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A NEW SPECIES OF *PSEUDAGRION* SELYS, ITS SEPARATION AND COMPARISONS (ODONATA: COENAGRIONIDAE)

by

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ABSTRACT

Examination of typical *Pseudagrion gigas* Schmidt from West equatorial Africa has necessitated separation of the taxon in South and East Africa, hitherto known under the same name, as a distinct species, which is now named *Pseudagrion gamblesi* spec. nov. Detailed comparisons, with descriptions, are given, including the metallotype of *gigas*. A marked peculiarity of this new taxon is the variability in development of the female prothoracic stylets. The relationship of the closely allied *Ps. inopinatum* Balinsky is discussed.

INTRODUCTION

Amongst small collections of Odonata from Ivory Coast, submitted for identification during recent years by Dr. Claude Dejoux of Office de la Recherche scientifique et technique Outre-Mer, there was a single male of the genus *Pseudagrion* Selys belonging to a species I had not previously examined. It was very similar in male anal appendages to the species in South and East Africa regarded for the past thirty years as *Ps. gigas* (Ris) Schmidt, but differing otherwise in facies. On communicating this information to Robert Gambles, who has worked for many years on Nigerian and other West African Odonata, he said he had taken a few of this species in Nigeria. He considered this was probably the true *gigas* and had suspected that the eastern taxon would prove to be distinct. He informed Roger Lindley, who has periodical visits to Ivory Coast and Central African Republic, about my interest in this and other taxa of that area. Lindley kindly, and very promptly, sent me a short series of both sexes of the equatorial species. These notes and descriptions result from the invaluable co-operation by

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Gambles and Lindley. I would also like to take this opportunity of recording my appreciation for the Lepidoptera and Odonata Lindley has sent on other occasions.

It was also found necessary to bring *Ps. inopinatum* Balinsky into this research because of its close affinity with both taxa.

COMPARISONS

True *gigas* was described from Sikasso, which is now in the south of the Federation of Mali and just north of the Ivory Coast border. On consulting the original description in Ris' manuscript published by Erich Schmidt (1936) it was soon evident that the male from Dejoux and both sexes of the species sent by Lindley were true *gigas*, agreeing in all essential features. The taxon from South and East Africa hitherto called "gigas" was clearly a distinct species, not an infra-specific entity.

I take pleasure in naming the eastern taxon after Robert Moylan Gambles in recognition both of his contributions to the study of African Odonata and for his invaluable advice in the present instance.

The differences between the new species and *gigas*, apart from distribution, chiefly lie in the larger size of *gamblesi*, its bright chrome yellow face in the male, the heavier black markings at maturity, the presence of a small sub-basal inner tooth on the superior appendage and the presence, in the female of prothoracic stylets. In *gigas* the face is green, the black markings are less heavy, there is no sub-basal tooth on the superior appendage and no stylets in the female. In the third species, *inopinatum*, the size is still smaller, the male has no antehumeral stripes or occipital line; but the male has a tooth on the superior appendage and the female has prothoracic stylets.

These and other differences may be compared in tabular form:

	gamblesi	*inopinatum*	*gigas*
Abdomen ♂	over 36 mm	under 34 mm	under 37 mm
Abdomen ♀	over 36 mm	under 34 mm	under 36 mm
Hindwing ♂	over 27 mm	under 25 mm	under 26 mm
Hindwing ♀	over 27 mm	under 26 mm	26 mm
Labrum, ♂	chrome yellow	green	green
Frons, mature ♂	mainly black	mainly black	green
Frons, juv. ♂ ♀	brown-yellow	brown-yellow	green
Back of occiput, ♂	yellow line	no line	green line
Antehum. stripes, ♂	narrow	nil	broad
Lateral stripes, synth. ♂	moderate	thick	reduced
Black on legs, ♂	heavy	heavy	narrowed stripes
Abd. ♂, dorsum	black with green sheen	matt black	black with green sheen
Segm. 10 ♂ (dors.)	all black	all black	black with blue spot
Sup. append.	with sub-basal tooth	with sub-basal tooth	tooth absent
Its lower branch (ventr.)	gently curved	very concave	gently curved
Inf. append.	all black externally	all red-brown	black at apex
Prophalline funnels	short	short	long, slender
Prothor. stylets	present, variable	long	absent
Pruinosity, mature ♀	rarely present	(?) absent or slight	well developed

In *inopinatum*, females have not been examined for this research and Balinsky does not mention pruinosity in this sex.

Pseudagrion gigas (Ris MS) Schmidt Text fig. 1
Schmidt, 1936: 33, fig. 15
Schmidt (1936) says that Ris verified the manuscript. Further, he says "In Grösse und Habitus am nächsten *spernatum* und b (*natalense*). Ausgezeichnet durch die robusten

gelben Beine mit nur schmalen schwarzen Linien". Thus, in dimensions and form he places it nearest *spernatum* Selys and *natalense* Ris (a subspecies of *spernatum*, teste Pinhey, 1964: 40). It is distinguished by the yellow legs with narrow black stripes, but it is less robust than the new species. The original description was made from two males (holotype and paratype) from Sikasso. These specimens, in the Renée Martin collection, are in Paris Museum.

Description of both sexes from Ivory Coast and Central African Republic:
Male (mature). Labium pale ochreous. Face, front of orbits and frons bright green when fresh (the labrum tending to retain this colour more than the other portions which fade to yellow or stain a brownish tint); labrum with very fine black basal line, postclypeus broadly black at base; antenna black, except scape anteriorly green. Vertex black with pale yellow-green postocular spots, joined to a line at back of occiput (as in the type) or isolated from the occipital line in other males (mature or less so). Orbits ventrally pale yellow-green.

Prothorax black with green lateral and dorsal crescentic fasciae which remain visible at maturity; collar, lower sides and post-lateral edges of hindlobe green. Synthorax black to below humeral suture, green at sides; also a fine green juxta-carinal line and broad antehumeral stripe which may reach the humeral suture or be separated from it as in the figure; slight black dorsal markings on lateral sutures.

Venation and pterostigma very similar to *gamblesi*, reddish brown; also with 15-16 Px in forewings. Legs brownish yellow. Femora with black stripe, slender proximally, thickening distad; tibiae with more or less continuous, thick black stripe on anterior surfaces.

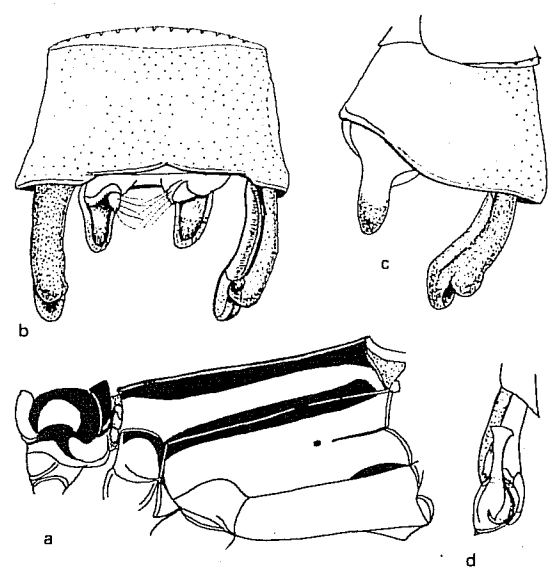

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Fig. 1. *Pseudagrion gigas* ♂: a. thorax; b, c. terminalia above, from left; d. prophallus.

Abdomen with broad bronze-black dorsal band, with green sheen, on all segments but on segments 8-9 enclosing blue (or violet) dorsal bands; and a minute sub-basal central blue spot on segment 10. Sides of abdomen green to yellowish green. Superior appendages very similar to *gamblesi*, slightly less robust and without the sub-basal inner tooth. Inferior appendages yellowish, black apically, unlike *gamblesi*. Prophallus very similar, but the apical funnels longer and more slender.

In other specimens the green colour of thorax and abdomen has faded, as on the head. In the oldest males there is very fine white pruinosity on dorsum of head and on mesepisterna.

Abdomen 34-36 mm, hindwing 23-25 mm.

Schmidt gives abdomen 36 mm (probably including anal appendages) and hindwing 29 mm, but this wing-length seems to be too great.

The female of true *gigas* does not appear to have been described. Four females were sent by Roger Lindley, all mature, pruinosed.

Metallotype ♀ (mature, pruinosed). Face as in males, mainly green; frons and vertex strongly marked with white pruinosity except laterally to the ocelli; pruinosed postocular spots linked across back of occiput. Orbits ventrally yellow.

Thorax coated dorsally and laterally with white pruinosity. Prothorax mainly pale with sparse black markings; no trace of prothoracic stylets. Synthorax marked as in male but with wider antehumeral stripes, much broader than half the mesepisternum and reaching the humeral suture; below this suture more narrowly black and with no black at first lateral suture (only a fine trace in C.A.R. ♀). Mesost. lamina swollen at lateral angle.

Venation and pterostigma paler red-brown; forewing with 14 Px. Legs as in male but slightly pruinose and with the black markings reduced on metathoracic leg.

Abdomen with white pruinosity reaching to middle of segment 6; a continuous broad black dorsal band on all segments; at sides yellower than in male. Cerci rather short, ferruginous; ovipositor sheaths reaching slightly over halfway along segment 10.

Abdomen 34,5 mm, hindwing 26 mm.

Metaparatypes similar; in one from Central African Republic there is a fine trace of a black line on first lateral thoracic suture; cerci darker in the others; size very similar.

Material. Females: *Metallotype* ♀: Lovonokaha, Korhago, Ivory Coast 6 Apr 1970 (R. Lindley); one paratype from same locality; others, Torgokaha, Korhago, Ivory Coast, 4th Jan 1970 (R. Lindley); Ouham River, Bohina, Bouar, Central African Republic, 25 Dec. 1974 (R. Lindley).

Males: Bac de Siemen, Ivory Coast, 20 Febr 1975 (C. Dejoux); Lovonokaha, Korhago, 3 Jan 1970 and Torgokaha, Korhago, Ivory Coast, 4 Jan 1971; Margin's Ponds, Bouar, 17 Dec 1974 and Ouham River, Bohina, Bouar, Central African Republic 25 Dec 1974 (all R. Lindley).

Pseudagrion gamblesi spec. nov. Text fig. 2

Pseudagrion gigas Pinhey (nec Schmidt) 1951: 84, figs. 172, 173, 185

Pseudagrion gigas auctorum (nec Schmidt)

Holotype ♂ (mature). Labium pale ochreous; labrum, genae, orbits in front, anteclypeus chrome-yellow; postclypeus broadly black (as in figure), margined anteriorly and laterally with yellow. Antennae black; frons and vertex black, the frons seemingly with yellow lateral intrusions connected to anterior of orbits but these bars dusted with black (as in all mature males). Occiput with short posterior yellow line. Isolated greenish yellow postocular spots; orbits ventrally all yellow.

Prothorax black, the collar and lower sides yellow and with lateral triangular yellow maculae as in the figure. Synthorax black to well below humeral suture; a very fine carinal pale line and with narrow dull greenish yellow antehumeral stripes. Sides olivaceous to yellowish olive, with short black line on first lateral suture and a narrow stripe above second suture. Ventral end of black on mesepimeron contracted.

Wings hyaline, venation dark ferruginous. Pterostigma dark ferruginous with pale marginal line; outer costal angle acute. Ac joins anal vein soon after the latter leaves posterior margin (less than length of Ac). Postnodal cross-veins of forewing 15 Px (left), 16 (right).

Femora and tibiae olivaceous on inner surface, all black on outer surface; tarsi ferruginous.

Abdomen slender with broad bronze-black dorsal band, with green sheen, on all segments except 8 and 9; sides of segments 1-3 green, end of 3 and from 4-7 brownish yellow; segments 8-9 dark violet-blue (obscured by darkening in mature condition), with black lateral stripe (also obscured); segment 10 all black above, green laterally.

Anal appendages blackish brown on outer surfaces, paler on their concave inner surfaces. Superior appendage longer than segment 10 in dorsal view, with two distal branches closely apposed, the lower one extending further than the upper; both branches with inner apical contact surfaces for tandem linkage; the stem having a small inner sub-basal tooth near upper edge. Inferior appendage shorter, concave dorsally. Prophallus ending in simple paired funnels typical of group A of this genus (Pinhey, 1964).

Abdomen (without append.) 41 mm, hindwing 28 mm.

Pale colours in life: face is characteristically bright chrome-yellow (recalling *Ps. citricola* Barnard, a much smaller species of S. Africa); eye chrome-yellow with dark brown cap; frons greenish yellow; postocular spots pale blue-green. Pale markings on thorax, legs and base of abdomen green, segment 10 more yellowish green; segments 8-9 blue or violet, but this soon obscured at maturation. In place of pruinosity as a pronounced ageing factor in this and other species (such as *Ps. whellani* Pinhey) it appears that melanin pigment spreads. This obscures yellow in the frons, sometimes the antehumeral stripes, and generally the blue tone of segments 8 and 9.

Paratype males. These show little difference from the holotype:

A less mature ♂ from Nandweni (Natal) has a pale red-brown pterostigma; abdominal dorsal band more greenish metallic; segments 8-9 violaceous with the lateral black stripe clearer; a mature ♂ Busi River (Rhodesia) differs from the holotype in having thinner black lateral stripes on thorax; a mature ♂ from Vila Paiva (Mozambique) has lost the frontal yellow, the antehumerals are obscure, but segments 8-9 are clearly pale blue with black lateral stripe, whilst in another from this locality the frontal yellow is visible. In two mature males from Chifua R. (Ndola) and one ♂ from Kabompo River (all Zambia) not only are the above markings obscure but also there is a variation of the mesepimeral black,

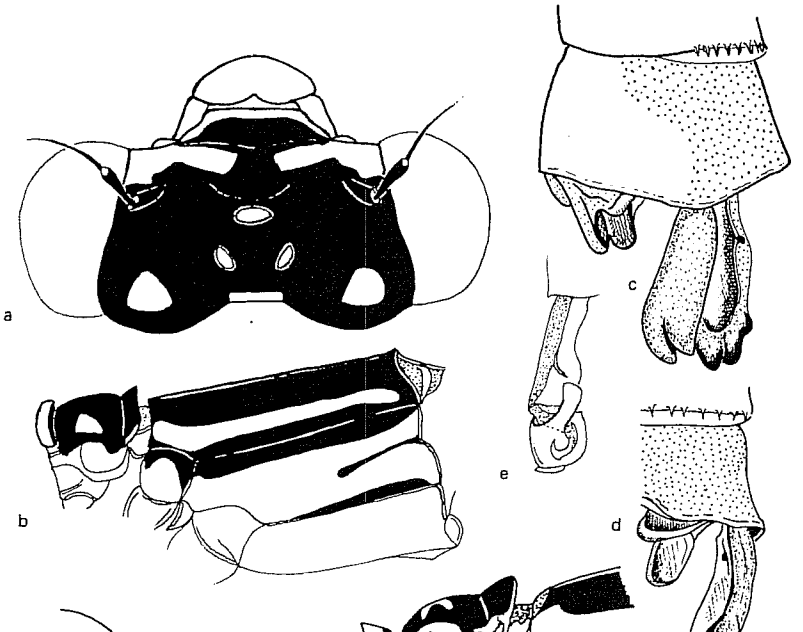

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Fig. 2. *Pseudagrion gamblesi*: holotype ♂ — a, b. head, thorax; c, d. terminalia from left, from above; e. prophallus. ♀ — f. head of allotype; g. prothorax to lower end of synthorax of allotype; h. prothorax of paratype (Ndola, June, 1959).

below humeral suture, since instead of this black contracting at ventral end it extends downwards. This is evidently no more than a minor difference since in another mature ♂ from Chifua River the mesepimeral black contracts.

Immaturity: In immature males the markings are clearer. Juvenile ♂ Lusevwe R. (Kapiri Mposhi) resembles the holotype but all pale marking are distinct. In tenerals from the same river and from North Mwinilunga, the markings are all clear and the frons is almost entirely yellow, with only mere traces of black at base and below junction with postclypeus. This indicates that the yellow frontal bar on maturer males is not really an intrusion from face or orbits but that the

frons is yellow on eclosion from the larval shuck and later this yellow is divide medially by a thick black band and the black gradually diffuses outwards fro here at maturity.

The only East African ♂ available, from Malawa Forest, Western Kenya, ha lost the outer half of the abdomen. It is almost mature and differs from all th others in a reduction of black markings on the lateral sutures of the thorax.

Allotype ♀ (nearly mature). Markings of head in female very like those in the tenera ♂, the frons mainly yellow or greenish yellow. Labium pale ochreous; face orbits in front, and frons green to greenish yellow. Postclypeus with less blac than in male, the black irregular, uneven on the two sides and enclosing sma yellow spots; a black bar at base of frons. Yellow bar at back of occiput longe postocular spots larger, green. Orbits below pale greenish ochreous.

Prothorax with more extensive greenish yellow marking than in male, includin dorsal crescentic spots; hindlobe black, yellow at sides and posterior edge; wit very short conical stylets. Mesostigmal lamina yellow, depressed, slightly raise posteriorly. Synthorax with the black descending less below humeral suture tha in male; greenish yellow antehumeral stripes much broader; a shorter black lin on first lateral suture and only a small dorsal hemisphere on second.

Venation and pterostigma paler; forewing with 16 Px on each side. Femor greenish ochreous, with post-lateral black streak, widening at knee and shorte on hindfemur; tibiae ochreous with black anterior stripes.

Abdomen thicker than ♂, with continuous bronze-black band on all segment Sides greenish ochreous to ochreous. Ovipositor sheath reaching only halfwa along segment 10; cerci short, fusiform, reddish ochreous.

Abdomen 39,5 mm, hindwing 28 mm.

Paratypes show some differences, and all maturer ones have less pale marking smaller postocular spots, darker prothorax without dorsal crescentic marking Variability in development of prothoracic stylets is a special feature:
♀ Busi River, face deep green, frons dark olive, green postocular spots linked vi the stripe on occiput; stripes on femora and tibiae thicker. Vila Paiva (les mature), like allotype, but the postclypeal black is reduced so that the yello spots connect with the exterior, whilst in a maturer female the postclypeal blac is very broad, just like the males. Ndola: there is far more variation, both i markings and in prothoracic stylets. One mature female closely resembles th allotype, having the same markings and short stylets, but, like Ndola males wit ventral end of mesepimeral black descending slightly; others, both mature an teneral show this slight mesepimeral extension and also the stylet itself extend forward from its thickened base as a fine process of variable length, reachin about a third to over one half across middle lobe. The teneral ones differ from th allotype also in the postocular spots almost or quite linking up, whilst in th mature females with elongated stylets the postclypeal black varies from moderat to as complete as in the holotype male, the frontal black with similar variation s that older examples have black frons with lateral yellow bars. A Kabomp River ♀, not quite mature, has the broad postclypeal black of the male, the pal frons almost as in the allotype, and extended stylets; one juvenile from Mwini lunga (boma) has the head markings just like the holotype male, the prothora with finely extended stylets.

Lastly, a Rhodesian female from Nyamadzi River, near Mt. Selinda, not onl combines features of the other paratypes but adds a further oddity for thi

species, a thin but very distinctive white pruinosity over the head, thorax and basal segments of the abdomen. The postclypeus is as black as the male, the frons as in the allotype but pruinosed, postocular spots very small and isolated, stylets with extensions reaching a third across middle lobe, but the mesepimeral black like the allotype, not extended downwards.

The tendency in Zambian specimens of both sexes to have the downward ventral extension of the mesepimeral black is nullified as a racial entity by the exceptions to this. The tendency, again, in Zambian females to have thread-like extensions to the stylets is, again, cancelled out by the variation in length of the process and by the extension in the Rhodesian example from Nyamadzi River. Nevertheless, this remarkable variation in markings and stylets is significant in Group A of this genus which shows a degree of constancy, allowing for maturation and ageing criteria (pruinosity and melanic tendencies). The stylets were previously described and illustrated by Pinhey (1964: 58, 59, 177). It may be assumed that this species is in a state of evolutionary flux.

Size variation: ♂ ♀ abdomen 37-39,5 mm, hindwing 28-30 mm.

Holotype, allotype, paratypes in National Museum, Bulawayo. Paratype ♂ ♀ will be in British Museum (Nat. Hist.).

Type material. Holotype, allotype Bazeley Bridge, 25 km S.W. of Umtali, Rhodesia, 10 Nov. 1965 (E. Pinhey). *Paratypes.* Natal: ♂ Nandweni, 24 Dec. 1949 (A. H. Newton); Rhodesia: ♂ Busi River, E. of Mt. Selinda, Nov. 1955 (E. Pinhey); ♀ Nyamadzi River, E. of Mt. Selinda, Apr. 1956 (E. Pinhey); Mozambique: ♀ Busi River, Espungabera, E. of Mt. Selinda, 8 Sept. 1965 (E. Pinhey); ♂ ♀ Vila Paiva, Gorongoza, Sept. 1957 (E. Pinhey); Zambia: ♂ ♀ Chifua River, 45 km S. of Ndola, March 1959, Apr. 1959, May 1959, June 1959, Jan. 1960, Febr. 1960 (R. A. Green and E. Pinhey); ♂ Lusevwe River, 45 km E. of Kapiri Mposhi, 21 March 1969 (E. Pinhey); ♂ ♀ Kabompo River, E. Mwinilunga District, Febr. 1960 (E. Pinhey); ♀ Mwinilunga (boma), 30 Sept. 1973 (A. Heath); ♂ Ikelenge, N. Mwinilunga, Febr. 1960 (E. Pinhey).

Additional records (Pinhey 1951, 1961a, 1961b under "*Ps. gigas*"). *Transvaal Museum:* Umvumvumvu River, W. Melsetter, Rhodesia, Oct. 1947 (E. Pinhey); Ingamanhé Forest, Vila Pery Distr., Mozambique, Sept. 1947 (E. Pinhey). *National Museum of Kenya*: Fourteen Falls and Thika, N. of Nairobi; Malawa Forest, Kakamega Distr., W. Kenya. *Balinsky* (1971): records this species (as "*gigas*") from Badplaas, Eastern Transvaal, Dec. 1968.

Known distribution. Natal, Transvaal, Mashonaland, Mozambique, Zambia, Kenya.

Ecological notes. This large species is found at fast flowing waters, often near cascades or rapids, where the streams or rivers are open, with grasses and sedges on the banks.

Pseudagrion inopinatum Balinsky

Balinsky, 1971: 11-15, fig. 1

There are two males in the National Museum, one of them a paratype kindly donated by Balinsky.

Notes on paratype ♂ supplemented by extracts from Balinsky's description:

Male (mature). Labrum, genae, anteclypeus and orbits in front green (Balinsky gives the labrum greenish blue to brown, the anteclypeus and genae brown to black). Postclypeus black. Frons black with pinkish or bluish white pruinosity on anterior

portion; vertex black with small green isolated postocular spots; no pale line on bac of occiput.

Prothorax all black above, without pale dorso-lateral fasciae; some white to bluis white pruinosity. Synthorax black to well below humeral suture, with, again, son pruinosity, but no trace of pale antehumeral stripes. Sides greenish ochreous, wit thick black stripes on both lateral sutures, broadly linked up at their dorsal origins t the black zone below humeral suture. Legs ochreous or yellow-brown internall broadly black externally.

Venation brown; pterostigma as in the other two species but paler red-brow Forewing with 13-15 Px. Ac in forewing situated further distad on anal vein, than c hindwing.

Abdomen broadly matt-black on all segments (pruinose on most segments of oth specimens in type series). Anal appendages all reddish brown, only slightly darkenir along dorsal surface of superior appendage. Superior appendage with well develope black apical hook-facets; the lower branch more slender in lateral view and much mo convexly rounded ventrally, so that after the stem of the superior the outer portion broader than in *gigas* or *gamblesi*. Upper branch with a small sub-basal inner toot like *gamblesi*, the lower branch less upturned in its apical portion. Inferior appenda all pale red-brown. The form of these appendages is well illustrated in Balinsk (figs 1. h-k). Prophallus very like *gamblesi*.

Teneral males (teste Balinsky) have the frons broadly pale brown; postocular spo much larger. Antehumeral stripes are present, evidently contracting with age due the spread of melanic pigment.

A mature ♂ (Drakensberg) only differs slightly: narrower black lines on later sutures of synthorax, more narrowly linked at origins. Superior appendage n darkened at all. It is much smaller than the type series.

Female. Balinsky describes two females believed to belong to this species. The pr thorax has long yellow stylets, which appear from Balinsky's illustration (fig. 1. e) be longer than half the median lobe; mesostigmal lamina flat, yellow, black at later angle, provided with spines; no epaulettes. Measurements of type series (Balinsky):

total length ♂ 31-34 mm, ♀ 32-33 mm

hindwing ♂ 23-24 mm, ♀ 24-25 mm

"Total length" here is presumably the abdominal length together with appendages

Paratype ♂ (National Museum), abdomen 33 mm, hindwing 24 mm

Drakensberg ♂, abdomen 29 mm, hindwing 21,5 mm.

Material. National Museum, Bulawayo: paratype ♂ Badplaas, Eastern Transvaa 12 December 1968 (B. I. Balinsky); ♂ Drakensberg, Natal, 5 October 1942 (A. H Newton).

Balinsky's type series included 8 males, 2 females, all from Badplaas, 10 and 12 Dec 1968.

Affinities. Although similar to *gigas* in certain respects, including the green labrum it is decidedly nearer *gamblesi* in essential features, the sub-basal tooth on the superio appendage, the prophalline terminalia, the heavily blackened legs and the presence c prothoracic stylets in the female. It is smaller than both and is itself distinguished b the lack of a pale line on the occiput, the lack of antehumeral stripes in the male, th matt-black abdomen and the plain red-brown inferior appendage. By these characters as well as the shape of the superior appendages, and by its distribution overlappin with *gamblesi* it is a distinct species.

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