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Taxonomy of *Cryptocephalus* Geoffroy – what do we know?

(Coleoptera: Chrysomelidae: Cryptocephalinae)

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Abstract: The number of species in the genus *Cryptocephalus* Geoffroy, 1762 was surveyed, mostly with the help of secondary literature, and found to be 1794. A preliminary check-list, including subspecies, variations and forms, was made available in the internet at: www.b.shuttle.de/tricho/Cryptoce.htm. The state of research on the *Cryptocephalus*-fauna was briefly summarised for the faunistic regions. The subgenera described were reviewed, and a determination key and synonymy are given. The following replacements names were proposed: *C. osseusignatus* **nom. nov.** for *C. complicatus* Bryant, 1954, not Jacoby, 1889; *C. brachynigrobasalis* **nom. nov.** for *C. nigrobasalis* Kimoto & Gressitt, 1981, not Bryant, 1946; *C. lunulatus* **nom. nov.** for *C. lunatus* White, 1968, not Bryant, 1943; *C. birgita* **nom. nov.** for *C. indicus* Pic, 1950, not Suffrian, 1854; *C. falli* **nom. nov.** for *C. ochraceus* Fall, 1932, not Stephens, 1831; *C. aulacensis* **nom. nov.** for *C. vitticollis* Pic, 1950, not Weise, 1891; *C. dimidiativittatus* **nom. nov.** for *C. semivittatus* Medvedev & Samoderzhenkov, 1987, not Fairmaire, 1902; *C. yorubae* **nom. nov.** for *C. calabaricus* Bryant, 1943, not Weise, 1922; *C. optimus* **nom. nov.** for *C. egregius* Schaeffer, 1934, not Weise, 1887.

Zusammenfassung: Die Erfassung der Anzahl beschriebener Arten in der Gattung *Cryptocephalus* Geoffroy, 1762 ergab 1794 Arten. Vorrangig wurde Sekundärliteratur genutzt. Eine vorläufige Artenliste, die Unterarten, Variationen and Formen beinhaltet, wurde im Internet verfügbar gemacht unter: www.b.shuttle.de/tricho/Cryptoce.htm. Der Stand der Forschung über *Cryptocephalus* wurde kurz für die faunistischen Regionen skizziert. Ein Bestimmungsschlüssel der Untergattungen und deren Synonymie werden vorgestellt. Die folgenden Ersatznamen werden vorgeschlagen: *C. osseusignatus* **nom. nov.** für *C. complicatus* Bryant, 1954,

nec Jacoby, 1889; *C. brachynigrobasalis* **nom. nov.** für *C. nigrobasalis* Kimoto & Gressitt, 1981, nec Bryant, 1946; *C. lunulatus* **nom. nov.** für *C. lunatus* White, 1968, nec Bryant, 1943; *C. birgita* **nom. nov.** für *C. indicus* Pic, 1950, nec Suffrian, 1854; *C. falli* **nom. nov.** für *C. ochraceus* Fall, 1932, nec Stephens, 1831; *C. aulacensis* **nom. nov.** für *C. vitticollis* Pic, 1950, nec Weise, 1891; *C. dimidiativittatus* **nom. nov.** für *C. semivittatus* Medvedev & Samoderzhenkov, 1987, nec Fairmaire, 1902; *C. yorubae* **nom. nov.** für *C. calabaricus* Bryant, 1943, nec Weise, 1922; *C. optimus* **nom. nov.** für *C. egregius* Schaeffer, 1934, nec Weise, 1887.

Key words: Cryptocephalini, check-list, world catalogue, biogeography, homonymy

Introduction

Cryptocephalus Geoffroy, 1762 is one of the most species-rich genera in Chrysomelidae, and therefore amongst the most species-rich genera in the animal kingdom. Since the catalogue of CLAVAREAU (1913), no check-list was published for *Cryptocephalus*, but many new species as well as new subgenera were described. For this publication, a new check-list based on a literature survey was compiled. Data from this check-list was used to analyse the state of knowledge of the taxonomy for the different faunistic regions. The usefulness of the preparation of a catalogue of *Cryptocephalus* at present is discussed.

Material and Methods

The following sources of information were used: Zoological record, revisions and faunistic reviews and museum specimens. In cases where homonyms were detected, original descriptions were checked. In many other cases, original descriptions were not checked. The spelling and the availability of names given in the check-list is therefore preliminary. The intrasubspecific names have not been checked for availability, too, at present all names listed including those for forms and aberrations should not be used to avoid homonyms.

The dynamics of species description was documented by summarising species described between 1758 and 1775, and those described between 1776 and 1800, and the following 25-years periods until 2000.

Results

Number and distribution of species

A total of 1794 species and subspecies was found to be described. Additionally 469 synonyms were revealed, not considering the named variations. A preliminary check-list was made available in the internet at **www.b.shuttle.de/tricho/Cryptoce.htm**

Most species were described from the Palaearctic region, followed by the Afrotropical and the Neotropical regions (Fig. 1). Looking at the periods of description, most species were described between 1850 and 1875, the number is decreasing until today (Fig. 2). In the following, the state of research on the faunistic regions is briefly summarised.

Afrotropical Region

The last revision was provided by SUFFRIAN (1857). Only few species occur both on the Arabian Peninsula and the Afrotropical Region. The generic identity of many afrotropical Cryptocephalinae is doubtful, because the genera *Lophistomus* Weise, 1896, *Protinocephalus* Reineck, 1913, *Anteriscus* Weise and the afrotropical species of *Melixanthus* Suffrian were not revised so far. Even if none of the species described in one of these genera should be transferred to *Cryptocephalus*, the fauna is extraordinary species-rich. The number of species described is 472, 109 (27%) of which are from Madagascar (Fig. 1). So far, no species described from Madagascar was found to occur also in continental Africa. Most species were described between 1850 and 1950, and more species were described in the period between 1900 and 1925 compared to other periods (Fig. 3). Except for the recently described *C. meridiobrunneus* Schöller, 2002, the last species was described in 1968.

Australian Region

The last revision was provided by LEA (1904). Comparatively few species were described from Australia in the genus *Cryptocephalus* (83), the fauna seems to be poorly known. Problems occurred with the definition of the Australian genera of Cryptocephalinae. SUFFRIAN (1859) synonymised (in partim) *Idiocephala*, *Aporocera*, *Mitocera*, *Chloroplisma* and *Ochrosopsis* with *Cryptocephalus*. However, the Australian Cryptocephalinae were recently extensively studied by REID (1990), including praeimaginal stages and ecological characters. Like most other Anglo-

Saxon PhD-studies, this interesting book is not available for the scientific community. According to REID (pers. com.), the genus *Cryptocephalus* is not present in Australia. For this reason the species described in *Cryptocephalus* as well as those described in *Physicerus* Chevrolat, 1837, *Dicenopsis* Saunders, 1842, *Anodonta* Saunders, 1843, *Euphyma* Baly, 1877b, *Idiocephala* Saunders, 1845 were not included in this review. A part of the Papuan *Cryptocephalus* were recently transferred to the genus *Melatia* (REID, 1998), at present 78 species would remain in *Cryptocephalus*.

Nearctic Region

The last revision was provided by WHITE (1968), including aedeagus studies. Only three species were described following this study (RILEY & GILBERT, 1999) (Fig. 4), therefore the determination of Nearctic species is not complicated. Many species of the southern States of the United States of America belong to yet undescribed species-groups which are species-rich in Mexico (SCHÖLLER, unpubl. data). A study of the systematics should therefore include the species of Mesoamerica. The number of species described is 108.

Neotropical Region

The last revision was provided by SUFFRIAN (1866). The check-list compiled by BLACKWELL (1946) included the Cryptocephalinae. The species treated by MONROS (1949) in his revision of the genus *Mylassa* Stål were not included in the check-list. SEENO & WILCOX (1982) treated *Mylassa* as a synonym of *Cryptocephalus*, but I support the view of JACOBSON (1916) that *Mylassa* is a valid genus to be placed in Pachybrachini (SCHÖLLER, 2000). *Mecostethus* Stål and *Stegnocephala* Baly are treated as a full synonym of *Cryptocephalus*. Few problems on the generic level are expected. The number of species described is 324. Most species were described between 1850 and 1875 (Fig. 5). The last species was described in 1960.

Oriental Region

The oriental fauna was never studied systematically. Major contributions include SUFFRIAN (1854, 1860) and the book of JACOBY (1908) on India and Burma. Although PIC described 30% of the oriental species between 1911 and 1950, his publications almost never referred to previous authors. MEDVEDEV & SAMODERZHENKOV (1987) worked on the

fauna of Vietnam. More recently, two areas were treated which contain a portion of palaearctic elements, namely Taiwan and Nepal (CHÛJÔ, 1954; MEDVEDEV & SPRECHER-UEBERSAX, 1997). The number of species described is 227. More species were described in the period between 1900 and 1925 compared to other periods (Fig. 6).

Palaearctic Region

The Palaearctic species were reviewed and partly revised by SUFFRIAN (1847, 1848, 1853, 1854, 1860, 1863). TAPPES (1871) and MARSEUL (1875) reviewed western Palaearctic and SOLSKY (1871) eastern Palaearctic species. Later works were geographically more restricted. Large territories were covered e. g. by BURLINI (1955, 1967; Europe), CHEN (1942; China), GRESSITT & KIMOTO (1961; China, Korea), KIMOTO (1964; Japan), LOPATIN (1984; Central Asia and Kazakhstan), LOPATIN & CHIKATINOV (1997; Israel, Jordan, Sinai), MEDVEDEV (1973; Siberia and Far East, 1992; Far East, 1996; Arabia), MEDVEDEV & VORONOVA (1976, 1977; Mongolia), MEDVEDEV & SHAPIRO (1965; Eastern Europe), PETITPIERRE (2000; Iberian Peninsula), SASSI & KISMALI (2000; Turkey), WARCHALOWSKI (1991; Europe), and WEISE (1882; Europe and Asia). WARCHALOWSKI (1999) reviewed the subgenus *Burlinius* in part. However, no area was ever completely revised, and there are still many neotypes and lectotypes to designate. The number of species described is 652, 208 of which are from Europe, 400 from Asia and 43 from North Africa (Fig. 1). Most of the European species were described until 1900 (Fig. 7). The study of the North African (Fig. 8) and Asian (Fig. 9) species started relatively late, i. e. later than 1850, and is still in progress. More species from the Asian part were described in the period between 1975 and 2000 compared to other periods (Fig. 9).

Tab. 1: Mean year of description of the species of *Cryptocephalus* depending on the geographical region. AFR=Afrotropical region, ORR= Oriental region, PAL=Palaearctic region, NAR=Nearctic region, NTR= Neotropical region, A=Asia, C=continental Africa, E=Europe, N=North Africa.

E	NTR	NAR	N	ORR	AFR	A
1840	1869	1879	1880	1893	1903	1918

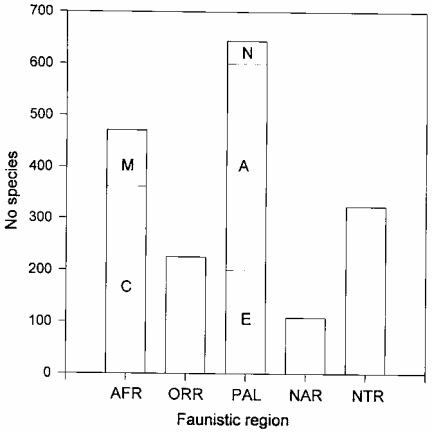

Fig. 1: Number of species of *Cryptocephalus* depending on faunistic regions. AFR = Afrotropical region, ORR = Oriental region, PAL = Palaearctic region, NAR = Nearctic region, NTR = Neotropical region, A = Asia, C = continental Africa, M = Madagascar, E = Europe, N = North Africa.

Synonymy and subgenera

Geoffroy (1762: 231) is the author of *Cryptocephalus*. Type species by subsequent designation by Latreille (1810) is *Chrysomela sericea* Linnaeus, 1758. Because Geoffroy did not use the binary system of nomenclature, the Commission on Zoological Nomenclature in Opinion 228 (Opinions and Declarations, vol. 4, part 18, p. 211, issued April 1954) placed this work on the Official Index of Rejected and Invalid Works in Zoological Nomenclature. Then the first valid description of *Cryptocephalus* was found in Müller's Fauna Insectorum Friedrichsdalina (1764: xiii). Later, generic names published by Geoffroy (1762) were deemed to be available in Opinion 1754 (Commission, 1994), including *Cryptocephalus*.

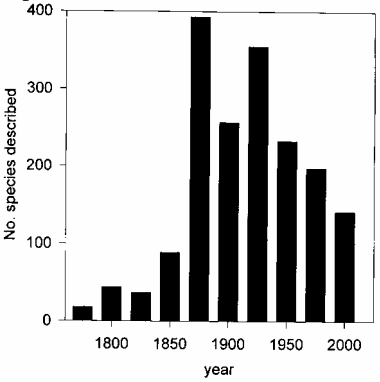

Fig. 2: Number of species of *Cryptocephalus* of the world described between 1758 and 1775, and those described between 1776 and 1800, and the following 25-years periods until 2000.

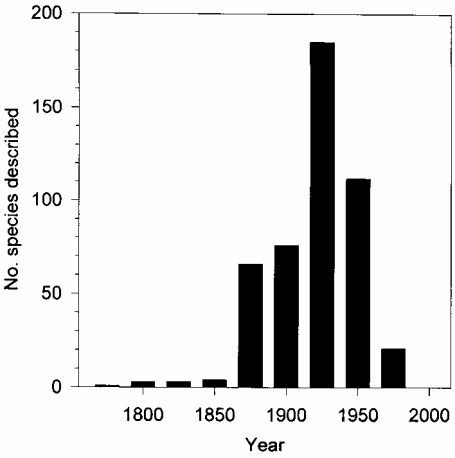

Fig. 3: Number of Afrotropical species of *Cryptocephalus* described between 1758 and 1775, and those described between 1776 and 1800, and the following 25-years periods until 2000.

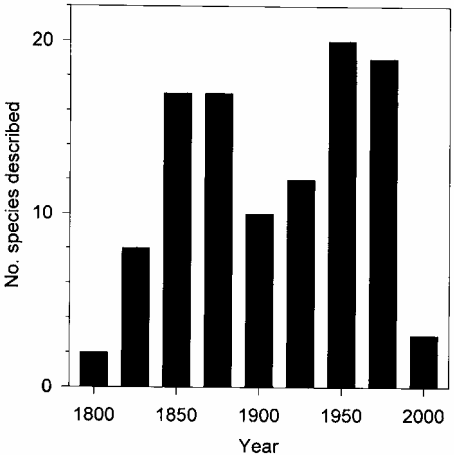

Fig. 4: Number of Nearctic species of *Cryptocephalus* described between 1758 and 1775, and those described between 1776 and 1800, and the following 25-years periods until 2000.

Three genera were identified to be synonyms, and one subgenus was found to be a full synonym of *Cryptocephalus*.

Genus *Cryptocephalus* Geoffroy

Cryptocephalus Geoffroy, 1762:231. Type-species *Chrysomela sericea* Linnaeus, 1758:374.

Canthostethus Haldeman, 1849:245 [described as subgenus]. Type-species *Canthostethus rugicollis* Haldeman, 1849:258 (preoccupied =

Cryptocephalus schreibersi Suffrian, 1851), designated by WHITE (1968: 24).
Mecostethus Stål, 1858:61. Type-species *Mecostethus sahlbergi* Stål, 1857 by monotypy.
Stegnocephala Baly, 1877a:32. Type-species *Cryptocephalus hemixanthus* Suffrian, 1863:203 by original indication (synonymized by Weise, 1921:8).
Strigophorus Chevrolat, 1837:422 [in Dejean]. Nomen nudum.

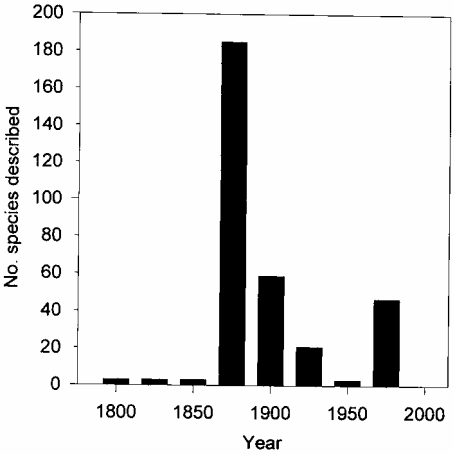

Fig. 5: Number of Neotropical species of *Cryptocephalus* described between 1758 and 1775, and those described between 1776 and 1800, and the following 25-years periods until 2000.

So far, attempts to subdivide *Cryptocephalus* were undertaken only for the Palaearctic Region (but see notes on Australian species). The only exception is the subgenus *Anteriscus* Weise described from tropical Africa, which was treated by following authors as subgenus of *Melixanthus* Suffrian, 1854.

Subgenera

1. subgenus *Anteriscus* Weise, 1906:39. Type-species *Cryptocephalus ertli* Weise, 1906:40.
2. subgenus *Asionus* Lopatin, 1988:8. Type-species *Cryptocephalus flavicollis* Fabricius, 1781:140 by original designation.
    = *Ariana* Berti & Rapilly, 1973:867 [preoccupied].
    = *Asiopus* Lopatin, 1965: 452 [preoccupied, Sharp, 1892].
3. subgenus *Bertiellus* Lopatin, 1977:72. Type species *Cryptocephalus umarovi* Lopatin, 1969:201.

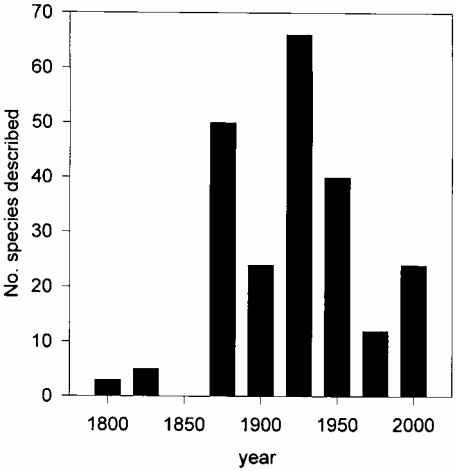

Fig. 6: Number of Oriental species of *Cryptocephalus* described between 1758 and 1775, and those described between 1776 and 1800, and the following 25-years periods until 2000.

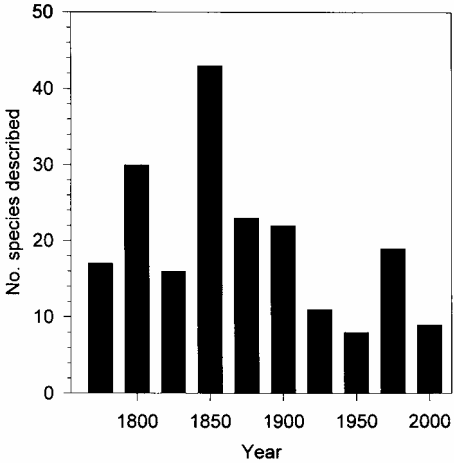

Fig. 7: Number of European species of *Cryptocephalus* described between 1758 and 1775, and those described between 1776 and 1800, and the following 25-years periods until 2000.

4. subgenus *Burlinius* Lopatin, 1965:455. Type-species *Chrysomela fulva* Goeze, 1777:321 by original designation.

5. subgenus *Cerodens* Burlini, 1969:539. Type-species *Cryptocephalus emiliae* Burlini, 1956:178 by original designation.

= *Ceropachys* Burlini, 1953:75 [preoccupied, Cost, 1847].

6. subgenus *Disopus* Chevrolat, 1837:425 [in DEJEAN]. Type-species *Chrysomela pini* Linnaeus, 1758:375 by monotypy.

= *Taxaris* Gistel, 1848: 123 [replacement name for *Disopus* Chevrolat].

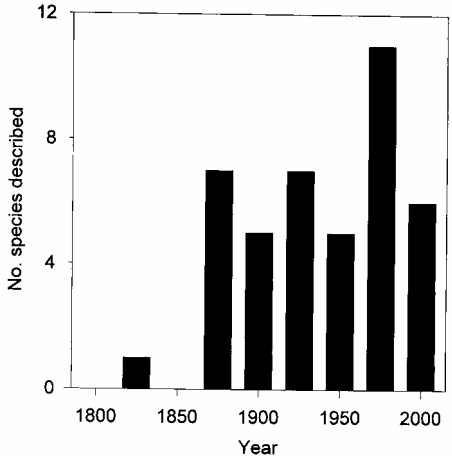

Fig. 8: Number of North African species of *Cryptocephalus* described between 1758 and 1775, and those described between 1776 and 1800, and the following 25-years periods until 2000.

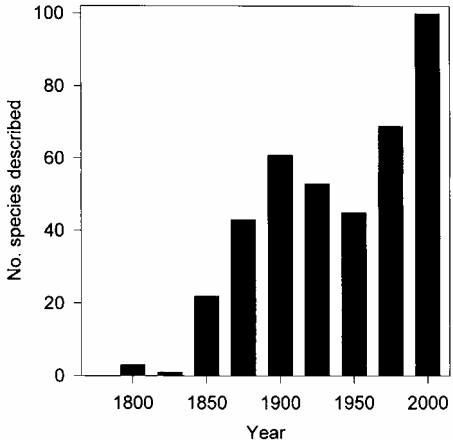

Fig. 9: Number of Asian species of *Cryptocephalus* described between 1758 and 1775, and those described between 1776 and 1800, and the following 25-years periods until 2000.

7. subgenus *Homalopus* Chevrolat, 1837:446 [in Dejean]. Type-species *Cryptocephalus loreyi* Solier, 1836:687 by monotypy.

= *Heterodactylus* L.N.Medvedev, 1963:38 [preoccupied, Spix, 1825: 25 (Reptilia)]. Type species *Cryptocephalus macrodactylus* Gebler, 1830: 206 by original designation.

= *Heterichnus* Warchalowski, 1991:76 [replacement name for *Heterodactylus* L.N.Medvedev].

= *Cryptodontus* Burlini, 1969:535. Type species *Cryptocephalus informis* Suffrian, 1847:66.

8. subgenus *Lamellosus* Tomov, 1979:43 type species *Cryptocephalus angorensis* Pic, 1908: 14.
9. subgenus *Protophysus* Chevrolat, 1837:422 [in DEJEAN]. Type species *Cryptocephalus lobatus*, Fabricius, 1792:63 designated by Monros & Bechyné, 1956:1123.

= *Proctophysus* Redtenbacher, 1845: 118 [error for *Protophysus* Chevrolat].

Key to subgenera

1 Antennae short, segments 4 to 10 expanded, similar as in Clytrini ..... *Cerodens* Burlini
- Antennae filiform, segments 4 to 10 may be shallowly widened 2
2(1) The third pair of femora of male with projection, the first pair of tibiae expanded and convex at about their middle and bended inwards apically ..... *Homalopus* Chevrolat
- Third pair of femora of male normal 3
3(2) More than one-half, generally 2/3 of the last segment of tarsus surpass lobes of third segment of tarsus; elytrae at least in apical half setose 4
- One-half the length of the last segment of tarsus surpass lobes of third segment of tarsus at maximum 5
4(3) Legs robust, tibiae strongly expanded apically, apex oblique truncate terminating in a ridge ..... *Bertiellus* Lopatin
- Legs normal ..... *Asionus* Lopatin
5(3) Epipleurae horizontal, in lateral view visible anteriorly only, first pair of tibiae strongly depressed and expanded .... *Disopus* Chevrolat
- Epipleurae oblique or almost vertical, in lateral view entirely visible, first pair of tibiae normal or sometimes depressed 6
6(5) Elytrae with long erect setae, third pair of male tibiae expanded ..... *Protophysus* Chevrolat
- Elytrae glabrous 7
7(6) Head small, inner margin of eyes with a shallow internal canthus, puncturation of elytrae regularly ..... *Burlinius* Lopatin
- Head large, inner margin of eyes with a deep and narrow internal canthus, puncturation of elytrae frequently irregular 9
9(8) Prosternum between the coxae narrow, coxae are separated by less than their diameter ..... *Homalopus* Chevrolat
- Prosternum between the coxae broad 10
10(9) First pair of male tibiae with hook-shaped, ventrally bended projection ..... *Lamellosus* Tomov

- First pair of male tibiae normal 11
11(10) Claws appendiculate ..... *Anteriscus* Weise
- Claws simple ..... *Cryptocephalus* s. str.

New replacement names suggested

Cryptocephalus osseusignatus **nom. nov.**

= *Cryptocephalus complicatus* Bryant, 1954:848 **syn. nov.**

For this species from Peru a replacement name had to be given as JACOBY (1889:109) used *complicatus* already for a species from Panama.

Etymology: the name refers to the bone-coloured, U-shaped marking on the elytra.

Cryptocephalus brachynigrobasalis **nom. nov.**

= *Cryptocephalus nigrobasalis* Kimoto & Gressitt, 1981:351 **syn. nov.**

For this species from Thailand a replacement name had to be given as Bryant (1946:613) used *nigrobasalis* already for a species from Senegal.

Etymology: the name refers to the short body length and the black basal margin of the elytra.

Cryptocephalus lunulatus **nom. nov.**

= *Cryptocephalus lunatus* White, 1968:65 **syn. nov.**

For this species from Texas, USA, a replacement name had to be given as BRYANT (1943:790) used *lunatus* already for a species from the Republic South Africa.

Etymology: the name refers to the crescent-like red elytral spot.

Cryptocephalus dimidiativittatus **nom. nov.**

= *Cryptocephalus semivittatus* L.N.Medvedev & Samoderzhenkov, 1987:32 **syn. nov.**

For this species from Vietnam, a replacement name had to be given as FAIRMAIRE (1902:260) used *semivittatus* already for a species from Madagascar.

Etymology: the name refers to the abbreviated stripe parallel to the elytral suture.

Cryptocephalus yorubae **nom. nov.**

= *Cryptocephalus calabaricus* Bryant, 1943:788 **syn. nov.**

For this species from Nigeria, a replacement name had to be given as WEISE (1922:44) introduced *calabaricus* already as a replacement name

for *Cryptocephalus simplex* Suffrian, 1857:177 (nec HALDEMAN 1849: 249) from Nigeria and Togo.

Etymology: the name refers to the kingdom of Yoruba in the 15th Century.

Cryptocephalus optimus **nom. nov.**

= *Cryptocephalus egregius* Schaeffer, 1934:459 **syn. nov.**

For this species from the USA (Louisiana, Texas, Arkansas, Georgia and New Jersey), a replacement name had to be given as WEISE (1887: 169) used *egregius* already for a species from Asia. *C. egregius* Weise was found to be a synonym of *C. hirtipennis* Faldermann, 1835.

Etymology: the name refers to the replaced name, optimus means excellent, too.

Cryptocephalus birgita **nom. nov.**

= *Cryptocephalus indicus* Pic, 1950:5 **syn. nov.**

For this species from the India, a replacement name had to be given as Suffrian (1854:58) used *indicus* already for a species from India.

Etymology: this species is dedicated to my wife Birgit.

Cryptocephalus falli **nom. nov.**

= *Cryptocephalus ochraceus* Fall, 1932:25 **syn. nov.**

For this species from the U.S.A., a replacement name had to be given as STEPHENS (1831:362) used *ochraceus* already for a species from Europe. *C. ochraceus* Stephens was found to be a synonym of *C. connexus* Olivier, 1807:829.

Etymology: this species is dedicated to the original author, H. C. FALL, who contributed significantly to our knowledge of the Nearctic Cryptocephalinae.

Cryptocephalus aulacensis **nom. nov.**

= *Cryptocephalus vitticollis* Pic, 1950:5 **syn. nov.**

For this species from Vietnam, a replacement name had to be given as WEISE (1891:149) used *vitticollis* already for a species from Europe. *C. vitticollis* Weise was found to be a synonym of *C. rufipes* Goeze, 1777: 321.

Etymology: this species is named after the first state founded on vietnamese ground, Aulac, in 257 BC in the red river delta.

Discussion

A total of 667 species were added compared to the catalogue of CLAVAREAU (1913). The only estimate published after CLAVAREAU by ERBER (1988) suggested an increase of 10%, i. e. about 1240 species. In this study it was shown that species number in *Cryptocephalus* increased by 58% since CLAVAREAU (1913). The percentage of synonyms (26%) is moderate, indicating that additional synonyms will be found in the future.

The study of the European fauna was completed relatively early. This is reflected by a low figure for the mean year of description (Tab. 1). On the other hand, the Neotropical region was revised early, but almost no further studies took place. This results in a low figure for the mean year of description, too. The study of the Asian fauna is still going on, and this is reflected by the highest number for the mean year of description. I suggest that the mean year of description is best used for comparison of faunas with a similar state of exploration but different numbers of species, e. g. the Nearctic and the North African fauna.

I expect the Palaearctic, Afrotropical and Neotropical faunas to be most species-rich. The knowledge of the fauna most species-rich at present, i.e. the Palaearctic fauna (Fig.1), is expected to increase little in the future. The absolute number of species in the second species-rich, i.e. Afrotropical fauna is expected to increase most. However, the percentage of new species will be highest in the Neotropical fauna, because little was added in the last century and it was not studied anymore since 1960.

Looking at periods of 25 years, most species were described between 1850 and 1875 (392), followed by the period 1900 and 1925 (Fig. 2). The reason for the former are the studies by EDUARD SUFFRIAN. The reason for the description of many species between 1875 until 1925 is colonialism. Many specimens were brought from tropical colonies to the European museums and were described by European scientists. There is a constant decrease in the number of descriptions from 1950 until today. This may be due to the crisis of biosystematics.

The description of new subgenera will be necessary when the Neotropical and Afrotropical species will be revised. However, as the Palaearctic subgenera were defined using many characters present in males only, changes might occur if more characters are considered in the analysis.

The compilation of a new catalogue would be more promising after clarification of generic problems in Australian and Afrotropical Cryptocephalinae. Moreover, a number of Asian and Oriental *Cryptocephalus* are expected to be described in the next years. I proposed a preliminary check-list published in the internet instead, which can be updated and validated until sufficient knowledge accumulates to prepare a new world catalogue of Cryptocephalinae.

Literature

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