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Cover picture: ***Gomphomacromia paradoxa***, ♂ Chile 4.5 mi E Puerto Cisnes 24-i-1995

Photographer: Rosser W. Garrison

Cover photograph: *Gomphomacromis paradoxa* ♂: This taxon was the first odonate genus and species described by Brauer. The names show preferences to be seen in Brauer's nomenclature, that is to say, the attentiveness for similarities as in the genus name and the indication if there was an unusual feature as in the species name.

Picture: Rosser W. Garrison, Chile: Aisén Region, Aisén Prov., seepage 4.5 km east of Puerto Cisnes, ca. 44.7374 S, 72.6480 W, 24 January 1995.

The scientific names of Brauer's odonate taxa

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Abstract

An explanation is presented for each of the 135 scientific names given to Odonata by F. M. Brauer (fossils and synonyms included), in addition the names of the actual genera in which Brauer's species are now classified are explained. Prior to that part biographical information is given and Brauer's merits in enlightening the taxonomy of dragonflies are analysed. Conclusions are drawn as to his preferences in odonatological nomenclature and finally the difficulties are discussed, which Brauer had to face in his taxonomic work.

Zusammenfassung

In dieser Arbeit werden die 135 wissenschaftlichen Namen, die Brauer an Odonaten vergeben hat, einschließlich fossiler Taxa und Synonyme erklärt, darüber hinaus auch die Genera, in die Brauers Arten jetzt eingeordnet sind. Doch zuvor wird auf Brauers Biographie eingegangen und seine Verdienste um die Taxonomie der Libellen herausgestellt; im Anschluss an die Erklärungen werden Brauers Präferenzen bei der odonatologischen Namengebung herausgearbeitet und schließlich wird auf die Schwierigkeiten eingegangen, denen sich Brauer bei seiner taxonomischen Arbeit gegenüber sah.

Key words: dragonflies, Austria, history of odonatology, biography, taxonomy, nomenclature

Preface

Since the publication of Linnaeus (1758) animals have been classified by a combination of just two scientific names, one for the genus, which it may share with other closely related organisms, one for the species itself.

In principle these names may lack a meaning besides labeling each species unmistakably, but most authors endeavour to give some additional information, which among other things may concern morphology, colour, pattern, size, similarities, behaviour, places, biotopes, or, when dedicated to persons, may refer to the history of entomology. Traditionally scientific names are Latin or Latinised Greek. However, as these languages no longer are an indispensable part of scientific education, nowadays authors explain the etymology of the names they give; but in former times most authors did not indicate what they had in mind when naming a taxon, perhaps thinking it to be self-evident. That certainly seems to apply to the Austrian entomologist

Friedrich Moritz Brauer (1832-1904) (Fig. 1), who was one of the most prominent odonatological authors of the 19th century. So certainly an attempt might be worthwhile to try to ascertain his thinking. One must keep in mind however, that Brauer not only described dragonflies and therefore this treatise only covers a fraction of his nomenclatural efforts; but as Odonata are a clearly defined part of those, they certainly can provide some understanding of his methods and preferences.



Fig. 1. Middle-aged Brauer with entomological equipment (from ZOBODAT).

Material and Methods

Brauer's scientific names for Odonata have been extracted from Paulson & Schorr (2019) and their descriptions have been accessed (mostly from Biodiversity Heritage Library (BHL)), the Greek or Latin words on which these names are based have been quoted and the probable meaning of the names explained resorting to the wording of the first description, if possible, if not, conjectures have been made as how they might apply. The names have been listed in alphabetical order, first of genera and then of species as to facilitate how to find the respective explanations. Fossil taxa are handled separately. Also the synonyms are explained as are the actual genera into which Brauer's species have been subsequently placed. But first some information is given as to Brauer's biography and his importance for odonatology.

Brauer's contribution to odonatology

The most extensive biography of Brauer is provided by his disciple A. Handlirsch (1905), from which only some aspects shall be summed up here.

Brauer grew up in and near Vienna, where his parents, a well to do merchant and his second wife, had migrated from Northern Germany. It should be noted that the importance of Vienna in those times differed greatly from nowadays. Presently it is the capital of a minor European state with a population of less than nine million. Then it was the capital of the Austro-Hungarian Monarchy, that encompassed the modern states Czechia, Slovakia, the southern part of Poland, the western part of Romania, the part of Serbia north of the Danube, Croatia, Slovenia, the eastern part of Italy north of the Po-river and the name giving states Austria and Hungary, and furthermore until defeated by Prussia in 1866 it had supremacy in the German Confederation, that means, this monarchy was one of the five major powers in Europe, and it had an ambition to play a significant role in the political world and in science, which in the 1850s brought about the expedition of the 'Novara' (see below p. 5).

Friedrich's liking of entomology was aroused by his father and a brother of his mother as well as by a tutor, who was in charge of him from his sixth year. When Brauer was 14 years old, he was presented with a small collection of exotic insects, and due to his desire to identify these, his mother and uncle arranged a meeting with V. Kollar, entomologist at the Hofmuseum (Imperial Museum). Due to his visits to this institution the boy gained a broader knowledge of entomology, and while not completely understanding it, he was inspired by Burmeister's 'Handbuch der Entomologie'. Aged 16 with a friend he had the idea to compile a book on dragonflies 'like that of Charpentier', which shows his scientific interest being developed already early in his life. About that time, by breeding, he detected the larvae of *Chrysopa* and of *Ascalaphus* not known at that time, and was induced to report his findings in a scientific society, which accepted his results into its publications. By this Brauer was motivated to investigate the life history of neuropterous insects *sensu* Linné for those species for which Burmeister had stated the metamorphosis to be unknown. Two years later in 1852 one of his discoveries (the life history of *Panorpa communis*) was published in the proceedings of the Viennese Academy. At the same time he suggested a new classification of neuropterous insects, from which his early interest in systematics is to be seen. As he had failed his matura exam twice in that year (then a precondition for studying at university), as a consolation gift

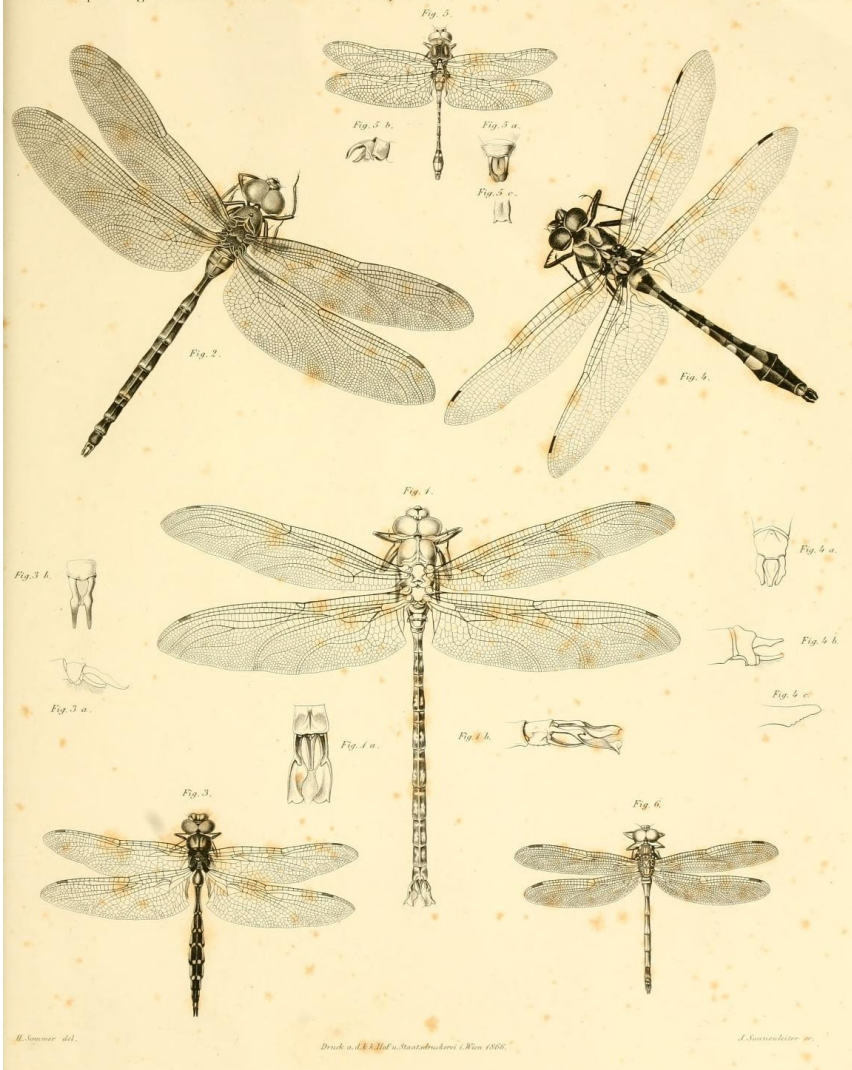


Fig. 2. Plate II from Brauer 1866b: 1. *Staurophlebia magnifica* [= *S. reticulata* (Burmeister)] ♂, together with appendages seen obliquely from above 2. *Gynacantha idae* [= *Heliaeschna idae*] ♀. 3. *Cordulia NovaeZealandiae* [= *Procordulia smithii* (White)] ♂. (appendages dorsal view and lateral view) 4. *Macromia elegans* [= *Epophthalmia elegans*] ♂ (appendages dorsal view and lateral view) 5. *Gomphomacromia paradoxa* ♂. (appendages dorsal view and lateral view; inferior appendage) 6. *Agrionoptera nicobarica* [= *A. insignis nicobarica*] ♂.

Brauer was allowed to visit Hermann August Hagen (1817-1893) at Königsberg, with whom he had been in contact by letter since his publications. By a special permission of the ministry of education Brauer was allowed to begin – like most of those who were interested in natural science at that time – the study of medicine at the Viennese university in summer 1853. In 1861 Brauer accepted employment at the 'Naturalienkabinett' of the Imperial Museum, not an entomological one however, but in the department of molluscs, where he stayed for 16 years. But he continued to publish on entomological themes, Diptera and especially botflies being an additional special field. These studies later led to a new classification of that group (cf. Contreras-Lichtenberg 2004: 50).

After the Austrian frigate 'Novara' in 1857 – 1859 had been sent around the world for scientific research, the collections of botanical, zoological and ethnological material had to be analysed and published. Brauer was entrusted with the description of the Neuroptera *sensu* Linné. His meticulous publication of the material (Fig. 2) induced others to send their collections to him for description. These were E. von Ransonett-Villez (1838-1926), an Austrian diplomat, who had collected from the Red Sea and in Sri Lanka (then Ceylon), Carl Semper (1832-1898), nephew of the famous architect, who had collected on the Philippines and later became professor of zoology at Würzburg (cf. Heß 1908) (these specimens were sent to Brauer by Semper's brother Georg, residing in Altona), J.J. Kaup (1803-1873), then director of the Grand-ducal Museum in Darmstadt, well known for his contributions to palaeontology, who had received specimens from that region, which now is Indonesia (cf. below p. 20). Kaup had already presorted these and given names to those which he surmised to represent a new species. Brauer adopted these names if they were not preoccupied or the specimen pertained to a taxon already described (Brauer 1866a: 563). As there is no evidence that the descriptions of those species were written by Kaup, I do not follow Schneider (2004) who treats Kaup as author of these taxa. Finally Brauer dealt with material from the Museum Godeffroy at Hamburg. That museum was established by shipowners, who sent collectors of zoological and botanical material with their ships to the South Sea region hoping to make a profit by selling these products. In addition Brauer described specimens from the Imperial Museum at Vienna.

Inspired by the experiences and the knowledge gained by these publications Brauer tackled a task by which he promoted odonatology to a great extent: He listed all 'Neuroptera *sensu* Linné' in a two-part publication containing a key to all odonate genera and a thorough description of the typical features of the genera of the Libellulidae and Corduliidae, which families had not yet been covered by Selys and Hagen in a synopsis or a monograph. Included was for each genus a list of its species known to Brauer with the respective author, their provenance and an indication if they were at the Vienna Museum by the abbreviation (M. C.) {= Museum Caesareum = Imperial Museum}. The value of this work was that it was a sound basis for classifying new taxa. It is to be noted that all these achievements (and others in the field of dipterology) were accomplished while Brauer was employed at the conchology department of the 'Naturalienkabinett' as scientific aide.

In 1871 Brauer decided to complete the final exams of his study of medicine, because that was a precondition for a further career in science. In the next year Brauer habilitated in the philosophical faculty (an examination which was necessary as a requirement for

a professorship), two years later he became associate professor at Vienna university; in 1876 he was appointed curator in the university's entomological department, two years later he became Correspondent to the Academy of Science and Professor of Zoology at the university, in 1888 Fellow of the Academy. In 1898 he was assigned to the position of Director of the Zoological Museum.

In the years after 1870 his rather few odonatological publications resulted in only one recent genus and seven species. Furthermore in collaboration with two junior staff members at the museum, discoveries from an East Siberian fossil locality resulted in two genera and six species names being published, of which five names turned out to be given for one taxon in different larval stadia (see below p. 26).

But Brauer's last years were overshadowed by health problems due to tremor, which prevented him from fulfilling his duties according to his high standards. So he finally applied for retirement. But he did not live to enjoy that: He was buried on the last day of his employment on New Year's Eve in 1904 aged 72.

The importance of Brauer's work for entomology might be seen from these numbers: As a consequence of his research the Linnean Class of Insecta was split into 17 orders, the Neuroptera *sensu* Linné into seven orders. The systematics of Diptera was changed due to his observations on the pupae of Brachycera (cf. Contreras-Lichtenberg 2004: 50). Considering only his contribution to odonatology (fossil taxa excluded), 22 genera are due to him (three of which became synonyms, see below) and 105 species group names, of which six are recognised as subspecies, 29 are synonyms and one a homonym.

Because of the nomenclatural focus of this paper one aspect has not been treated yet, whereas it is relevant for an appraisal of Brauer as an odonatologist: what did he contribute to the knowledge of the dragonfly fauna of Austria and Europe? His first contribution was a summary of the dragonflies in the Vienna region with local and phenological informations (Brauer 1850), but it was imperfect, as some species had obsolete names. Six years later (Brauer 1856) he listed the Odonata of the whole Danubian monarchy based on Selys (1850), but some informations on locations and phenology are added from other sources. However in this publication Brauer added the Perlidae, being at that time occupied with the larval development of the Neuroptera *sensu* Linné. One year later the 'Neuroptera Austriaca' was published (Brauer & Löw 1857), which book included all Neuroptera in the old sense from the 'Erzherzogthum Oesterreich', that means the western part of the Danubian Monarchy, including today's Czechia, Austria, Slovenia, a coastal part of Croatia and some regions of Northern Italy. In it Löw dealt with the Psocidae which family Brauer seems to have not liked too much (Handlirsch 1905: 137). In the first section the body parts of Neuroptera were explained followed by an explanation of the entomological terms used in the book; the third part held a description of the larval stadia of each of the genera arranged according to families, then three keys led via families and genera to the respective species, for each of which a description, local and phenological information were given. It is to be seen that this was a valuable introduction to the study of the insects covered by this work. Aspöck (1984: 15) states, that this publication was the most important guide to the Neuroptera of Central Europe for 50 years. Almost 20 years later followed a survey on the Neuroptera *sensu* Linné (Brauer 1876), which not only covered

Europe, but also the adjoining areas in North Africa and Anatolia, and in some cases even Siberia and Kamchatka. This paper however was just a catalogue of the respective species again with localities where they were observed; but how highly it was esteemed is to be seen by the fact that two years later an extract of that catalogue was published as far as it concerned Germany and Austria (Brauer 1878b).

Brauer's taxa

(Underlined vowels bear the accent)

Genera

As Brauer's contribution to odonatology was mainly effected by his ability to distinguish new genera this part of his scientific work shall be described first. Of his new genera some were based on a single specimen described as new by him (e.g. *Lyriothemis*, *Staurophlebia*, *Tetrathemis*), a practice that nowadays, because of a much better knowledge of Odonata, would be avoided. One of his new genera was *Libella* [a *libella* originally was an instrument of builders shaped like an inverted T, which name because of its shape was first given to the Hammerhead Shark and in the sixteenth century transferred to zygopterous larvae from there. Later it became one of the customary names for dragonflies, and finally the diminutive *Libellula* was chosen by Linné as the scientific name for Odonata in general (cf. Fliedner 2012)]. This genus, useful when described because it comprised some twenty species, later turned out to be a junior synonym of *Orthetrum* Newman [= straight abdomen], a genus name not in use at the end of the eighteen sixties (see Hagen 1888). Two other genera of Brauer, *Microthemis* [= small themis cf. *Brachythemis* below] and *Nannodythemis* [= dwarf *Dythemis*] became obsolete, as their species were later classified into other genera. It is to be noted, that the new genera were based mainly on differences in wing venation, which were not apt for being reflected in the new genus names. So they rather describe other features, as to be seen below.

Agrionoptera 1864

Gr. ἄγριος –α –ον = living on the fields, wild + –πτερος –ος –ον (in compounds) –winged

The first part of the name refers to Fabricius' genus *Agrion*, which in his time incorporated all Zygoptera, and in Brauer's times mostly was used for non-calopterygid damselflies not attributed to other genera. Brauer chose the name because in the wings of this libellulid genus he saw a similarity to zygopteran wings: "Vorder und Hinterflügel fast gleich gross, letzterer am Grunde nicht erweitert, kaum breiter als ersterer, beide am Hinterrande abgerundet, in der Gestalt den Flügeln der *Agrioniden* (*Euphaea*) im weiteren Sinne ähnlich [Forewing and hindwing of about the same size, the latter not expanded at the base, hardly broader than the former, both rounded at the rear margin, the shape of the wings similar to those of the agrionids in a broader sense (*Euphaea*)]" (p. 163).

Brachydiplax 1868a

Gr. βραχύς –εῖα –ύ = short + *Diplax*

In 1840 Charpentier had published a libellulid genus *Diplax* not aware that it already had been described under the name *Sympetrum* by Newman in 1833. As the priority

of the latter name was not known commonly until about 1880 (see Hagen 1888) *Diplax* was considered to be the correct name. Charpentier (1840: 12) explains his choice of the name thus: "Nomen e Graecis vocabulis δις et πλάξ derivatum ob prothoracis formam ... Prothorax in postica parte elevatus vel erectus in plagulam vel discum a duobus semicirculis formatum [The name is derived from the Greek words δις (= twice, doubly) and πλάξ (= anything flat and broad) because of the shape of the prothorax. ... The prothorax is elevated or erect in its hind part into a little area or disk formed by two semicircles]". That means this shape of the prothorax, which is at the base of the name, is similar to the upper case letter B. When Brauer was in need of new names for his genera he decided to use the element *-diplax* to denote they were libellulid genera irrespective of the shape of their prothorax. The first species he classified as *Brachydiplax* has a short abdomen: "Hinterleib kurz, dreiseitig, am Grunde etwas dicker [Abdomen short, trilateral, somewhat thicker at the base]" (1868a: 173).

Brachythemis 1868b

Gr. βραχύς -εῖα -ύ = short + -θέμις = law as established by custom / the goddess of order *-themis* was never a dragonfly taxon's name of its own, but in 1861, when Hagen had to describe many new libellulid genera from North America, he was inspired by the names in *-etrum* (e.g. *Sympetrum*) suggested by Newman 1833, but he wanted to avoid a change in gender from the feminine *Libellula*. Therefore he chose *-themis* as the second element for eight genera (see Hagen 1888), two of which later were synonymised with one of the others. Most probably Hagen chose this name starting from other names of divine beings established in Odonata, e.g. *Echo* or *Nehalennia*. Brauer took up this formation of names for twelve new taxa, two of which later became obsolete (see above p. 7). Other authors followed with names ending in *-themis*, not only for libellulid, but also for corduliid and synthemistid dragonflies, so that now there are more than 50 such genus names. *Brachythemis* got its name because of this: "Hinterleib kurz, dick, vom Grunde an allmählig dünner, spitz [Abdomen short, thick, getting thinner from the base gradually, pointed]" (1868d: 736).

Crocothemis 1868b

Gr. κρόκος = saffron; for *-themis* ≈ libellulid dragonfly see *Brachythemis*

Even though the name is neither explained in the first description nor the feature to which it alludes is even mentioned there, it is evident that it refers to the large saffron coloured basal patches in the hindwings of all species included in the new genus by Brauer (cf. Fliedner 1997: 40).

Diplacina 1868a

For *Diplax* (stem *Diplac-*) ≈ libellulid dragonfly see *Brachydiplax* + Gr. suffix -ινος -η -ον = made of/ like a

The similarity of this genus to *Sympetrum* (formerly *Diplax* Charpentier) is not easily ascertained from its first description, but best recognised from the first description of *Diplacodes* [Gr. -ώδης = like a] by Kirby (1889: 308): "This genus will include all the species placed in *Diplacina* by Brauer, except his type, *D. nana*, from the Philip-

piners, which is clearly not generic with the others. Several species previously referred to *Diplax* will come better here".

Erythrodiplax 1868b

Gr. ἐρυθρός –ά –όν = red; for –*dip*lax ≈ libellulid dragonfly see *Brachydip*lax

Of the nine species originally included in this new genus none is described as truly red, but for three, that means less than half of them, a reddish shade is mentioned in their first description, namely *fusco-rufa* (= reddish brown) and two times *flavo-rufescens* (= reddish yellow), the other species are differently coloured. As he normally does, Brauer classifies the genus by characters of wing venation.

Gomphomacromia 1864 (Cover photo and Fig. 2, 5)

Gr. γόμφος = bolt, for shipbuilding or for other uses + μακρός –ά –όν = long, extensive, + ὤμος = shoulder + feminine form of the suffix –ιος –ια –ιων = concerning.

The name is chosen for the similarity of two genera, the genus *Gomphus* Leach, which got its name from the feature "Abdomen clavate in both sexes" and the genus *Macromia* Rambur: "Körper schlank zylindrisch, ... das Hinterleibsende beim Männchen fast wie bei Gomphiden erweitert [Abdomen slim cylindrical, ... its rear part expanded in the males almost as in gomphids]" (Brauer 1866b: 80); concerning *Macromia* Brauer states: "Die Gattung *Macromia* trennt sich von allen Cordulinen durch den bis an das Basalende durchzogenen zweiten Cubitalraum. Die neue Gattung schliesst sich aber den Gattungen an, deren zweiter Cubitalraum am Basalende leer ist, d.s. *Epitheca* Charp. und *Cordulia* [The genus *Macromia* is separated from all cordulines by the second cubital space being crossed by transverse veins. The new genus however is associated with genera in which the second cubital space is free at the basal termination, which are *Epitheca* Charp. and *Cordulia*]" (l.c. 81).

Lyriothemis 1868a

Gr. λύριον = a small lyre; for –*themis* ≈ libellulid dragonfly see *Brachythemis*

The name refers to the superior male appendages of the single species included in the genus when founded, *L. cleis*, which are somewhat shaped like the gently curved arms of a lyre: "Anhänge so lang als die 2 letzten Ringe ..., die oberen ... wenig geschwungen von oben fast bis zur Spitze gleichbreit, diese fein und etwas auswärts gerichtet, seitlich etwas geschwungen und bis vor die Spitze erweitert [Appendages as long as the last 2 segments ..., the upper ones ... curved only a little, dorsally of equal breadth almost up to the tip, which is fine and somewhat bent outwards and expanded almost as far as the apex]" (p. 182).

Macrodiplax 1868b

Gr. μακρός –ά –όν = long; for –*dip*lax ≈ libellulid dragonfly see *Brachydip*lax

Brauer founded this genus on the species *M. cora* (Brauer 1867a), which is not especially long. So the name most probably refers to the legs of his specimen: "Beine zart aber ziemlich lang, schwarz [legs delicate but rather long, black]" (1867a: 20).

Nannodiplax 1868b

Gr. νάννος or νᾶνος = dwarf; for *Dip*lax ≈ libellulid dragonfly see *Brachydip*lax

Again the first description does not say why Brauer chose this name, because, be-

sides characters of wing venation, it only mentions the bilobed prothorax. But again this genus is based on just one species (*N. rubra* from Australia), which with its total length of 23 mm is fairly small.

Nannothemis 1868b

Gr. νάννος or νᾶνος = dwarf; for *-themis* ≈ libellulid dragonfly see *Brachythemis*

When Brauer established this genus, all species already described that were included in it were taken from the genus *Nannophya* Rambur, 1842 (Gr. φύα = stature), the characteristic feature of which was: "J'ai formé ce genre sur la plus petite espèce de Libellulide connue [I have based this genus on the smallest known libellulid species]". Being small is also true for the species *Libellula phryne* Perty, on which Kirby (1889: 259) founded his genus *Nephepeltia* (see Kirby 1890: 44) and the nomina nuda *N. semiaurea* (that species was described by Karsch (1889: 253)) and *N. prodita* (Hagen 1861: 320). Now only the one species *N. julia* (Uhler, 1857), the smallest North American dragonfly, remains in the genus *Nannothemis*.

Neurothemis 1867a

Gr. νεῦρον = any linear feature in an organism, so sinew, tendon, vein, nerve, fibre in plants; in entomology used for wing veins; for *-themis* ≈ libellulid dragonfly see *Brachythemis*

With this name Brauer replaced the preoccupied genus name *Polyneura* Rambur (Gr. πολύς, πολλή, πολύ = many, much), which got its name from the many wing veins: "Caractères du genus *Libellula*. Ayant les nervules beaucoup plus nombreuses [Characters of the genus *Libellula*. Having the veins far more numerous]" (Rambur 1842: 127).

Onychothemis 1868a

Gr. ὄνυξ (stem ὄνυχ-) = talon, claw; for *-themis* ≈ libellulid dragonfly see *Brachythemis*

In his key Brauer (1868b: 365) gives as a distinguishing feature: "Klauen ungezähnt, Schienen mit grossen Dornen [Claws without tooth, tibiae with big thorns]". So this characteristic is at the base of the name.

Orchithemis 1878a

Gr. ὄρχις = testicle; for *-themis* ≈ libellulid dragonfly see *Brachythemis*

The name refers to the special shape of the male's secondary genitalia: "Genitalien am zweiten Ringe senkrecht nach unten abstehend, gross und eigenthümlich gedreht, so dass der sonst hinter dem Hamulus und mit demselben in einer Ebene liegende Lobus nach innen gedreht, der Hinterseite des Hamulus anliegt und dem der anderen Seite zugewendet ist. ... Durch diese Lage kann man die Lobi nur von unten sehen. [Genitals on the second segment protruding vertically downwards, large and peculiarly turned, so that the lobus, which otherwise lies behind the hamulus and with it in one plane, turned inwards, lies against the back of the hamulus and faces that of the other side. ... Because of their position the lobes are only to be seen from underneath]."

Pachydiplax 1868b

Gr. παχύς -εῖα -ύ = thick, stout; for *-diplax* ≈ libellulid dragonfly see *Brachydiplax*

As one difference of this taxon from his genus *Libella* (younger synonym of *Orthetrum* Newman), the abdomen of which Brauer says to be sword-shaped, he gives: "9. und 10. Ring sehr kurz, Leib fast gleich dick, kurz [9th and 10th segment very short, abdomen of almost equal stoutness, short]" (p. 368).

***Staurophlebia* 1865b**

Gr. σταυρός = cross + φλέψ (stem φλεβ-) = artery, vein + adjectival suffix -ιος - ία - ιον = related to, associated with

The name is evoked by a feature of the wing venation: "Die Subcosta durchkreuzt den Nodus und endet ausserhalb desselben gabelig in die Mediana und Costa [The subcosta crosses the nodus and ends beyond it bifurcating into median and costa]" (p. 907).

***Tetrathemis* 1868a (Fig. 3)**

Gr. τετρα – (in compounds) = four; for *-themis* ≈ libellulid dragonfly see *Brachythemis*

An irregularity concerning the discoidal cell gave the name: "Cellula cardinalis (Dreieck) in beiden Flügeln 4eckig, durch Knickung der Vorderseite [Cellula cardinalis (triangle) in both wings quadrangular as the anterior side of the triangle is bent]" (p. 183).



Fig. 3 Brauer's type of *Tetrathemis irregularis*: The quadrangular shape of the 'triangle' in all wings that is at the base of the names *Tetrathemis* and *irregularis* is very well discernible. Picture: H. Bruckner NHMW.

***Trithemis* 1868a**

Gr. τρι – (in compounds) = three; for *-themis* ≈ libellulid dragonfly see *Brachythemis*

The name refers to the shape of the prothorax: "Hinterrand des Prothorax dreilappig, der Mittellappen, klein, ganz [Rear margin of the prothorax three-lobed, the median lobe being small, entire]" (1868d, 735).

***Urothemis* 1868**

Gr. ούρα = tail; for *-themis* ≈ libellulid dragonfly see *Brachythemis*

At the base of the name is a peculiarity of the vulvar scale in the females, which Brauer describes in his key: "Scheide des Weibchens bedeckt mit rohrartiger Klappe, 9. Ring ebenfalls rohrartig erweitert [Vagina of the female covered by a tube-shaped flap, 9th segment also expanded like a tube]" (1868b: 366).

Species

In Paulson & Schorr (2019) all subspecies are listed as synonyms. Their subspecific rank is not mentioned. As in the systematics that publication is followed, Brauer's taxa presently deemed to be subspecies are listed among the synonyms.

(Parentheses around the genus name mean that the current genus of the species is not that of its first description)

abnormis [*Onychothemis* 1868a]

L. *abnormis* –is –e = irregular

Brauer based his genus *Onychothemis* (q.v.) on this species. Gr. ὄνυξ –υχος = claw, talon as first part of the new taxon shows which irregular feature Brauer had in mind: "Beine stark und lang, Schienen gebogen, mit langen, wenigen, kräftigen Dornen in weiten Abständen, die gebogen und so stark wie die Klauen sind; Klauen ohne Zahn, nur die des letzten Fusspaares mit einer kleinen Kerbe ausser der Mitte [legs strong and long, tibiae curved, with a few long robust spines well spaced out, which are curved and as strong as the claws. Claws without a tooth, only those of the last pair of legs with a little notch outside of the middle]" (p. 171).

aeruginosum [(*Ceriagrion*) 1869]

L. *aeruginosus* –a –um = rusty

"Der ganze Körper oben rostbraun, Kopf unten heller, grüngelb bleich, ebenso die Brustseiten und Beine, ... [The whole body rusty brown above, the head lighter below, pale yellow-green, as are the sides of the thorax and legs, ...]" (p.13).

africana [(*Trithemis*) 1869]

L. *africanus* –a –um – African

Brauer's specimen was from Sierra Leone.

annulata [(*Melanesobasis*) 1869]

L. *an(n)ulatus* –a –um = furnished with a ring (or: rings) (*an(n)ulus* = a little ring)

The species is described from a single juvenile specimen, lacking the rear part of the abdomen from the base of the fourth segment. The name refers to rings on the residual abdominal segments: "Erster Hinterleibsring schwarzbraun, der Grund, und ein schmaler Ring am Ende gelblich, zweiter Ring ... am Vorderrand ein schmaler weisser, am Hinterrand ein breiter schwarzbrauner Ring, ... Dritter Ring ... am Vorderrande mit feinem weissen, am Hinterrand mit dunkelbraunem und vor diesem mit weisslichem Ring, der sich seitlich nach vorne zu einem Längswisch erweitert. 4. Ring scheint ebenso gefärbt, der Rest fehlt. Die dunklen Ringe scheinen beim reifen Thiere metallisch zu werden [First abdominal segment blackish brown, its

base, and a slim ring at the end yellowish, second segment ... at the base a slim white ring, at the rear margin a broad blackish brown one. ... Third segment ... at the base with a fine white ring, at the rear with a dark brown one, and before it a whitish ring, which laterally expands into a longitudinal streak directed ahead. The fourth segment seems to be of the same pattern. The rest is missing. The dark rings seem to become metallic in the adults]" (p.11).

anomalala [(*Erythrodiplax*) 1865a]

L. *anomalus* –a –um = irregular, anomalous (from Gr. ἀνώμαλος = uneven, irregular)

This species differs from others of the group "durch den ungetheilten Endlappen des Prothorax [by the undivided posterior lobe of the prothorax]" (1866b, 91).

appendiculata [(*Risicnemis*) 1868c]

L. *appendicula* = small appendage + –atus –a –um = equipped with

The taxon is said to be "Von den übrigen Arten durch die langen unteren Anhänge, ... verschieden. [Distinct from the remainder of the species by its long inferior appendages]" (p. 548).

asiatica [(*Ischnura*) 1865a]

L. *asiaticus* –a –um = Asian

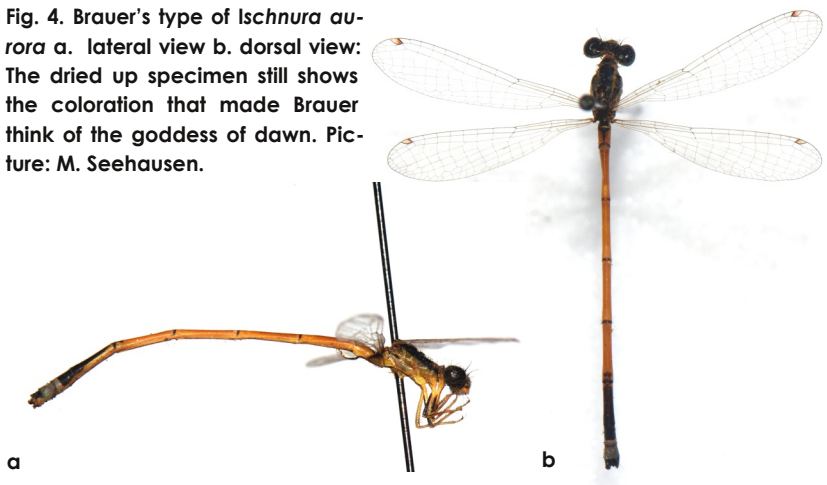
"Patria: China (Shanghai, Hongkong)." As far, as I can see species of *Ischnura* at that time had been described from Europe, Africa, America, Australia and Polynesia, but this one seems to have been the first described from Asia.

atropurpurea [(*Risicnemis*) 1868c]

L. *ater* –tra –trum = black, dark + *purpureus* –a –um = purple-coloured

The relevant passage of the description reads: "Körper tief schwarz, etwas glänzend, Thorax vorne blau, seitlich purpurmetallisch [body deeply black, somewhat shiny, thorax frontally blue, laterally of a metallic purple]" (p. 549).

Fig. 4. Brauer's type of *Ischnura aurora* a. lateral view b. dorsal view: The dried up specimen still shows the coloration that made Brauer think of the goddess of dawn. Picture: M. Seehausen.



aurora [(*Ischnura*) 1865a] (Fig. 4)

L. *Aurora* = the goddess of the morning

As Brauer capitalised the name, the Roman goddess of the morning is the source of the name, probably induced by the orange overall impression of the male: "♂ *Aurantiacum* [♂ orange]".

australis [*Nannophya* 1865a]

L. *australis* –is –e = southern

The species is described from "Vaterland: Australien, Sidney (sic) [Country: Australia, Sydney]", which from the European point of view certainly is a southern provenance.

bipunctata [(*Diplacodes*) 1865a]

L. *bi-* (in compounds) = two + *punctum* = point, spot + *-atus* –a –um = provided with Brauer's description "... ad stigmata mesothoracalia [sic] punctis duobus nigris [... with two black spots at the mesothoracic stigmata]" does not distinguish if he speaks of one black spot on each side of the thorax, making two in total, or if two spots on each side of the thorax are at the base of the name. Indeed there are two adjacent dark spots to be seen on the metathorax, not mesothorax, as Brauer stated erroneously (see Endersby & Fliedner 2015: 120).

bisignata [*Urothemis* 1868a]

L. *bi-* (in compounds) = two + *signum* = mark, sign, indication + *-atus* –a –um = provided with

Most probably the name refers to the dorsal pattern of segments eight and nine being different from the others: "1. Ring oben in der Mitte schwarz, 4., 5., 6. und 7. in der Mitte des Hinterrandes mit einem kleinen, viereckigen, schwarzen Fleck, 8. und 9. mit breiter schwarzer Rückenstrieme [1st segment dorsally black in the middle, 4th, 5th, 6th and 7th with a small quadrilateral spot in the middle of the rear margin, 8th and 9th with a broad dorsal stripe]". Otherwise one might think of a temporal feature: "Schläfen oben glänzend schwarz, in der Mitte ein rothgelber Punkt, eben so nach unten neben dem Augenrande [temples shining black above, in the middle a reddish yellow spot, likewise below near the margin of the eye]" (1868a: 175).

brevistylus [(*Hydrobasileus*) 1865c]

L. *brevis* –is –e = short + *stylus* = a stake, a pointed instrument used by the Romans for writing upon wax tablets.

In late antiquity and later on y often was written for i, and the terminus styli in entomology referred to the anal appendages, as in this case: "appendicibus analibus sup. maris longitudine segmenti penultimi, appendicibus feminae brevissimis, nigris [the male's superior anal appendages as long as the second last segment, the female's very short, black]" (1865c: 978).

caledonicum [(*Orthetrum*) 1865a]

L. *Caledonicus* = from the Scottish Highlands (L. *Caledonia*)

Brauer refers to the provenance of his specimens: "Patria: Nova Caledonia. Mai. [Country: New Caledonia, Grande Terre]".

cgstor [(*Castoraeschna*) 1865b]

Gr. Κάστωρ (L. *Castor*) = (in ancient mythology:) one of the Dioscuri, sons of Zeus and Leda, with his twin brother Polydeukes (L. *Pollux*) considered to be a hero and helper in time of need.

The choice of name is elucidated from the last sentence of the description: "Der *Aeschna heros* ähnlich, doch die Schulterlinien oben nicht hakig und viel breiter etc. etc. [Very similar to *Aeshna heros*, but the humeral lines not hooked above and much broader etc. etc.]" (1866b: 73). That means Brauer substituted the typological name with a well known hero from mythology.

cerinorubellum [(*Ceriagrion*) 1865a]

L. *cerinus* –a –um = wax-coloured + *rubellus* –a –um = reddish

The name consists of the younger synonyms of two *Ceriagrion* species, viz. *Agriion cerinum* Rambur (= *C. coromandelianum* (Fabricius) named from its provenance from the Coromandel Coast in India) and *C. tenellum* (DeVillers) by its younger synonym *Agriion rubella* Vander Linden: "Ich hielt diese Art für *Ag. cerinum* Rbr., doch gibt Rambur bei diesem die unteren Anhänge kurz an. Aehnlich sind die Anhänge von *Ag. tenellum* De Vill, gebildet [I thought this species to be *Ag. cerinum* Rbr. but Rambur states the inferior appendages in this species to be short. Similarly formed {to those of this species} are the appendages of *Ag. tenellum* De Vill.]" (1866b: 59).

chalybea [*Brachydiplax* 1868a]

L. *chalybeus* –a –um = of steel, steel-

The name probably reflects the colour of the thorax: "Thorax vorne glänzend metallisch schwarz, seitlich unten braun Brust hinter den Beinen in der Mitte schwarzbraun [thorax frontally metallic black, laterally brown at the bottom, ... thorax behind the legs in the middle blackish brown]" (p. 173).

cingillum [(*Pseudagrion*) 1869]

L. *cingillum* = a small girdle

The description of the species mentions annular markings of the abdomen, which probably have led to the name. The relevant phrases from the description are shown in italics "Erster Hinterleibsring blau, oben an der Basis ein schwarzer, vier-eckiger Fleck, der den Hinterrand breit blau lässt, die äusserste Kante daselbst erst *einen feinen schwarzen Ring bildend*. Zweiter Ring oben blau, in der hinteren Hälfte ein metallisch schwarzer, vorne in zwei seitliche Spitzen ausgezogener, hinten *durch einen schmalen blauen Ring* vom schwarzen Hinterrande, bis auf eine schmale schwarze mittlere Verbindungslinie, *getrennter Fleck* [First abdominal segment blue, on top at the base a black, square patch, which leaves the posterior margin broadly blue, the outermost edge there *forming a fine black ring*. Second ring blue above, in the posterior half a metallic black patch, drawn out anteriorly into two lateral peaks, posteriorly separated *by a narrow blue ring* from the black posterior margin except for a narrow black median connecting line]" (p. 11).

cleis [*Lyriothemis* 1868a]

Gr. Κλεΐς = female name, e.g. of the mother and daughter of Sappho, but also of courtesans.

Brauer founded his genus *Lyriothemis* on this species, which he says has similarities in wing venation with the calopterygid genus *Cleis* (because of homonymy now *Umma* Kirby), created by Selys in 1853 together with the genus *Sappho*, but also others named from courtesans, of which only the genus *Mnais* is still valid. "Längsadern, besonders im Hinterflügel der Sect. nodalis und subnodalis, medius und brevis vor dem Ende stark und fast zurückgebogen in den Rand mündend wie bei der Calopteryginen-Gattung *Cleis* Selys [longitudinal veins, especially in the hind wing the sectors nodus and subnodus, media and brevis before the end strongly and almost recurved merge into the margin like in the calopterygid genus *Cleis* Selys]" (p. 180. For the 'sector brevis' see Hagen (1849: plate)).

concolor [*Anax* 1865a]

L. *concolor* = concoloured i.e. of the same colour.

Probably the name is due to the fact, that in this species the frons, thorax and first two abdominal segments are of matching yellow-green color: "fronte viridiflava immaculata, ... thorace flavo-viride (!) immaculato ... segmento primo et secundo flavo-viridibus [with an unstained yellowish green frons, ... an unstained yellowish green thorax, .. the first and second segment yellow-green]" (p. 508).

cora [(*Macrodiplax*) 1867a]

Gr. Κόρη is one of the names of the goddess Persephone (κόρη = girl, maiden)

As the name is capitalised in Brauer's publications it is certainly a person for whom the species is named; but it is not known if Kaup, who had suggested the name, wanted to honour some female known to him, or if it is another species called after a character from ancient mythology. Persephone, as she normally is named, was the beautiful daughter of the goddess Demeter, the patroness of agriculture. Hades, the god of the netherworld wanted to marry the girl, but her mother did not allow it. So he abducted her to his realm, where he kept her. Demeter, mourning for her lost daughter, prevented the crops from growing, so that Zeus had to establish a compromise: Persephone was allowed to return to her mother for a part of each year, the rest of the year she reigned as queen in the netherworld. This myth is thought to have been an explanation why crops do not grow in winter.

(The calopterygian genus *Cora* Selys certainly is named after the Greek goddess (Beolens 2018: 91), but there is no evidence that the same is true for Kaup's suggestion).

corallina [(*Erythrodiplax*) 1865a]

L. *corallinus* –a –um = coral-red

Brauer describes the male as "rufa [L. all shades of red]" and specifies that for the single parts of the body (frons, thorax, abdomen, appendages).

cornigera [(*Rhionaeschna*) 1865b]

L. *corniger* –era –erum = having (or bearing) horns, horned

The name probably refers to the male's superior appendages, which are described thus: "Appendicibus analibus superioribus maris subrectis, angustis, fuscis, margine interno post medium subsinuatis, apice acutis, crista longitudinali apice dilatata, erecta, semilunari, instructis [The male's superior appendages nearly straight, narrow, dark brown, at the inner margin behind the middle slightly sinuate, pointed at the apex, apex, furnished with a longitudinal erect semilunar crest widened at the apex]" (p. 906).

coronata [(*Protorthemis*) 1866a]

L. *coronatus* –a –um = furnished with a garland or crown

As usual the name suggested by Kaup (see *kaupi* p. 20) is not explained in the first description. It might refer to yellow markings of the male's head which perhaps reminded him of a crown: "Stirne vorne schwarz, etwas metallisch, die Quernath (sic) fein gelb gesäumt und an den Seiten am Augenrande jederseits eine kleine gelbe Makel [Frons black in front view, somewhat metallic, the transverse suture bordered by a fine yellow line and laterally at the margin of the eye on both sides a small yellow mark]" (p. 565).

croceus [(*Hydrobasileus*) 1867d]

L. *croceus* –a –um = saffron-coloured

Brauer describes the overall impression as "Lehmgelb [yellow like clay]" (p. 813).

decora [(*Neurothemis*) 1866]

L. *decorus* –a –um = adorned / beautiful, good looking, handsome

This name suggested by Kaup (see *kaupi* p. 20) probably refers to the remarkable wings of the females (males were not known then): "Flügel mässig breit, die hinteren bis zum Hinterrande des 4. Ringes reichend, vom Grunde bis über die Hälfte des Postcubitalraumes (beiläufig die 2 ersten Drittel) in der ganzen Breite schwarzbraun, besonders unten schön violett glänzend, die Farbe scharf und gerade abgegrenzt, zwischen dieser Grenze und dem Pterostigma eine milchweisse Querbinde, die den Hinterrand nicht erreicht, dann hyalin, die äusserste Spitze gebräunt [Wings moderately broad, the hindwings reaching the rear margin of the 4th segment, the whole breadth being blackish brown from the base until more than half the postcubital sector (that is the first two-thirds), sparkling beautifully violet particularly beneath, the colour is distinct and straight, between this border and the pterostigma a milky-white band not reaching the rear margin, distally hyaline, the extreme tip being brownish]" (1866a: 567).

denticauda [(*Brachydiplax*) 1867b]

L. *dens*, –ntis = tooth + *cauda* = tail (in insects abdomen or appendages)

A feature of the male's appendages is described by this name: "Appendices sup. schwarz, so lang als die 2 letzten Ringe, wie bei andern *Diplax*-Arten geformt, ausserhalb der Mitte, an der verdickten Stelle unten ein kurzer zahnartiger breiter Fortsatz, der am unteren Rande 4 Zähne trägt, von denen die 2 ersten grösser und getrennter sind, die 2 letzten dicht beisammen stehen [Superior appendages black, as long as the last 2 segments, formed like in other species of *Diplax*, beyond the middle beneath the thickened part a short tooth-like broad extension, which

has at its inferior margin 4 teeth, of which the former two are bigger and more distant, the rear ones are close to each other]" (p. 301f).

duivenbodei [(*Brachydiplax*) 1866a]

Maarten Dirk van Renesse van Duivenbode (1804 – 1878) from Ternate was one of the collectors, from whom Kaup (see *kaupi* p. 20) received specimens, which he had sent to Brauer for description (cf. Endersby & Fliedner 2015: 142). But there is no evidence that the type of his eponym species indeed had been collected or sent by him.

elegans [(*Epopththalmia*) 1865b]

L. *elegans* = nice, fine, neat, elegant

Brauer remarks: "Von Hagen als *Epopththalmia elegans* früher versendet, doch meines Wissens nicht beschrieben [Previously sent by Hagen under the name *Epopththalmia elegans*, but not described as far as I know]" (p. 905). So we can only state that the name is one of those which evokes the pleasant appearance of dragonflies.

erythrya [(*Risioenemis*) 1868c]

Gr. ἐρυθρός = red + οὐρά = tail (in entomology often for abdomen)

In this species the last abdominal segments are red: "6. am Hinterrande roth, 7.—10. ganz scharlachroth sammt den Anhängen [6th red at the rear margin, 7th-10th totally scarlet together with the appendages]" (p. 550 f).

femina [(*Agriocnemis*) 1868c]

L. *femina* = female, woman

The name refers to the male inferior appendages, which looked to Brauer similar to a female ovipositor: "Untere Anhänge ... so lang als der 9. Ring, am Ende dicht aneinander liegend, legscheidenartig [Inferior appendages ... as long as the 9th segment, apically close together, ovipositor-like]" (p. 555).

filiformis [(*Teinobasis*) 1868c]

L. *filum* = thread, string + *-formis -is -e* (in compounds) = having the form of

Brauer does not explain his choice of the name, but he assigns the new species to the genus *Amphicnemis* Selys 1863, in the description of which it reads: "Abdomen très-long et grêle [Abdomen very long and slim]" (Selys 1863: 152).

filum [(*Teinobasis*) 1868c]

L. *filum* = thread, string

Brauer describes this species directly after the preceding one in the same genus; so the slimness of the abdomen has also evoked this name.

furcata [(*Sangabasis*) 1868c]

L. *furca* = a two-pronged fork + *-atus -a -um* (in compounds) = equipped with, marked with

The name probably refers to the male superior appendages, which are described thus: "Obere Anhänge so lang als die 2 letzten Ringe, gelb, halbkreisförmig gebogen [Upper appendages as long as the 2 last segments, yellow, curved semicircularly]" (p. 544).

gigantea [(*Camacina*) 1867a]

L. *giganteus* –a –um = gigantic [Latinised from Gr. γιγάντειος]

In his key Brauer states: "Sehr große Art [very large species]" (p. 7).

glauca [(*Luzonobasis*) 1868c]

Latinised from Gr. γλαυκός –ή –όν = light blue, grey, glaucous

The name describes the bluish colour of several parts of Brauer's female specimen (other parts of the description left out): "Prothorax blauweiss ... Thorax schmutzig blau, vorne gelblich, ... Hinterleib unten bläulich oder gelblich, oben schwarz, ... 8. blau mit vorne breiter, hinten plötzlich feiner Rückenstrieme und den Hinterrand von schwarzer Farbe, 9. und 10. Ring ganz blau [Prothorax bluish white ... Thorax dirty-blue, in front yellowish ... Abdomen ventrally bluish or yellowish, dorsally black ... 8th segment blue with a proximally broad, distally suddenly fine dorsal band and the rear margin of black colour, 9th and 10th segment totally blue]" (p. 543).

glaucum [(*Orthetrum*) 1865d]

Latinised from Gr. γλαυκός –ή –όν = light blue, grey, glaucous

The name describes the blue pruinescence of the male: "Körper schwarzbraun, dicht blaubestäubt [Body blackish brown, densely blue pruinose]" (p. 1012).

gracilis [(*Aethriamanta*) 1878a]

L. *gracilis* –is –e = slim, slender, thin, lean

This is a slim species: Brauer says: "♂ schanker als *M. Duivenbodei* m.; die letzten fünf Ringe viel dünner als die vorigen, ähnlich *Acisoma* [♂ slimmer than *M. Duivenbodei* m(ithi); the last five segments much narrower than the anterior ones, similar to *Acisoma*]" (p. 195).

halterata [(*Drepanosticta*) 1868c]

Gr. ἄλτηρες (pl.) = weights held in the hand to give an impetus in leaping, bar-bell + L. –atus, –a –um = equipped with

The name refers to a process on each side of the prothorax in both sexes: "Prothorax schwarz, der Hinterlappen gerundet, jederseits einen langen etwas Sförmig geschwungenen und röthbraun geknöpften Fortsatz tragend, der 1/3 der Länge der Vorderseite des Mesothorax erreicht und diesem anliegt [Prothorax black, rear lobe rounded, bearing on both sides a long process slightly curved like an S and bearing a reddish brown knob; these processes are up to 1/3 of the mesothoracic forepart's length]" (p. 551).

hieroglyphicum [(*Paracercion*) 1865a]

L. *hieroglyphicus* –a –um Latinised from Gr. ἱερογλυφικός = hieroglyphic

As usual Brauer does not explain his choice of the name. It probably refers to the x-shaped yellow marks on the prothorax of the female: "pronoto viridi-nigro, maculis flavis formam litterae x imitantibus [prothorax greenish black, with yellow marks imitating the shape of the letter x]". Otherwise one could think of a detail of the head's marking described in Brauer (1866b: 54): „Jedes Nebenaug am Innenrande dunkelgrün gesäumt, ein querer Mondfleck vor dem vorderen Nebenaug, je-

derseits neben dem seitlichen Nebenaugē ein kleiner "V"-förmiger Fleck [each ocellus bordered dark green, a traverse moonlike spot before the anterior ocellus, on both sides of the lateral ocelli a small, v-shaped marking]."

hyalina [*Paraphlebia* 1871]

L. *hyalinus* –a –um Latinised from Gr. ὑάλινος –η –ον = made of crystal or glass, transparent
The name refers to the wings, which are described as "vollkommen hyalin [completely hyaline]" (p. 105).

idae [(*Heliaeschna*) 1865b]

The species is named after the Austrian Ida Laura Pfeiffer, née Reyer [1797-1858] (see Beolens 2018: 191). She was one of the first female explorers; she had discovered the species in Borneo: "Patria: Borneo. (Von Ida Pfeiffer entdeckt.) [Country: Borneo. (Discovered by Ida Pfeiffer)]".

igneae [(*Igneocnemis*) 1868c]

L. *igneus* –a –um = fiery, flaming, flame-coloured, ardent

The colour of the species is at the base of the name: "♂... Körper scharlachroth mit Einschluss der Dornen, Brustseiten und Unterseite allmählig heller grünlichgelb ... ♀ Gleicht fast dem ♂, die Farbe bleicher, mehr olivengelb am Thorax [♂ ... Body scarlet inclusively the spines, thorax laterally and ventral parts gradually lighter greenish yellow ... ♀ coloured almost like the ♂, of paler colour, on the thorax rather olive yellow]" (p. 547. The spines are at the legs which are not described in the first description (Hämäläinen, in litt.)).

irregularis [*Tetrathemis* 1868a]

L. *irregularis* –is –e = irregular

The irregularity to which the name points is the fact, that in this species, for which Brauer introduced his genus *Tetrathemis*, the triangle is not really a triangle but quadrilateral: "Cellula cardinalis (Dreieck) in beiden Flügeln 4eckig, durch Knickung der Vorderseite [Cellula cardinalis (triangle) in both wings quadrangular as the anterior side of the triangle is bent]" (p. 183; cf. fig. 2).

kaupi [*Neurobasis* 1867b]

The species is named for J.J. Kaup (1803-1873), then director of the Grand-ducal Museum in Darmstadt, who had sent a collection of about 50 species from Indonesia to Brauer for determination. Kaup grew up in his native city Darmstadt under the care of his mother, as his father, then an officer in the Danish army, had to be where his professional duties took him. After the death of his mother Kaup aged 17 had to fend for himself. First he worked as a poorly paid auxiliary at the 'Grossherzogliches Naturalien-Cabinett' [Grandducal Natural History Collections], but then decided to study Zoology and went to Göttingen and to Heidelberg, for one semester at each University. Subsequently for two years he was employed at the Rijks-Museum van Natuurlijke Historie at Leiden. After returning to Darmstadt he worked at the Grandducal Museum first as assistant, later as inspector and finally as director. As his payment initially was poor, he also had to teach pupils from well to do families to have a satisfactory living, one of these being Hermann von Rosenberg (see below s.v. *rosenbergi* p. 24). Kaup had good relations with many of the

outstanding zoologists of his time and he relied on these bonds on his extensive travels abroad, which he also used to enlarge the collections of the Grandducal Museum. But later he lost his reputation, because, having first developed similar evolutionary thoughts on the basis of paleontological findings, strictly opposed Darwin's theory (cf. Beolens 2018: 213).

lestoides [(*Pericnemis*) 1868c]

Gr. ληστής = robber, pirate + suffix -(ο)ειδής -ής -ές = looking like a

The name refers to a similarity to Leach's genus *Lestes*. Which similarity Brauer had in mind he does not say, but it might be the dorsal coloration: "Prothorax grünmetallisch, ... Thorax vorne metallischgrün;... Hinterleib unten gelb, oben schmutzig grün oder purpurmetallisch [Prothorax metallic green, ... Thorax frontally metallic green; ... Abdomen yellow underneath, dirty green or metallic purple above]" (p. 542). This fits with the coloration of the European *Lestes* species best known to Brauer, which is metallic green or purple on the upper side, and also to those of other parts of the world (cf. Silsby 2001: 91).

lestoides [(*Drepanosticta*) 1868c]

Gr. ληστής = robber, pirate + suffix -(ο)ειδής -ής -ές = looking like a

Also for this species Brauer does not say which similarity to the genus *Lestes* he had in mind. The green metallic parts in the males of this species are restricted to the head and the anterior part of the thorax, the abdomen is brown dorsally: "Kopf dunkelgrün-metallisch, ... Thorax vorne metallischgrün ... Hinterleib lang zart, 1. Ring gelb, die übrigen oben braun [Head dark green metallic, ... Thorax green metallic frontally ... Abdomen long, delicate, first segment yellow, the others brown dorsally]" (p. 552). Perhaps the form of the upper appendages of the male may have led to the name, which is similar to that of European *Lestes* species (see van Tol 2005: 169 fig. 59).

lineata [(*Cratilla*) 1878a]

L. *lineatus* -a -um = lined

The name refers to the markings of the abdomen: "Hinterleib schwarzgrün, die Kanten schwarz. Längs der Mittelkante und über der Seitenkante vom ersten bis zum achten Ringe eine feine gelbe Längslinie, der Leib daher mit drei feinen gelben Längslinien, die mittlere durch die Kante getheilt [Abdomen blackish green, the edges black. Along the middle edge and above the lateral edge from the first to the eighth segment a fine yellow longitudinal line, the abdomen therefore with three fine longitudinal lines, the middle one divided by the edge]" (p. 202).

loewii [*Tamea* 1866a]

The species most probably is named for the German entomologist Hermann Loew (1807-1879), who described more than 4000 species of Diptera (cf. Beolens 2018: 251). There is no information, why Kaup (see *kaupi* p. 20) suggested him as eponym of the species, but probably there has been some cooperation between these two scientists.

luzonicum [(*Orthetrum*) 1868a]

L. *luzonicus* –a um = from Luzon

Brauer gives as provenance of his specimens: "Luzon. (Philippinen.) Ind(ia) or(ientalis) [East India] Kaiserl(iche) Sammlung [imperial collection]". The specimens from Luzon, the biggest island of the Philippines, he had got from Carl Semper (see above p. 5; about him see Beolens 2018: 379-380).

metallica [(*Cratilla*) 1878a]

L. *metallicus* –a –um = of or belonging to metal, metallic

Brauer describes the overall appearance of the ♂ as "Metallisch dunkel blaugrün [metallic dark bluish green]" (p. 199).

mithroides [(*Erythemis*) 1900]

Gr. suffix –(ο)ειδής = looking like a

The name is due to the similarity of the wings to the species *Libellula mithra* Selys in Sagra, 1857. Brauer was aware of the synonymy to *Erythemis attala* (Selys in Sagra: 1857), as he refers to it on p. 262, 5 pages before he states in his description of the new species: "Flügel wie bei *attala* Selys, nur das Pterostigma kleiner [wings as in *attala* Selys, but pterostigma smaller]" (p. 267).

nana [(*Diplacina*) 1868a]

L. *nana* = a female dwarf

This is a rather small species for a libellulid: "Körperlänge 33 mm Länge des Hinterleibs 22 mm [total length 33 mm abdomen 22 mm]" (p. 175).

oculata [(*Brachygonia*) 1878a]

L. *oculatus* –a –um = furnished with eyes

The first feature, about which Brauer informs in his description, is: "Augen sehr groß, mit einer ziemlich langen Naht verbunden [Eyes very large, connected by a rather long suture]" (p.194).

oligoneura [(*Neurothemis*) 1867e]

Gr. ὀλίγος –η –ον = few + νεῦρον = any linear feature in an organism, so sinew, tendon, vein, nerve, fibre in plants; in entomology used for wing veins

Earlier in 1867 Brauer had replaced the preoccupied genus name *Polyneura* Rambur, the characteristic of which was the high number of wing veins, by *Neurothemis* (see p. 10). In the paper, in which this species is introduced, Brauer points to species and female specimens from that genus, which show a lesser dense venation. And this he states explicitly for the new species: "fast so groß wie *palliata* {younger synonym of *N. fluctans* (Fabricius), one of the densely veined species}, aber weitmaschig [almost as big as *palliata*, but venation widely meshed]" (p. 976).

paedjsca [(*Sympecma*) 1877]

Gr. παιδίσκη = young girl, maiden (feminine diminutive form of παῖς = child)

This probably is one of the names attributable to the charm or lovable characteristics of Odonata as shown by their French name demoiselles or names ending in –jungfer (= maid) in German, as found in the names *virgo* and *puella* given by Linnaeus

(cf. Fliedner 1997: 92). The interesting story of this species name, first attributed by Brauer to the German-Russian explorer Eduard von Eversmann (1794-1860), is related by Jödicke (1997: 122-126) (cf. also Brauer 1880 + 1882).

paradoxo [*Gomphomacromia* 1864]

Gr. παράδοξος -η -ον = contrary to expectation, incredible

The name probably refers to a peculiarity of the venation in the left wing of Brauer's female specimen, on which he comments: "Vielleicht individuelle Abnormität, denn der rechte Flügel ist davon verschieden und mehr dem Manne gleich [Perhaps an individual abnormality, for the right wing differs from it and is more like the male's]" (Brauer 1866b: 83) (cf. cover and fig. 2, 5).

pilidorsum [*Pseudagrion*] 1868c]

L. *pilus* = hair + *dorsum* = back

The name refers to the pilosity of the thorax: "Thorax ... vorne stark behaart [Thorax ... very pilose in front]" (p. 553).

pulcherima [*Orchithemis* 1878a]

L. *pulcherimus* -a -um = most beautiful, prettiest (superlative)

Brauer does not explain the name, but it most probably refers to the species' multi-coloured appearance with a metallic sheen: "Olivengelb, röh- und blaumetallich gefärbt, zuweilen blau bestäubt [Coloured olive yellow, red and blue metallic, sometimes blue pruinose]" (p. 198).

pygmaea [*Rhyothemis*] 1867b]

L. *pygmaeus* -a -um Latinised from Gr. πυγμαῖος -α -ον = dwarfish

For a Libellulid it is a rather small species: "Körperlänge mit App. 25 mm [total length with appendages 25 mm]" (p. 298).

ramburi [*Neurothemis*] 1866a]

Jules Pierre Rambur (1801-1870) was a French entomologist, who in 1842 tried to catalogue the 'Neuroptera' from around the world based on the many entomological collections in and around Paris listing 356 species and adding 17 new genera to those already described. By this he contributed to odonatology significantly, whereas he stated "Neuroptera" to be his least favourite group of insects (see Fliedner & Endersby 2019: 67). Kaup (see *kaupi* p. 20) probably suggested him to be the eponym of the new species, because he saw that it pertained to the genus authored by Rambur under the preoccupied name *Polyneura* (= with numerous veins), which later was replaced by *Neurothemis* Brauer.

ransonetti [*Orthetrum*] 1865d]

This species was described by Brauer from a specimen collected at al Tur on the Sinai coast of the Red Sea by the Austrian diplomat and explorer Eugen Freiherr von Ransonnét-Villez (1838 -1926), who in 1862 had travelled to Palestine and Egypt, in 1864-65 to India. Beolens (2018: 343) mentions that Brauer had described the species from specimens collected by G. Ritter von Frauenfeld, but Brauer (1865e: 1011) clearly states, that these two specimens from the same region had been in the collection of the Imperial museum undetermined.

regia [(*Rhyothemis*) 1867a]

L. *regius* –a –um = royal, of a king, regal

In his description of the wing pattern Brauer points to a hyaline lying r reaching the pterostigma, and r may be an abbreviation for rex (king), *regina* (queen) or *regius* (royal): "... vorne schliesst sich an die hyaline Querbinde hinter dem Sector principalis ein solcher Längsstrich an, der bis zum Pterostigma reicht und hinter seinem Ende einen grossen hyalinen runden Fleck hat. Durch diesen Längsstrich und runden Fleck entsteht eine Figur, die einem breiten liegenden kleinen "r" nicht unähnlich ist [distally from the sector principalis the hyaline crossband is joined by a similar longitudinal stripe as far as the pterostigma, which has at its end a big hyaline round spot. By this longitudinal stripe and round spot a figure is effected not unlike a broad lying lower case "r"]" (p. 24) (According to Charpentier 1840, 42 + pl. XLVII, 9-12 the sector principalis is the vein, which ends at the apex of the wing next to the radius principalis, which runs from the wingbase to the apex adjoining the pterostigma at the inner side).

rosenbergi [*Gynacantha* 1867b]

The name was given by Kaup (see *kaupi* p. 20), who according to Schneider (1995: 254) owed the collection of the specimens sent to Brauer for description to his former pupil Hermann von Rosenberg (1817-1888). Rosenberg had gone to the Netherlands East Indies in 1839, where he first served as a military cartographer on Sumatra, but after 16 years changed to the civil service. During his surveys he also collected ethnographical and zoological material, also on Sulawesi (then Celebes), the Moluccas and Western New Guinea. In 1871 he returned to Europe, first to his native town Darmstadt with a part of his collections, then moved to s'Gravenhage (today's The Hague) in 1875 to utilize his collections deposited there.

rosenbergi [*Tamea* 1866a]

Kaup had suggested naming this species after Brauer; but Brauer did not accept that, making Rosenberg (see lemma above), who had collected the specimen on Ceram, the eponym (cf. Schneider 2004: 83).

rubra [*Nannodiplax* 1868]

L. *ruber* –bra –brum = red, ruddy

Brauer gives as an overall impression: "Reifes ♂ gelbroth [Mature ♂ yellowish red]" and adds later: "Thorax braunroth [Thorax brownish red]" and "Hinterleib roth [Abdomen red]" (1868c: 556f).

transmarina [*Tamea* 1867]

L. *transmarinus* –a –um = beyond the sea, from over the sea, transmarine

As Brauer gives as type locality: "Viti-Inseln [Fijian islands]" the species is certainly transmarine.

ustulata [*Rhinocypha* 1867b]

L. *ustulatus* –a –um = past participle of *ustulo* = to scorch, singe

The name, which was suggested by Kaup, probably refers to the largely black coloration of the thorax and abdomen (as if having been charred) and dark markings

on the distal part of the the greenish yellow hyaline wings in both sexes, the colour of which is characterised as "rauchbraun [brown like from smoke]". (For Brauer's error in taking the species for *Sundacypha petiolata* (Selys, 1859) and its correction see Schneider 2004: 79).

villosovittatum [(*Orthetrum*) 1868a] (Fig. 5)

L. villosus -a -um = shaggy, hairy + *L. vittatus* -a -um = wearing a band or ribbon (usually a headband)

"Thorax einfarbig olivengelb, nur jederseits vorne von der Wurzel der Vorderflügel bis zum Prothorax eine schwarzbraune unten dunklere und braun zottig behaarte Strieme [Thorax unicolorously olive-yellow; but on each side anteriorly from the base of the forewing to the prothorax a blackish brown streak, darker below, and covered with brown shaggy hair]."



Fig. 5. Brauer's type of *Orthetrum villosovittatum*: To recognize the shaggy bands originating from the fore wings bases, which have led to the name, a closer look is required. Picture: M. Seehausen..

Brauer's fossil taxa

Brauer described fossil odonate taxa only once, together with two junior staff members at the Naturhistorisches Museum Wien Josef Redtenbacher (1856–1926) and Ludwig Ganglbauer (1856–1912) in 1889. The Petersburg Academy had received several collections of fossil plants and insects from Eastern Siberia and entrusted the Swiss palaeontologist Oswald Heer (1809–1883) with the description of this material, but he had only accomplished analysis of the botanical part before his death. So Brauer was asked to describe the insects, which he did with his colleagues (Fig. 6).

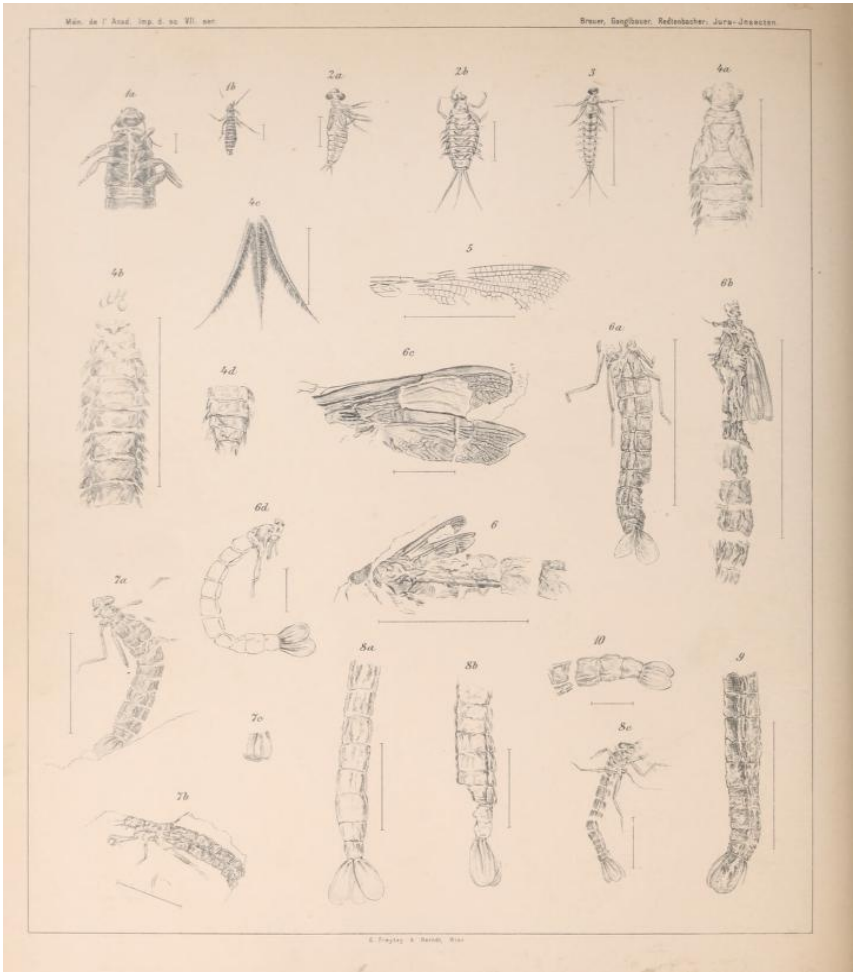


Fig. 6. Pl. II from Brauer et al. (1889): 5. *Palaeophlebia synlestoides*, fore wing. 6. a-d *Samarura gigantea* (c. wing, greater magnification) 7a. *Samarura minor* b. ditto, larva, mask extended c. ditto, caudal lamellae 8., b, c, *Samarura pulla* 9. *Samarura angusta* 10. *Samarura rotundata* (6 to 10 are deemed to be the same taxon nowadays).

Palaeophlebia

Gr. παλαιός -ά -όν = old, ancient; φλέψ (stem φλεβ-) = artery, vein + adjectival suffix -ιος -ία -ιον = related to, associated with

Whereas Brauer does not explain the name, it may be concluded that he assessed the wing venation to be of an archaic type in an evolutionary sense.

synlestoides

Genus name *Synlestes* Selys 1868 + Gr. suffix –(ο)ειδής –ής –ές = looking like a

In the first publication Selys had declared, that the new genus pertained to his 'légion *Podagrion*', the genera of which generally had 'secteurs interposés' (= intermediate sectors) (cf. Selys 1862: 6). And this character Brauer also found in the wing venation of this taxon: "Durch das reguläre Pterostigma ... sowie das Vorhandensein von Schaltsektoren ... in die Gruppe *Podagrion* gehörend [By its ordinary pterostigma ... and the presence of intermediate sectors belonging to the category *Podagrion*]", and he subsequently mentioned differences of this fossil from other genera of *Podagrion*.

Samarura

L. *samara* = the seed of the elm + Gr. οὐρά = tail

This genus was described from larvae having rounded caudal lamellae, which indeed show some resemblance to elm seeds (see Fig. 6, 6a+d; 8a,b,c; 9; 10).

gigantea

L. *giganteus* –a –um = gigantic, enormous [Latinised from Gr. γιγάντειος]

The size is enormous for zygopteran larvae: "Länge der grössten Larven inclusive den Schwanzkiemen ca. 6,1 mm (sic, but it must read cm, because the caudal lamellae are said to be 5.5 mm and are about nearly a tenth of the total length according to the figure on pl. II) [Length of the biggest larvae with its caudal gills about 6.1 centimetres]". The following species names for the other smaller larvae included in this genus in the first description are now considered as younger synonyms: (*S. minor* = the smaller one; *S. pulla* = a young one (of animals, like chicken or foal or piglet, for which Brauer states it might be a juvenile larva of the former; *S. angusta* = narrow, because this fragment of an abdomen is not as broad as *gigantea*, and *S. rotundata* = rounded, a form with shorter oval caudal gills).

Brauer's homonym

Among the names created by Brauer for Odonata is one homonym. As its history shows well, the problems he had to overcome in classifying the Neuroptera collected during the 'Novara'–Expedition, shall be treated here a little more extensively. In his first Novara publication (Brauer 1864, 163f) he created the new genus *Agrionoptera* (see above p. 7; cf. below p. 55 Appendix) based on "(*Libellula insignis* Rambur Neuropt. p. 123. Java), Nikobaren Ins. Karnikobar und Kondul". But a year later (1865c: 978) he disclaims: "Gatt. *Agrionoptera* m. Die auf der Weltreise gesammelte Art dieser Gattung ist nicht, wie ich früher (in meinem Verzeichnisse) angab Rambur's *Lib. insignis*, sondern eine kleinere, dieser sehr verwandte neue Art. *Agr. insignis* hat das kais. Museum aus Amboina erhalten. Die neue Art charakterisire ich folgendermassen: *Agr. nicobarica* m. ...[Genus *Agrionoptera* m(ihi)]. The species from this genus collected during the world tour is not, as I stated (in my catalogue), Rambur's *L. insignis*, but a smaller very closely related new species. The Imperial Museum received *A. insignis* from Amboina. I characterise the new species as follows: *A. nicobarica* mihi ... (cf. p. 34)". In his final detailed publication of the 'Novara'–Neuroptera (1866b: 100f) he repeats this statement, adding, that Rambur's species must be much larger

than his *A. nicobarica*. But as his description would fit for both species very well, he adds a thorough comparative diagnosis of his species *A. nicobarica* and the species from Amboina he erroneously deems to be *A. insignis* (Rambur). But as he gave a thorough description under the name *A. insignis* he had inadvertently created a homonym. And there was a further consequence: One year later (1867b: 288) we see that his classification had induced Hagen's contradiction: "*Agrionoptera insignis* Rbr. Menado. Es gibt hier mehrere einander sehr ähnlich sehende Arten, die nur durch Vergleich der Typen bestimmt werden können. Ich halte die mir vorliegenden Stücke für die Art, welche ich in den Novara Neuropteren als *insignis* beschrieben habe. — Hagen meint, dass Rambur's Art davon verschieden sein dürfte. Mir ist es unklar, warum diess der Fall sein soll ... [... There are several species looking very similar, which only can be determined by comparing those with the types. I take the available specimens for that species I have described in the Novara Neuroptera as *insignis*. — Hagen believes that Rambur's species might differ from it. I do not grasp, why that should be true ...]". And in this publication Brauer describes a new species *Agrionoptera quatournotata* from Menado (see p. 36), because it differs from the species, which he takes to be *A. insignis* (Rambur). Ironically his taxa *A. nicobarica* and *A. quatournotata* in Paulson & Schorr (2019) are treated as junior synonyms of *A. insignis* (Rambur), Bridges (1994) regards them as subspecies of it, as does Steinmann (1997). Brauer's homonym – created 1866b: 101 by mistake – finally was corrected by Selys (1879: 304) who described the species under the name *A. sexlineata* (L. six-lined) referring to three conspicuous sinuous lines on each side of the thorax.

From that we can see how difficult it was for Brauer depending on the older descriptions e.g. by Burmeister (1839) or Rambur (1842) to find out if he had correctly recognized their taxa, and that the only remedy was if a correctly classified specimen was at hand with which to compare the new one. But until the 'Novara'-Expedition the Vienna museum did not have many exotic Odonata species.

Brauer's species group synonyms

Due to Paulson & Schorr (2019) being the basis of the systematics in this paper, subspecies will be found in this chapter. But it has been tried to ascertain from Bridges (1994) and Wikipedia among other sources, if taxa presently are classified as subspecies and to give notice. The author however is no taxonomist, and so one or other subspecies may have escaped notice.

While Brauer's synonyms no longer play a role in taxonomy it may be worthwhile to have a look at them to understand his criteria in naming dragonflies better and to have additional elements of scientific names explained.

Braces {} include the genus first chosen for the species by Brauer, if subsequently changed.

albicauda {*Libellula*} 1865b [= ***Orthe|tr>trum albistylum
| |*** (Selys, 1848)]

L. *albus* –a –um = white + *cauda* = tail

The name refers to the white cerci: "segmento decimo appendicibusque albis [with white tenth segment and appendages]". But in males the tenth segment

normally is not white in European specimens (cf. Dijkstra & Lewington 2006: 252f). But already in the first description Brauer remarks, that it is "simillima [most similar]" to *Orthetrum albistylum* [L. with white styli]. Perhaps he did not expect, that species known to him from Europe might occur as far away as Shanghai.

brasiliqna, *Tramea* 1867d [= **T. binotqta** (Rambur, 1842)]

L. *Brasilianus* –a –um = from Brasilia, Brazilian

"Brasilien" is named for its country of occurrence. (for *binotata* see below s.v. *subbinotata* p. 37).

ceylanica, *Neurothemis* 1867a [= **N. fluctuans** (Fabricius, 1793)]

L. *Ceylanicus* –a –um = from Ceylon [now: Sri Lanka].

"Patria Ceylon [Country Ceylon]". But that statement is erroneous, as *N. fluctuans*, with which Brauer's taxon is synonymised, does not occur there (see Seehausen & Dow 2016: 43). Fabricius probably chose the name *fluctuans* (L. fluctuating/being doubtful) because according to the description by Burmeister (1839: 853) it is "corpore nunc ferrugineo, nunc testaceo [i.e. having sometimes a brownish rustcoloured, sometimes a brickcoloured body]", because the body colour changes with the viewing angle (Wildermuth & Martens 2019: 847).

chalcopqtilon, {*Celijthemis*} 1867a [= **Rhyothemis regia** Brauer, 1867)]

Gr. χαλκός = copper, metal + πτίλον = wing (of insects)

"Farbe der Flügel dunkelbraun, schön metallisch grün und purpurschillernd [wing colour dark brown, beautifully iridescent metallic green and purple]". But already Brauer stated at the end of the original description: "Ich kann diese Art, der an der Spitze breiteren Flügel wegen, nicht für eine dunkle Varietät von *C. Regia* m. halten, der sie sonst am nächsten verwandt ist. [I cannot take this species to be a dark variety of *Rhyothemis regia* Brauer because of the wings being broad at the apex, but for which it otherwise is the closest relative]". This taxon is deemed to be a Polynesian subspecies of *R. regia* (Bridges 1994; Steinmann 1997: 334).

chloropleura {*Libellula*}; 1865a [= **Erythrodiplax connata** (Burmeister, 1839)]

Gr. χλωρός –ά –όν = greenish yellow, pale green + –πλευρος –ος –ον = with ... sides

The explanation of the name is found in the description of Brauer 1866b: 89: "Thorax an den Seiten ohne Zeichnung, einfarbig grünlich gelb [Sides of the thorax without marks, unicoloured greenish yellow]". The actual species name *connata* (L. born at the same time, twin) might refer to the similarity to the European species *Sympetrum vulgatum* (see Rambur 1842: 93).

cornuta {*Hypocnemis*} 1868c [= **Risioicnemis serrata** (Hagen, 1863)]

L. *cornutus* –a –um = having horns, horned

The name reflects the processes on the prothorax: "Prothorax querachterförmig, hellblau, am Vorderrande mit 2 kleinen, dicken, schwarz geknöpften Hörnern, in der Mitte mit 2 aufrechten, nahe aneinander stehenden, dicken, gelben Hörnern, die Seitenlappen stark erweitert, der Hinterrand in der Mitte stark eingezogen und daselbst mit einem flachen, schief nach hinten und oben gerichteten zwei-

spitzigen Horn, der Rand schwarz und neben letzterem Horn jederseits ein schwielig schwarzer Punkt. [Prothorax formed like a traverse eight, light blue, at the fore margin with 2 small, stout horns with a black knob, in the middle with 2 erect, stout yellow horns, the lateral lobes augmented strongly, the rear margin in the middle very concave, with a flat, obliquely backward upturned bifid horn, the margin black and on each side of the latter horn a calloused black spot]". The name *serrata* [L. serrated] describes the wing tips, where the outer edge of each cell is concave, so that the apical margin of the wings looks "denticulé [denticulate]."

diplax, *Neurothemis* 1867a [= **N. stigmatizans** (Fabricius, 1775)]

Brauer states at the end of his description: "Die Art erinnert durch die weiten Maschen an *Diplax* [This species is reminiscent of the wide meshes {viz. of wing venation} of *Diplax*] (For more on this outdated genus see above s.v. *Brachydiplox* p. 7). Fabricius' name *stigmatizans* [L. marking with a spot] refers to a white mark on the pterostigma (see Endersby & Fliedner 2015: 219). Ris (1911: 574) classified Brauer's taxon as pertaining to the subspecies *N. stigmatizans bramina* (Guérin, 1838). The name *bramina* would refer to the Brahmin caste of the Hindus. But as Guérin's specimen was from New Ireland, his choice of name is enigmatic.

dispar, *Rhyothemis* 1867d [= **R. phyllis** (Sulzer, 1776)] (Fig. 7)

L. *dispar* = unlike, different

Brauer states: "Diese prachtvolle neue Art bildet in der Zeichnung ein wahres Mittelglied—zwischen *Rhyoth. Phyllis* Sulz, und *Regia* m. [This gorgeous new species



Fig. 7. Brauer's type of *Rhyothemis dispar*: The taxon today is seen as local subspecies of *R. phyllis* (Sulzer). Picture: M. Seehausen.

by its pattern constitutes a real link between *R. phyllis* Sulzer and *R. regia* (Brauer)], but adds: "Der Unterschied der Scheidenklappe des ♀ und der Genitalien der ♂ bestimmen jedoch die Arten aufrecht zu halten, obschon auch diese nach den Gegenden wandelbar erscheinen (siehe *Cordulegaster annulatus* in Sely's [sic] Monographie) [The difference of the vulvar lamina of the ♀♀ and the genitalia of the ♂♂ however demand us to maintain the species, whereas also they seem to vary according to regions (see *Cordulegaster annulatus* in Selys' monograph)]." That means by this name he wanted to emphasize that the new species was a different one. Malte Seehausen, who has examined some 500 specimens of *R. phyllis* from the whole range of the species in several major entomological collections (most types included) states that presently twelve subspecies are recognised among which are the three subspecies described by Brauer (*dispar*, *obscura*, *vitellina*), but that it not has been possible to distinguish all these reliably without knowledge of their provenance either by morphological characters of the genital structures or by considering the different coloration of the face, the labium or the wings. So for a final taxonomical evaluation of the subspecies further study is essential (Seehausen, in litt.). Also Dow (2017) states: "There is a need for taxonomic research into the *R. phyllis* complex". (*Phyllis* was a figure from Greek mythology, cf. Endersby & Fliedner 2015: 200).

(The erroneous attribution of *R. dispar* to *R. semihyalina* [L. half hyaline, because the proximal third of the hindwings is of a "noir metallique [metallic black]" in Paulson & Schorr (2019) was corrected in February 2020).

distigma {Agrion} 1869 [= ***Ischnura heterosticta*** (Burmeister, 1839)]

Gr. δι- (in compounds) = (with) two + στίγμα = mark, spot (in odonatology usually for pterostigma)

Like Burmeister's name for the species (*hetero-sticta* = differently spotted) the naming by Brauer also refers to the difference of the pterostigmata in the fore and hind wings. Whether the difference in shape or in coloration or both are diagnostic for the name, cannot be seen from the description: "♂. Flügel glashell. Pterostigma im Vorderflügel kurz, die Aussenseite etwas weniger schief als die Innenseite, die Hinterseite etwas in die dahinter liegende Zelle bogig eingedrückt, — tief schwarz, der vordere äussere Winkel hell weiss, im Hinterflügel dasselbe rhombisch, weisslich, in der Mitte kaum getrübt, beide etwas weniger als eine Zelle überstellend [♂. Wings hyaline. Pterostigma in forewing short, the distal side slightly less inclined than the proximal side, the posterior side somewhat arched into the underlying cell – deep black, the anterior outer angle bright white, the same [pterostigma] in hind wing rhombic, whitish, hardly darkened in centre, both [pterostigmata] overlying a little less than one cell]".

erythraea {Tramea} 1867d [= ***Trithemis annulata*** (Palisot de Beauvois, 1807)]

Gr. ἔρυθραῖος -α -ον = red

Brauer describes the overall appearance as "röthlich braungelb [ruddy brownish yellow]". (The name *annulata* refers to dark rings at the anterior and posterior margin of the abdominal segments; but this feature is less pronounced than in other *Trithemis* species, see Wildermuth & Martens 2019: 806).

excisa {*Aeschna*} 1865b [= **Remartinia luteipennis** (Burmeister, 1839)]

L. excisus –a –um: past participle of *excido* = to cut out, excise

The name refers to the males superior appendages: "Appendicibus analibus superioribus maris basi angustis, post medium dilatatis et profunde excisis, suberosis, apice clavatis, triquetris [The superior anal appendages of the males narrow at the base, beyond the middle dilated and deeply excised, nearly 'gnawed off', clavate at the apex, triangular]". Burmeister (1839: 837) also mentions the male's excised cerci, but chose the name from the wing colour (*lutei-pennis* = yellow-winged). But that is not a constant feature in this species (Hagen 1867: 50).

incerta, *Neurothemis* 1867a [= **N. ramburii** (Brauer, 1866)]

L. incertus –a –um = uncertain, doubtful

The species might be named 'uncertain' because Brauer was not completely sure of its taxonomic status: "Dem ♀ von *P. fluctuans* sehr ähnlich aber sicher verschiedenen [Very similar to the ♀ of *Polyneura* (= *Neurothemis*) *fluctuans*, but certainly different]". (For the synonymy with *N. ramburii* see Seehausen & Dow (2016: 60)).

infernalis {*Libellula*} 1865a [= **Trithemis festiva** (Rambur, 1842)]

L. infernalis –is –e = belonging to the lower regions, infernal

The name probably refers to the mainly blackish brown or blackish violet pruinose coloration, which seems to have been seen as related to the netherworld. Rambur, who described an immature male, did not have this dark thought of a connection to the netherworld calling the species *festiva* (= pleasing, pretty) in reference to its yellow and black pattern.

innominata, *Neurothemis* 1867a [= **N. manadensis** (Boisduval, 1835)]

L. innominatus –a –um = unnamed

Brauer does not explain his choice of the name, but it certainly means 'species not named until now'. (Boisduval's specimen was captured near Manado, a town in the northeastern part of Sulawesi).

julius, *Anax* 1865a [= **A. parthenope** (Selys, 1839)] (Fig. 8)

L. Julius = a male member of the clan of the Julii in ancient Rome, the most prominent being Gaius Julius Caesar, the dictator, who was assassinated at the Ides of March 44 B. C.

Brauer named almost none of his species after persons (cf. below p. 45), and the only name from antiquity except mythological ones, *cleis*, goes back to a Selysian genus name (see p. 16). So there must be a different explanation, which nevertheless includes the ancient dictator. Brauer knew the North American species *Anax junius*, but seems not to have been aware that its original name was *Libellula junia* Drury, which had been adapted in gender to Leach's masculine genus *Anax* (that, being a proper name, would not be changed nowadays). So Brauer probably took *junius* for an indication of the month, when the species is on the wing, and when he saw that his specimen of a similar species had been caught in Shanghai, where the 'Novara' stayed in end of July (and the first days of August) 1858 (cf. v. Scherzer 4th edition 1870: III), he decided to name the species accordingly. And that month got its name after the death of the dictator in his honour. (The

direct references to C. Julius Caesar and M. Junius Brutus in Beolens (2018: 207) are erroneous). Selys had caught his specimen of *A. parthenope* [Gr. = with the voice of a virgin] near Naples, for which town it was a poetic name after one of the sirens, who was said to have been buried near Naples, had become its patroness, worshipped in a cult. In his detailed description of the 'Novara' Neuroptera Brauer (1866b: 66) states his taxon to be "dem *A. parthenope* sehr ähnlich [very similar to *A. parthenope*]", which species he only knows to occur in Europe and Africa (1866b: 61). According to Wildermuth & Martens (2019: 411) the nominal taxon ranges no farther east than the western part of Mongolia, while Brauer's taxon at least should be treated as an eastern subspecies.



Fig. 8. Brauer's type of *Anax julius*: The name probably goes back to the month when the species was caught in Shanghai. This taxon was treated as a subspecies ("race") of *A. parthenope* first by Martin (1908: 21), but according to some taxonomists should be reinstated as good species (cf. Wildermuth & Martens 2019: 411). Picture: M. Seehausen.

leontina, *Libellula* 1865a [= *L. connata* (Burmeister, 1839)]

By capitalization in the first description the name is to be recognised as a proper name. Although not mentioned in the description this species is named for Brauer's first wife Leontine, née Boschetty, whom he had married in 1856. The name goes back to antiquity, when it denoted a female from Leontinoi, a Greek colony near the Eastern coast of Sicily (today's Lentini), the name of which settlement might be interpreted as "the lion-like people". (For *connata* see above s.v. *chloropleura* p. 29).

longicauda, *Traumea* 1867d [= *T. binotata* (Rambur, 1842)]

L. longus –a –um = long + *cauda* = tail (in odonatology referring to abdomen or appendages)

This name most probably refers to the superior appendages: "Anhänge schwarzbraun, die oberen ... so lang als die 3 letzten Ringe [appendages dark brown, the upper ones ... as long as the last three segments]". It cannot refer to the abdominal length, which in this specimen is 41 mm with appendages, in the specimens of *T.*

binotata named *subbinotata* and *brasiliana* by Brauer in the very same publication it is 51 mm each. (For *binotata* see below *subbinotata* p. 37).

macrogmia {*Aeschna*} 1865b [= ***Coryphaeschna adnexa*** (Hagen, 1861)]

Gr. μακρός -ά -όν = long, extensive, + ὤμος = shoulder + feminine form of the suffix -ιος -ια -ιον = concerning.

The name refers to the antecubital space of the fore wings: "Alis pallide fusco-viridibus, ...; anticorum area antecubitale longissima [With pale brownish green wings, ...; the fore wings' antecubital area exceedingly long]. (Hagen's name *adnexa* (L. connected) probably is due to his doubt about whether his mutilated single specimen might not pertain to a related species (see Fliedner & Endersby 2019: 93).

magnifica, *Staurophlebia* 1865b [= ***S. reticulata*** (Burmeister, 1839)]

L. *magnificus* -a -um = great, magnificent, stately

Probably the stately size "Länge des Hinterleibs 67 mm ... Flügelspanne 115 mm [abdominal length 67 mm ... wingspan 115 mm (Brauer 1866b: 75)]" has led to the name. The name *reticulata* (L. reticulated) is due to fuscously bordered wing cells which give a netlike impression.

nicobarica, *Agrionoptera* 1865c [= ***A. insignis*** (Rambur, 1842)]

L. *Nicobaricus* -a -um = from the Nicobar islands

This is one of Brauer's toponyms: "Patria: Ins. Nicobaricae [Country: Nicobar Islands]". (Rambur 1842: 123 called the species *insignis* (L. remarkable) because of the base of the hindwings being remarkably slim). In Bridges (1994) and Steinmann (1997) this taxon is classified as subspecies. Why Brauer thought this species to differ from *A. insignis* (Rambur) see above p. 27 and below Appendix p. 55)

nicobarica, *Neurothemis* 1867a [= ***N. fluctuans*** (Fabricius, 1793)]

(see lemma above)

Also for this taxon Brauer states: "Patria die Nikobaren (Karnikobar) und Singapur [Country: the Nicobar islands (Car Nicobar) and Singapore]". (For *fluctuans* see above *ceylanica* p. 29).

novaezeelandiae, {*Cordulia*} 1865a [= ***Procordulia smithii*** (White, 1846)]

L. *Novaezeelandia* = New Zealand

This is another species named from a specimen's provenance: "Vaterland: Neuseeland, Aukland [Country: New Zealand, Auckland]". (The actual name refers to Alexander John Smith (1812 – 1872), who as an officer participated in the Antarctic expedition of J. C. Ross from 1839 to 1843 and later was member of the Administration of Victoria [Australia]).

obscura, *Rhythemis* 1868d [= ***R. phyllis*** (Sulzer, 1776)]

L. *obscurus* -a -um = dark, dusky, shady

The text of the first description, to which Bridges (1994) refers, does not give a clue, for among the species Brauer (1868e: 715) lists for a group of *Rhythemis*, the characteristic of which is: "Flügel grünlichbraun hyalin, die Spitze braun gesäumt,

die Basis der Hinterflügel dottergelb, schwarz gefleckt [Wings greenish brown hyaline, the apex being bordered brown, the base of the hindwings egg-yolk-yellow, mottled black]", it reads: "*obscura* Brau. (? *Phyllis* var.) Amboina (M. C.)". The only additional information by Brauer is found in an earlier publication (1867d: 816), where he discusses wing coloration in *Rhyothemis* species: "Die vorwaltend gelbgeflügelten Arten gehen allmählig in die nur schwarz und hyalin gefleckten über, so zum Beispiele führt *Splendida* Rbr. durch *Murcia* Fabr. diese durch die Var. *obscura* von *Phyllis* Sulz. auf *Phyllis*, diese auf *dispar* m. und das Weibchen der letzteren auf *Regia* [The predominantly yellow-winged species gradually change to the only black and hyaline marked ones, for instance *R. splendida* (Rambur) (= *arria* Drury) leads via *R. murcia* (Fabr.) (= *variegata* Linnaeus), thence via the variety *obscura* of *Phyllis* to *Phyllis*, thence to *dispar* mihi (= Brauer) and the female of the latter to *Regia*". So the name probably refers to the pattern of the wings. This assumption is confirmed by Selys 1878: 299: "NB. L'*obscura* Brauer, d'Amboine possède au contraire au nodus une tache noire plus grande que chez la *Phyllis*. [NB. *R. obscura* Brauer from Amboina has in contrast (to *R. snelleni*) at the nodus a bigger black spot than *R. phyllis*]", which means that the wings of *R. obscura* on the whole are darker than that of *R. phyllis*. Ris 1913: 944 in the first real description of the taxon, which he treats as subspecies of *R. phyllis*, gives the dimensions which these nodal spots may have. For the subspecific rank of this taxon see above s.v. *dispar* p. 31. (*Phyllis* was a figure from Greek mythology, cf. Endersby & Fliedner 2015: 200).

pectoralis {*Libellula*} 1867a [= ***Lathrecista asiatica*** (Fabricius, 1798)]

The name, suggested by Kaup (see p. 20), refers to the fact, that the thorax is conspicuous by its several yellow dorsal and lateral stripes which are described by Brauer extensively. In Schneider (2004) the taxon ranks as subspecies. *Lathrecista* (from Gr. λαθραῖος = clandestine, hidden + κίστη = basket, urn) might have got its name because of the male's inconspicuous secondary genitalia, see (Endersby & Fliedner 2015: 168). L. *Asiaticus* -a -um = Asiatic: Fabricius specimen was from East India.

petalura {*Libellula*} 1865a [= ***Orthetrum pruinosum*** (Burmeister, 1839)] (Fig. 9)

Gr. πέταλον = a leaf + ούρά = a tail.

Brauer chose this name because of the leaflike expansions of the eighth abdominal segment: "segmento octavo margine inferiore nigro, dilatato, subalato [the eighth segment having a black expanded, slightly foliate inferior margin]". Mature males of *O. pruinosum* [L. covered with hoarfrost, pruinous] show a bloom, which is not blue, as in the European libellulid species, but reddish violet.

pseudosphronia, *Neurothemis* 1867a [= ***N. manadensis*** (Boisduval, 1835)]

Gr. ψευδ- = false, pretending to be + *Sphronia*, a female name from late antiquity, derived from Gr. σώφρων -ων -ον = of sound mind, self-controlled

In 1773 Drury named a species *Libellula sphronia*, which was a synonym of his *L. fulvia* published in the same volume, which name probably was inspired by a figure from the Italian poet's Torquato Tasso (1544-1591) main opus 'La Gerusalemme liberata (= Jerusalem delivered)', but most probably indirectly by a tragedy "Olindo

and *Sophronia*" by Abraham Portal (ca 1727-1809) based on Tasso's poem published in 1758, or on the English version of Tasso's work in heroic couplets published in 1763 by John Hoole (1727-1803), whose mother had been a née Drury. Which similarity between the species prompted the choice of the name, is not to be seen from Brauer's description of both species in the same paper. (For *manadensis* see above p. 32 s.v. *innominata*). According to Seehausen & Dow (2016: 90) one of Brauer's specimens of *N. pseudosophronia* at the Hessisches Landesmuseum in fact is *N. terminata* Ris, 1911 (*L. terminata* = terminated, probably because the dark coloration of the wings in most specimens only reaches the half of the pterostigma. It is a manuscript name from Rambur).



Fig. 9. Brauer's type of *Libellula petalura* [= *Orthetrum pruinosum* (Burmeister)]: a. lateral view The type specimen shows well the dilatations of the eighth segment, that led to the name. b. labels: As the name on Brauer's label is capitalized, it is evident, that he transferred it from Leach's genus to this libellulid species, as he did when taking Selys' genus name *Cleis* for another libellulid species because of some similarity. But it is to be noted that Leach's genus name refers to the shape of the male appendages, not to some foliate dilation of an abdominal segment. Picture: M. Seehausen.



quatuornotata, *Agrionoptera* 1867b [= *A. insignis* (Rambur, 1842)]

L. quat(t)uor = four + *notatus* –a –um = marked

Brauer mentions the difficulties in separating other species of the genus *Agrionoptera* from *A. insignis* (Rambur), but states: "Bis jetzt muss ich die benannte Art für die Rambur's halten. Davon entfernt sich durch die fast schwarzbraunen Basalstriche im Flügel die 3. Art. † *Agrionoptera quatuornotata* nov. sp. aus Menado von Duivenbode ge-

sammelt [Until now I cannot but take the mentioned species to be that of Rambur. From that is separated a 3rd species {besides *A. insignis* and *A. nicobarica* cf. p. 38} by the almost blackish brown basal streaks in the wing † *A. quatuorotata* nov. sp. from Menado, collected by Duivenbode]". (In this publication the † indicates species described by Brauer himself from Kaup's specimens). But it is to be noted, that the specimen, which Brauer took to be *A. insignis* (Rambur) indeed was a different species see above p. 27 and Appendix p. 55. In Bridges (1994) and Steinmann (1997) (there erroneously as *quatorotata*) the taxon ranks as subspecies, but in Wikipedia it is not among the subspecies any longer. For *insignis* see *A. nicobarica* p. 34.

samoensis, {*Libellula*} 1867a [= ***Tramea transmarina*** Brauer, 1867]

L. samoensis –is –e = from Samoa

"Vaterland: Die Samoa oder Schifferinseln [Country: Samoa or Saylor Islands]".

soror, *Trithemis* 1868a [= ***T. aurora*** (Burmeister, 1839)]

L. soror = sister

Brauer does not explain his choice of name, but as the description follows that of *T. aurora* immediately it seems clear that he believed the species to be a sister taxon to the previous one. (Burmeister named the species after the Latin goddess of dawn because of it being reddish yellow and having reddish yellow wing bases as well).

spinicauda, {*Agrion*} 1865a [= ***Ischnura aurora*** (Brauer, 1865)]

L. spina = thorn, spine, prickle + *cauda* = tail (in entomology: abdomen or appendage)

The name refers to a bifid spine on the rear of segment ten: "ultimo ... postice valde elevato, spina angusta, apice bifida armata [the last (segment) much elevated at the rear, with a slim spine armed with a bifid tip]".

subbinotata, *Tramea* 1867d [= ***T. binotata*** (Rambur, 1842)]

L. sub- (in compounds) = (inter alia) not quite, nearly + *bi-* (in compounds) = two, double + *notatus* –a –um = marked

In Brauer's specimen the dark basal markings in the hindwings, which led to the name *T. binotata* (Rambur), were smaller: "Basalfleck der Hinterflügel sehr schmal und kurz, nur bis zur halben Flügelbreite nach hinten reichend ... [Basal markings of the hindwings very narrow and short, only reaching to half the breadth of the wings ...]".

subfasciolata {*Libellula*} 1865a [= ***Orthetrum caffrum*** (Burmeister, 1839)]

L. sub- (in compounds) = (among others) not quite, nearly + *fasciola* = a small band + *-atus* –a –um = marked with, equipped with

The name refers to *L. fasciolata* Rambur, which also is a synonym of *Orthetrum caffrum* (Burmeister): "*Libellulae fasciolatae* Rbr. *simillima*. [Most similar to *L. fasciolata* Rambur]", which got its name from two strikingly yellow bands on the thorax frontally and laterally, the latter of which – still recognizable in adults – has led to the vernacular name 'two-striped skimmer'. (*caffrum* probably is a reference to the provenance of Burmeister's specimens from Durban, a region, where 'Caffers' live, dark coloured Bantu tribes of Southeast Africa. That name originates from Arabic kafir = infidel, the displeased usage by muslim merchants of Arab provenance which was adopted by the European colonists cf. Fliedner 2006: 18).

tahitensis {*Aeschna*} 1865b [= ***Anaciaeschna jaspidea*** (Burmeister, 1839)]

Tahitensis –is –e = from Tahiti

The name reflects the provenance of Brauer's specimen: "Patria Tahiti [Country Tahiti]". The genus *Anaciaeschna* shows features of both genera (*Anax* + *Aeshna*) (*A. jaspidea* (L. jasperlike) probably got its name because the female's thorax is olive-green with greenish yellow bands on the sides, cf. Fliedner 2006: 13).

thoracantha, {*Diplax*} 1867b [= ***Raphismia bispina*** (Hagen, 1867)]

Gr. $\theta\acute{\omega}\rho\alpha\chi$ = corselet + $\acute{\alpha}\kappa\alpha\nu\theta\alpha$ = thorn, prickle

Brauer's description says: "Unterseite des Thorax vorne und die Hüften gelblich, hinter den Beinen bis zur Quernaht braun, nur die Mittelnah gelb, hinter der Naht gelbbraun mit brauner Querlinie. Gerade an den Enden der Y-förmigen Naht jederseits ein starker, langer, mit der Spitze nach unten und etwas nach vorne stehender gelber an der Spitze schwärzlicher Dorn [Underside of the thorax anteriorly and the coxae of a yellowish colour, behind the legs brown to the transverse suture, only the middle suture yellow, behind the suture yellowish brown with a brown transverse line. Directly at the ends of the Y-shaped suture on each side a strong, long yellow thorn, which apically is directed downward and slightly forward and blackish at the peak]". Hagen's name *bispina* (L. two-spined) refers to the same feature, as does Kirby's genus name (derived from Gr. $\rho\acute{\alpha}\phi\acute{\iota}\varsigma$ = needle, cf. Endersby & Fliedner 2015: 209).

vitellina, *Rhythemis* 1868a [= ***R. phyllis*** (Sulzer, 1776)]

L. *vitellus* = the yolk, the yellow of the egg + *-inus* –a –um = pertaining to, made of

Probably the colour of some wing veins and the membrane in the hind wings is referred to: "Adern schwarzbraun, am Grunde des Discoidalfeldes des Hinterflügels und ebendort zwischen den braunen Flecken wie die Membran dottergelb [Wing veins fuscous, at the base of the hind wing's discoidal field and there between the brown markings egg-yolk-yellow like the membrane]". Brauer himself was in doubt if his ♀ specimen really was a new species or a varying form of *R. phyllis* (cf. above s.v. *dispar* p. 30), but as he had never seen a ♀ of that species with hyaline wing tips, he decided to treat it as a species of its own. For the subspecific rank of this taxon see above s.v. *dispar* p. 30.

Brauer in ...

Not all dragonfly names that go back to Brauer are found in his own publications:

There are two examples, in which Selys credits a species name to Brauer. For ***Apanisaggrion lais*** (Selys, 1876: 990) (a courtesan's name from antiquity, chosen because of a similarity to the genus *Lais* Selys, 1853, which has been changed to *Mnesarete* Cowley, 1934 because of homonymy) in his description Selys states having found the name for the species in the collection of the Imperial Museum at Vienna. To base a name on such a similarity is in accordance with Brauer's practice (cf. above s.v. *cleis* p. 16). But as there is no indication that the description published by Selys came from Brauer too, Selys in spite of his statement remains the author (see Fliedner & Endersby 2019: 172).

A little more complicated is the case of '***Agrionoptera lineata*** Brauer' published by Selys (1879: 302) with an insufficient description, that only presents differences to other

closely related taxa. This name first is mentioned for a taxon from the Philippines in Brauer (1868d: 729) without any description. As Brauer (1878a: 201) described an *Orthemis* (now *Cratilla*) *lineata* from Malacca (for which see above p. 21), and as Selys (1879) mentions having received a male of *A. lineata* unknown to Brauer from A.R. Wallace collected in Malacca, it is no wonder that these two species were mixed up (e.g. Kirby 1890: 31), whereas in Brauer (1868d: 729) the genera *Agrionoptera* and *Orthemis* are clearly distinguished, and therefore it is rather unlikely that he would not have mentioned if he had assigned the *Agrionoptera* species to a different genus). But there is more to the problem of that taxon, as Karsch (1890: 385ff) distinguishes the two species and quotes an elaborate description provided by Brauer himself for the *Agrionoptera* taxon, but assigns it to the closely related new genus *Nesoxenia* Kirby, 1889 [Gr. νῆσος = island + ξένος = guest, stranger from outside + feminine adjectival suffix]. In his text Brauer mentions that his specimen is no longer available to him, as it has been transferred to the collection of Selys, which is already mentioned in Selys (1879). So this delayed description of the taxon presented as nomen nudum in 1868 might be cited as 'Brauer in Karsch, 1890' (cf. below appendix p. 55).

From this text it can be seen clearly to what feature the name *lineata* [L. *lineatus* –a –um = lined] refers: "Zweiter bis fünfter Ring rothgelb, oben mit 3 feinen gelben Linien, die am zweiten Ring von 3 gelben Flecken vor der Querkante beginnen, die mittlere ist durch die braune Rückenlängskante getheilt und wie die seitlichen, die knapp über dem Seitenrande laufen, durch die braunen Querkanten unterbrochen [Second to fifth segment reddish yellow, with 3 fine lines dorsally, starting at the second segment from 3 yellow spots before the transverse border, the middle one is divided by the brown longitudinal dorsal edge and – like the lateral ones, situated narrowly above the lateral edge – interrupted by the brown transverse borders]". It might be added that Brauer's ♀ specimen lacked segments six to ten and therefore he gives no information about the missing part of the abdomen.

So it is evident, that Brauer had prepared an elaborate characterisation of the specimen, which according to Selys (1879) had been collected by C. Semper (see p. 5). Brauer had named it, but for some reason had not published its description in his respective papers Brauer (1867a + c). That would have been lost to odonatology but for Karsch's interest in distinguishing the genus *Agrionoptera* from Kirby's new genus *Nesoxenia*.

Actual genera

Naturally the species described by Brauer were not all classified in genera established by him, and it is to be noted that more than 120 years with many taxonomic changes have passed since Brauer described his last odonate species. Therefore it is worthwhile also explaining the names of other author's genera, into which species described by Brauer are classified now.

Aethriamanta Kirby, 1889: 283

As usual Kirby does not explain his choice of the name. It might be composed of L. *aethra* = bright sky (borrowed from Greek) and *amant* = stem of the participle *amans* = loving and the philologically inappropriate feminine ending –a, to show the gender unmistakably which is not to be seen in the participle form.

Agriocnemis Selys, 1877: 142

This name combines two elements that refer to genera established earlier, the first to *Agrion* Fabricius (see above *Agrionoptera* p. 7). The element *-cnemis* refers to the genus *Platycnemis* (Gr. πλατύς *-εῖα* *-ύ* = broad + κνημῖς = greave, legging; an allusion to the broadened tibiae in that genus), which Selys (1863: 148) chose as type genus of his 'légion *Platycnemis*', in the publication of which he created eight new genera, all with names ending in *-cnemis* as a reference to the relationship to the type genus. But in the progress of his taxonomic work on the 'Agrionines' he saw, that not all of these genera were closely related to *Platycnemis* (e.g. *Pericnemis*, see below p. 43). So *-cnemis* in odonate genus names may just mean 'Coenagrionid damselfly', which also applies for the genus *Agriocnemis*. As usually Selys does not explain the name of this taxon, but certainly it should be part of his 'légion des *Agrions*'.

Anax Leach, 1815: 137

Gr. ἄναξ = sovereign, king might be chosen as the name because of the large size of the species *A. imperator*, the only one Leach knew when establishing the genus, or because of its dominant behaviour at the waterside.

Brachygonia Kirby, 1889: 259; 310

Gr. βραχύς *-εῖα* *-ύ* = short + *-γονία* (in compounds) begetting, generation.

Probably the rather short secondary genitalia of the males are the base of the name: "Appendages of the second segment distinct, not very prominent".

Camacinja Kirby, 1889: 266

The name might be composed of Gr. καμάκινος = made of reed, cane or like material and the feminine suffix *-ia*, to avoid a change in gender to *Neurothemis*, from which the new genus was taken. The name accordingly would be a reference to the abdomen being "stout, not thickened at the base, the sides nearly parallel", the last feature being also a criterion in the key earlier in the paper for distinguishing this genus from others.

Ceriagrion Selys, 1876: 527

Agrion (from Gr. ἄγριος = living in the fields) was the name established by Fabricius to contain all of the damselflies. To this Selys added *Ceri-* (from the L. *cerinus* *-a* *-um* = wax-coloured) as a first element being an allusion to the generally yellowish colouring. "Coloration générale jaunâtre orangée [General orangish yellowish colouring]".

Cratilla Kirby, 1900: 542

L. *cratis* = (among others) wickerwork; lattice; + feminine diminutive suffix *-illa*

Perhaps the "dense reticulation" is the source of the name.

Diplacodes Kirby, 1889: 308

The name is composed of *Diplax* (see above *Brachydiplox* p. 79) and Gr. adjectival suffix *-ώδης* = looking like, resembling. Kirby transferred into this genus species from the genera *Diplax* Charpentier and *Diplacina* (see p. 8).

Drepanosticta Laidlaw, 1917: 339

Gr. δρέπανον = sickle + στικτός *-ή* *-όν* = pricked, tattooed; spotted, dappled

There is a problem with the name, as in the first description nowhere is a sickle-

shaped mark mentioned. So it is to be seen that *-sticta* here is a reference to Selys' "legion *Platysticta* (= broad marked, with reference to the pterostigma)", into which Laidlaw classified his new genus. Probably the name refers to the male's upper appendages of the type species, which are sickle-shaped in lateral view (see Laidlaw 1915: 390 and Laidlaw 1917: pl. XIV, 4a).

Erythemis Hagen, 1861: 168

This is one of the first nine names in *-themis* Hagen created in 1861 (see above *Brachythemis* p. 8). Gr. ἐρυθρός means red and was chosen, because in the three species on which Hagen based this genus, at least the abdomen of the males is red or ferruginous.

Epopthalmia Burmeister, 1839: 844

This name [Gr. ἐπι(ι)- (in compounds) = on, upon; ὄφθαλμός = eye] alluding to the process on the rear of the eyes was chosen by Burmeister for a taxon to comprise all corduliids disregarding the precedence of the genus *Cordulia* Leach. Burmeister's name is now restricted to a macromiid genus, to which the first species classified into it by Burmeister pertains.

Gynacantha Rambur, 1842: 209

Gr. γυνή = woman + ἄκανθα = thorn, prickle.

The feature, by which the author distinguished this taxon from *Anax* and *Aeshna*, is spines beneath the tenth abdominal segment of the females.

Heliaeschna Selys, 1882: 667

Gr. ἔλικες = forked tendrils of the vine + genus name *Aeshna* (for the spelling see below)

In 1758 Fabricius had split the genus *Libellula* Linnaeus into three, creating the new genera *Agrion* (see above *Agrionoptera* p. 7) for the damselflies and *Aeshna* for the non-libellulid Anisoptera. In the 19th century the name normally was written *Aeschna* (with c) and in this form is part of many compound names like in this one. The etymology of the name is not known, whereas *Aeschna* in the 17th century in England was in use for Ephemeroptera (cf. Endersby & Fliedner 2015: 96). As usual Selys does not explain his choice of the name, but most probably it is due to this feature: "♀ Le 10e segment prolongé en dessous en une plaque fourchue procombante, à branches fines, longues, aiguës, écartés [♀ 10th segment elongated beneath into a prominent forked plate with fine, long, pointed splayed branches]".

Hydrobasileus Kirby, 1889: 266

At the base of this species' name are Gr. ὕδωρ = water + βασιλεύς = king. Why he chose the name, Kirby does not explain.

Igneocnemis Hämäläinen, 1993: 155

The author established the taxon as a subgenus of *Risioecnemis* (see below p. 44) for a group of species, in which he chose *Risioecnemis ignea* (Brauer) (see above p. 20) as type.

Ischnura Charpentier, 1840: 20

The author explains that the name is combined from Greek ἰσχνός [= slender,

lean] and ούρά [= tail; in entomology used for abdomen] because of the slenderness of the abdomen as a characteristic of this taxon.

Luzonobasis Villanueva, 2012: 584

"Etymology. – Combination of the name 'Luzon' (the largest Philippine island) and the suffix "basis" indicating its close relationship with other *Teinobasini*." (*Teinobasis* see below p. 44).

Melanesobasis Donnelly, 1984: 30

The author separated a group of Fijian species from the Selysian genus *Nesobasis* (see below). He states: "The name has a double meaning: the genus occurs in Melanesia, and it is characterized largely by its very dark coloration". It is to be added, that Gr. μέλας means 'black' and νῆσος means 'island', and that Melanesia therefore means 'region of the black islands', the islands being called black because of the dark skin colour of the indigenous people. In the Selysian name *Nesobasis* the first part is a reference to the Fiji islands, from where the species included into the new genus came, and the second part points to a similarity with the genus *Telebasis* Selys, 1877 (because of homonymy today *Teinobasis* Kirby, 1890 which see p. 44).

Nannophya Rambur, 1842: 27

The name of this genus which was erected by Rambur for the smallest dragonfly he knew, is combined from Gr. νᾶνος or νάννος = dwarf + φύη = stature or growth. Later the root '-*phya*' was also utilised by other authors as in *Archaeophya* Fraser, 1959; *Austrophya* Tillyard, 1909; *Cordulephya* Selys, 1870; and *Metaphya* Laidlaw, 1912.

(*Nesoxenia* Kirby, 1889: 260+291, see p. 39)

Neurobasis Selys, 1853: 18

The name is combined from Gr. νεῦρον = nerve, or wing veins in entomology and βάσις = base, foundation as a reference to the presence of crossveins in the basal space, whereas in the genus *Calopteryx* it is normally free.

Orthetrum Newman, 1833: 511

Newman wanted this genus, which he excised from the genus *Libellula*, to comprise the species with a straight abdomen [Gr. ὀρθός = straight + ἦτρον = abdomen]. Differently shaped members of the new genus he did not know then (cf. Fliedner 1997: 32).

Paracercion Weekers & Dumont, 2004

In 1907 Navas had founded a genus *Cercion* (Gr. κέρκιον diminutive of κέρκος = tail of a beast, used in reference to the cerci, by which the type species was to be distinguished from other coenagrionids) for the single species *Coenagrion lindenii* (Selys, 1840). Later species from eastern Asia had been included into this genus. But an examination of the larvae and a molecular genetical analysis showed, that *C. lindenii* really belonged in the genus *Erythromma* [= red eye]. So the name *Cercion* became unavailable, and a new genus name had to be found for the East Asian species. For this the authors created *Paracercion*, adding the Greek element παρα- (in compounds: alongside) to the obsolete name.

Paraphlebia Selys in Hagen, 1861: 71

Gr. παρα- (in compounds) = alongside, beside + φλέψ (stem φλεβ-) = artery, vein + feminine form of the adjectival suffix -ιος - ία - ιον = related to, associated with
The suffix *-phlebia* is used in Odonata names in reference to wing venation. One characteristic feature in this genus in Selys (1862: 9) is: "Des secteurs supplémentaires interposés entre tous les secteurs [Supplementary sectors found between all sectors]".

Pericnemis Selys, 1863: 151

Gr. περι- (in compounds) = all around + *-cnemis* = coenagrionid damselfly (see above s.v. *Agrioncnemis* p. 40)

In 1863 Selys had described this taxon as belonging to his 'légion *Platycnemis*'. But then Selys (1877: 131) withdrew it from there. The first part of the name refers to the pterostigma of the single species included then, for which Selys states: "Je ne connais aucun autre Odonate qui ait le ptérostigma conformé comme celui de *Pericnemis* [I do not know any other odonate which has its pterostigma formed like that of *Pericnemis*]". Characteristic of it is: "Ptérostigma jaunâtre, entouré d'une forte nervule de même couleur [Pterostigma dark yellow, encircled by a broad vein of the same colour]".

Proorthemis Kirby, 1889: 261, 290

Gr. πρώτος -η -ον = foremost, first + ὀρθός -ή -όν = straight; for *-themis* see *Brachythemis*

The genus *Orthemis* was given its name by Hagen (1861: 161) because in the only species he included the abdomen as in *Orthetrum* (Newman), was straight (see Brauer 1883: 88: "*Orthemis*-Arten haben den Hinterleib am Grunde nie besonders blasig erweitert und fast gleich dick oder nach hinten allmählig verdünnt [In *Orthemis* species the abdomen is never inflated much at the base and almost of equal size or gradually reduced distally]" (the explanation in Fliedner & Endersby (2019: 196) referring to the straight first sector of the triangle is erroneous). Kirby transferred species from the Indonesian region classified in that genus previously to this new genus. By this decision and the creation of a genus *Thermorthemis* for species from Madagascar and Africa he restricted the genus *Orthemis* to the Americas. He does not explain his choice of the first part of the name, but he may have deemed this genus to be older in an evolutionary sense than the other two.

Pseudagrion Selys, 1876: 491

Gr. ψευδ- = false, pretending to be + *Agrion* (see above s.v. *Agrionoptera* p. 7).

The Selysian name refers to the difficulty in distinguishing the genera, as if the Pseudagrions pretended to be true Agrions.

(*Raphismia* Kirby, 1889: 263 + 293 see p. 38)

Rhinocypha Rambur, 1842: 232

In the genus *Rhinocypha* [Gr. ῥίς (stem ῥιν-) = nose + κυφός = bent forwards, hunch-backed] a characteristic feature is the protruding clypeus.

Rhiongeschna Förster, 1909: 220

Gr. ῥίον = any jutting part of a mountain, whether upwards or forwards + *Aeshna* (see above s.v. *Heliaeschna* p. 41).

The single species *R. maita* (= *R. brevifrons* (Hagen, 1861)) on which the author based the genus, has a peculiar prominent vertex (cf. Fliedner & Endersby 2019: 212).

Risioecnemis Cowley, 1934: 204

The suffix *-cnemis*, as in *Pericnemis* (see above 43) is a reference to the Selysian 'légion *Platycnemis*'. Brauer had classified several species into the genus *Hypocnemis* Selys, 1863, which had been established together with *Pericnemis*, but its name was preoccupied. Selys himself had tried to emend that by another name, but that also was preoccupied. So Cowley in 1934 replaced it by *Risioecnemis*, the first part of which name is an homage to the eminent Swiss odonatologist Friedrich Ris (1867-1931) who had died not long before.

Sanggbasis Villanueva, 2012: 594

"Etymology. – Combination of the word 'Sanga', which in the local Cebuano dialect means 'fork/ branch' referring to its cerci and the suffix "basis" indicating its close relationship with other *Teinobasini*." (*Teinobasis* see below).

Sympyema Burmeister, 1839: 823

The genus received its name by accident: For his 'Handbuch' Burmeister had been given access to Charpentier's manuscript of the treatise to be published in 1840, where the name *Sympycna* [Gr. σύμπυκνος - pressed together, compressed, tight] had been scheduled for the lested genus, which at rest keeps its wings tightly to the abdomen, while other *Lestes* species hold them apart, so that they make a figure like an inverted V. But Burmeister did not decipher the name correctly and published it in the nonsense form now in use. Because his 'Handbuch' was published prior to Charpentier (1840), the originally intended name had to be abandoned.

Teinobasis Kirby, 1890: 157

Selys (1877: 112) had established a taxon *Telebasis* as a subgenus of *Telebasis*, Selys, 1865 (Gr. τήλε = at a distance + βάσις = base, as a reference to the base of the wing being somewhat remote from the thorax due to long petiolation of the wing), which, when elevated to generic rank, had to be renamed because of homonymy. So Kirby replaced the first element of the name by τείνω = stretch out.

Tramea Hagen, 1861: 143

The genus name *Tramea* appears to be associated with L. *trameare* = to pass through, which fits very well for species with vagrant behaviour. But there is a history in that name: In 1849 Hagen already had foreshadowed that he was going to establish a genus *Trapezostigma* (Gr. τραπέζιον = *trapezium* + στίγμα = a prick, puncture, mark, in dragonfly names often used for *pterostigma*); but in 1861 he assigned the species, which he had foreshadowed as pertaining to the planned taxon, to the genus *Tramea* the characteristic of which was: "pterostigma small, trapezoidal", that means: he had simplified the unwieldy denomination achieving two additional advantages: first the pun with the Latin verb mentioned above, second that the new name could be treated as feminine, whereas the former name would

have been neuter in gender and all the species transferred from the feminine genus *Libellula* would have had to undergo a change in gender.

Conclusions

Upon considering the names given by Brauer to Odonata we can make out certain preferences:

Of his 19 generic names for recent taxa ten end in *-themis* (as do two obsolete genus names by him), five in *-diplax*. By using these elements which are to be interpreted as 'libellulid dragonfly' he wanted to give a taxonomic orientation. A further examination shows that nine names refer to morphology, six to size, three to similarities to established genera, two to coloration, and one of the fossil genera refers to evolution.

Of his 105 species group names (fossil ones and synonyms included, but the homonym and the seven names suggested by Kaup not incorporated) 22 reflect morphology, 16 coloration, 13 pattern, 11 similarities to other taxa, 7 refer to size (of which 4 are fossil ones), 4 allude to beauty. Of these one goes back to a nomen nudum by Hagen (*elegans*).

Among the names referring to morphology or similarities there are five which indicate, that some feature of the taxon is not in accordance with what might be expected (*abnormis* p. 12, *anomala* p. 13, *dispar* p. 30, *irregularis* p. 20, *paradoxa* p. 23; on three of these species a new genus is founded), and five reuse older genus names from different odonate families because of some similarities which may be very superficial (*cleis* p. 16, *diplax* p. 8, the collection name *lais* p. 38, *macromia* p. 34, *petalura* p. 36).

Of Brauer's 9 eponyms in dragonflies the first he ever created is dedicated to his wife, five are the persons to whom he owed his specimens directly or indirectly, three refer to ancient mythology, one also being a hint to coloration (*aurora*), two being a reference to the similarity to other taxa (*cleis* to an obsolete Selysian genus, *castor* to *Aeshna heros* Fabricius, cf. p. 15). We might compare that with the 10 names proposed by Kaup: of these five were eponyms, one species he wanted to be named after Brauer, who rejected and replaced it by a dedication to Rosenberg, from whom Kaup had got most of his specimens. Of the other names suggested by Kaup two refer to pattern, two to coloration (one being preoccupied and replaced by *duivenbodei*) and one to beauty.

Of Brauer's 13 geographical names eight directly, one indirectly (*transmarina*) refer to islands, from where his specimens came, six of which are classified as synonyms in Paulson & Schorr (2019). Of the other four, three refer to a continent (*africana*, *asiatica*, *australis*) and a synonym to Brasilia. Why there are so many synonyms among these, is to be seen from Brauer 1867b, 289. After having stated, that sometimes, especially in *Diplax*, the anal appendages of distinct species may be almost alike, and in other species the outer parts of the second segment, he continues: "Bei Thieren von so verschiedener geographischer Verbreitung ist es immer gerechtfertigter, eine Artverschiedenheit anzunehmen als bei Thieren gleichen Vaterlandes [In animals of such a different geographical distribution it is always better to assume the species are different compared with animals of the same country]", that means at a time when the wide distribution of some species was not yet known – for instance *Neurothemis fluctuans* (Fabricius) or

Agrioptera insignis (Rambur) – it seemed advisable to name specimens from islands at some distance from the known locations of a taxon after their provenance.

There are no dragonfly names by Brauer referring to environment or habitat nor to behaviour, which seems natural as he described his species from preserved specimens without knowing them from nature.

Wasscher & Dumont (2013: 394) have given a survey of the percentage of synonyms in the most prolific authors of dragonflies. For Selys it is 20%, for Hagen 26%. For Brauer (subspecies and names by Kaup excluded) it would be 30%. Why so many more?

To answer this question we must consider the conditions, under which Brauer had to work. He describes his difficulties thus (Brauer 1867a: 4): "Obschon ich gewissenhaft bemüht war, die früher beschriebenen Libellen stets zu erkennen, war ich dennoch mit der Deutung nicht immer glücklich, wie aus der von Hagen gegebenen Revision meiner Novara-Neuropteren hervorgeht [Although I always scrupulously sought to recognize the dragonflies described previously I was not always lucky with the allocation, as is to be seen from Hagen's revision of my Novara-Neuroptera (Hagen 1867)]". And he continues: "Es ist immerhin ärgerlich, dass Thiere, die man mit aller Mühe untersucht, die man in keinem Werke beschrieben geglaubt hat, dennoch von einem andern Autor mit alten Namen belegt werden, auf die man bei gewissenhaftester Bestimmung nicht kommen konnte, weil entweder die frühere Beschreibung zu kurz, oder wohl gar fehlerhaft war. Derartige Unannehmlichkeiten werden aber selbst dem sorgfältigsten Autor passiren, in so lange nicht alle, von älteren Autoren in der früher üblichen kurzen Weise beschriebenen, Thiere neu und ausführlich, d. i. zeitgemäss beschrieben sind, wie diess für jene Abtheilungen geschehen, welche bereits monographisch bearbeitet wurden [It certainly is annoying, if animals, which one has examined most painstakingly and which one thought had not been described in any publication so far, are named by some other author with an earlier name, which one could not discern even with most scrupulous care, because either the earlier description was too short, or even faulty. Such annoyances however may happen to the most diligent author until all animals described by earlier authors in the previously customary short manner will be described anew in detail, that is according to the requirements of our time, as it has been done for those groups, which are already covered by a monograph]". This last sentence is a reference to the works by Selys and Hagen in the years before.

But also, apart from this difficulty at that time, certainty about the assignment of a taxon could only be achieved by comparison with a confirmed specimen (then called 'type' in a different sense from the modern usage); that means for exotic species access to at least one large collection was necessary. Hagen and Selys had visited many collections in Europe, the largest ones, apart from Selys' own, collections in or around Paris or in England, and they both had prepared thorough detailed notes about the specimens encountered there. Besides, Hagen had been sent more than 1500 specimens from Northern America when preparing his 1861 publication (Fliedner & Endersby 2019: 43). So Brauer, who was less experienced and only had access to the Imperial Collection at Vienna, which by no means was equally rich, had to work under less satisfactory conditions.

As a consequence of these problems Brauer not only admonished other authors to prepare more diligent descriptions, but did it as well. When he had first published on the

dragonflies collected by the Novara expedition in four publications in the years 1864 to 1865, the new species were described in Latin on about half a page each, always using features of wing venation as had become customary by the publications of Selys and Hagen (the two new genera were described in German). In 1866, when reviewing these descriptions in a new publication, he augmented the Latin descriptions given before by additional German ones about three to four times as long giving as the reason in the preface (1866b: 4) "stets bestrebt gewesen zu sein, die Beschreibung nach den Anforderungen der Neuzeit zu entwerfen und ziemlich ausführlich zu halten [having always tried to formulate the descriptions according to the requirements of the modern age and to keep them fairly detailed]". So we see Brauer as an author aiming to spare other scientists the difficulties he himself had had.

His penchant for taxonomically unambiguous descriptions and the avoidance of synonyms is also apparent from a remark in Brauer (1867a: 3): "Was nützt es, wenn Hagen in seinem Verzeichnisse der Ceyloner Neuropteren (zool. bot. Ges. 1858, p. 480) z. B. *Lib. nebulosa* Fabr. oder *Agrion Coromandelianum* Fabr. aufzählt, wenn niemand weiss was darunter zu verstehen ist. Es wäre weit angenehmer, wenn Hagen diese und viele andere Odonaten dort in seiner unübertrefflichen Weise beschrieben hätte, wobei weder das Verdienst eines unsterblichen Fabricius gelitten hätte, noch die Wissenschaft mit unnöthigen Synonymen beschwert worden wäre [What is the use anyhow, if Hagen in his catalogue of Sri Lanka's Neuroptera (...) lists e.g. *Libellula nebulosa* Fabr. or *Agrion coromandelianum* Fabr., if nobody has any idea what to make of those. It would have been far more acceptable, if Hagen there had described those and many other Odonata in his unmatched manner. Thereby, neither the merits of the immortal Fabricius would have been diminished, nor had the science been burdened with unnecessary synonyms]". Even harsher was the reaction to a would-be entomologist, who published his observations of well known dragonflies in southern Germany, Switzerland and Alsace (then occupied by Prussia), intended to be the first part of a major opus, for which he had usurped Fabricius' title 'Systema naturae, sistens insectorum classes, genera, species ... [System of nature, constituting classes, genera and species of insects ...]' (Brauer 1879: 25): "Wundern wir uns darum nicht, wenn er, aller bestehenden Literatur zum Trotze, noch neue Eintheilungen und Namen schafft [Therefore we should not wonder, that he {= the author} – in spite of all existing literature – creates additional classifications and names]". Brauer continues: "Wir hätten nicht so viele Worte über dieses Machwerk verloren, wenn wir es nicht für unsere Pflicht hielten, Persönlichkeiten, welche mit Vorliebe Förderer der Wissenschaft sind, zu warnen und der die Wissenschaft missbrauchenden Unverschämtheit einen Damm zu setzen [We would not have spent so many words about this sorry effort, if we had not reckoned it to be our duty to alert people who like to be patrons of science, and to put a damper to the insolence that abuses science]". This scathing answer to nomenclatural arrogance certainly may show some of Brauer's character, which is at the base of his success and glory in science.

In appreciation of his meticulous care five authors (Selys, Kirby, Förster, Krüger, Bianchi) dedicated six dragonfly taxa to Brauer, three of which later turned out to be synonyms. Nevertheless Brauer's care for the knowledge of Odonata, which also is to be seen from the scientific names he created, places him among the greatest odonatologists of his age.

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Fig. 3. *Tetrathemis irregularis*: © by Natural History Museum Vienna, NOaS Image Collection / H. Bruckner; published with permission.

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Fig. 9 a+b. *Libellula petalura*: © Malte Seehausen; published with permission.

Appendix:

The *Agrionoptera* problems

Publication	Information on <i>Agrionoptera</i>
Brauer 1864	In the Novara collection Brauer has found specimens from the Nicobar Islands, which he (correctly) identified as <i>Libellula insignis</i> Rambur; on these he founded his genus <i>Agrionoptera</i> .
Brauer 1865c	He sees that Rambur's <i>insignis</i> should be much larger than <i>Sympetrum vulgatum</i> (L.); his Nicobar specimens are smaller than that, but in the Imperial Museum he detects very similar specimens from Amboina, which meet the requirements of size. So erroneously he takes these to be the real <i>insignis</i> (Rbr.). Therefore he describes the species from the Nicobars as <i>A. nicobarica</i> .
Brauer 1866b	To avoid the two similar species being confounded, in his report of the Novara-collection he gives a detailed comparative diagnosis of the two species, by this creating a sufficient description of the species which in his opinion is <i>insignis</i> (Rbr.), thus generating a homonym.
cf. Brauer 1867b	Hagen in a letter disagrees with Brauer's identification of <i>A. insignis</i> (Rbr.) [This disagreement is not mentioned in Hagen 1867]
Brauer 1867b	Brauer refuses Hagen's contradiction. He describes a specimen from the Kaup collection from Menado (Celebes), which differs from the species he takes to be Rambur's <i>insignis</i> , as <i>A. quatuorotata</i> (a second synonym of Rambur's species).
Brauer 1868d	In his summary on <i>Agrionoptera</i> he lists besides Rambur's <i>insignis</i> his taxa <i>nicobarica</i> , <i>quatuorotata</i> and a nomen nudum, <i>A. lineata</i> from the Philippines
Selys 1879	Selys lists 11 species of <i>Agrionoptera</i> in which he gives a description of <i>A. lineata</i> from the Philippines, which he credits to Brauer, whose specimen has been transferred to the Selys collection (he says the ♀ specimen was collected by C. Semper). Furthermore he corrects Brauer's error concerning the Amboina specimens describing these as <i>A. sexlineata</i> .
Brauer 1883	Brauer states, that in species of <i>Agrionoptera</i> the abdomen is slim and three-sided, inflated at the base, while in <i>Orthemis</i> the abdomen is rather of equal breadth or only slightly reduced distally, which features he says Selys has not taken into consideration in his 1879 publication
Kirby 1889	Kirby splits a new genus <i>Nesoxenia</i> from <i>Agrionoptera</i> , distinguished by a convex frontal tubercle, which is bifid in <i>Agrionoptera</i>
Karsch 1890	Karsch doubts whether the species described by Selys as <i>A. lineata</i> Brauer really pertains to the genus <i>Agrionoptera</i> or to the closely related new genus <i>Nesoxenia</i> Kirby, 1889. He contacted Brauer, who sends a detailed description of the species, but cannot tell to which genus it really belongs, as his specimen is now in Selys' collection, and his note does not cover the feature, by which the two genera are to be distinguished.

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