adjectives or participles of Late Latin and modern biological Latin, which are often complicated by prefixes, suffixes or inclusion of two roots. This group of epithets is very similar to group 2.1 and can be distinguished from the latter by artificiality or by the well-defined morphological trend.

2.2.1. Epithets indicating similarity with the recent representatives of the genus (*succinoemarginatus, succinonigra, palaeobicostatus, palaeominuta, palaeoparvula, palaeorugosus, pseudofuscula*, etc.) or other taxa

(*cainosternus*, *cioides*, *corticaroides*, *halticaeforme*, *primordialis*, *probiphyllus*, *pterostichoides*, *sitonitoides*, *tetropoides*, *tyroides*).

2.2.2. Informative morphological epithets (Latin or latinized Greek languages) developed from the maximally shortened rudiments of traditional descriptions in Latin: *amplicolis*, *anceps*, *angustitibialis*, *antennatus*, *appendiculata*, *aterrimus*, *bicarinatus*, *bilobus*, *canaliculata*, *carinulatus*, *cephalotes*, *coriaces*, *costalis*, *crassicornis*, *decolorata*, *densipunctatus*, *denticollis*, *elongata*, *emarginata*, *erectosquamata*, *fasciatus*, *foveopunctatus*, *fuscipes*, *glabrellus*, *glabricornis*, *gnathotrichus*, *granulatus*, *granulicollis*, *hexarthrus*, *inaequicollis*, *laticlavus*, *limbatus*, *longelytrata*, *longicornis*, *longispina*, *microphthalmus*, *minutus*, *nigrescens*, *procerus*, *pubescens*, *punctatissima*, *quadryfoveatus*, *parva*, *pilosellus*, *robustus*, *rostratus*, *rubromaculata*, *saeticornis*, *setosa*, *sexspinus*, *spiculatus*, *stipulicornis*, *stricticollis*, *subaeneus*, *subdiscedens*, *subnudus*, *subtilis*, *tenuipes*, *temuitarsis*, *tesselatus*, *tuberculatus*, *viridis*, etc.

2.3. Adjectival patronyms: *berendtiana*, *javetana*, *ryzhkovianus*.

2.4. Chrononymic epithets derived from the assumed epoch of origin or from the age of the inclusion: *eoecnica*, *oligocenicus*.

2.5. Taphonymic and electronymic epithets showing the conservation mode and status (*defuncta*, *inclusus*, *inquilinus*, *ingemescus*, etc.) derived from different names of amber and resin (*ambericus*, *ambricum*, *electrica*, *electrinus*, *electrus*, *jantaricum*, *resinatus*, *succineus*, *succinobaltica*) or the combination of these characters (*glaesiseputa*).

2.6. Instrumentonymic epithets derived from the equipment used for study: *microtomographicus*.

2.7. Adjectival toponyms:

2.7.1. Astionymic epithets: *contienensis*, *daugpilenensis*, *insterburgensis*, *kraxtenpellensis*, *kunnegsgarbensis*, *palvenikensis*, *regimontanus*, *rikojotensis*, *rovnoensis*, *sarnensis*. The epithet *rovnoensis* can be etymologically attributed to the electronymic group because it also refers to Rovno amber.

2.7.2. Choronymic epithets derived from regional names: *barticus*, *europaeus*, *germanicus*, *nadravicus*, *notangicus*, *pomeranicum*, *prussica*, *sambicus*, *samlandica*, *saxonicum*, *scalovicus*, *ulmerigicus*, *varmicus*.

2.7.3. Hydronymic epithets: *balticeus*, *balticus*, *succinobaltica*. The second, which is a very common epithet, could be also assigned to choronymic or electronymic epithets because it can be semantically treated as referring to the Baltic Sea, the Baltic region or to Baltic amber.

3. Epithets containing parts of a simple phrase

For amber beetle names, there are only two current examples (both derived from the Czech language), but the group can theoretically be numerous and various.

3.1. Including a preposition and a noun: *zjantarū*.

3.2. Including a pronoun and an adverb: *jetotak*.

The analysis of specific epithets of beetles described from Eocene Central European amber shows some interesting patterns, which are summarized below. The general conclusions presented here are probably also true for other types of amber and other groups of amber insects, but future detailed studies are needed before making comparisons.

The lexicon (word diversity) of names of beetles from Central European amber is limited by different factors and is firstly related to the described species diversity. Two semantic groups (1.1.1 and 2.2) strongly predominate in number and variety. Other groups are represented by a significantly less diverse lexis (1.4 and 2.1) and sometimes by 1–3 lexemes only (1.6, 1.7, 2.3, 2.4 and 2.6).

Anthroponymic (patronymic and matronymic) naming reflects the history of Central European amber study, mining and collection. Patronymic epithets are much more numerous than matronymic: of the 145 different epithets dedicated to real people (semantically united groups 1.1.1 and 2.3), 127 are patronymic while only 16 are matronymic and one is derived from the last names of two people (*hoffeinsorum*). The naming of species after the last name of a person strongly predominates. The maximum number of species is named in honour of scientists and researchers, but the most frequent species names are formed after famous collectors (*groehni* – 16 names, *hoffeinsorum* – 8 names, *kerneggeri* – 6 names). Most epithets are dedicated to German and Russian people. The number of epithets derived from American/English and Polish names is lower but still numerous. The epithets related to Ukrainian, Czech, Latvian and Danish names are mostly of recent origin, coined in the last few decades. They are indicative of the countries with high-level science of systematics and intensively working amber researchers. The popularity of anthroponymic species-groups names is possibly based on: (1) simplicity of formation that is the absence of grammatical agreement with the generic name and (2) special importance attached by amber researchers to private individuals. Amber (including that with biological inclusions) is a gemstone and thereby a comparatively expensive source of paleontological knowledge. Sometimes researchers can obtain the most interesting pieces of amber with inclusions for study only as donation or loan. Obviously, the role of collectors is especially important in these cases.

Besides words of Latin and Greek origin, species names of Central European amber beetles include words and word roots of other languages (Baltic, Germanic and Slav). These lexical components reflect the geography and history of the nations living around Central European amber outcrops. Toponymic and electronymic epithets, nouns in apposition and epithets consisting of a phrase show the mixed cultural, historical and national peculiarities of the Central European region especially well.

Colour features are used for names of the amber beetle relatively rarely (*aterites*, *aterrimus*, *bicoloratus*, *decolorata*, *fasciatus*, *fuscipes*, *nigra*, *nigerrima*, *rubromaculata*, *subaeneus*, *tesselatus*, *viridiaeneus*, *viridis*) in comparison with the frequency of specific epithets of extant species. This circumstance is explained by the unremarkable, mainly monochromatic black or dark brown colour of inclusions with very rarely visible lighter areas on the dorsum or dark metal shine of the cuticle.

The most frequent names of Central European amber beetles are as follows: *balticus* (-a, -um) – 18 species; *electricus* (-a, -um) and *electrus* (-a, -um) – 11 species; *succineus* (-a, -um), *succinus* and *succinicus* – 8 species; *succini* – 6 species; *ambericus* (-a, -um) – 6 species; *eocenicus* (-a, -um) – 5 species. Sometimes such a rather common species name can be given to a species from the newly described genus and the binominal combination can be considered original because the specific name characterizes the generic epithet additionally. Such cases could not be detected in our specific monominal analysis and recommendations do not refer to such naming. The most original groups among the studied amber epithets are 2.6, 3.1 and 3.2, group 1.1.2 being very interesting too. Electronymic epithets (1.3 and 2.5) are typical of different amber insects and different amber types. Chrononymic (2.4) and taphonymic (2.5 partly) epithets are typical of fossils in general. Logically strange but interesting lexical models are formed from compound semantic lexemes, which (1) unite an electronymic epithet and the specific epithet of a similar extant taxon (*succinoemarginatus*, *succinonigra*), (2) combine electronymic and patronymic epithets (*succinokotejai*), (3) unite patronymic and landscape epithets (*alexagrestis*), and (4) connect electronymic and hydronymic epithets (*succinobaltica*). Such semantically mixed lexemes are attributed to the classified subgroup according to a more significant component.

On the basis of mentioned above, it is subjectively recommended to avoid simple and ordinary epithets (such as *balticus*, *ambericus* or *electricus*) for new beetle species from amber. This recommendation is based on the stipulations that (1) extant European species can also have the epithet *balticus*, (2) fossil resins of different ages (called “ambers”) are numerous and such epithets as *ambericus* or *electricus* are vague, and (3) species with these identical names are already numerous.

The relatively rare chrononymic epithets (*eocenicus*, *oligocenicus*) are not particularly suitable either. According to modern views, the epithet *oligocenicus* is not adequate for taxa from amber that is currently determined as Eocene; the epithet *eocenicus* can be used for beetles from other various and numerous Eocene fossil outcrops.

The possible confusion of species names can be easily avoided using new original names. Taxonomists and amber researchers are therefore encouraged to propose original and linguistically interesting names for future beetle species described from amber inclusions. Newly described fossil beetle species are themselves intrinsically unique, and their specific epithets are also expected to reflect this quality in future studies.

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