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A revision of  
African Lestidae (Odonata)

by Elliot Pinhey  
National Museum, Bulawayo, Zimbabwe

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# Occasional Papers

of the National Museums and Monuments

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## A revision of African Lestidae (Odonata)

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## ABSTRACT

All known taxa of African Lestidae are reviewed and described, both Afrotropical (Ethiopian) and Palaearctic North African species. Emphasis is on Afrotropical species and their types, where available, but some have been lost, others damaged. Examination has stressed features of wing venation and anal appendages, as in earlier reviews, and also some of the more neglected venational and other characters indicated by studies of orbit, prothorax, sternite, prophallus (peneal organ), vulvar scale and ovipositor of all species; bursae of only a few females since they are not readily taxonomic. Details of anal appendages and particularly prophalli have necessitated introduction of a few descriptive terms, which are explained in a glossary.

From inter-relationships it has been shown that *Chalcolestes* Kennedy and *Paralestes* Schmidt are of subgeneric status and Schmidt's interpretation (1951) of *Chalcolestes* is incorrect, a new subgenus **Pseudo-chalcolestes**, being required for *silvaticus*. Two other new subgenera are erected, **Icterolestes** for *ictericus*, **Malgassolestes** for *simulator*. *Africolestes* remains in synonymy to subgenus *Lestes*. Straightness of a radial vein in Kennedy's genus is shown to be a size criterion, not a diagnostic feature. *Xerolestes* is accepted, on further examination, as a valid subgenus. There are consequently two genera in this fauna, *Sympecma* and *Lestes*, and seven subgenera, subordinate to *Lestes*. It also appears that *Sympecma* is closer to the *Paralestes* groups than to typical *Lestes*.

Examples of type species of genera and subgenera are all detailed, including *praemorsus*, the Oriental type of *Paralestes*. New types have been erected for three of the valid species, *amicus*, *pruinescens* and *silvaticus*.

Recorded synonymy has only been checked for Afrotropical taxa and new synonyms or other alterations have been made in these. Confusion in some taxa has been overhauled as far as possible. Altogether, twenty-one species are listed for this Continent, but the true status of *regulatus* Martin remains uncertain in the absence of its type. *L. pruinescens* is restored as a good species.

Earlier descriptions relied too much at times on markings of preserved material, some of which were due to post-mortem discoloration. Emphasis is laid on strong tendencies in many species to melanism and staining which can both appreciably affect patterns and colours.

Early stages are excluded except for mention of larval characters under the family diagnosis and in a few of the references. Notes are recorded on ecology and behaviour, sex recognition factors and also possible causes for some of the melanic tendencies. Separation of the Malagassian taxa is briefly discussed with other aspects of distribution.

A historical survey, a list of abbreviations employed and a glossary, keys to all taxa and detailed references are included.

Grammatically, species have been much confused in gender. Conformity has been achieved here by accepting "Lestes" as a masculine term.

## INTRODUCTION

## Note:

Rhodesia changed its name to Zimbabwe during the course of publication. Please read the text accordingly.

## General remarks

In the past there have been several reviews of family Lestidae. The first one of significance was Selys (1862) for all species known up to that time. Kirby (1890) included Lestidae in his World Catalogue, a list with synonymy and type designations. Martin (1910) reviewed the African species, with many new, or supposedly new, taxa. Regional reviews for Africa have been given by Ris (1921), May (1933), Fraser, Schmidt and Pinhey (all 1951), followed by other reviews in more recent years by various authors for North Africa and parts of the Afrotropical (Ethiopian) Region (see Crosskey & White, 1977).

None of these has been comprehensive for species now known in Palaearctic North Africa or for the Ethiopian Region. Several features of taxonomic value have been omitted or inadequately considered.

It has been increasingly difficult to be sure of the identifications of some species and particularly females. The 1910 paper of René Martin, with its proliferation of taxa, some of them obviously infraspecific, has required much attention, because of its inadequate descriptions, loss of types and damage to other type material. It has also seemed probable that some describers using dried material have failed to realize the strong tendencies to post-mortem changes in Afrotropical Lestidae. The present paper is an attempt to clear up as many uncertainties in the taxonomy as possible.

Although it was originally intended to revise the Ethiopian taxa only it was soon obvious, from dubious records and from the inter-relationships of groups, that inclusion of the few North African Palaearctic taxa would not only improve the nature of this revision but that this wider scope was a necessity.

All known African adult Lestidae have been examined except *regulatus*, of which the type is lost, the description inadequate and only a tentative status applicable. The separate Palaearctic subfamily Sympecmatinae, with its one North African species, is only covered in diagnostic features. The other taxa have been examined and descriptions given for all essential characters, including some rather neglected features, omitting only some minor colour details of face and sides of abdomen, which appear to have no significance. Variability is discussed at some length.

Larval stages have not been considered except in the family diagnosis and in a few life cycle references.

It has been found that there are only two valid genera, *Sympecma* and *Lestes*. *Chalcolestes*, *Paralestes* and *Xerolestes* are subordinate to *Lestes*, and of subgeneric status. Three new subgenera are described:

**Pseudochalcolestes** subg. nov.

**Malgassolestes** subg. nov.

**Icterolestes** subg. nov.

New types erected for valid species are:

**Neo-holotype**, *L. amicus* Martin

**Lectotype** ♂, **Allo-lectotype** ♀, *L. silvaticus* (Schmidt)

**Holotype** ♂, *L. pruinescens* Martin

#### Abbreviations and glossary

(Venation after O'Farrel, 1970).

1A	Anal vein. Convex (+).
abd.	Abdomen. (Length of abd. excludes anal appendages unless otherwise stated).
Ac	Cubito-Anal cross-vein. Cuq.
Afrotropical Region	Ethiopian Region. See Crosskey & White, 1977.
Bursa copulatrix	Genital receptacle in segment 8 of ♀, opening at a gonopore (ostium) near bases of larger terebrae at end of this segment.

Cu P	Cubital vein. Concave (—). Cu <sub>2</sub> .
Duodecimal system of measurement	1' 1" 1"', symbols for foot, inch and line, with 12 lines to inch. See Burmeister's description of <i>plagiatus</i> , <i>virgatus</i> : 1" 5''' = $1\frac{5}{12}$ inch = 35,4 mm.
flange	Flattened extension on inner surface of superior appendage.
fw.	Forewing.
hood	Membranous fold at end of prophallic head often bearing or developed into a ligula.
humeral suture	Mesothoracic suture between metepisternum and mesepimeron.
hw	Hindwing.
inferior appendages	Paired sub-anal appendages of ♂, developed from larval paraprocts in Zygoptera.
lateral sutures	First lateral suture, between mesothorax and metathorax; second lateral suture, on metathorax between metepisternum and metepimeron.
ligula	A development of hood (q.v.).
MA	Median vein. Convex (+).
M <sub>1a</sub>	In Needham notation this was an upper median vein (or postnodal sector of Selys). Now regarded as IR <sub>2</sub> (+), an indirect or intermediate radial vein.
mesepimeron, mesepisternum	Lower and upper plates of mesothorax.
metepimeron, metepisternum	ditto, of metathorax.
ovipositor sheath	Valves enclosing terebrae (gonapophyses) of segments 8-9.
pt.	Pterostigma.
R <sub>1</sub> , R <sub>2</sub> , IR <sub>2</sub> , R <sub>3</sub> , IR <sub>3</sub> , R <sub>4</sub>	Radial veins in sequence, alternatively + and —. (R <sub>4</sub> was formerly R <sub>4</sub> + <sub>5</sub> ).
scoop	Membranous floor of prophallic head. Occasionally extended as lateral folds.
shelf	Ridge at distal end of prophallic head.
sternites	Main ventral sclerites on synthorax, below metepimeron.
superior appendages	Paired cerci of male.
synthorax	Fused meso- and metathorax. Pterothorax.
ultranodal sector	Supplementary intercalated upper ♂ section of IR <sub>2</sub> , immediately below subpterostigmatal row of cells.

**Institutions:**

- BMNH* Entomological Department, British Museum (Natural History). London.
- BMZHU* Naturkunde Museum: Zoologisches Museum, Humboldt Universität. Berlin — DDR.
- CAS* California Academy of Sciences. San Francisco.
- DM* Durban Museum and Art Galley. Durban, Natal.
- HM* Hamburgisches Zoologisches Museum und Institut. Hamburg.
- IIANL* Instituto de Investigação Agronomica. Nova Lisboa, Angola.
- IRSNB* Institut Royal des Sciences Naturelles de Belgique. Bruxelles (de Selys collection)
- MLUH* Zoologisches Museum, Martin-Luther Universität. Halle-Wittenberg.
- MRACT* Musée Royal de l'Afrique Centrale, Tervuren. Bruxelles.
- MSF* Entomologische Sektion, Senckenbergische Naturforschende Gesellschaft. Frankfurt-am-Main.
- MW* Zoologische Abteilung, Naturhistorisches Museum. Wien.
- NMB* National Museum. Bulawayo, Zimbabwe.
- NRS* Entomologiske Advelningen, Naturhistoriska Riksmuseet. Stockholm.
- PMNHN* Département d'Entomologie, Muséum National d'Histoire Naturelle. Paris.
- PPIS* Plant Protection Institute. Salisbury, Zimbabwe.
- RSM* Royal Scottish Museum. Edinburgh.
- RUC* Rhodes University Collection. Grahamstown.
- SAM* South African Museum. Cape Town.
- SUC* Stellenbosch University Collection. Stellenbosch. Cape Province.
- TMP* Transvaal Museum. Pretoria.
- UF* Istituto di Zoologia dell Università. Firenze, Italia.
- UMAA* Museum of Zoology, University of Michigan. Ann Arbor (Förster Collection).
- USNM* Smithsonian Institution. United States National Museum. Washington.
- USSRL* (Zoological Institute, USSR Academy of Sciences. Leningrad (Martin Collection, pars)).

**List of Taxa** (\* = type species)

## Subfamily LESTINAE

Genus *LESTES* LeachSubg. *Lestes* Leach **stat. nov.** (*Africalestes* Kennedy)

- \**L. sponsa* (Hansemann)
- L. barbarus* (Fabricius)
- L. dryas* Kirby
- L. macrostigma* (Eversmann)
- L. virens virens* (Charpentier) (? = *sellatus* Hagen)
- L. amicus* Martin
- L. virgatus* (Burmeister) (= *rothschildi* Martin) **syn. nov.**

Subg. *Chalcolestes* Kennedy **stat. nov.**

- \**Ch. viridis viridis* (van der Linden)

Subg. *Pseudochalcolestes* nov.

- \**Ps. silvaticus* Schmidt
- Ps. auripennis* Fraser

Subg. *Paralestes* Schmidt **stat. nov.**

- \**P. praemorsus* Hagen (S.E. Asia)
- P. tridens* McLachlan (= *niger* Martin)
- P. dissimulans* Fraser (= *simulans* Auctorum)
- P. plagiatus* (Burmeister) (? = *regulatus* Martin) and f. *tarryi* Pinhey
- P. pinheyi* Fraser
- P. uncifer* Karsch

Subg. *Malgasolestes* nov.

- \**M. simulator* McLachlan (= *simulans* Martin)
- M. pruinescens* Martin **stat. rest.**

Subg. *Icterolestes* nov.

- \**I. ictericus* Gerstaeker (= *jacobi* Martin, *geminata* Fraser, **syn. nov.** *disarmata* Fraser)

Subg. *Xerolestes* Fraser **stat. nov.**

- \**X. pallidus* Rambur
- formae: *pallidus* Rambur, *somaticus* Förster, *cineraceus* Martin, *radiatus* Martin, *chromatus* Martin, *wahlbergi* Ris, *stigmatus* Navás.
- X. ochraceus ochraceus* Selys
- X. ochraceus unicolor* McLachlan
- X. ochraceus aldabrensis* Pinhey

## Subfamily SYMPECMATINAE

Genus *SYMPECMA* (Charpentier MS) Burmeister

- \**S. fusca* (van der Linden)

## HISTORICAL ACCOUNT

In this historical survey taxa now considered in synonymy will be enclosed in square brackets.

In 1815 Leach erected several new genera, *Lestes*, *Calepteryx* (corrected later to *Calopteryx* by Burmeister), *Gomphus*, *Anax*, *Cordulegaster* and *Cordulia*. Although he did not subdivide the true *Libellula* group this was a significant step forward. Except for Fabricius' *Agrion* and *Aeshna* in 1775, it heralded the emergence of subordinate genera from the all-embracing "Libellula" *sensu lato* of Linnaeus. Under his new genus *Lestes*, Leach only mentioned there were British species but without designation. The only true member of the genus described prior to 1815 was the Fabrician *barbarus*. The word "Lestes" in Greek signifies a robber.

The first African species in this genus was this Palaearctic *Agrion barbara* Fabricius (1798). For twenty years after 1815 Leach's name *Lestes* was apparently overlooked. Hansemann and van der Linden recorded between them in 1820-25 *sponsa*, [*nympha*], *viridis* and *fusca*, all under *Agrion*. Charpentier (1825) again used this generic name for *virens*, [*forcipula*] and [*leucopsallis*]. Brullé (1832) introduced a new generic title [*Puella*]. In 1836, Eversmann described *macrostigma* in *Agrion* but Stephens placed his [*nympha*] in *Lestes*.

Burmeister (1839) still used *Agrion* but also *Sympecma* from Charpentier's manuscript and introduced the first Afrotropical species, *plagiatus* and *virgatus*, both described from Port Natal (now Durban). Charpentier followed in 1840 using both words *Sympecma* and [*Sympycna*] for *fusca* and Selys, that same year, described [*Lestes picteti*]. This paper of Selys determined the constant use of *Lestes* or its later subsidiaries, separating them from the *Agrion* complex. Rambur (1842) introduced the palaearctic [*vestalis*] and [*forcipula*], the Afrotropical [*forceps*] and the third distinct species *pallidus*, all under *Lestes*, and in some detail.

In a long, rambling paper (1848-49), issued in many parts, Hagen discussed miscellaneous genera and, in brief allusion to *Lestes barbara*, gave this as the type of *Lestes*, an almost casual remark which later led to confusion on this all-important matter, its importance emphasized by the cosmopolitan range of the genus *Lestes*.

Over a decade later (1862) appeared Selys' major revision of Legion *Lestes*, the first paper to place this group on an orderly basis, but regrettably without figures. This monograph provided the Afrotropical *ochraceus* and the palaearctic [*sellata*], the latter described in Selys' paper by Hagen. The next Ethiopian species described was *icterica* by Gerstaecker (1869). Selys (1862, 1887) was also the first to record the European *L. barbarus*, *viridis* and *Sympecma fusca* from North Africa (Algeria and Egypt). Roster (1888) described early stages of *barbarus* and *S. fusca*.

Kirby's Catalogue (1890) summarized the World Odonata known at that time and designated many type species. He introduced *Lestes dryas* as a new name for *nympha* Selys.



(nec Hansemann) and designated Stephens' [*nympha*] as type species of *Lestes*, van der Linden's *fusca* as type for *Sympecma*.

In 1895, McLachlan described three species, two from Madagascar, *unicolor* and *simulator*, and one Mozambique, *tridens*. Kirby added [*obscurus*] in 1898, Karsch described *uncifer* the following year. Calvert (1901) placed *Lestes* in a new subfamily of its own. Then, a few years later, Förster's [*somaticus*] appeared in 1906. This was followed by the tantalizingly vital paper by Martin (1910), with the largest number of newly described African lestid taxa before or since that time. This was unillustrated and most of the types are now lost or damaged: *amicus*, [*chromatus*], [*cineraceus*], [*jacobi*], [*niger*], *pruinescens*, [*radiatus*], [*regulatus*], [*rothschildi*] and [*simulans*]. It has been one of the most difficult tasks to attempt to unravel problems arising from this paper and assess the synonymy. Only two of the taxa remain valid species and *regulatus* remains rather a conundrum. In the same paper Martin recorded North African localities for several *Lestes* and *S. fusca* and mentioned a form of *ochraceus* from islands west of the Seychelles, a form recorded again by Campion (1913) and later named as a subspecies by Pinhey (1967a).

Kennedy (1920) described numerous Odonata taxa at generic level, with marked brevity, including [*Africalestes*] and *Chalcolestes*. Ris appears to have intended to revise *Lestes* (circa 1930) but he died in 1931 and his only paper reviewing African fauna was on those of southern Africa (1921) in which he described *wahlbergi*. His interpretation of *ictericus* proved a false trail, as Gambles showed (1976), and led to confusion in later papers by Fraser (1950) and Pinhey (1951). Navás (1924) described [*stigmatus*]. Andrés (1928), with some assistance in identifications by Ris, recorded *virens* and *viridis* from Egypt but his record for teneral [*sellatus*] had already been doubted by Morton. In 1933 May surveyed the characters of North African species and their early stages, with the exception of *macrostigma*.

There was a long gap in significant information until Fraser (1950) gave a detailed account of the *pallidus* complex. This led to an upsurge of activity. Fraser described [*geminata*] in 1951 and in the same year both Fraser and Schmidt provided keys for Lestidae, including Schmidt's new *Paralestes* and *Chalcolestes silvaticus*; and Pinhey reviewed and re-described species of Southern Africa. Two more of Fraser's species, *dissimulans* and *pinheyi* appeared in 1955. Aguesse & Pruja recorded localities for North African *Lestes* in 1957. In various papers between 1961 and 1967 Pinhey reviewed other regional *Lestes* fauna, in one of which Fraser (1961) inserted his [*disarmata*]. Pinhey's 1962 Catalogue listed the Afrotropical (Ethiopian) taxa and synonymy and his 1967 Seychelles paper included *L. unicolor aldabrensis*, collected by Blackman. The previous year Lieftinck provided more North African locality data.

Gambles contributed markedly in 1976 by disentangling *ictericus*, *ochraceus* and *pallidus*. A year later, Dumont extended the range of *pallidus* to Mauritania.

As a footnote to this historical section Drury's "*Lestes lucretia*", erroneously described from "Cape of Good Hope" may be briefly considered as a reminder of locality errors perpetrated during the early transoceanic voyages. Drury (1773: pl. 48 fig. 1) described it

first as *Libellula lucretia* and later, with Westwood (1837: 97, pl. 48 fig. 1) as *Lestes lucretia*. Burmeister (1839: 818 nr 1) referred it to *Agrion*. This very elongated large zygopteran is, of course, now known as *Mecistogaster lucretia* (Drury), family Pseudostigmatidae. It is known to occur only in Neotropical forests.

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Since the commencement of this lestid research there have been many others who have been of inestimable assistance and particularly the following: J. Legrand loaned all the existing material in *PMNHN* relevant to René Martin's 1910 descriptions. Through the good offices of Dr. B. Kiauta, information was obtained on lestids and other Odonata presented by Martin to the U.S.S.R. Academy in Leningrad, this information communicated by Drs. N. N. Akramowski and L. A. Zhiltzova. Enquiries on the Förster collection were answered by Mrs. L. K. Gloyd. Dr. G. Demoulin (*IRSNB*) provided some information on markings of Rambur's type *pallidus*. Dr. S. Asahina, National Institute of Health, Tokyo, gave locality data on Schmidt's type series of *silvaticus*. Dr. H. J. Dumont, University of Gent, and Dr. D. A. L. Davies, of Searle Research Laboratories, High Wycombe, England, donated certain of the North African material, and previously J. A. Whellan (now of Overseas Pest Research London) presented some Moroccan Odonata including a long series of *barbarus*. Dr. O. S. Flint, of the Division of Neuropteroids, Smithsonian Institution, permitted me to retain some of the lestids sent for examination. Dr. A. J. Prins (July 1978) sent records from the South African Museum, Cape Town.

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From the Republic of South Africa the National collection, Bulawayo, was enhanced by the presentation some years ago of the late Dr. A. H. Newton's collection which contained many Natal Lestidae. M. J. Scoble of Transvaal Museum provided post-1948 records in that Museum, collected since the preparation (1948) of "Dragonflies of Southern Africa" (Pinhey, 1951). C. D. Quickelberge sent data for Durban Museum.

Staff of the National Museum, Bulawayo, have assisted over the years in collecting, literature, a few geographical queries and general encouragement. Micrometer measurements of synthorax dimensions were undertaken by the Curator of Invertebrates, Mrs. C. Car. And the ever-willing help of F. C. de Moor, previously of our Staff, is also highly commended.

### COLOUR, PATTERN AND STAINING

Recognition of true patterns, particularly thoracic ones, is of importance in *Lestes* but it is at times fraught with difficulties due to the onset of both melanism and pruinescence, and in many other instances, whether mature or less mature, through post-mortem changes. It is necessary to consider these diffusions in some detail.

*Normal colours.* Facial pale colours may vary from green or pale blue to yellow, the yellower tones, when not due to discoloration, being at times associated with more arid conditions. Ground colours of the body are shades of yellow, brown, grey-brown, red-brown, dull green to dark brown.

Many species develop bronze sheens on head and particularly on parts of the abdomen, at or near maturity. Most of subgenera *Lestes*, *Chalcolestes* and *Pseudochalcolestes* have bright metallic colours on head and body, forming regular bands on thorax, which generally reflect green, sometimes bronze, or often blue in juveniles. All except one of the *Paralestes*, as well as *Malgassolestes* have irregular metallic bands or maculae on the thorax. *Icterolestes* and *Xerolestes* lack metallic lustre, but in some individuals develop brown or black fasciae. Gambles (1976) discusses colour changes in life in *Paralestes*.

Melanic tendencies are common in many species and reach extreme proportions in males of *pallidus* form *wahlbergi*, and in the species *pruinescens* and *macrostigma*. Normal black zones are generally glossy but sometimes they have a matt texture. Useful diagnostic features include presence or absence of black on ventral surfaces of orbits and on sternites, in the latter usually involving distinctive patterns.

Apart from encroaching of metallic markings by melanic pigment in maturer individuals, there is the greater or lesser development of pruinosity, white to bluish white in shade. This is strongly exhibited in *macrostigma*, *plagiatus*, *dissimulans* and in *pruinescens*. Pruinosity in heavily melanised individuals seems to increase with age and blackening and *wahlbergi* may be much more pruinose white than other forms of *pallidus*. There may even be a correlation between these opposites, the melanism and the pruinescence.

Melanic and pruinose intrusions gradually obscure normal markings, even sometimes in those with metallic fasciae. Some further remarks on melanic development are recorded after specific descriptions of *plagiatus* (p. 410).

*Patterns.* Uniform metallic thoracic bands, as in most of subgenus *Lestes*, are more or less constant and are also present in teneral state. In old individuals blackening sometimes forms

round the edges of the fasciae and may gradually encroach on them; pruinosity is usually ventral or sparse on other parts of synthorax but may envelop the prothorax and terminal segments of the abdomen.

In those with irregular or fractionated metallic markings, as in most *Paralestes* and *Malgassolestes*, the fasciae are also evidently present in their teneral state, whether complete bands or isolated maculae (see further remarks after specific description of *pinheyi*). The pattern will only be altered by spread of melanin. Patterns of head or abdomen, seen in adults, are faint or browner or absent in teneralis. The metallic sheen may not always be apparent in teneralis but will gradually develop along brown fasciae. On the abdomen, however, the sheen may develop on the basal segments before appearance of the dark dorsal band, whilst the distal segments develop the black more quickly and may lose their sheens, or these change to more bronze or violet tints (pp. 416, 419).

In *Paralestes*, other than *plagiatus*, there is a moderately constant form of synthoracic pattern, except for the completeness or incompleteness of antehumeral fasciae. This pattern is evinced by antehumerals; darkened humeral depression; fasciae on mesepimeron; dorsal spots on lateral sutures; sometimes (particularly *dissimulans*) at metastigma; and two spots on metepimeron.

The development of dark maculae in the less mature stages of the imago can be studied by just examining a number of individuals sometimes seen in shaded spots. Brown maculae first appear in minute depressions on labrum (rarely), postclypeus, vertex and dorsal ends of thoracic sutures. Brown or black may spread from these depressions. In those with generally pale coloured thorax, *Icterolestes* and *Xerolestes*, the fasciae of the more marked individuals start at the humeral suture, but in *wahlbergi* both heavy melanism and pruinosity develop unusually early in sub-adults.

Despite the great variation of *pallidus*, as indicated by named morphs, localised variability is more frequent in *pinheyi* and *dissimulans* than in any other African Lestidae. In these two the divergent development of metallic bands or isolated spots from teneral condition imply that *pinheyi* and *dissimulans* can be regarded as dimorphic. To a lesser extent *tridens* is also dimorphic, the mature individuals being either the pale norm or the dark form (*niger*).

Leg-patterns need not be considered here in detail. Femoral stripes are of taxonomic value in a few species. In those with black femoral patterns the fore femur is normally more heavily blackened than femora 2-3. Dotted lines are more significant.

Pruinose patterns develop somewhat differently in species, for instance, more heavily or diffused in *Paralestes* than in most subg. *Lestes*, in which it is generally more ventral. The prothorax and terminal segments of the abdomen, however, may be exceptionally pruinosed.

*Melanic inducement.* Observations suggest that melanic tendencies are possibly increased in flood-water conditions following heavy precipitation (Pinhey, 1967c, 1976). This was particularly apparent in northern Botswana where spreading of swamp fringes and inundation of low ground led to a preponderance of melanic *wahlbergi*. An unusually well

melanised male *plagiatus* was found at a swamp near Quelimane. Elsewhere melanic *Pseudagrion* have been recorded in a flooded tributary of the Zambezi River (pp. 440, 458).

*Post-mortem thoracic discoloration.* Descriptions of *Lestes* have generally been made from preserved material, as with other Odonata. This genus is greatly subject to surface discoloration due to internal decomposition and staining can sometimes result in uniformly developed fasciae. Martin, in particular, has referred in original descriptions to brown or golden yellow antehumerals. These obviously false antehumerals are more recognizable as such when they are irregular, especially if they differ in development on left and right sides of the synthorax. Comparison of both sides will often clarify whether yellow, grey, brown or black "fasciae" are normal or induced, but occasionally they can match and cause uncertainty.

In those with regular metallic stripes these may be similar enough on both sides, but discrepancies occur in those with irregular bands and here left and right may show confusingly different patterns. They may, for instance, illustrate isolated spots on one side but with these linked on the other. However, these metallic fasciae, unless overlaid with stain of flat colours, of ferruginous or brown shades, are natural, whether bilaterally symmetrical or otherwise.

Some examples of a few proven instances of staining and false antehumerals are recorded under *pallidus* with illustrations. Colours recorded when captured show these "patterns" to be stages of decomposition in the preserved state (p. 455).

*Wing colours.* In most species the wings are hyaline, even at maturity, although in more aged individuals of either sex they may become faintly greyish yellow or even fumose. Melanised specimens, as in *wahlbergi*, also usually have fumosed wings. Yellow wings at and before maturity are exhibited in *virgatus* and *silvaticus*, and still more so in *auripennis* whilst in *amicus* the extreme is achieved where all stages have saffronated wings tipped with brown.

The pterostigma is generally unicolorous, or at most pale in centre or with finely pale edges, but it is distinctly bicoloured in *barbarus* and frequently so in *pallidus*.

#### STRUCTURE AND COMPARATIVE FORM

*Ridge behind antennal cavity* (Text fig. 15, 29, 116, 140). This ridge is prominent and its outer free end is variable in form. In most subgenera the end is more or less straight and pointed. In *plagiatus*, *pinheyi*, *auripennis* it is often more obtuse, whilst in *virgatus*, *amicus*, *barbarus* and *silvaticus* it has more of a tendency to curl backwards at the tip. In *ictericus* it is distinctly broad and straight. The scape of the antenna shows some variation from cylindrical to more conical shape. In the antennal cavity between scape and ridge there is often a small rounded tumour. The tumour is more or less developed in *tridens*, *pinheyi* and *uncifer* and often visible in *barbarus*, *amicus*, *simulator*, *ictericus*, *pallidus* and *ochraceus*. It has not seemed practicable to employ these antennal features in taxonomy.

*Prothoracic hind lobe.* In both sexes this lobe is evenly curved posteriorly in most taxa but sharply constricted at sides in *Sympecma* and subgenera *Chalcolestes* and *Malgassolestes* (Text fig. 52, 135, 139, 209). This modification, applying to both sexes, has no obvious tandem linkage significance. Anal appendages of the male are not remarkably adapted in these three taxa.

*Mesostigmal lamina of female.* The lamina in both sexes is slender, generally with a straight or almost straight posterior ridge. Differences in species are slight and do not assist much in specific identification, but in *uncifer* and *ictericus* the posterior ridge is foreshortened, thickened to a more or less elliptical shape. In all others, including the Palaearctic species, the posterior ridge is narrow.

*Width of synthorax* (Table 1). It is obvious to the naked eye that the synthorax is more slender in some species particularly subgenera *Icterolestes* and *Xerolestes* than in others, including the type species *Lestes sponsa*.

Measurements were made (excluding *pruinescens*) with a micrometer scale in simple units, without conversion to the metric scale. The dimensions of the synthoracic mesepisternum were used as a guide to length and breadth of the thorax. Although the range of size of different species is a variable factor, *virens*, *dryas* and *tridens* usually being small, *virgatus*, *amicus*, *plagiatus* and *uncifer* appreciably larger, the size variations of a small portion of the body, such as a mesepisternum, would be proportionately less.

The table giving the shape of the mesepisternum, shows results for male examples of each species, length of abdomen, dimensions of mesepisternum and ratio of length to width. "Length" here is just taken as that of the mid-dorsal carina; "width" is the measurement straight from carina to upper angle of the mesinfraepisternum where it joins the mesepimeron.

The table indicates the narrowest mesepisternum (and hence, the synthorax) is found in *Icterolestes ictericus*, *Xerolestes pallidus* and *ochraceus*, *Malgassolestes simulator*, *Paralestes pinheyi* and *tridens*. In all these the width is 1.1 units or less, and the ratio is high, 4.5 to 5. The longest synthorax is found in *virgatus*, *amicus* and *uncifer*, 5.2 or more units. Widest measurements include *sponsa* and all those with ratio 3.

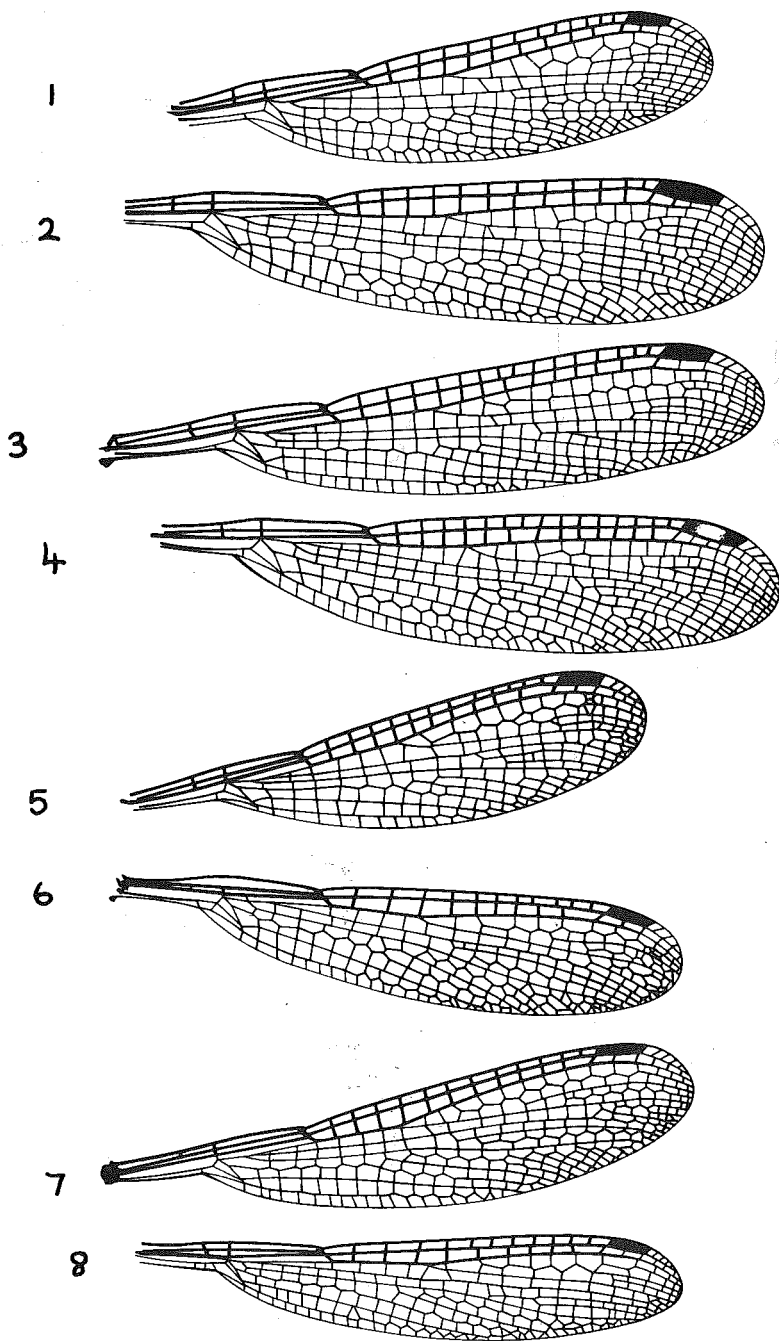
The results accord moderately well with subgeneric divisions:

High ratio 5 (narrow thorax) — *Icterolestes*; *Xerolestes pallidus*.

ratio 4.5 — *Xerolestes ochraceus*.

ratio 4 — *Lestes barbarus*, *L. virgatus*, *L. amicus*; *Paralestes*; *Malgassolestes simulator*.

ratio 3 — all other *Lestes*; *Chalcolestes*; *Pseudochalcolestes*.



Venation. Forewings of 1. *Lestes sponsa*; 2. *L. amicus*; 3. *L. auripennis*; 4. *L. plagiatus*; 5. *L. ictericus*; 6. *L. pallidus*; 7. *L. ochraceus*; 8. *Sympecma fusca*.

## Wing structures (Text fig. 1-8)

Wings usually narrowed apically but apex short, broadly rounded in *L. dryas* and *macrostigma*, *I. ictericus* and some *X. ochraceus*.

TABLE 1. Measurements

Subgenus and species	Shape of mesepisternum			Wing characters (normal variation)		
	Abd. ♂ mm	Mesepisternum Length Width	Ratio L/W (approx.)	Length of Pt mm	No. of Px forewing	Start of interc. veins, R4-MA fw
<i>Lestes sponsa</i> .. .. .	30	4,1 × 1,3	3	1,25-1,5	11-12	Px 2-3½
<i>L. virens</i> .. .. .	26	3,6 × 1,2	3	1,25	9-12	Px 3-5
<i>L. dryas</i> .. .. .	26	4,1 × 1,3	3	1,35-1,5	11-13	Px 1½-3
<i>L. barbarus</i> .. .. .	33	4,8 × 1,3	4	1,25-1,5	10-14	Px 2-4
<i>L. macrostigma</i> .. .. .	33	3,8 × 1,4	3	2,0-2,5	13-14	Px 3-5
<i>L. virgatus</i> .. .. .	40	5,4 × 1,3	4	1,5-2	12-14	Px 2½-5
<i>L. amicus</i> .. .. .	37	5,4 × 1,3	4	2,3-3	12-13	Px 4-7
<i>Chalcolestes viridis</i> .. .. .	32	3,7 × 1,2	3	1,75	11-13	Px 4-5
<i>Pseudochalcolestes silvaticus</i>	31	4,5 × 1,4	3	1,5-1,75	11-12	Px 3-5
<i>Ps. auripennis</i> .. .. .	33	4,7 × 1,4	3	2,3-2,5	13-15	Px 4-5
<i>Paralestes tridens</i> .. .. .	28	4,2 × 1,0	4	1,0	9-11	Px 4-5
<i>P. dissimulans</i> .. .. .	34	4,7 × 1,3	4	1,25	9-11	Px 2½-5
<i>P. plagiatus</i> .. .. .	35	4,8 × 1,3	4	1,5-2,0	11-13	Px 3-5
<i>P. pinheyi</i> .. .. .	32	4 × 1,1	4	1,25-1,5	12-14	Px 4-6
<i>P. uncifer</i> .. .. .	38	5,2 × 1,2	4	1,0-1,25	11-13	Px 4-6
<i>Malgassolestes simulator</i> ..	31	4,7 × 1,1	4	1,0-1,25	10-12	Px 4-5
<i>M. pruinescens</i> .. .. .	—	(not measured)		1,2	11-12	Px 6
<i>Icterolestes ictericus</i> .. .. .	31	4,8 × 0,9	5	1,25-1,3	11-13	Px 3-5
<i>Xerolestes pallidus</i> .. .. .	31	4,6 × 0,9	5	1,25-2,0	9-11	Px 2-3
<i>X. ochraceus</i> (& spp.) ..	33	5,0 × 1,1	4,5	1,75-2,0	11-13	Px 2-3½

*Pterostigma* (Table 1). Short (1.5 mm or less), thick, rectangular in *L. barbarus*, *dryas*, *virens*, all *Paralestes* except *plagiatus*, *Malgassolestes* and *Icterolestes*. It is broad, rectangular and long (over 1.5 mm) in *L. macrostigma*, *Ch. viridis* and *Ps. silvaticus*; narrow in *L. sponsa*, *P. plagiatus* and *Xerolestes*; convex and broad in *L. virgatus*, *amicus* and *Ps. auripennis*.

Serrations on costal edge above pterostigma show some variation in number of teeth and size, for instance, more robust in *virgatus* and in *Xerolestes*. No correlation has been found to be significant.

*Postnodal cross-veins* (Table 1). Px in forewings are most numerous (12-15) in *L. barbarus*, *macrostigma*, *virgatus*, *pinheyi*, *amicus* and *Ps. auripennis*. Px are fewest (9-11) in *P. tridens*,



*dissimulans* and *X. pallidus*. There is generally, however, much infra-specific variation. They are useful guides in some taxa, particularly *Xerolestes*.

*Discoidal cell*. This is not of much significance in genus *Lestes*. It is narrower in hindwing than in forewing, the lower distal angle still more acute.

*Anal cross-vein*. Ac is normally situated approximately at point of separation of anal vein. In *Chalcolestes* it is sometimes slightly distal to this point but more consistently and obviously so in forewing of *Pseudochalcolestes*.

*Cubital vein*. CuP, especially in forewing, arches forwards on leaving discoidal cell in several Afrotropical species, like *L. virgatus*, quite unlike the more typical condition of *L. sponsa* in which there is no strong preliminary curving. This arching on leaving discoidal cell has been given as a character for Chlorolestidae (Synlestidae). Where it occurs in African *Lestes* the origin of R<sub>4</sub> below subnodus in Chlorolestidae, instead of nearer the arculus in Lestidae is definitive.

*Supplementary intercalary veins* (Table 1). These are subgenerically important in space R<sub>4</sub>-MA. In *Paralestes* and two related Madagascar subgenera *Malgasolestes* and *Pseudochalcolestes* only the long supplementary veins are fully developed. In all the other subgenera there are short accessory veins before the wing margin in this space. These longer intercalaries start well proximal (at Px 1½ — 3) in *Sympecma*, *Xerolestes*, most subg. *Lestes* and *P. dissimulans*; but more distad in others, especially *P. amicus*. In family Chlorolestidae there are no intercalaries in this space until almost halfway or even far beyond this point, all being comparatively short veins. In the table given here, last column, two or three examples of Lestidae were examined for commencement of intercalaries in all North African species (except *barbarus*), in *Pseudochalcolestes* and *Malgasolestes simulator*; only the lectotype examined for *M. pruinescens*. For all the others, including *barbarus*, ten to twelve examples were examined.

*IR<sub>2</sub>*. This is the only radial vein which calls for further study. Its straightness in *virgatus* caught the attention of Kennedy in his separation of *Africalestes*. In comparison with related species it appears that the straighter vein prevails in longer wings, whilst in smaller species like *sponsa* it is undulant. It might be suspected that smaller size in this context was a secondary development, restricting this vein.

*Ultrastigmal sector*. This is a supplementary upper section of IR<sub>2</sub>, just posterior to the row of cells under the pterostigma. It is employed diagnostically in *Xerolestes* as an additional aid in separating the species *ochraceus*, which tends to have more doubled cells in this sector before the level of the pterostigma than *pallidus*. It is a very variable condition, as in duplication of cells in other respects. In subg. *Lestes* doubled cells before pterostigma are usually absent, or only an occasional deformity, but it may involve one doubled cell in *dryas* or *barbarus* or as many as two and a half in *sponsa*. *Pseudochalcolestes* and *Malgas-*

*solestes* normally lack them, *Chalcolestes* may have one doubled cell or none. *Paralestes* normally has no such cells except, peculiarly, in *dissimulans*, which usually has one or one and a half doubled cells except in the West Nigerian form.

#### *Abdominal characters*

These are not very significant structurally, in the taxonomic sense, except for the presence or absence of a dorsal carina on segment 10. This dorsal crest is only strongly developed in both sexes of *L. sponsa* and *P. plagiatus*. In *pinheyi* and *uncifer* and a few others it is partially developed and mainly in the male, in many there is no trace of the carina.

The shape of the terminal invagination on segment 10 may be more or less constant but can vary in *Xerolestes* or others from a V-shape to a shallow curve, the stronger V influenced by those with the dorsal crest. Marginal denticles on the invagination are again variable, infra-specifically, and do not appear to be significant.

#### *Anal appendages of male*

Superior appendages always forcipate, but in three of the *Paralestes* (*plagiatus*, *pinheyi* and *uncifer*) their form is more that of surgical nasal forceps, curved well downwards, gradually converging, instead of being horizontally convergent. Total length varies with species but is less significant than shape. They always bear small denticles on the outer surface, particularly on the distal portion of the appendage. These denticles are sparse in some species, numerous in others, uniseriate or sometimes in pairs or threes in longitudinal direction. They vary in size in a species.

On their inner surface there is always, except in *I. ictericus*, a sub-basal tooth, which may be angular or rounded, occasionally (*dissimulans*) only a swelling. It is normally constant in form but can vary infra-specifically in size or shape in *L. virgatus*, *P. plagiatus* and *uncifer*. Distal to this tooth and more or less connected to it is a flattened inner expansion extending posteriad to join the main appendage before its apex. This inner extension has evidently developed to aid gripping the female's thorax during tandem linkage, and it is here denoted a **flange**. This flange generally exhibits a characteristic shape on its edge and, except again in *ictericus*, it has a specific armature, consisting of more or less developed marginal denticles and large or small teeth. In *dissimulans* the marginal shape of the flange is unusually variable, probably not indicating subspeciation. A Nigerian male is aberrant in having the flange quite differently formed on left and right (Text Fig. 84.). Variation in prominence of denticles in armature of a species is partly explained through usage during tandem link-up.

Inferior appendages, like the superiors, show considerable variation and in particular their length is indeed diverse, especially in subgenus *Lestes*. In *L. dryas* and *L. sponsa*, for instance, the inferior reaches almost as far, in side view, as the incurved superior; in others much less so, in *virgatus* and *amicus* it is comparatively very short.

In some species the inferior is merely a rounded or conical structure, whilst in others, it bears a long or short extension which may be horizontal or angled in one direction or

another. The least development of an arm is seen in *pallidus*, where the extension is merely a small upturned knob.

*Prophallus of male* (employing explanatory terms).

The prophallic head in *Lestes* is very variable and complex. It is shaped like a **scoop** and usually more or less open, the chitinized stem branches supporting the head clearly visible in most instances. These branches dip down and diverge distally and generally terminate in a point on a curve. Beyond these points there is usually a centro-distal membranous **hood**, which may be large or small and normally bears or may form a reversed **ligula**. The hood is attached more or less centrally on the scoop. The ligula varies specifically. At the distal end of the scoop there is normally a transverse **shelf** or ridge of variable length and form, sometimes simple, in others excavated on its free surface. Where the hood is large it may rest distally on the shelf or be folded in below it. The *scoop* itself usually has parallel edges, terminating distally at the shelf and proximally angled inwards to where it commences on the membrane below the chitinized stem branches. From below the hood, anteriorly, a channel runs obliquely each side to this angle of the scoop's margin.

These are, in simple explanatory terms, the more typical features of the prophallic head but there are many variants. These can be discussed subgenerically and *Sympecma fusca* will also be included:

*Sympecma fusca*. Ligula bilobed, each lobe sweeping round to a point. Terminal shelf simple.

*Lestes*, subg. *Lestes*. In *sponsa* there is a large hood bearing a narrow ligula above it. Terminal shelf simple. In *barbarus* and *dryas* the hood or ligula is large, in *macrostigma*, *virens*, *virgatus* and *amicus* small. Terminal shelf simple in *macrostigma* and *dryas*, but notched in *virens*, *barbarus*, *virgatus* and *amicus*.

*Pseudochalcolestes*. Ligula broad but smallish and shelf reduced.

*Malgassolestes*. Ligula large; shelf angled in *simulator*, simple in *pruinescens*.

*Paralestes*. In type species *praemorsus* and most African species the hood is large, but is small in *pinheyi* and *uncifer*. Shelf broadly excised in *praemorsus* and *uncifer*; simple in *plagiatus*, *dissimulans* and *pinheyi*. In *tridens* the shelf is absent, its place taken by convergent thick folds from the rear margin of the scoop.

*Xerolestes*. Ligula large, shelf simple.

The two which follow show considerable divergence from the normal features. In particular, the scoop is extended laterally into broad, rounded folds which curve over and partially obscure both the chitin stem branches and the central part of the scoop. There is no hood or ligula:

*Icterolestes*. Aligulate. Shelf simple. Lateral folds greatly extended.

*Chalcolestes*. Aligulate. Chitin stem branches much elongated, divergent, extending to, and fusing with the shelf. This shelf is greatly extended laterally and terminates each side in slender palp-like arms. Lateral folds less broad than in *Icterolestes*.

*Ovipositor sheath of female*

If the ventral edge is straight or evenly curved, the denticulations are evenly distributed along this edge after the base. If the sheath is deeper distally, the denticulation is confined to this more convex distal portion or, at least, it is more pronounced. Denticulation varies in prominence and, as Gambles remarks (*in litt.*), the teeth doubtless wear down with use, particularly where plants chosen are highly siliceous.

*Vulvar scale of female*

This is a fold, angled like a hinge mid-ventrally, which lies just proximal to the ovipositor sheath. Its posterior and lateral margins, both sides of the body, may meet at an angular or curved apex or they may form a short extension, according to the species.

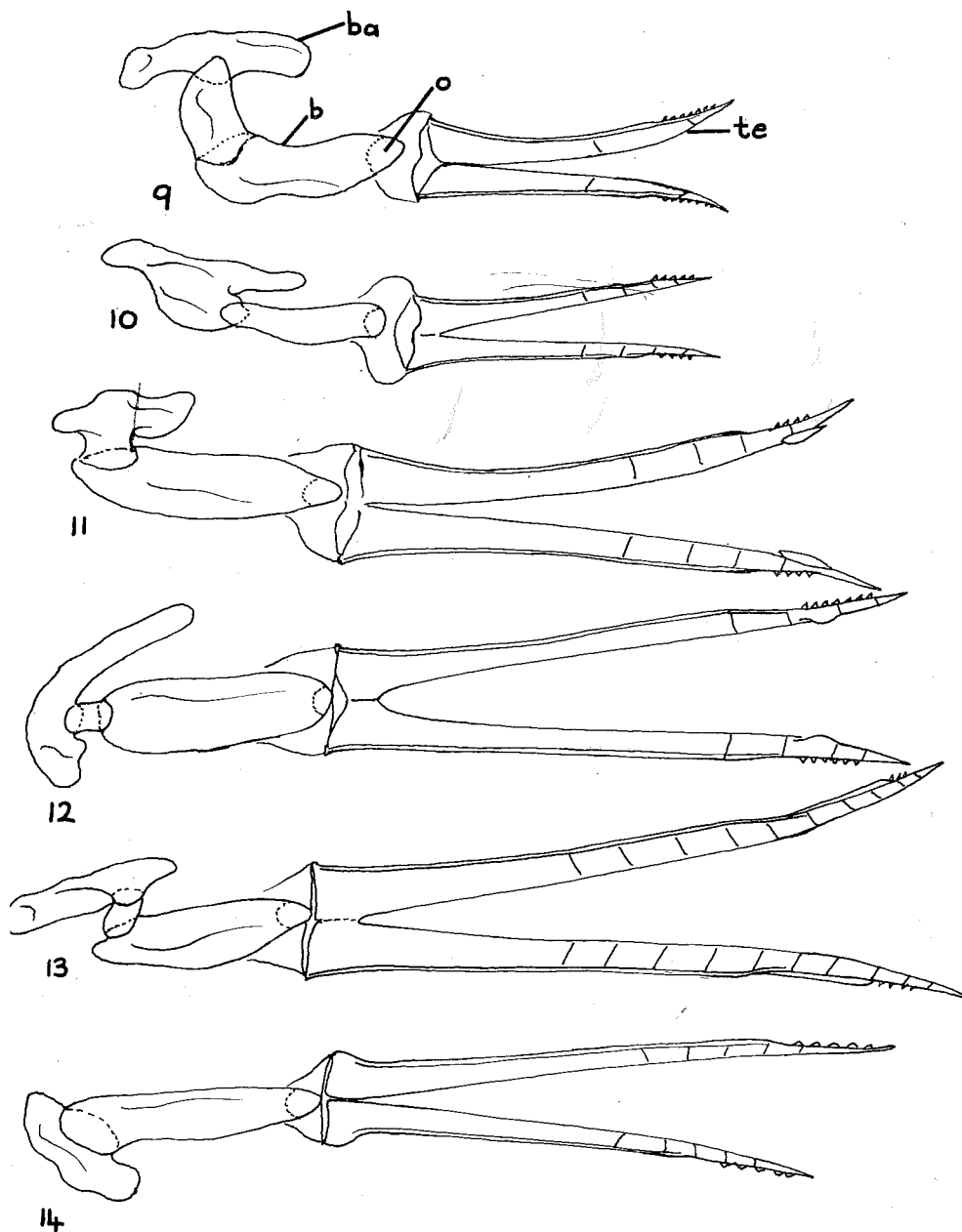
In most Afrotropical species the scale is simple. In *Xerolestes* there tends to be a kink on posterior margin before the apex. The apex is roundedly extended in *auripennis*, whilst in *virgatus*, *amicus*, *sponsa* and other North African species there is an acute extension.

*Bursa copulatrix* (Text Fig. 9-14)

This receptacle of various shapes lies inside segment 8 and has its ostium or gonopore at the distal end of the sternite on this segment, between the bases of the anterior and larger more ventral pair of terebrae (gonapophyses). Examples are illustrated for *L. barbarus*, *virgatus*, *P. dissimulans*, *plagiatus*, *pinheyi* and *X. pallidus*. There is a main bursa which terminates, usually via a narrow channel, in a transverse arm. The ventral terebrae are not necessarily equal in length and show variation in this feature. For practical purposes there is no immediate identificatory value that can be applied to the bursae.

*Note on tandem linkage*

The generally marked development of inner armature on the superior appendage of the male coupled with the lack of variability in mesostigmal lamina appear to suggest that the male's grip with superior is effective through sub-basal tooth and flange securing a hold between prothorax and synthorax. Variation in length of inferior appendage in subgenus *Lestes* is not reflected in any obvious modification of the female prothorax in *sponsa* or *dryas* so presumably the longer inferiors take advantage of the deep constriction between prothoracic collar and median lobe. Nor does the thorax appear modified for *ictericus*.



Bursae of females. 9. *pallidus* (Khwaai); 10. *pinheyi* (Maun); 11. *barbarus* (Morocco); 12. *plagiatus* (Khamii); 13. *virgatus* (Ndola); 14. *dissimulans* (Wankie).  
 b = bursa copulatrix, ba = bursal arms, o = ostium (gonopore), te = ventral terebra (of segment 8) seen dorsally.

## BIOLOGICAL AND ECOLOGICAL ASPECTS

Although early stages are not described in this paper except in general diagnosis of the larva, their oviposition sites and other aspects affect their distribution.

*Ecology.* Lestidae favour quiet, reedy or grassy pools, streams or the calmer inlets of rivers. As warm weather brings onset of rains, rain pools where there is standing vegetation will frequently have members of this family. *Lestes* are often the first odonate fauna to appear at such temporary sites (Pinhey, 1976). Their ova are resistant to desiccation even in dried mud and remain viable in the dry season until heavy precipitation occurs. Prolarvae can emerge and drop from plants into the water (Corbet, 1962: 17, 34).

Some species are to be found in adult condition most of the year. Gambles (1960) studied ecological conditions for *virgatus* in different months in Nigeria. It is suggested that they can at times survive the dry season in juvenile state. Further information on lestid ecology was recorded by Gambles in 1976.

*Sympecma* in Europe is known to hibernate during the maturation period (Corbet, 1962: 124) and in 1888 Selys declared *S. fusca* to be the only dragonfly he knew to hibernate with certainty.

Although rain-pool breeders must, in larval state, rely on small or minute organisms which preceded them in the water, Ris (1921: 269) regarded lestid larvae as "voracious feeders on Crustacea and small larvae of Ephemeroidea and Diptera".

*Behaviour.* Imagines when they settle normally choose perches, grasses or other vegetation where their abdomen can hang more or less vertically. In mature condition wings in both sexes are very characteristically held half open but in teneral and in all adult stages of *Sympecma* the wings remain closed when at rest after eclosion, as in other Zygoptera except Chlorolestidae. During these resting periods males frequently wave their abdomens up and down, exhibiting what Heymer (1972) describes as wing cleaning or wiping. In females, abdominal motion may provide another response. Corbet (1962: 180) says female *sponsa* may refuse attentions of male by opening the wings and raising its abdomen.

*Sex recognition.* Loibl (1958) considered that female lestids recognize their own male by shape and feel of anal appendages during tandem linkage. The male, on the other hand, does not recognize the female except by trial and error and Loibl illustrates, photographically, males in tandem with wrong species, or with another male or with species of a different genus.

It has been suggested (e.g. Pinhey, 1972b) that bright spots on terminal or subterminal segments of the abdomen in male Zygoptera or in libellulids such as *Atoconeura*, are recognition points, especially for the female. Heymer (1972) says the bright yellow or red colours in male *Calopteryx* on ventral surfaces of segments 8-10 are signals for females and to display such signs the males wave their abdomens up and down. Other examples could

be cited such as the libellulid genus *Hadrothemis* in some of which only females or immature males have prominent abdominal signal bands.

In *Lestes* such display spots are not strongly developed but a point requiring investigation in this context is the pale distal annulus or white pruinosed annulus, on segment 9 which is frequently present in one or both sexes of *dissimulans*, *tridens*, *simulator*, *pruinescens* and sometimes even in *ictericus*. Another possibility might be the white pruinosed prothorax which sometimes stands out in contrast to the duller synthorax.

*Flight.* Mature Lestidae generally do not appear to fly far from their perches near or over the water, but teneral will, like many other Odonata, retreat into bush or scrub away from water. *Xerolestes* may be found at times far from water, with *pallidus* high up on hills. Sylvan species like *amicus* tend to remain at breeding sites, but the close relative *virgatus*, of bush or forest, may be found further afield at times. No record has been found of actual migration in Lestidae.

Times of flight will naturally vary according to climate and season. A few remarks on this aspect in Rhodesia and Botswana indicate some specific distinctions. Here *pallidus* and *plagiatus* are seen in flight most of the year in suitable localities but with much greater abundance in the warmer, moist season, November to March. A more restricted period seems to be the case in *dissimulans* and *pinheyi*, September to March, whilst available records for *amicus* at Victoria Falls are only in the dry season July to October. In northern Zambian forests, however, *amicus* has been collected from January to May and is probably on the wing there nearly all the year.

*Predation on adult Lestidae.* The only record available is of adult lested remnants (det. Pinhey) removed from stomach of a nightjar (Caprimulgidae) at Ijara, near Garissa, Northern Frontier District, Kenya, Aug. 1951 (Lord Richard Percy).

*Distribution.* Although Okavango delta Odonata have a pronounced similarity to those of the palustrine system of and near the upper Zambezi River (Pinhey, 1978), conforming with the theory of change of flow of this river (Pinhey, 1976: 526), the small populations of Okavango Lestidae, other than *pallidus*, do not provide much data. *Lestes dissimulans* is the only example providing a link in this pattern from Zambezi to Limpopo systems across Botswana.

The locally melanic tendencies of *pallidus* in shallow flood-waters are discussed elsewhere.

In general distribution of this cosmopolitan family, the most widespread is the Holarctic *dryas* extending across the Northern Hemisphere. The other Palaearctic species are confined to North Africa, Europe and adjacent parts of western Asia. Records of *barbarus* (Martin, 1910) and of *sponsa* in the Afrotropical region are misplaced, as observed under these species. Of Afrotropical species the most widespread is *ochraceus* because of its insular races, but this species is scarce to the south of the Zambezi River and with no confirmed records in South Africa. In Continental Africa the most widely distributed are

*virgatus*, *plagiatus* and *pallidus* since these are found from the Cape to equatorial Africa with *pallidus* at least extending to Senegal and Mauritania. Other Continental species have wide tropical coverage, such as *ictericus* and *pinheyi*, neither of which is known yet south of the Limpopo River. The most restricted are *amicus* in south central Africa and subgenera *Malgassolestes* and *Pseudochalcolestes* of Madagascar.

### TAXONOMY OF HIGHER GROUPS

Family Lestidae, in the African Continent, consists of two distinct subfamilies, Lestinae and *Sympecmatinae*, each, in the present survey, containing only a single genus. It will be indicated later that *Chalcolestes* and *Paralestes*, formerly accorded generic rank, are intermingled in characters with other taxa which are introduced here as well as with *Lestes* itself, all representing subgenera.

Lestidae and its two subfamilies, together with genera and subgenera will be considered in group analysis, including keys, before consideration of species and infraspecific categories.

### LESTIDAE Tillyard

Lestidae Tillyard, 1914: 203; Tillyard, 1917: 276

*Diagnosis for African taxa* (venation as in O'Farrel, 1970)

*Adults*: Small to medium-sized, slender, petiolate Zygoptera. Ridge behind antennal cavity well developed. Postocular spots absent. Tibial spines long. Superior appendages of male more or less forcipate, usually well armed externally and interiorly.

Pterostigma more or less elongated, above two or more cells; with tendency to rectangular shape; well braced. Nodus within proximal third of anterior edge of wing. Arculus approximately midway between base and nodus. Origin of  $IR_3$  and  $R_4$  much closer to arculus than to nodus. Discoidal cell with lower distal angle acute.  $R_3$  rising well distal to nodus. An oblique vein always present connecting  $R_3$  near its origin with  $IR_3$ . Supplementary sectors (anticalaries) well developed. CuP generally not strongly arched near its origin from discoidal cell but sometimes more steeply curved. Anal vein normally more or less at anal crossing but occasionally prior to this point.

At rest the wings are held half open, except in teneral and in *Sympecmatinae* which close their wings.

*Larvae*. Slender, elongated; abdomen cylindrical. Antenna with seven segments. Three long, tapering, lamellate caudal gills, their secondary trachea more or less at right angles to main trachea, without much branching. Legs long and slender. Prementum (mask) with exceptionally long, narrow lateral lobes, reaching at least to bases of middle legs. Apex of mentum narrowly excised. Prementum setose, palps with complex teeth.



## LESTINAE Calvert

Lestinae Calvert, 1901: 18, 45; Calvert, 1902: 32

Calvert introduced Lestinae as a subfamily of Agrionidae which, up to the turn of this century, had been divisible into Calopteryginae and Agrioninae, but with *Lestes* presenting an anomaly (as in Tillyard, 1913).

Lestinae was raised to family rank by Tillyard (1914), but later authors, e.g. Fraser (1933) Schouteden (1934), still used Lestinae, although early editions of Imms' Textbook of Entomology employed the family name. Lestidae was established as the unit by the late 1940s. In 1951 Fraser introduced Sympecmatinae, separating this from the truer Lestinae.

Lestinae (*sensu stricto*) is characterized by the unequally divided arculus, the lower portion much the longer, so that the sectors of the arculus are well antieriad. Consequently the base of the discoidal cell is distinctly longer than in Sympecmatinae, and thus the quadrilateral is broader in *Lestes*. However, the angle of the arculus tends to be fractionally more posteriad in *dryas*, *macrostigma* and *virens*, than in *sponsa* and other species.

Other points of difference will be indicated in the survey of genera and subgenera which follows the references to genus *Lestes*.

**LESTES** Leach

*Lestes* Leach, 1815: 137 (genus 486); Stephens, 1836: 76; Selys, 1840: 135; Rambur, 1842: 243; Hagen, 1849: 147; Selys, 1862: 292, 295 (8, 11 sep.); Kirby, 1890: 160; Martin, 1910: 82; Ris, 1921: 268; Schmidt, 1928: 244; Fraser, 1933: 29; Schouteden, 1934: 77; Schmidt, 1938: 136; Fraser, 1951a: 68, 69; Pinhey, 1951: 40; Schmidt, 1951: 121, 122; Nielsen, 1954: 65; Lieftinck, 1954: 25; Conci & Neilsen, 1956: 64; Robert, 1958: 75; Lieftinck, 1960: 129 (with synonymy); Pinhey, 1961a: 5; Pinhey, 1961b: 11; Pinhey, 1962b: 93; Belyshev, 1973: 494.

Type species *Lestes nympha* Stephens (1836) = *Agrion sponsa* Hansemann 1823 (teste Kirby, 1890: 160)

*Puella* Brullé, 1832: 104. Type species *Agrion barbara* Fabricius 1798 (syn. Cowley, 1935: 56)

*Anapetes* Charpentier, 1840: 18. Type species *Agrion forcipula* Charpentier (1825) (= *Agrion sponsa* Hansemann 1823) (syn. Cowley, 1935: 56)

*Africalestes* Kennedy, 1920: 84. Type species (quoted by Kennedy) *Lestes virgatus* Burm. (Syn. Schmidt, 1951: 122)

*Chalcolestes* Kennedy, 1920: 84. Type species (Kennedy) *Agrion viridis* van der Linden 1825 (quoted as *viridus* by Kennedy). *Chalcolestes* Fraser, 1951a: 68; Schmidt, 1951: 121, 126. **Syn. nov.**

*Paralestes* Schmidt, 1951: 121, 124; Fraser, 1951a: 68. Type species (Schmidt) *Lestes praemorsa* Selys 1862 (♀ Manila, Philippines). **Syn. nov.**

*Xerolestes* Fraser, 1951a: 69. Type species *Lestes pallida* Rambur 1842. **Syn. nov.**

Note on type species of *Lestes*: Fraser (1951a), Schmidt (1951), Lieftinck (1954) and Pinhey (1962b) indicated that *Agrion barbara* Fabricius (1798) was the type species, following Hagen (1849: 147). Kirby (1890), Fraser (1933: 29) and Cowley (1935: 56) gave *L. nympa* Stephens (*Agrion sponsa* Hansemann) as type species. I had discussed the pros and cons of *barbarus* or *sponsa* with Fraser as long ago as 1949 and he expressed the view (*in litt.*, 13 Feb) that I was "technically" correct to use *barbarus* since Kirby (1890: 160) as first reviser had overlooked Hagen's reference to *barbarus* (in 1849) when he designated *nympa* as type species. However, examination of Hagen's paper indicates a degree of vagueness. This designation must, therefore, be regarded as invalid and Kirby's fixation of the type must be accepted.

#### *African Lestidae*

A partial revision of the *Lestes* complex, introducing a new taxon *Paralestes*, was given by Schmidt (1951) but his paper was predated by Fraser's review of the lestoids as a whole (Febr. 1951). Fraser incorporated some of Schmidt's results from a manuscript copy. Schmidt's paper was published by Pierre André in Paris with the note (last page) indicating that it was produced in "3e trimestre 1951," in the third quarter, July to September.

Schmidt, unfortunately, took the unusual view that Kennedy's genus *Chalcolestes* (1920) was given invalid characters, but that these could be adjusted by employing a different feature in his new Madagascar species *Chalcolestes silvaticus*. In doing this the prophalline character mentioned by Kennedy seems to have been disregarded as well as further, overlooked features in which *Chalcolestes viridis*, the type species, greatly differs from *silvaticus*. An attempt is made here to remedy this by erecting a new taxon *Pseudochalcolestes*.

Group taxa which will be described now are the following:

Genus *Lestes* Leach (and subg. *Lestes* Leach). Type species *nympa* Stephens (= *sponsa* Hansemann).

Syn: *Africalestes* Kennedy, type species *virgatus* (Burmeister)

Subg. *Chalcolestes* Kennedy (described as genus). Type species *viridis* (v.d. Linden)

Subg. *Pseudochalcolestes* nov. Type species *silvaticus* (Schmidt)

Subg. *Paralestes* Schmidt (described as genus). Type species *praemorsus* (Selys)

Subg. *Malgassolestes* nov. Type species *simulator* McL.

Subg. *Icterolestes* nov. Type species *ictericus* Gerst.

Subg. *Xerolestes* Fraser. Type species *pallidus* Rambur

Genus *Sympecma* Burm. Type species *fusca* (v.d. Linden)

It will be shown that *Chalcolestes*, *Paralestes* and *Xerolestes* rank as subgenera, not truly generic because of relationships in characters. Ris long ago urged for some years that *Lestes* was a compact unit, not divisible into separate genera (Ris, 1910; Schmidt, 1951: 121) and as far as African taxa are concerned the following descriptions still bear this out.

#### Subfamily Lestinae

##### *LESTES* Leach

In Africa this single genus now embraces all groups of this subfamily. It can be divided into seven subgenera on reasonably characteristic distinctions.

In general characters, the arculus is angled well anteriorly, giving a distinctly longer base to the discoidal cell than in *Sympecmatinae*. The anal crossing vein Ac is generally more vertical than in *Sympecma* but sometimes it is more or less oblique and in this as well as other features there is variation in this genus.

Subgeneric characteristics (a-g) will now be discussed followed by a summarized list of the inter-related features which clearly indicate their status.

#### a. Subgenus *Lestes* Leach (Text Fig. 15-44)

Apart from the generic type species *sponsa* (Hansemann) this includes other Palaearctics *barbarus* (Fabricius), *dryas* Kirby, *macrostigma* (Eversmann) and *virens* (Charpentier); and the Afrotropical species *amicus* Martin and *virgatus* (Burmeister).

Kennedy's *Africalestes*, type species *virgatus*, was placed in synonymy to genus *Lestes* by Schmidt (1951) and this synonymy would strictly apply to subg. *Lestes*. Kennedy's brief description merely said that " $M_{1a}$ " (i.e.  $IR_2$ ) was straighter than normal and the peneal organ had a "strap-like inner fold".

It is true that  $IR_2$  is straight in *virgatus*, but it is slightly less so in its very close relative *amicus* which would have to be in *Africalestes* if this were a valid taxon. In the small *sponsa* and others this vein is undulant, but in larger relatives like *barbarus* and *macrostigma* it is more level. *L. virgatus* and *amicus* are decidedly larger insects and it would appear that undulation in small species gives way to straightness with increased size; it is merely a size criterion, not a diagnostic feature (see *Structure*). Another factor can influence this, the doubling of cells in the ultranodal sector which, if moderately developed, as in *sponsa*, promotes irregularity in  $IR_2$ , the reverse being the case in absence of doubled cells.

The "strap-like fold" of the prophallus is not at all obvious. In Palaearctic subgenus *Lestes* there is a distal hood which sometimes develops as a ligula. In this respect *Africalestes* shows difference in that the hood is in the form of a pronounced hook-like ligula, far less "strap-like" than in the others. Comparisons of the prophalli in Lestidae have been given earlier in Notes on Structure. There is one other feature applicable to *virgatus* and *amicus*, in the length of synthorax compared to width (see table), which is

greater than in most of this subgenus, but this is also partly relative to overall size. From the table it is seen that the ratio of length to width is 4 in these two and in the moderately large *barbarus*. Consequently, the only valid difference in *Africalestes* lies in the prophallus and for this male character, not a very marked one, it seems advisable to leave *Africalestes* in synonymy.

Characteristics of subg. *Lestes* are that space  $R_4 - MA$  is not constricted but encloses both long and short distal intercalary veins. Ultranodal sector without doubled cells before level of pterostigma but these are slightly developed at times and sometimes in *sponsa* may show up to  $2\frac{1}{2}$  such cells. Prothoracic hind lobe evenly curved on posterior margin; synthorax usually short and broad, longer in *barbarus*, *amicus* and *virgatus*; mesothorax with uniform, narrow to very broad metallic ante-humeral bands. Inferior appendages more variable in size and form than in the other subgenera. Prophallic hood and ligula variable. Vulvar scale produced at distal angle to an acute point, except in *barbarus* and *macrostigma*.

Ac, in *barbarus*, *virens* and to a lesser extent *sponsa*, generally oblique, not vertical as in other species.

Melanism is sometimes quite appreciable in *virgatus* but in *macrostigma* mature individuals have the metallic thoracic fasciae completely obliterated by it.

Schmidt (1951) shows that Palaearctic species can be split into two groups on comparative length of inferior appendage: those with inferior half as long as superior, or less, include *barbarus*, *macrostigma* and *virens* (to which *amicus* and *virgatus* could be added); those with inferior nearly reaching as far as superior include *sponsa* (and *dryas*). Such grouping does not appear significant and there appears to be no correlating modification in female prothorax to accommodate longer inferiors.

b. Subgenus *Chalcolestes* Kennedy (Text Fig. 45, 46)

Kennedy (1920) regarded this as a full genus but his description merely said that the "upper segment of the arculus equals the lower", (which is not the case in examples examined for this revision) and that the prophallus lacks the internal fold. Schmidt (1951) regarded the arculus character invalid since (if correct) it would embrace the Australian taxon *Austrolestes* Tillyard (1913: 425) as well as *Sympecma*. In fact the arculus condition is quite similar in *viridis* to *sponsa* and other *Lestinae*, angled well forward, quite unlike *Sympecma*. Recent examination of *viridis*, especially the prophallus, has shown how distinct this taxon really is.

Schmidt attempted to re-diagnose *Chalcolestes*, instead of erecting a new group-name for his Madagascar species *silvaticus*. This unusual procedure appears to ignore the distinctive prophalline feature in which *viridis* differs so markedly from *silvaticus*.

In saying the prophallus lacks the "internal fold" (hood or ligula as here expressed) Kennedy focused on the most distinctive feature of *viridis* without emphasizing its essential form. It is now possible to reconstitute the characteristics of *Chalcolestes*:

Ac on forewing either at point of separation of anal vein or distal to it by about a quarter of the length of Ac. Space  $R_4$ -MA with intercalaries starting at Px 4-5. Hind lobe of prothorax strongly constricted laterally. Synthorax with regular broad green metallic fasciae. Prophallus aligulate; terminal shelf much extended transversely and produced into thin lateral arms; chitinized stem very elongated, reaching terminal shelf; lateral lobes of scoop extended, enveloping the centre of the prophallic head.

- c. Subgenus **Pseudochalcolestes** nov. [so-named for its former confusion with *Chalcolestes*]. (Text Fig. 47-62)

*Chalcolestes* (Schmidt MS) Fraser 1951; Schmidt, 1951 (nec Kennedy).

Type species *Chalcolestes silvaticus* Schmidt. Also includes *auripennis* Fraser. Schmidt, in attempting to refashion the characters of *Chalcolestes* said that Cuq (i.e. Ac) in forewing is well distal to separation of the anal vein and that space  $R_4$ -MA includes only one distinct intercalary sector (actually two such veins as Fraser previously recorded). Another character mentioned was that the thorax was marked with metallic green. The sexual distinctions of the obtuse sub-based tooth on the superior appendage and the robust spines on the ovipositor valves are not relevant when the second species, *auripennis* Fraser is considered. Schmidt included *amicus* in this group but admitted he had not examined this species. It is, in fact, in subgenus *Lestes*. The two species of this subgenus are only from Madagascar.

Apart from the first three characters in the previous paragraph there are two more features. The flange of the superior appendage has a minute isolated tooth in the middle of the upper surface. In the prophallus the ligula and terminal shelf are small and there are chitinous elements on either side of the stem of the prophallus.

- d. Subgenus *Paralestes* Schmidt (1951) (Text Fig. 63-126)

Described as a genus, Schmidt diagnosed this group on the space  $R_4$ -MA which he said enclosed only one long distinct intercalary vein, whereas there are two such long veins, as Fraser recorded in his key (1951a) which predated Schmidt's paper of the same year.

Species include *tridens* and *dissimulans*, the males with the usual forcipate superior appendages, as well as three others, *plagiatus*, *pinheyi* and *uncifer*, with appendages long, curved down like surgical nasal forceps.

Apart from the reduced intercalaries without distal short ones, other features include: Ac at separation of anal vein; no doubled cells before pterostigma in ultranodal sector except in *dissimulans*. Synthorax with irregular metallic antehumeral fasciae, which are either complete bands, dissected on outer surface (or hooked), or else much fractured. An exception is *plagiatus* in which they are slender and regular. In *uncifer* the female mesostigmal lamina has a shorter, more elliptical ridge than other species. Prophallus variable, but ligulate. Vulvar scale not sharply extended at distal angle as in some of subgenus *Lestes*.

- e. Subgenus *Malgassolestes* nov. [so-named as a purely Madagascar group] (Text Fig. 127-139)

Type species *simulator* McLachlan, with one other known species, *pruinescens* Martin.

Like *Paralestes*, there are only the long intercalary veins in space  $R_4$ -MA; thorax with irregular metallic antehumeral stripes (more or less melanised in *pruinescens*); and the prophallus is ligulate. This subgenus differs in having the prothoracic hind lobe sharply constricted at sides. The two known species are from Madagascar only.

- f. Subgenus *Icterolestes* nov. (*ictericus* or *Ikterikos* in Greek means jaundice or yellow thing). (Text Fig. 140-150).

Type species *Lestes icterica* Gerstaecker. Only one known species.

Like *Xerolestes*, this subgenus has a long narrow, plain brown thorax, without metallic markings, sparse if any brown or black fasciae. Wing apices short, broadly rounded. There is a tendency for Ac to be slightly oblique but less so than in *barbarus* and *S. fusca*. Superior appendage, unlike all other African Lestidae, without any inner armature. Prophallus, uniquely like *Chalcolestes*, aligulate; terminal shelf simple; lateral folds greatly developed, enveloping most of the prophallic head. Female with ridge on mesostigmal lamina short, elliptical, more like *uncifer* than other species.

- g. Subgenus *Xerolestes* Fraser (Text Fig. 151-205)

Fraser described this essentially as a genus without thoracic markings, or only slight fasciae, and considered it a xerophytic development. He also remarked on the coloration of the pterostigma, which is of rather less consequence.

Although it differs from other subgenera, except *Icterolestes*, in lacking metallic markings on the thorax, the brown or black markings can grade through to the heavily melanised variant *pallidus* f. *wahlbergi*. Other characters: thorax long and narrow, mesepisternum about five times as long as wide; space  $R_4$ -MA with long and short intercalaries, the longest intercalaries starting well proximal at Px 2-3; longer than all other Ethiopian species and most North African *Lestes*; Ac generally rather oblique, less so than in *S. fusca*; prophallic hood large, the terminal shelf simple.

The paler forms of *Xerolestes* are found in more arid localities, but the melanic ones are chiefly seen at shallow inundations and swamps. There are two species, *pallidus* and *ochraceus*.

#### *Inter-relationships in these subgenera*

The following inter-relationships between the subgenera of *Lestes* indicate that they are too closely affiliated with interwoven characters to be accorded generic status:

- (1) *Space R<sub>4</sub>-MA*. Short as well as long intercalaries in subgenera *Lestes*, *Chalcolestes*, *Xerolestes* and *Icterolestes*; only long intercalaries in the three others, *Pseudochalcolestes*, *Paralestes* and *Malgassolestes*.
- (2) *Prothoracic hind lobe*. Sharply constricted laterally in true *Chalcolestes* and *Malgassolestes*; evenly curved posteriorly in all the other five.
- (3) *Metallic antehumeral stripes*. These are narrow or broad but uniform in subg. *Lestes*, *Chalcolestes*, *Pseudochalcolestes* and in *Paralestes plagiatus*; they are irregular exteriorly or more or less fractured in *Paralestes* (except *plagiatus*) and *Malgassolestes*; and quite absent in *Icterolestes* and *Xerolestes* (which may sometimes however, have brown or black fasciae).
- (4) *Sternites in Pseudochalcolestes auripennis* (but not *silvaticus*) with long black U-mark as in *Lestes virgatus* and *amicus*, all these having regular metallic antehumeral stripes. The vulvar scale in these three is also rather similar; and the pterostigma.
- (5) *Shape of wing apex*. Apex short, broad and rounded in *Icterolestes*, *Lestes dryas* and *L. macrostigma*. In all others the apex is narrowed, less rounded, projecting slightly more, but sometimes rounded in *X. ochraceus*.
- (6) *Lateral folds of prophallic head*. Broadly expanded to fold over this part of the prophallus in *Chalcolestes* and *Icterolestes*; not expanded in the other five.

The relationship between those in no. (1), with narrowed space might suggest *Paralestes* can retain generic status with *Pseudochalcolestes* and *Malgassolestes* as subgenera of it. *Pseudochalcolestes*, however, has affinities to *Lestes* such as *virgatus* in iridescent bands and to *Chalcolestes* in this and other respects. *Icterolestes* in peneal character is very distinctive and, yet, in this character alone it is strongly associated with *Ch. viridis*.

#### Subfamily SYMPECMATINAE Fraser

##### Sympecmatinae Fraser, 1951a: 66

Characterized by the unusually narrow discoidal cell for African Zygoptera because the arculus is angled at about halfway instead of well forward as in *Lestes*. Hence, the base of the discoidal cell is of much shorter length in Sympecmatinae.

Space R<sub>4</sub>-MA with only two long well developed intercalary veins, no short terminal additions, in this respect resembling *Lestes* subgenera *Pseudochalcolestes*, *Paralestes* and *Malgassolestes*. These intercalaries are unusually long, starting at Px 1½-2½. Accessory vein Ac is much more strongly oblique, especially in forewing, not parallel to the antenodal crossveins as in the majority of Lestidae.

Prothoracic hind lobe sharply constricted at sides, as in *Chalcolestes* and *Malgassolestes*. Prophallic head with bilobed ligula.

Structurally, it is only in shape of pterostigma, presence of oblique vein and the forcipate superior appendages of the male that this subfamily conforms to the general characteristics of family Lestidae. There is one genus, *Sympecma*.

They are small lestids which, again unlike Lestinae, keep their wings closed at rest in the mature state.

#### SYMPECMA (Charpentier) Burmeister

*Sympecma* (Charpentier MS) Burmeister, 1839: 283; Charpentier, 1840: 145; Fraser, 1951a: 66; Conci & Nielsen, 1956: 62

*Sympycna* Charpentier, 1840: 19; Hagen, 1849: 148 (as subgenus); Selys, 1862: 336 (52 sep.); Kirby, 1890: 163 (syn. ad *Sympecma*); Schmidt, 1928: 249 (= *Sympecma*); Belyshev, 1973: 518

Type species *Agrion fusca* van der Linden (teste Kirby, 1890).

Only species *Sympecma fusca* is recorded from North Africa. Generic characters as for the subfamily (above).

#### PHYLOGENETIC CONSIDERATIONS

Insular species can help in visualizing some of the facets involved in considering the origins of Afrotropical *Lestes*. The distinctiveness of Malagasy species from continentals indicates long separation, but not long enough to lack earlier influences, sustained prior to the severance of Madagascar from Gondwana. *Malgassolestes* and *Pseudochalcolestes* retain the reduced venational space in medio-apical region of the wing as in *Paralestes* of Continental Africa and of Asia. The elongated male appendages of the *plagiatus* group may represent a later specialization. The wing reduction, incidentally, is also seen in *Sympecma*, pointing to a still earlier group separation, with *Sympecma* showing more affinity to the *Paralestes* complex than to more typical *Lestes*.

A further point here is that *Malgassolestes* exhibits lateral constriction of the prothoracic hind lobe exactly as in *Sympecma* and unlike *Pseudochalcolestes*, perhaps again narrowing the field of relationship. This prothoracic condition is, however, shown by *Chalcolestes* which does not have the reduced medio-apical venation.

The only other Madagascar taxon *unicolor* is close enough to *ochraceus* of the mainland to be only a modified race of it and to have caused a little confusion of identity in the past. Subspecies *aldabrensis* is a further modification of *unicolor*, not directly of *ochraceus*. Cosmoledo *Lestes*, although not examined during this revision, are probably *aldabrensis* since the Cosmoledo islands are less than 200 km east of the Aldabra islands, in the same group to the north of Madagascar. It may be surmised that these populations and subsequent race probably arose through the wafting of large numbers of immature *unicolor* northwards by southerly winds off Madagascar following population increases on the parent island.



The peculiar peneal relationship between *Chalcolestes* and *Icterolestes*, which are otherwise so markedly different, must have important genetical significance of a rather involved nature. *Chalcolestes* is the more specialized in prophalline characters. Whether *Icterolestes* is related to *Xerolestes* in general characters through convergence or to *Chalcolestes* by mutational retrogression it is difficult to assess.

The closely woven characters of *pallidus* and *ochraceus* suggest rather recent separation. Instability of subsidiary and transverse veins, which is the criterion here, is however, a prevalent phenomenon in Odonata venation. The main longitudinal veins and basic features like the arculus are reliable venational features but there is considerable variation in cross-veins and anticalaries.

KEYS

Four main keys have been prepared, with North African species separated from Afro-tropical species in the specific keys. This is merely for convenience. These keys are:

- a. Group key to African Lestidae: genera and subgenera.
  - b. Specific key to North African Palaearctics.
  - c. Specific key to Afrotropical species.
  - d. Keys to males of certain infra-specific categories: in *plagiatus*, *ochraceus*, *pallidus*.
- a. Group key to African Lestidae.
1. Upper and lower segments of arculus almost equal in length. Space R<sub>4</sub>-MA enclosing only two long intercalary veins, no short distal ones. Ac oblique. Prothoracic hind lobe sharply constricted laterally. Prophallus with bilobed ligula. ♀ cercus very long, robust . . . . . Subfamily Sympecmatinae, genus *Sympecma* (p. 358)
  - Upper segment of arculus much shorter than lower, so that the quadrilateral is far broader. Ac normally vertical. Prophallus with single-lobed ligula or no ligula. ♀ cercus normal. Subfamily Lestinae, genus *Lestes* . . . . . 2
  2. Space R<sub>4</sub>-MA with only two long intercalary veins . . . . . 3
  - Space R<sub>4</sub>-MA with long and distal short veins . . . . . 5
  3. Prothoracic hind lobe sharply constricted on posterior margin. Antehumeral stripes (when visible) irregular on exterior margin. Madagascar only . . . . . *Malgasselestes* subg. nov. (p. 356)
  - Prothoracic hind lobe evenly curved on posterior margin . . . . . 4
  4. Ac well distal to point of separation of anal vein. Antehumeral stripe uniform in shape. Flange of superior appendage with minute tooth near the middle of the upper surface. Madagascar only . . . . . *Pseudochalcolestes* subg. nov. (p. 355)
  - Ac at point of separation of anal vein. Antehumeral stripe irregular exteriorly or fractured, or rarely narrow, uniform (*plagiatus*). No dorsal tooth on middle of flange. Continental Africa . . . . . subg. *Paralestes* (p. 355)

5. Synthorax with metallic antehumeral and other markings . . . . . 6  
 — Synthorax plain, without metallic markings; sometimes with brown or black markings . . . . . 7
6. Prothoracic hind lobe sharply constricted laterally. Prophallus aligulate, with large lateral enveloping folds . . . . . subg. *Chalcolestes* (p. 354)  
 — Prothoracic hind lobe evenly curved on posterior margin. Prophallus ligulate, the lateral folds short, simple, scoop-like . . . . . subg. *Lestes* (p. 353)
7. Long intercalaries in space  $R_4$ -MA start at Px 2-3. Flange of superior appendage well armed. Prophallus ligulate, the lateral folds short, simple . . . . . subg. *Xerolestes* (p. 356)  
 — Long intercalaries in space  $R_4$ -MA start at Px 4-5. Flange of superior appendage unarmed. Prophallus aligulate, the lateral folds very large, enveloping . . . . . *Icterolestes* subg. nov. (p. 356)

b. Key to Palearctic North African species of Lestidae.

1. Segments of arculus equal in length, the discoidal cell very narrow. Space  $R_4$ -MA with only long intercalaries starting proximad at Px  $1\frac{1}{2}$ - $2\frac{1}{2}$ . Ac very oblique. Prothoracic hind lobe sharply constricted laterally . . . . . *Sympecma fusca* (p. 473)  
 — Lower segment of arculus decidedly longer than upper, the discoidal cell broad . . . . . *Lestes* . . . . . 2
2. Prothoracic hind lobe sharply constricted laterally. Ac sometimes slightly distal to separation of anal vein. Prophallus aligulate; terminal ridge very wide, with lateral arms; lateral folds very broad. Sub-basal tooth of superior appendage obtuse. Vulvar scale with small angular extension before apex . . . . . *Chalcolestes viridis* (p. 385)  
 — Prothoracic hind lobe evenly curved posteriorly. Ac at point of separation of anal vein. Prophallus ligulate, the lateral folds normal. Sub-basal tooth of superior more or less acute. Vulvar scale without *pre-apical* extension . . . . . s.g. *Lestes* . . . . . 3
3. Labrum black with yellow lower edge. Pterostigma 2 mm or more. Synthorax, at maturity, not metallic, mainly pruinosed black. Femora almost all black. Forewing ♂ 13-14 Px, ♀ 15-16 Px. Vulvar scale simple, with slight swelling before apex . . . . . *L. macrostigma* (p. 371)  
 — Labrum green or yellow. Pterostigma 1,5 mm or less. Synthorax metallic green, at least down to first lateral suture. Femora partly yellow. Forewing normally with lower postnodal index. Vulvar scale either plain, simple, or with acute apical extension . . . . . 4
4. Postclypeus yellow at lateral edges. Orbits and sternites below all yellow. Pterostigma bicoloured. Superior appendage yellow, black at apex. Mesostigmal ridge all yellow. Vulvar scale simple . . . . . *L. barbarus* (p. 367)  
 — Postclypeus not yellow laterally. Pterostigma unicolorous. Superior appendage mainly black. Mesostigmal ridge at least half black. Vulvar scale with acute apical extension . . . . . 5
5. Small species, abdomen ♂ 27 mm or less. Orbits below yellow. Sternites with black lateral bars. Femora 2-3 yellow with black stripes. Forewing with 7-12 Px. Inferior appendage yellow, half as long as superior . . . . . *L. virens* (p. 372)

- Larger, abdomen ♂ 29 mm or more. Orbits below black, sternites yellow or scarcely marked. Femora 2-3 broadly black. Forewing with 11-14 Px. Inferior appendage brown or black, nearly as long as superior . . . . . 6
- 6. Mid-femur mainly black enclosing a dotted yellow stripe. Superior appendage straight, then incurved distally. Inferior appendage with flat distal extension inturned apically, like a bird's head. Mesostigmal ridge partly yellow . . . . . *L. dryas* (p. 369)
- Mid-femur black, not enclosing dotted yellow line. Superior appendage evenly forcipate. Inferior appendage with long, straight extension, scarcely inturned. Mesostigmal ridge all black . . . . . *L. sponsa* (p. 364)
  
- c. Key to Afrotropical (Ethiopian) species of *Lestes* (♀ *pruinescens* unknown).
  - 1. Space R<sub>4</sub>-MA enclosing long intercalary veins but no short distal ones. Prophallus ligulate . . . . . 2
  - Space R<sub>4</sub>-MA enclosing long intercalaries and short distal ones . . . . . 10
  - 2. Ac in forewing well distal to separation of anal vein. Synthorax with uniform narrow metallic antehumerals. Flange of superior appendage with minute dorso-central tooth. Prophallic head with chitin elements on either side of stem . . . . .
  - . . . . . s.g. *Pseudochalcolestes* (Madagascar) . . . . . 3
  - Ac in forewing at separation of anal vein. Synthorax with irregular or fractured antehumerals (but narrow, uniform in *plagiatus*) . . . . . 4
  - 3. Pterostigma 1,75 mm or less. Forewing with 11-12 Px. Orbits below more or less black. Labrum of ♀ with black lower edge. Sternites all pale. Femora broadly black. Superior appendage with large blunt sub-basal tooth, Inferior appendage without slender distal arm. Cerci black. Vulvar scale simple . . . *L. (Ps.) silvaticus* (p. 388)
  - Pterostigma over 2 mm. Forewing with 13-15 Px. Orbits below yellow. Labrum not black-edged. Sternites with long bifurcate black stripe. Femora not black. Superior appendage with acute sub-basal tooth. Inferior appendage with long slender, out-turned distal appendage. Cerci yellow, black at tip. Vulvar scale with rounded extension at distal angle . . . . . *L. (Ps.) auripennis* (p. 390)
  - 4. Prothoracic hindlobe sharply constricted laterally . . . . .
  - . . . . . s.g. *Malgassolestes* (Madagascar) . . . . . 5
  - Prothoracic hind lobe evenly curved posteriorly . . . s.g. *Paralestes* (Continental). 6
  - 5. Superior appendage with acute sub-basal tooth; flange straightish, with both subterminal and terminal teeth. Inferior appendage about a third as long, with long orange apical hair. Cerci of ♀ brownish yellow. Vulvar scale simple . . . *L. (M.) simulator* (p. 424)
  - Superior appendage with rounded sub-basal tooth; flange more curved, without teeth. Inferior appendage about a fifth as long, without orange apical hair (♀ unknown) . . . . . *L. (M.) pruinescens* (p. 430)
  - 6. Superior appendages distinctly forcipate. Orbits below more or less black. Segment 10 normally without dorsal crest (except certain *dissimulans* from Northern Nigeria) 7
  - Superior appendages turned downwards distally. Orbits below yellow or green. Sternites with lateral stripes. Segment 10 with dorsal crest (reduced in ♀ *plagiatus*) . 8

7. Pterostigma very short, 1 mm. Sternites with only traces of black distal dots. Sub-basal tooth of superior appendage large, angular; flange with two prominent teeth. Inferior appendage with slender extension. Cerci normally all yellowish. Vulvar scale angular, steeply sloped . . . . . *L. (P.) tridens* (p. 392)
- Pterostigma over 1 mm. Sternites broadly marked with black. Sub-basal tooth of superior small or moderate, rounded; flange without teeth. Inferior appendage without slender extension. Cerci black at apices or mainly black. Vulvar scale rounded at distal angle, the sides not steeply sloped . . . . . *L. (P.) dissimulans* (p. 398)
8. Antehumeral stripes narrow, more or less complete, regular (or pruinosed). Pterostigma 1,5 mm or more. Forewing with 11-12 Px. Superior appendage obtusely turned down at a broad tumour or knee-cap, the apical portion thick. Cerci black, slender. Vulvar scale with edge slightly sloped . . . . . *L. (P.) plagiatus* (p. 407)
- Antehumeral stripes irregular or fractionated. Pterostigma 1,5 mm or less. Down-turned portion of superior appendage not thick. Cerci yellow. Vulvar scale with edge not sloped . . . . . 9
9. Smaller species, hindwing 20-23 mm. Pterostigma over 1 mm. Forewing with 12-14 Px. Femora with 2 black stripes. Superior appendage with knee-cap, the end portion very slender, down-turned almost at a right angle. Inferior appendage conical, without slender extension. Cerci thick, short . . . . . *L. (P.) pinheyi* (p. 415)
- Larger, hindwing 24-25 mm. Pterostigma 1 mm. Forewing with 11-12 Px. Femora with 3 stripes (occasionally 2). Superior appendage without knee-cap, the distal portion broad, flat, sinuous, turned down obliquely. Inferior appendage rounded, with slender extension. Cerci slender, elongate . . . . . *L. (P.) uncifer* (p. 420)
10. Thorax with uniform metallic green stripes. Sternites with long black bifurcate band (or with black spots). Vulvar scale normally with acute extension at distal angle . . . . . s.g. *Lestes (Africalestes)* . . . . . 11
- Thorax without metallic green bands. Sternites unmarked with black or (in melanics) more or less suffused with black but not in spots or U-shaped bands . . . . . 12
11. Wings clear in juvenile, yellow at maturity, without deeper apical colour. Pterostigma 2 mm or less. Flange of superior appendage with large tooth on margin before terminal teeth. Cerci black, sometimes yellow at base . . . . . *L. (L.) virgatus* (p. 374)
- Wings always yellow, brown at apices. Pterostigma over 2 mm. Flange of superior without this marginal tooth. Cerci brownish yellow, black at apices . . . . . *L. (L.) amicus* (p. 383)
12. Wing apices short, broadly rounded. Superior appendage with no sub-basal tooth, the flange unarmed. Prophallus aligulate with large enveloping lateral folds. Ovipositor sheath short, broad, straightish ventrally, more convex distally. Vulvar scale simple . . . . . s.g. *Icterolestes* . . . . . *L. (I.) ictericus* (p. 432)
- Wing apices more elongate, not normally broadly rounded. Superior appendage with sub-basal tooth and serrated flange. Prophallus ligulate, without expanded lateral folds . . . . . s.g. *Xerolestes* . . . . . 13
13. Pterostigma usually 1,75 mm or more (slightly less in insular ssp. *aldabrensis*), never bicolorous. Forewing 11-13 Px. Ultra-nodal sector usually with 3-4 doubled cells

before pterostigma. Femora 2-3 with 1 partial brown stripe (rarely 2). Superior appendage straight, inturned distally at a right angle. Inferior appendage with horizontal slender extension. Ovipositor sheath below sharply convex on distal third. Vulvar scale with subapical kink, with a black point on posterior edge, the apex of the scale not rounded nor extended . . . . . *L. (X.) ochraceus* (p. 462)

- Pterostigma usually 1,5 mm or less, often bicolorous. Forewing with 7-10 Px (rarely 11). Ultra-nodal sector usually with 1-2 doubled cells before pterostigma. Femora 2-3 with 2 stripes (sometimes 1 in ♀). Superior appendage gradually inturned. Inferior appendage with distal, slightly upturned, rounded knob. Ovipositor sheath only slightly curved below on distal third. Vulvar scale sometimes with kink on posterior edge, the apex rounded and slightly produced . . . . . *L. (X.) pallidus* (p. 439)

d. Keys to males of infra-specific taxa, in *plagiatus*, *ochraceus* and *pallidus*.

*Lestes plagiatus* mature ♂:

1. Abdomen 33-37 mm, hindwing 24-28 mm, pterostigma 1,5-2 mm. Pterostigma at maturity dark brown to black. Thorax well pruinose and usually well marked with black. Superior appendage robust, with very prominent "knee" at the down-curve; stout sub-basal tooth; flange serrated distally . . . . . form *plagiatus*
- Smaller, abdomen 31-33 mm, hindwing 21,5-22,5 mm, pterostigma 1,5-1,75 mm. Pterostigma ferruginous. Thorax much less pruinose, and much less black. Superior appendage less robust, "knee" less prominent; fine, acute sub-basal tooth; flange all serrated along its edge . . . . . form *tarryi*

*Lestes ochraceus* and subspecies (♂):

1. Pterostigma 1,75-2 mm, dark brown to black. Abdomen 30-36,5 mm, hindwing 19-24 mm. Forewing with 11-13 Px. Thorax usually with black fasciae. Superior appendage with flange gently curved, not invaginated before apex. Inferior appendage all yellow . . . . . subsp. *ochraceus*
- Pterostigma shorter, 1,5-1,75 mm. Thorax rarely with fasciae. Superior appendage with flange mainly straighter but sharply excised before the end. Inferior appendage with the extended arm all black . . . . . 2
2. Pterostigma brown. Forewing with 12-14 Px. Thorax brown. Abdomen 31-36 mm, hindwing 20,7-23 mm . . . . . subsp. *unicolor*
- Pterostigma dark brown to black. Forewing with 10-11 Px. Thorax greenish ochreous. Abdomen 29-34 mm, hindwing 20-22 mm . . . . . subsp. *aldabrensis*

*Lestes pallidus*, described forms (♂):

1. Synthorax yellow to brown, without black markings (at most only partial sutural markings). No sternal black markings . . . . . 2
- Synthorax with antehumeral markings or strong lateral markings . . . . . 3
2. Synthorax brown or reddish brown. Pterostigma brown to black or bicolorous . . . . . f. *somalicus*
- Synthorax yellowish. Pterostigma long and yellow . . . . . f. *chromatus*

3. Synthorax brown or grey-brown with antehumeral marking and some sutural markings.  
No sternal black markings . . . . . 4  
— Synthorax green with some black markings; or mainly black at least laterally. Sternites  
at least partly black . . . . . 5
4. Brown. Mesepisternum with a long black antehumeral stripe and humeral line . . . . .  
. . . . . f. *pallidus*  
— Brown. With long black antehumeral stripe as well as humeral and lateral stripes . . . . .  
. . . . . f. *radiatus*  
— Grey-brown. With interrupted antehumeral stripe and sutural lines . . . . . f. *cineraceus*
5. Green. With black sutural markings, as well as fasciae on metepimeron and on sternites  
. . . . . f. *stigmatus*  
— Thorax sometimes partly green but heavily blackened, the sides and sternites mainly  
black . . . . . f. *wahlbergi*

## TAXONOMY OF SPECIES

### LESTIDAE

#### Subf. LESTINAE

#### LESTES Leach

LESTES (LESTES) SPONSA (Hansemann) Text fig. 1, 15-20, pp. 341, 366

*Agrion sponsa* Hansemann, 1823: 159

*Lestes sponsa* Selys, 1840: 140; Selys, 1862: 301 (17 sep.); Kirby, 1890: 160; Schmidt, 1928: 247 (fig. only); May, 1933: 33, 92 (adult and larva); Cowley, 1935: 56; Cowley, 1940: 174; Longfield, 1949: 177, pls.; Conci & Nielsen, 1956: 66, 69, figs.; Robert, 1958: 85, figs.; Loibl, 1958: 55-80; Corbet, 1962: 12, 24, 37, 120 etc.; Pinhey, 1966b: 284; Belyshev, 1973: 504, fig. 211

*Lestes sponsus* Martin, 1910: 102

*Agrion forcipula* Charpentier, 1825: 6 (syn. Kirby, 1890)

*Lestes nymphæ* Stephens (Kirby MS) 1829: 26 (nom. nov.); Stephens, 1836: 77 (syn. Kirby, 1890)

Type described from Germany.

This species is the generally accepted type species of *Lestes* Leach.

The word *sponsa*, in Latin, means a bride, *sponsus*, a promise or a bridegroom. The usual form of the name, *sponsa*, will be retained here.

**Characters:** Sectors of arculus well forward, like *viridis* and all Ethiopian species. A metallic green species, with strong dorsal crest on segment 10. Inferior anal appendage very long, its distal portion with arm inturned. Vulvar scale with distal angular extension.

**General description.** Mature ♂ pruinose white laterally and ventrally. Small.

*Mature ♂ (Germany).* Labrum and face green or blue-green. Postclypeus and head above black or metallic green. Orbits below black.

Synthorax metallic green to first lateral suture, and below this at dorsal end. Black stripe at dorsal carina, black stripe enclosing an ochreous line at humeral suture. Sternite strongly white pruinose, faintly showing a thick black U-shaped mark. Femora 2-3 mainly black, with narrow ochreous stripes.

Wings hyaline or slightly fumose. Venation dark brown to black. Pterostigma shortish, broad or narrow, the posterior edge straight; above about two cells; black, with pale anterior or anterior and distal edge. Forewing with 11-12 Px. Ac at or slightly before separation of anal vein. Space R<sub>4</sub>-MA with long intercalaries starting proximally, at Px 2 to Px 3, and short distal ones.

Abdomen broadly metallic green on most segments; segment 1 all pruinose (juveniles with squarish distal spot); 9-10 black; segment 10 with pronounced dorsal crest and with denticles on distal margin.

Anal appendages mainly black. Superior appendage gradually forcipate, with numerous outer denticles. Sub-basal tooth sharply acute, well connected with flange. Flange serrated and straight, abruptly inturned before the end. Inferior appendage extending about three-quarters as far as superior in side-view; conical at base, with long straight but inturned distal arm. Head of prophallus with broad, rounded distal hood, surmounted anteriorly by a long narrow lip. Terminal shelf simple.

Abd. 29-30 mm; hw. 20-21 mm; pt. 1,25-1,5 mm. (Selys, 1862, gives abd. ♂ 25-30, ♀ 25-29; hw. 18-21 mm). Pruinose ♂ (Japan) essentially similar. Pterostigma paler, browner. Thoracic dorsal carina and humeral suture all black.

*Mature ♀ (Japan).* Labrum greenish yellow, postclypeus and head above dark metallic green or bronze.

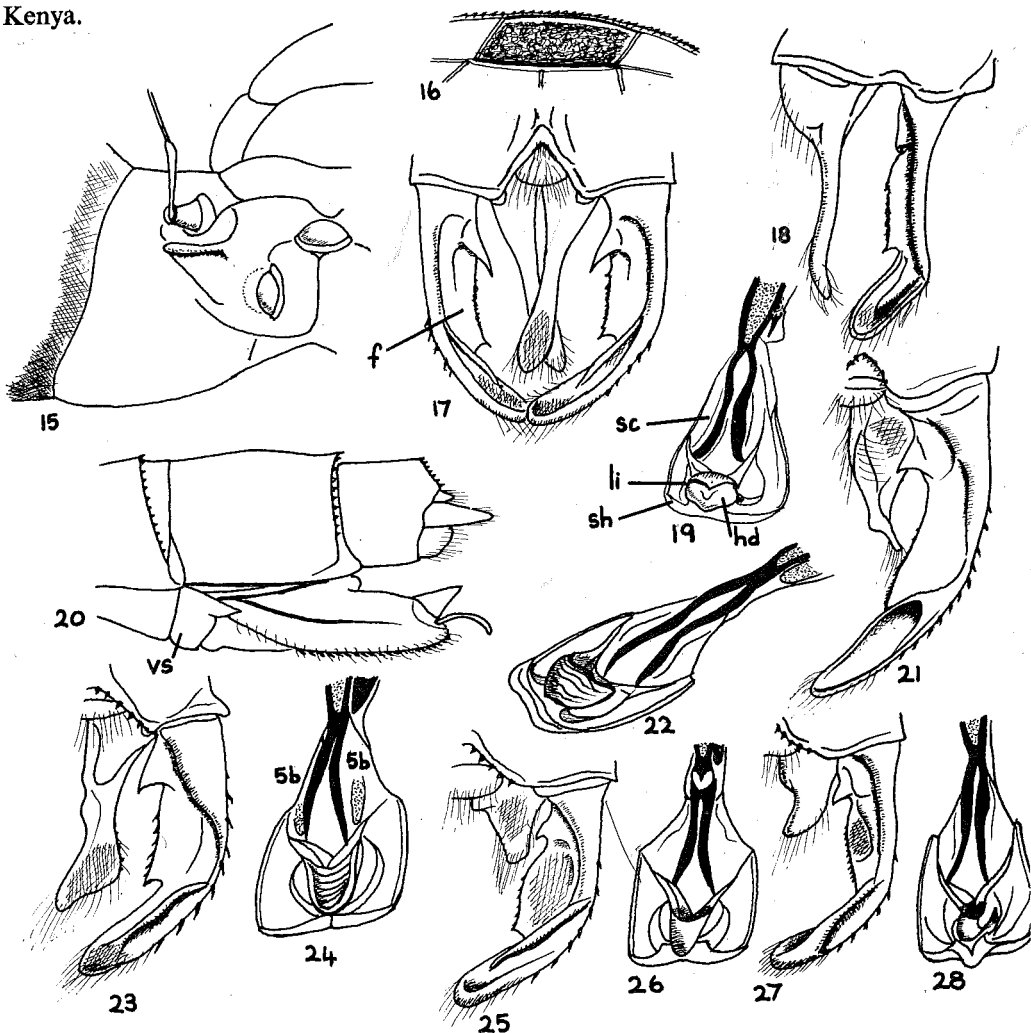
Prothoracic hind lobe narrow. Mesostigmal lamina narrow, black, with straight black posterior ridge. Synthorax metallic green, as in ♂. Sternite with trace of a lateral brown bar and small medial spot at distal end.

Pterostigma brown. Forewing with 13-14 Px.

Abdomen with metallic band on all segments, but only on distal end of segment 1 and restricted on 10. Segment 10 with slight crest, Cerci thick, mainly black. Ovipositor sheath black on lower half; scarcely curved ventrally, slightly more so on denticulate distal half. Vulvar scale produced to an acute apical point at upper distal angle.

Abdomen 29-30 mm; hindwing 22,5 mm.

**Distribution.** Widespread in Europe; North and NW Asia. Martin (1910) gives Algeria: common at lake margins. A Kenya record must be discounted (see Pinhey 1966b: 284): 3 ♂ in *RSM*, Edinburgh are labelled: "Laikipia, Brit. East Africa, 6/1905, F. J. Jackson". These specimens were from the G. T. Bethune-Baker Collection. This is a most unlikely record and, as I remarked in 1966, the specimens were probably collected when Sir Frederick Jackson (former Governor of Uganda) was on leave in Europe. *Laikipia* is in northern Kenya.



Subgenus *Lestes* (15-28). *L. sponsa*: 15. Left side of head of ♂ showing ridge behind antennal cavity; 16. pterostigma of right forewing; 17-18. anal appendages dorsally and from left; 19. prophallus; 20. terminal segments and ovipositor sheath and vulvar scale at its base (all Germany except prophallus from Japan). *L. barbarus* (Morocco): 21. right anal appendages from above; 22. prophallus. *L. dryas* (California): 23. anal appendages dorsally, 24. prophallus. *L. macrostigma* (Turkey): 25, 26. the same. *L. virens* (Germany): 27, 28. the same.

f = flange, hd = hood, li = ligula, sc = scoop, sh = shelf.



**Material examined.**

*NMB*: W. Germany: Karlsruhe Weingarten, July 1964.  
Japan: Hokkaido, Aug. 1935.

An Algerian record of Martin's has been reported to me (*USSRL*):  
Algeria (Martin Colln).

**LESTES (LESTES) BARBARUS (Fabricius) Text fig. 11, 21, 22, pp. 347, 366**

*Agrion barbara* Fabricius, 1798: 286; van der Linden, 1825: 36

*Lestes barbara* Hagen, 1849: 147 (type species); Hagen & Selys, 1850: 161; Selys, 1862: 318 (34 sep.); Hagen, 1863: 194; McLachlan, 1889: 348; Martin, 1910: 82; Fraser, 1933: 49 fig. 20

*Lestes barbarus* Selys, 1887: 67 (Egypt); Roster, 1888: 164 pl. 3 (early stages); Kirby, 1890: 162; Martin, 1910: 84, 87; Morton, 1924: 30; May, 1933: 31, 89 (adult and larva); Cowley, 1940: 174; Schmidt, 1951: 122 (quoting Hagen, 1849, *Lestes barbarus* as type species of *Lestes*); Conci & Nielsen, 1956: 65, 66 figs.; Aguesse & Pruja, 1958: 103 (Morocco); Robert, 1958: 82; Loibl, 1958: 55-80; Corbet, 1962: 178; Lieftinck, 1966: 10 (Morocco)

*Agrion nympha* Hansemann, 1823: 161 (syn. Kirby, 1890)

*Lestes barbata* Belyshev, 1973: 509 fig. 213 (? laps. cal.)

Type from Barbary in North Africa.

Martin (1910) says (p. 82) "Enfin, à juger d'après un exemplaire rapporté de l'Afrique tropicale par M. Ch. Alluaud, *Lestes barbara*, l'espèce européenne, habite également l'Afrique chaude". On p. 87, in placing *Lestes barbarus* near *obscurus* and *niger* he gave the specific distribution as central and southern Europe, Asia Minor and from there to India; throughout Mediterranean Africa; and states that Alluaud collected the only known record for tropical Africa. He said it was identical to the European form. It would seem probable that Alluaud's *barbara* was either a misidentification, or the locality was incorrect.

**Characters.** Non pruinose. Pterostigma bicolorous. Wing apices broadly rounded, as in *dryas* and *ictericus*. Sectors of arculus well forward as in *sponsa*, *viridis*, and all Ethiopian species. Orbits below and sternites unmarked with black. Anal appendages yellow with black apex; inferior appendage over half as long as superior, with flat extension ending in an out-turned point. Vulvar scale simple.

**General description.** Non-pruinose.

*Almost mature male (Morocco).* Labrum greenish yellow. Postclypeus bronze-black, yellow at lateral margins. Head above bronze or metallic green, but antennal bases yellow. Orbits below yellow.

Prothorax brownish yellow with bronze maculae; hind lobe broadish with short bronze basal band. Synthorax bright metallic green to first lateral suture and below this at dorsal end. Dorsal carina yellow; a yellow stripe above humeral suture. Second lateral suture unmarked. Sternites all yellow.

Femora 2-3 yellow with black outer and anterior stripes.

Wings hyaline. Venation yellowish brown to brown. Pterostigma short and thick, brown or pale brown, yellow-brown on distal third; its anterior and posterior veins black, posterior one straight. Forewing with 10-14 Px. Ac at separation of anal vein. Space  $R_4$ -MA with intercalaries starting at Px 2-4 and consisting of two long veins and several short distal ones.

Abdomen with metallic green to bronze dorsal band on all segments, but only on distal half of segment 1 and narrowed on 10. Segment 10 without crest, the distal invagination broad, shallow, edged with black denticles.

Anal appendages yellow, black at apices, or superiors black on distal half. Superior appendage gradually forcipate, the end portion rather strongly grooved, with pronounced outer denticles. Sub-basal tooth almost a right angle, well separated from flange. Flange straight, slightly kinked at distal end; edged with minute denticles. Inferior appendage extending over half as far as superior in side-view; broadly conical at base, depressed, with small inner fold; a flat distal extension narrowed to a fine point, the narrow apical portion out-turned and having a tuft of brown hair at the tip. Prophallic head with large, broadly rounded ligula with small sharp apical point. Terminal ridge notched.

Abd. 33-34 mm; hw. 23-24 mm; pt. 1,25-1,5 mm.

♀ (Morocco). Essentially similar. Prothoracic hind lobe broad. Mesostigmal lamina very narrow, yellow, with thick, straight, yellow posterior ridge. Forewing with 12-13 Px. Cerci yellowish. Ovipositor sheath brown, or brown with yellow base; mainly straight ventrally, denticulate for most of its length, more so on distal half. Vulvar scale simple.

Abd. 32-34 mm; hw. 24-25 mm.

(Selys (1862) gives abd. ♂ 26-34, ♀ 29-32 mm; hw. ♂ 21-24, ♀ 22-25 mm)

**Distribution.** Temperate and Southern Europe; Asia Minor, Iran, Turkestan, N.W. India; Egypt (Selys), Tangiers, Algeria (Martin), Morocco.

**Material examined.**

*NMB*: Morocco, El Jadida, March 1963 (J. A. Whellan)

Elsewhere:

*USSRL*: Algeria (Martin Colln).

## LESTES DRYAS Kirby Text fig. 23, 24, p. 366.

*Lestes dryas* Kirby, 1890: 160 (nom. nov. pro *Lestes nympa* Selys, 1840, nec Hansemann, 1823); May, 1933: 32, 91 (adult and larva); Longfield, 1949: 180, pls; Conci & Nielsen 1956: 66, 70, figs.; Aguesse & Pruja, 1957: 151; Aguesse & Pruja, 1958: 104; Robert, 1958: 84, figs.; Loibl, 1958: 55-80; Corbet, 1962: 37, 64, 91; Lieftinck, 1966: 10; Belyshev, 1973: 500, fig. 209

*Lestes nympa* Selys, 1840: 141; Selys, 1862: 301 (17 sep.)

*Lestes uncatus* Kirby, 1890: 160 (given before *dryas* but placed in syn. to it, selection by Cowley, 1935: 56)

Type *dryas* described from Germany, *uncatus* from U.S.A.

**Characters.** Near *sponsa* in markings and anal appendages but arculus broken very slightly lower down, at least in ♂, more like *macrostigma* and *virens* in this respect. Wings broad, well rounded at apices like *barbarus* and *ictericus*. Orbits below black. Mid-femur with black interrupted by dotted yellow lines as in *Malgassolestes*. Inferior appendage very long, the end shaped like a bird's head. Vulvar scale with acute apical extension.

North African specimens (teste Lieftinck, 1966) are larger than those from Europe and North America.

**General description.** Small in Winnipeg examples, larger in Californian. Pruinosity very slight, mainly ventral and white (also on sides of thorax in mature Calif. ♂).

*Mature ♂ (mainly Winnipeg).* Labrum greenish yellow to blue or blue-green. Postclypeus and head above black with metallic green reflection and some blue tints. Orbits below black with green sheen.

Prothorax metallic green with blue tints. Synthorax metallic green to first lateral suture, slightly beyond this at dorsal end; fine yellow mid-dorsal carina and a narrow yellow humeral stripe, which are more developed in Californian ♂ and the humeral stripe upturned at dorsal end. Sides and ventral surface yellow; black stripe at and below second lateral suture (broader in Calif. and more or less enclosing a yellow spot); a trace of a spot on metepimeron behind legs (much more prominent in Calif.); sternite with lateral spot.

Femora black, with ochreous inner stripe, mid-femora with ochreous outer dotted line enclosed in the black (middle leg lost in Calif. example). Tibiae and tarsi all black.

Wings hyaline, broad as in *barbarus*, with well rounded apex. Venation dark brown to black. Pterostigma short, broadish, nearly rectangular; above two cells; dark grey-brown (yellow in teneral); anterior and posterior veins black, proximal and distal ones cream. Forewing with 11-13 Px. Ac at separation of anal vein. Space R<sub>4</sub>-MA with long intercalaries starting very proximally, at Px 1½ to Px 3, and short distal ones.

Abdomen with complete metallic green band except segment 1, with a more or less rounded distal zone. Segment 10 with a distal crest, invagination V-shaped and denticulate.

Superior appendage rather straightish at first, forcipate, well inturned distally, with robust outer denticles; brown to black with yellow outer basal macula. Sub-basal tooth acute, with narrow gap to flange. Flange broad, denticulate, straightish, curved to a point, with small terminal excision before joining main stem. Inferior appendage reaching three-quarters as far as superior in side-view; paler brown, yellower on the conical base; with long distal arm, depressed on dorsal surface, the apical region broadened, shaped rather like a bird's head, flattened on both surfaces, inturned in this apical part, fringed with longish white hair. Head of prophallus, very large grooved, rounded ligula. Distal shelf simple.

Abd. 27-31 mm (Californian one larger than Canadian); hw. 20,3-23 mm; pt. 1,3-1,5 mm.

(Robert, 1958 gives abd. ♂ 28-33 mm; hw. 20-24 mm; pt. 1,2-1,6 mm).

Lieftinck, 1966 (North African examples) gives hindwing as large as 25,7-28,3 mm.

*Mature* ♀ (*Benfleet*). Labrum yellower. Head above more bronze. No visible pruinosity. Orbits below more or less black. Prothorax metallic green, anterior collar greenish yellow, a central yellow spot on middle lobe, hind lobe narrowish, yellow, metallic green at base. Mesostigmal lamina (Saskatchewan) narrow, black, with straight black posterior ridge which is yellow at outer end. Synthorax as in ♂, the metallic green at dorsal end continuous with black stripe on second lateral suture. A black metepimeral spot behind hind leg. Sternite with only a trace of a lateral spot but with a median posterior black spot.

Femora ochreous with narrower black than in ♂, but mid-femur with yellow-dotted line; tibiae partly yellow. Abdomen with continuous metallic green band on all segments but only on distal half of segment 1. Cerci black, with yellow latero-basal spot. Ovipositor sheath black, partly yellow above, reaching beyond segment 10; only slightly curved, denticulate for most of its length. Vulvar scale produced at distal angle to an acute apex.

Abd. 29 mm; hw. 25 mm; pt. 1,75-2 mm.

A damaged Saskatchewan ♀ differs slightly: Black line on second lateral suture narrower. Sternite all yellow. Cerci thick, ferruginous, black on inner surface. Ovipositor sheath more yellow in upper half.

Abd. 27 mm; hw. 21,5-22 mm.

(Robert: Abd. ♀ 26-30 mm; hw. 21-26 mm; pt. 1,6-1,8 mm)

**Distribution.** Europe, northern and temperate Asia to Japan, North America; Morocco (Aguesse & Pruja); Moyen Atlas (Lieftinck).

#### **Material examined.**

##### *NMB.*

England: Benfleet, Essex, July 1963 (D. A. L. Davies)

U.S.A.: Pincrest, Tuolumne Co., California, July 1947 (P. A. Arnaud)

Canada: Lloydminster, Saskatchewan, July 1947; Winnipeg, Manitoba, July 1970  
(D. A. L. Davies)

LESTES MACROSTIGMA (Eversmann), Text fig. 25, 26, p. 366

*Agrion macrostigma* Eversmann, 1836: 246

*Lestes macrostigma* Rambur, 1842: 249; Selys, 1862: 296 (12 sep.); Kirby, 1890: 160; Martin, 1910: 102 (Morocco); Morton, 1924: 30; Cowley, 1940: 174; Schmidt, 1951: 122; Conci & Nielsen, 1956: 66, 68, figs; Robert, 1958: 76, figs; Lieftinck, 1966: 11; Belyshev, 1973: 497, fig. 207

*Lestes picteti* Selys, 1840: 138 (Syn. Selys, 1862)

Type described from Orembourg (Orenburg), U.S.S.R.

**Characters.** A very dark species, well pruinosed, not strongly metallic as in other North African species; legs almost all black. Labrum mainly black. Pterostigma exceptionally long. Nodal index high. Arculus not angled quite so far forward as in *sponsa*.

**Description.** ♂ black, much pruinosed: thin blue pruinosity on dorsum of thorax, white pruinosity on rest of thorax and base of abdomen.

*Mature ♂ (Turkey).* Labrum black, with yellow distal margin. Postclypeus and head above all black. Orbits below black.

Synthorax blue to white pruinose, obscuring the markings. (In juvenile ♂ the mesepisternum metallic violet).

Legs nearly totally black.

Wings hyaline, moderately broad, the apex broadly rounded. Venation brown to black. Pterostigma long, thick, almost rectangular, the posterior edge very slightly curved; above 3-4 cells; black (yellow in juvenile).

Forewing with 13-14 Px. Ac at point of separation of anal vein. Space  $R_4$ -MA with long intercalaries starting between Px 3 and Px 5; and short distal intercalaries.

Abdomen pruinosed black on segments 1-2, 8-10, metallic green to bronze on 3-7 (in juvenile, metallic blue or violet on segments 1-2). Segment 10 with slight distal crest, the invagination denticulate.

Anal appendages black. Superior appendage evenly forcipate, well inturned apically, with numerous outer denticles. Sub-basal tooth small, somewhat acute; flange broad, nearly straight, strongly denticulate, well incurved at end. Apical portion of superior with prominent ridge. Inferior appendage extending about half as far as superior in side-view; broad at base, with wide cylindrical extension, directed posteriad and rounded at tip where it bears a tuft of pale hairs. Prophallic head like *virens*, the small ligula slightly longer. Terminal shelf almost straight on free margin.

Abd. 32-33 mm; hw. 23-24 mm; pt. 2-2,5 mm

*Mature* ♀ (*Turkey*). Almost as pruinose as ♂. Labrum also black with yellow edge. Prothoracic hind lobe moderate. Mesostigmal lamina very narrow, black, with straight black posterior ridge. Legs as in ♂.

Pterostigma as in ♂. Forewing with 15-16 Px.

Abdomen all black with green or purple sheen. Cerci black. Ovipositor sheath black; gently curved ventrally, denticulate on outer half. Vulvar scale black, simple, with slight swelling on distal margin close to apex. Size as in ♂.

(Selys (1862) gives Abd. ♂ 35, ♀ 32 mm; hw. ♂ 24, ♀ 25 mm; Robert (1958) gives abd. ♂ (+ append.) 35-38, ♀ 32-36 mm; hw. ♂ 24-26, ♀ 25-27 mm; pt. ♂ 2,15, ♀ 2,5 mm).

**Distribution.** S. Europe to S.W. Russia; Mediterranean coast; Asia Minor, Cyprus; Morocco and (Martin): Algeria.

**Material examined.**

*NMB.*

Turkey: Izmir, W. Anatolia, 27 May 1972 (H. J. Dumont).

LESTES VIRENS (Charpentier) Text fig. 27, 28, p. 366

*Agrion virens* Charpentier, 1825: 8

*Lestes virens* Selys, 1850: 156; Selys, 1862: 317 (33 sep.); McLachlan, 1889: 348; Kirby, 1890: 162; Martin, 1910: 102; Morton, 1924: 29; May, 1933: 31, 89 (adult and larva); Schmidt, 1938: 136, 138; Schmidt, 1951: 122; Conci & Nielsen, 1956: 65, 67, figs; Robert, 1958: 83, figs; Loibl, 1958: 55-80; Lieftinck, 1966, 10; Belyshev, 1973: 514, fig. 216

*Lestes vestalis* Rambur, 1842: 250 nr 9 (syn. Hagen, 1849: 148)

*Lestes virens vestalis* Schmidt, 1938: 137

*Lestes sellata* Hagen, (in Selys, 1862): 318 (34 sep.) ♂

*Lestes sellatus* Kirby, 1890: 162; Förster, 1906: 342; Morton, 1924: 30; Andrés, 1928: 21; Schmidt, 1938: 137; Schmidt, 1951: 122

Hagen (1862) writing in Selys' 1862 monograph described mature ♂ *sellatus* from Syria and a very teneral ♂ from Egypt (leg. Ehrenberg). Selys, in a footnote, said it was near *virens*. The close affiliation between *virens* and *sellatus* has long been suspected, as in Schmidt (1938), despite slight colour or other differences. Dumont has expressed probable synonymy in personal correspondence (*in litt.* 8 Jan., 18 Oct. 1978). Few records have been actually attributed to the little known *sellatus* (*per se*) and the original Egyptian record of the teneral specimen is believed by Dumont to be a misidentification. He believes that true *virens* (*sellatus*) has not been found in Egypt.

Type series of *virens* was from Lusitania (Portugal and S.W. Spain). Both the types of *virens* and *vestalis* are apparently lost (Schmidt, 1938: 138). Type *sellatus* (Syria) has damaged appendages. It is in *BMZHU*.

Subspecies *vestalis* extends from northern France through central and south eastern Europe to Asia Minor. The North African race is considered to be same as the nomotypical *virens* of southern Europe.

*Lestes virens virens* (Charpentier) Text fig. 27, 28

**Characters.** Another very small metallic green species. Arculus angled very slightly more posteriorly than in *sponsa* and most African species. Orbits below yellow. Forewing with rather low postnodal index, 7-12 Px. Inferior appendage half as long as superior, with thick inturned extension. Vulvar scale with acute apical prolongation, like *dryas* and *sponsa*.

**Description.** Small species. Non-pruinose.

*Mature ♂ (mainly Germany).* Labrum green or greenish yellow (yellow, in Golan Heights); postclypeus and head above bronze to green. Orbits below all yellow (some grey, probably staining), (G. Hts).

Synthorax metallic green or bronze to first lateral suture, and further at dorsal end. A narrow, incomplete, black-edged, yellow humeral stripe; a black band on second lateral suture (only a dorsal bar, G. Hts). Metepimeron with long black dorsal spot. Sternite with short black lateral bands and a partial median line (markings reduced in G. Hts).

Femora 2-3 yellow with broad black outer band and narrow anterior line.

Wings narrow, hyaline. Venation dark brown. Pterostigma short, broadish, above two cells; brown (yellow in juvenile); posterior vein black, straight; proximal and distal veins cream. Forewing 9-12 Px (7-11 in G. Hts). Ac at separation of anal vein. Space  $R_4$ -MA with long intercalaries starting at Px 3 to Px 5, and with short distal veins.

Abdomen with metallic green or bronze band on all segments (segment 1 only on distal two-thirds, G. Hts). Segment 10 without crest; invagination broad, shallow, denticulate.

Superior appendage black, yellow exteriorly in basal half (brownier in G. Hts); straightish at first, then gradually forcipate, with numerous outer denticles (few in G. Hts). Sub-basal tooth acute, well separated from flange. Flange long, straightish, denticulate (more curved in G. Hts). Inferior appendage yellow, black ventrally; reaching about half as far as superior in lateral view; the inturned apices thick broadly rounded at apex, fringed with yellow or white hair. Head of prophallus with ligula very reduced, the terminal shelf strongly bifurcate, with V-shaped notch.

Abd. 24-27 mm; hw. 16,5-19 mm; pt. 1,25 mm.

(Selys, 1862: abd. ♂ 29-30, ♀ 26-27 mm; hw. 20 mm).

*Mature ♀ (Golan Heights).* Very similar. Sternites below all yellow. Prothoracic hind lobe narrow, well upturned, mainly metallic green above; with yellow on edge and ventrally. Mesostigmal lamina narrow, with black posterior ridge which is yellow at outer end. Abdomen with complete green or bronze band, but on segment 1 only distally metallic green. Cerci yellow. Ovipositor sheath yellow; almost straight ventrally, denticulate for most of its length. Vulvar scale with upper distal angle produced to an acute point, as in *sponsa* and *dryas*.

Abd. 24-26 mm; hw. 19-20 mm; pt. 25 mm.

Selys' description of *sellatus* differs slightly, the pterostigma described as long and the anal appendages with some differences, the flange rounded, the inferiors said to be very short.

**Distribution.** Southern Europe, Asia Minor, Syria. Concerning the Mediterranean region Martin said it was widespread. The *sellatus* record from Egypt (leg. Ehrenberg) is somewhat uncertain, as stated above. For *virens* Robert gave Morocco and Algeria, McLachlan gave Esmir (Morocco) and Lieftinck, again, Morocco.

**Material examined.**

*NMB.*

Germany (no loc.)

Golan Heights (Syria-Israel border): Birket Bab-el-Haoua, June 1972 (H. J. Dumont)

LESTES (LESTES) VIRGATUS (Burmeister) Text fig. 13, 29-38, pp. 347, 375

*Agrion virgatum* Burmeister, 1839: 824, nr 30.

*Lestes virgata* Selys, 1862: 323 (39 sep.)

*Lestes virgatus* Kirby, 1890: 163; Grünberg, 1903: 696; Förster, 1906: 341; Martin, 1910: 86; Ris, 1921: 274 fig. 11; Schouteden, 1934: 78; Pinhey, 1951: 50, figs; Fraser, 1955a: 9; Gambles, 1960: 21 (ecol.); Pinhey, 1961a: 7; Pinhey, 1961b: 13; Corbet, 1962: 123, 124 (ecol.); Pinhey, 1962b: 94; Pinhey, 1964b: 97

*Lestes rothschildi* Martin, 1906: 508 (Nairobi); Martin, 1910: 86, 90; Martin, 1922: 232; Pinhey, 1961a: 8 **Syn. nov.** (Legrand & Pinhey)

Type ♂ and ♀ *virgatus* from Port Natal (now Durban) in *MLUH* have not been examined by the author.

Burmeister's original description (1839) in Latin:

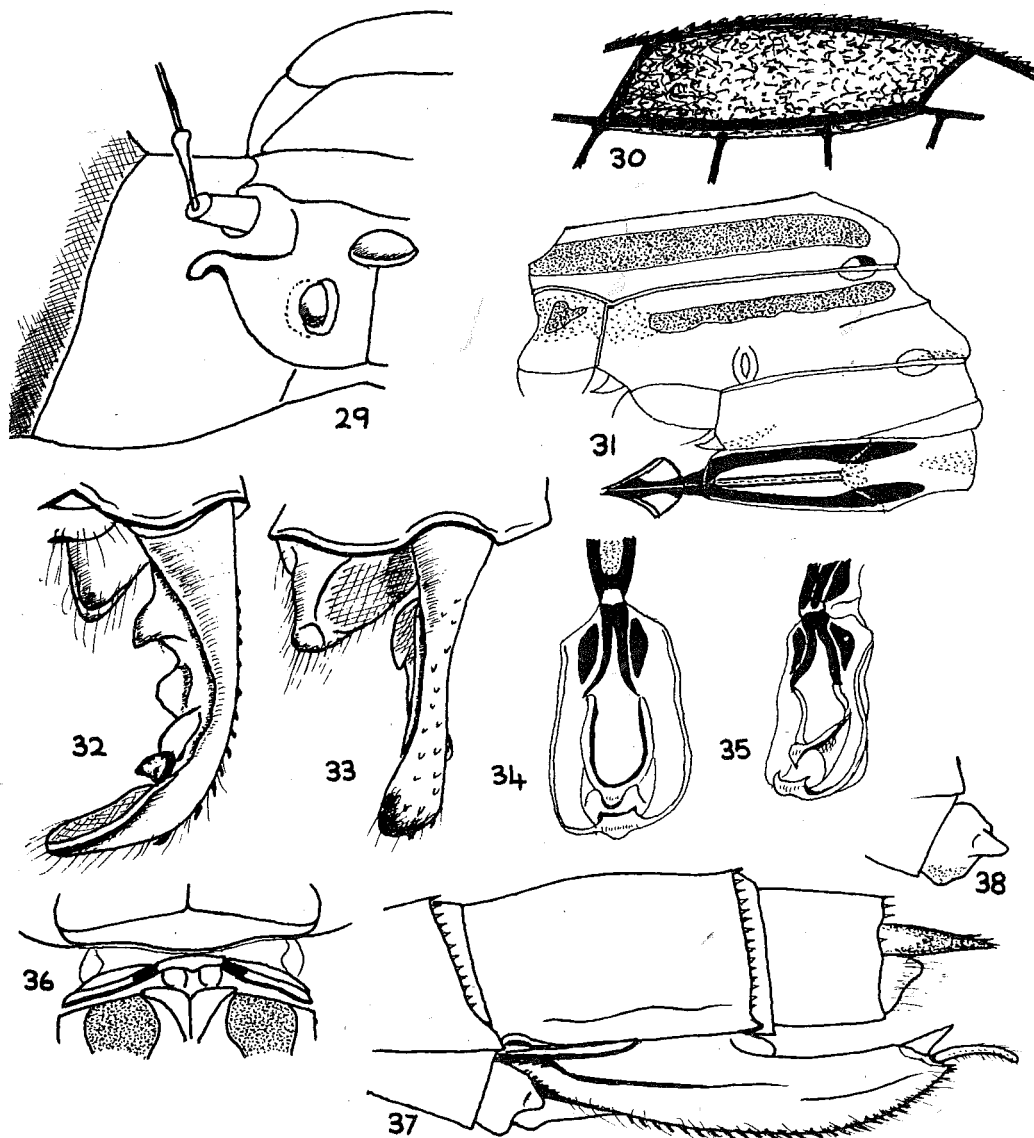
"Testaceum, mesonoto vittis quatuor viridi-aeneis; abdominis dorso-aeneo, fascia angusta segmentorum basali albida. Long. Corp. 1'' 7''"



♂. alis luridis, stigmatibus nigris; forcipe nigra.

♀. alis luteis, stigmatibus fuscis in medio flavis.

Port Natal aus Hallenser's Sammlung."



Subgenus *Lestes* (29-38). *L. virgatus*: 29. left side of head of ♂, with antennal cavity and ridge behind it; 30. pterostigma of right forewing, ♂; 31. synthorax of ♂ from left (dense stippling is metallic, other dotted areas brown); 32, 33. right anal appendages from above, left ones from side; 34, 35. prothorax below and from left; 36. junction of ♀ pro- and mesothorax; 37. terminal segments and ovipositor sheath; 38. left side of vulvar scale (29, 30, 32, 33 from Cowie, 31, 34, 35 from Karkloof, 36, 37 from Stapleford, 38 from Ikelenge).

The total length of body in this description was 39,7 mm (see Duodecimal system in Glossary).

In this brief description the fact that the four metallic bands (i.e. two each side of mesothorax) are bronze-green and the pterostigmata black in male indicate a mature condition. In younger males the mesothoracic bands are vivid green, the pterostigmata are yellow in the centre, as indicated in Burmeister's description of the female. No mention is made of the anal appendages except the casual remark that they are black.

It is a common species in Natal, as elsewhere.

**Characters.** Wings in mature condition normally yellow; pterostigma broad and swollen, convex on posterior edge, black with yellow centre or all black. Mesothorax with two rather regular iridescent green bands (each side); sternites with long black lateral stripes joined anteriorly. Superior appendages robust, forcipate, with sub-basal tooth, the flange with prominent marginal as well as terminal teeth. Vulvar scale, like many of this sub-genus, with acutely produced distal angle.

**General description.** Pruinosity seldom extensive, at least dorsally, and sometimes absent at maturity on thorax; sometimes coating terminal segments of abdomen.

*Mature* ♂. Labrum green or greenish yellow, sky blue or blue-green, even showing such individual variation in life. Postclypeus black, ferruginous at sides, or all black; frons and vertex ferruginous with black markings of variable extent, the black on dorsum of orbits with green reflection; at times postclypeus and head blackish ferruginous or, in tropical Central Africa, all black. Orbits below yellow; sometimes with some darkening (probably decomposition).

Prothorax pale to deeper brown, with darker dorsal markings; hind lobe narrow, uniformly curved posteriorly. Antehumeral stripe complete, uniform iridescent green, of variable width; mesepimeron with less complete stripe. Older males may have traces of black at dorsal carina and on the periphery of the green bands. A dorsal spot on humeral suture. Sometimes the synthorax may be partly suffused with brown or grey discoloration, but melanised, intense black encroachment on the green bands can often occur. Sternites with long black lateral stripes joined, U-shaped, at anterior end; median line often more or less brown or black.

Femora black, brown interiorly; tibiae and tarsi black.

Wings yellow to faintly fumose. Venation black. Pterostigma broad, convex on posterior edge giving a swollen appearance; brownish yellow or ferruginous, with black suffusion, the central area usually clearer; or all black; above slightly over two cells. Forewing with 12-14 Px, in one Mwinilunga example 14 on left, only 11 on right forewing. Ac approximately at separation of anal vein. Space  $R_4$ -MA with longer intercalaries starting Px  $2\frac{1}{2}$ -5.

Abdomen mainly black dorsally, with green reflection, especially on segment 2; sometimes

a pale brown mid-dorsal line on 2-5; segments 9-10 often more sparsely black than the others. Segment 10 without dorsal crest and without apical denticles.

Anal appendages black; flange of superior sometimes paler. Superior appendage gradually forcipate, with robust outer denticles. Sub-basal tooth very robust, broadly angled at apex, less frequently rounded or obtuse. Flange closely connected to sub-basal tooth; sharply convex to form a rather rounded middle tooth and ending in a broad, obtuse, kinked apical tooth. Apex of appendage grooved.

Inferior appendage broadly conical, extending about a third as far as superior in side-view; very slightly lobed apically. Prophallic head (Nqutu) with very small, prominent ligula; distal shelf with shallow apical excision. Examples from Karkloof and Ikelenge similar.

Abd. ♂ 36-39 mm, hw. 25-29 mm; pt. 1,5-2 mm (usually nearer 2 mm).

A small Ikelenge ♂ has abd. 32, hw. 24 mm.

*Variation.* A very mature pruinosed ♂ (north of Turk Mine) is heavily melanised on thorax, antehumeral green stripe reduced to a narrow band above humeral suture. Head almost all black, with little green reflection. Pterostigma all black. A pruinosed Vumba ♂ is almost as dark but the green thoracic bands are broader and the black pterostigma is centrally purplish red. A Balla Balla ♂ resembles the Vumba one but pterostigma all black. In a series of Ikelenge males, head all black, thoracic bands variable; prophallus normal.

The obtuse sub-basal tooth of the superior tends to be more consistent in Ikelenge examples but not constantly so. In one such ♂ the tooth on right superior is obtuse, that on left sharply angled at apex.

Living colours of mature ♂ (Balla Balla): eye deep blue, more sky-blue below, with black dorsal cap. Labrum sky-blue; genae pale blue-green. Sides of abdominal segments 1-6 greenish blue. In Louis Trichardt (Outlook Estate) males the metallic antehumeral stripes narrow; sides of thorax yellow with a narrow blue-green stripe, the upper end of mesepimeron blue; ventrally whiter. Eyes and face as in Balla Balla example.

*Juvenile* ♂. Postclypeus and frons all ferruginous. Prothorax with iridescent green dorsal spots on middle lobe. Synthoracic green bands sharper and clearer, sometimes bluer in tone. Legs with reduced black on femora and tibiae, only on anterior parts. Wings often hyaline. Pterostigma more or less cream, with or without yellow centre; or brown with cream or yellow centre; or (Ikelenge) yellow, edged with ferruginous suffusion. On abdomen the dorsal metallic band divided by pale line on 2-5; metallic band incomplete on ends of segments; 9-10 often all ferruginous. Superior appendage partly ferruginous. In teneral state the appendage is all yellow or cream. A teneral ♂ (Matopos) has body all creamy yellow.

*Mature* ♀. Very similar to male on head, thorax, legs and wings, but body markings with less black. Postclypeus often all ferruginous.

Prothoracic hind lobe narrow. Mesostigmal lamina narrow, slightly widened in middle, with straight posterior ridge. In old ♀ the metallic mesothoracic stripes are sometimes more violet.

Legs with browner markings, only black on tarsi and anterior surfaces of femora and tibiae; more broadly so in old female.

Pterostigma rarely all black at maturity; usually more or less yellow centrally.

Abdomen with continuous dark dorsal band on most segments, even in juveniles, less dark on basal segments. Cerci thick, short, black, often yellow at base; occasionally yellow with black tips. Ovipositor sheath mainly brownish yellow; reaching end of segment 10 or frequently beyond this; evenly curved below, strongly denticulate for most of its length, or at least the distal two-thirds. In an Ikelenge ♀ the ovipositor sheath is all black, well denticulate on distal two-thirds. Vulvar scale with acute upper apical prolongation.

In a mature Ikelenge ♀ the postclypeus and head above are all black; green thoracic stripes edged with black; pterostigmata all black.

In juveniles the cerci are all yellowish brown; ovipositor sheath same colour, with black ventral denticles.

Abd. ♀ 35-39 mm, hw. and pt. as in ♂.

It appears that central and equatorial west African forest material of either sex tend to show blacker head and always a black pterostigma. The more obtuse sub-basal tooth cannot be regarded, any more than these darker markings, as of racial significance. These tendencies are probably influenced by ecology, the moister forest environments.

#### *Lestes rothschildi* Martin (1906)

The apparent type ♂ in *PMNHN*, loaned for this review by Legrand, has the following labels: "(blue, printed) Museum Paris — Afrique Orient. Angl. — Nairobi — Maurice de Rothschild — 1906; (blue, printed) Coll. R. Martin — 1920 — Museum Paris; (white, in Martin's script) Aofüt; (white, in script) *Lestes Rothschildi* nov. spec. ♂; (white, in Erich Schmidt's script) App. gef. Schmidt 25.vii.42."

This ♂ was, thus, collected Nairobi, August 1906 by Rothschild as in the description. Schmidt's label indicates that he inspected it on 25th July, 1952. Presumably, "App. gef." means Inspection (Appell) was made (gefertigt) or (requested) gefragt.

Martin (1906, translated) said very briefly that the wings of this ♂ were rather uniform yellowish; forewing with 12-13 Px; pterostigma longish, thick, above 2-2½ cells, yellowish brown encircled with blackish. Abd. 38,5 mm, hindw. 21 mm. Nairobi, (as "Narobi"), August. In his later paper (1910) Martin only gave the locality as Afrique Orientale in his equally brief description.

It appears that Martin only had the single ♂. The specimen is complete and agrees well with *virgatus* in all features; a not quite mature ♂ with head and thorax stained. I have added one more (red) label: "Holotype ♂, *L. rothschildi* Martin, syn. ad *virgatus* (Burm.)". Legrand (*in litt.* 20 May, 1976) before loaning the specimen observed that he believed it to be the type described by Martin (1906) and that it was similar to examples of *virgatus* sent previously to Paris Museum (by Pinhey) and that it appeared to be a *synonym* of this.

*Notes on holotype* ♂. Labrum ferruginous. Postclypeus ferruginous, with black anterior and central markings. Frons ferruginous with darker transverse band nearly to base. Head above ferruginous, with black markings, those on vertex with metallic green sheen. Antennal socket and base of antenna ferruginous. (All these areas evidently stained).

Prothorax with iridescent green dorsal fasciae, extending on to hind lobe. Synthorax ferruginous to first lateral suture; with broad iridescent green mesepisternal and mesepimeral stripes; sides yellow, with several ferruginous smears. Sternite, as in typical *virgatus*, with bifurcate black stripes. Femora 2-3 ochreous inwardly, black outwardly; femur 1 with narrower outer stripe; tibiae black anteriorly; tarsi blackish ferruginous.

Wings greyish yellow. Venation dark ferruginous anteriorly, blacker posteriorly. Pterostigmata shaped as in *virgatus*, brownish yellow, suffused with ferruginous at ends; convex between black veins; above less than 2 cells in left forewing, 2½ cells in right forewing. Forewing with 13 (left), 12 (right) Px. Venation as in *virgatus*.

Abdominal dorsal band metallic green on distal half of segment 1, on 2-8, darkening on 6-8, all divided by a mid-dorsal yellow line; 9-10 with bronze dorsal band. Superior appendage black, formed as in *virgatus* but with a malformation of one sub-basal tooth, which is angled and prominent on left appendage, more conical on right and surmounting a blunter extra tooth ventrally and partly distal to it; tooth at end of flange conical. Inferior appendage ferruginous, marked with black, shaped as in *virgatus*. Prophallus also as in *virgatus*.

Abd. 36,5 mm; hw. 26,5 mm; pt. almost 2 mm in all wings (Martin gives pterost. 1,5-1,75 mm).

**Ecology of *virgatus*.** Locally common in woodland or forest, sometimes in thick bush. It favours small pools, sluggish forest streams or, in Zululand, it was amongst reeds around a coastal pool. Gambles (1960) and Corbet (1962) record it breeding in small temporary pools. Oviposition in vegetation prior to pools filling up.

**Distribution.** Eastern Cape northwards, inland or coastally, to Ethiopia, equatorial central and West Africa. The most westerly record I have is Nigeria (Gambles).

#### Material examined.

##### *NMB.*

Eastern Cape: East London, July, 1963; Port St. Johns, July, 1963; Buffalo Pass, E. London, Nov. 1979 (N. Duke).

Natal: Durban Aug. 1955; Ladysmith, March 1952 (A. H. Newton); Karkloof, April 1960 (K. M. Pennington); Palmet River, Sydenham, Sept. 1956; Cowie's Hill, Aug. 1959; Nqutu, Zululand, Nov. 1948, Oct. 1949 (A. H. Newton); Duffs Rd, July 1962; Nkhandla, July 1950 (A. H. Newton); Kambula, Nov. 1950 (A. H. Newton); Burman's Bush, Durban, May 1956 (C. G. C. Dickson); Pietermaritzburg, 10 Oct. 1978 (J. G. H. Londt); Umtamvuna Nature Res., Nov. 1979 (E. Pinhey).

Swaziland: Mbabane, April 1978 (J. G. H. Londt).

Northern Transvaal: Louis Trichardt, Apr. 1976 (E. Pinhey); Luvuvhu River, 2 km E. of Louis Trichardt, 13 Dec. 1978 (E. Pinhey); Outlook Farm, 1415 m, Zoutpansberg, Dec. 1978 (Pinhey & Philip); Pilgrims Rest, 26 Mar. 1978 (F. C. de Moor)

Rhodesia: Tuli-Shashi River, May 1959 (E. Pinhey); Balla Balla, Dec. 1956 (E. Pinhey); Bulawayo, Febr. 1915; Matopos, Bulawayo, Oct. 1953 (E. Pinhey), April 1975 (F. de Moor), May 1975 (E. Pinhey); Ferney Creek, Selukwe, Sept. 1973 (E. Pinhey & F. de Moor), Nov. 1976 (M. Villet); Que Que, Oct. 1977 (M. Villet); Fort Victoria, Apr. 1957 (E. Pinhey); Bikita, Jan. 1960, May, 1969; Runde (Lundi) District, Apr. 1971 (T. Payne); 25 km NE of Turk Mine, Jan. 1957 (D. K. B. Wheeler); Umvumvumvu River, west Melsetter, Oct. 1976 (E. Pinhey); Melsetter village, Oct. 1976 (E. Pinhey); ♂ ♀ *in cop.* Alicevale Farm, Burmah Valley, Umtali, Dec. 1977 (D. K. B. Wheeler); Vumba Mts, Umtali, Oct. 1953 (E. Pinhey), Sept. 1955 (J. A. Whellan); Stapleford, Penhalonga, Nov. 1967; Inyanga Mts, Oct. 1957; Nyagui R., Uzumba, NE of Salisbury, 14 July 1976 (V. T. M. Baker)

Malawi: *in cop.* Mudi Riv., Limbe-Blantyre, Nov. 1970 (Philip Mhlanga); Ruo Gorge, Mt. Mlanje, May 1970 (E. Pinhey); Dedza forest, March 1979 and Nchisi forest, Dec. 1979 (J. G. M. Wilson).

Zambia: Lusaka, Nov. 1960 (R. C. Dening); Solwezi, Apr. 1963 (E. Pinhey); Ikelenge, N. Mwinilunga, March, 1960 (E. Pinhey), May 1961 (E. Pinhey), May 1964, Jan. 1965 (E. Pinhey), Apr.-May 1972 (E. Pinhey & F. de Moor)

East Angola: Lutchigena Riv., Caianda, 10 May 1963 (E. Pinhey)

South Tanzania: Njombe, 9° OS, 34° 35E, Sept 1963 (C. H. McCleery)

Northern Uganda: Labwor Hills, Karamoja, March 1952 (T. H. E. Jackson)

Ethiopia: Ghibie Valley between Jimma and Addis Ababa, July 1963 (R. G. Hill). (C. Consiglio also reports it from Ethiopia).

Previously examined and named by Pinhey:

*TMP.* (see Pinhey det 1951).

Eastern Cape Prov.: Kingwilliamstown; Dunbrody

Natal: Durban; Sarnia; Princetown; Hudley, Zululand

Northern Transvaal: Moordrift; Pretoria

Rhodesia: Matopos, Bulawayo; Salisbury; Mangesi River; Chirinda Forest, Mt. Selinda; Zambezi-Sanyati Riv. junction.

*RUC.* (Pinhey det 1951). Cape: Barkly East.

Expedn. Nairobi to Abercorn (Mbale), N. Zambia, Apr. 1954: Lake Chila, Mbale (E. Pinhey)

Swedish Expedn Southern Africa (1951) (see Brinck, 1955)

E. Cape: Mount Frère, March 1951

- Identified 1957 for L. D. E. F. Vesey Fitzgerald: Mbale, Zambia; Ufipa Plateau, South Tanzania.
- Ident. for Stuttgart Expedn: Msingi, Kilimanjaro, 1400 m, Jan. 1952 (E. Lindner) (see Pinhey, 1958).
- Recorded Pinhey 1961a: Widespread in Tanzania and Kenya from sea-level to 7000 ft. (2 150 m) and in Uganda as far north as Karamoja  
and Pinhey 1961b: Ndola, Zambia
- Ident. for *CAS*, 1965:  
Natal: Eshowe, Zulul.; Rhodesia: Matopos; Marandellas; Ruanda: Gabiro, Kagera Park, 1 325 m, Dec. 1957
- Ident. for J.-J. Symoen's Bangweolo research (see Pinhey, 1967b). Shaba: Lubumbashi; Msipashi; Lualaba River; Katshupa; Kabiashia
- Ident. for *PPIS*, Febr. 1978:  
Rhodesia: Salisbury, Apr. 1954 (J. A. Whellan); Chipani Springs, Urungwe, Nov. 1949 (J. A. Whellan); Chirinda Forest, Febr. 1948 (J. A. Whellan)
- Identified *TMP* (1978):  
Northern Transvaal: Fountains, Pretoria, Febr. 1949 (E. Pinhey); Pretoria, Oct-Nov. 1961 (L. Vári); Cyprus Farm, Ofcolaco, Sept. 1961 (L. Vári).  
Mozambique: Inhaca Island, Maputo Sept. 1957 (G. van Son)
- Identified by other specialists:  
*IRSNB*: Port Natal (Durban); Grünberg (1903: 696): Kassiabona, Nyassa;  
Ris (1921: 274): Eastern Cape; Natal; Rhodesia; Schouteden (1934: 78)  
(*MRACT*): Kapiri, Shaba (Legros)
- DM*, Natal: Umbilo, Durban 1914 (L. Bevis)  
A. H. Newton Colln (Nqutu): Natal: Ladysmith; Kambula; Nkandhla; Nqutu.
- In *SAM*, Cape Town (teste A. J. Prins): Cape: St Mathews, Kingwilliamstown Distr. 1894 (R. Lightfoot); Dunbrody 6 May 1912; Zululand (F. Ris): M'fongosi, March 1911 (W. E. Jones); Matabeleland: Matopo Dam 16 Febr 1911.
- Checked in *RSM*, Edinburgh, (Pinhey Aug. 1978). Natal: Durban 16 Dec. 1907; Kenya: Kitale, 20-22 Oct. 1924 (G. W. Jeffery); Uganda: Labwor Hills, Karamoja March 1952 (T. H. E. Jackson).
- Consiglio, 1978: Ethiopia.

## LESTES (LESTES) AMICUS Martin Text fig. 2, 39-44, pp. 341, 387

*Lestes amicus* Martin, 1910: 85, 91; Ris, 1921: 275 fig 12; Schouteden, 1934: 77, fig 77 (fig. 77, wings, erroneously labelled "*Lestes virgatus* Martin"); Pinhey, 1951: 41 figs; Pinhey, 1961a: 7; Pinhey, 1961b: 12, pl.; Pinhey, 1962b: 93; Pinhey, 1967b: 8; Pinhey, 1976: 531 pl. 1

Martin's type (♂) appears to be lost. From the description (adapted here) it was an abnormally small juvenile ♂ from Mozambique, with stained thorax:

Lips and face testaceous. Head above greenish black, posteriorly yellow.

Prothorax brown with green (dorso-) lateral bands. Synthorax reddish brown with broad metallic green antehumeral stripe, followed by brown, black and yellow markings (insufficiently clarified).

Legs yellow, strongly striped with black.

Wings yellow, strongly saffronated apically; pterostigma elongated, brownish yellow, between black veins, slightly swollen in centre. 13 Px (probably forewings).

Abdominal segments 1, 10 black above, the others bronze. Superior appendage brown to black, slightly longer than 10, straight, then well incurved. Sub-basal tooth acute (followed by a "second tooth"). Inferior appendage short, black.

Abd. (with append.?) 35 mm, hw. 22 mm, pt. 2,25 mm.

The diagnostic character here is the deeper apical area of the yellow-tinted wing, described by Martin as "très safrané". Saffron is variously described as a deep yellow or orange colour.

**Type:** A male in *NMB* has been chosen as a *Neo-holotype* to replace the lost type from Mozambique. The specimen selected is also from Mozambique and is normal, mature, non-pruinose example: forewings with 12 (left) and 11 Px; abd. 38,5 mm, hw. 26 mm, pt. (fw.) 2,5 mm.

It bears the labels: Chiluvo Hills, Vila Machado, Mozambique, 14 Nov. 1967 (E. Pinhey); and a red neoholotype label, designated June 1978.

**Characters.** Closely related to *virgatus* but wings yellow at all stages and with distinctive orange-brown or brown apices, unlike all other African Lestidae. Pterostigma longer and paler than *virgatus*. Inner flange of superior appendage straight. Vulvar scale as in *virgatus*. a much less variable species.

**General description.** Mature ♂ sometimes with slight white pruinosity on sides of thorax, more pronounced on dorsum of segments 8-10 of abdomen.



*Mature* ♂. Labrum green. Postclypeus dark ferruginous to black; head above black. Orbits below yellow, often a little black anteriorly.

Prothorax black; hind lobe very narrow. In juvenile, prothorax yellow-brown with dorsal green fasciae on all lobes. Synthoracic green bands as in *virgatus*; development of black areas also similar but rather less. Sternites with same bifurcate stripe.

Femora and tibiae black with yellow-brown posterior stripe. Tarsi black.

Wings yellow with conspicuous red-brown to brown apical maculae. Venation dark brown; costa, R<sub>1</sub> and R<sub>2</sub> black. Pterostigma swollen as in *virgatus* but longer; brownish yellow, pale orange-brown or ferruginous, with paler, often clear creamy centres, not suffused with brown or black; above 2½ cells.

Forewing with 11-13 Px, usually 12. Intercalaries between R<sub>4</sub>-MA shorter than in most species, starting at Px 5-7.

Abdomen with dorsal black band on all segments, with green or violet sheen on some of them. Segments 8-10 frequently pruinosed; a slight dorsal crest on 10, without denticles on distal margin or only vestigial ones.

Anal appendages black. Superiors straight at start, gradually forcipate apically, with exterior denticles small, not numerous and internal armature less developed than *virgatus*. Sub-basal tooth pointed, less attached to flange. Flange curved at start, then with straight edge, the terminal tooth transverse.

Inferior appendage reaching about a quarter as far as superior, simple, broadly conical. Prophallic head (Lake Chila) very like *virgatus*, ligulate flap longer; stem of head sharply curved, with less chitin on membrane. Terminal ledge with a more V-shaped excision.

Abd. ♂ 35-36,5 mm, hw. 26-29 mm, pt. 2,3-3,0 mm.

Martin's example, abd. 33 mm, hw. 22 mm, was evidently a dwarf.

*Juvenile* ♂. Orbits below all yellow. Postclypeus black with orange lateral triangular maculae. Frons and vertex ferruginous, often with traces of black. Prothorax yellowish brown, with suffused greenish brown dorsal markings. Synthorax as at maturity or paler. Markings on femora and tibiae dark brown. Wings similar but pterostigma usually paler. Abdominal segments 9-10 often brownish yellow with narrower black dorsal band.

*Mature* ♀. Labrum green. Differs from ♂ in postclypeus and frons more or less black; head above ferruginous, with metallic green fasciae. Orbits below yellow.

Prothorax ferruginous, with blackish brown markings; hind lobe narrow. Mesostigmal lamina narrow, yellow, with straight, slender posterior ridge, slightly thickened laterally.

Synthorax as in ♂.

Legs and wings as in ♂. Pterostigma reddish brown.

Abdomen blackish brown to black dorsally, without pruinosity, with green reflections on segments 2-7, this band divided mid-dorsally by a pale line on 2-5. A slight crest on segment 10. Cerci slender, shorter than 10, brownish yellow, with black tips. Ovipositor sheath brownish yellow, or browner or greyer on ventral half; always extending beyond end of segment 10; evenly and rather well curved ventrally, strongly denticulate throughout.

Vulvar scale like *virgatus* but with the upper apical extension larger.

*Juvenile* ♀ with head above paler, ferruginous. Legs with narrower black on femora and tibiae. Pterostigma more brownish yellow. Abdomen with black on all segments, divided by pale mid-dorsal line on segments 2-5. Cerci paler.

Abdomen 35-36,5 mm; hindwing and pterostigma as in ♂.

**Ecology.** Very local and gregarious, preferring wet patches in forest or swamp-forest. At Victoria Falls it has become established and common in the spray forest, known casually as the "rain forest". Occasionally found in thick bush.

**Distribution.** Very local in south central Africa: Rhodesia, Mozambique, Angola, Shaba (Katanga) and southern Tanzania.

**Material examined.**

*NMB.*

Mozambique: Chiluvo Hills, Oct.-Nov. 1963, Nov. 1967 (E. Pinhey) (neoholotype)

Rhodesia: Que Que, Oct. 1977 (M. Villet); Victoria Falls, Sept-Oct. 1953, July 1955, Sept. 1957 (E. Pinhey)

Zambia: Ndola, Apr. 1961 (R. A. Green); Solwezi, Apr. 1963 (E. Pinhey); Ikelenge, Mwinilunga, Apr. 1957 (R. M. Kitchingman), Febr. 1960, Jan. 1965 (E. Pinhey); Lake Chila, Mbale, Febr. 1957 (L. D. E. F. Vesey Fitzgerald)

East Angola: Lutchigena Riv., Caianda, Jan. 1965 (E. Pinhey)

Previously examined and named by E. Pinhey:

Expedn. Nairobi to Mbale, N. Zambia:

Lake Chila, Mbale Apr. 1954 (E. Pinhey)

Recorded Pinhey 1961a:

Tanzania: Chimala, south of Iringa (W. Peters); Ukerewe Isl. Colln, Lake Victoria (Fr Conradt)

Recorded Pinhey 1961b:

Shaba (Katanga); Lubumbashi

Ident. 1965 for *CAS*:

Angola: Nova Lisboa 174 m, May 1958

Zaire: Kinda 1050 m, Febr. 1958

Recorded Pinhey, 1967b, Symoens Lake Bangweolo research:

Shaba: Lubumbashi and Msipashi (J-J. Symoens)

Ident. 1971 for *IIANL*, Angola:

Angola: Nova Lisboa

Ident. 1978 for *PPIS*:

Victoria Falls, Oct. 1953 (E. Pinhey)

Recorded by other specialists.

Ris (1921: 275):

N.E. Zambia: Upper Luangwa River (S. A. Neave)

Zaire: Kapiri, Shaba (Legros); Kihsenda (Bequaert)

Schouteden (1934: 77): *MRACT*.

Zaire: Lubumbashi; Kapiri; Tshinsenda; Atene; Lusambo; Bianos; Kisamba

Checked in *RSM*, Edinburgh (Pinhey Aug. 1978).

Malawi: Mzuzu 1200 m; Bungulo, Nkhata Bay 700 m; Kandole: all June-July 1962  
(D. R. Gifford)

*LESTES (CHALCOLESTES) VIRIDIS* (van der Linden) Text fig. 45, 46, p. 387

*Agrion viridis* van der Linden, 1825: 36 (nec. 1820, 1823)

*Lestes viridis* Selys, 1840: 137; Selys, 1862: 297 (13 sep.); Selys, 1887: 67 (Egypt); Kirby, 1890: 160; Martin, 1910: 102 (Algeria, Egypt); Morton 1924: 30; Schmidt, 1928: 247, 250; Andrés, 1928: 21 (Egypt); May, 1933: 31, 90 (adult and larva); Conci & Nielsen, 1956: 66, 68 figs.; Aguesse & Pruja, 1957: 151; Robert, 1958: 76 figs; Loibl, 1958: 55-80; Corbet, 1962: 17, 45, 46; Lieftinck, 1966: 11

*Chalcolestes viridis* Schmidt, 1951: 126, 127

*Agrion leucopsallis* Charpentier, 1825: 5 (syn. Selys, 1862)

*Lestes viridis parvidens* Artobolewskii, 1929: 141 (Crimea); Cowley, 1940: 174

*Chalcolestes viridis parvidens* Schmidt, 1951: 127

Type *viridis* was from Bologna, Italy; *parvidens* from Crimea.

The north African and Southern and Central European taxon is subspecies *viridis*. Subspecies *parvidens* is found in Syria and neighbouring territories in south eastern Europe and Asia Minor.

*Lestes viridis viridis* (van der Linden) Text fig. 45, 46

**Characters.** Marked rather like a large *virens*, described originally in the same year. Labrum green with black margin. Prothoracic hind lobe sharply narrowed at side, like *simulator*. Arculus as in *sponsa* and Afrotropical species. Sub-basal tooth of superior appendage obtuse. Inferior appendage extending less than half as far as superior, with flat extension. Prophallic head with lateral folds as in *ictericus*, chitinous stem branches elongated to fuse with the enlarged shelf. Vulvar scale with small extension on posterior margin before apex.

**Description.** Slight ventral pruinosity.

*Mature ♂ (Germany).* Labrum green with black lower margin. Postclypeus black. Head above metallic green or bronze. Orbits below more or less black or bronze-black.

Prothoracic hind lobe sharply narrowed at sides, almost like *simulator*. Synthorax metallic green to first lateral suture and below this at dorsal end; dorsal carina yellow, black-edged; black humeral stripe enclosing a yellow line; black stripe on second lateral suture. Sternites with distal black dots only. Femora 2-3 black exteriorly, yellow interiorly.

Wings not broadly rounded at apices; hyaline. Venation brown, costa and radials black. Pterostigma longish, rather thick, above 2 cells; brownish yellow to pale ferruginous between black veins, the posterior edge slightly curved. Forewing with 11-13 Px. Ac at separation of anal vein or only a fraction distally (unlike *silvaticus*). Space R<sub>4</sub>-MA with long intercalaries starting at Px4 to Px5 in forewing (Px3 — Px4 in hindwing) and short distal veins.

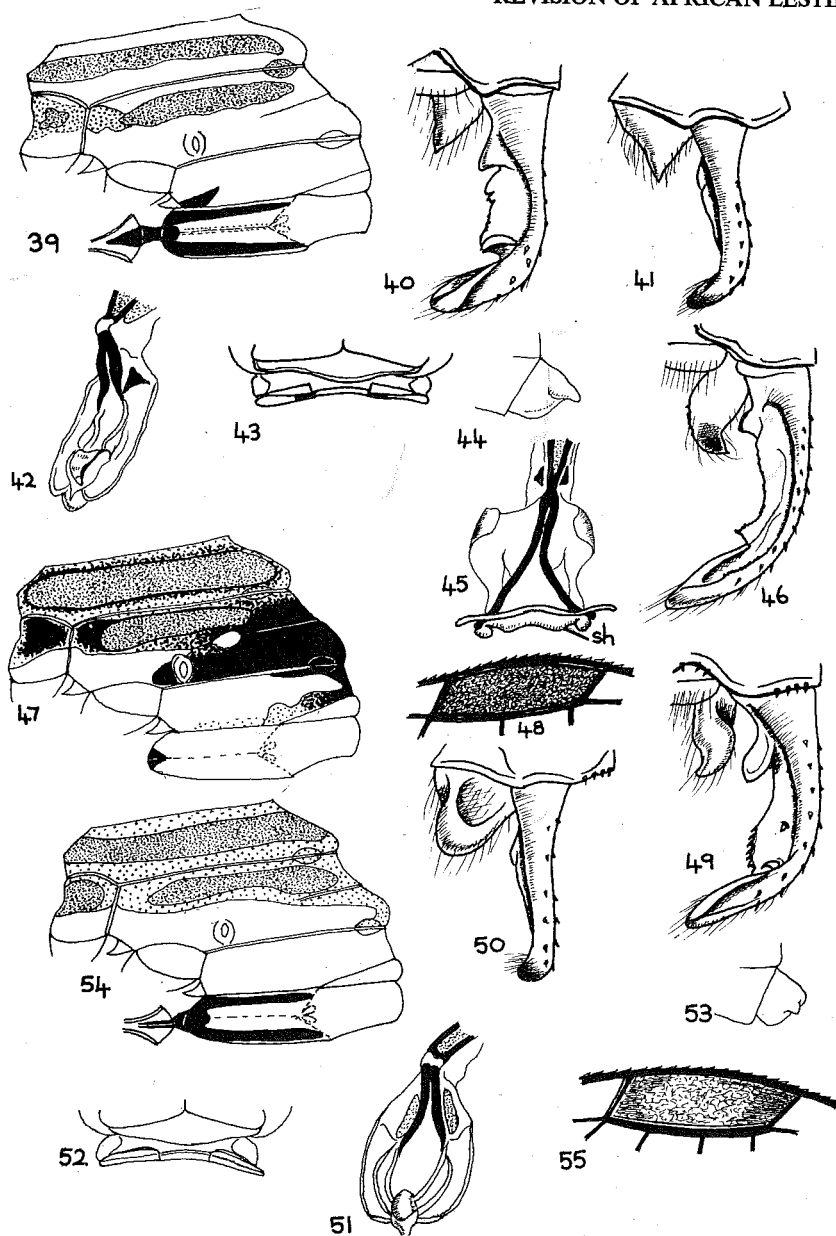
Abdomen metallic green to bronze on all segments. Segment 10 without crest, the invagination broad and shallow, not denticulate.

Anal appendages black, superiors yellow on flange. Superior appendage evenly forcipate, with numerous outer denticles. Sub-basal tooth prominent but obtuse. Flange very narrow, long, well curved, finely denticulate but mainly at distal end. Inferior appendage extending less than half as far in side-view; broad at base, the extension flat, curved slightly outwards to an acute point. Head of prophallus quite distinct; with lateral fold, not quite as broad as in *ictericus*; the stems thick, strongly bifurcate distally to join the very short, broadly transverse distal shelf which is extended laterally into slender arms.

Abd. 33 mm; hw. 24 mm; pt. 1,75 mm.

(Selys' measurements are larger: abd. ♂ 34-39, ♀ 32-33 mm; hw. 25-27 mm.)

*Mature ♀ (Germany).* Slight white ventral pruinosity. Very like ♂. Prothoracic hind lobe



Subgenera *Lestes* (39-44), *Chalcolestes* (45, 46), *Pseudochalcolestes* (47-55). *L. amicus*: 39. synthorax of ♂ (Victoria Falls); 40, 41. right anal appendages from above, left ones from side (Caianda); 42. prophallus (Lake Chila); 43. prothoracic hind lobe and mesostigmal lamina of ♀ (Chimanimani); 44. left side of vulvar scale (Que Que). *L. viridis* (Germany): 45, 46. prophallus, right anal appendages from above (sh = shelf). *L. silvaticus* (Madagascar): 47. ♂ synthorax (Foret l'Est). 48. pterostigma of right forewing, ♂; 49, 50. right appendages from above, left ones from side; 51. prophallus; 52. hind lobe of prothorax and mesostigmal lamina of ♀; 53. vulvar scale. *L. auripennis* (Madagascar): 54. ♂ synthorax (Analavelona); 55. pterostigma of right forewing ♂.

narrowish in centre, strongly narrowed laterally. Mesostigmal lamina black, yellow outwardly, with straight bicoloured posterior ridge. Synthorax as in ♂.

Legs and wings as in ♂. Forewing with 12-13 Px. Abdomen metallic green or bronze. Cerci black. Ovipositor sheath black with yellow sub-lateral stripe; ventrally rather straight, strongly denticulate on curved distal third. Vulvar scale with small angular extension on distal edge before apex.

Abd. 32-33 mm; hw. 27-28 mm; pt. 2,25 mm.

**Distribution.** Central and southern Europe; Asia Minor and Syria; Selys gives Egypt; Martin says Algeria, in lakes; Andrés records Egypt, Algeria and Syria; Aguesse and Pruja give Ifane, Morocco.

**Material examined.**

NMB. W. Germany: Karlsruhe, Killisfeld, Aug. 1963.

Elsewhere:

USSRL. Morocco: Tanger (Tangiers)

LESTES (PSEUDOCHALCOLESTES) SILVATICUS Schmidt Text fig. 47-53, p. 387

*Lestes silvaticus* (Schmidt MS) Fraser, 1949: 24 (locality only); Lieftinck, 1965: 236 (locs).

*Chalcolestes silvaticus* Schmidt, 1951: 122, 127, figs. 4-7

*Lestes (Chalcolestes) silvaticus* Pinhey, 1962b: 94

Type series of both sexes have not been examined by the author. They are in Dr. Asahina's collection and he kindly provided data (*in litt.* 13 Jan. 1978) on these. There are 7♂ and 1♀. The data on Schmidt's specimens: "Chalcolestes silvaticus n. sp.; Analamazotra, Madagascar, leg. Olsufief, (ix. 31), 14.12.30; Typus:". All the remainder of the males are from the same locality, but one was collected 28 Nov, two on 20 Nov and two on 2 Dec. 1930. Since Schmidt's series was designated "Typus", i.e. syntypes, I sent lectotype labels for ♂ and ♀ collected 14 Dec. 1930 to Asahina, at his suggestion.

Notes extracted from Schmidt (1951):

♂. Face and head above green. Orbits below black (c.f. Schmidt, fig. 7c). Prothorax above green. Synthorax greyish with metallic green stripes on mesothorax. Metepisternum pruinosed white, ventral surface also pruinosed. Wings mainly fumose brown. Pterostigma dark brown. Superior appendages black, inferiors brown.

Abd. (? with append.) 32-36 mm; hw. 20-24 mm.

♀. Forewing with 10-14 Px (usually 11). Abd. 33,5 mm; hw. 24 mm.

**Characters.** Placed in *Chalcolestes* by Schmidt, this species, like the larger *auripennis* has Ac, in forewing only, distal to separation of anal vein. Pterostigma shorter than in *auripennis*; mainly black and less swollen. Orbits below black. Thorax blacker but sternites without black pattern. Superior appendages inturned more obliquely with massive sub-basal tooth; flange without terminal tooth, this being replaced by a minute tooth above the flange. Inferior appendage without apical projection. Female cerci black. Vulvar scale rather simple.

**General features.**

Small species, with only a trace of pruinosity.

*Mature* ♂. Labrum green. Postclypeus, frons and vertex all black. Orbits below mainly black.

Prothorax nearly all matt black, with traces of brownish yellow. Hind lobe very narrow. Synthorax black or very dark ferruginous to second lateral suture except at ventral end of metepisternum; with broad iridescent green antehumeral and mesepimeral stripes. Sternal plate almost unmarked with black, unlike the *virgatus* group.

Femora and tibiae broadly black, brown posteriorly; tarsi black. Wings shaped as in *virgatus*, fumose not yellow. Venation black. Pterostigma shaped like *virgatus* but posterior edge straighter; black or black with blackish red centre; above two cells, rarely two and a quarter. Forewing with 11-12 Px. Ac in forewings distal to separation of anal vein by about half the length of Ac, but in hindwings at this point of departure. Space R<sub>4</sub>-MA with long intercalaries, starting at Px 4 — Px 5.

Abdomen very black, except lower sides of segments 1-2, with green or violet sheen only on basal segments. Segment 10 without crest; distal invagination broad and shallowly rounded, edged with small denticles.

Superior appendage all black; gradually forcipate, the end portion inturned obliquely; this end part with an inner ridge above a slight depression; only a very few, robust outer denticles. Sub-basal tooth massive, obliquely truncate, broadly flattened on inner surface, and rather separated from flange. Flange curved to a straight, serrated edge, without terminal tooth, but with a small tooth on inner edge of main stem above end of flange; and with a minute central tooth. Inferior appendage dark ferruginous, black at base; in side view, over one third length of superior; basal portion more depressed than the conical distal part; in side view showing a large, rounded medio-basal depression. Head of prophallus a small rounded ligula; terminal ridge very small. Chitin elements on either side of stem of head of prophallus.

Abd. 30-34 mm; hw. 20-24 mm; pt. 1,5-1,75 mm.

Although the type series males were pruinose ventrally, they appear to have been less mature because of their metallic green prothorax and greyer synthorax.

*Mature* ♀. Head and thorax as black as in ♂, except for slight traces of yellow at sutures especially humeral and first lateral sutures. Labrum greenish yellow, prominently black a, distal edge. Orbits below black.

Prothoracic hind lobe narrow. Mesostigmal lamina black, narrow, with broad, straight, low posterior ridge, less developed than in *virgatus*. Femora and tibiae more ferruginous, but also black anteriorly.

Wings yellow or smoky yellow. Venation dark brown. Pterostigma as in ♂, black, paler centrally, less swollen than *virgatus*. Forewing with 11-12 Px. Ac in forewing slightly distal to separation of anal vein, in hindwing at this point. Intercalaries as in ♂.

Abdomen with black band on all segments but less enveloping than in ♂; a green reflection on segments 1-2. Cerci slender, black, shorter than segment 10. Ovipositor sheath mainly black, browner above, extending beyond segment 10; slightly curved, evenly denticulate almost throughout. Vulvar scale scarcely sloped at distal ends, with slight distal extension below apex.

Dimensions as in ♂.

**Distribution.** Only known from Madagascar. No ecological notes available.

**Material examined.**

*NMB.* Forêt de l'Est, Tananarive, Nov. 1961 (R. Vieu).

Previously seen.

Pinhey det. 1973, for *USNM*: Tamatave Prov., Moramonga, Oct. 1962.

LESTES AURIPENNIS Fraser Text fig. 54-62, pp. 341, 387, 396

*Lestes auripennis* Fraser, 1955b: 39, figs. 6, 7; Pinhey, 1962b: 93

Type ♂ and ♀ (*PMNHN*) were examined in Paris in 1974. The ♂ bears the following labels: "Analavelona 1320 m; (blue label) Institut Scientifique Madagascar; *Lestes auripennis* Fraser ♂ det. Fraser 1955; and a red type label". The allotype ♀ has the same data labels, but it has lost part of the abdomen.

**Characters.** With iridescent green thoracic bands and bifurcate black sternal pattern as in *virgatus*, but Ac in forewings distal to separation of anal vein, yet at this point of departure in hind wings. Orbits below not black. Pterostigma very long. Superior appendage rather like *amicus*, but inferior appendage with slender apical prolongation. Prophalline head and vulvar scale different from *virgatus* group.

**General features.** No pruinosity.



*Mature* ♂. Labrum orange-yellow. Postclypeus mainly black, orange-red at sides. Frons orange and greenish brown. Vertex metallic green with some orange markings. Orbits below yellow.

Prothorax reddish brown, with green dorsal reflections; hind lobe narrow like *virgatus*. Synthorax deep ferruginous, lower sides yellow; with rather uniform green antehumeral and mesepimeral bands like *virgatus*; sternites with similar long bifurcate black stripe.

Femora and tibiae dark ferruginous anteriorly, yellowish brown posteriorly; tarsi blackish ferruginous.

Wings distinctly yellow. Venation brown but costa,  $R_1$  and  $R_2$  black. Pterostigma long, swollen, shaped like *virgatus* but narrower; above  $2\frac{1}{2}$  cells; creamy white to pale orange between brown veins, the distal third or quarter grey, a trace of grey at proximal end. Forewing with 13-15 Px. Ac in forewings distal to separation of anal vein by half or two-thirds length of an Ac; in hindwings more or less at Ac. Space  $R_4$ -MA with long intercalaries starting at Px 4 — Px 5.

Abdomen with green-reflecting dark band on all segments, the green reduced distally, especially on segments 9-10. Segment 10 without crest, only shallowly excavate, with sinusously curved, smooth yellow dorsal lips to the excavation, without denticles, or only a lateral one on each side of the segment.

Superior appendage short, evenly forcipate; yellowish brown, the incurved ends mainly blackened; apical portion grooved; very numerous outer denticles. Sub-basal tooth prominent, the flange narrow, straight, terminating in a strong black, transverse dorso-lateral tooth, and before this a minute central tumour on flange, more rounded than the tooth in *silvaticus*. Inferior appendage ferruginous, extending over half as far as superior and ending in a long, out-curved, tapering prolongation with a minute hook.

Head of prophallus with longer ligula than *silvaticus*. Chitinized arms at base of scoop shorter and thicker than in *virgatus*. Chitin elements at their sides darker.

Abd. 32-37 mm; hw. 23,5-27 mm; pt. 2,3-2,5 mm.

*Mature* ♀. Labrum orange. Postclypeus brownish yellow, ferruginous anteriorly. Frons and vertex as in ♂. Orbits below yellow.

Prothorax as in ♂. Hind lobe very narrow, its edge thick. Mesostigmal lamina narrow, yellow, with straight posterior ridge. Synthorax as in ♂, with vivid green mesothoracic bands.

Legs as in ♂, tarsi blacker.

Wings yellow, venation as in ♂. Pterostigma as in ♂ but almost all cream, with only a trace of grey at distal end. Forewing with 13-14 Px.

Abdomen with greenish black band on all segments, but much paler on segment 10. Cerci slender, brownish yellow, with black at extreme apices. Ovipositor sheath brownish yellow,

extending slightly beyond segment 10; straightish ventrally for one third, gently curved on strongly denticulate distal two thirds. Vulvar scale with outer edge sloped from a broadly rounded apical extension.

Abd. 31-34 mm; hw. and pt. as in ♂.

**Distribution.** Known from Madagascar only.

**Material examined.**

*NMB.* Analavelona (type locality), 50 km N.W. of Sakaraha, S.W. Madagascar, April 1954

LESTES (PARALESTES) TRIDENS McLachlan Text fig. 63-71, p. 396

*Lestes tridens* McLachlan, 1895: 24(♂); Förster, 1906: 342; Martin, 1910: 85; Sjöstedt, 1917b: 24; Ris, 1921: 438 (incogn.); Schouteden, 1934: 78; Pinhey, 1951: 47 figs

*Paralestes tridens* Schmidt, 1951: 124 figs 5, 8

*Lestes tridens* Pinhey 1961a: 8; Pinhey, 1961b: 13

*Lestes (Paralestes) tridens* Pinhey, 1962b: 94

*Lestes tridens* Kimmins, 1970: 196; Carfi, 1974: 152 fig. 1

*Lestes niger* Martin, 1910: 84, 88; Pinhey, 1951: 45; Pinhey, 1961a: 9; Pinhey 1962b: 94 (synonymy)

The male type, described from one example taken at Delagoa Bay, designated a holotype by Kimmins (1970) in subgenus *Paralestes*, was examined by me in the *BMNH* in 1974. Apart from Kimmins' holotype label it bears the following data: "type, Delagoa Bay, McLachlan Coll. B.M. 1938 — 674 (blue label); and (McLachlan's handwriting) *Lestes tridens* McL."

It is in good condition. The antehumeral band has a bluish green reflection not mentioned by McLachlan who describes it (without a figure) as "a rather broad black band on either side of the dorsal crest, its edge irregular externally and there showing two broad excisions, the lower of which is filled in by a bright yellow oblong space; posteriorly the bands are bordered with brown beneath . . .". The yellow and probably the brown fasciae are evidently post-mortem changes. Forewing with 10 (left), 9 (right) Px; hindwing with 9 and 8½ Px. Hindwing 20 mm.

Head dark brown above. Pterostigma brown. Superior appendages pale yellow, black at base and apex.

**Characters.** A small species, dark at maturity. Orbits below partly black. Wings hyaline.

Forewing with only 9-11 Px. Pterostigma short. Antehumeral band complete but dissected on outer edge. Femora 2-3 black, enclosing two white stripes. Superior appendage with massive sub-basal tooth. Flange consisting of two teeth. Inferior appendage with apical extension. Hood of prophallus very large. Vulvar scale angular, with steeply sloped outer edge.

**General description.** There are two forms, the first being the darker one, nearer *niger*.

*Mature ♂.* White pruinosity very slight to moderate, below head, sides of thorax, base of legs and sometimes on segments 9, 10.

Labrum green. Postclypeus and all head above black; orbits below black.

Prothorax black; hind lobe rather broad and flat. Synthorax pale pinkish to ochreous brown. Antehumeral stripe broad, black, trilobed (as in figure); often with grey or brown staining on mesepisternum; sides of thorax with only small black maculae (as in fig.); sometimes obscured heavily with black, the entire metathorax laterally black. Sternum occasionally with short black lateral lines (*Chirinda Forest ♂*) but usually only small black distal dots. The mesepimeral maculae vary in shape but sometimes a greyish suffusion spreads between them and then the spots are obscured.

Femora 2-3 black, with two white striae; fore femur with broad whitish yellow inner band and narrow anterior line. Tibiae white with black anterior stripe. Tarsi black.

Wings hyaline to very faintly fumose. Venation black. Pterostigma very short, rectangular, above 2 cells; black or very dark grey-brown, usually with whitish yellow anterior edge but this sometimes obscured. Forewing with 9-11 Px, generally 9 or 10, rarely 12 or even 13. Ac at separation of anal vein. Space  $R_4$ -MA with intercalaries as in *Paralestes* but occasionally a fractional extra terminal one; the longer intercalaries commencing at Px 4 — Px 5.

Abdomen black dorsally on all segments, without green reflections. Segment 10 raised slightly, post-medially, the distal excision semicircular and armed with small denticles.

Anal appendages dark brown, blacker at base and apex. Superior appendage gradually forcipate, the apex obliquely inturned; with many outer denticles. Sub-basal tooth massive, angled apically, separated from flange; flange consisting of a second large tooth, more acute, and a smaller, oblique apical one. Flange and apices of superior appendage sometimes more or less whitish yellow. Inferior appendage short, extending about one fifth as far as superior in side view; double-lobed at base, having a short, slightly inward-directed, pointed tumour; beyond this base a finger-like apical extension directed laterally and terminating in a tuft of long white or greyish white hair (c.f. *simulator*). (Carfi (1974) shows a good figure of appendages). Head of prophallus with chitinous arms (rather sinuous in side view) and a very long, large hood, ligula with curved grooves. Terminal ridge absent, replaced by convergence of the thick latero-distal ends.

The paler, more typical mature ♂ is shown in examples from Ellisras (Northern Transvaal). These are well pruinosed below orbits, on thorax, and segments 9-10 or only 10. Superior appendages yellow with black extremities.

*Juvenile* ♂. Labrum brownish yellow. Head above darkish brown. Antehumeral band black with green sheen. Lateral thoracic markings sharper. Legs with narrow black stripes. Abdominal segment 1 black but yellow at base; the other segments black with bronze sheen; on 3-7 with paler terminal semi-annuli. Superior appendage yellow, black at apex and base as in type, and sub-basal tooth black.

*Teneral* ♂ (Mbale). Face and head above, orbits below, and legs all brownish yellow. Antehumeral band developed but faint. Abdominal dorsal band also developed, but segment 9 is only black at base (c.f. *dissimulans*), segment 10 and appendages entirely brownish yellow.

Abd. 27-31 mm; hw. 19-22 mm; pt. 1 mm.

*Mature* ♀ (*Lake Duluti*). Some lateral pruinosity on thorax. Labrum green. Postclypeus yellow-brown with two black dots. Frons pale greenish yellow with black basal crescent, or all green. Vertex pale and dark brown, with some green reflections. Orbits below mainly dark brown to black.

Prothorax pale brown with black dorsal markings. Hind lobe broad, black, the sides yellow. Mesostigmal lamina rather narrow, with low, straight posterior ridge which is partly black. Synthorax marked as in ♂. Sternite only marked with distal dots. Femora as in ♂.

Wings hyaline. Venation black. Pterostigma short, black, as in ♂. Forewing with 10-12Px. Venation otherwise as in ♂.

Abdomen with black dorsal band on segments 2-8, on segment 1 only at base; 9 black only at base; 10 all yellow. Cerci short, yellow, rather thick. Ovipositor sheath mainly black, reaching slightly beyond segment 10 or only to the end of this; straightish below, slightly more curved on more denticulate distal third. Vulvar scale angular, with steeply sloped outer edge and very slightly extended at apex.

An *Ellisras* ♀ is white pruinose, like the males, on orbits, entire thorax, base and distally on abdomen.

Abd. 27-30 mm; hw. and pt. as in ♂.

#### *Lestes niger* Martin (1910)

The single ♂ representing Martin's type has evidently been lost for a long time. Fraser (*in litt.* 1949) thought it was lost. Like *tridens* it was described from Delagoa Bay and both authors omitted figures of the appendages.

It has been thought by several authors that *niger* might be a darker form of *tridens*. The description of *niger* is close to that of *tridens* with a few minor differences. Martin's description (modified and translated) includes the following information:

♂. Lips and epistome testaceous yellow. Head above black.

Synthorax mainly deep metallic green dorsally; with a broadish black band below humeral suture (typically this band broken in *tridens*); three large black lateral spots; ventral surface yellowish grey.

Legs yellow with black lines.

Wings lightly tinted with yellow. Pterostigma short, brown, rectangular, with pale outer edge. Forewing with 10-11 Px.

Abdomen with black dorsal band; segments 6-7 with yellow basal annuli.

Superior appendages longer than segment 10, brownish yellow, blackish at apex, regularly incurved; a strong, pointed basal tooth, followed by another pointed one. Inferior appendages short, stout, blackish.

Abd. 27,5 mm; hw. 19 mm; pt. 1 mm.

It can only be considered to be a synonym of *tridens* by virtue of its size, short pterostigma, number of post nodal cross-veins and shape of superior appendage, although the identical coastal type locality is of some importance. There is no mention of an extended process on the inferior appendage, which should have been significant.

**Ecology.** Very local in open reed beds or at reedy, grassy margins of small or large pools, even lakes. In Zululand (Hudley) it was abundant on a stagnant pool, at crater lake Duluti it was equally common. Gambles (1976) records it from ponds.

**Distribution.** Natal, Transvaal, Mozambique, Rhodesia, Zambia, East Angola, Zaire, Tanzania, Kenya, Uganda, Somalia and Gambles (1959 *in litt.*) said he had found it in Northern Nigeria.

#### Material examined.

##### *NMB.*

Northern Natal: Hudley, Zululand, Nov-Dec. 1948 (E. Pinhey)

N.W. Transvaal: Huwi Private Nature Reserve, Ellisras, Dec. 1977 (Raphael Mpala)

Rhodesia: Limpopo Riv. — Mozambique border, Apr. 1961 (E. Pinhey); swamp near Chirinda Forest, Mt. Selinda, Chipinga, Febr. 1961 (E. Pinhey)

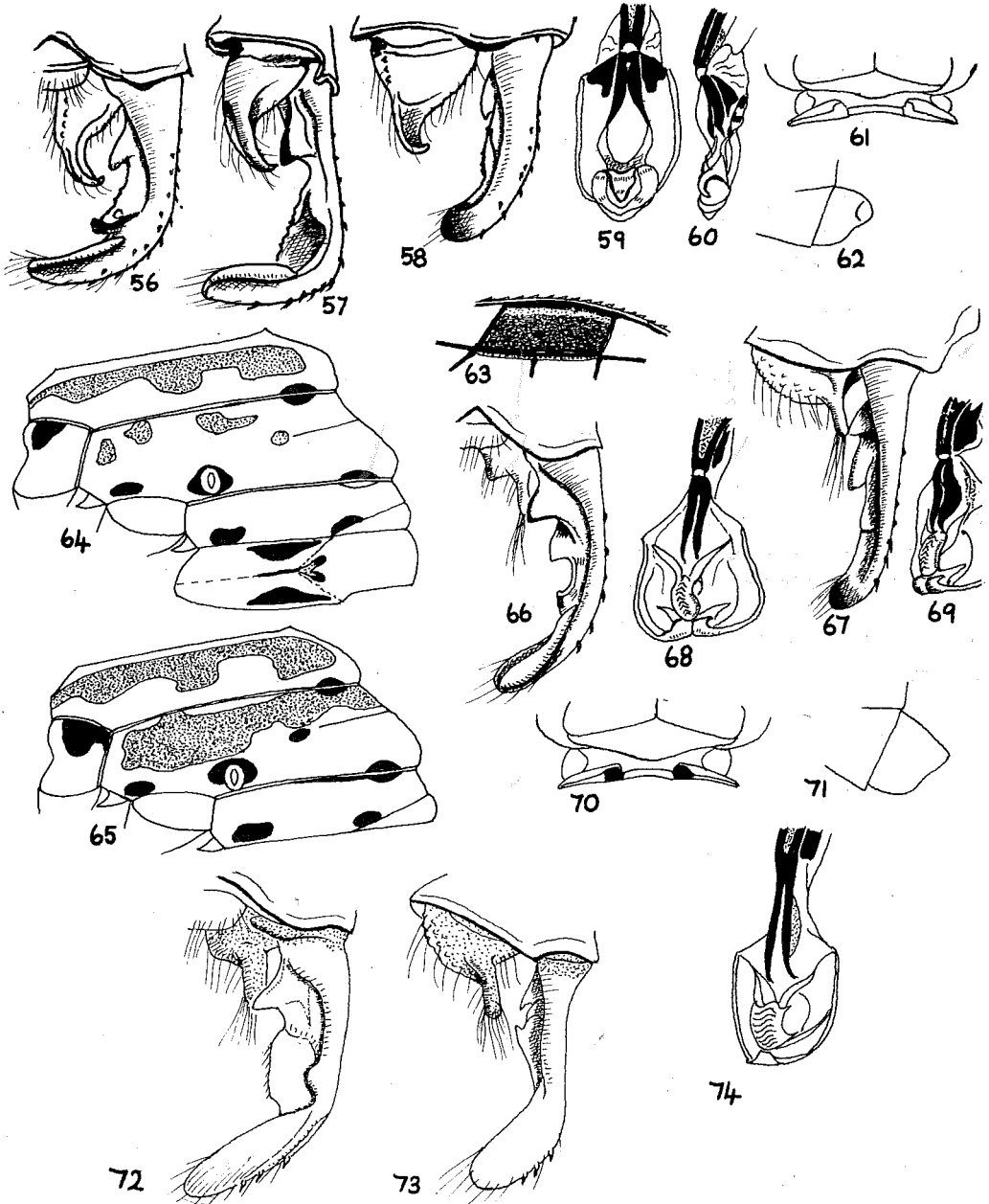
Northern Zambia: swamps at Ikelenge, North Mwinilunga, Jan. 1965 (E. Pinhey); Mbale, Apr. 1954 (E. Pinhey)

East Angola: Lutchigena Riv., E. of Caianda, Jan. 1965 (E. Pinhey)

North Tanzania: Lake Duluti, Arusha, Apr. 1952 (E. Pinhey)

#### Previously examined.

*TMP* (Pinhey 1951: 48):



Subgenera *Pseudochalcolestes* (56-62), *Paralestes* (63-74). *L. auripennis* (continued): 56-58. right anal appendages from above, left appendages from below, left ones from side. 59, 60. prothallus from below and from side. 61. hind lobe of prothorax and mesostigmal lamina of ♀; 62. left side of vulvar scale. *L. tridens*: 63. pterostigma of right forewing, ♂ (Angola); 64, 65. ♂ synthorax (Ellisras); 66, 67. anal appendages from above and from side (Angola); 68, 69. prothallus (Angola); 70. hind lobe of prothorax and mesostigmal lamina of ♀ (Ellisras); 71. vulvar scale (Lake Duluti). *L. praemorsus* (Sulawesi): 72, 73. anal appendages from above and from side; 74. prothallus.

Zululand: stagnant pool, Hudley, end of Nov. 1948 (E. Pinhey)

Expedn. Nairobi to North Zambia, 1954:

North Zambia: Lake Chila, Mbale (Abercorn), Apr. 1954 (E. Pinhey)

Pinhey (1961a)

Tanzania: Amani, E. Usambara Mts (E. Pinhey); Ukerewe Isl. Colln Lake Victoria (Fr Conradt)

Kenya: Malindi; Sabaki-Karawa; Sekoke Forest; Kikuyu escarpment.

Confirmed ident., *PPIS* (1978):

Zululand: Hudley, Nov-Dec. 1948 (E. Pinhey)

Other Collections.

Sjöstedt (1917b) (NRS):

Zaire: Kingoyi, May (K. A. Laman) (mentioned also by Schouteden 1934)

Carfi (1974):

Somalia: Ola Uager, Aug. 1970

#### LESTES (PARALESTES) PRAEMORSUS Hagen Text fig. 72-74, p. 396

*Lestes praemorsa* Hagen (in Selys), 1862: 320 (36 sep.)

*Lestes praemorsus* Kirby, 1890: 162

The type ♀ was described from Manila (Philippines). Hagen gave dimensions, abd. 30, hind wing 21 mm, distinctly smaller than the female from Sulawesi, described below. This is the type species of *Paralestes* Schmidt (1951).

**Characters** (Sulawesi). Very similar in markings to large specimens of *tridens* and some *dissimulans*. The very pale, forcipate anal appendages are more like pale examples of *pallidus* but the black inferior appendage is shaped like *tridens*. Cerci of ♀ exceptionally long. Only brief notes will suffice for this extra-African species.

**Mature ♂** (*Celebes, now Sulawesi*). Well pruinosed with white as in *dissimulans*. Labrum green. Postclypeus and head above black with ferruginous maculae. Orbits below in both sexes black with white pruinosity.

Synthorax with irregular but continuous metallic green antehumeral stripe, and with small lateral fasciae as in *tridens* and others of this subgenus. Femora in both sexes: femora 2-3 broadly black antero-exteriorly, enclosing a more or less dotted yellow stripe; fore femur black with yellow outer and inner lines.

Pterostigma short, thick, above 2 cells. Forewing with 12 Px. Ac at separation of anal

vein. Space  $R_4$ -MA with intercalaries, starting at Px 5-6; no extra, distal intercalaries. Upper sector of arculus far shorter than lower.

Abdomen with incomplete band on segment 1, then complete on other segments, reflecting bronze on all but the distal segments.

Superior appendage gradually forcipate, entirely creamy white except for extreme base and sparse outer black denticles in apical half. Sub-basal tooth acute, with wide gap before flange, which is convex and lacks a distal tooth, this armature strikingly similar to pale examples of *pallidus*. Inferior appendage black, extending in side view slightly more than a quarter of superior; shaped like *tridens*, swollen at base with slender extension tipped with white hairs. Prophallus head with large grooved ligula, as in *tridens*. Terminal ridge simple.

Abd. 33 mm; hw. 23 mm; pt. 1,3 mm.

*Mature* ♀. Only traces of ventral pruinosity. Labrum green. Head above much more ferruginous.

Synthorax with markings as in ♂. Prothoracic hind lobe moderate. Mesostigmal lamina narrow, consisting mainly of a very thick posterior ridge.

Pterostigma like ♂ but above 2 to 3 cells. Forewing with 14-15 Px.

Abdomen with continuous dorsal band but reflecting metallic green, except on distal segments. Cerci unusually long, slender, distinctly longer than segment 10; whitish yellow. Ovipositor sheath reaching end of segment 10, almost entirely black; slightly curved ventrally, rather more so on distal half, which in this example has only minute denticles. Vulvar scale simple, black, the apex not projecting, the distal edge slightly sloped.

Abd. 34 mm; hw. 26 mm; pt. 1,3-1,5 mm.

**Distribution.** South East Asia; Philippines and Indonesia.

**Material examined.**

NMB. 1♂, 1♀ Nonggala 900 m, Rantopao, south central Celebes (now Sulawesi), Indonesia, Sept. 1937.

LESTES (PARALESTES) DISSIMULANS Fraser Text fig. 75-89, pp. 347, 403

*Lestes dissimulans* Fraser, 1955a; 38 fig. 1; Pinhey, 1962b: 94

For reasons given under *simulator*, *simulans* Martin is transferred to synonymy under that species, and most of the later records of *simulaus* Auctt.(nec Martin) are placed here under *dissimulans*:



*Lestes simulans* Pinhey, 1961a: 9; Pinhey, 1961b: 13; Pinhey, 1962b (?pars): 94; ?*simulans* Pinhey, 1967b: 9 fig. 1; Pinhey, 1976: 533; Legrand, 1976: 375-381 (and larvae); Marshall & Gambles, 1977: 178

*Lestes tinctipennis* Fraser (MS) (syn. Gambles, vide infra)

Holotype ♂ *dissimulans* (M<sub>RACT</sub>), is a unique, incomplete specimen from Dakwa, Zaire. Pinhey examined this in 1964 and, again, in 1974. It bears the following labels:

"Dakwa 9/vii/1933; J. Leroy; Holotypus".

Unfortunately, like a few other types of this genus, the distal half, segments 6-10 and appendages, of the abdomen have been lost. A few notes on holotype ♂ made in M<sub>ACT</sub>:

Labrum and genae pale green. Postclypeus, frons and head above black with blue-green sheen. Orbits below black.

Synthorax with broad but tapering greenish black antehumeral stripe, irregularly excised on outer side, rather like *tridens* and *simulator*. Mesepimeron with broad, partly metallic band; diffuse dark or black markings against spiracle and an incomplete band on second lateral suture.

Femora pale ochreous with greenish black exterior and posterior stripes.

Wings hyaline. Pterostigma broad, rectangular, dark brown, paler at anterior and distal ends; above two cells. Forewing with 10 Px, hindwing with 8-9 Px.

Hw. 19 mm.

Fraser's description (1955) includes figures of anal appendages (1e) and thorax (1f.) Additional remarks from his description:

Prothorax black with ill-defined dorsal, metallic green spots.

Abdomen bluish grey, with black markings: segment 1 with broad basal spot; segments 2-7 with dorsal band, gradually widening, and divided by a yellow mid-dorsal line; 8 almost all black; segment 9 blue on distal third, 10 black.

Anal appendages with sub-basal tooth poorly developed on superior and shown in figure as a rounded bulge; flange convex, markedly denticulate.

Abd. (probably with append.) 29,5 mm; hw. 19 mm.

Fraser says it differs from *simulans* Martin in the broad black and green post-humeral (i.e. mesepimeral) band, and by the bluntness of the sub-basal tooth of the superior, instead of a sharp tooth. However, if the type *simulans* was lost at the time of Fraser's description (and this was inferred in correspondence), how did he find that *simulans* had a sharp sub-basal tooth? Martin's description only very vaguely mentions two small yellow inner teeth on the appendage which do not adequately provide such information. The "blue" distal third of segment 9 may have been either pruinosity or a paler grey-blue end portion frequently seen

in some specimens of this genus; and the ground colour of the abdomen is described as blue-grey.

*Lestes tinclipennis* Fraser (ined.) is a single ♂ in *BMNH* with type label and data: "Kiambere Distr., 3500', Upper Tana R. xi.51. J. G. W. Kenya. F. C. Fraser det. 1952". This specimen was sent by me to Fraser, from amongst a series of *Lestes* collected by J. G. Williams for me at this locality. Gambles (1978) *in litt.*, who has examined it, says it is identical with specimens hitherto regarded as probable *simulans*.

**Characteristics.** Nearest to *tridens* and *praemorsus*. Larger than *tridens*; pterostigma slightly longer. Space  $R_4$ -MA typically with two long intercalaries, occasionally tending to extra distal one. Prothoracic hind lobe evenly curved. Antehumeral stripe typically complete but frequently incomplete. Mesepimeron rarely with complete band, usually broken; metathoracic spiracle generally marked with black. Sternite markings characteristic, especially in ♀. Superior appendages gradually forcipate, but the sub-basal tooth rounded (like *pruinescens*), the flange curved, without distal tooth. Inferior appendages conical.

This species and *pinheyi* are the most variable of the Afrotropical species in markings.

**General description.** The series in the National Museum, Bulawayo, considered now to be this species, agrees in most characters except that there is rarely a distinct mesepimeral band, although in a few specimens this part of the thorax is obscured by post-mortem staining. Like *pinheyi* the antehumeral stripe may be complete or fractionated. There is also, peculiarly in this species, some variation in the shape of the flange of the superior appendage. In the majority it is curved like Fraser's illustration, but occasionally it is nearly straight. Examples with curved or straighter flange may even occur in the same locality and at the same time of year. Specimens in copula were taken at Victoria Falls, Balla Balla, Khwaai River and Shakawe.

**Mature ♂.** Usually well pruinose, at least on thorax, but not always. Thoracic markings as variable as *pinheyi*. Eye colour in life (Balla Balla, *in cop.*): ♂ light blue, whitish blue below; ♀ greyer blue above.

Labrum brownish yellow to green. Postclypeus dark ferruginous with dorsal dots, varying to all black, sometimes green laterally; head above dark ferruginous, dark brown to black. Orbits above greenish black, below more or less black, usually with white pruinosity.

Prothorax green with black markings or all black, with white pruinosity; hind lobe rather narrow. Synthorax when not stained with false markings pale ochreous, greenish ochreous to ferruginous, sometimes melanised, paler on metathorax. Broad metallic green antehumeral stripes, irregular exteriorly, these stripes bright green in a Mozambique ♂, but generally dulled by thin pruinosity; the irregular outer edge with one or two large excisions, sometimes large enough to sever the stripe; or the antehumeral fractured into a small dorsal metallic macula and an elongated ventral fascia. Mesepimeron and mesinfraepisternum normally with isolated maculae, small or large, only occasionally forming a broad black,

partially green mesepimeral band (which may be obscured by melanism or stains). Sides, when clear of stain or pruinosity, with short sutural black, or a broad stripe on second lateral suture; with a black spot or suffusion at spiracle; small or large spots on metepimeron, often at both ends of this plate. Sternite with separate lateral black stripes, often obscured or masked by pruinosity, together with large or small central brown or black maculae.

Femora ochreous or greenish ochreous, with three pronounced black stripes; tibiae black anteriorly or broadly black, pale only on posterior surface; tarsi black.

Wings varying from hyaline to brownish fumose. Venation dark brown to black, but ferruginous in Vom ♂. Pterostigma short, thick, rectangular, like *tridens*; above 2 cells; all dark brown to black, or whiter on anterior or distal edge, or both edges, occasionally (Vom) at proximal edge. Forewing with 9-11 Px. Ac at point of separation of anal vein. Space  $R_4$ -MA with long intercalaries starting proximad at Px  $2\frac{1}{2}$  — Px 4 (but Px 4 — Px 5 in Akure ♂), rarely with any tendency to extra terminal trace.

This is the only African *Paralestes* which normally exhibits doubled cells before pterostigma in ultranodal sector.

Abdomen segment 1 dark green, black dorsally at distal, or sometimes basal end; segments 2-10 with black dorsal band; segment 9 with pale distal annulus which may be pale green, whitish green, white or cream, often constricted or divided by black median line, sometimes obscured by white or bluish white pruinosity in segments 9-10; in many examples from Zambia southwards no pale annulus is visible at maturity, in others it does show, and in a Shakawe ♂ segment 9 is all white except at base. Segment 10 all black or pruinosed, with only a very slight dorsal ridge at distal end, the invagination wide, shallow, without denticles. In the Vom ♂ segments 9-10 are brownish yellow (perhaps greener in life?), 9 with narrow black dorsal line at base, segment 10 with rather more prominent dorsal ridge.

Anal appendages black. Superior appendage gradually forcipate, like *tridens*, with robust outer denticles, apex of superior with rather longish hair. Sub-basal tooth obtuse, small and rounded or moderately large. Flange generally curved, as in Fraser's figure, denticulate on the curve, without distal tooth. In a very few individuals from Botswana and Rhodesia northwards to Uganda, the curvature is slight, even in localities where some specimens have more obviously curved flanges. The flange is often ochreous, brownish yellow or green, not black. Inferior appendage conical, extending about a quarter or third as far as superior, and with an inner fold; apex of inferior slightly flattened dorso-laterally.

Head of prophallus with large, broad ligula, ungrooved. Terminal shelf simple.

The variation in curvature of the flange of the superior appendage may be due to genetical factors, but it is most unusual. In a Nigerian ♂ described below the flange differs on left and right sides.

Abd. 29,5-34 mm; hw. 20-23 mm; pt. 1,25 mm. (an unusually large pruinose Balla Balla ♂ has abd. 35,5 mm, hw. 23,5 mm.)

*Teneral* ♂ (*Chingola*). Head pale pinkish brown to brown, with small darker brown or black markings, in another example with metallic spots on head. Prothorax brown with black or metallic dorsal band, continuous on to hind lobe. Antehumerals varying in development but brighter green; black dorsal spots on all sutures of synthorax; mesepimeron with brown dorsal smear and one or two ventral maculae; metepisternum with ventral and spiracular spots, metepimeron with largish spot behind legs and a dorsal smear. Sternum with broad lateral stripes. Legs with brown stripes, fainter than at maturity. Wings hyaline or faintly fumose. Venation dark brown. Pterostigma whitish yellow to brownish white. Abdomen segment 1 greenish yellow dorsally; 2-5 greyish olive, darkened distally; segments 6-10 brown dorsally, 9 brownish yellow on distal two-thirds, 10 pale brown. Anal appendages yellow.

*Mature* ♀. Non-pruinose, or slight white ventral pruinosity, but in some southern specimens thinly white even dorsally on thorax.

Labrum green or yellowish green. Postclypeus and head above brown or ferruginous, sparsely marked with black. Orbits below not or partially black.

Prothorax brown above, often with black stripes. Hind lobe narrow. Mesostigmal lamina narrow, with straight, thick brown or black ridge. Synthorax with variably complete or fractured green-metallic antehumeral stripes, as in ♂. Other thoracic markings similar. Sternites both centrally and laterally black, or these zones fused. (Vom ♀).

Legs as in ♂.

Wings hyaline to fumose. Venation black. Pterostigma brown to black, as in ♂.

Abdomen segment 1 all green above; continuous band on segments 2-10, except for a cream or yellow annulus at distal end of 9, which is clear on most specimens, even those from southern Africa, except when pruinosed white. Segment 10 usually all black above. Cerci yellow or pale ferruginous, with black tips, or black with yellow dorso-basal macula, or all black. Ovipositor sheath (southern or equatorial specimens) brownish yellow, black ventrally or distally, or nearly all black; reaching end of segment 10; gently curved ventrally, more so on strongly denticulate distal third. Vulvar scale simple, with sloped distal edge.

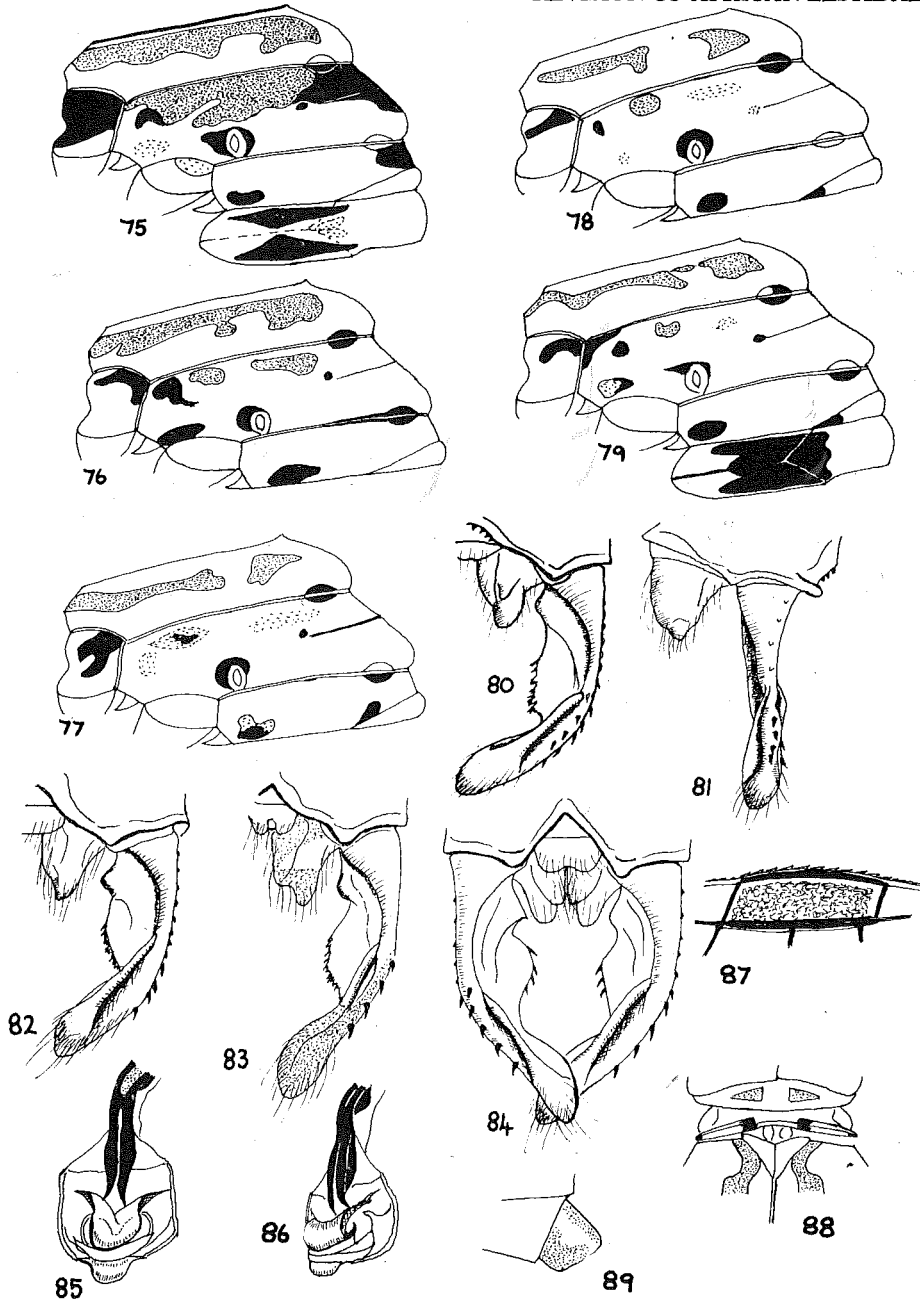
Abd. 29-32 mm; hw. 21-23 mm; pt. 1,25 mm.

**Variation.** The development of the antehumeral stripe seems to be merely individual variation, but there are more stable differences.

Those from southern Africa, especially from south of the Zambezi River, may represent a darkish race, with more fumose wings and the annulus in ♂ on segment 9 generally obscured. It is also possible that the differences are ecological.

Two pairs from Nigeria show significant differences: ♂ ♀ from Vom (northern Nigeria). These may represent an arid population, but the stronger dorsal carina on segment 10 (♂) may point more to racial possibilities:

♂ *Vom*. Much paler on head, thorax and abdomen than in other mature specimens, but



Subgenus *Paralestes* (75-89). *L. dissimulans*: 75-79. Synthorax of ♂ Chingola, ♂ Angola, ♂ Busonga, ♂ Vom, ♀ Vom; 80, 81. right anal appendages from above, left ones from side (Chingola); 82, 83. right appendages above, Busonga and Vom (black areas stippled); 84. all anal appendages from above (Akure, Nigeria, with variant flanges); 85, 86. prothorax (Chingola); 87. pterostigma right forewing ♀ (Vom); 88. junction of pro- and mesothorax (Vom); 89. vulvar scale (Vom).

it has white ventral pruinosity. Antehumeral metallic stripe fractured. Wings hyaline. Venation ferruginous. Pterostigma grey-brown. Segments 9-10 mainly yellow, 10 with a rather pronounced dorsal ridge. Superior appendage yellow, with black apical portion; inferior black with yellow exterior and partially dorsal surfaces.

♀ *Vom.* Labrum brownish yellow. Orbits below partly black. Thorax unusually pale. Mesostigmal lamina broadish, with thick low posterior ridge. Antehumeral stripe narrowly complete on right side, severed at upper two-thirds on left side. Lateral thoracic spots small but sternal black heavily developed centrally and laterally, as in text fig. 79. Pterostigma brownish yellow, suffused with brown. Segment 10 yellow with small black dorso-lateral dots and a very slight distal crest. Vulvar scale normal.

Abd. ♂ 31,5 ♀ 32,5 mm; hw. ♂ 21, ♀ 21,5 mm.

♂ ♀ from Akure, Western Nigeria, show other peculiarities, apart from uneven development of the flange of superior appendage on the two sides:

*Mature ♂ Akure.* No pruinosity visible. Labrum green. Postclypeus green with three black dots. Frons black, green laterally; vertex partly green, with black markings. Orbits below dark brown anteriorly.

Mesepisterna dark ferruginous (perhaps stained) on upper half, except the carina, the outer edge of this area indented; lower half and mesepimeron greenish ochreous, metathorax yellow; with black lines on sutures, and small spots on mesepimeron and below as in other males.

Legs normally marked.

Wings hyaline. Pterostigma black with yellow anterior edge. Forewing with 11 Px. In this male and the female there are no doubled cells in ultranodal sector prior to pterostigma.

Abdominal segment 1 black only at base; segment 9 with white distal annulus, almost severed dorsally. Segment 10 brownish yellow, black along distal edge, with brown mid-dorsal band; no crest, the invagination slightly less shallow, with two small denticles, unlike normal *dissimulans*.

Superior appendage all blackish brown. Sub-basal tooth more right-angled in shape than others. Flange peculiarly different on right and left superiors in this example: on right superior (fig. 84) the flange starts with a wide shallow excision after sub-basal tooth, then slopes (with robust denticles) straight to main stem of appendage; on left superior the flange commences with a small excision from sub-basal tooth and then is convexly curved, bearing finer denticles, and, finally, slightly outcurved again to main stem; thus showing strong sinuosity on left appendage, straightness on right one. Inferior appendage normal, ferruginous. Prophallus normal.

*Mature ♀ Akure.* Labrum green. Postclypeus and head above brown, with black markings. Orbits below mainly black.

Synthorax greenish ochreous above, to greenish yellow below, with only the merest trace of ventral white pruinosity. Antehumeral stripes not clearly defined (slight staining), apparently ferruginous and fractured or only narrowly connected. A dorsal black spot on humeral suture, brown dorsal spot and short line on both lateral sutures. Black spot at ventral end of mesepimeron, at spiracle, at both ends of lower part of metepimeron. Sternite with small central and short lateral fasciae, widely separated.

Femora with three black stripes.

Wings hyaline. Pterostigma dark brown with yellow anterior edge. Forewing with 12 (left) and 11 (right) Px.

Abdomen with continuous brown dorsal band on segments 2-9, with distal yellow annulus on 9; segment 10 greenish yellow with narrow mid-dorsal brown stripe. Cerci brownish yellow with black apices. Ovipositor sheath normal, the denticles very small. Vulvar scale normal.

Abd. ♂ 33,5, ♀ 32 mm; hw. ♂ ♀ 23 mm.

Whether the Vom or Akure examples represent distinct racial entities will not be decided here, with only single specimens of either sex.

**Ecology.** Swamps and grassy pools, quiet streams, sometimes seen at temporary rain-pools. In the Okavango swamp delta only a few individuals have been seen at Shakawe and Khwaai.

**Distribution.** Widespread and possibly forming separate subspecies but this requires further study. Known distribution: South Mozambique, Transvaal, Rhodesia, Botswana, Zaire, Angola, Tanzania, Kenya, Uganda and Ruwenzori district, Congo Rep. (Brazzav.), Gabon, Tchad, Nigeria, Senegal.

**Material examined.**

*NMB.*

South Mozambique: Moribane, North of Dombe (on Lusitu Riv.), March 1970 (E. Pinhey)

Northern Transvaal: Mosdene swamps, Naboomspruit, Dec. 1976 (F. C. de Moor)

Rhodesia-Matabeleland: Balla Balla, Dec. 1956 (E. Pinhey); Matopos dam, Bulawayo, Sept. 1977 (E. Pinhey); 25 km NE of Turk Mine, Sept. 1957 (D. K. B. Wheeler); Delaware Ranch, Matetsi, Nov. 1973 (F. C. de Moor); Wankie, Nov. 1961 (E. Pinhey); Victoria Falls, Jan. 1956 (E. Pinhey); Matsheumhlope, Bulawayo, 16 Jan., 1979 (D. K. B. Wheeler)

Botswana: Notwane Riv., S. of Gaborone, Feb. 1976 (G. Bailey); Khwaai Riv., 19° 08S, 23° 48E, Dec. 1968, Dec. 1973 (Falcon Coll.); Mohembo-Shakawe, March 1974 (Pinhey & de Moor)

Malawi: Senga Bay, Salima, Feb. 1980 (J. G. M. Wilson)

NW Zambia: Swamp near Chingola, May 1961, Jan. 1965 (E. Pinhey)

Angola: Jau, Huila Distr., S.W. Angola, Apr. 1971 (H. D. Brown); Lutchigena, E. of Caianda, E. Angola, Jan. 1965 (E. Pinhey)

SW Uganda: Busonga farms, Apr. 1954 (T. H. E. Jackson)

Northern Uganda: Karamoja, Apr. 1950 (T. H. E. Jackson); Aremo, Labwor Hills, Karamoja, March 1952 (T. H. E. Jackson)

Eastern Zaire: Mutwanga, North of Ruwenzori range, March 1950 (T. H. E. Jackson)

Congo Rep. (Brazz.): Ketta and Mambili forests, Ouessou Distr., Apr. 1960 (T. H. E. Jackson)

Northern Nigeria: Vom, Jan. 1959 (R. M. Gambles)

Western Nigeria: Ogbesse Riv., between Akure and Owo, April 1957 (R. M. Gambles)

Previously examined and ident. as *simulans* (or near):

Pinhey, 1961a (additional to Uganda records above):

Tanzania: Ukerewe Isl. Colln, Lake Victoria (Fr Condradt)

Kenya: Kiambere, Tana Riv. (J. G. Williams); Thika (E. Pinhey); Kisumu (W. Kenya)

Uganda: Lutoto; Entebbe; Mabira Forest; Madi Opei

Ident. 1966 for Dr. Dejoux (of Ivory Coast):

Tchad: Fort Lamy, Aug. 1966 (C. Dejoux)

Pinhey, 1967b:

Shaba: Tumbwe, Kafubu Distr. (J-J. Symoens)

Pinhey, 1972, for Dr. Villiers:

Senegal: Linguère (Ndilla), Sept. 1967 (A. Villiers)

Ident. June 1975 for J. Legrand, *PMNHN*:

Gabon: ♂ ♀ Ipassa source, Nyame Pende, Makokou, 13 Sep. 1973

Ident. as *dissimulans* for *PPIS*, Feb. 1978:

Zaire: Mutwanga, N. of Ruwenzori range, March 1950 (T. H. E. Jackson)

Records of "*simulans*" (♂) from Ghana (teste Gambles, *in litt.*, 10 May 1978):

Mole National Park, July-Aug. 1974 (Adrian Marshall); Takoradi, 29 June 1960 (R. M. Gambles)

Checked in *RSM*, Edinburgh (Pinhey Aug. 1978).

Uganda: Kidongo, Bwamba Valley (G. D. H. Carpenter);

N. Nigeria: Vom 14 Feb. 1960 (R. M. Gambles).



LESTES (PARALESTES) PLAGIATUS (Burmeister) Text fig. 90-103, pp. 341, 347, 412

*Agrion plagiatum* Burmeister, 1839: 824 nr 29

*Lestes plagiata* Selys, 1862: 324 (40, sep.)

*Lestes plagiatus* Kirby, 1890: 163; Förster, 1906: 342; Ris, 1908: 307 nr 4; Martin, 1910: 79; Ris, 1921: 276 fig. 13; Schouteden, 1934: 78; Pinhey, 1951: 46, figs; Pinhey, 1961a: 6; Pinhey, 1961b: 13; Pinhey, 1962b: 93; Cammaerts, 1966: 317; Pinhey, 1967b: 9; Pinhey, 1976: 533

*Lestes forceps* Rambur, 1842: 245 nr 3 (syn. Selys 1862)

*Lestes obscurus* Kirby, 1898: 245; Förster, 1906: 341; Martin, 1910: 84; Ris 1921: 438 (syn. teste Champion *in litt.*, 1913)

?*Lestes regulatus* Martin, 1910: 86, 90, 91; Pinhey, 1961a: 8; Pinhey, 1962b: 94

*Lestes tarryi* Pinhey, 1962a: 20 **syn. nov.**

Burmeister's description (1839):

"Testaceum, mesonoto supra et in latere vittis duabus angustis nigris, nec non vitta alba, a basi alarum posteriorum ad pedes medios descendente; abdominis dorso infuscato. Long. corp. 1'' 5''' . ♂ et ♀

♂. forcipe pallida, pterostigmatibus flavis.

♀. alis luteis, stigmatibus flavis, fusco-limbatis.

Vom Port Natal, aus Drège's Sammlung."

Thus, both sexes were collected in the Durban (Port Natal) area, both were immature, particularly the ♂, because of the coloration of body, pterostigma and anal appendages. Types ♂ and ♀ in *MLUH* have not been examined by the author. The body length measurement used here by Burmeister (c.f. *virgatus*) of 1'' 5''' . or 35,4 mm was the original Roman duodecimal system of measurement — see Glossary.

**Characters.** A large species with narrow pterostigma and black venation. Synthorax with rather uniform, narrow metallic green antehumeral and mesepimeral stripes. Superior appendage long, sloped down at a dorsal tumour, here termed a "knee", the inferior appendage very short, simple.

#### General description.

*Mature* ♂. Very variable in appearance of pterostigma and in development of pruinescence (usually extensive for this genus) and of blackening. Labrum green. Postclypeus and head above black, with faint postocular area (or this pruinose white). Eye in life mainly deep blue. Orbits below greenish yellow or pruinose.

Prothorax black, more or less coated with white pruinosity. Hind lobe moderately broad.

Synthorax generally well pruinosed; with narrow metallic green antehumeral stripe and a shorter mesepimeral one visible; or the green bands thickly outlined in black, the mesepimeral stripe sometimes upturned; or the mesothorax heavily blackened, the metallic bands obscured by either melanism or pruinosity (totally obscured by pruinosity in a ♂ from swamp near Quelimane). In others the pruinosity is confined to metathorax, which normally shows a thick black band at second lateral suture. Occasionally the mature ♂ has no thoracic pruinosity when fresh. Sternite with separate black lateral stripes, sometimes obscured by pruinescence (in a Matopos ♂ the stripes are long and broken).

All femora brownish yellow with two black stripes usually joined at distal end. Tibiae 2-3 black anteriorly, tibia 1 with an additional lateral stripe. Tarsi black.

Wings hyaline to faintly fumose, even fumose in some non-pruinose examples. Venation black. Pterostigma narrow, usually long, its posterior edge straight; generally above 2 cells, sometimes over 2 cells in one or two wings of same individual; or above  $2\frac{1}{2}$  in some; in La Manda River ♂ above 3 small cells in right forewing. Pterostigma commonly black or blackish brown at maturity, frequently with yellow or obscure anterior line. In a Keurboom's River ♂ it is black with white distal and posterior edges. In many others at maturity it is ferruginous, with or without paler anterior edge. In Swaziland ♂ and a Zeerust ♂ it is pale at anterior, distal and proximal edges and in a Pretoria ♂ all edges are pale. Forewing with 11-13 Px; Ac at point where anal vein leaves margin; space  $R_4$ -MA with long intercalaries starting at Px 3 — Px 5.

Abdomen with dark brown or black band on all segments, often only partly on segment 1; with metallic green reflection (sometimes darkened) on segments 2-6 (absent in a Gaborone ♂). Segment 10 with mid-dorsal crest; often coated with white pruinosity.

Anal appendages black, sometimes dark brown. Superior appendage robust, very long, turned down in a gentle curve at two-thirds of its length, at this point with a large inner dorsal tumour, like a knee; with strong outer denticles and shortish white hair on the distal portion. Sub-basal inner tooth prominent, acute, joined to inner flange. Flange rather sinuous, serrated on distal portion, with obtuse terminal, transverse tooth, below and beyond which is a ventral ridge below the "knee".

Inferior appendage, in side view, very short, extending less than one fifth of the superior, somewhat rounded and with narrow-inner fold. Head of prophallus (Bikita) with small ligula which is not transversely grooved. Terminal shelf simple.

*Teneral ♂ (Essexvale).* Labrum and vertex all yellowish brown. Synthorax deeper, with very narrow green mesothoracic stripes but no black markings except on ventral corner of metepimeron. Legs striped with brown. Venation pale ferruginous. Pterostigma pale ferruginous, or more pinkish (Molumbo), or brownish yellow (Hluhluwe). Abdomen with pale greenish brown dorsal stripe on segments 1-6, darker on 7-8; 9-10 and anal appendages all ferruginous or yellowish brown.

*Juvenile males, more mature.* Head above black, ferruginous in ocellar-antennal region.

Thoracic region often already with some latero-ventral pruinosity. Synthorax as for teneral or with more black developing, around the green bands and at sutures. Pterostigma darker ferruginous, with or without pale anterior edge.

Abd. 33-37 mm, hw. 24-28 mm, pt. 1,5-2 mm (only 1,3 in ♂ from Molumbo and La Manda River).

*Mature* ♀. Essentially like juvenile male. Pruinosity less developed as a rule. Head, above ferruginous or darker, or with traces of brown or black, sometimes all black. Orbits green or yellow below.

Prothorax brownish yellow with black dorsal markings, hind lobe moderately broad. Mesostigmal lamina narrow, with slightly curved black posterior ridge, sometimes foreshortened.

Synthorax with narrow green antehumeral stripe, sometimes darkened or blackened, sometimes with a second black stripe near dorsal carina; a shorter, similar stripe on mesepimeron; traces of black at and below second lateral suture. A Loch Vaal (Cape) ♀ has several black thoracic stripes (possibly, partially decomposition process). Sternites with short fine lateral stripes.

Legs marked more or less as in ♂.

Wings faintly fumose, venation brown or black. Pterostigma ferruginous or black, with similar variation to ♂; but all orange-brown in a Gaborone ♀.

Abdomen with black band on segments 1-7, with green reflection, 8 and most of 9 usually black, but 9 often pale at distal end or distal half, occasionally 9 and 10 black (Groblersdal). Sometimes 9 only has two black stripes. Segment 10 brownish yellow with traces of black or with a black mid-dorsal line. Segment 10 with slight crest. Cerci slender, variable in colour, brownish yellow, pale brown, dark grey, dark brown or black; in a Matopos ♀ black with yellow on inner basal half.

Ovipositor yellowish brown with some darkening; extending to or slightly beyond segment 10, the ventral edge of the sheath straightish, slightly more curved on strongly or weakly denticulate distal half. Vulvar scale with outer edge sloped, a very slight kink below apex.

*Teneral* ♀. Very similar to teneral ♂ (Essexvale, above). Pterostigma in a Plettenberg Bay ♀ orange-brown. Cerci brownish yellow.

*Juvenile* ♀. Again similar. Postclypeus and head above ferruginous or darker. Pterostigma normally ferruginous; brownish yellow in a Zwart Koppies ♀. Segment 8 often brownish yellow with two black dorsal stripes, 9-10 with median black dorsal line. Cerci yellow with black tip, but ferruginous in a Gaborone ♀.

Abd. 34-36 mm, hw. and pt. as in ♂.

## Development of mesothoracic black:

♂. On emergence, there are just slender whisps of antehumeral and mesipimeral green lines. In teneral state these lines may become thinly margined with black. Later, in juveniles, this black increases in thickness, expanding away from the green. In almost mature condition the black is usually much wider, with some green iridescence spreading over the two bands, but often invaded by white pruinosity. In the older or well pruinose ♂ the black has expanded to cover nearly all the synthorax but it is often overlaid heavily with white, the green reflection diminishing or absent. In some of the older ones the zone just above the humeral suture may remain a browner shade.

♀. Only the early green or black-edged green stripes develop, with very sparse lateral markings, but pruinosity sometimes more or less covers and obscures much of the thorax.

Examples from Malawi, Zambia, Uganda do not differ from those of Southern Africa.

*Lestes forceps* Rambur (1842)

Type ♂ stated by Rambur to be from "Cap" and it was in the Audinet-Serville collection. This collection was later-included in the de Selys collection, now in *IRSNB*.

I have not examined this ♂ and have accepted the synonymy accorded by Selys, Kirby and other authors.

*Lestes obscurus* Kirby (1898)

Mature type ♂ in (*BMNH*) examined by the author in 1974. It bears the labels: "(Distant's script) Type, H.T. Barberton; obscurus pa-type Kirby; Distant Colln 1911-383."

Kimmins (1970: 195) in 1968 added a holotype ♂ label. Segments 7-10 have been lost. It is certainly a synonym of *plagiatus* as stated by Campion (*in litt.* 9 Dec 1913) to Ris (1921: 438).

*Lestes regulatus* Martin (1910)

The type ♂, described by Martin from Ethiopia (Abyssinia) is evidently lost and I have been unable to relate any specimens with certainty to this taxon. In his key on p.86 Martin places it next to *virgatus* (in his group III). ♀ not known.

Extract from Martin's description (adapted and translated): ♂. Labrum yellow. Epistome greenish. Head above black, yellow posteriorly.

Prothorax black, marked with yellow, strewn with irregular patches of blue pruinosity. (Syn-)thorax with straight, brilliant metallic green antehumeral stripes. (The other markings, golden yellow and black stripes are vague and probably indicate post-mortem discoloration); it is marked with pruinosity at sides and ventrally there are blackish spots.

Legs yellow, shaded with blackish.

Wings hyaline, broadish. Pterostigma rectangular, described on p.86 as brown and long, on p.91 as yellow between black veins. Forewing with 12-13 Px.

Abdominal segment 1 black with large pruinose centro-dorsal spot; other segments above metallic greenish black, 3-7 with narrow yellow basal semi-annuli; 6-10 mainly black, this widening progressively.

Superior appendages dark brown, very long, much longer than segment 10; straight, converging terminally but not visibly incurved. Extreme ends slightly curved down. A large, prominent, very pointed black (sub-)basal tooth. (No further details). Inferior appendage in the form of broad, short nipples.

Abdomen (with anal appendages) 36 mm; hindwing 23 mm, pterostigma 1,75 mm.

Locality. Abyssinia (Ethiopia).

Remarks. Antehumeral and number of Px veins are similar to *virgatus* and juvenile *plagiatus*, the hyaline wings like juvenile *virgatus* or mature *plagiatus*. Superior appendages apparently different from available material in their straightness, the slight down-turn at their apices a little like *plagiatus* group, but their inferior appendages, as described, more similar to *pallidus*, although in their broadness they could be like the conical inferiors of *plagiatus*.

In the absence of type or matching material this taxon must either be invalidated or placed nearer *plagiatus*. Further Ethiopian material might prove or disprove this connection.

*Lestes plagiatus* form *tarryi* Pinhey

*Lestes tarryi* Pinhey (1962a)

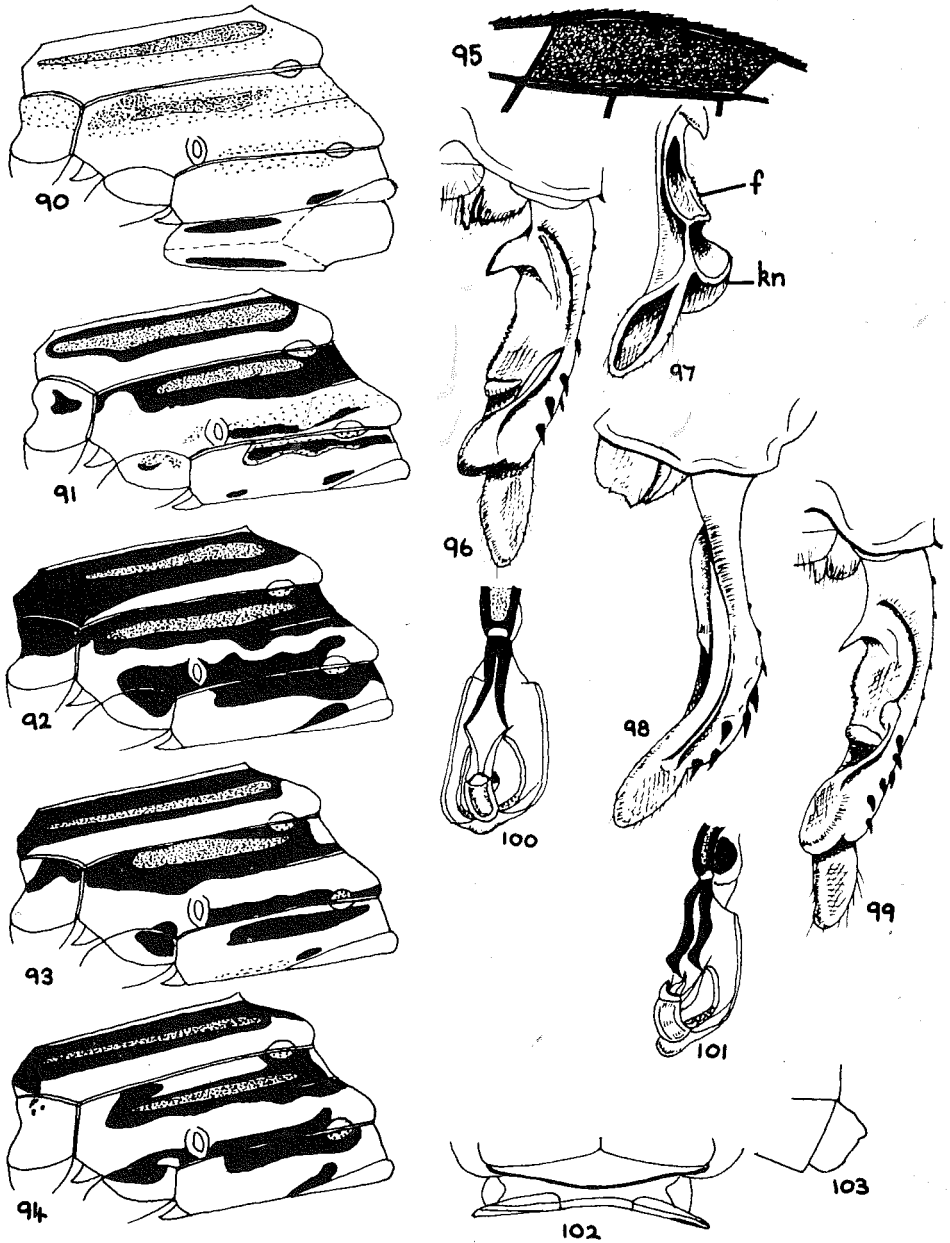
Described from 4 males collected in Northern Nigeria by D. W. Tarry in April 1960. Holotype and two paratypes in *NMB*; one parat. ♂ in *BMNH*. From discussion with Gambles (1978) it appears that this is not a subspecies but only a form more prevalent in equatorial Africa, particularly Central Africa to Nigeria. It is perhaps an ecological modification.

Characters. Smaller, less robust than typical *plagiatus*, with rather shorter pterostigma.

Although evidently mature the four males have little pruinosity and sparse thoracic blackening. Pterostigma ferruginous. Segments 8-10 paler than even pre-adults of typical *plagiatus*. Superior anal appendage less robust, the "knee" less prominent, not so sharply rounded; sub-basal tooth finer, flange slightly more curved, serrated almost throughout.

Abd. 31-33 mm, hw. 21,5-22,5 mm, pt. 1,5-1,75 mm.

Described from Mailumba, North Guinea zone, Northern Nigeria, Apr. 1960 (D. W. Tarry).



Subgenus *Paralestes* (90-103). *L. plagiatus*: 90-94. synthorax of ♂ Essexvale (teneral), Matopos, Balla Balla, Selukwe, Zwart Koppie; 95. pterostigma right forewing (mature ♂ Bikita); 96. right anal appendage from above, 97. ventral view of superior from sub-basal tooth along flange to apical portion (f = flange, kn = knee) and 98. left appendages from side (Bikita); 99. right appendages of *tarryi* from above (Nigeria); 100, 101. prothallus (Bikita); 102, hind lobe of prothorax and mesostigmal lamina ♀ (Salisbury); 103. left side of vulvar scale (Salisbury).

**Ecological notes on *plagiatus*.** Settles on grasses, sedges or reeds standing in water or on the banks of pools, dams and slow streams, in shaded or open conditions. Males very frequently curl up and wave the abdomen. Seen in all months of the year in the Matopos area. In Febr. 1978 it was exceptionally abundant at Inyanga, many pairs *in copula*. In eastern Africa it is less common than in southern Africa.

**Distribution.** Most parts of Cape Province, Natal, Transvaal; drier areas of Botswana; Mozambique, Rhodesia, Malawi, Zambia, Angola, Zaire, Tanzania, Kenya, Uganda, to the Sudan border, westwards to Nigeria.

**Material examined.**

*NMB.*

Cape Prov.: Grahamstown, Apr. 1971 (J. G. H. Londt); Plettenberg Bay, Feb. 1968 (J. A. Cottrell); Keurboom's River, Jan. 1970 (C. Besnard); Blaubank stream, Zwart Koppies, Apr. 1957 (C.S.I.R.); Loch Vaal, May 1957 (C.S.I.R.); Somerset East, Oct. 1978, Alicedale Dam and Kirkwood, Nov. 1978 (all J. G. H. Londt); Beacon Bay, E. London, Jan. 1980 (A. J. Duke)

Natal: Pietermaritzburg, Apr. 1950 (A. H. Newton); Spioen Kop, Dec. 1949 (A. H. Newton); Umtentweni, July 1951 (A. L. Capener); Drakensberg Mts, Dec. 1949 (A. H. Newton); Ladysmith Apr. 1952 (A. H. Newton); Nqutu, Zulul., Apr. 1949, March 1951 (A. H. Newton); Kambulu, March 1950 (A. H. Newton); HluHluwe, Zulul., March 1950 (A. H. Newton); Nondweni, June 1948 (A. H. Newton); Nkandhla, Apr. 1961 (A. H. Newton); Haladu, Nov. 1948 (A. H. Newton); Quedeni, Sept. 1948 (A. H. Newton)

Swaziland: Mantengu Falls, Jan. 1975 (F. C. de Moor)

Northern Transvaal: Pretoria, Nov. 1951 (A. L. Capener); Sterkfontein, Dec. 1966 (H. N. Empey); Zeerust, Nov. 1948 (E. Pinhey); Mosdene Farm, Naboomspruit, Dec. 1976 (Falcon Coll.); Bundu Inn, 25° 28S, 28° 55E, Groblersdal, Apr. 1973 (F. C. de Moor); Klipfontein, Dec. 1979 (Falcon Coll.)

Southern Mozambique: Vila Paiva, Sept. 1957 (E. Pinhey)

Rhodesia: Gwanda, March 1967 (E. Pinhey); Balla Balla, Nov. 1956 (E. Pinhey); Essexvale, Dec. 1927; Bulawayo, Sept. 1956 (E. Pinhey); Matopos, Bulawayo, May 1938 (G. Arnold), ♂ ♀ *in cop.* May 1965 (E. Pinhey), May 1966 (D. K. B. Wheeler), Jan. 1975 (F. C. de Moor); Khami, E. of Bulawayo, Jan. 1940 (G. Arnold), Sept. 1967 (E. Pinhey); Sawmills, North of Bulawayo, Dec. 1921; Ferney Creek, Selukwe, Sept. 1973 (Pinhey & de Moor); Bembesi Distr. Febr. 1973 (F. C. de Moor); Bikita, Jan. 1969, May 1969; Redcliff, Que Que May, July, Oct. 1977 (M. Villet); Delaware Ranch, Matetsi, *in cop.* Nov. 1973 (F. C. de Moor); Salisbury, Feb. 1956 (E. Pinhey), Feb. 1962, Sept. 1975 (D. Tett); Prince Edward Dam, Salisbury, Jan. 1948 (E. Pinhey); Dechwe Forest, north of Sinoia, Lomagundi Dist., July 1976 (R. K. Brooke); Melsetter, Oct. 1976 (E. Pinhey); Umvumvumu River, west Melsetter, Nov. 1967 (E. Pinhey); Bazeley

Bridge, 35 km SW of Umtali, Febr. 1961, Nov. 1965 (E. Pinhey); Inyanga, Nov. 1960; Pungwe Riv., Honde Gorge, below Inyanga, Nov. 1956 (E. Pinhey); Marowe Riv., Brondesbury Park 1846 m, *in cop.* Feb. 1978 (E. Pinhey); Arcturus 14 Aug. 1976 (V. T. M. Baker); Mazoe, Apr. 1979 (N. Duke)

Southern Botswana: Notwane Riv., Gaborone, *in cop.*, Feb., March, May, Nov. 1976, Febr. 1977, Feb-Mar. 1978 (all G. Bailey)

Northern Mozambique: swamps near and 140 km W of Quelimane, May 1970 (E. Pinhey); Vila Junqueiro, May 1970 (E. Pinhey); Molumbo and 40 km SW of Molumbo, Apr. 1970 (E. Pinhey)

Malawi: Chagwa Lake, Zomba Plateau, March 1977 (M. J. Parr); Magombe, Sept. 1963

Northern Zambia: Makonde, Apr. 1967 (R. C. Denning); Ndola, May 1959, Jan-Feb. 1960 (R. A. Green & E. Pinhey); Kasempa, Dec. 1959 (P. Johnsen); Kabompo River, East Mwinilunga, Apr. 1963 (E. Pinhey); Matonchi, West Mwinilunga, Apr. 1963 (E. Pinhey); Mporokoso, Apr. 1967 (R. C. Denning)

Shaba, Zaire: La Manda River, Jan. 1958 (E. Pinhey)

Northern Uganda: Madi Opei, Acholi, March 1952 (T. H. E. Jackson)

Northern Nigeria: f. *tarryi* from Mailumba (as above)

Previously identified.

*TMP.* (Pinhey, 1951: 47; and species ident. 1976-78):

Cape Prov.: Groot Riv.; Knysna; East London; Dunbrody (E. Cape); Natal: Princetown; M'Fongosi; Hudley, Zulul.; Transvaal: Botchabelo; Acornhoek; Saltpan, N. Pretoria; Waterval; Woodbush; Bundu Inn, Verena 25° 28S, 28° 55E, Nov. 1973 (W. Breytenbach); Mozambique: Ingamanhé Forest; Magude; Vila Pery; Rhodesia: Matopos; Salisbury: Mazoe; Inyagui Riv., Mtoko Rd; Umvumvumu River, west Melsetter; Umtali; Honde Gorge; Sanyati Riv. mouth, Zambezi River.

*RUC* (Pinhey, 1951)

Cape Prov: Grahamstown

Ident. for Swed. Exped. southern Afr., 1950-51 (Brinck, 1955):

shallow silty pond in Natal Nat. Park, Apr. 1951

Expedn Nairobi to Mbale, N. Zambia, April 1954 (Pinhey):

Zambia-Tanzania border: Ufipa Plateau

Ident. 1957 for Vesey Fitzgerald, Mbale: Mbale, Zambia; Ufipa Plat., Zambia-Tanz. border



Pinhey, 1961a:

Kenya: Thika; Chepalungu; Uganda as far north as West Nile and Aswa River.

Pinhey, 1966c:

Northern Zaire: Garamba Nat. Park (H. de Saeger)

Pinhey, 1967b:

Shaba: Lubumbashi (J-J. Symoens)

Ident. 1973 for *USNM*:

Transvaal: Kruger Nat. Park

Ident. 1975 in *SUC*:

Natal: Amanzimtoti; Pietermaritzburg

Re-examined Febr. 1978 in *PPIS*:

Rhodesia: Ruwa Riv., Salisbury, Feb. 1950 (J. A. Whellan); Prince Edward Dam, Salisbury, April, Nov. 1947 (E. Pinhey); Mazoe Dam, Jan. 1947 (E. Pinhey)

Other collections:

*IRSNB*: ♂ ♀ Cap de Bonne Espérance

Ris (1921: 276): many localities in Eastern Cape; Natal and Zululand; Transvaal; Rhodesia.

Schouteden (1934: 78), in *MRACT*:

Zaire: Sankisia, July 1911 (Bequaert) (det. F. Ris)

*DM*:

Natal & Zululand: Nqutu, 29 Jan. 1949; Haladu, 8 Apr. 1949 (both almost certainly from A. H. Newton); Krantzkloof, 23 Jan. 1915.

*SAM* (teste A. J. Prins). Cape: Dunbrody 4 March 1912 (F. Ris); Knysna Jan 1936 (H. G. Wood); East Natal, July 1925 (J. Bohenford); N. Transvaal: Louis Trichardt Jan-Feb 1928 (R. F. Lawrence); Rhodesia: Salisbury March 1917 (R. W. E. Tucker).

LESTES (PARALESTES) PINHEYI Fraser Text fig. 104-115, pp. 347, 418

*Lestes uncifer* Pinhey, pars, 1951: 48-50, figs 51, 52, 61, 63, 64

*Lestes pinheyi* Fraser, 1955a: 10 (compared to *uncifer*); Pinhey, 1961b: 13; Pinhey, 1962b: 94; Pinhey, 1967b: 8; Pinhey, 1967c: 2; Kimmins, 1966: 209 (type and lectotype details); Pinhey, 1976: 533

Lectotype ♂ (Kimmins) and allotype ♀ (Pinhey) from Rusape, Mashonaland, are in the *BMNH*. The lectotype (Kimmins, 1966) bears the following labels:

"Rusape, 22.2.48, E. Pinhey; *Lestes* sp.n. E. C. G. Pinhey det. March 1948; (Fraser's script) *L. pinheyi* Fraser; F.C.F."

The allotype bears the same data.

**Characters:** A slender species, nearest *plagiatus* but less robust, with the metallic antehumeral stripe irregular or broken; forewing often with more Px. Superior appendage turned down more abruptly, almost at a right angle, the end portion slenderly cylindrical. Flange without terminal tooth. Thoracic markings, like *dissimulans*, most variable.

**General description.** White pruinosity in adult ♂ develops laterally and ventrally on thorax, not dorsally; occasionally much reduced, to traces at leg bases.

*Mature* ♂. Labrum greenish yellow. Postclypeus and head above black, but brown in a mature Khwaai ♂. Orbits below cream, with white pruinosity.

Prothorax black above. Hind lobe narrower than in *uncifer*. Synthoracic markings exceptionally variable; usually black down to first lateral suture, leaving a brown stripe on either side of humeral suture; the black enclosing a bright or dark metallic green antehumeral stripe (in a pruinose Nkomane River ♂ still reflecting traces of purple of immature condition); this stripe sometimes very broad, sometimes narrow, frequently more or less incised laterally (as in others of the group); in other mature males, especially those in Okavango and other swamps, the stripe broken up into large or small spots, which may at times be narrowly linked; or occasionally the green stripe obscured by melanism. Mesepimeral green stripe also broad or narrow, sometimes short, most frequently elbowed at ventral end. Sometimes with black stripe at second lateral suture. In a 4-River ♂ variety (*in copula*), the synthorax is ferruginous, not black, with separate green antehumeral spots, and an Nkhata Bay ♂ also has brown thorax. Sternite with black lateral stripes.

Femora 2-3 yellow with two black stripes and a partial third one; fore femur mainly black. Tibiae black anteriorly; tarsi black.

Wings hyaline, sometimes faintly fumose. Venation black. Pterostigma short, somewhat rectangular, with straight posterior edge; usually black, occasionally dark brown; unicolorous or frequently edged all round with a pale line or at least all edges except distal one; occasionally only the anterior edge pale; above approximately two cells. Forewing with 12-14 Px. Ac at point of departure of anal vein. Space  $R_4$ -MA with long intercalary veins starting far out at Px 5 — Px 6, sometimes at Px 4.

Abdomen with continuous black band on segments 1-9, reflecting bright metallic green on 2-5, duller to black on other segments; 10 brownish yellow, generally with brown or black dorsal carina; or this segment mainly brown or black, sometimes pruinosed white; with raised dorsal crest; denticles absent or just a few very fine ones.

Superior appendage long, usually brown (black in forests of North Malawi and Zambia); occasionally yellow with the down-turned apical portion black or brown; or black at base. As in *plagiatus* with a "knee" or patella-like tumour, where the appendage turns down, the

turn almost a right angle; apical portion slenderly cylindrical with long white hair. Sub-basal tooth prominent, acute (but small in an *Ikelenge* ♂); flange without distal tooth; below the "knee" is a short ventral ridge. Outer dentition on superior rather sparse. Inferior appendage brown, broadly conical, only about one fifth or less the length of the superior, with a narrow inner fold.

Head of prophallus. Hood short; smaller reversed ligula than *plagiatus*, without transverse grooves.

*Teneral* ♂. Postclypeus pale or deeper brown, often with three black dots, head above pale to deeper brown, sometimes with traces of black. Synthorax with antehumeral and mesepimeral stripes more or less complete, metallic purple, sometimes the antehumeral broken into two purple maculae, in a Chingola swamp ♂ these maculae brown. Pterostigma very pale grey brown, with clear edges; or very pale pinkish grey or greyish yellow. Abdomen with metallic green band on segments 1-9, 10 yellow or brownish yellow; superior appendage yellow.

*Juvenile* ♂. Postclypeus and head above ferruginous to dark brown, often with three dark postclypeal dots. Prothorax brown. Antehumeral stripes complete, green or often purple, or sometimes reduced to two maculae; a metallic streak on mesepimeron.

Pterostigma pale to darker brown, with pale edges. Abdomen dorsally metallic green to darker green or brown on segments 1-9, 10 and superior appendage yellow or brownish yellow.

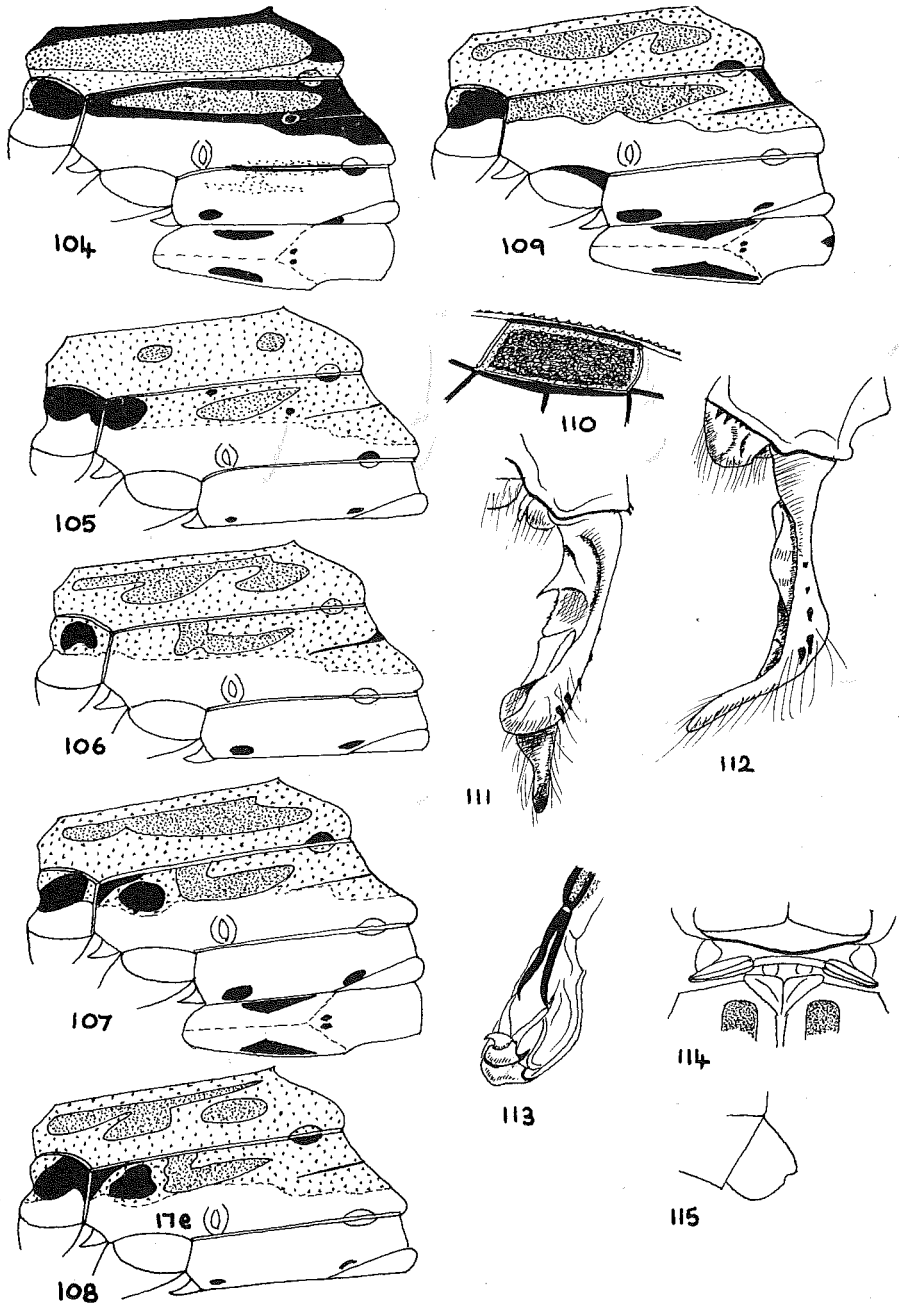
Abd. 30-32 mm, hw. 20-23 mm, pt. 1,25-1,5 mm.

*Mature* ♀. Postclypeus and head above brown with small black markings on both, or all black. Thorax often with ventral white pruinosity.

Prothorax pale brown with faint dark bands. Hind lobe narrower than in *uncifer*. Mesostigmal lamina narrow, brownish yellow with straight posterior ridge. Synthorax with complete metallic green, blue-green or dark blue antehumeral band, lobed or incised near its upper end, or narrowed at lower end; or divided into two portions or small spots. Mesepimeral metallic stripe short, usually elbowed at lower end. Sternite with black lateral stripe.

Pterostigma brown, dark brown or black, with variable pale edges as in ♂. Wings sometimes faintly fumose.

Abdomen, segment 1 yellow, 2-9 above dark brown or black with green reflection on 2-5; segment 10 yellow, with or without black mid-dorsal line, or with brown dorsal dots, or dark brown (Lake Chila). Cerci yellow. Ovipositor sheath ferruginous or brown and black, extending only to end of segment 10; straightish, slightly curved on finely denticulate distal portion. Vulvar scale with outer edge sloped; a very slight sub-apical kink.



Subgenus *Paralestes* (104-115). *L. pinheyi*: 104-109. synthorax (Salisbury ♂ (pruinose), '4-Rivers ♂ (*in cop.*), Sepopa ♂, Sepopa ♀, Xugana ♀, Ikelenge ♀) (finely stippled areas metallic, loosely dotted areas brown); 110. pterostigma of right forewing ♂ (Salisbury); 111, 112. right anal appendages from above, left ones from side (Salisbury); 113. prothorax (Ikelenge); 114. junction of pro- and mesothorax ♀ (Ikelenge); 115. left side of vulvar scale (Salisbury).

Juvenile and teneral examples as for ♂ but a teneral ♀ Mukwadzi Forest has three isolated green spots in place of the antehumeral.

Abd. 28-29 mm, hw. and pt. as in ♂.

Note on metallic antehumeral bands:

In both sexes these bands tend to develop from immature to mature state in varied form, but it might be considered more dimorphic than polymorphic, the bands either more or less complete or else broken into two portions. The fractured stripe appears to develop more often in palustrine conditions.

The Four Rivers ♂ (taken *in copula*) with ferruginous thorax may be considered an unusual variety.

**Ecological notes.** Found at reedy or grassy pools, and most commonly in palustrine, swampy conditions, most of the year except, perhaps, June to August.

**Distribution.** Known to me so far only from south central Africa and Nigeria: Rhodesia, Botswana, North Malawi, Zambia, East Angola, Shaba (Zaire) and Northern Nigeria. The Nigerian record is from Gambles' collection (1959).

**Material examined.**

*NMB.*

Rhodesia: Victoria Falls, Sept. 1957 (E. Pinhey); Salisbury, Febr. 1956 (E. Pinhey); Prince Edward Dam, Salisbury, March 1950 (E. Pinhey)

Botswana: Nkomane Riv. (now Nghabe Riv.), 20° 06S, 23° 20E, March 1974 (E. Pinhey); Thamalakane Riv., Maun, Dec. 1968, Dec. 1975 (Falcon Coll.); Sepopa, Febr. 1967, March 1974 (E. Pinhey); Xaro boat camp, S. of Shakawe, 18° 17S, 22° 00E, March 1974 (Pinhey & de Moor); Mohembo *in cop.*, 18° 23S, 21° 48E, Jan. 1970 (E. Pinhey); Moremi Game Res., Dec. 1975 (Falcon Coll.); Khwaai Riv., *in cop.*, 19° 08S, 23° 48E, Dec. 1968 (Falcon Coll.); Four Rivers camp, *in cop.*, 19° 03S, 23° 10E, Dec. 1973, 1975 (Falcon Coll.); Meakome camp, 19° 03S, 23° 04E, Dec. 1973 (Falcon Coll.); Gadikwe and Xugana lagoon, Moanachira Riv., 19° 04-10S, 23° 06-14E, Dec. 1973, 1975 (Falcon Coll.); Linyanti Explor. camp, 18° 20S, 23° 50E, March 1976 (Pinhey & de Moor); Chobe rapids, Kasane, 17° 50S, 25° 12E, Sept. 1974 (E. Pinhey)

North Malawi: Mukwadzi Forest, Nkhata Bay, May 1966 (E. Pinhey); Nov. 1970 (Philip M'hlanga)

Zambia: Pemba, SW Zambia, Apr. 1972 (Pinhey & de Moor); Kafue, Oct. 1961 (L. D. E. F. Vesey Fitzgerald); North Zambia: 50 km S. of Ndola, Febr. 1960, Apr. 1961 (E. Pinhey & R. A. Green); 15 km E. of Kanona, NE of Ndola, March 1969 (E. Pinhey); swamp 30 km SW of Kitwe, Apr. 1972 (Pinhey & de Moor);

Chingola swamp, Apr. 1972 (Pinhey & de Moor); Ikelenge, N. Mwinilunga, Febr.-March 1960 (E. Pinhey), Nov. 1961, March 1962 (E. Pinhey); 50 km S. of Kawambwa, March 1969 (E. Pinhey); Lake Chila, Mbale, Apr. 1954 (E. Pinhey)

East Angola: Lutchigena Riv., E. of Caianda, Jan. 1965 (E. Pinhey)

Previously identified.

(Pinhey 1951) *TMP*, series (as "uncifer") Rusape, E. Rhodesia, Feb. 1948 (E. Pinhey)

Identified for R. C. Dening (1961):

N. Zambia: Samfya, Lake Bangweulu (R. C. Dening)

Pinhey, 1967b:

Shaba: Msipashi, Kundelungu Plateau, nr Lake Mweru (J-J. Symoens)

Ident. Feb. 1978 for *PPIS*:

Rhodesia: Prince Edward Dam, Salisbury, Jan. 1950, March 1950 (J. A. Whellan); Rusape, eastern districts, Febr. 1948 (E. Pinhey)

Zambia: ♀ Lunzuwa Falls, 24 July 1965

LESTES (PARALESTES) UNCIFER Karsch Text fig. 116-126, p. 421

*Lestes uncifer* Karsch, 1899: 381 (♂ ♀ Tanzania); Förster, 1906: 341; Martin, 1910: 84; Ris, 1921: 278 fig. 14; Schouteden, 1934: 78

*Paralestes uncifer* Schmidt, 1951: 124

*Lestes uncifer* Fraser, 1955a: 10; Pinhey, 1961a: 7; Pinhey, 1961b: 13

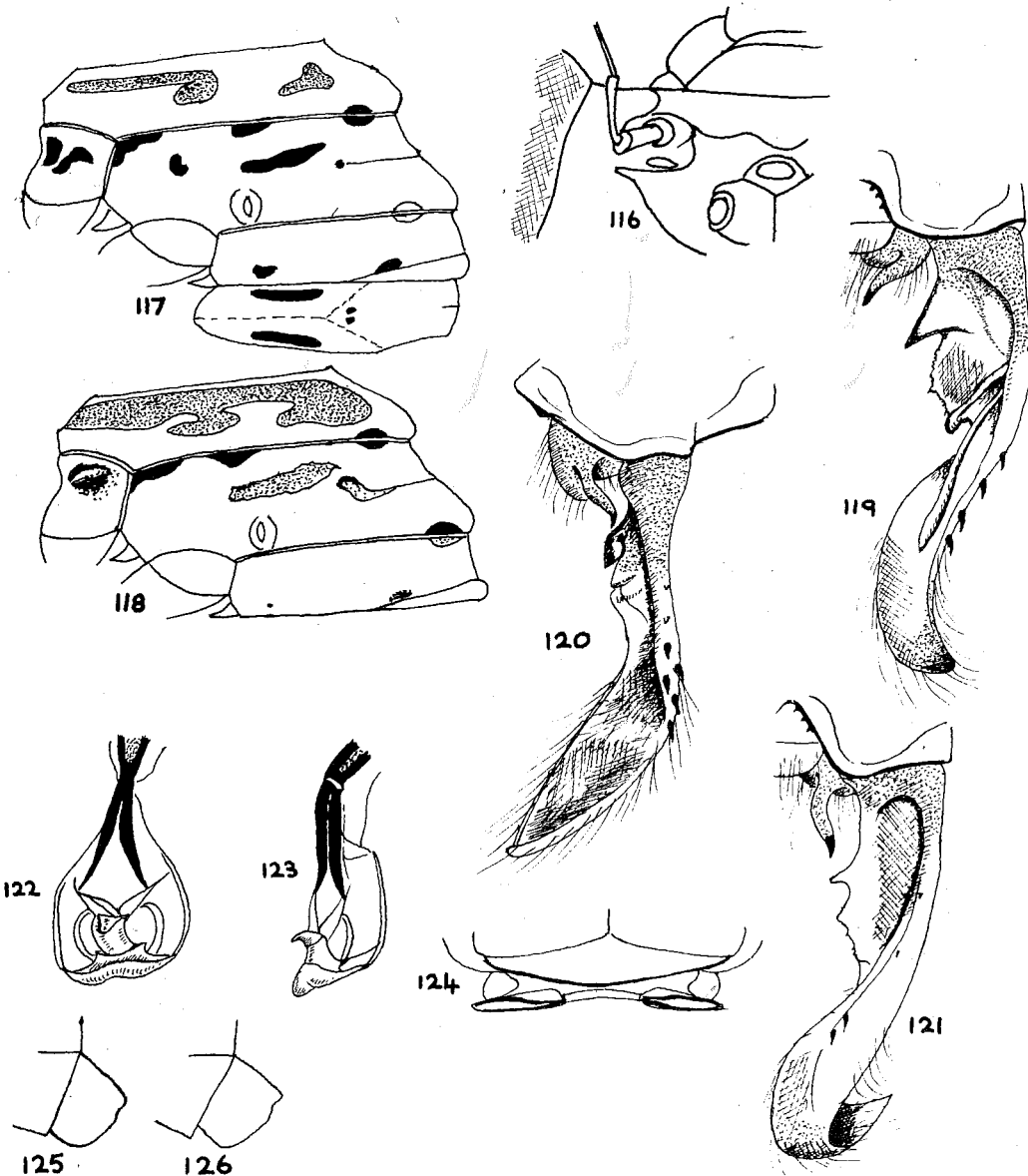
*Lestes (Paralestes) uncifer* Pinhey, 1962b: 94

*Lestes uncifer* Pinhey, 1967b: 9; Carfi, 1974: 153 fig; Pinhey, 1976: 533

Type ♂ in *BMZHU* was examined by Pinhey (1964). It bears the label: "Bondei, Jan. 1886" and is complete and in mature condition. Collected (♂ and ♀) at Bondei, Pangani, on south east coast of Tanzania, Jan. 1886 (leg. Dr. C. W. Schmidt). Forewings with 12 and 13 Px in ♂ and pterostigma covers 2 cells. Abd. 39 mm (in Karsch 41, including appendages), hw. 25 mm, pt. 1,5 mm.

For the ♀, Karsch gives hw. 25 mm, pt. 1,6 mm.

Some of the details in Karsch's original description (translated): Head above black; labrum and front of clypeus yellow. Thorax yellow with blackish bands and anastomosing spots, laterally with two black spots. Legs yellowish, striped with black. Wings yellowish in ♂, hyaline in ♀. Veins and pterostigma black. Abdomen above dark brown. Superior appendage pale yellow, blackish at base and apex; very long, curved inwards and downwards, with long, light grey hairs before apex.



Subgenus *Paralestes* (116-126). *L. uncifer*: 116. Part of left side of head of ♂ showing elliptical tumour in antennal socket (Victoria Falls); 117, 118. Synthorax ♂♂ (Victoria Falls); 119-121. right anal appendages above and left ones from side (Victoria Falls), right ones from above (Madi Opei); 122, 123. prothallus (Ikelenge and Madi Opei); 124. hind lobe of prothorax and mesostigmal lamina ♀ (Victoria Falls); 125, 126. left side of vulvar scale (Vumba and Ikelenge).

Abdomen ♂ 41 mm; hindwing ♂, ♀ 25 mm; pterostigma ♂ 1,5, ♀ 1,6 mm. (Length of ♀ abdomen not given).

A slightly larger species than average *plagiatus*, with anal appendages curved down sinuously, the end portion very flat and hirsute; no "knee" tumour. Femora 2-3 with 3 dark stripes. Abdomen of ♀ appreciably shorter than ♂.

**General description.** Pruinosity much less developed than *plagiatus* or *pinheyi*.

*Mature* ♂. Labrum green (Karsch gives yellow). Postclypeus and head above black or in late juvenile, ferruginous with sparse black markings. Orbits below cream, sometimes with a trace of black (which may be post-mortem). Eye, in life, pale blue below, deeper blue above.

Prothorax brownish yellow with brown dorsal markings. Hind lobe broad. Mesothorax ferruginous with metallic antehumeral band sometimes complete but usually broken into two portions, or into three small isolated spots. (Karsch describes this portion as yellow, with blackish bands and anastomosing spots). Sides yellow to pale greenish yellow, with sparse brown spots arranged somewhat like *tridens*. Sternite with brown lateral stripe.

Femora yellow with three brown stripes. Tibiae 2-3 with anterior stripe, tibia 1 with two stripes.

Wings clear to faintly yellow. Venation black. Pterostigma short, above two cells; blackish brown to black, somewhat rectangular, sometimes with very faint pale anterior edge. Forewing with 11-13 Px. Ac at point of departure of anal vein. Space  $R_4$ -MA with long intercalary veins starting at Px 4 — Px 5.

Abdomen segment 1 green with squarish dorso-basal patch or green with distal black annulus, or with dorsal lines. Segments 2-10 with a more or less complete dorsal dark brown band, without green reflection; or the band on 2 often incomplete. Segment 10 distally with dorsal crest, edged with small denticles.

Superior appendage long, cream-coloured, black at base, black with long white hair at apex; distal half with outer denticles; turned rather gradually downwards, this portion sinuous and flattened, the tips divergent. Sub-basal tooth prominent, acute, as in the type; flange flat, curved with small brown apical transverse tooth. In examples from Salone Forest, Mwinilunga and Madi Opei the sub-basal tooth is very small. Inferior appendage dark ferruginous, rounded, with slender black-tipped apical extension (as in *tridens*), extending about one fifth of superior.

Prophallus head. Moderately large ligula, not grooved. Distal shelf with very wide, shallow depression.

Juvenile males slightly paler. Mwinilunga males tend to be small on average.

Abd. 32-39,5 (usually 38-39) mm; hw. 22-25 mm; pt. (smaller than Karsch's dimensions) 1-1,25 mm.



Pale colours in life (Mwinilunga ♂): eye deep blue, paler below; labrum very pale blue; side of thorax bluish white to creamy white; abdomen pale blue. In a Victoria Falls ♂, eye deep blue, pale green below; labrum whitish green; sides of thorax and abdomen 1-3 pale green, rest of abdomen pale greyish green.

*Mature* ♀. Labrum greenish yellow. Postclypeus and head above pale ferruginous, darker brown in a Mwinilunga ♀. Orbits below all cream.

Prothorax pale brown with very sparse brown markings. Hind lobe broad. Mesostigmal lamina narrow, pale brown, with thick, short elliptical posterior ridge. Antehumeral stripe varies from a complete band to three small spots, the latter apparently more frequent. A Mwinilunga ♀ has some lateral thoracic pruinosity.

Wings hyaline. Pterostigma ferruginous, dark brown or black, sometimes with paler or white anterior edge. Venation as in ♂.

Abdomen segment 1 mainly or all green, often brown at base; segments 2-7 with brown dorsal band; 8-9 brown with black median stripe; segment 10 brownish yellow with sparse brown markings; or (Mwinilunga) 8-10 all brown; or 10 very yellow. Segment 10 with crest. Cerci yellow. Ovipositor sheath scarcely reaching end of 10 or slightly longer, all ferruginous, or with some black at or near distal end; ventrally straight, the denticulations small, mainly on slightly curved apical portion. Vulvar scale with outer edge straighter than *plagiatus*; a slight kink close to apex as in *pinheyi*.

In a teneral ♀ (Salone Forest) the pterostigma is all very pale pinkish brown.

It seems that the ♀ generally has a markedly shorter abdomen than in the ♂ (see above): abd. ♀ 34-34,5 mm; hw. and pt. as in ♂.

**Ecology:** A rather uncommon species, found near reedy pools or streams but generally amongst bush or clumps of trees nearby.

**Distribution.** Natal, Mozambique, Rhodesia, Zambia, Zaire, Tanzania (Karsch's type), Uganda, Somalia (Carfi) and Nigeria.

**Material examined.**

*NMB.*

Natal: Burman's Bush, Durban, Sept. 1956 (C. G. C. Dickson)

Mozambique: Beira, Dec. 1960 (E. Pinhey); Salone Forest, S. of Marromeu, Zambezi Riv., Nov. 1967, May 1969 (E. Pinhey)

Rhodesia: Victoria Falls, Jan. 1956 (E. Pinhey); Vumba Mts, Umtali, March 1962 (E. Pinhey)

NW Zambia: Ikelenge, Mwinilunga, Jan. 1965 (E. Pinhey)

Malawi: Senga Bay, Salima, May 1979, Feb. 1980 (J. G. M. Wilson)

Northern Uganda: Madi Opei, Acholi, March 1952 (T. H. E. Jackson)

Previously identified.

(Pinhey, 1951, the "uncifer" locality in Rhodesia is *pinheyi*)

Expedn Nairobi to Mbale, N. Zambia, 1954:

N. Zambia: Lake Chila, Mbale and Kalambo Falls, Apr. 1954 (E. Pinhey)

identified for Vesey Fitzgerald 1957:

N. Zambia: Mbale (Abercorn) (L. D. E. F. V-F.)

Pinhey, 1961a (specimens collected by van Someren now in *BMNH*)

Kenya coast: Malindi (van Someren)

Uganda: Kangole (van Someren); Aremo, Labwor Hills, Karamoja (van Someren);

Madi Opei and Paimol, Acholi (T. H. E. Jackson)

Pinhey, 1961b: Shaba: Mubale

Pinhey, 1966c: N. Zaire: Garamba Nat. Park (H. de Saeger)

Pinhey, 1967b: Shaba: Lubumbashi and Kukuni, Kafubu (J-J. Symoens)

Ris (1921): Mozambique: ♂ Lourenço Marques (now Maputo) (Ris colln, *MSF*)

Schouteden (1934), *MRACT*:

Zaire: ♂ ♀ in *cop.* Kasenga (J. Bequaert); Eala (M. Mayné)

Carfi (1974), in *UF*:

Somalia: Giohar, Aug. 1964

Checked in *RSM*, *Edinburgh* (Pinhey Aug. 1978). N. Nigeria: Kaduna 28 June 1965 (K. I. Skilliter)

LESTES (MALGASSOLESTES) SIMULATOR McLachlan Text fig. 127-135, p. 428

*Lestes simulatrix* M'Lachlan [*sic!*], 1895: 25 (Madagascar); Förster, 1906: 342; Martin, 1910: 85, 88; Sjöstedt, 1917a: 8, pl 1 (♀) (footnote, as *simulator*);

*Lestes simulator* Schmidt, 1928: 248; Fraser, 1949: 24 (localities only)

*Paralestes simulatrix* Schmidt, 1951: 122, 124, 126, figs. 3, 4, 6; *Lestes (Paralestes) simulatrix* Pinhey, 1962b: 94; Kimmins, 1970: 196 (type notation)

*Lestes simulans* Martin (? pars), 1910: 85, 88, 89

For reasons stated below, *simulans* Martin (nec Auctorum) is placed here in synonymy

after examination of the only remaining material labelled *simulans* by Martin in *PMNHN*. The alteration of *simulatrix* to the masculine form *simulator* is merely to bring conformity to genus *Lestes*, formerly divided by authors between masculine and feminine genders.

McLachlan's type ♂ of *simulator* in *BMNH* was given a holotype label by Kimmins (1970). I examined it in 1974. It bears the labels:

"Holotype; Type; (McLachlan's script) *Lestes simulatrix* McL.; (blue label) Madagascar, McLachlan Coll. B.M., 1938-674."

*Type* ♂. Nearly mature, with traces of white pruinosity. Labrum yellow-brown, with black lateral dots and median line; postclypeus with black anterior border, head black above, with ochreous markings.

Antehumeral stripe broad, with bluish green reflection; deeply excavate near middle of lateral edge; mesepimeron with a smaller angular macula than the figure of the juvenile here (fig. 127). Femora with black stripe having green metallic sheen.

Wings hyaline. Pterostigma short, thick, brown, rectangular; above 2 cells. Forewing with 10 Px, hindwing 9 Px.

Abdominal segment 1 with two green dorsal maculae; segments 2-6 with bronze-black band; 6-9 more purplish brown on proximal halves, brownish yellow distally; 10 brownish yellow.

Superior appendage gradually forcipate, black; few black outer denticles. Sub-basal tooth prominent, acute. Flange straightish, having a small sharp, subapical tooth and also a broad obtuse, rather sheath-like terminal tooth. Inferior appendage black, gradually conical, scarcely reaching half as far as superior in side view; tipped with a distinct tuft of orange hair.

Abd. 30,25 mm; hw. 19 mm.

**Characters.** As in the subgeneric description, the prothoracic shape, in both sexes, sharply constricted at sides, is distinctive. Antehumeral stripe rather like *tridens* and others, excised laterally. Femora broadly black, enclosing a yellow-dotted line. Superior appendage with sharp sub-basal tooth, the flange straightish, with two distal teeth, these characters of the superior all different from *pruinescens*.

Only a juvenile ♂ is in the National Museum, Bulawayo. This can provide further details.

*Juvenile* ♂ (*Tananarive*). Head and thorax mainly ferruginous; labrum and postclypeus with black markings; vertex with black maculae between ocelli and on orbits; orbits below yellow and ferruginous.

Prothorax with metallic green dorsal maculae, the hind lobe damaged but apparently similar to the ♀ (below). Synthorax with excised antehumeral stripe and other thoracic markings as in fig. 127; the mesothoracic fasciae with bronze sheen, metathoracic ones plain brown. Sternite with short lateral streaks.

Femora brownish yellow, broadly black anteriorly, this black enclosing a row of yellow hypheas. Tibiae yellow, black anteriorly, tarsi black.

Wings hyaline. Venation ferruginous, costa,  $R_1$  and  $R_2$  dark brown. Pterostigma pale brown. Forewing with 10-12 Px. Ac at point of separation of anal vein. Space  $R_4$ -MA with long intercalaries starting Px 4 — Px 5; no extra distal veins.

Abdomen with dark dorsal band as in holotype, but segment 9 with distinctly whitish yellow distal annulus; segment 10 with a trace of a distal crest above, the distal margin broadly indented and edged with small denticles.

Superior appendage ferruginous, darker distally (somewhat damaged in this juvenile) with sub-basal tooth and inner flange as described above. Inferior appendage darker brown, with narrow apical extension tufted with orange hair.

Prophallus head with very large grooved ligula, shaped rather like *tridens*. Terminal ridge angled in middle.

Abd. 31 mm; hw. 21,5 mm; pt. 1,0-1,25 mm.

The first description of a ♀ was by Sjöstedt (1917), who figured its head and thorax (his pl. 1, figs. 7, 8). The thorax has thicker markings than the ♂ described above, especially the antehumeral stripe, with greatly reduced excision.

*Juvenile ♀ (Tananarive)*. Labrum pale ferruginous. Postclypeus dark brown with ferruginous lateral fasciae. Frons ferruginous. Vertex as in ♂. Orbits below yellow with a trace of black.

Prothorax ferruginous with black dorsal traces. Hind lobe rather broad, black centrally, abruptly narrowed and pale ferruginous laterally. Mesostigmal lamina narrow, straight, with thick, straight brown posterior ridge. Synthorax very like ♂, with excised antehumeral stripe and largish mesepimeral fasciae. Sternite with short lateral stripes.

Femora 2-3 as in ♂, with dotted yellow line interrupting the black.

Wings hyaline. Otherwise as in ♂.

Abdominal segment 1 with partial band above; the rest as in ♂, with white distal annulus on segment 9. Segment 10 yellowish brown, without crest. Cerci brownish yellow, short and thick. Ovipositor sheath brown, just reaching end of segment 10; ventrally straightish on basal half, slightly convex on weakly denticulate distal half. Vulvar scale simple, with straight lateral edge parallel to hinge, not produced at apex.

Abd. 30 mm; hw. 22 mm.

Range of size from these examples and from descriptions:

Abd. ♂ 30-34,5, ♀ 29-33 mm; hw. ♂ ♀ 19-23 mm; pt. 1,0-1,25 mm.

*Lestes simulans* Martin (1910)

Legrand loaned (1977) the only remaining examples in *PMNHN*, attributable to *simulans*. These are two very teneral males, which have lost the end segments of the abdomen. One of them was labelled *simulans* by Martin.

Martin's original description (adapted and translated):

♂. Face all brownish yellow. Head above of same colour (p. 89) but (p. 85) greenish black varied with yellow; with black spots around ocelli and encircling each eye; head posteriorly yellowish. [The colour discrepancy might have referred separately to teneral and adult ?]

Prothorax blackish with two small yellow dorsal dots, two larger median ones and a terminal line. (Syn-)thorax golden yellow; a narrow dorsal yellow line between two broad green antehumerals [evidently, as in other descriptions, he inferred left plus right sides], these bands strongly excavate medially enclosing golden yellow markings [probably yellow stain]. Sides yellow with two broad oblique green stripes [one each side]. Legs yellow with black lines.

Wings hyaline. Pterostigma yellow [indicating a teneral example], rather oblique inwardly. Forewing with 10-11 Px.

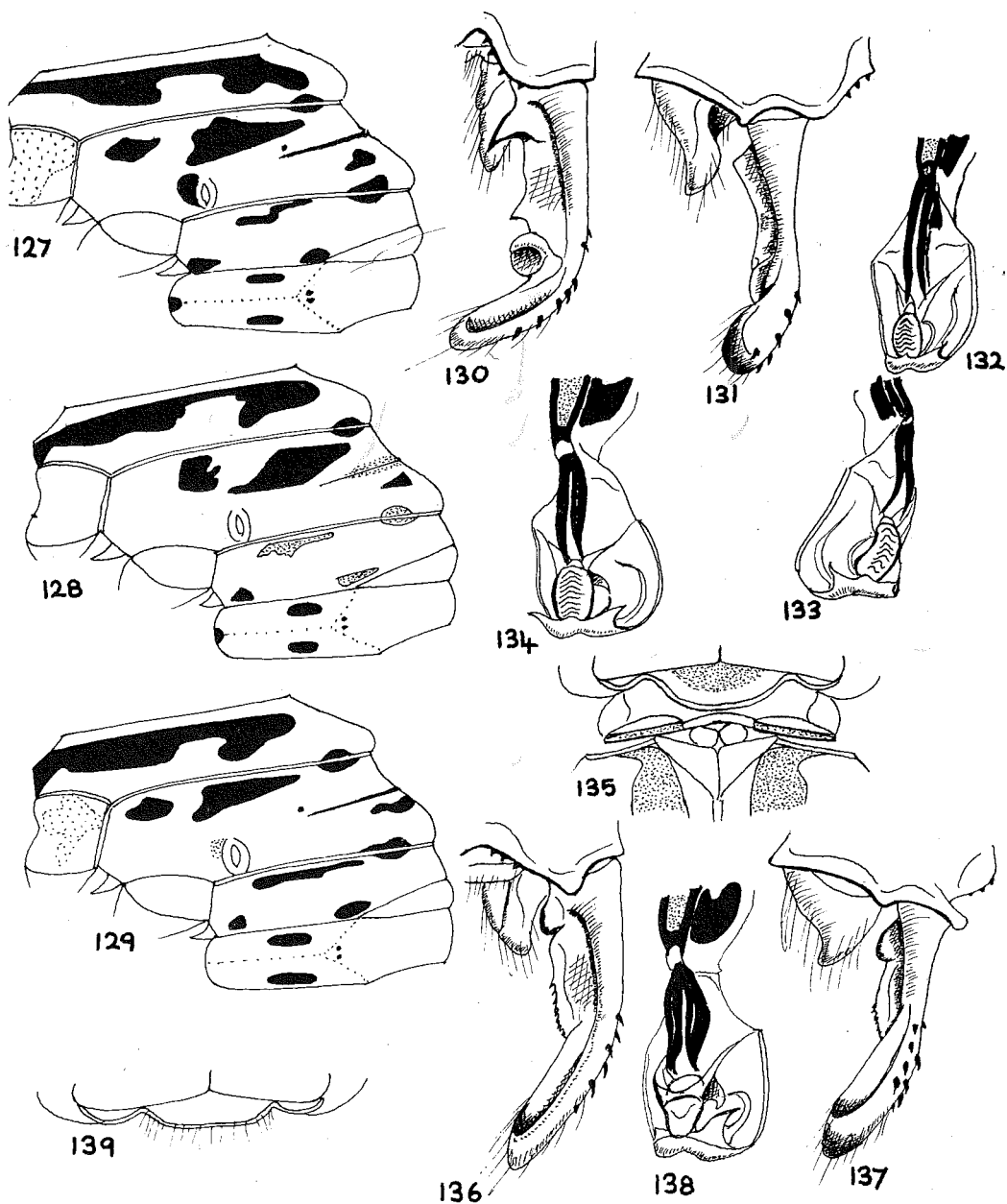
Abdomen bronzed above. Sides of segments 1-2 yellow, on 2 with dorsal longitudinal yellow lines on either side of median line, on 2-5 a narrow basal yellow annulus; segment 9 brown with pale yellow annulus on distal quarter; segment 10 brown. Superior appendage yellow [? teneral] or brown [? mature], longer than segment 10, evenly forcipate, bearing before the end two small yellow inner teeth (p. 89), or two rather acute teeth (p.85.) Inferior appendage about a quarter as long as superior.

♀. Resembling ♂. Abdomen mainly chestnut; cerci pale brown, extremely short and narrow. Abd. ♂ 31, ♀ 33 mm; hw. 22,5 mm; pt. 1,25 mm.

Locality: "Afrique de l'Est" (p. 85), "Afrique continentale, probablement orientale." (p. 89).

The above description appears to be a confused and incomplete reference to both teneral and mature examples of the series, the yellow pterostigma being only the very immature condition. The mention of two small inner acute teeth may be the two terminal teeth of the flange in *simulator*, but one of these teeth could presumably refer to the prominent sub-basal one. Lack of clarity here must leave the decision open, whether *simulans* was the same as *simulator* or possibly that the general description referred to two, not one species.

Martin further suggests (p. 89) that *simulans* may represent the continental race of *simulatrix*, differing in smaller size of *simulans*, some differences in coloration and form of male appendage. There can be no evidence yet available for this, either from comparative description or from the remaining teneral males in Paris Museum, these showing distinct prothoracic connection with the Madagascar group, *Malgassolestes*.



Subgenus *Malgassolestes* (127-139). *L. simulator*: 127-129. synthorax of teneral ♂ (Madagascar) and of two teneral *simulans* (*Paris Mus.*); 130, 131. right anal appendages of *simulator* from above, left ones from side (Madagascar); 132, 133. prophallus of *simulator*; 134. prophallus of *simulans* (labelled "Afrique", *Paris Mus.*); 135. junction of pro- and mesothorax ♀ *simulator* (black stripes include metallic markings). *L. pruinescens*, ♂ lectotype: 136, 137. right anal appendages from above, left ones from side; 138. prophallus; 139. hind lobe of prothorax.

Of the two teneral incomplete males loaned by Paris Museum one has been hesitatingly afforded the name *simulans* by Martin but it may possibly have been one of the tenerals in the description. In this example, in which segments 7-10 are missing, the labels are as follows: "(White, in Martin's script) *L. simulans* [but with *Lestes simulatrix* and *Lestes tridens* deleted!] — Afrique; (blue, printed) Coll. R. Martin — 1920 — Museum Paris."

*Teneral* ♂. Labrum dark greyish red; rest of face and head ferruginous. (The dark tone perhaps developing after the description?). Postclypeus anteriorly and medially black; vertex grey-black around ocelli and on dorsal stripes across orbits (staining); orbits below dark green and ochreous.

Prothorax pale ferruginous with greenish black dorsal fasciae. Hind lobe broad but abruptly constricted laterally. Mesepisterna ferruginous to humeral suture; sides of thorax paler to pale yellow ventrally; median carina finely black; broad greenish black antehumeral band widely excised at two-thirds; a brown dorsal spot on humeral suture, short brown lines on both lateral sutures. Mesepimeron with two greenish black fasciae (as in fig. 128). Metepisternum with brown dorsal spot, metepimeron with dark streak below second lateral suture and a brown spot behind hind leg. Sternum with brown lateral spots.

Femora 2-3 with broad black latero-anterior stripe dissected by a yellow-dotted line (as in *simulator*, *pruinescens*). Femur 1 with plain broad black stripe; tibiae black anteriorly, tarsi black.

Wings hyaline. Venation dark brown. Pterostigma short, rather broad and rectangular; brownish yellow, between black veins; above 2 cells. Forewing with 11 and 10 Px.Ac at departure of anal vein. Space R<sub>4</sub>-MA with only longish intercalaries, commencing at Px4 or Px 5, as in *simulator*.

Abdomen with partial dorsal brown band on segments 1-2, a bronze band on 3, darker on 4-6. Prophallic head like *simulator*.

Hw. 21,5 mm; pt. 1,25 mm.

I have added a label: *Lestes simulans* Martin, teneral♂, doubtfully type.

The second teneral ♂ has the head separated in a glass tube and segments 6-10 are missing. The labels: "(grey, in Martin's script) *Lestes* — Afrique; (blue, printed) Coll. R. Martin — 1920 — Museum Paris."

Thoracic markings, pterostigmata and venation as in the above example, as well as the shape of the prothoracic hind lobe. Forewings with 11 Px.

Thus, by prothoracic hind lobe and the dotted yellow femoral line these specimens belong to *Malgassolestes*; and by prophallus and intercalary veins to *simulator*. The vaguely described armature of the superior appendage defeats any attempt to supplement this conclusion. Whether Martin's series of *simulans* included an additional species from East Africa seems impossible to verify.

**Distribution.** Madagascar.

**Material examined** (*simulator*, det. E. Pinhey)

*NMB*. Madascar: Tananarive, March 1933 (Gregor van Olsufieff)

*L. simulans*: 2 teneral males (*PMNHN*)

Information elsewhere (1977):

*USSRL*.

*L. simulator* from "Afrique".

Checked in *RSM*, *Edinburgh*: Madagascar: Mandritsara (Janson Colln).

**LESTES (MALGASSOLESTES) PRUINESCENS** Martin **Stat. rest.** Text fig. 136-139, p. 428

*Lestes pruinescens* Martin, 1910: 84, 89, 90

*Paralestes pruinescens* Schmidt 1951: 126 (syn. ad *simulatrix*); *Lestes (Paralestes) pruinescens* Pinhey, 1962b: 94

In *PMNHN* there is a single ♂ labelled *pruinescens* by Martin, evidently from the type series but it is heavily melanised, far more strongly black on thorax than the original description which was evidently made from a more clearly marked but mature pruinosed ♂. This ♂, kindly loaned by Legrand (1977) bears the following labels:

"(white, with Martin's script) *Lestes pruinescens* — Madagascar; (blue, printed) Coll. R. Martin — 1920 — Museum Paris." It is in good condition except for the legs of which only the two hind legs remain. Except for the complete loss of antehumeral and other thoracic fasciae through intense melanism (c.f. *pallidus* form *wahlbergi*) this ♂ agrees moderately well with the original description. I have added a *Lectotype* ♂ label.

Martin's description (1910) (adapted and translated):

♂. Lips yellow. Head above black, yellow posteriorly.  
Thorax blue pruinose, with blackish antehumeral stripes, their outer margins irregularly excised; ventral surface with whiter pruinosity.  
Legs yellow, well marked with blackish brown.  
Wings hyaline. Pterostigma nearly rectangular; brown.  
Forewing with 11-12 Px.  
Abdomen deep bronze-blue above; segment 1 black at base; 2 pruinose at sides; 3-6 with narrow basal yellow annuli; 9-10 black in certain individuals, blue pruinose in others; segment 10 strongly indented medially; abdomen below yellowish, black under terminal segments.  
Superior appendage black, regularly incurved terminally, a little longer than segment



10, bearing a rounded tubercle below and rounded teeth. Inferior appendage very short.

Abd. 30 mm (p. 84), 31 (p. 89); hw. 20 mm; pt. 1 mm.

Locality: Madagascar. ♀ unknown.

The above description infers that there were several males in the original series. Like other descriptions in this 1910 paper the vital characters of the anal appendages were very vaguely sketched, without figures to clarify them. However, the one surviving ♂ labelled *pruinescens* by Martin fills in all the missing features of the description including the rounded sub-basal tooth which is evidently Martin's "un tubercle arrondi".

Martin continues (p. 90) to say this may be the same species as *simulatrix* and *simulans* but separated on colour, which is hardly a valid reason for describing two new species, distinguished from *simulator*. He says "On pourrait se demander si les trois formes *simulatrix*, *simulans* et *pruinescens* n'appartiendraient pas à la même espèce. J'ai cependant cru devoir les séparer en l'état actuel, d'autant mieux que la coloration de *pruinescens*, absolument particulière, semble ne pouvoir être la coloration à l'état très adulte des autres espèces."

Schmidt (1951) says he had seen the type of *pruinescens* in Paris Museum and decided it was an adult *simulatrix*. It must be assumed that the specimen he actually examined was the new lectotype.

Examination of this well pruinosed, strongly melanic ♂ *pruinescens* in 1977 clearly indicated that it differed both in venation and anal appendages from *simulator*.

*Lectotype. Mature* ♂. Labrum green. Postclypeus and entire head above black. Orbits below black with white pruinosity.

Thorax all black with white pruinosity (the combination giving a bluish tone), on dorsal and ventral surfaces; markings obscured. Prothoracic hind lobe (fig. 139) moderately broad in centre, abruptly narrowed laterally.

Hind femur ochreous inwardly, with narrow black posterior line joined at distal end to a very broad black latero-anterior band enclosing a yellow hyphenated line. Hind tibia ochreous, black anteriorly; tarsi black.

Wings hyaline. Venation black. Pterostigma short, broad, black, with faint pale anterior line. (In right forewing the apical, post-pterostigmatal cells are rather malformed). Forewing with 12 (left), 11 (right) Px. Ac at point of departure of anal vein. Space  $R_4$ -MA with intercalaries shorter than usual, starting at Px 6 in forewing, Px 7 in hindwing; without extra distal intercalaries.

Abdomen segment 1 white pruinose; segments 2-9 with black dorsal band; on segment 9 with broad pinkish white annulus, severed by a fine black dorsal line, on distal two-fifths of this segment. Segment 10 dark ferruginous with some black markings; without dorsal carina; terminal excision broad.

Anal appendages black (figs. 136, 137). Superior appendage gradually forcipate, slightly longer than segment 10; with outer denticles. Sub-basal tooth rounded, obtuse. Flange simple, gently curved, only minutely serrate, without terminal teeth. In lateral view the superior has a small latero-ventral ridge. Inferior appendage broad, extending about one-fifth as far as superior, with slender inner fold; in side view the conical apex incurved ventrally before apex; apical hair not orange. Prophallic head with ligula shorter than in *simulator* and less grooved; terminal ridge simple (fig. 138).

Abd. 29 mm; hw. 20 mm; pt. 1,2 mm.

Apart from the slightly shorter intercalary vein, starting at Px 6 in forewing, it differs from *simulator* in the rounded sub-basal tooth; flange without the two distal teeth; and slight differences in the inferior appendage.

**Distribution.** Madagascar.

**Material examined.**

Lectotype ♂ in *PMNHN*.

Other information (1977):

*USSRL*.

*L. pruinescens*, Madagascar. Martin Collection.

**LESTES (ICTEROLESTES) ICTERICUS** Gerstaecker Text fig. 140-150, pp. 341, 434

*Lestes icterica* Gerstaecker, 1869: 222, nr 83; Gerstaecker, 1873: 52; Förster, 1906: 342

*Lestes ictericus* McLachlan, 1895: 28; Martin, 1910: 87; Ris, 1912: 149 fig. 1; Schmidt, 1951: 122, 123; Gambles, 1976: 15-24, figs.

*Lestes jacobi* Martin, 1910: 86, 93; Martin, 1912: 97 (Sikasso); ?*jacobi* Schouteden, 1934: 77; *jacobi* Pinhey 1966a: 1; 1966b: 284, 285 (syn. ad *disarmata* Fraser)

*Lestes geminata* Fraser, 1951b: 1093 **syn. nov.**

*Lestes disarmata* Fraser, 1961, *In*: Pinhey, 1961a: 11 fig. 1

*Lestes disarmatus* Pinhey, 1962c: 892 (allotype ♀); Pinhey, 1964a: 326 (Victoria Falls); Pinhey, 1964b: 97; Gambles, 1976: 18, fig. (syn. ad *ictericus* Gerst.)

Gerstaecker's Kenya type ♂, in *BMZHU* was briefly examined in East Berlin in 1964. It bears this information:

"Mombas [*sic!*], V. D. Decken, no. 3944." Like other types the abdomen is incomplete, segments 7-10 being lost. I noted that the body was almost uniformly brown; pterostigma

brown; forewing with 12 Px; Ac at point of separation of anal vein except right hindwing where it is slightly before this point. Forewing 17,5 mm.

Gerstaecker's original brief Latin description said:

♂. Testacea, unicolor, pectoris lateribus pallidioribus, abdomine brunneo, vertice infusato: alis hyalinis, flavo-venosis, stigmatibus dilute brunneo.

A *Lestes pallida* Rambur et *ochracea* Selys corpore unicolore alisque brevioribus discedens. ♂ Mombasa Sept. 1862."

For measurements he gave hindwing 18 mm, (total) body length (only up to segment 7) 30 mm. This indicates that the end segments were missing even in 1869. Later workers commented on this. McLachlan (1895: 28) says it was a single mutilated example from "Mombasa" and Ris (1921) also says the abdomen was incomplete. Gerstaecker's description shows that he considered *icterica* differed from *pallida* and *ochracea* by its more uniform body coloration and shorter wings.

**Characters.** Plain brown and yellow body; pterostigma short; wing-apex broadly rounded, the venation here rather open. Ac often before separation of anal vein. Post-lateral projection behind antennal socket more obtuse than normal. Superior appendage with reduction of all dental armature. Head of prophallus with broad lateral folds and no terminal hood. Supra-anal plate large and prominent. (fig. 143).

**General description.** Sometimes with slight ventral pruinosity.

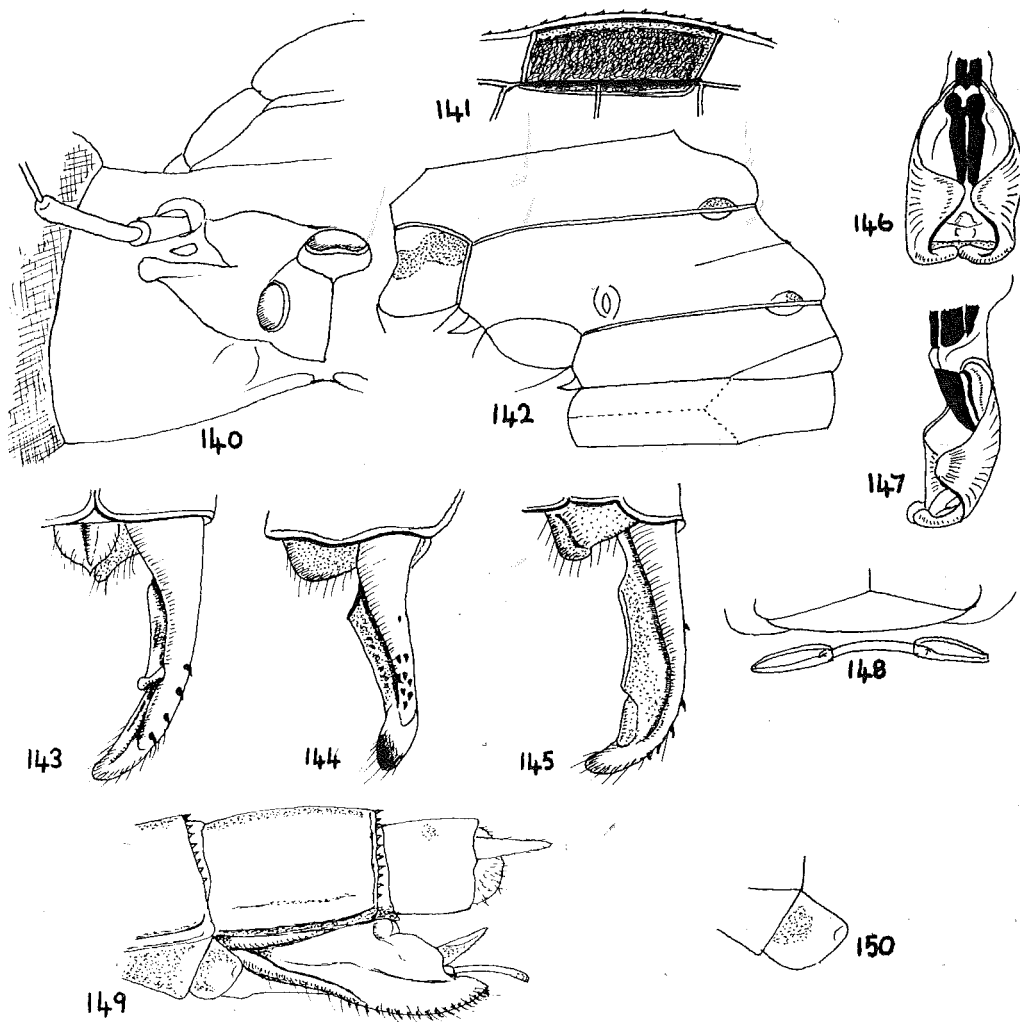
*Mature* ♂ (*Nuanetsi*). Labrum pale blue (or greenish blue), sometimes brownish yellow. Postclypeus and head above ferruginous, to black in older examples, the occipital area browner. Orbits ventrally all pale yellow.

Prothorax brownish yellow anteriorly, the rest dorsally brown with black maculae; hind lobe broad. Synthorax plain brown on mesothorax to about halfway down mesepimeron; rest of sides and sternal plates contrastingly all yellow, without dark markings; in others with black traces at ventral end of mesepisternum and on mesinfraepisternum (sometimes partially due to decomposition).

Legs brownish yellow. Femora 2-3 with three or four indefinite brown striae, more strongly developed on fore femur. Tibiae 2-3 with brown anterior stripe, fore tibia with inner and lateral stripes. Tarsi unmarked. Black setae contrast with the general pale brown colour.

Wings hyaline, to faintly fumose in old examples. Veins nearly black, except costa brown, yellow anteriorly and  $R_1$  brown. Pterostigma short, broad (as in fig. 141) or moderately broad; grey to deep or blackish brown (greyish-yellow in juvenile); posterior vein of pterostigma straight, dark brown, distal vein longer than proximal; in some there is a fine yellow anterior line, in one from Nuanetsi the entire anterior half of the pterostigma is yellow;

in others the proximal and distal edges are hyaline; or there is a combination of all these; above 2 cells or less. Forewing with 11-13 Px. Ac frequently a little before separation of anal vein in all wings, less frequently at this point. Venation rather open in apical region. Below and before pterostigma there may be two or three doubled cells, as in the *pallidus* group. Space  $R_4$ -MA enclosing long intercalary veins starting Px 4 — Px 5, with short distal veins.



Subgenus *Icterolestes* (140-150). *L. ictericus*: 140. left side of head, with tubercle in antennal cavity; 141. pterostigma right forewing; 142. synthorax; 143-145. right anal appendages above, left ones from side, left ones ventrally; 146, 147. prophallus (all ♂ Nuanetsi); 148. hind lobe of prothorax and mesostigmal lamina and 149. end segments of abdomen and ovipositor sheath (♀ Katambora); 150. left side of vulvar scale (Maramba River).

Abdominal segment 1 with grey or grey-brown dorsal irroration on distal half. Segments 2-8 with grey-brown dorsal band, deeper brown on 7-8, with subapical lateral spots on 3-7. Segment 9 yellow with dorsal brown or dark brown irroration, lessening or absent on distal quarter or third, thus with broad yellow distal annulus; with black mid-dorsal line or broad band on 9, or on 8 and 9. Segment 10 all yellow above or sometimes with brown distal annulus. In juveniles the general dorsal colour is paler, but normally with the dorsal line on 8-9 or on 9 and the broad pale distal annulus on 9; 10 sometimes with a pair of minute dorsal brown dots. Segment 10 without crest, the distal invagination slight. Supra-anal plate angular, somewhat ridged above, yellow and more prominent than normal.

Superior appendage rather short, gradually forcipate, poorly armed; yellow to brownish yellow; a small group of short outer distal black denticles, shown in side view to be in pairs. No sub-basal inner tooth; flange gently curved, narrowish, without dentition, with a slight distal tumour, followed (dorsal view) by a slight curved ridge which is yellow or partly black. Sometimes there is some dark brown or black on flange or near apex of appendage. Inferior appendage broadly rounded, almost conical, extending, in side view, only about one-fifth as far as superior; ventrally exhibiting a slight inner fold. Head of prophallus without ligula but with very broad lateral folds, covering the distal ends of the stem. Terminal ridge simple.

Examples from Victoria Falls area and Katambora are similar. A mature ♂ from Madi Opei has a greener labrum, head ferruginous, segments 8-9 dark ferruginous, with black median line. Otherwise similar.

Abd. 28,5-33,5 mm; hw. 17-20 mm; pt. 1,25-1,3 mm.

♀ (*Nuanetsi*). Labrum brownish yellow. Postclypeus and head above yellowish brown. Orbits below yellow.

Prothorax mainly brown; hind lobe broad. Mesostigmal lamina narrow, with short, thick, often elliptical posterior ridge. Synthorax as in ♂, with or without traces of dark markings.

Legs with markings even more reduced.

Wings as in ♂. Pterostigma greyish yellow to grey-brown, with similar variation. Ac, again, normally before start of anal vein, sometimes even well before it, in others at this point.

Abdominal dorsal band paler or faint, deeper on segment 8; segment 9 yellow with brown mid-dorsal line, or mainly brown with distal third yellow. Segment 10 yellow, with or without dorsal dots. Cerci broadish, yellow. Ovipositor sheath short, broad, brownish yellow; ventral edge scarcely curved in basal half, more denticulate and convex on distal half, the denticles variably small to very prominent in a Dondo ♀. Vulvar scale simple, its lateral edge parallel to the ventral hinge.

Abd. 27,5-31 mm; hw. and pt. as in ♂.

Females from Victoria Falls spray forest ("rain forest"), Maramba River and Katambora

show only slight differences: Ac sometimes at start of anal vein; segments 8-9 both yellow with brown dorsal line, which sometimes extends finely on to 10.

Four examples from Ivory Coast submitted by Legrand (1977) showed some black thoracic markings which were obvious stains since they were more developed on one side than on the other. Black fasciae on mesinfraepisternum in two of these males were, however, probably natural. Forewings with 12 Px on both sides in one ♂, 12-13 in two others, 13-14 Px in a ♀. Pterostigma brown in 1♂ 1♀, black in the other two males. Ac at or just before separation of anal vein. Wing apices broadly rounded. Prophallus in Lamto ♂ (Forges) as described above.

*Lestes jacobii* Martin (1910)

Type ♂ and ♀ described from "Congo" are apparently lost. Martin's description (adapted and translated) gave the following information:

♂. Lips yellowish. Epistome bluish or greenish yellow. A black band on frons. Head above mainly violaceous blackish; yellowish posteriorly. (Syn-)thorax red-brown above with ill-defined blackish antehumeral (evidently discoloration).

Legs yellow, scarcely marked with black.

Wings somewhat yellowish. Pterostigma rectangular, blackish brown. Forewing with 12-13 Px.

Abdomen matt-black above, segment 10 yellow-brown, a trace of yellow at end of 9.

Superior appendage brownish yellow, longer than segment 10, straight but regularly incurved distally, without visible teeth. Inferior appendage extremely short.

♀. Thoracic black much reduced. Abdomen mainly ferruginous, tinted with blackish; segment 10 brown. Cerci brown, conical, pointed and very short.

Abd. ♂ 30, ♀ 27,5 mm; hw. 17 mm; pt. 1,25 mm.

The general colour, and the unarmed superior appendage urged me to place this in synonymy with *disarmatus* (Pinhey, 1966b), so that it now falls to *ictericus*. The black markings were probably due to staining although it might have been a dark ♂.

The ♂ from Kienge in *CAS* identified as *jacobii* (= *disarmatus*) was noted at the time to be darker than normal on thorax and abdomen; subterminal abdominal segments dark brown, segments 10 and appendages paler brown, without mid-dorsal stripe on 10. Anal appendages as in *disarmatus*.

*Lestes geminata* Fraser (1951b)

Type ♀ from Mbaou (near Dakar), Senegal, (A. Villiers), in *PMNHN* was kindly loaned

for this revision. I had previously examined it in Paris in 1964 and 1974. It bears the following labels:

“(blue, in script) SÉNÉGAL — M’ Bao, 9.IV.1948 — A. Villiers rec; (blue, printed) Museum Paris; (white, Fraser’s script) *Lestes geminata* ♀ n. sp. ♀ Fraser det. 1951; (red, printed) TYPE.”

It is a well mature ♀ with badly damaged wings, pterostigmata only present in left wings.

♀. Labrum brownish yellow. Head pale ferruginous above, paler below, with some white pruinosity.

Thorax all pale ferruginous above, with traces of ventral white pruinosity.

Legs very pale brownish yellow, showing up the black setae.

Left hindwing less fractured than the others and shows the rounded apical area of *ictericus*. Venation pale brown anteriorly, darker posteriorly. Pterostigma brown, the distal end finely yellowish white; short, rectangular; above less than 2 cells. Left forewing with 12 Px. Ac just before separation of anal vein in all wings.

Abdomen pale brown, darkening at distal ends of segments. Segment 10 paler brownish yellow above. Only the left cercus remains: acute, pale yellow. Ovipositor sheath as in *ictericus*.

In Fraser’s description he says the wings are hyaline, palely tinted yellowish; venation pale brown. Forewings with 12-13 Px, hindwings 11 Px. He noted that some sub-costal veins distal to the pterostigmata were bifurcate and the ovipositor sheath projected more than in *pallidus* and was more robust. His measurements:

Abd. 30 mm; hw. 19 mm.

There seems no doubt that *geminata* is the same as *ictericus*. Legrand (*in litt.* 20 May 1976) suspected it to be similar to *disarmatus*. I have added a label on the synonymy to *ictericus*.

#### *Lestes disarmata* Fraser (1961)

The specimen described by Fraser was sent by me from a series collected in northern Uganda by Jackson. This holotype ♂ is in the *BMNH* and bears the labels:

“Madi Opei, Acholi, Uganda, March 1952, T. H. E. Jackson; (red label, Fraser’s script) Holotype *Lestes disarmata* sp. nov., F. C. Fraser 1953, L.102.” This type is listed by Kimmins (1970: 195). It is a darkish example of this taxon: Labrum brownish yellow; head and thorax dorsally deep brown. Forewing with 12½ (left) and 12 Px, hindwing with 12 and 11 Px.

Fraser's figure of the anal appendages clearly show the characters. Fraser's measurements:

Abd. 31 mm; hw. 17 mm.

Allotype ♀ (Pinhey 1962c; 892) from near Nuanetsi River, S.E. Rhodesia, April 1961 (E. Pinhey).

Gambles (1976) showed that *disarmatus* was conspecific with true *ictericus* Gerstaecker (nec Ris) when he borrowed the *ictericus* type from East Berlin.

**Ecology.** Found very locally, mainly in somewhat drier areas, at grassy or reedy rain pools or flood pools near large rivers; at Victoria Falls in the spray forest. Gambles (1976) found it among reeds at a flood-pool near a river and indicates that it does not wander from the site but it is occasionally found in dry grass in the dry season in Nigeria.

**Known distribution of *ictericus*.** Mozambique, Rhodesia, Malawi, Zambia, Zaire, Kenya, Northern Uganda, Sudan, Ivory Coast, Senegal. A ♀ in Selys Collection Bruxelles, from Dakar, labelled *ictericus* by Ris (1930) may possibly belong here (see under *pallidus*). The Malawi record was provided by M. J. Parr (*in litt.* 1977) from Liwonde, Northern Province, Malawi, July and October 1976 (M. Parr).

#### Material examined.

*NMB.* (det Pinhey)

Mozambique: Dondo Forest, W. of Béira, 28 Oct 1953 (E. Pinhey)

Rhodesia: 170 km SE of Nuanetsi, 21° 55S, 31° 30E, S.E. Rhod., Apr. 1961 (E. Pinhey);  
Victoria Falls, July 1955, Apr. 1962 (E. Pinhey); Que Que, 9 Nov. 1978 (M. Villet)

S.W. Zambia: Maramba River, near Victoria Falls, May 1963 (E. Pinhey); Katambora,  
Zambezi River, 58 km W. of Livingstone, May 1963 (E. Pinhey)

Northern Uganda: Madi Opei, Acholi, March 1952 (T. H. E. Jackson)

Malawi: Senga hill, Salima, Dec. 1979 (J. G. M. Wilson)

#### Previously identified:

Pinhey (1966a: 1), for *CAS*:

♂ 13 miles (21 km) N. of Kienge, 980 m, Shaba (Zaire), 22 Jan. 1958 (E. S. Ross)  
(ident. as *jacobi*)

#### Identified as *ictericus* for *PMNHN*, 1977:

Ivory Coast: ♂ ♀ Lamto, Pont Pons, 18 June 1970 (G. Duvalet); ♂ Odienné, 15 July  
1973 (V. Viltard); ♂ Lamto, 27 Sept. 1974 (Forges)

#### Re-examined and checked in *PPIS*, Feb. 1978:

Zambia: ♂ ♀ Maramba Riv., Victoria Falls, 18 May 1963 (E. Pinhey)



## Types examined:

- Type ♂ *ictericus* from Kenya, in 1964  
 Type ♀ *geminatus* from Senegal, in 1964, 1977  
 Type ♂ *disarmatus* from Uganda (sent to Fraser)

## Further records:

- Ris (1912: 167-169), "ictericus" from Sudan: see *pallidus*.  
 Fraser Colln, *BMNH*, *ictericus* (as "*pallida*")  
 ♂, ♀ Dakar, Senegal (A. Villiers) (teste Gambles, 10 May 1978)

LESTES (XEROLESTES) PALLIDUS Rambur Text fig. 151-188, pp. 341, 347, 443, 449

*Lestes pallida* Rambur, 1842: 252, nr 12; Selys, 1862: 325 (41 sep.); Martin, 1912: 97

*Lestes pallidus* Kirby, 1890: 163 (Senegal); Förster, 1906: 342; Ris, 1908: 308; Martin, 1910: 87; Martin, 1912: 97 (Sikasso); Fraser, 1950: 108-112, figs. 1, 2 (good figs and synonymy); Fraser, 1951b: 1094 (Dakar); Liefstinck, 1960: 137 (type); Pinhey, 1961a: 10; Pinhey, 1961b: 12; Pinhey, 1962b pars: 95 (with synonymy); Pinhey, 1967c: 2, 7; Aguesse, 1969: 85 (Senegal); Lindley, 1974: 688, 690 (Ivory Coast); Carfi, 1974: 152; Gambles, 1976: 15-24, figs; Pinhey, 1976: 531; Dumont, 1977: 576 (Senegal, Mauritania);

*Lestes ictericus* Ris (nec Gerstaecker), 1908: 309; Ris, 1912: 149 fig. 1; Ris 1921: 270 (syn. Gambles, 1976)

*Lestes pallidus* f. *ictericus* Pinhey, 1951: 42

*Lestes pallidus* f. *ochraceus* Pinhey (nec Selys) 1951: 44

*Lestes somalicus* Förster, 1906: 339-341; Martin, 1910: 84; Fraser, 1950: 109 (syn. *a. pallidus*)

*Lestes pallidus* f. *somalicus* Pinhey, 1962b: 95; Gambles, 1976: 16

*Lestes cineraceus* Martin, 1910: 86, 87, 93; Pinhey, 1962b: 95; Pinhey, 1964a: 324 **Syn. nov.**

*Lestes radiatus* Martin, 1910: 87, 94; Pinhey, 1962b: 94; Gambles, 1976: 16 **Syn. nov.**

*Lestes chromatus* Martin, 1910: 87, 94; Martin, 1912: 97; Pinhey, 1962b: 95; Gambles, 1976: 16 **Syn. nov.**

*Lestes wahlbergi* Ris, 1921: 273 fig 10; Pinhey, 1951: 51; Gambles: 1976: 16

*Lestes pallidus* f. *wahlbergi* Pinhey, 1962b: 95 (synonymy)

*Lestes stigmatus* Navás, 1924: 321 (9 sep.) nr 59, fig. 4; Gambles, 1976: 16

*Lestes pallidus* f. *stigmatus* Pinhey, 1962b: 95 **Syn. confirm.**

In this review it will be confirmed that *somalicus*, *wahlbergi*, *cineraceus* and *stigmatus* are synonyms of *pallidus* and it will be indicated that *chromatus* and *radiatus*, of which no types can be found, are also, conspecific. It may also be noted that Navás (1924: 323) described another (Columbian) species as *pallidus* Navás, a homonym which has since been renamed *L. confusus* Fraser (1950: 109).

All the above synonymized taxa are in reality only individual varieties and *pallidus* itself is, at least in Southern Africa, only an aberrant form. These forms are generally separable into two basic colour forms, sometimes with some overlap, and post-mortem changes may confuse such patterns that might exist in the fresh condition. The browner or yellower form includes the pale *chromatus* and *somalicus*, with melanic tendencies which were described as *cineraceus*, *pallidus* and *radiatus*. The other form is basically greener, the slightly marked *stigmatus* and the strongly melanic *wahlbergi*, with smokier wings.

Fraser (1950: 108, with excellent figs) took a different approach when he examined a very variable series of *pallidus* in PMNHN from Mts de l'Air and Senegal, collected by L. Chopard and A. Villiers. Assuming these (including "ochraceus") to be all variations of *pallidus* he divided the material into xerophytic and melanotic forms. Fraser had, in 1948, disclosed his conclusions on the synonymy of these forms to Pinhey who was at that time preparing *The dragonflies of southern Africa* (publ. 1951).

It is probably true that the paler or xerophytic forms may predominate in drier areas, the melanotics in other, moister ecological conditions. It does seem that in Northern Botswana and particularly in the Okavango swamps where the black *wahlbergi* is at times predominant, this appears likely to be largely due to flood conditions. It must also be emphasised that melanics appear to develop from paler less mature morphs under such conditions.

All the morphs, including *pallidus*, can intergrade in populations to a greater or lesser extent and exact replicas of their described or type-forms are generally scarcer than intermediates. However, except in one respect, the variable pterostigma, *somalicus* shows a tendency to constancy in coloration and lack of dark markings.

In the review and diagnosis of these forms, the original description of each morph will be discussed, starting with type *pallidus*. Following this, notes and descriptions will be given of other available material.

*Comparisons.* Distinctions from the closely related *ochraceus* are given under that species and in Gambles (1976). Venation normally less close in apical region. Pterostigma usually shorter, quite often bicoloured. Forewing with lower postnodal index. Only 1-2 doubled cells in ultranodal sector before pterostigma. Superior appendage more gradually forcipate; inferior appendage with a small base subtending a slightly upturned nodule. Vulvar scale more rounded, slightly extended at apex. In *pallidus* there is a stronger tendency to melanism.

**Form *pallidus* Rambur (1842)** (figs. 151, 166, 171-173, 177, 178)

Type ♀ in de Selys collections, (*IRSNB*) has been examined by many specialists, including Ris (1930) and Fraser, later by Lieftinck who designated it a holotype (1960) and I saw it in 1974. It now bears a superfluity of labels: "(whitish label, script, probably Rambur's) Sénégal; *Lestes pallidus*; Ramb; (pinkish label) *Lestes pallidus* R ♀; 42; (grey label) Collection Selys *Lestes pallidus* Ramb. Revision Ris 19 . . . ; (grey card edged with red) Type (written in red) *Lestes pallida* Ramb; (red label) Holotype; (white label) Holotype *Lestes pallidus* Ramb. det. M. A. Lieftinck '60."

Gambles (1976) believes that the Senegal label on this type is erroneous and that the Cape, as in Rambur's description was correct. He also suggested that a neotype should be created, but this hardly seems necessary. The black stripes of this type appear to be more frequently seen in the Senegal specimens I have examined than in the very much longer series of the species available from southern Africa. I am inclined to believe Senegal to have been the locality of the designated type, even if Rambur had a Cape specimen at the time of description. Perhaps his "Cap" was "Cap Vert" or Cape Verde, very close to Dakar?

The specimen is in very poor condition: segment 2 is quite gummed up, obliterating sex-distinction since the terminal segments of the abdomen are incomplete. I recorded brief notes (supplemented March 1978 by Demoulin): Labrum and genae yellow; head above pale brown. Thorax (fig. 151) yellowish brown; with blackish brown median carina separated from a broad upper black band by a pale brown line; a dark streak at both ends of humeral suture; a thick bar on mesinfraepisternum; and a short streak on upper part of second lateral suture. Legs yellowish brown, with black lateral stripes. Pterostigma yellowish brown.

Forewing with 9-10 Px.

Hw. 22,5 mm; pt. (forewing) 1,5 mm.

Also, in de Selys collection there is a Dakar ♀ examined by Ris (1930) who considered it to be *ictericus*. I examined it briefly in 1974, before Gambles' separation of true *ictericus*, so it is not certain whether this is a *pallidus*. It bears the labels: "(blue label) Dakar; (blue) *pallida*; (a label in Ris' script) 'Sans doute cet expl. n'est pas de la même espèce que le type. C'est près probablement une ♀ *L. ictericus* (Gerstaecker)' — Ris; (grey card) Collection Selys, *Lestes pallida* Ramb, Revision Ris 1930, *Lestes ictericus* Ris". In this example the face, head above, thorax, abdomen and legs of this ♀ are yellowish brown, with only traces of darker brown on head and thorax; pterostigma and costa brownish yellow. Abd. 32,5 mm; hw. 22 mm.

Rambur's original description was surprisingly detailed for such an early date as 1842, especially for a ♀. There is firstly a Latin résumé followed by the main description in which he compared the size to *L. forcipula* (Charp.) a synonym of *sponsa*. A few extracted notes, particularly of the abdomen, may assist, to supplement those from the damaged type given above: Head and thorax yellow; thorax with incomplete stripes and a black humeral line.

Femora with two black lines. Pterostigma rather large, yellow, Abdomen yellowish; with dorsal brown or blackish band on part of 7, all of 8, most of 9 and 10. Cerci yellow, almost as long as 10. ♂ stated to be unknown.

For locality he gives "Du Cap."

*Diagnosis:* *pallidus* is a pale form with black upper stripe on mesepisternum, partial humeral line.

**Form *somalicus* Förster (1906)** (figs. 154, 158, 163, 164, 167-170)

The Förster collection originally contained 3♂, 3♀ in the type series, all from Bucha, Manefluss, Webbi District, 5 Apr. 1901. They were collected during the Carlo, Freiherr von Erlanger Expedition (1901), in Somaliland, but the locality is now in Ethiopia. Dermestid activity later, unfortunately, damaged some of the Förster collection before its present deposition in *UMAA*. Mrs. Gloyd has informed me that none of the series is known to exist now.

Förster's original description was moderately detailed but unillustrated. Extract (adapted and translated from the German):

♂. Older specimens had some white pruinosity. Labrum pale blue-green or olive, edged with black, with central dark line on basal half. Head above reddish brown.

Synthorax dorsally dark brown on either side of median carina.

Femora and tibiae pale yellow with fine black lines.

Wings hyaline. Venation brown, nodal cross-veins yellowish. Pterostigma mainly black, but outer part whitish yellow (all black in old ♂). Forewing with 10-11 Px.

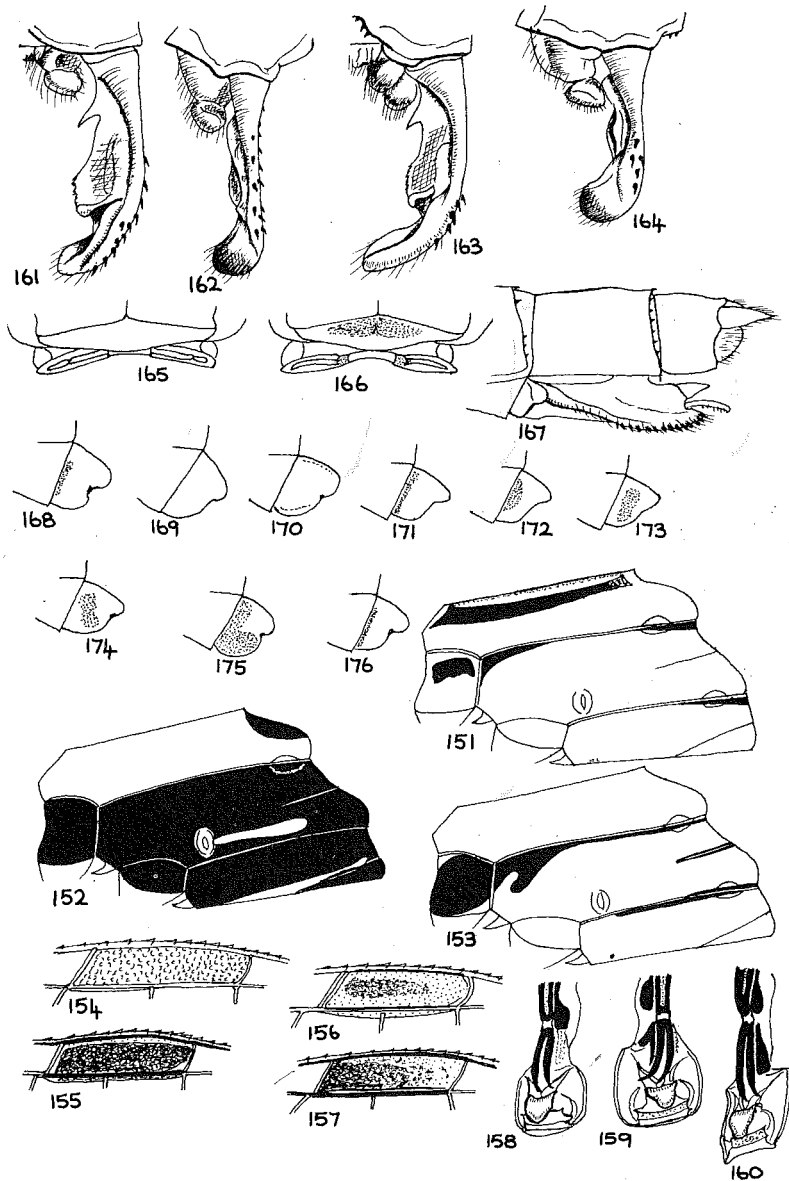
Abdominal segments 1-3 dorsally pale blue-green, redder distally, and on 1-5 an indistinct black fascia before distal ends.

Anal appendages reddish brown (darker in older ♂). Superior appendage rather longer than 10, forcipate, gradually inturned, club-shaped apically and with outer denticles. Sub-basal tooth well developed, followed by a broad flange. [Inferior appendage unmentioned].

Abd. (? with append.) 35 mm; hw. 21,5 mm; pt. 1,5 mm.

♀. Like ♂ but entire colouring paler, yellowish-red to fawn green. Labrum and face pale yellowish brown. Pterostigma paler brown, yellowish white distally. Forewing with 9 Px. Abdomen 1-2 with centro-lateral black dots. Cerci pale yellow, lanceolate, about three-quarters as long as 10. Ovipositor sheath dark coloured.

Abd. 32 mm; hw. 23,5 mm; pt. 1,75 mm.



Subgenus *Xerolestes* (151-176). *L. pallidus*: 151-153. Synthorax of holotype ♀ *f. pallidus*, ♂ *f. wahlbergi* (Maun, with pale areas green), ♀ *f. wahlbergi* (Nata); 154-157. pterostigma right forewing, ♂ *f. somalicus* (Bulawayo), ♂ *f. stigmatus* (Wankie), ♂ *f. wahlbergi* (Maun), ♂ *f. stigmatus* (Massangena); 158-160. Prophallus of *f. somalicus* (Ladysmith), *f. stigmatus* (Massangena), *f. wahlbergi* (Tsau); 161, 162. right anal appendages above, left ones from side of *f. radiatus* (Dakar); 163, 164. same, of *f. somalicus* (Bulawayo); 165, 166. Hind lobe of prothorax and mesostigmal lamina ♀, of *f. cineraceus* (Paris Mus.), *f. pallidus* (Nata); 167. terminal segments and ovipositor sheath of *f. somalicus* (Matetsi, *in cop.*); 168-176. left side of vulvar scale of *f. somalicus* (Kabwe, Turkana and Gwanda); *f. pallidus* (Linguère, Fort Lamy and Francistown); *f. wahlbergi* (Francistown, Gweta and Maun).

Referring to the coloration, particularly of the ♀, Förster considered it had the yellow brown tone of a steppe species.

*Remarks:* Despite the lack of information on the inferior appendage the other features strongly suggest a large pale form of *pallidus*. Martin (1910: 95) comments on the black pterostigma, but although in paler forms of *pallidus* it is normally browner, it is sometimes black and the pale outer zone is quite characteristic of this species, not found in any other African species except *barbarus*. In some other species the distal vein or edge may be pale but not any substantial distal portion of the pterostigma.

It can be accepted here as the common pale brown form of *pallidus*, found in drier areas, such as the Kalahari, but also, in juvenile state, being the precursor to other darker forms of this species.

*Diagnosis:* *somalicus* is the normal pale sparsely marked brown or reddish brown form of *pallidus*.

#### Form *chromatus* Martin (1910)

Type ♂ (and ♀) lost. The ♂ (Senegal) was *pallidus* but the ♀ (Soudan), doubtfully associated with it, was evidently an *ochraceus*.

Martin's description (adapted and translated):

♂ (Senegal). Head yellow, darker above.

Prothorax yellow with black lines. (Syn-)thorax (Martin p.87) brown with broad yellow antehumerals or (p.94) yellow with two broad brown antehumerals, poorly defined [almost certainly decomposition]; ventrally yellow.

Legs yellow with blackish lines.

Wings, with long veins yellow. Pterostigma narrow, rectangular, much elongated — 5 times as long as broad — pale yellow. Forewing with 9 Px.

Abdomen brown (p.87), yellow (p.94!); segment 1 all yellow; 2 with narrow black dorsal stripe, widened distally; 3-6 with brown dorsal band, 7-8 blackish; segments 9-10 yellow with narrow black dorsal stripe; segment 10 not invaginated distally. Anal appendages yellow. Superior appendage longer than 10; straightish, then regularly incurved before apex; with very acute yellow (sub-)basal tooth. Inferior appendage very short, nipple-shaped.

Abd. (? with append.) 35-36 mm; hw. 25 mm.

(♀ (Soudan): like ♂ but (syn-)thorax uniformly yellowish brown; a trace of a divided black lateral line; legs blackish; forewing with 13 Px; abdomen yellowish brown; 8-10 with narrow black dorsal line; cerci very short, brown).

*Remarks:* The type ♂ (Senegal) can be assumed, *in absentia*, to have been a large very pale *pallidus*. The non-invaginated end of segment 10 is not clear but its straightness may be relative, because the invagination in this group may be quite shallow at times. The inferior appendage strongly suggests *pallidus*, as well as the low post nodal index. The pale yellow pterostigma suggests either a teneral (unlikely because of black abdominal markings) or it may have been from a very arid locality in Senegal. The Soudan ♀, with its higher postnodal index, is most likely *ochraceus* which often has the dark dorsal line on 8-10. It will be recorded here in the distribution data for *Lestes ochraceus*.

*Diagnosis:* a yellow arid form with very elongated pterostigma.

**Form *cineraceus* Martin (1910) (fig. 165, 183)**

Martin's type ♂ appears to be lost and only an incomplete ♀, named by Martin and lent by Legrand in 1977, remains in *PMNHN*. It has no type label and abdominal segments 6-10 are missing. The data labels it bears are:

"(white label, Martin's script) *Lestes cineraceus*; (green, script) *Lestes* — Afrique; (blue, printed) Coll. R. Martin — 1920 — Museum Paris."

Extract of Martin's description (adapted and translated):

♂. Entire upper side of body uniform grey-brown. Some ventral pruinosity. Face testaceous, epistome rather bluish. Head above brown, yellow posteriorly.

Prothorax blackish, shaded with brownish. (Syn-)thorax above brownish grey, below powdery white; with interrupted antehumeral stripe. Sides with blackish bands.

Legs yellowish, marked with blackish.

Wings very pale yellowish. Pterostigma longish, brown, the distal quarter pale. Forewing with 8-10 Px.

Abdomen brownish grey; greenish at sides of segments 1-2.

Superior appendage short, scarcely as long as segment 10; brown, regularly curved (p.93), but (in key, 86, 87) almost straight (!); distal end enlarged; an interior whitish median swelling, without teeth. Inferior appendage fairly short, in form of tubercles, obtuse apically.

Abd. 29 (in key, possibly both sexes, 27-29) mm; hw. 18 mm; pt. 1,25 mm.

♀. Rather like ♂. Face and head brownish yellow. Thorax above all grey-brown, ventrally yellowish. Abdomen greyish brown, segments 9 and 10 yellow with black dorsum. Cerci excessively short, very pointed, yellow. Abdomen 26 mm.

Damaged ♀, Paris Museum:

Mature ♀. Pruinosed and closely resembling females of *somaticus* pattern. Labrum greenish ochreous. Postclypeus and head above pale brown, with two grey dots in lateral depressions of postclypeus. (Posterior part of head stained with black streaks). Orbits below cream, with white pruinosity.

Thorax pale brown with thick white lateral and ventral pruinosity. Prothoracic hind lobe plain, pale brown, narrow, evenly curved behind. Mesostigmal lamina pale brown, with straightish posterior ridge; the ridge constricted [deformed, since the kink is more distal on one side than on the other]. Synthorax with fine black line on humeral suture, a fine short one with distal dot on first lateral suture, a black metepimeral spot behind the legs. Sternite pale brown with white pruinosity.

Legs pale ochreous. Femora 2-3 with incomplete brown outer stripe; left fore femur with black lateral and anterior lines [right fore leg slender, degenerate]. Tibiae 2-3 with black anterior stripe, left fore-tibia with outer and anterior stripes; tarsi ochreous.

Wings hyaline. Venation brown. Pterostigma rectangular, on upper surface black with distal third white, on reverse, deep brown with distal third cream; above 2 cells. Apices of wings shaped as in *pallidus*. Ultranodal sector with 1-2 doubled cells before pterostigma. Forewing with 11 Px both sides. Ac approximately at separation of anal vein in left wings, but appreciably before this point in right wings. Space  $R_4$ -MA as in *pallidus*.

Abdominal segment 1 above with grey distal band; segments 2-4 with grey-brown band on proximal three-quarters, ending in brown spots and hyphens; 5 with continuous grey-brown band, ending in hyphens. [6-10 missing].

Abdomen (segm. 1-5 only) 19 mm [Martin gives full length 26]; hindwing 21,5 mm; pterostigma 1,5 mm. Locality: "Afrique".

*Remarks:* The ♂ described by Martin agrees in bicoloured pterostigma, number of postnodals, venation and inferior appendages with *pallidus*. The greyness of the body was probably similar to the Paris Museum ♀ which is quite distinctly *pallidus*. The inadequately described male superior appendage is of no assistance in identification.

In 1964 I saw a ♀ placed under *Lestes cineraceus* in the BMNH It was labelled "Maraco, Abyssinia, 5/1915". It resembled a large *pallidus*, the body rather uniform pale brown.

*Diagnosis:* pale rather greyish brown, with black sutural lines and, in ♂, an interrupted antehumeral stripe.

**Form *radiatus* Martin (1910)** (fig. 161, 162, 184, 185)

Types evidently lost. The description seems to imply that there was a single example of each sex from Abyssinia (now Ethiopia).



Martin's description (adapted and translated):

♂. Labrum yellow, frons with black band; head above brown, back of head yellowish.

Prothorax blackish brown with two brown dorsal spots and a posterior band. (Syn-)thorax with pale violaceous dorsal band; blackish antehumeral lines, followed by a yellow band, then two black humeral lines; sides with two oblique black bands; sternites plain yellow.

Legs pale yellow at base, then brown, marked with blackish.

Wings faintly tinted. Pterostigma longish, narrow, brown. Forewing with 8-9 Px.

Abdomen segment 1 with blackish basal quadrilateral; 2-6 dark brown above, this brown restricted at base of 2; segments 7-10 matt blackish brown. Segment 10 very slightly indented apically.

Superior appendage brown, scarcely longer than 10 [shape unmentioned]; a sharp sub-basal tooth, followed by a yellow flange. Inferior appendage blackish, very short, directed upwards.

♀. Like ♂. Legs yellow with black lines. Segments 1-2 bronzed above, rest of abdomen blackish, except last segment dirty brown. Cerci short, pointed, brown.

Abd. ♂ 35, ♀ 31 mm; hw. 20 mm; pt. 1,25 mm.

*Remarks:* from these incomplete descriptions it may be assumed that *radiatus* was a large mature *pallidus*, on the basis of general colour, low postnodal index and the very short upturned inferior appendages. Martin (p.87) places it in his key amongst these paler *Lestes* and between *cineraceus* and *pallidus*, inferring that in his opinion it was close to these. The violet and yellow tones were probably post-mortem changes. The duplication in some markings — two humeral and lateral stripes — probably referred to the two sides of the thorax, as in some of his other descriptions. These blacker fasciae are evidences of a slightly melanised ♂.

*Diagnosis:* a large brown morph, the ♂ with blackish antehumeral, humeral and lateral (probably sutural) stripes. It could be considered just a more heavily marked *pallidus*.

**Form *stigmatus* Navás (1924) fig. 155, 157, 159, 179-182, 186)**

Type ♂ in *PMNHN* was loaned by Legrand. It has lost segments 6-10 and the anal appendages. It bears the labels: "(white) B.E. Afrika — Kibwezi — R. A. Dummer; (green) 12.1.22; (green, Navás script) *Lestes stigmatus* ♂ Nav., (printed) Navás S.J. det; (blue, printed) Museum Paris—Longin Navás legit 19—; (red, script) Typus." I have added a label "*L. stigmatus* Nav., syn. ad *pallidus* Ramb., forma."

Type ♂, mature, pruinosed: Labrum green; postclypeus blackish ferruginous; frons green,

black centrally; occipital zone green. Orbits above ferruginous, black posteriorly, below green with some white pruinosity.

Prothorax ochreous, with black fasciae on anterior collar, black triangles on middle lobe; hind lobe broadish, dark ferruginous, yellower laterally. Synthorax (fig. 179) pale green with ventral pruinosity; a broad yellow false (decomposed) band on mesepisternum; black lines at humeral and both lateral sutures, on first lateral suture continuing as an oblique stripe to join the band on second lateral suture just before the spiracle. Metepimeron edged black at dorsal end, continuing as a stripe along lower edge of this plate; a dark brown spot behind hind leg. Sternites with black lateral and anterior marks obscured by pruinosity.

Femora 2-3 pale ochreous with brown outer stripe fractured into spots; fore femur with two solid black stripes. Tibiae 2-3 with fine black anterior line, fore tibia with thick black outer and anterior stripes.

Wings shaped as in *pallidus*; fumose. Venation dark ferruginous. Pterostigma rectangular, purplish black with traces of cream at distal ends. Forewing with 9 Px. Ac at separation of anal vein. Space  $R_4$ -MA as in *pallidus*.

Abdominal segments 1-5 dark green dorsally.

Hw. 21 mm, pt. 1,5 mm [not 2 mm as in Navás].

For the abdominal terminalia, Navás' description (all in Latin) translates as follows: Segments 1-7 with faint reddish yellow apical annuli; 8-10 all black.

Anal appendages are clearly figured (Navás' fig. 4), both dorsal and lateral views, and are like typical *pallidus*. The inferiors are stated to be short and black.

Abdomen (teste Navás) 31,5 mm, hindwing 21,5 mm (pterostigma 2 mm)

♀ (also described in Latin): Labrum blue-green, frons reddish yellow. Pro- and synthorax paler with narrower fuscous striae. Pterostigma paler. Cerci short, conical, brownish yellow. Subgenital lamina [ovipositor] with black styles. Abd. 31,5 mm, hindwing 23,5 mm.

Locality: Kibwezi, 12 Jan. 1922 (R. A. Dummer). In Navás colln.

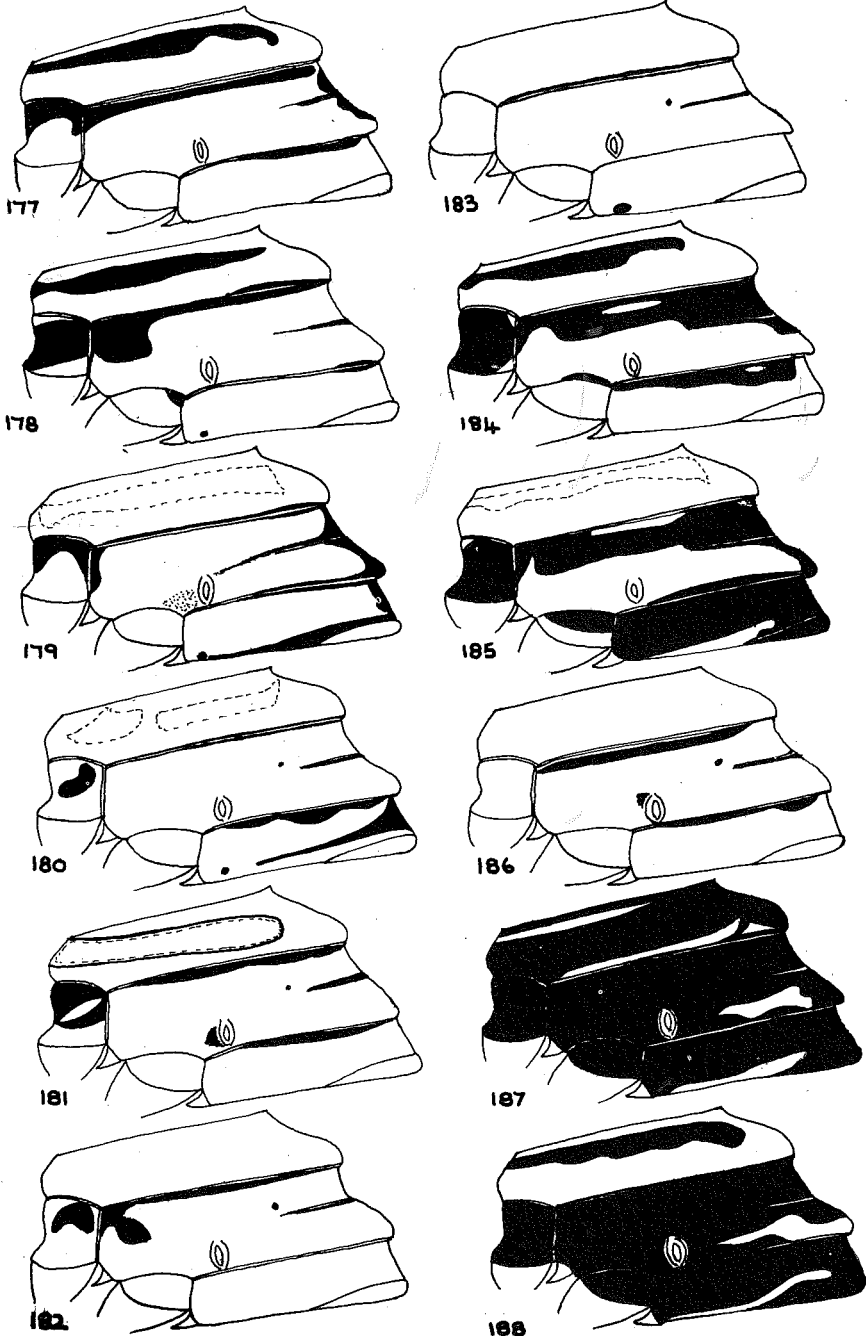
*Remarks:* By anal appendages, as well as other characters, this is a melanised green form of *pallidus*, a stage towards f. *wahlbergi*.

Kibwezi is in S.E. Kenya.

*Diagnosis:* A melanic green *pallidus* with fumose wings, black pterostigma, with black sutural markings on thorax; with strong black markings on metepimeron and sternites.

**Form *wahlbergi* Ris (1921)** (figs. 152, 153, 156, 160, 174-176, 187, 188)

The type, a single ♂ collected by J. A. Wahlberg in Caffraria, is in *NRS*. I have not examined it but the original description and figure are quite clear.



Subgenus *Xerolestes* (177-188). *L. pallidus* (continued): 177-178 synthorax of f. *pallidus* (♀ Senegal, ♀ Nata); 179-182. f. *stigmatus* (♂ type, ♂ Balla Balla, ♂ Turk Mine, ♀ Francistown); 183. f. *cineraceus* (♀ Paris Mus.); 184, 185. ♂ f. *radiatus* (Dakar, Olifants River); 186. lightly marked ♂ f. *stigmatus* (Wankie); 187, 188. ♂ f. *wahlbergi* (Tsau, Eranchi). Note: dotted lines outline decomposition markings.

Extract from Ris' description:

Mature ♂. Labrum pale yellowish brown with greenish shade. Head above dull to pale reddish brown.

Prothorax black. (Syn-)thorax dull black dorsally with three pale reddish brown lines on median and humeral sutures. Sides dull black; a broadish red-brown band on metepisternum. Ventrally black, with triangular yellowish spots on metasterna.

Femora with narrow black exterior lines; tibiae with internal lines.

Wings hyaline. Venation blackish. Pterostigma rectangular, reddish brown, the distal third pale yellowish brown.

Abdomen dorsally dark reddish brown, darker brown on segments 1-2; 3-6 with narrow distal annuli; segments 7-10 all black.

Superior appendage black and yellow (fig. 10 of Ris, identical to *pallidus*). Inferior appendage black at base (and shaped as in *pallidus*).

Abd. (with append.) 31 mm; hw. 18 mm; pt. 1 mm.

*Remarks:* by appendages and pterostigma this is a heavily melanised ♂ *pallidus*, although the wings are not fumose. This is usually the case with this morph.

*Diagnosis:* A strongly melanic *pallidus*, thorax all black except for paler stripes; pterostigma often bicolorous, wings not fumose.

### General descriptions.

Descriptions of examples pertaining to these morphs and their variants:

**Characters.** This is commonly a plain green or brown species with minimal markings on the thorax but with strong tendencies to melanism. Wings hyaline (fumose in many melanics). Pterostigma brown to black, often pale on distal third. Apical cells less dense than in *ochraceus*. Forewing with 9-11 Px. Ac at separation of anal vein. Usually 1-2 doubled cells in ultranodal sector before pterostigma. Space R<sub>4</sub>-MA with main intercalaries unusually long, starting at Px 2 to Px 3; with shorter distal veins. Inferior appendage characteristic, bulbous at base, subtending a small, rounded, upturned knob. Vulvar scale with distal margin rounded and slightly extended at apex.

### Examples of form *somalicus* Förster:

The reddish ♂ described by Ris (1921) as "ictericus" from Okosongomingo was evidently this *somalicus* form; also, those from White Nile and the series from the Kalahari were evidently *somalicus*.

*General description.* White pruinosity in mature specimens may be minimal or of moderate extent, ventrally and laterally. Several examples *in copula*.

*Mature ♂.* Labrum pale green, yellow or greenish yellow, even in same locality (whether semi-arid or palustrine). Head above brown to light or dark ferruginous, the postclypeus with or without dark dorsal dots (usually absent in arid zones). Orbits below yellow or pruinosed.

Pro- and synthorax pale to deep red-brown above, very occasionally more brownish yellow; sometimes slightly green, approaching the *stigmatus* form. Prothorax above unmarked, or with traces of black or brown fasciae. Lower sides and ventral surface usually paler, at least when fresh, or more brownish yellow. Usually no dark markings when in fresh condition, except a black metepimeral spot, sometimes elongated, behind the legs. Staining often develops as nebulous or regular grey, grey-black or yellow fasciae. More definite markings infer minor varieties; dorsal depression of second lateral suture crossed by black line (Nyamandhlovu ♂); black oblique stripe on mesepimeron, (a tendency towards *radiatus*) (Kachikau); or black dorsal dashes on each suture (Vant's Drift).

Femora 2-3 with brown or black outer stripe, often incomplete; stronger or blacker on fore femur; tracer on tibiae 2-3, blacker on fore-tibia.

Wings normally hyaline, rarely slightly fumose (examples Chiturapadzi and Khwaai). Pterostigma above 2 cells, very variable: dark brown, sometimes black; sometimes a trace of cream at distal end, or, cream or white on distal quarter or third (less so in hindwing); sometimes all brownish yellow to pale reddish brown, more rarely all brownish cream (pruinosed Khwaai ♂); or cream on forewing, suffused with grey on hindwing (S.W. Africa); or, again, brown or black with pale distal or anterior edges, or both. Forewing 9-11 Px, often differing on left and right.

Abdomen generally green dorsally, sometimes bluish or greyish green, on segments 1-3 or 1-5, deepening to brown on following segments. Terminal segments sometimes black, but if brown, then frequently with black median stripe on 8-10, or 9-10; segments 9-10 at times yellow, with or without black dorsal line. In one ♂ basal segments are dark green, terminal ones blackish brown with faint mid-dorsal line visible.

Appendages yellow to brown. Superior usually black or dark brown at apex, with flange yellow; one ♂ (Que Que) is ferruginous with distal two-thirds of appendage black; or all black with flange still yellow; or in a ♂ approaching *cineraceus* in colour, grey with brown base (Massangena). Superior gradually forcipate, incurved in outer part, with outer denticles. Sub-basal tooth acute, well separated from flange; flange somewhat curved and denticulate distally, having a transverse end tooth. Inferior appendage short, very characteristic; bulbous with small round, slightly upturned distal knob. Prophallic head (Ladysmith) with large moderate ligula. Terminal ridge single. This is similar in *stigmatus* (Massangena) and *wahlbergi* (Tsau).

*Juvenile ♂.* Labrum pale yellow; postclypeus and head above yellowish brown with or

without faint brown dorsal markings. Prothorax with brown dorsal fasciae. Synthorax brown to first lateral suture, below this yellow; black metepimeral spot behind legs. All femora and the fore tibia with brown outer stripe. Wings hyaline. Venation dark brown to black. Pterostigma pale grey-brown, usually with hyaline distal edge. Abdomen with faint darker green or pale brownish green dorsal band on segments 1-4, with distal twin spots; 7-10 rather darker brown with black dorsal stripe, at least on 9-10. Anal appendages pale brown, yellower on flange.

Teneral ♂ paler than this on head and thorax. Legs paler, the stripe only well developed on fore leg. Venation brown or black, costa,  $R_1$  and  $R_2$  pale brown. Pterostigma brownish yellow to creamy white. Segments 8-10 with or without black dorsal line. 9-10 and appendages brownish yellow, but superior appendage tipped with brown.

In some tenerals or juveniles, approaching *cineraceus*, the prothorax is greyish ochreous, synthorax more pale ferruginous; abdomen pale green with twin spots; brown on 7-8, yellow on 9-10. Some have traces of black markings on lateral sutures of thorax. Wings rarely faintly yellow. A teneral ♂ (Senegal) has an unusually high postnodal index, Px 11, 12.

Abd. ♂ 27-34.5 mm; hw. 18-25 mm; pt. 1.25-2 mm.

(On average, the abd. 32-33 mm, hw. 21-22 mm.)

*Mature ♀.* Often pruinose white ventrally. Labrum green, pale greenish yellow, yellow or brownish yellow. Head above yellowish brown to pale or dark red-brown, often with black dots on postclypeus; or (Wankie ♀) head greenish ochreous with anterior black transverse band on postclypeus. Orbits below yellow or pruinose.

Prothorax yellowish brown, usually with two black dorsal stripes; hind lobe broad. Mesostigmal lamina narrow, with straight or slightly curved posterior ridge. Synthorax dorsally brownish yellow, brown or ferruginous, often with a yellower band just above humeral suture; or greenish ochreous (Wankie), tending towards *stigmatus*. Sometimes with fine black line on humeral suture or black dorsal dots on humeral and lateral sutures. Sides paler, yellower, with the black metepimeral spot which is sometimes minute.

Legs brownish yellow, sometimes very pale; with variable black or brown outer stripes on femora, thick or reduced on femora 2-3, well developed on fore femur and fore tibia. A Nigerian ♀ (Mailumba) has unusually pale legs with the only black marking being anterior lines on all tibiae apart from the black spines.

Wings hyaline, sometimes fumose. Pterostigma variable, as in ♂: all brownish yellow, cream, pale red-brown to deep brown or black (Wankie ♀); or cream with grey suffusion on proximal two-thirds (Eranchi); or with fine cream distal or anterior edge; or distal quarter, third or even more creamy white to yellow, this distal paleness sometimes less on hindwing. In one ♀ it is brownish yellow with darker central suffusion (Katambora). Forewing with 9-11 Px, but 11-12 Px in a Kabwe ♀, only 8 Px (Khartoum), 9 and 8 Px (Senegal). Tortological forms sometimes result in doubling which may alter the nodal index. In another

instance (Thika) the left hindwing has 2 Ac, one at separation of anal vein, another more distal.

Abdomen with dorsal band pale greenish yellow, but 6-7 (or 6-10) darker than 1-5; segments 8-10 with narrow or broad black median stripe; or basal segments sometimes bronzed, distal ones black; or base of 1 pale, distal ends of 9-10, or 10, yellow. Most segments except the terminal ones have dorsal twin spots. Sometimes the entire abdomen above dark green to brown (Khwaai). Cerci yellow or brownish yellow, occasionally pinkish brown. Ovipositor sheath brownish yellow, marked with black, reaching end of segment 10; slightly curved ventrally on basal three-quarters, a little more curved on finely denticulate distal quarter. Styles of ovipositor straight or curved. Vulvar scale with long distal margin rounded and slightly produced at apex; sometimes with a subapical kink on posterior edge.

*Teneral* ♀. Pale ferruginous dorsally on head and thorax, yellow ventrally; postclypeus usually with two brown dorsal spots. Pterostigma all pale brownish yellow, very pale red-brown, yellowish white to almost white; or paler at distal end. Wings hyaline or faintly tinted. Abdomen paler; penultimate segments pale ferruginous or yellow; segments 8-10 with or without faint median stripe, but the stripe black in a Chobe ♀.

Abd. 28-34,5 mm; hw. and pt. as in ♂. (Average size of ♀ abdomen 30-33 mm; a dwarf ♀ (Lethlekane): abd. 27 mm, hw. 19 mm.)

#### Examples of form *chromatus* Martin

The nearest approach to this form is a Rustenberg ♂:

*Mature* ♂. Not pruinose. Labrum yellow; head and thorax all pale brownish yellow, with dark dots on postclypeus. Legs with fine brown outer stripes. Pterostigma longish, pale yellow (on underside with brown central suffusion). Segments 9-10 yellow with black dorsal stripe. Anal appendages yellow; superior with black apices. It is smaller than Martin's Senegal ♂.

Abd. c. 35 mm; hw. 21,5 mm; pt. fw. 1,5, hw. 1,8 mm.

#### Examples of form *cineraceus* Martin

From available series of *pallidus* no specimens have yet been allocated to this morph. Teneral males mentioned above under *somalicus* show tendencies towards this greyer form. A mature ♂ from Massangena, described under *stigmatus* is close to *cineraceus*.

#### Examples of form *pallidus* Rambur:

A slightly melanised form evidently seen more frequently in equatorial Africa with very occasional examples appearing amongst long series from Botswana.

*Mature* ♀ (*Senegal*). Slightly pruinose. Labrum greenish yellow. Head above brown. Prothorax with black dorsal stripes. Synthorax with black antehumeral stripes which are

similar on both sides; narrow black line on humeral suture. Pterostigma brown with pale anterior edge. Forewing with 8 Px. Abdominal black band narrowed near distal end of segment 9; 10 yellow with black dorsal line. Cerci pale pinkish brown. Ovipositor sheath blacker than in f. *somaticus*. Abd. 31 mm; hw. 19,5 mm. This specimen is closely similar to the holotype.

Another Senegal ♀ in U.S. Nat. Mus. is very similar on thorax. Abdominal pattern slightly different: paler dorsal band on basal segments; segment 5 with dark distal fascia; 6-7 with narrow mid-dorsal line; segment 8 with both a broader mid-dorsal band and a sub-lateral black line; 9 all black except a pale brown distal annulus; 10 all dark brown above.

*Mature* ♀ (*Fort Lamy*). Resembles Senegal females but black humeral line incomplete. Forewing with 8 Px. Abdomen 33 mm, hw. 20 mm.

*Almost mature* ♀ (*near Nata, Botswana*). Labrum green. Head above greenish brown, with black fasciae. Synthorax yellowish brown with rather uniform black antehumeral stripe and black humeral line; black fascia at ventral end of mesepimeron. Venation black, costa and radials pale brown. Pterostigma almost black. Forewing with 11 Px. Segments 7-10 with black mid-dorsal stripe. Abd. 31 mm, hw. 22,5 mm.

*Mature* ♀ (*NW of Francistown*). Slightly pruinosed. Like *Nata* ♀ but antehumeral stripe narrower and humeral line is fused to a broader black fascia below it on mesepimeron. Hindw. 21 mm.

*Mature* ♀ (*Bulawayo*). Less heavily marked. Synthorax pale brown, stained with grey and yellow markings. Traces of a humeral line, black ventral fasciae on mesepimeron and meseinfraepisternum. Pterostigma black, cream on distal third. Abdomen brown above, black on distal segments, but segment 9 with distal yellow triangles.

#### Examples of form *radiatus* Martin:

Melanics near this morph have been seen in a Senegal ♂ and a pair *in copula* from Kruger National Park.

*Pruinosed* ♂ (*Dakar*). Labrum green; postclypeus broadly black anteriorly; head above ochreous brown, with broad black band on frons and dark brown posteriorly. Prothorax brown with black dorsal fasciae. Synthorax paler brown above, yellow below; a broad black antehumeral band, narrowed dorsally; mesepimeron broadly black, enclosing a yellow spot; a black band just below second lateral suture and a black metepimeral spot. Sternites yellow. Wings hyaline. Pterostigma dark brown, whiter distally; forewings with 9 and 7 Px. Abdomen with continuous black band. Abdomen 26,5 mm, hw. 18,0 mm.

*Pruinosed* ♂ *in cop.* (*Kruger N. Park*). Thorax ferruginous, with broad black continuous bands on prothorax, mesepimeron and metepimeron. Pterostigma mainly black. Abd. 30 mm, hw. 20 mm.



*Pruinosed* ♀ (*in cop.* with above). Synthorax with thin black humeral stripe, expanded slightly at ventral end to unite with a black crescent on mesinfraepisternum. Pterostigma dark brown, cream on distal quarter. Segments 8-10 yellow, with broad black mid-dorsal band. Abd. 31,5 mm, hw. 23 mm.

**Examples of form *stigmatus* Navás:**

A common greener form showing considerable variation, some less marked than the type, others more heavily and tending towards *wahlbergi*.

Notes on examples from Kiambere (near type locality Kibwezi):

*Mature* ♂. Slightly pruinose. Labrum green; head above black. Synthorax yellowish green (heavily marked with black, but differing on left and right — staining); broad mid-dorsal carinal band; sides almost as black as *wahlbergi*, with green bands below humeral and second lateral sutures. Wings fumose. Venation black. Pterostigma black, with pale anterior edge (another is white on distal edge). Forewing with 10 Px. Abdomen black on all segments, with violaceous or bronze sheen on basal segments. Anal appendages black.

Abd. 33 mm, hw. 21-22,5 mm, pt. 1,5 mm.

Another ♂ is more heavily white-pruinose and equally melanic but paler on head and thorax. These Kiambere males are melanised *stigmatus* tending towards *wahlbergi*.

*General description (various localities)*. With or without pruinosity of variable extent. Thorax often stained with grey, black or yellow. Pairs *in copula* from Matabeleland and Okavango.

*Mature* ♂. Labrum green or blue-green; head above dark ferruginous to black, or ferruginous with black posterior band; greener in Mt Tarraouaji ♂.

Prothorax green to black. Synthorax olive green, paler below. Some have false yellow antehumeral and black marks, but in examples from Matabeleland their living thoracic colours were noted as all pale olive green without yellow or black fasciae. Sometimes the black is natural, and it is equal on both sides: such as, black humeral and lateral sutural lines; sometimes a line or stripe on lower part of metepimeron, in others only one sutural line; or a thickish stripe against mid-dorsal carina (sometimes only due to staining); one ♂ (Korhogo) has green thorax with black antehumeral stripe as well as juxta-carinal one and fine lines on sutures. Metepimeron usually with spot behind legs.

Legs normally well striped with black. Tarsi all yellow.

Wings hyaline to faintly fumose, rarely strongly fumose. Venation black. Pterostigma black or dark brown, with pale anterior or distal edges; or distal third forewing (or quarter hindwing) cream. Forewing with 10-11 Px.

Abdomen with dark brown to black band on all segments, usually incomplete on seg-

ments 1-2; in *Massangena* ♂ segments 1-3 blue, 4-5 greenish grey, 6-10 dark brown (near *cineraceus*). Anal appendages black.

Abd. 28-33,5 mm; hw. 19,5-21,5 mm; pt. 1,5 mm.

*Pruinosed* ♂ (*N. of Maun*): Head above brownish yellow. Thorax pale brown, yellow below. Synthorax with black juxta-carinal stripe which, however, is a nebulous grey on other side and stained. Traces of black on humeral and first lateral sutures. Pterostigma yellow, between black veins. 8-10 with black dorsal band. Superior appendage yellow with black apex.

Abd. 30,5 mm, hw. 20 mm.

Coloration in life (*Nyamandhlovu* and other *Matabeleland* specimens): eye pale blue-green, grey-blue below; labrum pale blue-green. Thorax pale olive above, turquoise laterally, creamy white below.

*Mature* ♀. Head above pale ferruginous or pale brown. Postclypeus usually with two black dots.

Prothorax with broadish hind lobe, sometimes black bars on middle lobe. Mesostigmal lamina narrow, with straightish posterior ridge. Synthorax green, often with thin black lines on all sutures, or only on upper part of first lateral suture. Small metepimeral spot behind legs. Sometimes with black fasciae on mesepimeron or mesinfraepisternum. At times lower part of thorax redder, verging on the *somalicus* group. An *Acholi* ♀ has black bars on prothorax, the synthorax greenish ochreous with black sutural and mesepimeral markings. It is almost a link to *f. radiatus*.

Wings hyaline or fumose. Pterostigma brownish black to black, often paler on anterior or distal edges; or black with distal third creamy white; or yellow suffused with dark brown; or brownish yellow (*Acholi*).

Abdomen black distally on segment 1; brown to black band on most segments (except 9-10) but narrowed and black on 8-10, reduced at end of 9 and on 10, segments 9-10 yellow. Cerci dark brown to black, rarely yellow (*Acholi*).

*Juvenile* ♀ (*Gweta*). Pterostigma black, outer third pale yellow. Abdominal segments 1 to base of 3 green above; 3-4 brown, 5-7 brown with black distal spots; 8-10 with the black dorsal zone constricted on end of 9 and on 10, which are yellowish green.

Abd. 31,5-33 mm; hw. 21,5-24,5 mm; pt. 1,25-1,75 mm.

#### Examples of form *wahlbergi* Ris:

Even this extreme melanic form is unusually variable. Pairs *in copula* were taken from many parts of northern Botswana and from *Matabeleland*.

*General description.* More or less strongly pruinose white.

*Mature* ♂. Labrum yellow, greenish yellow, green or blue-green. Head above all black, or with yellow or green band on or behind frons; or vertex greenish brown, black posteriorly on occiput, or with narrow postocellar band. Orbits below all black or white pruinose.

Prothorax brown, or brown with broad black mid-dorsal band or all black, but most frequently (whether brown or black), heavily marked with white pruinosity. Synthorax black laterally and ventrally, coated with white pruinosity; sometimes also black dorsally. Mesepisterna all green, greenish yellow, greenish brown; occasionally with central brown smear, more often with partial or complete, slender or broad black antehumeral stripe (sometimes masked with pruinosity); or with traces of a black line above humeral suture; or mesepisterna black with green or yellow stripes on or near median carina and above humeral suture, these stripes of variable width; or the stripes more central as twin antehumerals. Mesepimeron at times yellowish green, with black stripe at first lateral suture (more often all black). Metathorax black, but usually with green or greenish yellow band above second lateral suture. Sternites more or less all black (usually pruinosed).

Femora ochreous yellow with three black stripes and more heavily marked than other forms. Tibiae and tarsi with black anterior and at least traces of exterior black lines.

Wings hyaline, or more or less deeply fumose. Venation black. Pterostigma black, sometimes dark brown or dark red-brown; often with pale anterior edge which may occasionally be broadly yellow; sometimes yellow or brownish yellow on distal quarter or third. Forewing with 8-11 Px.

Abdomen black dorsally. Segment 10 flat. Segment 9 usually bluish white pruinose.

Anal appendages black, the superior more or less yellow on flange. Prophallic head typical.

*Juvenile* ♂. Nearly mature juveniles, despite some lighter markings, are strongly melanised and pruinose. Head with green or yellow band on or behind frons.

Mesepisterna green; or black with green stripes. Mesepimeron green with black markings. Metathorax green with black sutural stripes and with posterior part of metepimeron black; or metathorax mainly black. Pterostigma yellow or brownish yellow with dark brown central fascia; or from pale brown to black, with or without pale areas. Superior appendage yellow with black apex. Sometimes the abdominal band is narrow, expanding distally, broad on 7-10; in a *Sehitwa* ♂ the band is metallic brown with distal black spots on 1-6; 7-10 black.

Teneral males (taken amongst aggregates of mature *wahlbergi*) are reddish brown, yellower below, like f. *somalicus*.

Living colours, mature non-pruinose *wahlbergi* ♂ (Tuli-Shashi): eye light blue, whiter below, deep blue above. Labrum, genae and sides of anterior ocellus pale green. Mesepisterna pale olive-green; a pale green stripe above second lateral suture, on the otherwise black thoracic side; segments 1-2 at sides coeruleous green.

Abd. 27-33,5 mm; hw. 18-21 mm; pt. 1,3-1,5 mm.

**Mature ♀.** Postclypeus brown or greenish brown, with black dorsal spots or a stripe. Head above brown, with black fasciae or all dark brown to black.

Prothorax brown with thick black dorsal bands. Hind lobe broad. Mesostigmal lamina as in other forms but darker. Synthorax green or greenish ochreous to first lateral suture, yellow below this. Occasionally a thin black antehumeral stripe; often with black sutural lines; a large or largish ventral black fascia on mesepimeron spreading crescentically on to mesinfraepisternum, or this fascia much reduced, sometimes absent; black metepimeral spot behind legs. Sometimes, in slightly less mature ♀, with only sutural lines, but usually the mesinfraepisternal black and the metepimeral spot are present. Sternites greenish yellow with dark markings. Wings fumose. Pterostigma dark brown to black.

Abdomen with continuous broad black dorsal band, or segment 10 yellowish brown. Cerci yellowish brown or darker. Ovipositor sheath broadly black. Vulvar scale as in form *somalicus*.

Measurements approximately as in ♂.

**Ecology.** The species is found in open country, favouring grassy or reedy pools and streams, or at times in bush, grass or low vegetation at some distance from water, even on hill tops. Females and juvenile males are often predominant in bush. The species also occurs at grass-fringed pools in arid sandy waste lands.

Observations in southern Africa suggest that melanic tendencies do not appear under drier weather conditions or with normal water-flow of streams, but they are developed under flood conditions, due to excessive rainfall locally or upstream. This melanic tendency seems to apply to a few other genera during floods, the melanics appearing at resultant shallow water (Pinhey, 1976: 527). In *Lestes pallidus* this effect was particularly noticeable in northern Botswana in February 1967 after very heavy rain which had caused flooding across the more level grasslands between Nata and Maun and outlying parts of the further side of the Okavango swamps. This species was abundant, resting in great numbers on emergent grass in the shallow waters of the plains and all the adults were form *wahlbergi*, the rest being tenerals or juveniles ranging from pale brown to the greener form with developing black fasciae.

The extreme form *wahlbergi* seems to be confined to Africa south of 10°S. Form *somalicus* (brown in adult state) occurs in many areas of low rainfall, including arid regions and *chromatus* is evidently a very pallid variation of it. Form *stigmatus* extends in open country from southern to at least eastern Africa. The black striped morphs *pallidus* and *radiatus*, seem to be more common in west equatorial regions. If the very dark *wahlbergi* is limited in its distributional range this suggests a genetic factor in southern populations, with influence from climatic conditions.

**Distribution.** The species *pallidus* is found throughout continental Afrotropical Africa, except in forests. Form *wahlbergi* appears to be known only between latitudes 10°S and 27°S.

**Material examined.**

*NMB.* (month and year; mostly collected by the author or on his expedns, unless otherwise stated).

Form *somalicus*.

South West Africa. ♂ Kalahari Gemsbok National Park, May 1956 (H. K. Munro); Natal. ♂ Ladysmith, March 1952 (A. H. Newton); ♂ Vant's Drift, Blood Riv., 28°10S 30°20E, 12 km N. of Rorke's Drift, Nov. 1948 (A. H. Newton); Swaziland. ♀ Eranchi, Dec. 1954, Jan. 1955 (A. L. Capener); Mozambique. ♂, dry pan, Massangena, Save Riv., Dec. 1972 (F. C. de Moor); Transvaal. ♀ Mosdene Farm, Naboomspruit, Dec. 1976 (F. C. de Moor); Botswana. ♀ Chobe rapids, Kasane, Sept. 1974; ♂ ♀ Kachikau (18°10S, 24°30E), Apr. 1974; ♀ Chobe Park, South Gate, Apr. 1974; ♂ ♀ Goha Hills (18°27S, 24°15E), Apr. 1974, March 1976; ♂ Nata (20°13S, 26°11E), Febr. 1967; ♂ north Makgadikgadi Pan (20°15S, 25°33E), Febr. 1967, March 1974; ♀ Lethlakane (25°25S, 25°32E), Jan. 1959; ♂ ♀ Gweta (20°18S, 25°20E), Febr. 1967; ♂ Makala-ma-Bedi, Botletle Riv. (20°18S, 23°51E), Febr. 1967; ♂ ♀ Maun (20°06S, 23°20E), March 1974; ♂ Toteng (20°22S, 22°57E), March 1974; ♂ 110 km north of Maun, Apr. 1974; ♂ ♀ Khwaai Riv. (19°08S, 23°48E), Aug. 1963, Dec. 1968, Dec. 1973; ♂ ♀ Sepopa (18°44S, 22°12E), March 1974; Rhodesia. ♀ Tuli-Shashi River, S.W. Rhod., May 1959, May 1960; ♂ ♀ Chikwarakwara pan, Chipesi, Limpopo Riv., S.E. Rh., Dec. 1974 (F. C. de Moor); ♂ ♀ Bubyee Riv. Bridge, Chipesi, Dec. 1974 (F. C. de Moor); ♂ 160 km south east of Nuanetsi, S.E. Rh. May 1961; ♂ ♀ Chisumbanje, Lower Sabi Riv., S.E. Rh. Nov. 1959 (D.J.M.); ♂ Sabi Valley, Nov. 1959 (D.J.M.); ♂ ♀ Gwanda, March 1967; ♀ Balla Balla, Dec. 1974; ♂ ♀ Bulawayo, Apr. 1960, March 1961, Dec. 1969; ♂ ♀, ♂-♀ *in cop.* Nyamandhlovu, Nov. 1971, Febr. 1972, Oct. 1974 (M. W. Gardiner), May 1976; ♂ ♀ Que Que, April, Oct. 1976 (M. Villet); ♀ Wankie, Nov. 1961; ♂-♀ *in cop.* Delaware Ranch, Matetsi, Nov. 1973 (F. C. de Moor); Zambia. ♀ Kabwe, May 1961 (E. Pinhey); ♀ Katombora, Zambezi River (West of Vict. Falls), Sept. 1957; Kenya. ♀ Thika, north of Nairobi, Apr. 1949 (E. Pinhey); ♂ Kangatet, south Turkana, July 1954 (C. F. Hemming); Sudan. ♀ Khartoum, Dec. 1964; Northern Nigeria. ♀ Mailumba, Apr. 1960 (D. W. Tarry); Senegal. ♀ Rufisque, Febr. 1945; teneral ♂, ♀, Senegal, 1944; Transvaal, Benoni, June 1979 (M. H. Villet); Botswana. N.E. of Palapye, April 1979 (L. H. F. Coombs); Matabeleland. Kezi, Apr. 1980 (C. A. Car)

Form *chromatus*

Transvaal. ♂ Rustenburg, Oct. 1950 (A. L. Capener).

Form *pallidus*

Botswana. ♀ 140 km north west of Francistown, Febr. 1967; ♀ 25 km west of Nata, Febr. 1967; Rhodesia. ♀ Douglasdale, Bulawayo, March 1967; Tchad, ♀ Fort Lamy, Aug. 1966. Senegal. ♀ Linguère (Ndilla), Sept. 1967.

*Form radiatus*

North west Transvaal. ♂-♀ *in cop.* Olifant's Riv., Kruger Nat. Park, March 1971; Senegal, ♂ Dakar, Aug. 1944.

*Form stigmatus*

S.W. Africa. ♀ Ariomsvale, Karasburg, March 1963 (D. H. Eccles); Lesotho (Basutoland). ♀ Maseru, March 1963; Mozambique. ♂ Massangena pan, Save Riv., Dec. 1972 (F. C. de Moor); Botswana. ♂ ♀ 80 km north west of Francistown, Febr. 1967; ♂ 140 km north west of Francistown, Febr. 1967; ♀ Nata (20°13S, 26°11E), Febr. 1967; ♀ Gweta (20°18S, 25°20E), Febr. 1967; ♂ 100 km north of Maun, Dec. 1968; ♂, ♀, ♂-♀ *in cop.* Khwaai (19°08S, 23°48E), Dec. 1968; ♂ Tsau (22°09S, 22°27E), Febr. 1967; ♀ Sepopa (18°44S, 22°12E), Febr. 1967; Rhodesia. ♂ ♀ Chikwarakwara pan, Chipese, Limpopo Riv., Dec. 1974 (F. C. de Moor); ♀ Chisumbanje, lower Sabi Riv., Oct. 1959 (D.J.M.); ♂ ♀, ♂-♀ *in cop.* Balla Balla, Dec. 1956, Febr. 1966; ♂ ♀, ♂-♀ *in cop.* Nyamandhlovu, Dec. 1966; ♂ ♀ 25 km north east of Turk Mine, Jan. 1957 (D. K. B. Wheeler & Pinhey); ♂, ♂-♀ *in cop.* Wankie Nov., Dec. 1961; ♂ Victoria Falls, Dec. 1955; Kenya. ♂ ♀ Kiambere, 3500 ft (1080 m) Upper Tana Riv., Nov. 1951 (J. G. Williams); northern Uganda. ♀ Paimol, Acholi, June 1954 (T. H. E. Jackson); southern Sudan. ♂ Bor Riv., May 1976 (A. Archer); Ivory Coast. ♂ Korhogo, Apr. 1970 (R. P. Lindley); Fedn Mali (Soudan). ♂ Mt Tarraouaji, 900 m Monts de l'Air, Sept. 1947 (L. Chopard).

*Form wahlbergi* (from South West Africa and Swaziland northwards to southern Zambia)

S.W. Africa. ♂ Ariomsvale, Karasburg, March 1963 (D. H. Eccles); ♂ Otjikango (Ochikanga), June 1948 (C. Koch); Swaziland. ♂ Eranchi, Jan. 1955 (A. L. Capener); North east Transvaal. ♂ Gadzani Riv., Kruger Nat. Park, March 1971 (Dr Watson); Botswana. ♂ Chobe Nat. Park, South Gate, Apr. 1974; ♀ 80 km north of Francistown, Febr. 1967; ♂ ♀ 200 km north of Francistown, Febr. 1967; ♂ ♀, ♂-♀ *in cop.* Nata (20°13S, 26°11E), Febr. 1967; ♂ ♀, ♂-♀ *in cop.* Gweta (20°18S, 25°20E), Febr. 1967; ♂ ♀, ♂-♀ *in cop.* Nxai Pan (19°55S, 24°40E), Apr. 1971; ♂ ♀ north Makgadikgadi pan (20°15S, 25°33E), Febr. 1967, March 1974; ♀ Lethlakane (21°25S, 25°32E), Jan. 1959; ♂ Goha Hills (18°27S, 24°15E), March 1976; ♂ Savuti Channel (18°33S, 23°58E), March 1976; ♂ ♀, ♂-♀ *in cop.* Maun (20°06S, 23°20E), Febr. 1967; ♂ Sehitwa (20°30S, 22°40E), Febr. 1967; ♂ ♀ ♂-♀ *in cop.* Tsau (22°09S, 22°27E), Febr. 1967; ♂ Sepopa (18°44S, 22°12E), Febr. 1967; Rhodesia. ♂ Tuli-Shashi Riv., S.W. Rh. May 1959; ♂-♀ *in cop.* Nyamandhlovu, Febr. 1975; ♂ 25 km north east of Turk Mine Jan. 1957; southern Zambia. ♂ Pemba, Apr. 1972; south west Angola. ♂ Lucira, Moçamedes, Apr. 1971 (H. D. Brown).

## Previously examined. (det. Pinhey)

*TMP*, Pinhey 1951: 44, 45 (as "ictericus" and "ochraceus"):

S.W. Africa: Otjikango, W. of Otjiwarango (Ochikango), June-July 1948 (C. Koch);

S. Angola: "Lagoa", May 1948 (C. Koch); Botswana: Tsotsorogo Pan, June-July 1930 (G. van Son); Metsimaklaba, March 1930; Transvaal: Pretoria, June 1907, Nov. 1921, Apr-Sept. 1948 (E. Pinhey); Rustenburg, Oct. 1948 (A. L. Capener); Rhodesia: Salisbury, Dec. 1947 (E. Pinhey)

as form *wahlbergi*:

80 km N. of Otjikango (Ochikango), June 1948 (C. Koch) (flying over lake).

Expedition Nairobi to northern Zambia, 1954:

Kalambo Falls, near S.E. Lake Tanganyika, N. Zambia, Apr. 1954 (E. Pinhey) (Pinhey, 1961a: Records of "ictericus" and "ochraceus" in National Museum of Kenya (Coryndon) and van Someren Colln (now in *BMNH*) require checking for specific identification).

Pinhey, 1966d: Malawi: (as "cineraceus") Mukwadzi Forest, Nkhata Bay, May 1966 (E. Pinhey); (as *pallidus*) Limpasa Dambo, Nkhata Bay, May 1966 (J. A. Whellan)

Pinhey, 1967c: *pallidus* in Okavango swamps.

Pinhey, 1972a: North Senegal: Richard-Toll, Sept. 1948; Linguère (Ndilla), Sept. 1967; Barkedji, Sept, Nov. 1967 (all A. Villiers, leg.)

Ident. 1973, for *USNM*: Transvaal: f. *wahlbergi* from Mooketsi.

Ident. 1977, for *USNM*: Senegal: Dakar (*pallidus*).

Ident. Febr. 1978 for *PPIS*: Rhodesia: (form *stigmatus*) Chirundu Bridge, Zambezi River, Dec. 1947; Nagopanda Riv., Oct. 1948; ♂ ♀ *in cop.* Sanyati R. junction with Zambezi R., Dec. 1949 (all J. A. Whellan, leg.)

Examined (Pinhey) in other collections:

In de Selys Colln, *IRSNB*:

Holotype *pallidus*; also, a Dakar ♀ (labelled *ictericus*)

In *BMNH*:

*L. cineraceus* ♀. Ethiopia: Maraco, May 1915

Loaned by *PMNHN*, 1977:

Type ♂ *stigmatus*; a ♀ *cineraceus* (labelled by Martin).

Recorded elsewhere:

Martin (1912: 97): *pallidus* from Sikasso (S. Mali).

Ris (1908: 308): "ictericus", Kalahari, 1913 (H. Thomsen) in Berlin Mus.

Ris (1912: 149 fig. 1): "ictericus", Gondokoro, Sudan.

Ris (1921: 270): Klein Waterberg, Okosongomingo, S.W. Afr., in *HM*; White Nile, in *MW* and *NRS*.

Nielsen (1935: 76): (*L. somalicus*) Bucha, S. of Mane Riv., Somalia (S. Patrizi)

Fraser (1950): Niamey, Niger; Mt Tarraouaji & Agadez, Air, Mali.

Fraser (1951): M'Bao, Dakar, Senegal, 9 Apr. 1948 (A. Villiers) (same date as for type ♀ *geminata* — see *L. ictericus*).

Gambles (*in litt.*, 1959):

*pallidus* (as "ictericus"), from Northern Nigeria.

Balinsky (1967):

*wahlbergi*, Moremi Game Reserve, Botswana, Dec. 1963 — Jan. 1964 (B. I. Balinsky).

Carfi (1974: 152):

On Type series of *L. somalicus* and correction of name of territory.

*Carfi* det., Pinhey conf. 1978:

Somalia: Bud Bud, 31 March 1976; Afgoi 10, 20 May 1978; and (*f. stigmatus*) Jesomma, 3 May 1978. All leg. A. Simonetta.

#### LESTES (XEROLESTES) OCHRACEUS Selys Text fig. 189-205, pp. 341, 466

*Lestes ochracea* Selys, 1862: 325 (41 sep.); *Lestes ochraceus* Kirby, 1890: 163 (? Cape); Förster, 1906: 342; Martin, 1910: 86, 87; Ris 1912 (pars): 150 fig 2 (Sudan, as "*unicolor*") ; Ris, 1921: 271 fig. 9; Schouteden, 1934: 78; Fudakowski, 1936: 261 (French Soudan); Schmidt 1951: 122, 123; Gambles, 1976: 15-24 figs; Marshall & Gambles, 1977: 178 (Ghana)

*Lestes ? cineraceus* Pinhey (nec Martin), 1964a: 324 (Nkata Bay, Malawi)

*Lestes ? radiatus* Pinhey (nec Martin), 1964a: 326 (Balla Balla, Matabeleland)

*Lestes unicolor* McLachlan, 1895: 27 (Tamatave, Madascar); Förster, 1906: 341; Martin, 1910: 87; Ris 1912 (pars): 150, 151 fig. 3 (Madagascar); Sjöstedt, 1917a: 10 (♂); Fraser (Schmidt MS), 1949: 24 (locs only); Schmidt, 1951: 122, 123 figs. 4-7; Pinhey, 1962b: 96; Lieftinck, 1965: 236 (locs only); Kimmins, 1970: 196 (type); Gambles, 1976: 24 (distinct species)

*Lestes unicolor aldabrensis* Pinhey, 1967a: 28, fig. 12 (Aldabra); Gambles, 1976: 24

*Lestes ochraceus* Martin, 1910: 92; Campion (forma), 1913: 441, 445 (Aldabra (Fryer) and Cosmoledo (Thomasset) 1907)

*Lestes ochraceus ochraceus* Selys (Text figs 189-198)

I examined the type series in the de Selys collection (*IRSNB*) in 1974. All, including the type itself, have grey labels inscribed "*Lestes olivacea* Selys". The majority bear labels "Madagascar". Perhaps these are *unicolor* but time did not permit checking this. If they are then Selys considered them the same species.

The type ♂, like several other *Lestes*, has lost the end segments: from distal half of segment 7 to 10 and appendages. It bears the labels: "(white, de Selys' script) *L. ochracea* DS ♂; 43; Type!; (grey card) Collection Selys *Lestes olivacea* Selys Revision Ris 19 . . . ; (red edged



grey card) Type *Lestes ochracea* Selys". Förster (1906) stated that the type lacked the end of the abdomen. This type label was presumably added by Ris.

The DS refers, of course, to de Selys. Ris' unfinished date in this and *Lestes pallidus*, was a prelude to a revision which I believe was not completed. The date on *pallidus* was 1930. The type is in poor condition, without any locality data. I noted briefly that the epistome and head above were blackish brown; thorax paler brown with narrow blackish mid-dorsal and interrupted antehumeral lines. Pterostigma rather long, blackish brown. Abdomen with bronze-brown band on segments 2-5, yellowish brown on 6-7. Forewing 21 mm.

The alternative name "olivacea", suggesting a green tone, is not recorded in Selys' description (1862: 325-326) and is rather puzzling, since there is no mention of this colour. The thorax is described as "testacé en avant, jaunâtre en coté et en dessous . . ." and the same shades of colour are used for the abdomen. "Testacé" or testaceous is defined in Fowler's *Concise Oxford Dictionary* as a red brick colour, as in shell-fish. The Latin "testa" can mean a brick, earthen pot, (Molluscan) shell and other non-green objects. In post-mortem condition none of the relatively few *ochraceus* available for this paper are olivaceous but in the far more copious *pallidus* material many individuals are more or less green and often retain this colour. Selys was fully aware of the close affinities of these two species and it may be suggested that both species were before him during his preliminary separation. However, as will be shown below, living male *ochraceus* are sometimes green.

Selys' description mentioned the black thoracic markings. From *pallidus*, described on the previous page (325), he differentiates the two species on the supplementary ultranodal sector which he says shows 2 doubled cellules before the pterostigma in *pallidus*, 4 doubled cellules before pterostigma in *ochraceus*. He also says of *ochraceus* that the venation is more serrate at the end and at posterior margin, and the head in front and above blacker. In the paler forms of *pallidus* the head is much lighter but this is now known to be a far more variable species than *ochraceus*.

This difference in doubled cells is no criterion, only a guide, as Gambles (1976) has indicated, since cell duplication is generally haphazard in odonate venation. In *ochraceus* there may be 3 or 4 doubled cells before the pterostigma, but occasionally 2 or even only 1 but in *pallidus* usually 1 or 2.

Selys (p. 325) gives the locality as "Afrique. Probablement du Cap de Bonne Espérance". This Cape locality is open to question. The species is commonest in equatorial Africa and is decidedly scarce to the south of the Zambezi River. It is found very sparingly in Rhodesia. I have not seen it yet in Mozambique, nor in Botswana where *pallidus* is abundant, nor in collections from South Africa. In fact, all the specimens I examined in 1948 for *Dragonflies of Southern Africa* have since proved to be forms of *pallidus* and until my return from Kenya (1955) I had not collected any true *ochraceus* from southern Africa. Consequently Frasers' opinion (1950) that *ochraceus* was a synonym of *pallidus* was followed (Pinhey, 1951). Although Ris (1921, fig. 9) illustrated true *ochraceus* from Salisbury it has not so far been

rediscovered there. It also appears more likely that the type itself was collected on one of the early voyages along the West African coast.

Martin (1910: 92) placed *ochraceus* near his *jacobi* and gave localities as Cape (from Selys) and Aldabra islands, the latter now allotted a distinct race. The distinction between *pallidus* and *ochraceus* was emphasized in correspondence by Gambles who knew the true *ochraceus* when he was in Nigeria. In 1976 Gambles, in an important paper, showed not only the differences between these two but also separated *ictericus* which Ris (1921) had confused with *pallidus*, leading to further erroneous synonymy (e.g. Fraser, 1950, Pinhey 1962b). Ris (1912: 150-154) also confused *ochraceus* with *unicolor* in recording *unicolor* from Gondokoro in the Sudan, since his fig. 2 clearly indicates *ochraceus*, whereas fig. 3 truly shows the Madagascar *unicolor*. He suspected that the Nile ones were racially distinct from Madagascar *unicolor*, overlooking *ochraceus* in this instance.

**Characters.** Comparison with *pallidus* indicates that *ochraceus* is slightly larger on average (but both vary considerably in size), with less tendency to melanism; head often blackish brown above. Usually a trace of an antehumeral stripe (much more variable in *pallidus*); metepimeron with more prominent black macula behind legs (sometimes absent in *pallidus*); femora with more reduced markings. Wing apices often more rounded than *pallidus*. Venation closer distally and posteriorly. Pterostigma at maturity usually blacker and without tendency to bicoloration; generally longer, particularly in hindwing. Forewings with higher postnodal index, 11-13 Px (but only 10-11 in *aldabrensis*; normally 9-10 Px in *pallidus*); usually more doubled cells (3-4) in ultranodal sector of  $1R_2$  before pterostigma. Segment 10 often paler than 9. Superior appendage straighter, the distal third inturned almost at a right angle (gently curved in *pallidus*), with only the apical region black; inferior appendage with a finger-like distal extension (an upturned nodule in *pallidus*); ovipositor sheath ventrally straighter on basal part but more sharply convex distally than *pallidus*. Vulvar scale not rounded nor extended at apices.

Gambles (1976) also differentiates on the styles of the ovipositor sheath which he says are straight in *pallidus*, more or less curved in *ochraceus* and *ictericus*. This is not necessarily the case since the styles in *pallidus*, including those taken in *copula* are often curved.

**General description.** Mature ♂ usually has some white ventral pruinosity on thorax.

*Mature* ♂. Labrum pale brown, greenish ochreous, pale green, or (in life) sometimes blue-green. Postclypeus and head above pale to dark brown or black. Orbits below cream.

Prothorax pale brown, often with brown dorsal dots. Hind lobe rather broad. Synthorax pale brown or pale reddish brown, to about first lateral suture, brownish yellow to pale yellow below this; normally with broken or vestigial dark brown or black antehumeral stripe; a long thick or fine stripe with isolated dorsal spot, or just two brown or black maculae, or even merely a single central spot or smear, these variants in same or different territories. Humeral suture and sometimes mid-dorsal carina black, or only a dorsal spot

on humeral depression. Mesepimeron with complete or broken or faint stripe, or sometimes two or three prominent brown spots. Both lateral sutures may show dorsal spots. Metepimeral spot behind legs elongated or rounded, normally prominent. Sternites unmarked; sometimes with nebulous grey lateral smears.

Femora 2-3 brownish yellow or ochreous; only with a partial brown lateral stripe (sometimes black); fore femur with dark brown lateral and faint anterior stripes. Tibiae with brown anterior stripe; tarsi pale to darker brown (ochreous with last segment black in Balla Balla ♂). Males from Talanga Forest and Jemar have deeper brown stripes on femora and tibiae, each femur with two stripes: possibly conditioned by moister ecology.

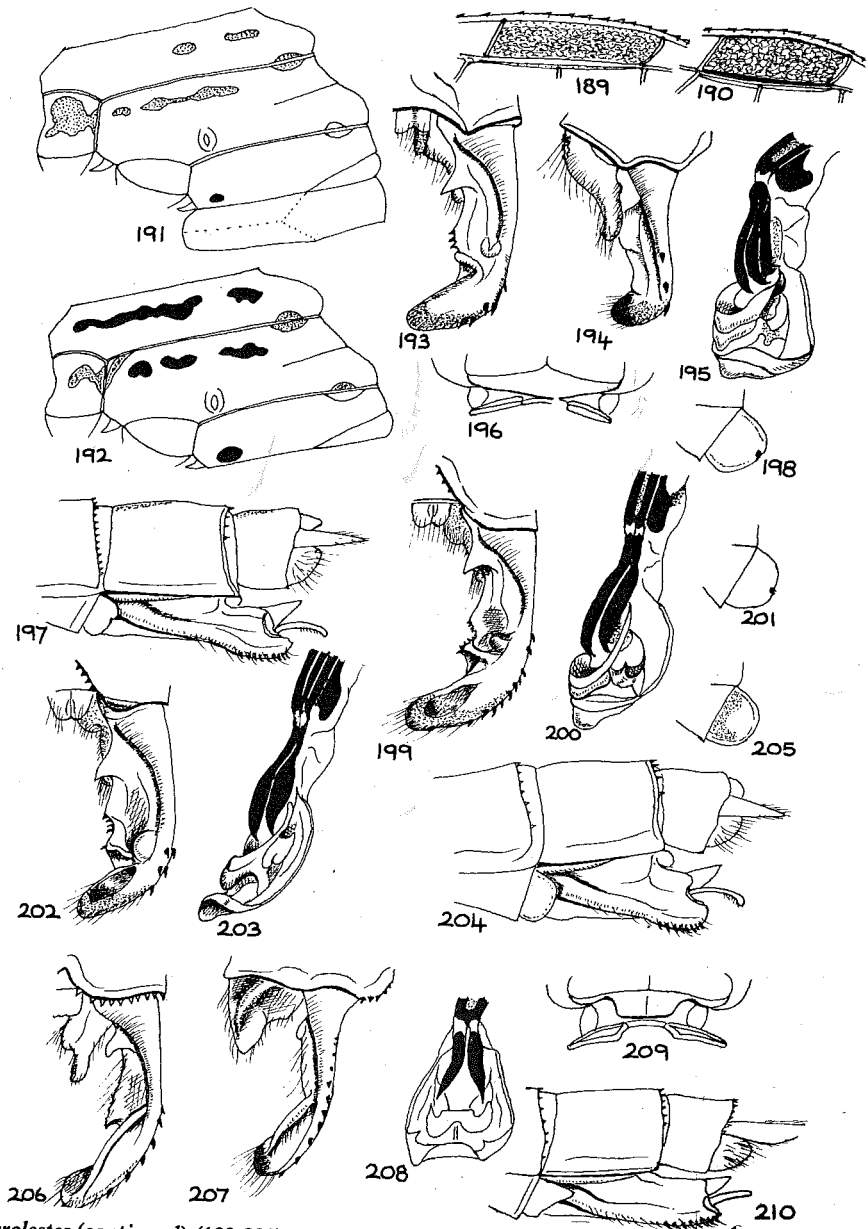
Wings hyaline (faintly fumose in old Balla Balla ♂). Wing apices narrowed, but sometimes rather rounded, as in Malawi examples and Gambles also mentions some with rounded apices in correspondence. Venation mainly black, costa, radius and pre-nodal veins brown. Venation near apex rather dense. Pterostigma narrow, elongated, with straight posterior edge; dark brown to black, sometimes with paler anterior edge; between darker veins; above about two cells (occasionally in mature ♂ shorter, all pale brown, above less than two cells (central Africa)). Ultranodal sector (of  $1R_2$ ) often with 3-4 doubled cells before pterostigmal level. Forewing with 11-13 Px. Ac at point of separation of anal vein. Space  $R_4$ -MA with long intercalaries starting at Px 2 to Px  $3\frac{1}{2}$  and with shorter distal veins.

Abdominal dorsal band very variable: segment 1 with brown distal area (only a greenish ochreous dorsum in Balla Balla ♂); segments 2-9 deep brown, with narrowish distal yellow (or diffuse) annulus on 9; 3-5 usually with dark brown or black latero-distal spots; segment 8 sometimes broadly black, 9 at times greyer brown, often with thick or slender black medium stripe; or 3-8 with gradually increasing brown band, with 9 all blackish brown. Segment 10 brown or yellow with complete or partial mid-dorsal black (or brown) stripe; without dorsal carina, the invagination more or less broadly V-shaped (less sharply V-shaped than *pallidus*), with only small denticles or none. Segment 10 is normally paler above than 9.

Superior appendage forcipate, straight at first, inturned distally almost at a right angle; yellow with black apices; few black outer denticles. Sub-basal tooth acute, prominent. Flange longish, gently curved, with two distal tumours, one transverse the other more dorsal. Inferior appendage yellow, reaching about a third of superior in lateral view, with straight horizontal, finger-like extension. Prophallic head with very large broad ligula. Terminal shelf simple. Stem broad.

In life the body may be greener, as the following notes indicate:

Living colours of ♂ (Balla Balla): eye deep blue, darker on top, sky-blue below. Labium very pale pinkish ochreous; labrum, anteclypeus, genae pale greenish blue. Thorax olive-green dorsally, apple-green at sides to whitish yellow ventrally; an emerald band above second lateral suture. Abdomen segments 1-2 apple-green, olive dorsally; 3-8 whitish grey-blue to pale grey-green; 9 all blackish brown, 10 and superior appendage whitish green.



Subgenus *Xerolestes* (continued) (189-205), genus *Sympecma* (206-210). *L. ochraceus*: 189, 190. pterostigma right forewing (Jemar, Nkhata Bay); 191, 192. synthorax (Jemar, Chirundu Bridge); 193, 194. right anal appendages from above, left ones from side (Jemar); 195. prophallus (Chirundu Bridge); 196. hind leg of prothorax and mesostigmal lamina ♀, 197. terminal segments of abdomen and ovipositor sheath, 198. left side of vulvar scale (all Chirundu Bridge). Subsp. *unicolor*: 199. right anal appendages above (Tulleary); 200. prophallus (Foret l'Est); 201. left side of vulvar scale. Subsp. *aldabrensis*: 202. right appendages above; 203. prophallus; 204. terminal segments and ovipositor sheath; 205. left side of vulvar scale (allotype ♀). *S. fusca*: 206, 207. right appendages above, left ones from side; 208. prophallus; 209. hind lobe of prothorax and mesostigmal lamina ♀; 210. terminal segments and ovipositor sheath (Trentino).

A Chirundu Bridge ♂: eye grey-blue, yellow laterally. Labrum and face in front pale blue-green. Thorax olive.

Abd. 30-36,5 mm; hw. 19,5-24 mm; pt. 1,75-2 mm (but 1,25 in ♂ ♀ Nkhata Bay). (Schmidt (1951: 123) gives abd. ♂ 32,5-33,6, ♀ 31,2-33,5 mm; hw. ♂ 19,6-20,2, ♀ 19,4-21 mm)

*Mature* ♀. Labrum ochreous, greenish ochreous to green. Postclypeus brown, with or without two or three black dorsal dots which are sometimes almost linked up. Head above brown. Orbits below unmarked with black.

Prothorax yellowish brown with broad hind lobe. Mesostigmal lamina narrow, brown, with straight brown posterior ridge. Synthorax brown, sometimes deeper red-brown, with or without brown antehumeral dark spots, occasionally almost a line; mesepimeron with reduced markings; in one Zambian female the mesepimeral streak more or less linked by an upward turn to a black trace on humeral suture. Black metepimeral spot as in ♂. Sternites unmarked or with nebulous grey lateral smear.

Legs like ♂, sparsely marked with brown.

Wings hyaline. Pterostigma as in ♂ (shorter in Nkhata Bay ♀), yellow brown, pale red-brown to dark brown, occasionally paler at anterior edge. Venation as in ♂ but Samfya ♀ with 12 Px (left), only 10 Px on right forewing.

Abdomen with brown dorsal band, usually with small darker twin spots on segments 1-5, the band continuing on 6-9; segment 9 without pale distal annulus. Segment 10 yellow or brownish yellow, with or without partial or complete brown median stripe; no crest, the distal invagination rather shallow. Cerci rather thick, yellow. Ovipositor sheath more or less reaching end of 10; yellow, blackish brown on lower half or across middle and on distal end; ventral edge straightish on basal two-thirds, sharply convex on denticulate distal third. Vulvar scale on posterior edge with subapical kink marked with a minute black point, the apex neither rounded nor extended.

*Teneral* ♀. Pterostigma creamy white. Segment 9 without pale distal annulus; 10 much paler than 9, with brown dorsal line.

Abd. 30-33 mm; hw. and pt. as in ♂.

The only variant, as mentioned above, which is significantly different is the pair of Malawi specimens from Nkhata Bay with short pterostigma and rounded apices.

**Ecology.** Usually found at stagnant reedy or grassy pools or quiet streams. At Chirundu Bridge it was on a sulphurous pool. The Balla Balla ♂ was on an open grassy rain pool, fringed with Cyperaceae, in company with *pallidus*, *dissimulans*, *plagiatus* and *virgatus*: an unusually rich lestid selection of 5 species.

**Distribution.** Rhodesia, Malawi, Zambia, Zaire, Tanzania, Kenya, Uganda, southern

Sudan, Cameroun, Nigeria, Ivory Coast, Guinea-Bissau. I have not yet seen examples from South Africa or S.W. Africa.

(Also, insular subspecies — see later.)

**Material of *ochraceus ochraceus***

*NMB.*

Rhodesia: Balla Balla, Dec. 1956 (E. Pinhey); Chirundu Bridge, Zambezi River, Nov. 1965 (Pinhey & J. A. Whellan)

Malawi: Nkhata Bay, Dec. 1961 (David Eccles)

Zambia: Kafue, 15 Oct. 1962 (L. D. E. F. Vesey Fitzgerald); Samfya, Lake Bangweulu, Aug. 1959 (R. C. Dening); Ikelenge, N. Mwinilunga, May 1961, Apr. 1972 (E. Pinhey)

Southern Sudan: Talanga Forest and Lukole stream 950 m, W. of Katire, March 1977 (A. Archer)

Northern Nigeria: Jemar, March 1959 (R. M. Gambles); Zomo Hills, N. Zana Prov., May 1960 (D. W. Tarry)

Centr. Afr. Rep.: Bouar, March 1974, Dec. 1974 (R. P. Lindley)

Ident. Pinhey (Febr. 1978), *PPIS*:

Sulphurous pool, Chirundu Bridge, Zambezi Valley, Nov. 1965 (J. A. Whellan)

Other records:

Martin (1910: 87, 94): "chromatus" ♀ ex Soudan, almost certainly *ochraceus*, not *pallidus*.

Ris (1912: 150, 166): Gondokoro, S. Sudan, and Uganda (Werner), as "unicolor";  
Ris (1921: 271): Rhodesia: Salisbury, Dec. 1911; Tanzania: Dar es Salaam, 16 Dec. 1913 (Dr. A. Dampf)

Schouteden (1934: 78) *MRACT*: S.E. Zaire: Albertville (M. Mayné)

Fudakowski (1936: 261). French Soudan

Schmidt (1951: 123): Cameroun and Guinea-Bissau (Tessman), in *BMZHU*.

Gambles (10 May 1978) says certain of those recorded by Lindley (1974): as *pallidus* from Ivory Coast are *ochraceus*.

*Lestes ochraceus unicolor* McLachlan (1895) (Text figs. 199-201)

I examined the type and allotype in 1974, in the *BMNH*. The type ♂ bears the labels:

"(McLachlan script) Type; Tamatave, Madagascar; *Lestes unicolor* McL.; (printed) McLachlan Coll BM 1938-674." It also bears a lectotype ♂ label (Kimmins, 1970: 196). The allotype, from Tamatave, is also from the McLachlan collection.

The lectotype ♂ is in good condition, but part of left forewing is affixed to a separate card: head brown, labrum and front of optic lobes yellow. Thorax yellowish brown, stained dorsally with some darker brown. Superior appendage brownish yellow, black at apex; inferior also black apically. Abd. ♂ 31, ♀ 34 mm; hindwing ♂ 21, ♀ 22.5 mm.

McLachlan gives the size range: abd. (+ app.) ♂ 33, ♀ 36 mm; hw. ♂ 21, ♀ 22-23 mm.

Although some authors have regarded *unicolor* as a distinct species, others have confused it with *ochraceus* from the mainland. The differences are clear but they appear to be subspecific in extent. Schmidt (1951) considered *unicolor* a larger species but as will be seen the dimensions overlap quite considerably. Ris' Gondokoro record of "unicolor" has been already corrected to *ochraceus*.

**Characters.** Close to the nominotypical race but colour more consistently reddish brown to brown on head and body. Thorax less often marked with spots. Pterostigma brown or pale brown. Forewing with 11-14 Px. Segment 10 in ♂ denticulate on distal margin. Flange of superior appendage with a pronounced distal invagination, edged with black denticles, just before terminal, tumour-like teeth. Finger-like extension of inferior appendage all black.

**General description.** No pruinosity on series examined nor mentioned in McLachlan's description.

*Mature* ♂. Labrum ochreous or brownish yellow. Postclypeus and head plain brown. Orbits below pale yellow.

Thorax brown above, ventrally yellow, brownish yellow in some. Prothoracic hind lobe broad. Mesepisternum unmarked (except staining in some); or sometimes with faint dark brown central spot, or in others two such spots or these linked. Mesepimeron at most with a dark smear. Sides unmarked except the black metepimeral spot behind the legs. Sternites unmarked.

Femora 2-3 with brown outer stripe, fore femur with black outer and slender anterior stripes.

Wings hyaline (McLachlan says hyaline or with very slightly smoky-yellowish tinge). Pterostigma shorter than average *ochraceus*, slightly thicker; above 2 cells or less; pale to dark brown, sometimes with slightly paler anterior or posterior edges, or just the distal edge pale. Forewing with 11-14 Px. Venation otherwise as in *ochraceus*, except that the intercalaries between  $R_4$  and MA start a little further out, at Px 3 to Px  $3\frac{1}{2}$ .

Abdomen with poorly defined brown dorsal band with sparse, blacker markings; segments 2-3 with distal twin spots or black lateral maculae; segment 9 deeper brown with slender dark brown or black median line (or the line absent). Segment 10 sometimes paler than 9 but not always, with or without brown or black dorsal line; a slight crest, the distal end with V-shaped invagination lined with small denticles.

Superior appendage shaped like *ochraceus*, robust, yellow, more or less black on inturned apices; in Alaotra ♂ the appendage is ferruginous with black apex (perhaps stained); numerous outer denticles. Sub-basal tooth acute. Flange broad but abruptly invaginated distally before tumour-like end teeth, the excision lined with black denticles. Inferior appendage as in *ochraceus* but with the digital extension all black. Prophallic head similar to the nominotypical subspecies.

*Juvenile* ♂. Paler brown. Mesothorax unmarked, or with one or two brown antehumeral spots and a mesepimeral mark (perhaps a stain). Pterostigma pale brown. Segments 9-10 with or without dorsal brown line, 10 scarcely paler than 9 or quite as dark. Superior appendage yellow, undarkened at apex. Inferior with extension dark brown. Teneral males similar or paler, the thorax sometimes more ferruginous.

Abd. 32-36 mm; hw. 21-23 mm; pt. 1,5-1,75 mm.

Despite this range of size, a long Tananarive series presented by René Vieu showed uniformity with abd. 33-34 mm. (Schmidt (1951: 123) gives abd. ♂ 33,7-36,3, ♀ 32-34 mm; hw. ♂ 20,7-22,3, ♀ 20,7-22,5 mm)

*Mature* ♀. Very similar to ♂. Prothoracic hind lobe broad. Mesostigmal lamina as in typical *ochraceus*. Mesepisternum with one or two black central, isolated spots or, more often, unmarked. Pterostigma thick, brown; above about two cells; in a Tananarive ♀ dark ferruginous. Segment 10 usually as dark as segment 9, with or without faint brown dorsal band; but in an Ambositra ♀ 8-10 with black dorsal line. Cerci yellow or brownish yellow, acute, thinner than in *ochraceus*. Ovipositor sheath as in *ochraceus*; brownish yellow with dark central and distal markings; rather less convex ventrally on distal third. Vulvar scale with kink on posterior margin but distal edge slightly more sloped than in *ochraceus*.

*Teneral* ♀. Paler. No antehumeral markings. Pterostigma pale brown, with pale posterior edge. Segment 10 as dark as segment 9, without dorsal line. As a single ♀ this could be just a poorly marked variant.

Abd. 33-36 mm; hw. and pt. as in ♂.



**Distribution.** Madagascar only.

**Material examined** (det. Pinhey)

*NMB.*

Madagascar: Tananarive, Sept. 1961 (René Vieu); Forêt de l'Est, Tananarive, Nov.-Dec. 1962 (R. Vieu); Alaotra, Ambratondrozaka Distr., 24 Dec. 1957 (B. Stuckenberg); Ambositra, S. of Antsirabe, Febr. 1972 (Cl. Besnard); Forêt de Lamboumakandro, Tulear, March 1961 (R. Vieu)

Previously examined.

Ident. Pinhey, 1973, for *USNM*: Ambabasoratra, Tamatave Prov., Aug. 1962; Boanary, Majunga Prov., Oct. 1962

Records elsewhere:

Ris (1912: fig. 3)

Sjöstedt (1917a: 10-11): Ile Ste Marie Moaroay, N.E. Madagascar, Aug. 1911 (Kaudern)  
*USSRL*: Madagascar.

*ochraceus aldabrensis* Pinhey (1967a) (Text figs. 202-205)

*Lestes ochraceus* was recorded from Aldabra island by Martin (1910) and by Campion (1913: 441) from Aldabra and Cosmoledo island groups. In a postscript (p.445) Campion considered the identification uncertain and that the specimens were nearer *unicolor* in shape of anal appendages. This belief was confirmed for the Aldabra specimens when R. A. A. Blackman submitted Odonata for identification which he collected on the Bristol University Expedition to the Seychelles archipelago in 1964-65. No material was collected in the true Cosmoledo group but the *Lestes* on Aldabra proved to be a new taxon very closely related to *unicolor*.

Holotype and allotype (taken in tandem), in *NMB*.

One pair of paratypes is in *BMNH*.

**Characters.** Closer to *unicolor* than to the nominotypical race. Labrum green. Head blacker. Venation darker in ♂. Forewing in ♂ with only 10-11 Px, but 12-14 in ♀. Distal margin of segment 10 black. Superior appendage like *unicolor* but with fewer outer denticles and also fewer on flange. Vulvar scale without kink on posterior margin.

**General description.** No pruinosity in ♂, but present in ♀.

**Mature ♂.** Labrum green or pale green. Postclypeus and head above dark brown to black. Prothorax brown. Synthorax greenish ochreous to first lateral suture, lower sides whitish

ochreous; unmarked except metepimeral spot behind legs. Sternites unmarked. Legs as in *unicolor*.

Wings hyaline. Venation dark brown to black. Pterostigma short, thick, dark brown to black, with or without pale anterior line; above 2 cells or less. Forewing with only 10-11 Px. Intercalaries between  $R_4$  and MA starting Px 3 to Px  $3\frac{1}{2}$  as in *unicolor*.

Abdomen with more pronounced dark dorsal band from distal end of segment 1 to 9. Distal half of 2 paler, with twin spots and black distal annulus; 3-6 with dark latero-distal maculae; 7-8 mainly blackish brown above, but with faint yellow line on either side of a black median stripe; segment 9 brownish yellow with both black mid-dorsal and dorso-lateral stripes. Segment 10 brownish yellow with black dorsal stripe, but no crest; the V-shaped invagination denticulate and the edge prominently black.

Superior appendage yellow with black apices, formed like *unicolor* but with fewer outer denticles and the flange less denticulate. Inferior appendage pale brown, blacker on the extension. Prophallic head essentially similar to *unicolor*.

Abd. 32-34 mm; hw. 20-22 mm; pt. 1,5-1,75 mm.

*Mature* ♀. Faint white pruinosity below head and at leg-bases. Labrum greenish ochreous. Postclypeus and head above brown to dark brown.

Thorax brown above. Prothoracic hind lobe narrow. Mesostigmal lamina narrow, brown, with straight posterior ridge. Synthorax as in ♂.

Wings hyaline. Venation reddish brown. Pterostigma ferruginous to black, with pale anterior edge. Forewing with 12-14 Px.

Abdominal segment 9 brown, with or without black median line. Segment 10 paler than 9, brownish yellow, again, with or without black dorsal stripe. Cerci brownish yellow. Ovipositor sheath as in *unicolor*, the distal end below slightly more convex. Vulvar scale similar but without kink on posterior margin.

Abd. 29-32 mm; hw. and pt. as in ♂.

**Ecology.** Blackman collected most of the specimens at a drying waterhole. Two of the females were found "well away from remaining water" under Casuarina trees.

**Distribution.** Aldabra island group, SW of main Seychelles archipelago. Probably the Cosmoledo specimens are this race (leg. Thomasset, teste Champion). Gambles (1976: 24) includes Zanzibar, but this is a most unlikely locality for this race, from personal experience. Zanzibar has previously been employed as regional name to include the Kenya and Tanzania coastal regions, not only the island off-shore. The record would be for typical *ochraceus*. The specimen in the *British Mus.* is (according to Gambles) a ♀ in very poor condition, headless, lacking the left forewing: "Zanzibar, 1 Febr. 1925 (H. J. Snell)". The pterostigma is unusually short, fw. 1,51 mm, hws 1,57, 1,65 mm; hw. 19,5 mm. (The Malawi *ochraceus* (♂, ♀) above has pt 1,25 mm).

**Material examined.***NMB.*

Aldabra: Waterhole near Wilson's Well, South Island, 24 Nov. 1964 (R. A. A. Blackman); under Casuarina trees. Settlement, 8 Dec. 1964 (R. A. A. Blackman).

Gambles (*in litt.* 10 July 1978) discovered about 20 unnamed *Lestes* of both sexes in the British Museum which proved to be *aldabrensis*, collected on Aldabra in 1968 by an Expedition of the Royal Society. After examination Gambles (*in litt.* 21 Oct. 1978) found that forewing postnodals varied from 10 to 15 Px, thus narrowing the supposed difference from *unicolor*.

## Subf. SYMPECMATINAE

## SYMPECMA (Charpentier MS) Burmeister

SYMPECMA FUSCA (van der Linden) Text fig. 206-210, pp. 341, 466

*Agrion fusca* van der Linden, 1823: 102 nr. 3, pl. 3 : 3

*Lestes fusca* Rambur, 1842: 257; *Lestes fuscus* Selys, 1887: 67; Roster, 1888: 166 pl 4 (early stages).

*Sympecma fusca* Charpentier, 1840: 145; Kirby, 1890: 163; Martin, 1910: 102; Schmidt, 1928: 249; Andrés, 1928: 21 pl. 3; May, 1933: 29, 88 (and larvae); Conci & Nielsen, 1956: 63, figs; Robert, 1958: 89, figs; Lieftinck, 1966: 11

*Sympycna fusca* Selys, 1840: 49; Selys, 1862: 337 (53 sep.); McLachlan, 1889: 348; McLachlan, 1902: 265; Cowley, 1940: 174; Belyshev, 1973: 525, figs.

This small species need not be considered in a general description since it is very distinct from the other Lestidae by subfamily and generic separation. It is the only *Sympecma* known in the African fauna. It was originally described from Bologna, Italy.

In the venation, apart from the narrow, discoidal cell, space R<sub>4</sub>-MA encloses only two main intercalaries, these being longer than in most *Lestes*, starting at Px 1½-2½. Ac very oblique.

Hind lobe of prothorax, both sexes, sharply constricted laterally, as in *Malgassolestes*. Anal appendages brown. Superiors forcipate, inferiors short and conical. Prophallic head with broad double ligula, each lobe curving round to a point. Distal shelf simple. Segment 10 of female with distal denticles. Cerci unusually long and robust. Ovipositor sheath gently curved, denticulate distally. Styles thickish and straight. Vulvar scale almost conical with long upper edge.

Mature specimens, unlike *Lestes*, rest with wings closed. McLachlan (1902) quotes Selys (1888) as declaring *S. fusca* to be the only Odonate species he knew with certainty to undergo hibernation.

**Distribution.** East, central and southern Europe; North Africa and western Asia. Selys said mediterranean Africa, McLachlan recorded Tangiers, Martin Algeria and Lieftinck Morocco. Andrés included Egypt and Palestine; Cowley, from the Mediterranean islands.

**Material examined.**

*NMB.*

Italy: Paludi dell' Adige, Volano, Trentino, Apr. 1949.

France: La Foix, E. Pyrénées, Apr. 1937 (W. Fassnid).

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