Peking Natural History Bulletin 1932-33, Vol. 7, p. 195.

AQUATIC INSECTS OF CHINA.
ARTICLE VI. REVISED KEY TO THE GENERA OF EPHEMEROPTERA.

BY DR. GEORG ULMER.

(*Hamburg, Germany*).

In the Peking Soeiety of Natural History Bulletin (1929-30 Vol. IV, Part 4, p. 1-18) Prof. C. F. Wu published a translation of the keys of genera out of my treatise "Uebersicht über die Gattungen der Ephemeropteren, nebst Bemerkungen über einzelne Arten." (Stett. Ent. Zeit. 81, 1920, p. 97-144) under the heading "Key to the Genera of Ephemerida By Dr. Georg Ulmer."

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. Cu_1 and A_1 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. Cu_1 and A_1 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.**

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. A_3 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.**

GENERA OF FAMILY I. PALINGENIIDAE.

A. M of fore wing (Fig 1) forked behind the middle; at least three long intercalaries in the first anal area; fore tarsus of male about 2½ 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.

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 ½ 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.

GENE

A. M of fore wing forked n
calaries in the lst a

B. Pronotum very sh
male almost as lo

C. Short intercal
first intercala
connected wi
longer than th

CC. No short int
of the male ne

D. The two
A_1; pen

DD. One of
from A_1,
lobes stra

BB. Pronotum longer,
fore leg of male ab
the two long interc
or even together;
claw-like.

C. Middle legs an
the forceps no

CC. Middle legs a
forceps with a
.....

AA. M of fore wing (Fig.
(or at the same time wi

B. No S-formed cross
the fore wing; tw
united with each
base; pronotum so
body, the other leg

C. Fore wing (Fi
forked; the in
eyes of male s
.....

CC. Fore wing w
area between
distance.....

GENERA OF FAMILY II. POLYMITARCIDAE.

A. M of fore wing forked near base and before radial sector; two long simple intercalaries in the lst 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 lst anal vein, the second is connected with the latter only by a cross vein; fore legs of the male longer than the body.....**ASTHENOPODES 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 lst anal area arising together from A_1; penial lobes curved like claws.....**ASTHENOPUS** Etn.

DD. One of the two intercalaries in the lst anal area (Fig. 13) arising from A_1, the other one arising opposite the first from A_2; 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 lst anal area running into A_1 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 A_1 or the last intercalary to the wing margin in the fore wing; two to nine intercalaries in the lst 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 A_1, this vein therefore forked; the intercalaries lying in the area between these 2 branches of A_1; eyes of male small, only half as broad as their distance.....**POLYMITARCYS** Etn.

CC. Fore wing without a forked A_1, this normal; intercalaries lying in the area between A_1 and A_2; 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 A_1 (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 .....**EXEUTHYPLOCIA** Lest.

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....**EUTHYPLOCIA** Etn.

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 A_1 often pairs of long intercalaries, sometimes in all these areas, sometimes only in several, and sometimes only in one area; fore femur about ⅔ as long as tibia.....**CAMPYLOCIA** Needh. & Murph.

EE. M of fore wing forked at the same time with the sector; fore femur ½ as long as the tibia.....**POLYPLOCIA** Lest.

GENERA 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 1⅔ to $1^2/_5$ as long as femur.

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

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.....**ICHTHYBOTUS** Etn.

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 2½ to 3 times as long as femur, tarsus about 4 times as long as femur; a series of cross veins between A_3 and wing margin (Fig. 2) both claws of fore leg blunt.....**EPHEMERA** L.

CC. Fore leg shorter, tibia 1¼ to 1½ times as long as femur; only a single cross vein between A_3 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 A_3 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 A_3 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.

GENERA OF FAMILY IV. POTAMANTHIDAE.

A. Cu_2 of fore wing (Fig. 3) is connected with Cu_1 at base (as it is normal); Cu_2 and A_1 independent from one another.

B. R_1 of hind wing (Fig. 3) is normal, i.e. the stem of R forms with R_1 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.....**POTAMANTHELLUS** Lest.

EE. Genital appendages stout and fully developed.....**RHOENANTHOPSIS** Ulm.

BB. R_1 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. Cu_2 of fore wing is not connected with Cu_1 at base, but with A_1, thus Cu_2 and A_1 having the same stem.

B. Only two long caudal filaments; R_1 of hind wing normal.....**RHOENANTHUS** Etn.

BB. Three long caudal filaments; R_1 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. A_1 of fore wing (Fig. 8,11) separated from A_2 at base. A_2 close to A_3; at the most A_2 is in the middle between A_1 and A_3; no free intercalaries between Cu_2 and A_1, also none between the long intercalary and Cu_2; forceps (almost without exception) with 2 short terminal joints, the basal being longer.....V. **LEPTOPHLEBIIDAE.**

DD. A_1 of fore wing (Fig. 12) close to A_2, A_2 remote from A_3, several (usually two) free intercalaries between Cu_2 and A_1, also between the long intercalary and Cu_2 (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 behin
from M_1; fore w
small and narrow,
veins, or hind win
.....

AA. Sc of fore wing (Fig.
or entirely wanting;
fore wing with 4 to 7
anterior areas, hind wi
large and medium speci
NB. The tenth famil
but there are known on
not the imago.

GENE

A. Hind wings (Fig. 8, 10

B. Claws all similar,

C. Hind wings
prominent pro
this crest the
being far befo
subcostal area
longer than th
plates.

D. In fore w
from A_2 ..

DD. In fore
only by a

E. In the
media
.....

EE. In t
of me
.....

CC. Hind wings
blunt process b
changing into
point of the co
and broad, sub
10th sternite n

he middle also whitish;
EUCORHOENANTHUS Lest.
adorned with reddish or

ps consisting of 2 or 3
feeble filaments.....
.POTAMANTHELLUS Lest.
developed.....
...RHOENANTHOPSIS Ulm.
y strongly against Sc and
Sc; only two long caudal
..POTAMANTHINDUS Lest.
nt with A_1, thus Cu_2 and

nal.....RHOENANTHUS Etn.
ngly bent against Sc and
....POTAMANTHODES Ulm.
DEA.

well developed, entirely

r wanting; wings with

.2 at base. A_2 close to
n A_1 and A_3; no free
between the long inter-
exception) with 2 short
.....
.V. **LEPTOPHLEBIIDAE.**

remote from A_3, several
and A_1, also between the
bital fork); forceps with
with two), the preceding
VI. **EPHEMERELLIDAE.**

ed at the posterior margin,
the subimago); no free
small species.....
.....VII. **CAENIDAE.**

BB. M of fore wing (Fig. 6,7,15) not forked; M_1 therefore simple; 2 free intercalaries behind M_1, the second one corresponding to M_2 but not arising from M_1; 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 (**PROSOPISTOMATIDAE**) looks similar to the **CAENIDAE**; but there are known only the nymph and the subimago of the **PROSOPISTOMATIDAE**, not the imago.

GENERA 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 A_2 is furcated, i.e. the first intercalary comes directly from A_2 .....**MASSERTELLA** Lest.

DD. In fore wing A_2 is not furcated, i.e. the first intercalary not at all or only by a cross vein connected to A_2,

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 $^3/_4$ 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 spurlike 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**....**DELEATIDIUM** Etn.

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

F. A_2 at the base of fore wing (Fig. 8) in the middle between A_1 and A_3, never as near to A_3 as in **Paraleptophlebia**; penial lobes each with a suspending thin spornlike 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. A_2 at the base of fore wing much nearer to A_3 than to A_1, 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.

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.... .....**HAGENULUS** Etn.

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 .....**THRAULODES** Ulm.

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 .....**HABROPHLEBIA** Etn.

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.....**HABROLEPTOIDES** Schoenem.

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

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 behind 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.

GENERA 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. A_1 and Cu_2 of
from each other.

C. Fore wing
margin most
of the sector
and anal re
wings black...

CC. Fore wing
singly; hind
only about h

D. Fore tib
second a
long as
1⅓ as l
of male
spur-like

E. Hin
not
as fe

F.

FF.

EE. Hi
broa
.....

DD. Fore t
second a
tibia, so
femur a
female of
tip into a
spur-like

BB. A_1 and Cu_2 of
appearing to aris
.....

AA. Median caudal filam
veins, Sc short and
.....

B. A_1 and Cu_2 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 $1^1/_5$ as long as the tibia or even shorter than this; fore tibia of female about $1\frac{1}{3}$ as long as the femur, tarsus about $\frac{3}{4}$ 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 $\frac{1}{2}$ 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 $\frac{3}{4}$ as long as tibia; forceps with only one short joint at tip..... **EPHEMERELLA** Walsh.

FF. Fore tarsus of female about $\frac{1}{2}$ as long as tibia; forceps with two short joints at tip.....**EPHEMERELLINA** Lest.

EE. Hind tarsus $^3/_5$ 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 $1\frac{1}{2}$ as long as femur, not longer than second and third joint of tarsus together; tarsus at least $1\frac{1}{3}$ 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. A_1 and Cu_2 of fore wing united toward the base (at the cross vein), thus appearing to arise from a common stem, otherwise same as **Ephemerella** .....**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.

GENERA OF FAMILY VII. CAENIDAE.

A. Cu_2 and cubital intercalary of fore wing (Fig. 16) as long as Cu_1, both therefore running up to the base; in first anal area the two intercalaries forming a very long narrow fork; A_2 and A_3 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 veins; 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 $1\frac{1}{3}$ as long as tarsus..... **CAENODES** Ulm.

CC. Fore leg of male much longer than hind legs, thin; fore femur about $\frac{1}{2}$ as long as tibia, and tibia about $1\frac{1}{2}$ as long as tarsus. .....**CAENIS** Steph.

BB. Prosternum very broad, twice as broad as long, the fore coxae therefore widely separated; second antennal joint 3 times as long as first joint..... ..... **EURYCAENIS** Bgtss.

AA. Cu_2 and cubital intercalary much shorter than Cu_1 in fore wing, (Fig. 20) not extending up to the base; in first anal area the two intercalaries forming a short and broad fork or separated from each other; A_2 and A_3 strongly curved and running parallel, usually unforked; cross veins of wing not arranged singly, but much more numerous, almost all areas with several to many cross veins; wing form varying; always three caudal filaments; forceps 2- to 3- jointed; penis more slender, often deeply split or divided; 10th sternite undivided.

B. 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 **Leptohyphes**, half as long as body.....**THICORYTHUS** Etn.

CC. Legs longer and thinner, as in **Leptohyphodes**.....**TRICORYTHODES** Ulm.

GENERA 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.....**CLOEON** Leach.

CC. First cross v
at or distad of

BB. Intercalary veins

BBB. Intercalary vein

AA. Hind wings present,

B. Hind wing with
other areas too.

C. Fore wing wi
.....

CC. Cross veins
.....

BB. Hind wing (Fig.
or 2 in the other ar

C. Intercalary vei

D. Hind win
on costal
veins.....

DD. Hind w
margin, d
with three
be forked.

CC. Intercalary ve

D. Hind wing

E. Hind
margi

EE. Hin
proces
the se

DD. Hind wi
a mere th

CCC. Intercalary
longitudinal ve
.....

GENE

A. With only 2 caudal fila

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 .....**OLIGONEURIA** 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
therefore long
short (sometim

GENUS

Only one genus, **PR**
only the very characteristi
classification being therefor
but there are four wings wit

FAMILIE

A. First anal area of fore
somewhat parallel to e
or S-formed intercalari
or straight and someti
wing almost circular, w
areas; pronotum very sr

AA. First anal area of fo
broadening toward ape
A_2 and A_3 parallel to e

B. First anal area of
intercalaries, exten
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 an
.....

CC. First anal ar
the longer pa
.....

GEN

Only one genus, **BAETISCA**

GENER

A. Hind tarsus shorter or
in length.

B. Cubital intercalary i

the base between R and anal
gitudinal veins) running up to
vein also forked; several to
ial area, 2 in the following
ong, the terminal joint short
.....**SPANIOPHLEBIA** Etn.
base between R and anal vein
of R, and forming a fork with
idinal vein instead of it); anal

ving, i.e. only one single cross
l joint very long, the terminal
lar lobes .....**LACHLANIA** Etn.
ing, i.e. several cross veins in
ania.....**NOVA** Nav.

d anal vein in the fore wing,
er one arising from the upper

ial vein running up to the
is in radial area; no indistinct
een anal vein and preceding
.....**HOMOEONEURIA** Etn.
id anal vein only the first one
a branch of the first, arising
indistinct (weak) longitudinal
n running into the first strong
tinct cross veins in this space,
cross veins; forceps 3-jointed,
very short, penis split into 2
.....**ELASSONEURIA** Etn.
en R and anal vein of the fore
or the first appearing as a
d; in the fore part of wing

which is only weakly marked;
about the middle of wing
.....**OLIGONEURIA** Pict.

ngitudinal vein, just after its base
a the same height as the base of
z.

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)... .....**OLIGONEURIELLA** Ulm.

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; A_1, A_2 and A_3 somewhat parallel to each other and equal in length; first anal area without paired or S-formed intercalaries, but with cross veins between A_1 and A_2. S-formed or straight and sometimes divided veins extending from A_3 to wing margin; hind wing almost circular, with very numerous long intercalaries also in cubital and anal areas; pronotum very small.....XI. **BAETISCIDAE.**

AA. First anal area of fore wing (Fig. 14, 18, 19) narrow only at base, distinctly broadening toward apex, A_2 much shorter and more strongly curved than A_1; only A_2 and A_3 parallel to each other; hind wing not circular but more or less oval.

B. First anal area of fore wing (Fig. 19) with several to many curved S-formed intercalaries, extending from A_1 to wing margin, some being forked, sometimes with shorter free intercalaries between the attached ones; pronotum well developed .....XII. **SIPHLONURIDAE.**

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 A_2 (i.e. the reverse of **Ecdyonuridae**)..... .....XIII. **AMETROPODIDAE.**

CC. First anal area of fore wing (Fig. 18) with 2 pairs of long intercalaries, the longer pair always lying near to A_2; with 2 caudal filaments .....XIV. **ECDYONURIDAE.**

GENUS OF FAMILY XI. BAETISCIDAE.

Only one genus, **BAETISCA** Walsh.

GENERA OF FAMILY XII. SIPHLONURIDAE.

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. A_1 of fore wing parallel to A_2 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. A_1 running into A_2 at base; cross veins of pterostigmal 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 $1^5/_8$ to $1\frac{3}{4}$ as long as femur; hind tarsus of male about $^5/_{12}$ 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 shorter than the 2 terminal joints together .....**COLOBURISCUS** Etn.

DD. Median caudal filament entirely wanting; fore tarsus of male about twice as long as tibia, tibia about $^9/_{10}$ 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, A_2 unbranched; fore tarsus of male at least twice as long as tibia, tibia almost $1^1/_8$ 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 $^1/_8$ as long as the lateral ones.....**METAMONIUS** Etn.

DD. Anal region broad in hind wing, A_2 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.

F. Ab
10
ma

FF. A
ste
its
lim
joi
5 j

AA. Hind tarsus longer tha

B. Claws all similar, na

C. Hind wing shoe
fore wing unus
broadly and ang
the two termin
median caudal
long as the body

CC. Hind wing no
venation.

D. Median cau
a quadrang
or somewha
the foregoin

E. Media

F. Fo
tar
da
.....

FF. F
of
fig

EE. Media

DD. Median ca
fore tibia; 1
of two sep
longer than
.....

F. Abdominal segments 5-9 with flat broad processes on sides; 10th sternite of male undivided, deeply obtusely notched on hind margin; median caudal filament tiny.....**SIPHLONISCA** Needh.

FF. Abdominal segments without flat broad processes; 10th sternite of male not split, forming a quadrangular plate, its hind margin projecting somewhat between the forceps-limbs; 2nd joint of forceps longer than the two terminal joints together; median caudal filament very short, with about 5 joints.....**PARAMELETUS** Bgtss.

AA. Hind tarsus longer than tibia, fore tarsus of male at least twice as long as tibia.

B. Claws all similar, narrow, hooked; abdominal segments not broadened sidewise.

C. Hind wing shoe-shaped, with concave hind margin and reduced venation; fore wing unusually long and narrow; 10th sternite of male not divided, broadly and angularly notched at middle of hind margin; forceps 4-jointed, the two terminal joints together hardly half as long as the 2nd joint; median caudal filament at least half as long as the lateral ones (at least as long as the body).....**DIPTEROMIMUS** Etn.

CC. Hind wing normal (Fig. 19) in form (somewhat oval) and with normal venation.

D. Median caudal filament tiny; 10th sternite of male not split, forming a quadrangular plate, its hind margin projecting between the forceps or somewhat concave; forceps 3- or 4-jointed, the last two joints short, the foregoing the longest of all.

E. Media of hind wing forked (Fig. 19).

F. Fore tarsus of male three times as long as the tibia; fore tarsus of female twice as long as the tibia; sternites 1-9 with a dark figure, consisting of points and lines on whitish ground ..... **SIPHLURELLA** Bgtss.

FF. Fore tarsus of male $2^7/_{11}$ as long as the tibia; fore tarsus of female $1\frac{1}{2}$ as long as the tibia; sternites not with these figures.....**SIPHLONURUS** Etn.

EE. Media of hind wing not forked.....**SIPHLONUROIDES** McD.

DD. Median caudal filament distinctly developed, though only as long as fore tibia; 10th sternite of male notched almost to base, thus consisting of two separate lateral pieces; forceps 4-jointed, 2nd joint much longer than the 2 very short terminal joints together..... .....**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.....**ONISCIGASTER** Etn.

GENERA OF FAMILY XIII. AMETROPODIDAE.

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 1½ times as long as tibia; fore tarsus of female about 2⅔ 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 2½ to 3 times as long as tibia; hind tarsus of male as long as or (in other species) 1½ to 2 times as long as tibia; fore tarsus of female 1⅓ as long as tibia; in the hind wing the median fork very long, several times longer than its stem; costal process same as **Ametropus**; 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.....**METRETOPUS** Etn.

GENERA OF FAMILY XIV. ECDYONURIDAE.

A. Only comparatively few (thickened) cross veins in the fore wing, arranged in the disk in about four broad adjacent transverse rows; ihnd 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 1⅓ 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 ½ 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 1½ times as long as tibia; hind tarsus of male about ⅓ 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.

C. Hind tarsus
tarsus of fen
distinctly len
as long as
filaments ab
deeply motch
projecting; f
joints togethe
.....

CC. Hind tarsu
(being only
male, and in
considerably
somewhat lo
long as the ti

D. First joi
of male

E. Cau
body
cubit
notc
sepa
is at
lobes
broa
4-joi
toget
2nd,

EE. Ca
times
blunt
stern
force
in th
whic
flat
proje
the
of f
.....

ıts 5-9 (or 6-9, female, or
0th sternite of male split
ps 4-jointed, the 2nd joint
ıer ; 10th sternite of female
¼ as long as body in male,
.....**ONISCIGASTER** Etn.

DAE.

fore tarsus of male about 5
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.

ery few joints ; fore tarsus
arsus of male as long as or
arsus of female 1⅓ as long
everal times longer than its
of male similarly but less
, 2nd joint very long, basal
.....**METRETOPUS** Etn.

AE.

fore wing, arranged in the
ving 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
nedian fork ; fore tarsus of
s of male about ⅓ as long
hind margin ; forceps and
.....**BLEPTUS** Etn.

least 4 longitudinal veins
(mostly) divided.

C. Hind tarsus of male much longer (1⅓ to 2 times) than the tibia ; hind tarsus of female also longer than the tibia ; first tarsal joint of hind leg distinctly lenghtened, 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, somwhat convex at middle, lateral pieces projecting ; forceps 4-jointed, 2nd joint much longer than the 2 terminal joints together ; penial lobes roundly broadened 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 **Siphloplecton** and in **Thalerosphyrus** male, and in **Arthroplea** being just as long); first tarsal joint of hind leg not considerably lenghthened, less different in length from the 2nd joint (either somewhat longer, or just as long, or somewhat shorter), and at most ⅓ 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 ⅓ 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 ⅙ to ½ as long as the 2nd .....**HEPTAGENIA** Walsh.

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 ½ as long.

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

F. In hind tarsus of male first joint about 1½ as long as second joint and not quite ⅓ 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 1½ as long as tibia; caudal filaments about 4½ 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..... ..... **SIPHLOPLECTON** 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 (⅓ to at most ½ as long than the tibia.

F. Fore tarsus of male shorter than tibia; fore tarsus of female ½ 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 ⅔ to ¾ of the length of the tibia; first joint

1, To this group belongs perhaps also: *Psendiron* McDunn.

onger than the 2nd ; first
y as long as second joint,
½ as long.

ly shorter than tibia.

out 1½ as long as second
ı ; forceps 4-jointed, first
joints together being only

ıormal at base, not very
tarsus of male about 1½
s about 4½ times as long
as long ; 10th sternite of
onvex broad notch in the
bounded on each side by
penis only incised, not
and rectangular, slightly
le the 10th sternite large,
mi-elliptical.....
...**THALEROSPHYRUS** Etn.
ery strongly bent against
ır to **Thalerosphyrus;** penial
on at apex.....
.... **SIPHLOPLECTON** Clem.
twice as long as second
s long as tibia ; caudal
the body, in the female
0th sternite of male as in
oint short, the 3 terminal
ng as the 2nd ; fifth joint
ort and broad, almost
titillators.....
..... **ARTHROPLEA** Bgtss.
most ½ as long than

ıia ; fore tarsus of female

e legs similar, blunt, in
le dissimilar ; fore tarsus
th of the tibia ; first joint

of fore tarsus of male rather more than ½ as long as second joint, which is distinctly longer than third; fourth joint is longer than fifth (this is the shortest) and about as long as first joint ; in the hind tarsus of male the two first joints subequal and distinctly longer than the third and the fourth joints, which are subequal; fifth joint the longest, equal in length to the three foregoing combined; forceps 4-jointed, the 10th sternite strongly excavated like **Epeorus**, penial lobes united and broadly triangularly expanded at the base, apically forming two cylindrical lobes, separated by a small incision..... .....**ANEPEORUS** McD.

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 $^5/_6$ 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.....**AFRONURUS** Lest.

FF. Fore tarsus of male longer (1⅙ to 2 times) than tibia ; fore tarsus of female longer than ½ 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 1⅙ as long as tibia, tibia about 1¼ as long as femur ; fore tarsus of female about ¾ as long as tibia, tibia about $^{12}/_{13}$ as long as femur; caudal filaments of male about 3 times as long as body, that of female 2½ 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;

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 1⅓ to 1½ times as long as tibia, tibia about 1½ to 2 times as long as femur; fore tarsus of female about ⅔ as long as tibia, tibia about $1^{1}/_{10}$ 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 1⅔ as long as tibia, tibia about 1¼ 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 1¼ 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,
ɜgs 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 $1^{1}/_{10}$ as
laments of male about 4
hose of female about twice
male projecting in the
between the forceps-limbs,
l, the 2 terminal joints
; the long 2nd joint; penial
d; 10th sternite of female
ıargin; claws dissimilar in
re.....**IRON** Etn.

ıt joint shorter than several

in male distinctly shorter
male about $1^{2}/_{3}$ as long as
; as femur; 1st joint about
l; fore tarsus of female
long as tibia, tibia almost
joint about half as long as
; 1st joint same as 2nd and
rd; 10th sternite of male
lle of hind margin between
somewhat convexly pro-
e 2 terminal joints together
joint; penial lobes entirely
er, thus forming narrow
broadened at apex, rarely
adened; titillators lying
sternite of female bluntly
oncave on hind margin
.....**RHITHROGENA** Etn.

sus in male longer than

J. First joint of fore tarsus in male about $^{2}/_{3}$ 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. *Polymitarcys virgo* L., wings.

Fig. 6. *Clöeon dipterum* L , ♀ wing.

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

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

Fig. 9. *Baëtis niger* L., hind wing.

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

PLATE II.

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

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

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

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

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

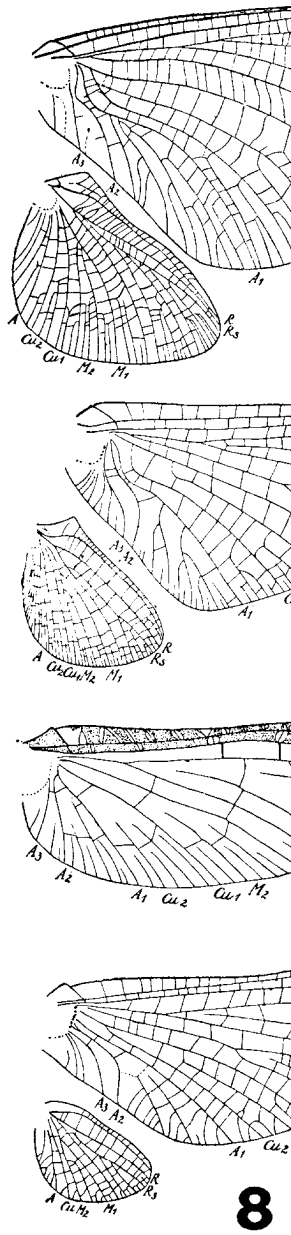
Fig. 16. *Caenis horaria* L., wing.

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

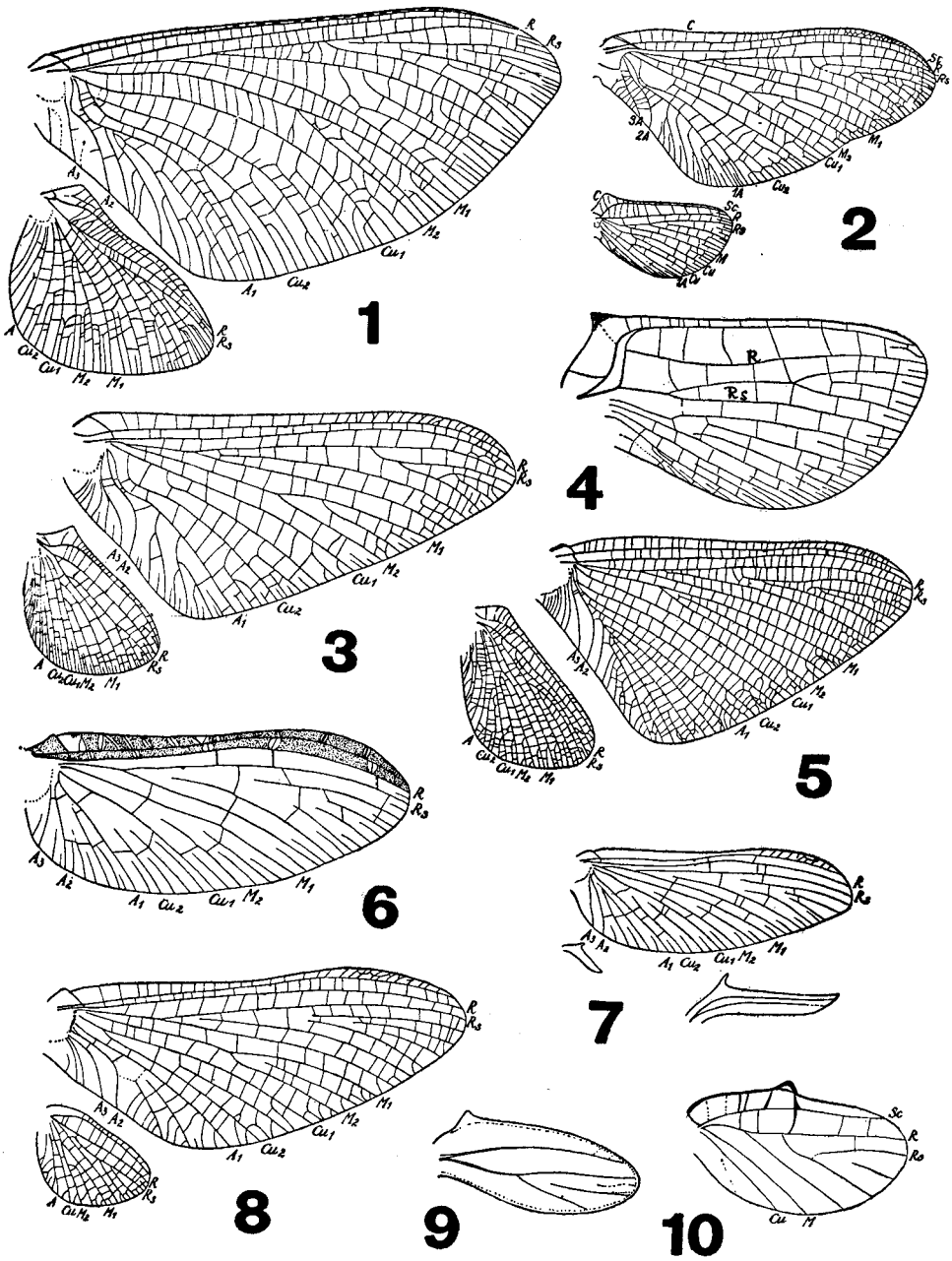
Fig. 18. *Heptagenia sulphurea* Müll., wings.

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

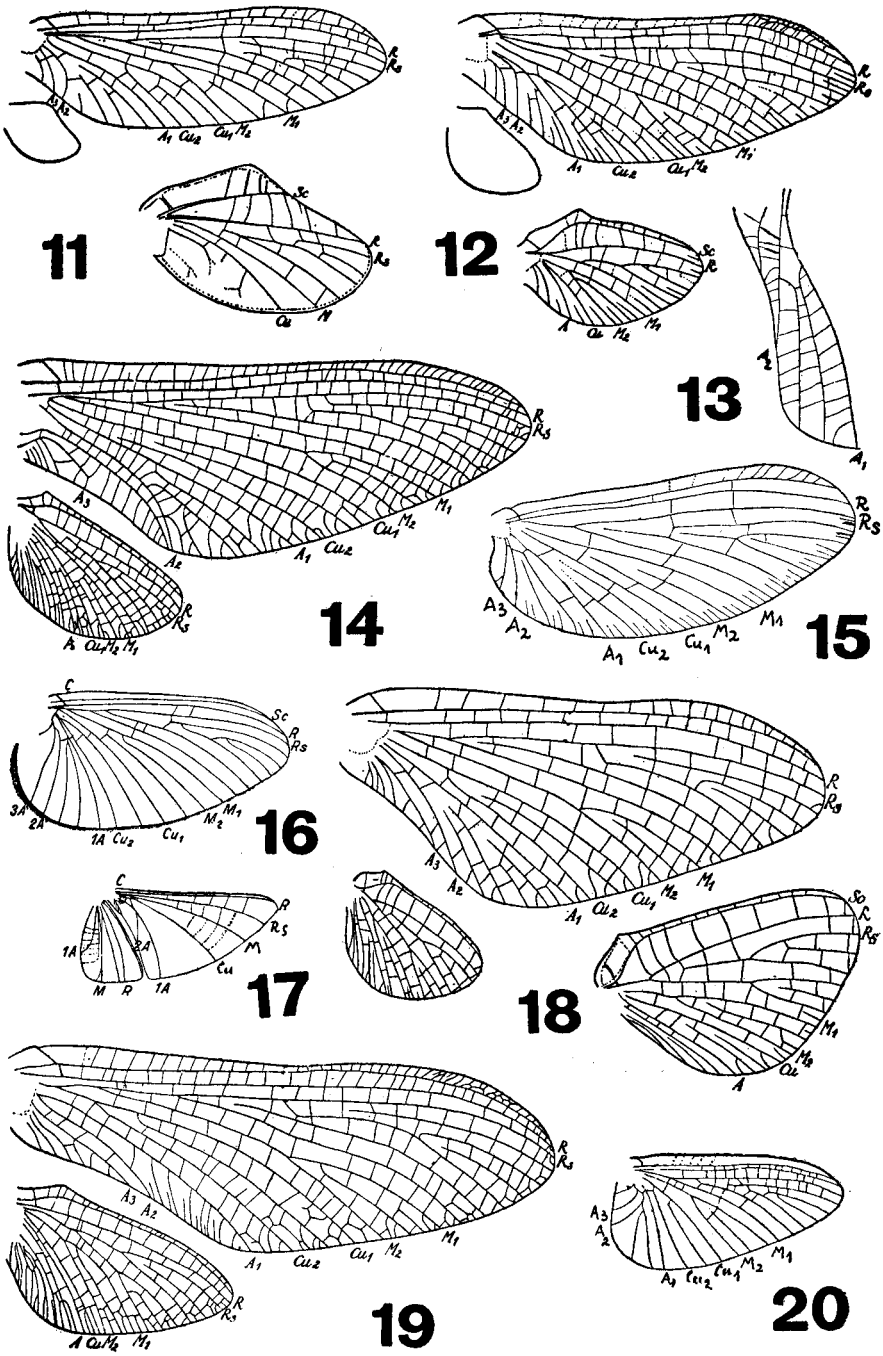
Fig. 20. *Tricorythus longus* Ulm., wing.



8



Ulmer, Revised Key to Ephemeroptera.



Ulmer, Revised Key to Ephemeroptera..