AN UNUSUAL MAYFLY (INSECTA: EPHEMEROPTERA) FROM THE TRIASSIC OF SOUTH AFRICA

by

E. F. Rick

C.S.I.R.O. Division of Entomology
P.O. Box 1700, Canberra City, A.C.T. 2601

ABSTRACT

An unusual mayfly from the Upper Triassic near Dordrecht in the Cape Province of South Africa is described as Xenophlebia oblongipes sp. nov. and is ascribed to a new family, the Xenophlebiidae, as its sole representative.

INTRODUCTION

The classification of Recent Ephemeropera is based, to a considerable extent, on structures other than the wings of the adults. However, the major groups (subfamilies and higher categories) of Recent Ephemeropera can be defined on differences in venation, with the possible exception of a few Baetidae (Aneuroplegidae and Macroplegidae) in which it is also necessary to know the structure of the adult tarsi, or the structure of the head of the nymph, to distinguish them from Heptageniidae.

The major trend in the wings of Ephemeropera has been reduction in the size of the hind wing. The known Permian species and some early Mesozoic ones had a hind wing that was as long as and slightly broader than the fore wing. Reduction has culminated in the complete loss of the hind wing in the more specialized Recent species of a number of phylectic lines. In the initial stages of reduction of the hind wing, a complementary torus, or obtuse angle, formed on the hind margin of the fore wing at a point about level with the apex of the hind wing. The torus is situated between the two branches of the cubitus, except in the Baetisidae. Even though the hind wing is relatively large in the Baetisidae, which retain a very primitive wing venation, the torus is in the anal field. The Baetisidae is the only family in which Ca and CuP are subparallel and connected by simple cross veins for all or most of their length. In all other mayflies, the torus, when present, is between the branches of Cu. As the hind wing is reduced, there is a greater complementary reduction in the length of CuP as compared with Ca so that the length of the wing margin occupied by the cubital field increases up to a point, and then remains relatively constant.

When the hind wing is very reduced or absent, the torus is lost, and the hind margin of the fore wing is rounded, and slightly to markedly widened in the cubito-anal field. The base of the wing is markedly widened in Concaeidae, Baetidae and Tricopterygidae but it is not widened in Leptophlebiidae. The hind wings are not markedly reduced (or absent) in other Ephemeropera. At no stage in the sequence of reduction do the two main branches of the cubitus become re-orientated and subparallel to one another as they are in the Permian Misgodtidae and Recent Baetidae.

However, the fossil species under review from the Upper Triassic of southern Africa has a very reduced cubito-anal area, and the two branches of Cu are close and subparallel (and connected by a simple cross vein or veins). The torus is lost but the wing is not widened at base. The cubito-anal field is markedly reduced and occupies only a minute area at the base of the wing.

Reduction in venation resulting in a long relatively narrow wing with a minute cubito-anal field (and a large MP field) had been unknown in any phylectic line, either fossil or Recent. This very unusual mayfly, of which only the wing, almost certainly a fore wing, is known, is referred to a new superfamily without recognisable close phylectic relationship to any known Ephemeropera.

SYSTEMATICS

SUPERFAMILY XENOPHLEBIODEA

super fam. nov.

Diagnosis

Wing. Stem of Cu distinct to wing base, as in Permian Ephemeropera, branching into CoA and CuP more basally than the thickened stem of the anal field. Basal thickened stem of anal field curved upwards, mainly at the cross connection between IA and CuP; stem more similar to that in Recent than in Permian species. Rs appearing to arise as a forward branch of MA, and MP arising very close to the wing base, before the separation of Rs + MA from the stem of K, as in Recent Ephemeropera. Bifurcates present on Sc and the upper branch of Rs. Posterior branch of MP arising close to base, not deflected towards CoA close to its origin from the stem of MP, but more or less straight throughout its length.

Note. The basal origins of the main veins are partly as in Recent Ephemeropera and partly as in the Permian Protconidae and Mystiophlebiidae. The more or less straight posterior branch of MP is similar to that in Baetidae, Heptageniidae and Lepidophlebiidae, as distinct from Ephmeroida, but the mid is developed very close to the wing base, as in Ephemeroida. The absence of cubital intercalary veins may be due entirely to the very marked reduction in the cubito-anal field of
the wing, and may not relate the group to the
cleptoptera. In which this area of the wing is fully
developed.

The absence of a tarsus indicates that the hind wing
was absent or minute, at least in the one known
species. However, development of the hind wing is variable in
Recent Ephemeropera.

The superficially represents a line of development
distinct from any that lead to the Recent Ephemeropera,
in which such a marked reduction in the cubito-
anal fields is unknown.

One included family, from the Upper Triassic of
southern Africa.

FAMILY XENOPHELIDAE fam. nov.

Diagnosis
Wing. MP forming a simple triad, or at most with a
tendency towards attached marginal intercalary veins.
Without intercalary veins between MP and CuA.
Without cubital intercalary veins (CuA and CuP con-
ected by a simple cross vein or veins). CuP straight, Rs
arising from close to wing base. Cross venation well
developed. Wing without short marginal intercalaries.
One included genus.

Genus Xenophelia gen. nov.

Etymology
Xenos = stranger, and phleps = vein, from the very
unusual venation.

Type species
Xenophelia optata sp. nov.

Diagnosis
Wing. Almost certainly fore wing; hind wing almost
certainly absent. Tornus absent. Cubito-axial area
minute. Triad on MA arising about middle of vein. Rs
forking moderately close to origin, but about level with
triad on MA. CuA and CuP very short, connected by
only a basal cross vein. Three distinct anal veins, all
minute, simple. MP with convex, middle branch forking
close to wing margin (possibly a variable character).
Cross veins complete over whole wing, simple, except
in part, close to margin. Cross veins simple in
perostigmatic area. Bulla on upper branch of Rs very
close to origin of branch.

Xenophelia optata sp. nov.
(Figures 1–5)

Type
C-Dk II 752 a, b and paratypes 754 a, b and 755 a, b,
in Bernard Price Institute.

Type locality
Bird's River, Dordrecht, Eastern Cape Province.
Molteno Formation. Upper Triassic.

Description
In Recent Ephemeropera specific characters are
recognized mainly in the terminalia which are unknown
for the species.

Holotype
Free wing, complete. Length c. 21 mm. Cross veins
not appreciably closer in the perostigmatic area than
more basally and, thus, perostigma not defined. Triad
on MP arising from basal fork in vein. Bulla on upper
branch of Rs at the level of the first cross vein to the
basal triad. Short cross connection from CuA near its
base to the stem of M before separation of MP. 1A very
widely separated from CuP, with a strong cross connec-
tion appearing at an upward continuation of the stem
of A. Only three anal veins, simple, the third very short.
C-Dk II 754 a, b is a complete wing, slightly weathered
and therefore the impression 's pale but
venation distinct, including basal swellings of the vein.
Costal margin thickened at base. Humeral vein simple,
humeral space not widened but rather long.
C-Dk II 755 a, b is the distal half of a wing from the
bullae to apex. This wing is very slightly larger than the
other two wings.

Note. The venation of the almost perfectly preserved
holotype wing is accentuated by mineral staining.

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photographs.
Figures 1–3. *Xenoskladus* sp. gen. et sp. nov. 1. C-Dt II 752 a, reversed. 2. C-Dt II 754 b. 3. C-Dt II 754 b. Base of wing enlarged.

[For use of specimens, see text.]