

Trithetrum, a new genus of African dragonflies formerly placed in *Sympetrum* (Odonata, Libellulidae)

Klaas-Douwe B. DIJKSTRA & Erik M. PILGRIM

ABSTRACT

DIJKSTRA, K.-D.B. & PILGRIM, E.M. 2007. *Trithetrum*, a new genus of African dragonflies formerly placed in *Sympetrum* (Odonata, Libellulidae). *J. Afrotrop. Zool.* 3: 77-81.

Based on many morphological differences, the genus *Trithetrum* is described as distinct from *Sympetrum* Newman. The genus contains *Trithetrum congoense* (Aguesse) and *T. navasi* (Lacroix), both formerly placed in *Sympetrum*. Two males from Congo-Kinshasa constitute the first records of *T. congoense* since its description from Congo-Brazzaville.

K.-D.B. DIJKSTRA, National Museum of Natural History Naturalis, PO Box 9517, NL-2300 RA, Leiden, The Netherlands (dijkstra@nmm.nl)
E.M. PILGRIM, Department of Biology, Utah State University, 5305 Old Main Hill, Logan, UT 84322, USA (anisopteran@biology.usu.edu)

Keywords: Anisoptera, dragonfly, taxonomy, Africa

INTRODUCTION

Lacroix (1921) described *Sympetrum navasi* shortly after completion of Ris's (1909-1919) revision of the World's Libellulidae, and its generic placement has never been carefully considered. Lieftinck (1969) called it 'decidedly a very aberrant member of the genus', noting the widening Fw discoidal field as the most important character, and raised *S. congoense* to species level, which Aguesse (1966) had described as a subspecies of *S. navasi*. The presence of the predominantly Holarctic genus *Sympetrum* Newman, 1833 in tropical Africa seems anomalous. In a similar case, Afrotropical damselflies formerly placed in the Holarctic genus *Enallagma* Charpentier, 1840 were found to pertain to several endemic genera (May 2002).

Comparison of male *S. navasi* and *S. congoense* with numerous *Sympetrum* species, including the type species *S. vulgatum*, revealed many generic-level differences in colouration, wing venation, and the shape of the vertex, pronotum, thoracic venter and male genitalia. Molecular work also has shown that *S. navasi* is genetically very distant from the rest of *Sympetrum* (sensu stricto) and is more closely related to other libellulid genera (Pilgrim & von Dohlen, unpublished). The family Libellulidae is the second largest in Odonata, with over 1000 species comprising almost 18% of the order. The classification of the approximately 140 genera recognised is difficult as this mostly relies on characters of wing venation, which are increasingly found to be unsuitable to define monophyletic groups (e.g. Fleck 2004; Dijkstra & Vick 2006). However, as *S. navasi* and *S. congoense* are not

similar to any other known libellulids and share clear autapomorphies, description of a separate genus is both required and warranted.

METHODS AND MATERIAL

Poststernum, secondary genitalia and appendages were examined with a JEOL 5400 LV scanning electron microscope. Disarticulated wings were scanned with a CanoScan8400F. Examined specimens are listed under the species; we compared these with numerous *Sympetrum* species and all Afrotropical libellulid genera.

Acronyms MNHN: Muséum National d'Histoire Naturelle, Paris; MRAC: Musée Royal de l'Afrique Centrale, Tervuren; RMNH: Nationaal Natuurhistorisch Museum Naturalis, Leiden.

Abbreviations Ax: antenodal cross-veins; Ax1: first antenodal (counted from base) etc., Fw: forewing(s); Hw: hindwing(s); S1: first abdominal segment; S2-3: second and third abdominal segments; etc.

SYSTEMATICS

Trithetrum n. gen.

(Figs 1a, 2a, 3, 4, 5a, 6a)

Type species: *Sympetrum navasi* Lacroix, 1921.

Etymology The name *Trithetrum* (a neuter) is an analogy to the *-hemis* names derived from *-etrum* names (e.g. *Orthemis* from *Orthetrum*); the probable origin of the suffix *themis*, now frequent in Libellulidae

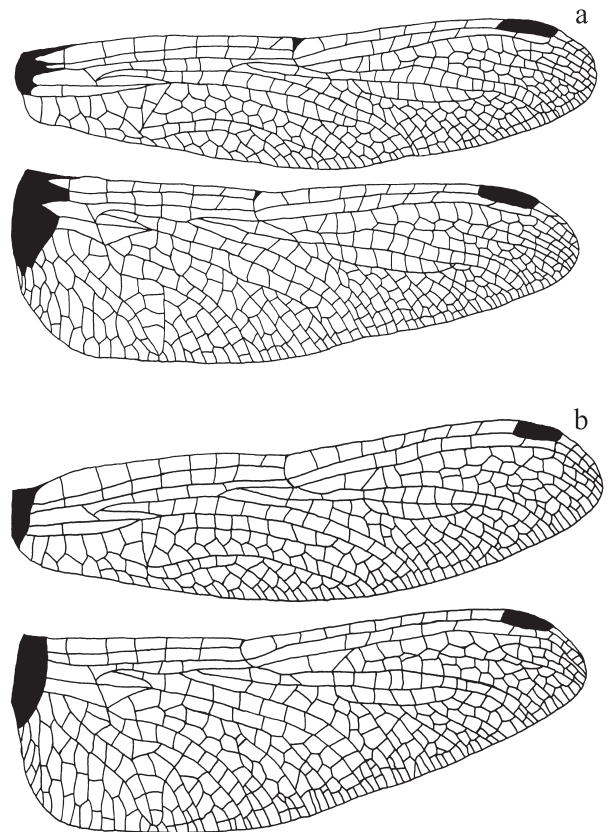
(Fliedner 1997). The 'reversed' derivation from *Trithemis* to *Trithetrum* conveys the deceptive similarity of *T. navasi* and *T. congoense* to *Trithemis* Brauer, 1868 (red and dark species, respectively) in the field. *Trithetrum* is also an amalgamation of *Trithemis* and *Sympetrum*.

Diagnosis The following autapomorphies separate the genus from other libellulids: (1) the hairy postero-lateral swellings of the poststernum (Fig. 3); (2) the uniform colouration lacking obvious markings; (3) the hypertrophied hamules (Fig. 4); (4) diagnostic details of the penis (Fig. 5a). Details and a full comparison with *Sympetrum* are provided below. In Africa, the following combination of venation features is usually diagnostic (Fig. 1a): (1) arculus stands about halfway Ax1 and Ax2; (2) 7.5 or 8.5 Fw Ax; (3) Fw triangle of two cells; (4) subtriangle of three cells; (5) Fw discoidal field of three rows at base, widening somewhat distally; (6) Rspl subtends single row of cells; (7) mid rib in anal loop rather straight. Other 'sympetrine' genera have similar venation, but *Diplacodes* Kirby, 1889, for instance, has fewer cells in Fw triangle, subtriangle and discoidal field, and *Crocothemis* Brauer, 1868, has more Fw Ax.

Description Male. Measurements (mm): total: 33-37; abdomen (excluding appendages): 20-25; Hw: 25-29; Fw pterostigma: 2.5-3.0.

Frons rounded with wide and shallow medial groove. Vertex rounded and not markedly swollen, not concealing anterior ocellus in dorsal view. Occipital triangle small, about as long as distance between it and vertex. Posterior side of head completely black; face (vertex to labium) uniformly pale brown (*navasi*) or black with lower frons, clypeus and labium dark brown (*congoense*).

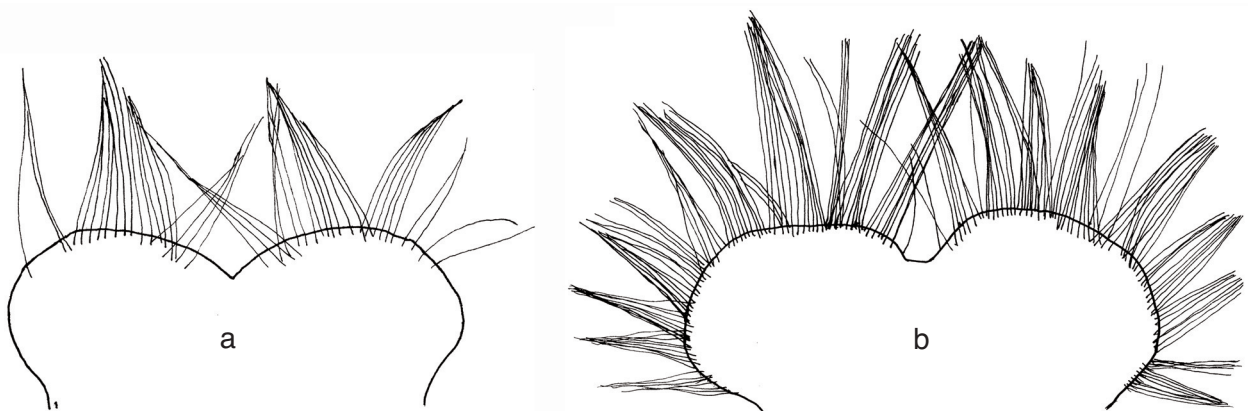
Pronotal hindlobe large and widest at mid height, with relatively sparse, erect fringe of long thick hairs; medial notch V-shaped (Fig. 2a). Synthorax slightly laterally compressed and notably covered with dense



Figs 1a-b. Wing scans. a. *Trithetrum navasi* (Ghana); b. *Sympetrum obtrusum* (USA).

long hairs. Postero-lateral corners of poststernum distinctly swollen (Fig. 3), these swellings especially densely clad with hair and more prominent in *congoense*. Thorax uniformly brown (*navasi*) or black (*congoense*).

Arculus slightly closer to Ax1 than Ax2 (Fig. 1a). Distal Ax usually incomplete (67%, n = 18) and distinctly



Figs 2a-b. Pronotal hindlobe in anterior view. a. *Trithetrum navasi* (Ghana); b. *Sympetrum obtrusum* (USA).

oblique when complete, 7-8.5 Fw Ax (7.5 in 56%). Fw triangles, cubital and bridge spaces with single cross-vein; supratrangles and Hw triangle without cross-veins; subtriangle of three cells. Fw discoidal field of three rows of cells from base to about level of node, widens slightly distally, 6-8 cells wide on wing border. At most a single cell-doubling between IR3 and Rspl. Anal loop elongate 'boot' of 16-19 cells and with rather straight mid rib, separated from very round tornus by 3-4 rows of cells. Venation black, membranule dark grey.

Legs uniformly black. Hind femora with many but sparse long hairs and external anterior row of 30-35 small denticles. Posterior hooks of tarsal claws at most a third as long as anterior hooks.

Abdomen slightly dorso-ventrally compressed, in dorsal view widest on S4 and gradually tapered to

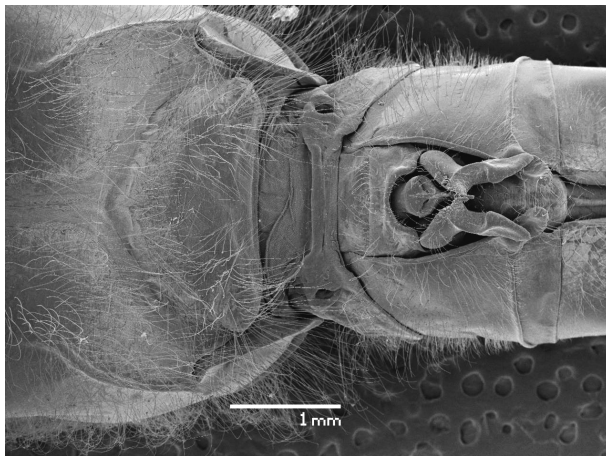
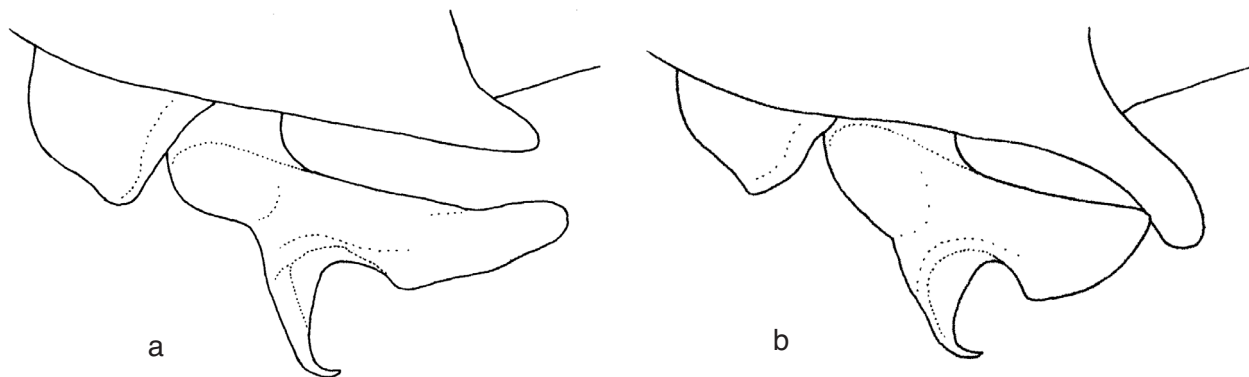


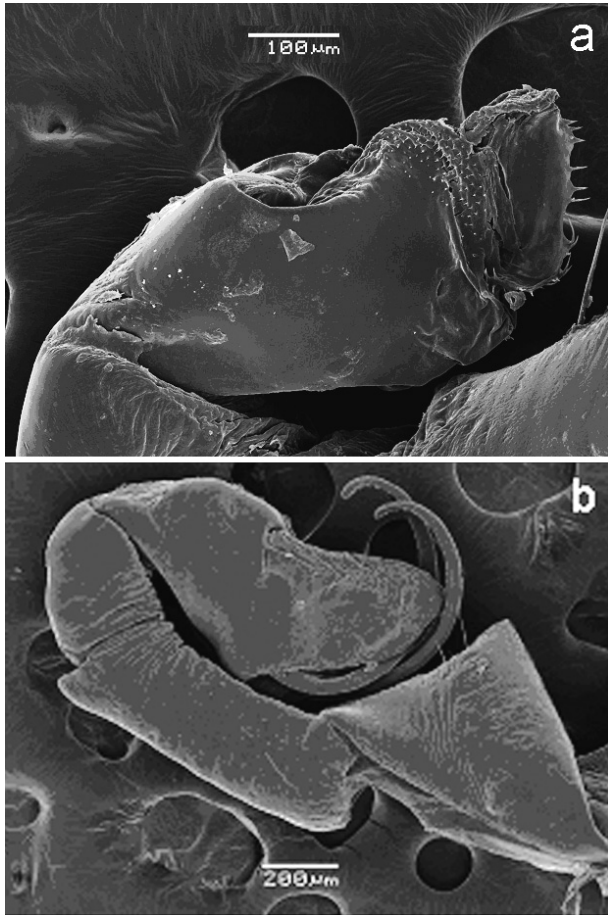
Fig. 3. Electron micrograph of *Trithetrum navasi* (Uganda) male venter of synthorax and S1-2 in ventral view, showing poststernum and secondary genitalia.

tip. Only S3 with prominent transverse subbasal ridge. Abdomen uniformly red (*navasi*) or black (*congoense*). Anterior lamina low; genital lobe short and narrow, angled posteriorly or postero-ventrally. Hamules hypertrophied with lobe and stalk massive (Fig. 4). Penis without cornua, but with small scoop-like structure at apex and a thin, transparent plate bordered by irregularly shaped and spaced filaments, making it appear frilled (Fig. 5a). Cerci sleek without ventral angle; epiproct about 70% of their length (Fig. 6a).

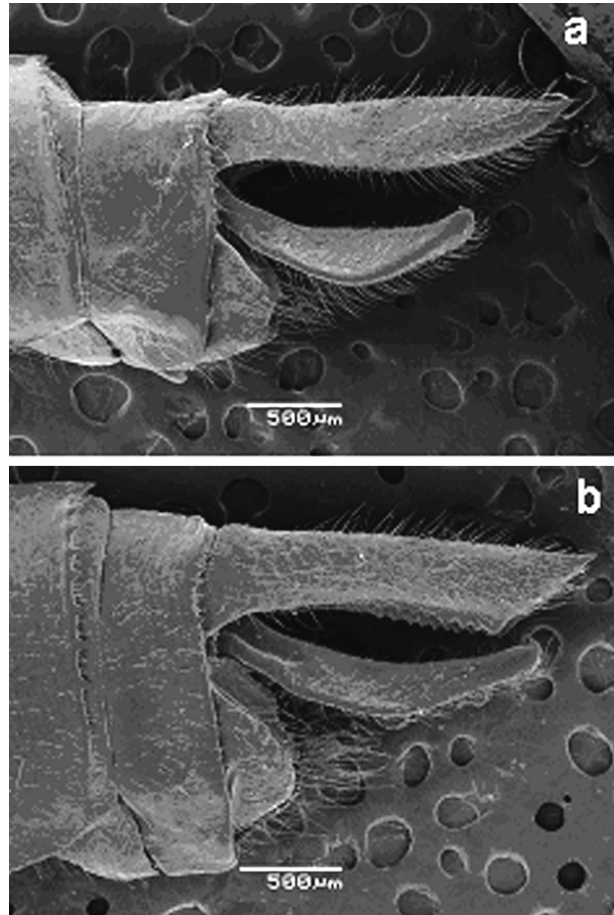
Comparison to *Sympetrum* The simple and uniform colour pattern of *Trithetrum* n. gen. differs markedly from the complex patterns seen in *Sympetrum*, which often include a black basal band on the frons, pale and dark bars on the back of the head, black lines along the thoracic sutures, dark pale-streaked legs, and variable dorsal and lateral black abdominal markings: the extent of black on all body parts is strongly correlated in *Sympetrum*, precluding a pattern of 'contrasting uniformity' (i.e. all black areas v. unmarked ones) as in *navasi*. Other distinguishing features of *Sympetrum* are: strongly swollen vertex protruding anteriorly, eclipsing anterior ocellus in dorsal view. The pronotal hindlobe is widest just above its base, the medial notch is deeper and U-shaped and the fringing hairs are more dense (Fig. 2b). Poststernum without hairy postero-lateral swellings. Posterior hooks of tarsal claws larger. Fw discoidal field narrows strongly distally, 3-4 cells wide on wing border and mid rib of anal loop distinctly bent (Fig. 1b). Membranule usually whitish. Abdomen often club-shaped, i.e. widened between S4 and tip. Hamules of more 'normal' proportions. Penis often with long cornua, but without apical scoop or plate (Fig. 5b). Cerci stout, usually with prominent ventral angle (Fig. 6b).



Figs 4a-b. *Trithetrum* n. gen. male secondary genitalia in lateral view. a. *T. congoense* (Congo-Kinshasa); b. *T. navasi* (Zambia).



Figs 5a-b. Electron micrographs of penis in lateral view. a. *Trithetrum navasi* (Benin); b. *Sympetrum striolatum* (Turkey).



Figs 6a-b. Electron micrographs of male appendages in lateral view. a. *Trithetrum navasi* (Uganda); b. *Sympetrum striolatum* (Turkey).

Trithetrum congoense (Aguesse, 1966) comb. nov.
Figure 4a

Sympetrum navasi congoensis Aguesse, 1966: 795 [holotype: Forêt de la Tsiam, Congo-Brazzaville; MNHN, not seen].

Sympetrum congoensis Aguesse, 1966 – Lieftinck (1969: 39).

Sympetrum congoense Aguesse, 1966 – Legrand & Lachaise (1980: 592); corrected spelling.

Material CONGO-KINSHASA: 1 ♂: Eala, xi.1934, J. Ghesquière (MRAC); 1 ♂: Mabali, Bikoro, Lac Tumba, x.1955, G. Marlier (MRAC).

Remarks Previously known only from the male holotype collected near Brazzaville, described as a subspecies of *S. navasi*. By colouration and hamule shape Lieftinck (1969) considered it sufficiently distinct for specific status, a conclusion shared by Legrand & Lachaise (1980). Both examined males

were identified as *Trithemis donaldsoni* (Calvert, 1899) by Fraser in 1955 (in litt.) and are slightly larger than the holotype (Hw 27-27.5 mm).

Trithetrum navasi (Lacroix, 1921) comb. nov.
Figures 1a, 2a, 3, 4b, 5a, 6a

Sympetrum navasi Lacroix, 1921: 378 [holotype: Bingerville, Côte d'Ivoire; MNHN, not seen].

Material BENIN: 2 ♂: Forêt de Lokoli, 9.VII.2002, S.L. Tchibozo (RMNH); 1 ♂: Kpinkonzoumè, 3.V.2002, S.L. Tchibozo (RMNH); GHANA: 3 ♂: Ankasa Resource Reserve, 10-12.IV.2000, K.-D.B. Dijkstra (RMNH); MALAWI: 1 ♂: Nkhata Bay District, Limphasa Dambo, 12.XII.2001, K.-D.B. Dijkstra (RMNH); UGANDA: 1 ♂: Lake Mburo, 30.IV.2001, R.H.A. van Grunsven (RMNH); ZAMBIA: 6 ♂: Samfya, 1960-1967, J.-J. Symoens (MRAC).

Remarks Widespread but never observed in large numbers at grassy verges of rivers and ponds, from The Gambia to Kenya, Malawi and Botswana.

DISCUSSION

The only other species placed in *Sympetrum* in tropical Africa, *S. fonscolombii* (Selys, 1840), agrees with typical *Sympetrum*. Nonetheless, its placement in *Sympetrum* is doubted too, as it may belong in *Tarnetrum* Needham & Fisher 1936 together with its American relatives (Schmidt 1987). The extinct *S. dilatatum* (Calvert, 1892) from St. Helena seems nearest *S. fonscolombii* (K.-D.B. Dijkstra, own observations). Further systematic work may place these species outside *Sympetrum*, leaving no true species of *Sympetrum* in sub-Saharan Africa (Schmidt 1987). By morphology, *Trithetrum* n. gen. has no obvious relatives in Africa. The vertex, tarsal claws, Fw discoidal field, cerci and hypertrophied hamule are similar to those of *Aethiothemis* Martin, 1908, but that genus has weakly developed frontal shields (absent in *Trithetrum* n. gen.) and more variegated coloration. It lacks the hairy poststernal swellings, as well as the overall hairiness of *Trithetrum* n. gen. *Aethiothemis* has 9-16.5 Fw Ax and the arculus lies close to Ax2 and often even distal of it.

We have not examined females or larvae of the new genus. Males of the two species are easily separated by hamule shape, genital lobe length (Fig. 4) and coloration: *T. congoense* is black throughout most of its body, while *T. navasi* has a pale brown face, a dark brown thorax and a red abdomen.

ACKNOWLEDGEMENTS

The first author thanks Eliane de Coninck for her help with the electron microscope, and Jan van Tol and Heinrich Fliedner for discussions on the new genus and its

name. Jos De Becker and Marc de Meyer were also helpful during work in MRAC, which was supported by SYNTHESYS. His work was further supported by grants from the German Federal Ministry of Science (BMBF, BIOLOG Programme, 01LC0025 and 01LC0404), while RMNH provided working facilities. The second author thanks Carol von Dohlen for laboratory space and funding, and James Pitts for comments on the manuscript.

REFERENCES

- AGUESSE, P. 1966. Contribution à la faune de Congo (Brazzaville) Mission A. Villiers et A. Descarpentries XXI. Odonates. *Bulletin de l'Institut fondamental d'Afrique noire (A)* 28: 783-797.
- DIJKSTRA, K.-D.B. & VICK, G.S. 2006. Inflation by venation and the bankruptcy of traditional genera: the case of *Neodythemis* and *Micromacromia*, with keys to the continental African species and the description of two new *Neodythemis* species from the Albertine Rift (Odonata: Libellulidae). *International Journal of Odonatology* 9: 51-70.
- FLECK, G. 2004. La larve du genre *Cyanothemis* Ris, 1915 (Odonata: Anisoptera: Libellulidae). Conséquences phylogénétiques. *Annales de la Société Entomologique de France (N.S.)* 40: 51-58.
- FLIEDNER, H. 1997. Die Bedeutung der wissenschaftlicher Namen europäischer Libellen. *Libellula Supplement* 1: 1-111.
- LACROIX, J.L. 1921. Deux Odonates nouvelles. *Annales de la société entomologique de Belgique* 61: 378-388.
- LEGRAND, J. & LACHAISE, M. 1980. Contribution a la faune du Congo (Brazzaville) Mission A. Villiers et A. Descarpentries. *Bulletin de l'Institut fondamental d'Afrique noire (A)* 42(A): 586-593.
- LIEFTINCK, M.A. 1969. Odonata Anisoptera. *Hydrobiological Survey of the Lake Bangweulu Luapula River Basin* 14: 1-61.
- MAY, M.L. 2002. Phylogeny and taxonomy of the damselfly genus *Enallagma* and related taxa (Odonata: Zygoptera: Coenagrionidae). *Systematic Entomology* 27: 387-408.
- SCHMIDT, E. 1987. Generic reclassification of some West-palaeartic Odonata taxa in view of their Nearctic affinities (Anisoptera: Gomphidae, Libellulidae). *Advances in Odonatology* 3: 135-145.