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A SECOND SPECIES OF *PENTAPHLEBIA* FOERSTER (ZYGOPTERA: *AMPHIPTERYGIDAE*), FROM THE NIGERIAN-CAMEROUN BORDER

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P. gamblesi sp. n. (♂ holotype: Obudu Plateau, Nigeria) is described, illustrated, and compared with the only other known sp. of the genus, *P. stahli* Foerster. The principal differences between the 2 spp. are in the form of the anal appendages which are much more elongate and slender in the former sp. There are also important venational differences between the 2 spp.

INTRODUCTION

During a three-day visit to the Obudu Plateau, very close to the south-eastern border of Nigeria with Cameroun, a single male zygopteran belonging to the genus *Pentaphlebia* was taken on 3 July, 1973. This specimen, which differs significantly from the only other known species of *Pentaphlebia*, is recognized as representing a new species of this very imperfectly known taxon. I take great pleasure in naming the new species *Pentaphlebia gamblesi*, after my friend Mr. R. Moylan Gambles who has done so much to advance our knowledge of Nigerian Odonata.

GAMBLES (1975) describes the characteristic nature of the dragonfly fauna in the mountainous plateau country on the Nigeria-Cameroun border, and points out that it is very different from the fauna of the bulk of Nigeria and the rest of West Africa. It is likely that the genus *Pentaphlebia* is entirely restricted to the Obudu - Bamenda - Cameroun Highlands, together constituting a very isolated massif which is markedly cooler and wetter than much of the surrounding areas of West and Equatorial Africa.

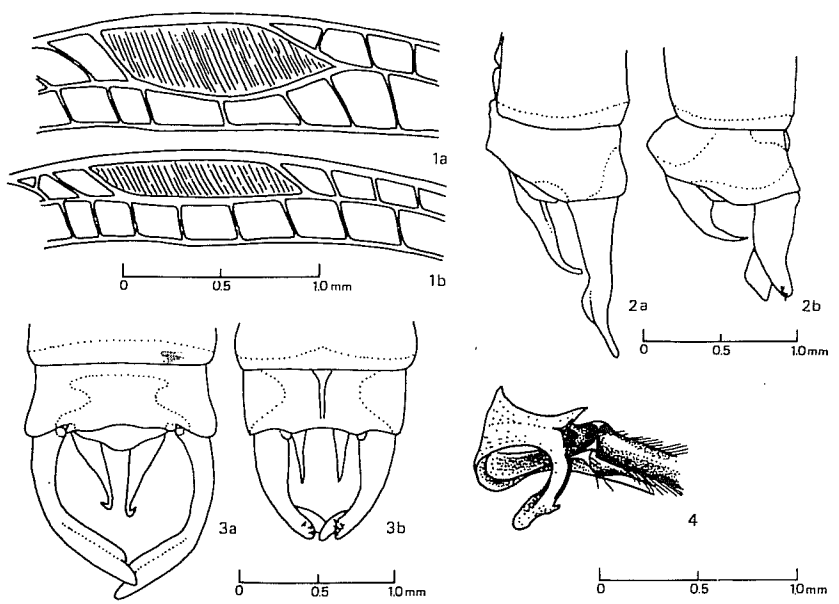
PENTAPHLEBIA GAMBLESI SPEC. NOV.

Figures 1a, 2a, 3a, 4

M a t e r i a l. – 1 ♂ (holotype): south-eastern Nigeria, Obudu Plateau, 1524 m, 6° 30′ N, 12′ E, 3.VII.1973, author's collection.

A species superficially resembling *P. stahli* FOERSTER, 1909, but slightly larger and with very different anal appendages and significantly different venation.

M a l e (holotype). – Head: Posterior vertex and occiput mostly velvety black, with rather ill-defined wedge-shaped orange-brown marks distal to the lateral ocelli on the vertex; ocelli yellowish; eyes pale olive brown with black markings (probably a post-mortem effect); frons and anterior vertex glossy brownish-black, with distinct transverse ridge; anteclypeus and postclypeus shiny dark brown, each with a central paler brown patch; anterior part of occiput pale yellow brown, but separated from genae by dark brown curved "moustache" band; labrum glossy metallic greenish-black; genae pale brown; labium pale brown; antennae dark brown.



Figs. 1-4. Morphological characters of *Pentaphlebia gamblesi* sp. n. (a) and *P. stahli* Foerster (b): (1) pterostigma; – (2) anal appendages, from the left side; – (3) anal appendages, from above; – (4) prophallus of *P. gamblesi* sp. n., ventrolateral view.

Prothorax: Anterior and posterior lobes mostly velvety black, each having two pale yellow spots; each side of the middle lobe pale orange-brown, with a dark eccentric spot, the whole lobe having a brown border which is very dark dorsally; laterally light brown with irregular mottling; ventrally pale orange-brown.

Synthorax: Mesepisternum dark brown or black with ferruginous antehumeral stripe; dorsal ridge of median suture black edged with yellowish line; humeral suture pale straw colour and very conspicuous; mesepimeron mostly very dark brown, but orange-brown at ventral end; metepisternum orange-brown, suffused with fine dark brown peppering, especially in the dorsal half; metepimeron light orange-brown, with slight brown peppering; mesinfraepisternum and metinfraepisternum orange-brown, the former with a dark brown central mark; legs ferruginous, slightly darker than the pale parts of the thorax.

Wings: Very narrow and slightly fumose with dense venation; anterior and posterior margins almost parallel from just distal to the nodus to the pterostigma; wing tips more acutely curved near the posterior margin than the anterior margin; veins very dark brown; pterostigma (Fig. 1a) ferruginous with the posterior margin strongly convex, the whole being trapezoidal with the proximal margin more longitudinal to the wing axis than the distal margin; nodus much nearer the base in the forewing than the hindwing;

nodal formula $\begin{array}{ccc} & \frac{4}{2}\,\frac{4}{2} & \\ 40 & & 37 \\ & \frac{4}{2}\,\frac{3}{2} & \\ 31 & & 32 \end{array}$; R_3 starts about two cells distal to the subnodus,

which is at the level of the 3rd P_x in the right forewing and left hindwing and between 2nd and 3rd P_x in left forewing and right hindwing; origin of IR_2 around 8 or 9 P_x in all wings; IR_3 at 3rd A_x in both forewings and in between 3rd and 4th A_x in the hindwings; arculus just distal to 2nd A_x in all wings, and nearer nodus than wing base.

Abdomen: Slender, with basal two segments and terminal three segments slightly dilated; general colour all brick-red, with segments 6-10 distinctly darker than the more proximal segments; each segmental annulus dark brown; segment 1 with a transverse dark brown patch on dorsum and a small dark brown spot laterally; dorsum of segment 10 also with a transverse dark brown patch; segments 2-10 with fine well developed transverse wrinkles; no other definite markings.

Anal appendages (Figs. 2a, 3a): Superiors forcipate and elongate, about three times the length of segment 10; apex with only very weakly developed spines and tubercles; ventrally with a long, relatively shallow subapical blade near the

tip; inferiors about half the length of superiors, slender and with sharply upturned point.

Accessory genitalia: End lobe of prophallus (penis) (Fig. 4) strongly constricted in the middle when viewed ventrally, with robust horns having flattened and twisted tips.

Abdomen: 44.0 mm (excluding appendages); Hindwing: 38.0 mm.

F e m a l e. – Unknown.

The new species is distinguishable from *P. stahli* as follows:

P. GAMBLESI SP. N.	*P. STAHLI* FOERSTER (Specimen given to the author by R.M. Gambles)
– Superior appendages long and strongly forcipate, slender, with relatively smooth tips and long, shallow ventral blade. Inferiors with only the tips upturned.	– Superior appendages shorter, more robust and less forcipate, with spiny and tuberculated tips and short, deep ventral blade. Inferiors with the distal half upturned (Figs. 2b, 3b).
– Nodal formula: as given in description.	– Nodal formula: $47\ \frac{6\,|\,5}{2\,|\,2}\ 47$ / $39\ \frac{5\,|\,6}{2\,|\,2}\ 39$
– Arculus nearer nodus than wing base.	– Arculus nearer wing base than nodus.
– Pterostigma 3 - 4 cellules in length, deep, posterior margin strongly curved.	– Pterostigma 4 - 5 cellules in length, shallow, posterior margin only slightly curved, almost a parallelogram (Fig. 1b).
– Origin of R_3 about 2 cellules beyond sub-nodus.	– Origin of R_3 immediately beyond sub-nodus.
– Origin of IR_2 near 8 or 9 P_X.	– Origin of IR_2 between 5 and 7 P_X.
– Abdomen (without appendages) 44.0 mm; Hindwing 38.0 mm.	– Abdomen (without appendages) 41.0 mm; Hindwing 37.5 mm.

However, the venation of the specimen of *P. stahli* donated by Mr. Gambles shows differences from the venation figured by ASAHINA (1956) and FRASER (1955) and it seems as though not too much reliance can be placed on the numbers of A_X, and on the origins of R_3, IR_2 and IR_3. The specimen of *P. stahli* examined is interesting in that each hindwing has one antenodal in the sub-costal space only (in addition to the normal A_X), in between the two primary antenodals. This may be regarded as a less well developed, but similar condition

to that figured for the Oriental amphipterygid, *Philoganga loringae*, (TILLYARD & FRASER, 1939 and MUNZ, 1919).

FRASER (1938) considered that the small number of antenodal in *Pentaphlebia* suggested that it was more archaic than the other genera belonging to the Amphipterygidae. The very small number of A_X (4 or 3) in the holotype of *P. gamblesi* and the occasional presence of non-coincident antenodals in the sub-costal space in *P. stahli*, may indicate that *Pentaphlebia* represents a particularly ancient evolutionary line existing as isolated relict populations.

FRASER (1955) considers that the venation of *Pentaphlebia stahli* is remarkably similar to that of the Australian amphipterygid genus *Diphlebia*. In respect of the antenodal pattern, the origin of R_3 and position of the arculus, as well as in general facies this is so. However, *P. gamblesi* has the arculus nearer the nodus than the wing base and the origin of R_3 is more distal, so that venationally *stahli* and *gamblesi* are surprisingly different although there is little doubt that they are correctly placed in the same genus.

The oblique quadrilateral of both species of *Pentaphlebia* is most similar to that of *Amphipteryx* within the *Amphipterygidae*, whereas other genera have this cell rectangular or nearly so. The proximal position of the nodus in *Pentaphlebia* is similar to the condition in *Devadatta* and *Amphipteryx*, whereas in *Diphlebia* and *Philoganga* it is much more distal. Considering these features of amphipterygid wings it is difficult to decide on the true evolutionary relationships within the family.

FRASER (1955) comments on the azure blue apical half of segment 9 in the female of *Pentaphlebia stahli* and he suggests that segment 9 would be at least partly blue in the male. The male specimens of *P. stahli* and *P. gamblesi* examined by the author show no blue whatsoever, but of course, this could be an age-determined character, developing, perhaps, in old specimens.

The specimen of *Pentaphlebia gamblesi* described in this paper was captured at a small artificial pool ("Grotto Pool") created by damming a stream close to the hotel at Obudu Cattle Ranch, Obudu Plateau. It was taken resting on foliage in riverine mist forest at 10.50 a.m. (local time) when the shade temperature was 19.0°C and the relative humidity was 96 percent. It was sunny at the time and there was considerable insect activity in the dense forest. The Obudu Plateau has a wet, cool and relatively dull climate, very different from the low-lying areas to the west, which are much hotter and less wet. The average annual rainfall is approximately 4280 mm, unevenly distributed throughout the year, July and August together receiving 1452 mm. July and August are also the coolest months (mean maximum about 16.5°C for both months) and January is usually warmest with a mean maximum of 19.0°C. The Obudu Plateau is also a relatively dull area with an average of 4.44 hours of sunshine per day; November, December and January being the sunniest months. In such weather conditions

Odonata need to be opportunists, becoming active very quickly when suitable short spells of sunshine occur. The restricting weather conditions for both insects and men in tropical mist forests must be one of the primary reasons why the Odonata are so poorly known from such interesting habitats.

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I am indebted to Mr. R. MOYLAN GAMBLES for comparing the new holotype with examples of *P. stahli* in his own collection and for the gift of one of these specimens. I am also grateful to Mrs. L.K. GLOYD for comparing my drawings of *P. stahli* and *P. gamblesi* with the type specimens of *stahli* in the Foerster collection at the University of Michigan, Ann Arbor, U.S.A.

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CROISSANCE DES LARVES DE *LESTES EURINUS* SAY ÉLEVÉES EN LABORATOIRE (ZYGOPTERA: *LESTIDAE*)

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LARVAL GROWTH OF *LESTES EURINUS* SAY UNDER LABORATORY CONDITIONS (ZYGOPTERA: *LESTIDAE*) – Larval growth of *L. eurinus* is studied in detail on a laboratory culture. The occurrence of several growing types (13, 14, 15 and 17 instars) is discussed. The growth of the laboratory reared larvae is compared to that of larvae caught in the field; this gives an evaluation of the efficiency of our rearing technique. Finally, an allometric study underlines the existence of two distinct growth phases in the life-cycle of this species.

INTRODUCTION

Un grand nombre de tentatives d'élevages en laboratoire ont déjà été entreprises dans le passé par différents chercheurs. La plupart de ces études n'aboutirent qu'à des résultats partiels car souvent, on ne parvenait pas à obtenir le cycle larvaire complet. Cependant, ceux qui sont parvenus à obtenir des adultes à partir d'élevages ont remarqué l'existence de plusieurs types de développement différents; c'est-à-dire que le nombre total de stades effectués avant l'émergence variait plus ou moins. On attribuait généralement ces variations à des conditions d'élevage inadéquates (BALFOUR-BROWNE, 1909; GRIEVE, 1937; MARTIN, 1939).

Plus récemment, en 1957, SCHALLER entreprit l'étude du cycle vital d'*Aeshna cyanea* Müll. Ayant réussi à effectuer l'élevage d'un grand nombre de ces larves sous des conditions de température stables, il observa quatre types de développement: 10, 11, 12 et 13 stades. Ces résultats l'ont amené à émettre l'hypothèse d'une détermination "ab ovo" des différents types de développe-