Cytotaxonomy, classification and phylogeny of African Carventinae (Heteroptera: Aradidae)

by

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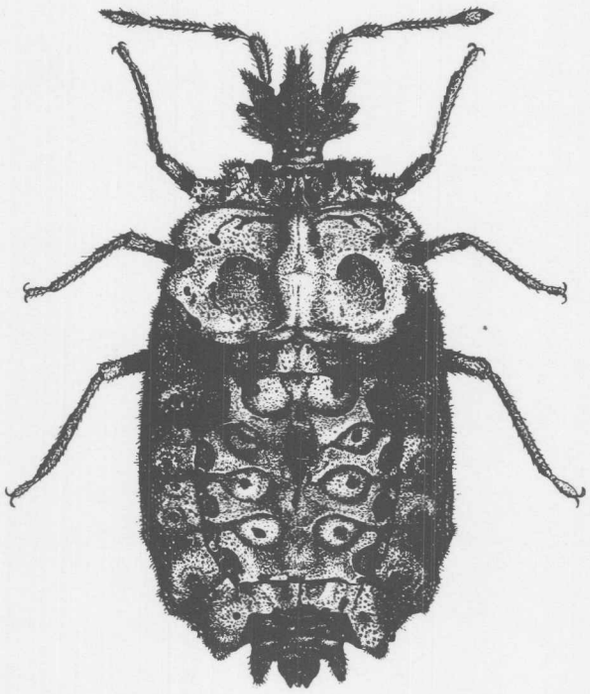

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Abstract

The southern African species of the Aradidae subfamily Carventinae are revised, resulting in the recognition of 7 genera, 24 species and 10 subspecies (excluding the nominal ones). Of these, 4 genera, 18 species and 10 subspecies are described as new. A neotype is designated for *Dundocoris natalensis*. Keys to the genera and species are given. Scanning electron photomicrographs of the dorsal and ventral aspects and external genitalia are provided for all the species.

The cytogenetics of the group are discussed and idiograms, based on chromosome area measurements, and photomicrographs of meiotic stadia (mostly metaphase I and metaphase II) are presented for all but one species. The chromosome numbers of the species vary between 2n = $7XY_1Y_2$ and 2n = 32XY and XY, X_1X_2Y and XY_1Y_2 sex chromosome systems occur. Multiple sex chromosome systems that originated from autosome-sex chromosome fusions are described for the first time in the Heteroptera. A unique case where two homologous autosomes have fused with the X- and Y-chromosomes respectively, is reported. Karyotype evolution and the origin of the different chromosome numbers are discussed and hypotheses presented. Pseudoploidy, fusions and to a lesser extent fragmentation, have played the major role in the karyotype evolution of the Carventinae. The cytogenetics of the other subfamilies of the Aradidae are briefly discussed and illustrated. It is argued that the ancestral chromosome number for the Carventinae and Aradidae (and therefore also the Pentatomorpha) is 2n = 14XY.

The morphological and cytogenetic data are integrated in the classification of the Carventinae and several of the subspecies are based on chromosome number differences. The homeostatic genetic species concept is proposed and its application to the Carventinae is discussed. Phylogenies for the genera and species are proposed.

The text is accompanied by more than 540 figures and more than 60 tables.

Samevatting

Die Suidelike Afrikaanse species van die Aradidae subfamilie Carventinae word hersien en dit het tot gevolg dat 7 genera, 24 species en 10 subspecies (met uitsluiting van die nominale subspecies), erken word. Van hierdie word 4 genera, 18 species en 10 subspecies as nuut beskryf. 'n Neotipe vir *Dundocoris natalensis* word aangewys. Identifikasiesleutels tot die genera en species word voorsien. Skandeerelektronmikroskoop foto's van die dorsale en ventrale aansigte word vir al die species ingesluit.

Die sitogenetika van die groep word bespreek en idiogramme, gebaseer op chromosoomoppervlakte metings, asook fotomikrogramme van die meiotiese stadia (hoofsaaklik meteafase I en metafase II) word vir al die species, uitgesonderd een, voorsien. Die chromosoomgetalle van die species wissel tussen $2n = 7XY_1Y_2$ en $2n = 32XY$, en XY, X_1X_2Y en XY_1Y_2 geslagschromosoomsisteme kom voor. Veelvuldige geslagschromosoomsisteme wat ontstaan het as gevolg van outosoom-geslagschromosoom samesmeltings word vir die eerste keer in die Heteroptera beskryf.. 'n Unieke geval waar twee homoloë autosome met die X- en Y-chromosome onderskeidelik saamgesmelt het, word rapporteer. Kariotiepevolusie en die oorsprong van die verskillende chromosoomgetalle word bespreek en hipoteses om dit te verklaar word aangebied. Pseudoploidie, samesmeltings en fragmentasie tot 'n mindere mate het die hoofrolle gespeel in die kariotiepevolusie van die Carventinae. Die sitogenetika van die ander subfamilies van die Aradidae word kortliks bespreek en geïllustreer. Dit word argumenteer dat die voorvaderlike chromosoomgetal van die Carventinae en Aradidae (en daarom ook van die Pentatomorpha) $2n = 14XY$ is.

Die morfologiese en sitogenetiese data word integreer in die klassifikasie van die Carventinae en verskeie van die subspecies is gebaseer op chromosoomgetal verskille. Die homeostatiese genetiese specieskonsep word voorgestel en die toepassing daarvan op die Carventinae word bespreek. 'n Filogenie word voorgestel vir die genera en species.

Die teks word aangevul deur meer as 540 illustrasies en meer as 60 tabelle.

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