AQUATIC INSECTS OF CHINA.

ARTICLE VI. REVISED KEY TO THE GENERA OF EPHEMEROPTERA.

BY DR. GEORG ULMER.

(Hamburg, Germany).


In my paper of 1920 there were some errors and mistakes which have been much augmented in the "Key". Moreover during the last ten or twelve years a series of new genera have been created and some of the older genera have become better known. Therefore I have prepared this revised Key and I wish to express my thanks to the Board on Publications of the Bulletin for their kindness in giving this new Key a place in the Bulletin.

Some remarks concerning the new genera will be published in another article.

SUBORDERS OF EPHEMEROPTERA.

A. Cu₁ and A₁ of fore wing diverging very strongly at base (Fig. 1, 2, 3, 5); hind tarsus with only four (sometimes fewer) freely movable joints; fifth joint if present closely and immovably united with tibia......SUBORDER I. EPHEMEROIDEA.

AA. Cu₁ and A₁ of fore wing running parallel to each other at base, rarely slightly diverging. (Fig. 6, 7, 8, 11, 12, 14-20).

B. Hind tarsus with only four freely movable joints; fifth joint if present closely and immovably united with tibia......SUBORDER II. BAETOIDEA.

BB. Hind tarsus with five freely movable joints.........................................................................SUBORDER III. HEPTAGENIOIDEA.

FAMILIES OF SUBORDER I. EPHEMEROIDEA.

A. Sc of fore wing (Fig. 1) hidden in a fold of the membrane under R, being invisible at apex and visible only at base; branches of R and M approaching each other in pairs; both wings dull and translucent; legs of female short and feeble, those of male strong; only two caudal filaments in male and female; genital appendages 3-jointed (exceptionally with more than two terminal joints), basal joint long..............

.............................................................................................................. I. PALINGENIIDAE.
AQUATIC INSECTS

AA. Sc of fore wing visible throughout, fully developed. (Fig. 2, 3, 5)

B. Both wings (Fig. 5) translucent, in male dull glistening, in female quite dull; no free intercalaries at hind margin of the wings; legs feeble, fore legs of male sometimes long, hind legs always short and feeble (except in Eutyplocia a.o.).

II. POLYMITARCIDAE

BB. Both wings (Fig. 2, 4) transparent and glistening; numerous short free intercalaries at hind margin, especially of the hind wing; legs strong, always functional.

C. A3 of fore wing (Fig. 2) not forked, but united with margin of the wing by several to numerous cross veins; in the hind wing the inner sectoral fork \((R_2+R_4)\) much longer than its stem; forceps with short basal joint, second joint longest.

III. EPHEMERIDAE

CC. A3 of fore wing (Fig. 3) forked once; here no cross veins at margin of the wing; in the hind wing \(R_2+R_4\) shorter or at most as long as the stem; forceps without short basal joint, first joint longest.

IV. POTAMANTHIDAE

AA. M of fore wing forked behind the middle; at least three long intercalaries in the first anal area; fore tarsus of male about \(2\frac{1}{2}\) time as long as femur; caudal filaments of female about as long as the body; forceps slender, consisting of 6 to 7 joints, the first joint very long, the last 5 to 6 joints short.

PALINGENIIDAE

AA. M of fore wing forked before the middle; only one long intercalary in the first anal area; fore tarsus of male only about as long as femur; caudal filaments of female about \(\frac{1}{2}\) as long as the body.

B. M of fore wing forked before the sector or at most at the same time with it; Sc and R at apex unclear and hidden; hind leg with only one claw; fore legs of male shorter than hind legs; front of head without a large forked process; 10th sternite of male short and broad, with deep and arched notch at posterior margin; forceps only 3-jointed, the last two joints short.

ANAGENESIA Etn.

BB. M of fore wing forked after the sector; Sc and R clearly visible at the apex though very near to costa, hind leg with two claws, fore leg of male longer and stronger than hind legs.

C. Front of head with a small forked process only; forceps slender, consisting of 7 joints, the first joint very long, the others short (as in Palingenia).

MORTOGENESIA Lest.

CC. Front of head with a large forked process; forceps only 3-jointed, the last two joints short.

PLETHOGENESIA Ulm.

GENUS OF FAMILY I. PALINGENIIDAE.

A. M of fore wing (Fig. 1) forked in the first anal area; fore tarsus of male about \(2\frac{1}{2}\) time as long as femur; caudal filaments of female about as long as the body; forceps slender, consisting of 6 to 7 joints, the first joint very long, the last 5 to 6 joints short.

PALINGENIA Etn.

B. Pronotum very short, fore leg of male almost as long as the male.

C. Short intercalaries at hind margin of the wings; legs feeble, fore legs of male sometimes long, hind legs always short and feeble (except in Eutyplocia a.o.).

CC. No short intercalaries at hind margin, especially of the hind wing; legs strong, always functional.

D. The two first intercalaries connected with each other, the inner sectoral fork \((R_2+R_4)\) much longer than its stem; forceps with short basal joint, second joint longest.

III. EPHEMERIDAE

CC. A3 of fore wing (Fig. 3) forked once; here no cross veins at margin of the wing; in the hind wing \(R_2+R_4\) shorter or at most as long as the stem; forceps without short basal joint, first joint longest.

IV. POTAMANTHIDAE

AA. M of fore wing forked behind the middle; at least three long intercalaries in the first anal area; fore tarsus of male about \(2\frac{1}{2}\) time as long as femur; caudal filaments of female about as long as the body; forceps slender, consisting of 6 to 7 joints, the first joint very long, the last 5 to 6 joints short.

PALINOENIA Etn.

BB. M of fore wing forked after the middle; only one long intercalary in the first anal area; fore tarsus of male only about as long as femur; caudal filaments of female about \(\frac{1}{2}\) as long as the body.

C. Front of head with a large forked process; forceps slender, consisting of 7 joints, the first joint very long, the others short (as in Palingenia).

MORTOGENESIA Lest.

CC. Front of head with a large forked process; forceps only 3-jointed, the last two joints short.

PLETHOGENESIA Ulm.
GEORG ULMER

GENERAE OF FAMILY II. POLYMITARCIDAE.

A. M of fore wing forked near base and before radial sector; two long simple intercalaries in the 1st anal area.

B. Pronotum very short, ring-like, not broader behind than in front; fore leg of male almost as long as the body or even somewhat longer; forceps stout.

C. Short intercalaries present at the apical margin of the fore wing; the first intercalary of the anal area goes into the 1st anal vein, the second is connected with the latter only by a cross vein; fore legs of the male longer than the body.............................................ASTHENOPIDES Ulm.

CC. No short intercalaries at the apical margin of the fore wing; fore legs of the male nearly as long as the body.

D. The two long intercalaries in the 1st anal area arising together from A1; penial lobes curved like claws......................................ASTHENOPUS Etn.

DD. One of the two intercalaries in the 1st anal area (Fig. 13) arising from A1, the other one arising opposite the first from A2; penial lobes straight, rod-like..............................................POVILLA Nav.

BB. Pronotum longer, almost as long as broad, much broader behind than in front; fore leg of male about half as long as body, much shorter than the abdomen; the two long intercalaries in the 1st anal area running into A1 near each other or even together; forceps very slender and long, penial lobes hooklike or claw-like.

C. Middle legs and hind legs broadened and fin-like, very short; basis of the forceps not with a claw-shaped link at the side.........................CAMPSURUS Etn.

CC. Middle legs and hind legs thin, not broadened, very short; basis of the forceps with a long claw-shaped link at the side..........................

...........................................................TORTOPUS Neech. & Murph.

AA. M of fore wing (Fig. 5) forked at most at the end of the first fourth and behind (or at the same time with) the sector; number and form of intercalaries varying.

B. No S-formed cross veins from A1 or the last intercalary to the wing margin in the fore wing; two to nine intercalaries in the 1st anal area of the fore wing united with each other by numerous cross veins and converging toward the base; pronotum somewhat broader than long; fore leg of male about as long as body, the other legs short and feeble; forceps 4-jointed.

C. Fore wing (Fig. 5.) with an additional branch to A1, this vein therefore forked; the intercalarys lying in the area between these 2 branches of A1; eyes of male small, only half as broad as their distance............................................POLYMITARCY S Etn.

CC. Fore wing without a forked A1, this normal; intercalaries lying in the area between A1 and A2; eyes of male very large, twice as broad as their distance......................................................EPHORON Walsh.
BB. Several to numerous S-formed cross veins running to the wing margin from A1 (when no intercalaries present) or from the last intercalary; none or at most one to three intercalaries in the 1st anal area of the wing; these when present united with each other by numerous cross veins.

C. Pronotum at least as long as broad behind; hind wing small, elongate oval, venation reduced, R not arising from base of the wing but from the sector at the end of the first third, M and Cu not forked; fore leg of male short, only about as long as the head and thorax together, that of the female still more delicate; hind legs very feeble; male with only two caudal filaments.

CC. Pronotum much broader than long; hind wing broader, with normal R, at least M being forked; fore leg of male about as long as the whole body, the other legs also well developed and long; male and female with three caudal filaments.

D. No intercalary in the 1st anal area of the fore wing; forceps of male with 2 joints, a long basal and a short apical joint.

DD. One to three intercalaries in the 1st anal area; forceps of male with only 1 joint, the short apical joint wanting.

E. M of fore wing forked behind the sector; besides and between the long intercalaries in the 1st anal area there are sometimes some shorter ones; in the areas between sector and A1 often pairs of long intercalaries, sometimes in all these areas, sometimes only in several, and sometimes only in one area; fore femur about \( \frac{3}{5} \) as long as tibia.

EE. M of fore wing forked at the same time with the sector; fore femur \( \frac{1}{2} \) as long as the tibia.

GENERAE OF FAMILY III. EPHEMERIDAE.

A. Only two long caudal filaments.

B. Male specimen.

C. Fore leg of male almost as long as body (at least two thirds as long), tarsus about \( \frac{1}{2} \) to \( \frac{2}{5} \) as long as femur.

D. Forceps with only one short terminal joint (i.e. only 3-jointed).

DD. Forceps with two short terminal joints (i.e. 4-jointed).

E. Forceps attached to a large, almost quadrangular plate (10th sternite), which is longer than the basal joint of the forceps; inner claw of the fore leg hooked, outer claw blunt.

EE. Forceps attached to a large, almost quadrangular plate (10th sternite), which is longer than the basal joint of the forceps; inner claw of the fore leg hooked, outer claw blunt; with darker....

AA. Three long caudal filaments.

B. Male specimen:

C. Fore leg long, as long as femur (Fig. 2) both.

CC. Fore leg short, cross vein between sector and A1 in fore wings.

BB. Female specimen:

C. Pronotum long.

CC. Pronotum short.

D. In New Zealand.

DD. Not in New Zealand.

B. Fore legs short, brachypterous.

EE. Forceps attached to a large, almost quadrangular plate (10th sternite), which is longer than the basal joint of the forceps; inner claw of the fore leg hooked, outer claw blunt.

GENERAE OF FAMILY III. EPHEMERIDAE.
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EE. Forceps attached to a broad rectangular plate, which is at most as long as the basal joint of the forceps; both claws of fore leg blunt; penial lobes hooked..............................................HEXAGENIA Walsh.

CC. Fore leg of male about half as long as the body; tarsus hardly as long as femur; penial lobes almost straight.............................................PENTAGENIA Walsh.

BB. Female specimen; pronotum longer than broad; fore tarsus as long as tibia.............................................................................HEXAGENIA Walsh.

AA. Three long caudal filaments.

B. Male specimen:

C. Fore leg long, tibia 2 1/2 to 3 times as long as femur, tarsus about 4 times as long as femur; a series of cross veins between A3 and wing margin (Fig. 2) both claws of fore leg blunt.............................................EPHEMERA L.

CC. Fore leg shorter, tibia 1 1/4 to 1 1/2 times as long as femur; only a single cross vein between A3 and wing margin; inner claw of fore leg hooked, outer claw blunt.............................................NEOEPHEMERA McD.

BB. Female specimen:

C. Pronotum longer than broad.............................................EATONICA Nav.

CC. Pronotum shorter than broad.

D. In New Zealand.............................................ICHTHYBOTUS Etn.

DD. Not in New Zealand.

E. Fore wing shorter and broader than in Pentagenia; a series of cross veins between A3 and wing margin; in the hind wing the second branch of M (almost without exception) running into Cu; anal region of hind wings little developed (Fig. 2).............................................EPHEMERA L.

EE. Fore wing longer and narrower; only a few (2 to 3) cross veins between A3 and wing margin; in the hind wing the second branch of M normally running into the first branch; anal region of hind wings well developed.............................................PENTAGENIA Walsh.

GENERAE OF FAMILY IV. POTAMANTHIDAE.

A. Cu2 of fore wing (Fig. 3) is connected with Cu1 at base (as it is normal); Cu2 and A1 independent from one another.

B. R1 of hind wing (Fig. 3) is normal, i.e. the stem of R forms with R1 and the radial sector together the letter Y (Ypsilon).

C. Three long caudal filaments (male and female); in the fore leg both claws blunt; fore tarsus of male about as long as tibia; wings not spotted with darker.............................................POTAMANTHUS Pict.

CC. Only two long caudal filaments (male and female).
D. Wings whitish, without spots, abdomen in the middle also whitish; genitalia of male feeble..........................LEUCORHOENANTHUS Lest.
DD. Wings and abdomen not whitish, wings adorned with reddish or purple or brown.
E. Genital appendages rudimentary; forceps consisting of 2 or 3 very small joints, penis forming only feeble filaments..............................POTAMANHELLUS Lest.
EE. Genital appendages stout and fully developed ..................................................RHOEANTHOPSIS Ulm.

BB. R1 of hind wing (Fig. 4) just after its base bent very strongly against Sc and then parallel to it, thus imitating the particulars of Sc; only two long caudal filaments..................POTAMANTHINDUS Lest.

AA. Cu2 of fore wing is not connected with Cu1 at base, but with A1, thus Cu2 and A1 having the same stem.
B. Only two long caudal filaments; R1 of hind wing normal...............RHOENANTHUS Etn.
BB. Three long caudal filaments; R1 of hind wing strongly bent against Sc and then parallel to it (Fig. 4)..............................POTAMANTHODES Ulm.

FAMILIES OF SUBORDER II. BAETOIDEA.

A. Sc of fore wing (Fig. 6,7,8,11,12,15,16,20) fully visible, well developed, entirely separated from R.
B. M of fore wing distinctly forked (Fig. 8,11,12,16,20)
C. Wings clear; hind wings present, very rarely wanting; wings with numerous cross veins.
D. A1 of fore wing (Fig. 8,11) separated from A2 at base. A2 close to A3; at the most A2 is in the middle between A1 and A3; no free intercalaries between Cu2 and A1, also none between the long intercalary and Cu2; forceps (almost without exception) with 2 short terminal joints, the basal being longer......................................................V. LEPTOPHLIBIIDAE.
DD. A1 of fore wing (Fig. 12) close to A2, A2 remote from A3, several (usually two) free intercalaries between Cu2 and A1, also between the long intercalary and Cu2 (i.e. within the cubital fork); forceps with only one short terminal joint (very rarely with two), the preceding being longer.............................................VI. EPHEMERELLIDAE.
CC. Wings (Fig. 16, 20) milky or darkly tinged, fringed at the posterior margin, hind wings wanting (sometimes present only in the subimago); no free intercalaries, often with only a few cross veins; small species...........................................VII. CAENIDAE.

BB. M of fore wing intercalaries behind from M1; fore wing small and narrow, veins, or hind wing

AA. Sc of fore wing (Fig. 8,10,16) or entirely wanting; with fore wing with 4 to 7 anterior areas, hind wing large and medium species.
NB. The tenth family but there are known only not the imago.

GENE
he middle also whitish; RHOENANTHUS Lest. adorned with reddish or slips consisting of 2 or 3 feeble filaments.

.POTAMANTHELLOS Lest. developed. ...

RHOENANTHOPSIS Ulm. strongly against Sc and Sc; only two long caudal...

.POTAMANTHINDUS Lest. at with A1, thus Cu2 and...

...RHOENANTHUS Etn. strongly bent against Sc and...

POTAMANTHODES Ulm. EA. well developed, entirely wanting; wings with...

3 at base. A2 close to 1 A1 and A3; no free between the long inter-

....V. LEPTOPHLEBIIDAE. remote from A3, several and A1, also between the....

VI. EPHEMERELLIDAE. id at the posterior margin, the subimago); no free small species.

....................VII. CAENIDAE.

BB. M of fore wing (Fig. 6,7,15) not forked; M1 therefore simple; 2 free intercalaries behind M1, the second one corresponding to M2 but not arising from M1; fore wing usually with only a few cross veins; hind wing very small and narrow, with only 2 to 3 longitudinal veins and usually a few cross veins, or hind wing entirely wanting; wings clear.

..........................................................VIII. BAETIDAE.

AA. Sc of fore wing (Fig. 17) not visible (or at most clear at the base), united with R or entirely wanting; wings milky or grayish tinged, with very simple venation; fore wing with 4 to 7 longitudinal veins, with cross veins at most in the first 2 to 5 anterior areas, hind wing without or with very few cross veins in the basal part; large and medium species.

IX. OLIGONEURIIDAE. NB. The tenth family (PROSOPISTOTIDAE) looks similar to the CAENIDAE; but there are known only the nymph and the subimago of the PROSOPISTOTIDAE, not the imago.

GENERAE OF FAMILY V. LEPTOPHLEBIIDAE.

A. Hind wings (Fig. 8, 10, 11) present, sometimes small.

B. Claws all similar, narrow and hooked.

C. Hind wings more or less broad oval, anterior margin convex, without prominent process; the crest of the arch lying before the middle, behind this crest the margin somewhat concave, the deepest point of this concavity being far before the end of Sc; Sc long, costal area long and narrow, the subcostal area broader than costal area; forceps 3-jointed, basal joint much longer than the two terminal joints together; 10th sternite not split into plates.

D. In fore wing A2 is furcated, i.e. the first intercalary comes directly from A2. MASSERTELLA Lest.

DD. In fore wing A2 is not furcated, i.e. the first intercalary not at all or only by a cross vein connected to A2,

E. In the hind wing the tip of Sc at 9/10 of wing length; intercalary median fork present; cross veins in the anal region present.

.......................................................... ATALOPHLEBIA Etn.

EE. In the hind wing the tip of Sc at 2/3 of wing length; intercalary of median fork absent; cross veins in the anal region absent.

..........................................................NOUSIA Nav.

CC. Hind wings more obliquely rectangular, anterior margin with prominent blunt process before or at the middle; behind this process the costal margin changing into a flat concave arch, reaching the end of R, the deepest point of the concavity lying at the end of Sc; Sc short, costal area short and broad, subcostal area narrower or at most as broad as the costal area; 10th sternite not divided into plates.
D. In hind wings the projection at the anterior margin is very strong, lying before the middle; M is forked, with an intercalary; cross veins present also in the cubito-anal region up to the hind margin; forceps with only two joints, the second small joint at the end wanting; penial lobes lying together, their apex knobbed.

E. Fore wing very long and small, the hind margin almost straight; first anal area with only 2 long intercalaries...ESBENOPHLEBIA Lest.

EE. Fore wing of a normal form, the hind margin more convex at the tornus; first anal area with 3 long intercalaries; the whole wing with more cross veins.......................... ADENOPHLEBIA Etn.

DD. In hind wing the projection at the anterior margin is smaller, lying in the middle; M without a fork and without an intercalary; no cross veins in the cubito-anal region; forceps with 3 joints; penial lobes divergent, with a spur-like process.......................... ADENOPHLEBIODES Ulm.

BB. Claws dissimilar, one blunt, the other pointed (hooked).

C. Hind wing (Fig. 8) obtuse oval, costal area narrow, long.

D. Median caudal filament as long as or longer than the lateral ones.

E. 10th sternite of male consisting of an undivided plate; abdomen with dark marks, otherwise same as Leptophlebia...DELEATIDUM Etn.

EE. 10th sternite of the male split into two plates, each representing the base of a forceps-limb; abdomen without dark marks.

F. A2 at the base of fore wing (Fig. 8) in the middle between A1 and A3, never as near to A3 as in Paraleptophlebia; penial lobes each with a suspending thin sporn-like appendage near apex, apex rounded or with hooks; costal margin of hind wing slightly and irregularly arched, the bending being strong at both ends, but interrupted in the middle by a shallow indentation; cross veins numerous in the fore wing; forceps 3-jointed, basal joint much longer than the two terminal joints together..........................LEPTOPHLEBIA Westw.

FF. A2 at the base of fore wing much nearer to A3 than to A1, sometimes appressed to penial lobes with the above mentioned thin and suspending appendage, and besides with a large or small usually bluntly triangular process, being directed to the side and lying in front of the apex; otherwise same as Leptophlebia..........................PARALEPTOPHLEBIA Lest.

DD. Median caudal filament much shorter than the lateral ones, otherwise same as Leptophlebia..........................BLASTURUS Etn.

CC. Hind wing (Fig. 10, 11) angularly broken at costal margin, costal area broad and usually greatly shortened, rarely long.
A gin is very strong, intercalary; cross to the hind margin; at the end wanting; in almost straight; SIBENOPHLEBIA Lest. gin more convex at calaries; the whole ADENOPHLEBIA Etn. is smaller, lying circalary; no cross joints; penial lobes NOPHLEBIODES Ulm.

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D. \(A_2\) and \(A_3\) of fore wing united with each other at base (with a common stem) or almost united; hind wing with strong, often hook-like projection on the costal margin, Sc very short; forceps 3-jointed, the basal joint longer than the two terminal joints together; last sternite of male not divided; female sometimes with ovipositor.

\[\ldots\]

DD. \(A_2\) and \(A_3\) of fore wing separated from each other; hind wing with blunt, never hook-like projection on costal margin.

E. M of hind wing forked; Sc only slightly shortened and reaching out over the projection of the costa, usually to about the middle between this projection and the end of the radius; forceps 3-jointed, basal joint much longer than the two terminal joints together; penis divided into two broad lobes, each lobe with an inward and upward directed thin appendage; last sternite not divided; its dorsal marginal lamella projecting far out in the middle.

\[\ldots\]

EE. M of hind wing not forked (Fig. 10, 11).

F. Sc of hind wing (Fig. 10) reaching almost to the apex, therefore long; forceps always 3-jointed, basal joint sometimes with a ring-like constriction at base.

G. Basal joint of forceps hardly as long as the two terminal joints together; last sternite divided into plates.

H. Hind wing rather narrow, especially in the distal half of the costal area; no cross veins in the distal part of the subcostal area; penial lobes very narrow, with only a small hook-like process near the base.

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HH. Hind wing (Fig. 10) broader, especially in the distal half of the costal area; 1 or 2 cross veins in the distal part of the subcostal area; penial lobes thicker, with long suspending sporn-like process from the apex.

\[\ldots\]

GG. Basal joint of forceps much longer than the two terminal joints together, last sternite undivided, but with two somewhat parallel short finger-like processes in the middle of the hind margin.

\[\ldots\]

FF. Sc of hind wing (Fig. 11) ending opposite to or just behind the projection of the costa, being therefore greatly shortened; forceps 3- or 4-jointed.
G. Last sternite of male divided into two triangular plates; Sc of hind wing ending opposite to the projection, being therefore greatly shortened; forceps 3-jointed, basal joint much longer than the two terminal joints together, with a ring-like constriction at base; penial lobes close to each other, narrow, each lobe with a down-hanging appendage .............................................. HABROPHLEBIODES Ulm.

GG. Last sternite of male not divided into plates.

H. Forceps distinctly 4-jointed, the short basal joint ring-like, the second joint much longer than the two terminal joints together. Sc of hind wing (Fig. 11) ending just beyond the projection at the deepest part of the costa; penis rather small, divided into two long contiguous lobes, without appendages; last sternite undivided, short, somewhat produced in the middle of the hind margin.................... CHOROTERPES Etn.

HH. Forceps 3-jointed, without a short ring-like basal joint, otherwise same as Choroterpes; Sc of hind wing still more shortened, ending opposite to the projection; penis divided into two lobes, each lobe usually with a thin down-hanging appendage; last sternite not divided, dorsal marginal lamella sometimes projecting far out on each side............................................ THRAULUS Etn.

AA. Hind wings entirely wanting.

B. Fore wing with pointed apex and with the apical margin undulated, having four teeth from the apex to the tornus.......................... FULLETA Nav.

BB. Fore wing not pointed at the apex and not undulated at the apical margin.

C. Fore wing long and narrow, usually with thick net-work of cross veins; forceps only 2-jointed, a long basal joint and a much shortened terminal joint; last sternite not divided; penial lobes very narrow and rod-like, fore-tarsus of male as long as tibia.............................................. HAGENULODES Ulm.

CC. Fore wing somewhat broader, with fewer cross veins; forceps 3-jointed, basal joint much longer than the two terminal joints together; last sternite not divided; penial lobes rod-like but broader; fore tarsus only about two thirds as long as the tibia; female with ovipositor............................ HAGENULOPSIS Ulm.

GENERAE OF FAMILY VI. EPHEMERELLIDAE.

A. Median caudal filament long; hind wing with well developed veins, Sc long and arched; basal joint of forceps much shorter than second joint.

B. A₁ and Cu₂ of fore wing not opposite to each other.

C. Fore wing of female not margined; hind wing of female black in both sexes.

D. Fore tibia as long as second and, if second as long as male, longer than one third of male. Sc of hind wing ending opposite to the projection; penial lobes close to each other, narrow, each lobe with a down-hanging appendage .............................................. HABROPHLEBIODES Ulm.

E. Hind wing of female not margined; hind wing of male and anal region of wings black.

F. Hind wing of female not margined; hind wing of male and anal region of wings black.

EE. Hind wing of female not margined; hind wing of male and anal region of wings black.

DD. Fore tibia as long as second and, if second as long as male, longer than one third of male. Sc of hind wing ending opposite to the projection; penial lobes close to each other, narrow, each lobe with a down-hanging appendage .............................................. HABROPHLEBIODES Ulm.

BB. A₁ and Cu₂ of fore wing not opposite to each other.
wo triangular plates; the projection, being 3-jointed, basal joint
into plates.
the short basal joint longer than the two hind wing (Fig. 11)
the deepest part ill, divided into two appendages; last
what produced in the
short ring-like basal nterpes;Sc of hind
ning opposite to the
lobes, each lobe
ning ; last
ual lamella some-

A. Median caudal filament wanting; hind wings small and with poorly developed
veins, Sc short and straight; basal joint of forceps longer than second joint

B. A₁ and Cu₂ of fore wing (Fig. 12) entirely (up to the base) separated
from each other.

C. Fore wing comparatively broad; the short free intercalaries at wing
margin mostly grouped in threes; hind wing comparatively small, region
of the sector occupying about two thirds of the wing, the medial, cubital
and anal regions only about one third; M not distinctly forked; both
wings black..................................................MElANEMERELLA Ulm.

CC. Fore wing (Fig. 12) much narrower, the short free intercalaries arranged
singly; hind wing comparatively larger, region of the sector occupying
only about half the width of the wing; wings not dark.

D. Fore tibia of male about twice as long as femur, much longer than
second and third joint of the tarsus together; tarsus at most 1⅕ as
long as the tibia or even shorter than this; fore tibia of female about
1½ as long as the femur, tarsus about ⅓ as long as tibia; hind tibia
of male and female not longer than femur; penial lobes without
spur-like process.

E. Hind tarsus at most ½ as long as tibia; second joint of forceps
not enlarged at tip; fore tibia of male more than twice as long
as femur.

F. Fore tarsus of female about ⅔ as long as tibia; forceps with
only one short joint at tip......................................EPHEMERELLA Walsh.

FF. Fore tarsus of female about ⅔ as long as tibia; forceps
with two short joints at tip.....................................EPHl3MERELLINA Lest.

EE. Hind tarsus ⅔ as long as tibia; second joint of forceps
broadened at tip; fore tibia of male twice as long as femur
..............................................................TORLEYA Lest.

DD. Fore tibia of male at most 1½ as long as femur, not longer than
second and third joint of tarsus together; tarsus at least 1⅕ as long as
tibia, sometimes twice as long; fore tibia of female about as long as
femur and also about as long as tarsus; hind tibia of male and
female often longer than femur; second joint of forceps enlarged at
tip into a thicker quadrangular part; penial lobes ending with long
spur-like process..............................................CHITONOPHORA Bgtss.

BB. A₁ and Cu₂ of fore wing united toward the base (at the cross vein), thus
appearing to arise from a common stem, otherwise same as Ephemelella
..............................................................DRUNELLA Needh.

AA. Median caudal filament wanting; hind wings small and with poorly developed
veins, Sc short and straight; basal joint of forceps longer than second joint
..............................................................TELOGANODES Etn.
AQUATIC INSECTS

GENERAE OF FAMILY VII. CAENIDAE.

A. Cu₂ and cubital intercalary of fore wing (Fig. 16) as long as Cu₁, both therefore running up to the base; in first anal area the two intercalaries forming a very long narrow fork; A₂ and A₃ forming a similar fork; cross veins of wing arranged singly, no area with more than one cross vein, only radial area with 2 to at most 3 cross veiws; wings broad, anal field broadened toward the body, broadly spread out; male and female with 3 caudal filaments; forceps 1-jointed, slender, pointed; penis broad, plate-like, undivided; 10th sternite undivided.

B. Prosternum very narrow, 2 to 3 times longer than broad, the fore coxae therefore closely approximate; second antennal joint not lengthened.

C. Fore leg of male scarcely longer than hind legs; fore femur about 4/5 or 5/6 as long as tibia, and tibia about 1 ½ as long as tarsus.

CAENODES Ulm.

CC. Fore leg of male much longer than hind legs, thin; fore femur about 1 ½ as long as tibia, and tibia about 1 ½ as long as tarsus.

CAENIS Steph.

BB. Fore wings comparatively narrow, broadest at the cubital region.

C. Legs short, hind leg somewhat longer than fore leg.

LEPTOHYPHES Etn.

CC. Legs longer and thinner, fore leg of male about as long as body, hind leg almost equally long, in female too is the hind leg almost as long as body.

LEPTOHYPHODES Ulm.

BB. Fore wings (Fig. 20) comparatively broader, much as in Caenis, broadest in the anal region.

C. Legs short as in Leptohyphe, half as long as body.

THICORYTHUS Etn.

CC. Legs longer and thinner, as in Leptohypode.

TRICORVTHODES Ulm.

GENERAE OF FAMILY VIII. BAETIDAE.

A. Hind wings wanting.

B. Short free intercalaries on outer margin of fore wing arranged singly.

C. First cross vein between R and upper branch of sector meeting the latter distinctly basad of the cross vein in the following area.

GLOEON Leach.
CC. First cross vein between R and upper branch of sector meeting the letter at or distad of the cross vein in the following area........ PROCLOEON Bgtss.

BB. Intercalary veins arranged in pairs (Fig. 15).................. PSEUDOCLOEON Klap.

BBB. Intercalary veins totally absent.................. BAETODES Needh. & Murph.

AA. Hind wings present, though sometimes very small.

B. Hind wing with cross veins at least in the costal area, very often in the other areas too.

C. Fore wing with numerous cross veins in basal half of costal area...

................................................................. CALLIBAETIS Etn.

CC. Cross veins absent in basal half of costal area of fore wing........

................................................................. NEOBAETIS Nav.

BB. Hind wing (Fig. 7, 9) without cross veins in the costal area, and with only 1 or 2 in the other areas, or without cross veins at all.

C. Intercalary veins of fore wing arranged singly (Fig. 7).

D. Hind wing (Fig. 7) very long and narrow, with long pointed process on costal margin, with at most 2 longitudinal veins, without cross veins................................................ CENTROPTILUM Etn.

DD. Hind wing comparatively broad, with pointed process on costal margin, distad of which is sometimes a second more blunt process, with three long longitudinal veins, the middle one of which can be forked................................................ CENTROPTILOIDES Lest.

CC. Intercalary veins of fore wing arranged in pairs.

D. Hind wing (Fig. 9) with 2 or 3 longitudinal veins.

E. Hind wing very small and narrow, without process on costal margin, with only 2 simple longitudinal veins....... ACENTRELLA Bgtss.

EE. Hind wing (Fig. 9) oval-shaped, with sharply or bluntly pointed process on costal margin, with 2 or at most 3 longitudinal veins, the second sometimes forked ............. BAETIS Leach.

DD. Hind wing with only occasional traces of a single vein, very narrow, a mere thread without costal projection........... HETEROCLOEON McD.

CCC. Intercalary veins of fore wing totally absent; hind wing with 3 longitudinal veins, the base of hind wing with an angulate projection

................................................................. BRUCHELLA Nav.

**Genera of Family IX Oligoneuriidae.**

A. With only 2 caudal filaments.
B. Three long strong longitudinal veins running up to the base between R and anal vein in the fore wing; Rs (the second of these longitudinal veins) running up to the base; Cu with very long fork (+), anal vein also forked; several to many cross veins in costal area, 3 to 4 in radial area, 2 in the following area; forceps 2-jointed, the basal joint very long, the terminal joint short. SPANIOPHLEBIA Etn.

BB. Only two longitudinal veins running up to the base between R and anal vein in the fore wing; Rs arising behind the middle of R, and forming a fork with it; Cu with shorter fork (or with shorter longitudinal vein instead of it); anal vein also forked.

C. Only one row of 3 cross veins in the fore wing, i.e. only one single cross vein in each area; forceps 2-jointed, the basal joint very long, the terminal joint short; penis divided into 2 broad triangular lobes. LACHLANIA Etn.

CC. More numerous cross veins in the fore wing, i.e. several cross veins in each area; forceps and penis same as in Lachlania. NOYA Nav.

AA. With three caudal filaments.

B. Only 2 strong longitudinal veins between R and anal vein in the fore wing, either both running up to the base or the lower one arising from the upper one as a shortened branch.

C. Both longitudinal veins between R and anal vein running up to the base; anal vein undivided; without cross veins in radial area; no indistinct longitudinal vein and no cross veins between anal vein and preceding longitudinal vein (Cu ). HOMOEONEURIA Etn.

CC. Of the 2 longitudinal veins between R and anal vein only the first one running to the base, the second one being a branch of the first, arising shortly before the middle of the wing; a long indistinct (weak) longitudinal vein between this forked vein and the anal vein running into the first strong longitudinal vein at base, numerous very indistinct cross veins in this space, anal vein forked; radial area with distinct cross veins; forceps 3-jointed, basal joint very long, the 2 terminal joints very short, penis split into 2 blunt triangular lobes. ELASSONEURIA Etn.

BB. Three strong longitudinal veins (Fig. 17) between R and anal vein of the fore wing, either all three running up to the base or the first appearing as a shortened branch (sector) of R; anal vein forked; in the fore part of wing several rows of cross veins.

C. Cu of fore wing with a long forked vein, which is only weakly marked; Rs much shortened, coming out of R in about the middle of wing. OLGONEURIA Pict.

(+). Instead of the second branch of Cu there can be a shortened longitudinal vein, just after its base connected with Cu by a cross vein; this cross vein stands on the same height as the base of the anal fork and is therefore much more basal than in Noya.

CC. Cu of fore wing therefore long and short (sometime)

GENUS

Only one genus, BAETISCA Pic.

FAMILY

A. First anal area of fore wing somewhat parallel to e or S-formed intercalaries or straight and sometimes wing almost circular, with 4 areas; pronotum very small.

AA. First anal area of fore wing broadening toward apex A2 and A3 parallel to e.

B. First anal area of intercalaries, extending with shorter free developed

BB. First anal area o but with 2 to 4 str prothorax well deve

C. First anal area sometimes with very short and ...

CC. First anal area the longer pai

GEN

Only one genus, BAETISCA Pic.

GENERAL

A. Hind tarsus shorter or in length.

B. Cubital intercalary
GEORG ULMER 209

CC. Cu of fore wing (Fig. 17) not forked; Rs already free at its base, therefore long; forceps with 3 joints, the first joint very long, the others short (sometimes with 3 short apical joints) 

GENUS OF FAMILY X. PROSOPISTOMATIDAE.

Only one genus, PROSOPISTOMA Latr.; imaginal-stadium still fully unknown; only the very characteristic broad nymph well known, the subimago extremely rare; classification being therefore impossible; subimago similar to Caenis in certain respects, but there are four wings with numerous longitudinal veins.

FAMILIES OF SUBORDER III. HEPTAGENIOIDEA.

A. First anal area of fore wing very narrow, not broadened at apex; A1, A2 and A3 somewhat parallel to each other and equal in length; first anal area without paired or S-formed intercalaries, but with cross veins between A1 and A2. S-formed or straight and sometimes divided veins extending from A2 to wing margin; hind wing almost circular, with very numerous long intercalaries also in cubital and anal areas; pronotum very small 

B. First anal area of fore wing (Fig. 14, 18, 19) narrow only at base, distinctly broadening toward apex, A2 much shorter and more strongly curved than A1; only A2 and A3 parallel to each other; hind wing not circular but more or less oval.

BB. First anal area of fore wing (Fig. 14, 18) without S-formed intercalaries, but with 2 to 4 straight and not connected intercalaries arranged in pairs; prothorax well developed.

C. First anal area of fore wing (Fig. 14) with only a pair of intercalaries; sometimes with indication of a second pair of intercalaries, which then are very short and lying near A2 (i.e. the reverse of Ecdyonuridae) 

GENUS OF FAMILY XI. BAEITICIDAE.

Only one genus, BAEITICA Walsh.

GENERAL OF FAMILY XII. SIPHNONURIDAE.

A. Hind tarsus shorter or at most as long as tibia; fore tarsus of male varying in length.

B. Cubital intercalary in fore wing unusually short.
C. A1 of fore wing parallel to A2 at base; cross veins of pterostigma region united with each other so as to form a thick net-work, the cells of which are arranged in two rows one behind the other; penis far extended, with long fork-like branches..........................CHIMURA Nav.

CC. A1 running into A2 at base; cross veins of pterostigma region not so thickly reticulate, and the cells not forming two rows........ANDROMINA Nav.

BB. Cubital intercalary in fore wing normal, very long.

C. Claws of all tarsi dissimilar in the pairs.

D. Median caudal filament rudimentary but distinctly jointed; fore tarsus of male about as long as tibia, tibia about \( \frac{5}{8} \) as long as femur; hind tarsus of male about \( \frac{5}{12} \) as long as tibia; fore tarsus of female about \( \frac{3}{8} \) as long as tibia; 10th sternite of male split almost up to the base, that of the female very deeply notched at hind margin; second joint of forceps longer than the two terminal joints together.................................COLOBURISCUS Etn.

DD. Median caudal filament entirely wanting; fore tarsus of male about twice as long as tibia, tibia about \( \frac{9}{10} \) as long as femur; hind tarsus of male almost as long as tibia; fore tarsus of female almost exactly as long as tibia; 10th sternite of male forming a board plate, roundedly or angularly notched at hind margin, that of the female bluntly triangular, angularly notched at hind margin; 2nd joint of forceps longer than the two terminal joints together........AMELETUS Etn.

CC. Hind tarsi and usually also the fore tarsi with similar, pointed claws.

D. Anal region of hind wing narrow, A2 unbranched; fore tarsus of male at least twice as long as tibia, tibia about \( \frac{1}{8} \) as long as femur; hind tarsus of male about \( \frac{3}{4} \) as long as tibia; 10th sternite of male angularly and broadly notched; 2nd joint of forceps longer than the two terminal joints together; median caudal filament very short, about \( \frac{1}{8} \) as long as the lateral ones.........................METAMONIUS Etn.

DD. Anal region broad in hind wing, A2 with several branches.

E. Fore tarsus of male hardly longer than tibia, claws of fore legs not hooked, but similar to each other; fore tibia of female much longer than femur; 10th sternite of male split almost to the base, thus consisting of two separate lateral plates; the two terminal joints of forceps short, being about \( \frac{3}{4} \) as long as the 2nd joint; 10th sternite of female not split; median caudal filament sometimes entirely wanting, sometimes very tiny..........................ISONYCHIA Etn.

EE. Fore tarsus of male at least twice as long as tibia, claws of fore legs pointed; fore tibia of female about \( \frac{3}{4} \) as long as femur.
ns of pterostigma region
work, the cells of which
penis far extended, with


CHIMURA
Nav.


ANDROMINA
Nav.


COLOBURISCUS Etn.
fore tarsus of male about
as femur; hind tarsus of
female almost exactly
forming a board plate,
gin, that of the female
margin; 2nd joint of
other.....AMELETUS Etn.


SIPHLONISCA Needh.


SIPHLURELLA Bgtss.


SIPHLONURUS Etn.


SIPHLONUROIDES McD.


SIPHLURISCUS Ulm.
BB. Claws dissimilar in the pairs; abdominal segments 5-9 (or 6-9, female, or 8-9, female) with flat broad processes on sides; 10th sternite of male split into two separate rectangular lateral plates; forceps 4-jointed, the 2nd joint longest, longer than the two terminal joints together; 10th sternite of female not divided; median caudal filament distinct, about 1/4 as long as body in male, about 1/6 as long as body in female............................................ONISCIOASTER Etn.

GENERAE OF FAMILY XIII. AMETROPIDAE.

A. Median caudal filaments as long as the lateral ones; fore tarsus of male about 5 times as long as tibia; hind tarsus of male more than 1/2 times as long as tibia; fore tarsus of female about 2/3 as long as tibia; median fork of hind wing (Fig. 14) about as long as its stem; costal process angular; 10th sternite of male deeply roundedly notched on hind margin between the forceps-limbs; forceps 4-jointed, the basal joint almost as long as the second, 2nd joint longest, the 2 terminal joints together only about as long as the basal joint.......................AMETROPUS Albda.

AA. Median caudal filament very rudimentary, with only very few joints; fore tarsus of male about 2 1/2 to 3 times as long as tibia; hind tarsus of male as long as or (in other species) 1 1/2 to 2 times as long as tibia; fore tarsus of female 1 1/2 as long as tibia; in the hind wing the median fork very long, several times longer than its stem; costal process same as Ametopus; 10th sternite of male similarly but less deeply notched; forceps 4-jointed, basal joint very short, 2nd joint very long, basal joint distinctly shorter than the 2 terminal joints together only about as long as the basal joint.......................METRETOPUS Etn.

GENERAE OF FAMILY XIV. ECYONURIDAE.

A. Only comparatively few (thickened) cross veins in the fore wing, arranged in the disk in about four broad adjacent transverse rows; hind wing with four longitudinal veins behind median fork; fore leg of male as long as the body, tarsus about as long as the tibia, tibia 1/2 as long as femur; first tarsal joint very short, second joint four times as long as this, third joint nearly as long as second, fourth joint shorter and fifth joint still shorter, but longer than first; hind tarsus of male about 1/2 as long as tibia; fore tarsus of female almost as long as tibia; forceps and penis similar to those of Heptagenia.............................................COMPSONEURIA Etn.

AA. Cross veins normal in number in the fore wing, (Fig. 18) thus forming a more or less thick network of cells.

B. Hind wing narrow and small, with very slightly developed cubital and anal regions, with only two longitudinal veins behind the median fork; fore tarsus of male almost 1 1/2 times as long as tibia; hind tarsus of male about 1/2 as long as tibia; 10th sternite of male slightly notched on hind margin; forceps and penis similar to those of Rhithrogena.............................................BLEPTUS Etn.

BB. Hind wing (Fig. 18) normally developed, with at least 4 longitudinal veins and also cross veins behind the median fork, cubitus (mostly) divided.
nts 5-9 (or 6-9, female, or 0th sternite of male split ps 4-jointed, the 2nd joint er; 10th sternite of female ¼ as long as body in male, .......ONISCIOASTER Etn.

fore tarsus of male about ½ 1½ times as long as tibia; ork of hind wing (Fig. 14) th sternite of male deeply nbs; forceps 4-jointed, the ngest, the 2 terminal joints .........AMETROPUS Albda. very few joints; fore tarsus arsus of male as long as or arsus of female 1½ as long several times longer than its of male similarly but less, 2nd joint very long, basal .........METRETOPUS Etn.

fore wing, arranged in the wing with four longitudinal body, tarsus about as long int very short, second joint second, fourth joint shorter tarsus of male about ½ as s tibia; forceps and penis .........COMPSONEURIA Etn. 18) thus forming a more or developed cubital and anal median fork; fore tarsus of s of male about ½ as long hind margin; forceps and ..........BLEPTUS Etn.

least 4 longitudinal veins (mostly) divided.

C. Hind tarsus of male much longer (1½ to 2 times) than the tibia; hind tarsus of female also longer than the tibia; first tarsal joint of hind leg distinctly lengthened, about as long as the other 4 joints together and about as long as the tibia (male) or only slightly shorter (female); caudal filaments about twice as long as the body; 10th sternite of male short, deeply motched on hind margin, somewhat convex at middle, lateral pieces projecting; forceps 4-jointed, 2nd joint much longer than the 2 terminal joints together; penial lobes broadly rounded at apex, titillators distinct

..............................................ATOPOPUS Etn.

CC. Hind tarsus of both male and female usually much shorter than tibia, (being only slightly longer than tibia in Siphlopecton and in Thalerosphyrus male, and in Arthroplea being just as long); first tarsal joint of hind leg not considerably lengthened, less different in length from the 2nd joint (either somewhat longer, or just as long, or somewhat shorter), and at most ½ as long as the tibia (in Thalerosphyrus), usually much shorter.

D. First joint of hind tarsus shorter than the 2nd; first joint of fore tarsus of male much shorter than second joint.

E. Caudal filaments of male and female about 3 times as long as the body; hind wings comparatively small, very narrow toward apex, cubital and anal regions slightly developed; 10th sternite of male notched on hind margin between the forceps-limbs and distinctly separated from the projecting lateral parts, on which the forceps is attached, the notch itself being convex; penis entirely cleft, the lobes being widely separated from each other, cylindrical, broadened into club-form at apex, titillators strong, blunt; forceps 4-jointed, 2nd joint much longer than the 2 terminal joints together; 1st joint of fore tarsus in male about ½ as long as 2nd, legs slender..............................................PAEGNIODES Etn.

EE. Caudal filaments of male and female about 1½ to 2½ (usually 2) times as long as the body; hind wings (Fig. 18) normal, more blunt toward apex, cubital region fairly well developed; 10th sternite of male rarely truncate on hind margin between the forceps-limbs, mostly somewhat projecting, but somewhat sunken in the middle, not strongly separated from the lateral pieces, which are not projecting; penis broad, the lobes close together, flat or somewhat hollowed on ventral side, apex blunt, rarely with projecting angles; titillators distinct, pointed, usually united in the median line; forceps and legs similar to Paegniodes; 1st joint of fore tarsus of male about ½ to ¾ as long as the 2nd ..............................................HEPTAGENIA Walsh.
AQUATIC INSECTS

DD. First joint of hind tarsus as long as or longer than the 2nd; first joint of fore tarsus of male as long as or nearly as long as second joint, joints 1 to 4 of nearly equal length, fifth joint \( \frac{1}{2} \) as long.

E. Hind tarsus as long as or hardly noticeably shorter than tibia.

F. In hind tarsus of male first joint about \( \frac{1}{2} \) as long as second joint and not quite \( \frac{1}{2} \) as long as tibia; forceps 4-jointed, first joint very short, the two terminal joints together being only about half as long as the second. 1

G. In fore wing (Fig. 18) \( Cu_2 \) is normal at base, not very strongly bent against \( A_1 \); fore tarsus of male about \( \frac{1}{2} \) as long as tibia; caudal filaments about \( 4\frac{1}{2} \) times as long as body, in female about 3 times as long; 10th sternite of male with straight or slightly convex broad notch in the middle of hind margin, which is bounded on each side by a bluntly rounded elevation; penis only incised, not deeply split, the lobes being long and rectangular, slightly broadened at apex; in the female the 10th sternite large, broadly produced, somewhat semi-elliptical.........................

THALEROSPHYRUS Etn.

GG. In fore wing \( Cu_2 \) at base is very strongly bent against \( A_1 \); in other details very similar to Thalerosphyrus; penial lobes each with a short incision at apex........................

SIPHILOPLECTON Clem.

FF. In hind tarsus of male first joint twice as long as second joint; fore tarsus of male twice as long as tibia; caudal filaments of male twice as long as the body, in the female only slightly longer than the body; 10th sternite of male as in Thalerosphyrus; forceps 5-jointed, 1st joint short, the 3 terminal joints together being only half as long as the 2nd; fifth joint seldom wanting; penial lobes short and broad, almost triangular, with distinctly pointed titillators........................

ARTHROPLEA Bgtss.

EE. Hind tarsus much shorter (\( \frac{3}{4} \) to at most \( \frac{1}{2} \) as long than the tibia.

F. Fore tarsus of male shorter than tibia; fore tarsus of female \( \frac{1}{2} \) as long as tibia.

G. In the male the claws of fore legs similar, blunt, in the other legs and in the female dissimilar; fore tarsus of male only \( \frac{3}{4} \) to \( \frac{3}{4} \) of the length of the tibia; first joint

1. To this group belongs perhaps also: Pseudiron McDunn.
onger than the 2nd; first y as long as second joint, $\frac{1}{2}$ as long.
ly shorter than tibia.
out $1\frac{1}{2}$ as long as second s about $4\frac{1}{2}$ times as long.
imal at base, not very tarsus of male about $1\frac{1}{2}$ s about $4\frac{1}{2}$ times as long.
ormal exc:avated like Epeorus, penial lobes united and broadly triangularly expanded at the base, apically forming two cylindrical lobes, separated by a small incision.

**GEORG ULMER**

GG. The claws in all the legs of male and female dissimilar, one claw blunt, the other pointed; fore tarsus of male nearly as long as tibia (about $\frac{3}{6}$ as long); joints of fore tarsus as in Anepeorus; joints of hind tarsus as in Ecdyonurus, decreasing in length from fifth, first, second, third to fourth, first joint distinctly longer than second; forceps 4-jointed; last sternite of male as in Ecdyonurus; penial lobes not separated from one another, much broader at the base than at the apex.

**ANEPEORUS** McD.

FF. Fore tarsus of male longer ($1\frac{1}{2}$ to 2 times) than tibia; fore tarsus of female longer than $\frac{1}{2}$ as long as tibia.

G. In the fore tarsus of male 1st joint longer than any of the others.

H. In the hind tarsus 1st joint longer than the 2nd., joints 1 to 4 gradually decreasing in length, 5th joint the longest; fore tarsus of male about $1\frac{1}{6}$ as long as tibia, tibia about $1\frac{1}{4}$ as long as femur; fore tarsus of female about $\frac{3}{4}$ as long as tibia, tibia about $1\frac{12}{13}$ as long as femur; caudal filaments of male about 3 times as long as body, that of female $2\frac{1}{2}$ to 3 times as long; 10th sternite of male deeply and broadly notched on hind margin, thus consisting of two diverging projecting lateral pieces, which bear the forceps; forceps 4-jointed, the 2 terminal joints together being almost as long as the long 2nd joint; penis divided up to the middle by a triangular notch, the lobes being robust, broadened outward at apex; 10th sternite of female straight on hind margin.
AQUATIC INSECTS

in the male the claws of fore legs similar, blunt, dissimilar in the other legs and in the female......

......................................................EPEORUS Etn.

HH. In the hind tarsus 1st joint not longer than the 2nd, joints 1 to 3 being somewhat similar in length, 4th joint shorter, 5th longest; fore tarsus of male about 1 1/2 to 1 1/2 times as long as tibia, tibia about 1 1/2 to 2 times as long as femur; fore tarsus of female about 3/4 as long as tibia, tibia about 11/10 as long as femur; caudal filaments of male about 4 times as long as body; those of female about twice as long; 10th sternite of male projecting in the middle of the hind margin between the forceps-limbs, convex; forceps 4-jointed, the 2 terminal joints together almost as long as the long 2nd joint; penial lobes not thickened at end; 10th sternite of female slightly notched on hind margin; claws dissimilar in male and female everywhere.................IRON Etn.

GG. In the fore tarsus of male 1st joint shorter than several of the following joints.

H. First joint of fore tarsus in male distinctly shorter than the 5th; fore tarsus of male about 1 1/2 as long as tibia, tibia about 1 1/4 as long as femur; 1st joint about 1/5 as long as the second; fore tarsus of female slightly more than half as long as tibia, tibia almost 1 1/4 as long as femur, 1st joint about half as long as the 2nd; in the hind tarsus 1st joint same as 2nd and slightly longer than the 3rd; 10th sternite of male usually concave in the middle of hind margin between the forceps-limbs, rarely somewhat convexly produced; forceps 4-jointed, the 2 terminal joints together shorter than the long 2nd joint; penial lobes entirely separated from each other, thus forming narrow pieces, usually somewhat broadened at apex, rarely somewhat lancet-like broadened; titillators lying close to the lobes; 10th sternite of female bluntly rounded or somewhat concave on hind margin

......................................................RHITHROGENA Etn.

HH. First joint of fore tarsus in male longer than the 5th.
fore legs similar, blunt, 
and in the female....

EPEORUS Etn.

joint not longer than the 
omewhat similar in length, 
gest; fore tarsus of male 
long as tibia, tibia about 
as femur; fore tarsus of 
tibia, tibia about 11/10 as 
hose of female about twice 
males projecting in the 
between the forceps-limbs, 
1, the 2 terminal joints 
the long 2nd joint; penial 
d; 10th sternite of female 
margin; claws dissimilar in 
re......IRON Etn. 

in male distinctly shorter 
males about 1 1/2 as long as 
as femur; 1st joint about 
fore tarsus of female 
long as tibia, tibia almost 
joint about half as long as 
1st joint same as 2nd and 
3rd; 10th sternite of male 
ile of hind margin between 
convexly pro-
2 terminal joints together 
joint; penial lobes entire 
thus forming narrow 
broadened at apex, rarely 
adened; titillators lying 
ernite of female bluntly 
oncave on hind margin 
RHITHROGENA Etn. 
as in male longer than

J. First joint of fore tarsus in male about 3/5 as 
long as 2nd, 2nd slightly shorter than third; 
fore tarsus of male about 1 4/5 as long as tibia, 
tibia hardly longer than femur; fore tarsus of 
female about 3/4 as long as tibia, tibia about as 
long as femur; hind tarsus about half as long as 
tibia, tibia about 8/9 as long as femur; tarsal 
joints of hind leg decreasing in length from 5th, 
1st, 2nd, 3rd to 4th, 1st joint sometimes hardly 
larger than 2nd; 10th sternite of male slightly 
convex on hind margin between the forceps-limbs 
or with projecting lateral pieces (similar to 
Epeorus); forceps 4-jointed, the 2 terminal joints 
together about as long as the 2nd; penial lobes 
entirely separated from each other, similar to 
Rhithrogena; claws dissimilar in the pairs....

CINYGMA Etn.

JJ. First joint of fore tarsus in male usually about 
half as long as 2nd, rarely longer or shorter; 
2nd joint usually somewhat longer than third; 
otherwise the measurements of the legs about 
the same as in Cinygma; claws also dissimilar in 
the pairs; 10th sternite of male slightly convex 
in the middle of hind margin and this arch 
separated by a blunt process from the non-
projecting lateral pieces, on which the forceps-
limbs are carried; forceps 4-jointed, the 2 
terminal joints together being much shorter than 
the second; penial lobes not fully separated, 
either strongly broadened sidewise at apex or 
only thickened at apex.........ECDYONURUS Etn.
EXPLANATION OF FIGURES.

PLATE I.

Fig. 1. *Palingenia longicauda* Oliv., wings.

Fig. 2. *Ephemera vulgata* L., wings.

Fig. 3. *Potamanthus luteus* L., wings.

Fig. 4. *Potamanthodes formosus* Etn., hind wing.

Fig. 5. *Polyomita virgo* L., wings.

Fig. 6. *Clóeon dipterum* L., ♀ wing.

Fig. 7. *Centroptilum luteolium* Müll., wings.

Fig. 8. *Leptophlebia marginala* L., wings.

Fig. 9. *Baëtis niger* L., hind wing.

Fig. 10. *Habroleptoides modesta* Hag., hind wing.

PLATE II.

Fig. 11. *Chordotères picteti* Etn., wings.

Fig. 12. *Ephemera ignita* Poda, wings.

Fig. 13. *Povilla adusta* Nav., anal part of fore wing.

Fig. 14. *Ametropus fragilis* Albda., wings.

Fig. 15. *Pseudocloeon camerunense* Ulm., wing.

Fig. 16. *Caenis horaria* L., wing.

Fig. 17. *Oligoneuriella rhenana* Imh., wings.

Fig. 18. *Heptagenia sulphurea* Müll., wings.

Fig. 19. *Siphlonurus lacustris* Etn., wings.

Fig. 20. *Tricyrthus longus* Ulm., wing.
Ulmer, Revised Key to Ephemeroptera.