

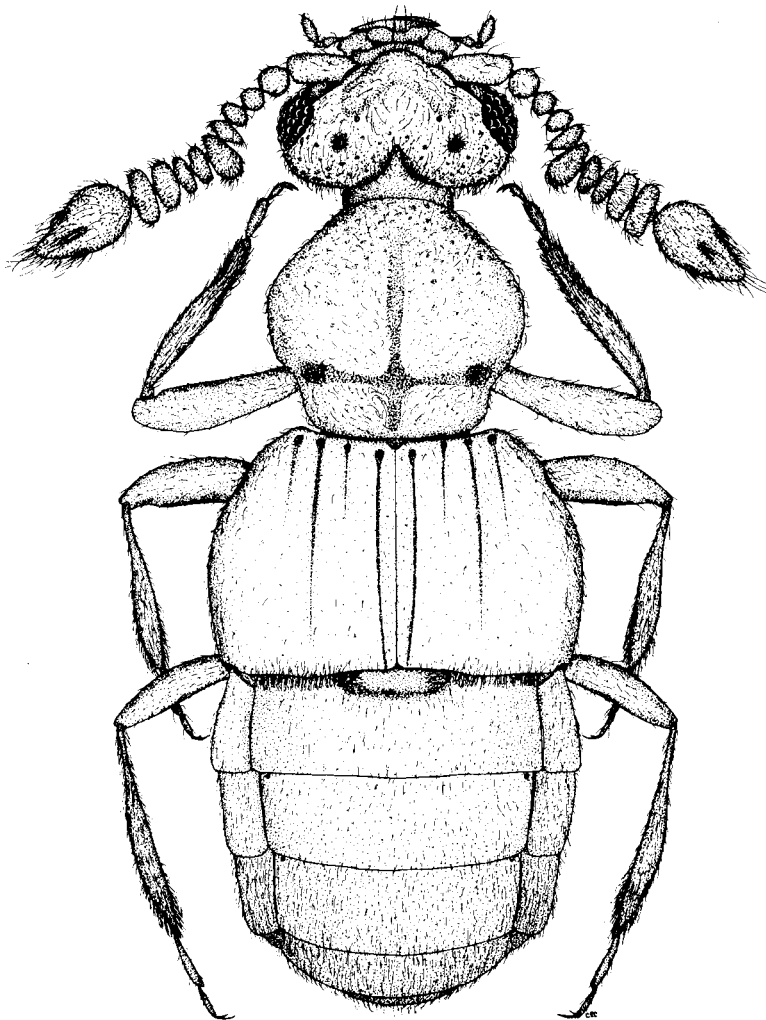
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ON POLYPHYLY OF THE CARPOPHILINAE WITH  
DESCRIPTION OF A NEW SUBFAMILY, CILLAEINAE  
(COLEOPTERA: NITIDULIDAE)

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ABSTRACT

The current nitidulid subfamily Carpophilinae is considered to be polyphyletic. This situation is rectified by proposing a new subfamily Cillaeinae for those members of the old Carpophilinae which have a flattened tegmen with fused lobes. The phylogenetic relationships of these groups are discussed, and a key to the subfamilies of Nitidulidae is provided.

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The Nitidulidae is a diverse and widely distributed group, whose composition and limits are still under discussion. During the last few decades, several taxa have been described without being placed in the revised classification. Other taxa have been removed from the family by Crowson, Sen Gupta, Jelinek, and Kirejtshuk. Currently there is no well-documented hypothesis of sister-group or phylogenetic relationships of the family, although Crowson (1955) and others have commented on the former and Kirejtshuk (1982) on the latter. Much remains to be done; for example, I feel that the Kateretinae appear to be much closer to the Cryptophagidae and allies than to the rest of the Nitidulidae, but morphological and possibly biological and/or ecological evidence is still needed.

In this report, I want to give evidence of polyphyly in the current Carpophilinae and propose a resolution to the problem by recognizing a new subfamily, Cillaeinae Kirejtshuk and Audisio.<sup>1</sup>

Murray (1864) divided the Carpophilinae into 2 sections: (1) the Latefimbriata and (2) the Anguste-fimbriata. To a certain degree, these sections correspond with groups here elevated to subfamilial rank. Studies of the male genitalia and the terminal segments of the abdomen reveal a sharp division between these groups, which has not previously attracted proper attention. Within the old carpophilines, the shape of the pregenital abdominal segment and the disposition of the aedeagus and anal sclerite are distinct in the genera related to *Carpophilus* on the one hand, and those related to *Cillaeus* and *Brachypeplus* on the other hand (see Figs. 1-4). The group related to *Carpophilus* has as a rule a strongly curved, bilobed tegmen with an extremely deep excision between the lobes and a nearly membranous penis (Dobson 1954a, b). The allies of *Cillaeus* and *Brachypeplus* on the other hand have a flattened

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<sup>1</sup> Because this solution was arrived at jointly by myself and Dr. P. Audisio of Rome University, the authorship of the taxon includes both names.

tegmen with fused lobes and a more or less flattened and sclerotized penis (Jelinek and Evans 1982; Marek 1982; Watrous 1982).

After comparative studies, it seems obvious that the male genital structures of *Carpophilus* and its allies are to a considerable degree similar to those of the *Epuraea* complex. This similarity is especially evident in species formerly placed in *Carpophilus* (*Myothorax*) (removed to *Taenioncus* Kirejtshuk 1984), which have the aedeagus, anal sclerite, and last abdominal segment very similar to these characters for members of the *Epuraea* complex, especially *Haptoncus*. This allows the hypothesis that the Carpophilinae (s. str.) and the *Epuraea* complex are sister-groups, or that *Carpophilus* and its allies are an offshoot of that complex.

The forms related to *Cillaeus* are generally similar in their male genital structures to those of the *Nitidula* complex (*Nitidula*, *Omosita*, *Soronia*, *Prometopia*, and others). These groups are similar also in external characters, particularly in those Hawaiian genera that appear to have retained many symplesiomorphies. If any of these similarities are indicators of common origin (synapomorphies), the taxa related to *Cillaeus* and *Brachypeplus* must be removed from the Carpophilinae proper, and regarded as a distinct group, with the same rank.

The *Nitidula* and *Epuraea* complexes are placed in the same subfamily, but in spite of some morphological similarity, they cannot be regarded as closely related. The *Nitidula* complex represents a very generalized and, without a doubt, ancient group within the Nitidulidae. The earliest known nitidulid fossil is from the Lower Cretaceous (L. Medvedev 1969) and is an obvious member of this group. Nevertheless, it is unlikely that their male genitalic characters are incipient (Kirejtshuk 1982).

The species of the *Epuraea* complex are quite numerous, yet very homogeneous, as is the Carpophilinae s. str. It may be that this vast assemblage of similar species is comparatively young, and as yet not greatly differentiated. On the other hand, the Cillaeinae are represented by a larger number of genera, which may suggest that they arose earlier than either the *Epuraea* complex or the Carpophilinae s. str. However, I think the genitalia of *Epuraea* and *Carpophilus*, with the long lateral lobes (seemingly homologous to parameres) and the membranous penis, are less likely derived from the ancestral type than the flattened, plate-like tegmen and sclerotized penis of *Nitidula* and *Cillaeus*. Thus, I conclude that the Carpophilinae s. str. and Cillaeinae have different phylogenetic origins, and that their external similarity is the result of convergence associated with similar ecological niches and modes of life.

Additional evidence of independent origins of the Cillaeinae and Carpophilinae may be taken from their distribution. The former have the greatest diversity and most generalized species in the Hawaiian Islands, while the second group (as well as their possible sister-group, the *Epuraea* complex) is represented in Hawaii by few, mainly pantropical, species. The origin of the Cillaeinae no later than the Eocene may also be presented as evidence.

Whether to consider these groups subfamilies or tribes is a very complex problem. Both are aberrant lineages of the common nitiduline stock, but although they are structurally and biologically distinct from the Nitidulinae, they undoubtedly are less so than are the Meligethinae, Cryptarchinae, Calonecrinae, and Kateretinae. A gap between the Cillaeinae and Nitidulinae seems to be clearer than one between the Carpophilinae and Nitidulinae (*Epuraea* complex). Elevation of both groups to subfamily remains provisional until a more precise elucidation of the sister-group relationships within the family.

## Carpophilinae Erichson 1843

TYPE GENUS. *Carpophilus* Stephens 1830.

DIAGNOSIS. Body more or less as convex dorsally as well as ventrally, rarely flattened; not strongly elongate; sides sharply sloping, not widely explanate. Labrum bilobed, deeply emarginated medially. Antenna with 3-segmented club. Pygidium and 1 or 2 preceding tergites exposed beyond elytra. Tergal fimbriae very narrow and subparallel to margin. Anal sclerite usually turned downward into deep emargination in middle of last sternite. Tegmen deeply cleft and rather strongly curved dorsoventrally. Penis trunk short, membranous.

INCLUDED TAXA.

*Carpophilus* Stephens 1830  
*Procarophilus* De Jong 1953 (fossil)

*Stilodes* Murray 1864  
*Urophorus* Murray 1864

Cillaeinae Kirejtshuk and Audisio,<sup>2</sup> new subfamily

TYPE GENUS. *Cillaeus* Castelnau 1835.

DIAGNOSIS. Body flattened and frequently strongly elongate, or convex and filiform; sides explanate, usually widely so. Labrum usually shallowly emarginate apically, sometimes bilobed. Antenna with 2- or 3-segmented club. Pygidium and 1-3 preceding tergites exposed beyond elytra. Tergal fimbriae large and well marked, at least on pygidium, or not visible (in filiform species). Anal sclerite never turned downward and last sternite not modified. Tegmen not bilobed, flattened. Penis trunk usually well sclerotized, flattened, short.

INCLUDED TAXA.

*Adocinus* Murray 1864  
*Apetasimus* Sharp 1908  
*Apetinus* Scott 1908  
*Brachypeplus* Erichson 1842  
*Campsopyga* Murray 1864  
*Cillaeopeplus* Sharp 1908  
*Cillaeopsis* Grouvelle 1899  
*Cillaeus* Castelnau 1835  
*Colopteroides* Watrous 1982  
*Colopterus* Erichson 1842  
*Conotelus* Erichson 1843  
*Cyrtostolus* Sharp 1908  
*Eunitidula* Sharp 1908  
*Eupetinus* Sharp 1908

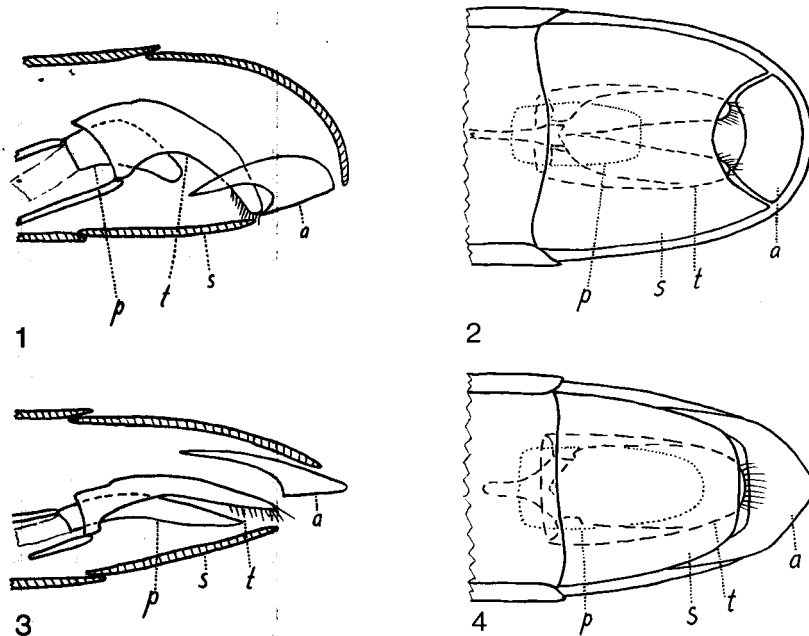
*Goniorcyctus* Sharp 1878  
*Goniothorax* Sharp 1908  
*Halepopeplus* Murray 1864  
*Hypodetus* Murray 1864  
*Ithyphenes* Murray 1864  
*Macrostola* Murray 1864  
*Nesapterus* Sharp 1908  
*Nesopeplus* Sharp 1908  
*Nesopetinus* Sharp 1908  
*Notopeplus* Sharp 1908  
*Orthostolus* Sharp 1908  
*Platynema* Ritsema 1885  
*Prosopeus* Murray 1864  
*Xanthopeplus* Fairmaire 1880

INCERTAE SEDIS.

*Carpophilops* Grouvelle 1898  
*Grammorus* Murray 1868  
*Macrostolops* Grouvelle 1916

*Teloconus* Grouvelle 1916  
*Tetrisus* Murray 1864

<sup>2</sup> See previous footnote.



Figs. 1-4. Generalized structures of male terminal abdominal segments of some Nitidulidae. 1, 2, Carpophilinae. 3, 4, Cillaeinae. [1, 3, cross section; 2, 4, ventral view; a—anal sclerite, p—penis, s—last sternite, t—tegmen.]

#### KEY TO SUBFAMILIES OF NITIDULIDAE

1. Sides of elytra gently sloping, epipleural border not, or hardly, raised; antenna with loose club, feebly separated from flagellum, not or barely depressed; outer edge of meso- and metatibia without distinct carinae ..... 2
- 1'. Sides of elytra with projecting epipleural border; antenna with distinct club, well separated from flagellum, moderately depressed; outer edge of meso- and metatibia with 1 or 2 usually distinct marginal carinae ..... 3
2. Antenna 11-segmented; elytra simple at outer apical corners; maxilla bilobed; aedeagus asymmetrical, with parameres jointed with phallobase; ovipositor with sclerites feebly defined .....  
Kateretinae Erichson 1843
- 2'. Antenna 10-segmented; elytra deeply emarginate at outer apical corners; maxilla with a single lobe; aedeagus symmetrical, with parameres fused with phallobase; ovipositor with sclerites well defined .....  
Calonecrinae Kirejtshuk 1982
3. Labrum and frons fused; procoxae open; tegmen without lateral lobes .....  
Cryptarchinae Reitter 1884
- 3'. Labrum free; procoxae open or closed; tegmen with or without lateral lobes ..... 4
4. Base of pygidium and frequently base of last sternite with a pair of arcuate impressions; meso- and metatibia strongly depressed, with

- a single marginal carina on outer margin; protibia often toothed on outer edge ..... Meligethinae C. Thomson 1859
- 4'. Base of pygidium and last sternite without arcuate impressions, occasionally with 8 small impressions; meso- and metatibia not depressed and usually with 2 marginal carinae on outer margin (sometimes reduced); protibia crenulate on outer edge, rarely with a strong subapical tooth ..... 5
5. Elytral apices reaching at least to middle of last tergite before pygidium, often covering part or all of pygidium; tergites not heavily sclerotized; tergal fimbriae absent or vague ..... Nitidulinae Latreille 1807
- 5'. Elytra shorter, pygidium and 1-3 preceding tergites exposed; exposed tergites heavily sclerotized; tergal fimbriae present or absent ..... 6
6. Body flattened, frequently strongly elongate or convex and filiform; sides explanate, often widely so; tergal fimbriae usually large and well marked, at least on pygidium, not visible in filiform species; anal sclerite never turned downward; tegmen flattened, not bilobed ..... Cillaeinae Kirejtshuk and Audisio, new subfamily
- 6'. Body more or less equally convex above and below, rarely flattened, not strongly elongate; sides sharply sloped, not widely explanate; tergal fimbriae very narrow; anal sclerite usually turned downward into deep emargination of last sternite, rarely normal; tegmen deeply cleft, strongly curved ..... Carophilinae Erichson 1843

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<sup>3</sup> References in the Grouvelle (1913) catalogue are not repeated.