
NATURAL RESOURCES INSTITUTE

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A REVISION OF THE GRASSHOPPER GENUS *HETERACRIS* (ORTHOPTERA: ACRIDIDAE: EYPREPOCNEMIDINAE)

J. P. GRUNSHAW

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Summaries

SUMMARY

With exceptions as stated in the text, 44 species and subspecies of the genus *Heteracris* are diagnosed, illustrated and keyed and their distribution is mapped. Six species *nefasitensis*, *juliea*, *zulu*, *drakensbergensis*, *acuticercus*, *trimaculata* and two subspecies *calliptamoides testacea* and *brevipennis nyambeniensis* are described as new. Three new generic and three subgeneric synonymies are proposed. Four former subspecies are raised to the rank of species and two species are relegated to the rank of subspecies. Eight lectotypes and two neotypes are designated. A key to the Afrotropical genera of subfamily Eypreopcnemidinae is given together with brief notes on their intergeneric relationships. The genus *Brownacris* Dirsh is transferred from the Eypreopcnemidinae to the Catantopinae.

RÉSUMÉ

Sauf les exceptions indiquées dans le texte, 44 espèces et sous-espèces du genre *Heteracris* sont diagnostiquées, illustrées et classées et leur répartition est cartographiée. Six espèces, *nefasitensis*, *juliea*, *zulu*, *drakensbergensis*, *acuticercus*, *trimaculata* et deux sous-espèces, *calliptamoides testacea*, et *brevipennis nyambeniensis*, sont décrites comme nouvelles. Trois nouvelles synonymies génériques et trois synonymies sub-génériques sont proposées. Quatre anciennes sous-espèces sont promues au rang d'espèces et deux espèces sont reléguées au rang de sous-espèces. Huit lectotypes et deux néotypes sont désignés. Une clé est fournie du genre afrotropical de la sous-famille Eypreopcnemidinae, ainsi que des notes brèves sur leurs rapports intergénériques. Le genre *Brownacris* Dirsh est transféré des Eypreopcnemidinae aux Catantopinae.

RESUMEN

Salvas las excepciones indicadas en el texto, 44 especies y subespecies del género *Heteracris* han sido diagnosticadas, ilustradas, codificadas y su distribución establecida. Se presentan seis nuevas especies: *nefasitensis*, *juliea*, *zulu*, *drakensbergensis*, *acuticercus*, *trimaculata*; y dos subespecies: *calliptamoides testacea* y *brevipennis nyambeniensis*. También se proponen tres nuevas sinonimias genéricas y tres subgenéricas. Cuatro clasificadas anteriormente como subespecies han sido ascendidas al rango de especies y dos especies relegadas al rango de subespecies. Se ha llevado a cabo la designación de ocho lectotipos y dos neotipos. También se proporciona una clave de los géneros afrotropicales de la subfamilia de las Eypreopcnemidíneas, junto con breves notas sobre sus relaciones intergenéricas. El género *Brownacris* Dirsh ha sido transferido de las Eypreopcnemidinae a las Catantopinae.

A revision of the grasshopper genus *Heteracris* (Orthoptera: Acrididae: Eyprepocnemidinae)

INTRODUCTION

Heteracris is a large grasshopper genus belonging to the subfamily Eyprepocnemidinae. A number of its species, according to the *Locust and Grasshopper Manual* (COPR, 1982), have been designated as occasional minor pests. The species in *Heteracris* have not been subject to any recent revisionary treatment. Uvarov (1939) provided a key to the Palaearctic species, whilst Dirsh (1962, 1970) provided keys to Congolese and Malagasy species respectively. Wintrebert (1972) provided a key to the species of Madagascar to accommodate his synonymy of *Horaecerus* under *Heteracris* and description of a new species, *H. uvarovi*. More recently, Popov (1981) revised the species previously placed in the *Cyclopterna*-*Paraeuprepocnemis*-*Asmara* group of genera which are synonymized here with *Heteracris*. The addition of new species to the genus, together with pre-existing descriptions for other un-keyed species, has led to difficulty in providing accurate species determinations. It is the aim of this study to revise the genus *Heteracris* for inclusion into a future handbook and field key of Eastern African grasshoppers.

Walker (1870) originally described the genus *Heteracris* to include a highly heterogeneous group of 43 species, subsequently recognized as belonging to several genera. Kirby (1902) designated *Acridium herbaceum* Serville (1838) as type species for *Heteracris*, retaining in it some twenty species. Brunner (1893), without making any reference to *Heteracris*, erected the superficially similar genus *Thisoicetrus* for which Kirby (1910) designated *Gryllus littoralis* Rambur (1838) as the type species.

I. Bolivar (1914) first attempted to differentiate *Heteracris* and *Thisoicetrus*, in his key to the genera of the euprepocnemines, by the shape of the pronotum and male cercus. Uvarov (1921) endorsed Bolivar's view that these two taxa could scarcely be separated but still retained both genera. Dirsh (1958) considered that differences in the shape of the male cercus represented a continuous series of variation and synonymized *Thisoicetrus* under *Heteracris*.

This present study has been based mainly on comparative aedeagal morphology which shows that, while the male genitalia of all *Heteracris* species conform to a basic pattern, modifications reflect the various evolutionary lineages within the group. In particular, the relationship between the structure and shape of the apical penis valves and the relative length of the cingular valves was used to determine monophyletic species groupings, based on a correlation between the lengthening of the cingular valves and the shortening of apical penis valves. Members of the *littoralis* group (predominantly N. African-Palaearctic species), for example, possess large apical penis valves and diminutive cingular valves, whereas in the *herbacea* group (confined to South Africa), the apical penis valves are much reduced with correspondingly longer and broader cingular valves. The former group also possess small and weakly sclerotized epiphalli, whilst in the latter group this structure is large, robust and more heavily sclerotized. It has helped in the recognition of the species to divide the genus into species-groups that correspond to centres of radiation for these features. These *Heteracris* species groupings are presented overleaf:

***littoralis* group**

littoralis
annulosa
harterti
minuta
persa
theodori

***coerulescens* group**

coerulescens
nefasitensis sp.n.

***brevipennis* group**

brevipennis *brevipennis*
b. laticercus
b. nyambeniensis

***syriaca* group**

(here transferred from
Paraeuprepocnemis Brunner)

syriaca
punctata
popovi
somalica

ungrouped species

buxtoni
leani
notabilis
pulchra
pterosticha
vinacea

***cyanescens* group**

cyanescens
juliea sp.n.

***herbacea* group**

herbacea
acuticercus sp.n.
calliptamoides
c. testacea subsp.n.
drakensbergensis sp.n.
speciosa
zulu sp.n.

***nigricornis* group**

nigricornis
antennata
concinnicus

***caloptenoides* group**

(here transferred from *Asmara*
 I. Bolivar)

caloptenoides
festae
glabra
sabaea

ungrouped Malagasy species

finoti
reducta
sikorai
zlotarevskyi

***adpersa* group**

adpersa
rantae

***pulchripes* group**

pulchripes
attenuata
aethiopica comb.n.
coeruleipennis
coerulipes
jeanneli
guineensis
prasinata
trimaculata sp.n.

***morbosa* group**

(here transferred from
Cyclopternacris
 Ramme)

morbosa *morbosa*
morbosa cincticollis
etbaica
hemiptera hemiptera
hemiptera aja
hoggarensis
iranica
puntica

Three nominal species attributed to the genus *Heteracris*, as recorded in *Johnston's Catalogue of African Grasshoppers* (Johnston, 1956), have not been examined because of lack of material.

1. *Thisoicetrus mutator* (Walker, 1870). Holotype male. EGYPT (BMNH?) [lost]. Probably a synonym of *annulosa*.
2. *Thisoicetrus turbidus* (Walker, 1870). Holotype female. EGYPT: Shubra (BMNH?) [lost]. Probably a synonym of *annulosa*.
3. *Thisoicetrus grossus* Schulthess, 1894. Holotype female. ETHIOPIA: Ogaden (MCSN, Genoa) [missing]. Probably a valid species.

MATERIALS AND METHODS

Methods are the same as those already given in a similar series of studies dealing with selected genera of hemiacridine grasshoppers (Grunshaw 1986, 1988), with the following exceptions: species are diagnosed in group order as they appear in the introduction, this is to facilitate comparison within the text. As a result of excessive curvature of the epiphallic bridge, much lophal detail is obscured when viewed from the customary dorsal aspect. Consequently, drawings of the epiphallus were taken from a ventral aspect with the plane of the lophi at right angles to the line of sight of the observer for which it was necessary to detach the epiphallus from the endophallus. A posterior aspect, giving maximum depth to the epiphallic bridge, together with selected drawings of the inter-lophal margins are also given where necessary.

Drawings of aedeagi were prepared after staining with Gurr's Giemsa R 66 stain to enhance resolution of the component parts. The previously dissected and cleared preparations of the endophallus were immersed in stain for a few minutes, then washed in water to remove excess; the endophallus stained blue-green. Tegminal markings were drawn from above after the wings had been spread laterally. A piece of white card was placed directly underneath the spread wing to aid the separation of lightly pigmented cells.

For comparative purposes the male cercus was divided into two parts; (1) a much broader basal stem; (2) a lamellate, down-curving apical process. Because of its much thinner structure, the apical process has a tendency to curl on drying and hence needs to be viewed critically.

Abbreviations used in figures

ap, anterior projections of epiphallus; a, ancorae of epiphallus, ac, arch of cingulum; apv, apical penis valves; bpv, basal valves of penis, cv, cingular valves; dep, dorsal ectophallic plate; ect, ectophallic membrane; rm, rami of cingulum, zyg, zygoma. (a & b of Figs. 189b, 190, 193 represent homologous parts of the distal expansions of the cingular rami); pp, proximal process of epiphallic lophi (Fig. 157).

Abbreviations for depositories

BMNH, British Museum (Natural History); IEE, Instituto Español de Entomología, Madrid; MCSN, Museo Civico di Storia Naturale, Genoa; MIZSU, Museo ed Istituto di Zoologia Sistemica dell'Università di Torino; MHN, Muséum d'Histoire Naturelle, Geneva; MNHN, Muséum National d'Histoire Naturelle, Paris; MNHU, Museum für Naturkunde der Humboldt – Universität zu Berlin, Berlin; NCIP, National Collection of Insects, Pretoria; NM, Naturhistorisches Museum, Vienna; NMK, National Museums of Kenya, Nairobi; NR, Naturhistoriska Riksmuseet, Stockholm; NRI, Natural Resources Institute, Chatham; SMNS, Staatliches Museum für Naturkunde in Stuttgart, Stuttgart; ZMA, Instituut Voor Taxonomische Zoologie (Zoologisch Museum), Amsterdam; ZMUF, Zoological Museum, University of Florence; ZI, Zoological Institute, Academy of Sciences of the U.S.S.R., Leningrad.

GENERIC INTERRELATIONSHIPS OF AFROTROPICAL EYPREPOCNEMIDINAE

The genera of the Eyprepocnemidinae are all allied by the presence of epiphalli with articulated ancorae (Dirsh, 1961) (see arrow Fig. 133 indicating point of articulation). The presence or absence of the anterior process of the male paraproct (see arrow Fig. 132) may be used to divide the subfamily into two groups. This structure is present in the genera *Jagoa*, *Amiphiprosopia*, *Heteracris*, *Taramassus*, *Cataloipus*, *Cyathosternum* and *Phyllocercus*. In *Phyllocercus* the anterior process is much reduced and occupies a somewhat intermediate position between these two sub-divisions. In the remaining genera, *Oxyaidea*, *Eyprepocnemis*, *Tylotropidius*, *Tropidiopsis* and *Jucundacris*, this character is absent.

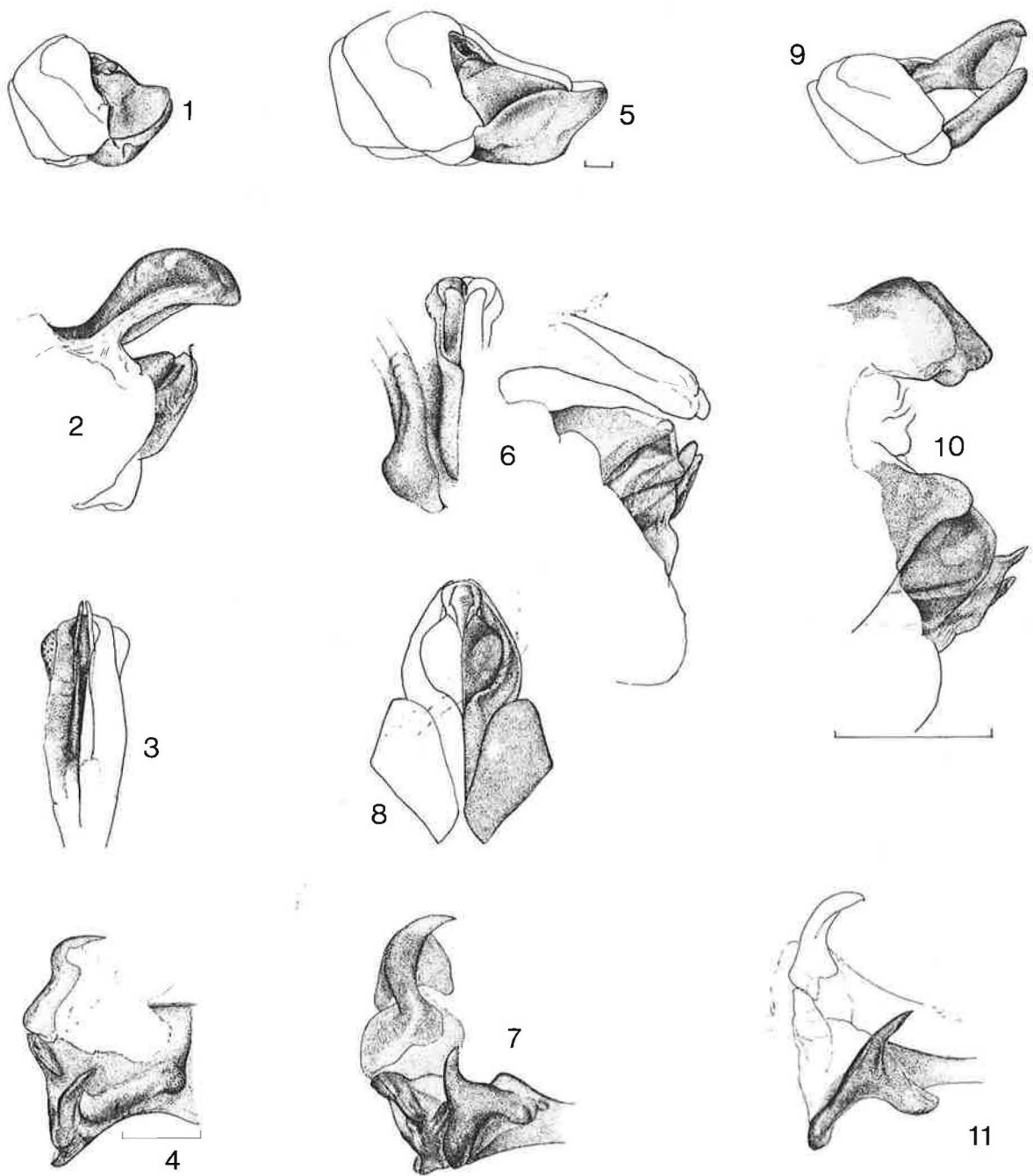
Amiphiprosopia, *Jagoa* and *Phyllocercus* also share strongly inflated 9th and 10th abdominal tergites and highly modified cerci (Figs. 1, 5, 9). Internally, all three genera share similar epiphallic structure, with large, heavily sclerotized tooth-like lophi (Figs. 4, 7, 11). The aedeagus of *Phyllocercus* is, however, unlike *Amiphiprosopia* and *Jagoa* in having slender and elongate cingular valves (refer to Figs. 3, 8, 6 for comparisons).

Heteracris, *Taramassus*, *Cataloipus* and *Cyathosternum* all share structurally similar aedeagi and epiphalli (Figs. 13, 19, 22), and are all closely allied. The aedeagi of *Taramassus* are very small, weakly sclerotized and can be differentiated from those of *Heteracris* in having cingular valves about as wide as the apical penis valves (Fig. 18). In *Heteracris*, the apical penis valves are always wider than the cingular valves (Figs. 336, 385). The aedeagal structure of *Cataloipus* is similar to that of *Heteracris* but differs in having lateral membranes which arise near the apex of the cingular valves (see arrow Fig. 21), and also by the absence of a protective sheath derived from the cingular rami, a feature which is present in *Heteracris* and appears to form a protective hood for the underlying genital structures.

The generic status and affinity of the monotypic genus *Cyathosternum* still remains unclear; its genitalia are indistinguishable from those of *Heteracris* (Fig. 12). while it shows a combination of characters seen in other genera of the subfamily. For example, the posterior femora resemble those of *Tylotropidius* and *Tropidiopsis*, being inflated basally and strongly narrowed distally (Fig. 26). A small notch at the apex of the subgenital plate is also present in *Cataloipus* (see Figs. 23 and 14). The male antennae bear strongly pectinate, pre-apical segments, a more extensive form of which is seen in the antennae of some *Taramassus* species (compare Figs. 16 and 51); although in some species of *Heteracris*, notably *antennata*, the median segments are strongly widened. *Cyathosternum* has not therefore been synonymized under *Heteracris*, but like *Cataloipus* or *Taramassus* may be a sister group.

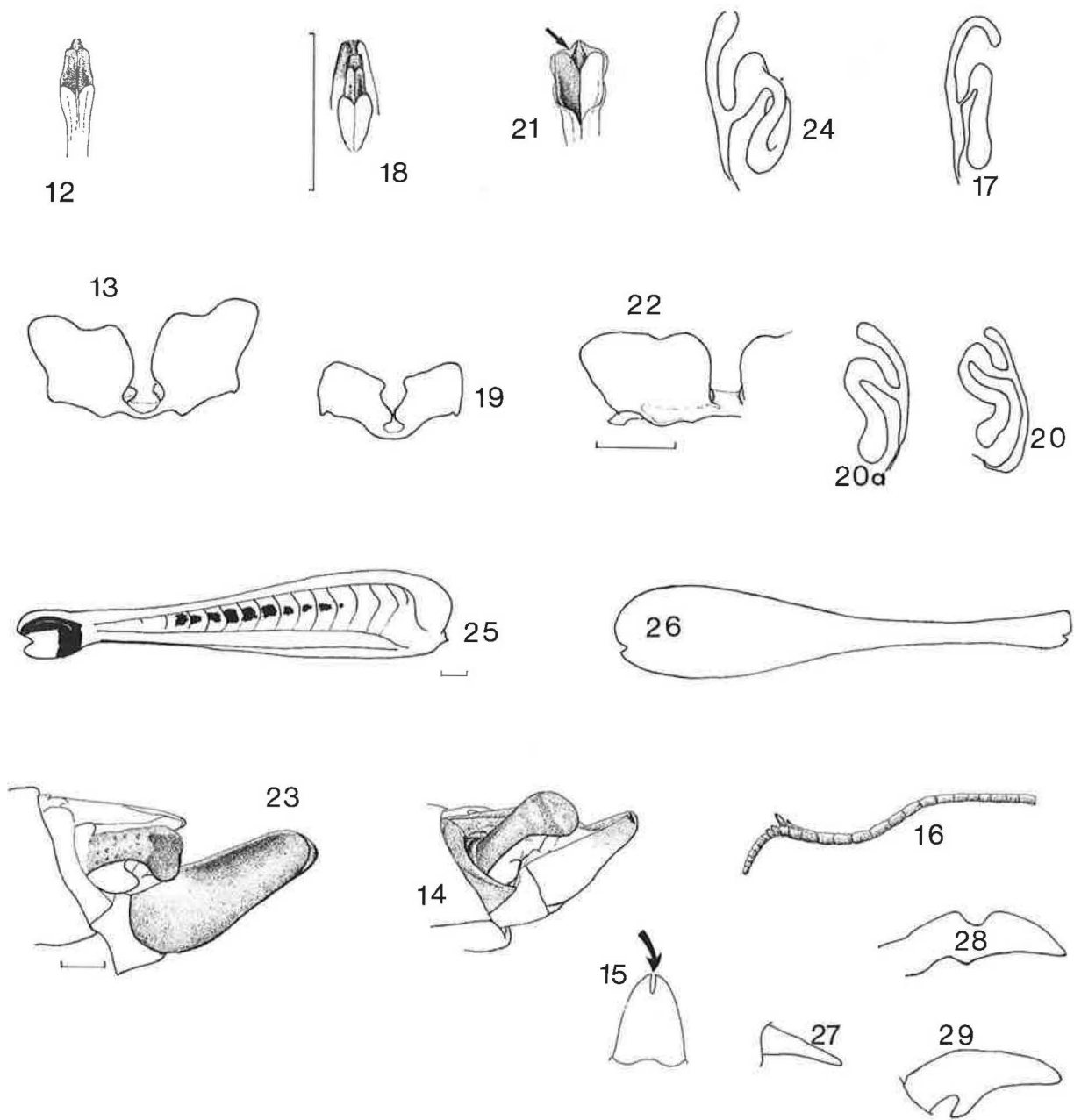
The aedeagal valves of *Tropidiopsis* are structurally similar to those of *Heteracris* (compare Figs. 30 and 315), but the two genera differ markedly in epiphallic structure, in particular at the point of articulation between the ancorae and the anterior projections of the lateral epiphallic plates. In *Tropidiopsis*, the point of articulation occurs along the inner lateral edge of the anterior projection (Fig. 32) rather than at its dorsal extremity as in *Heteracris* (Fig. 33). The aedeagal valves of *Tylotropidius didymus* (Fig. 34) differ widely from both *Heteracris* and *Tropidiopsis* with which many external characters are shared. A more detailed examination of all *Tropidiopsis* and *Tylotropidius* species is required to establish their true affinities.

The aedeagal valves of *Oxyaidea*, *Eyprepocnemis* and *Jucundacris* depart radically from the simple *Heteracris* type by (a) having large, heavily sclerotized, foliaceous aedeagi (Figs. 37, 40, 45), (b) the absence of the distal expansions of the cingular rami and (c) the lack of a proximal process on the inner edge of the lophal interspace (Figs. 38-39, 42-43, 46-47).



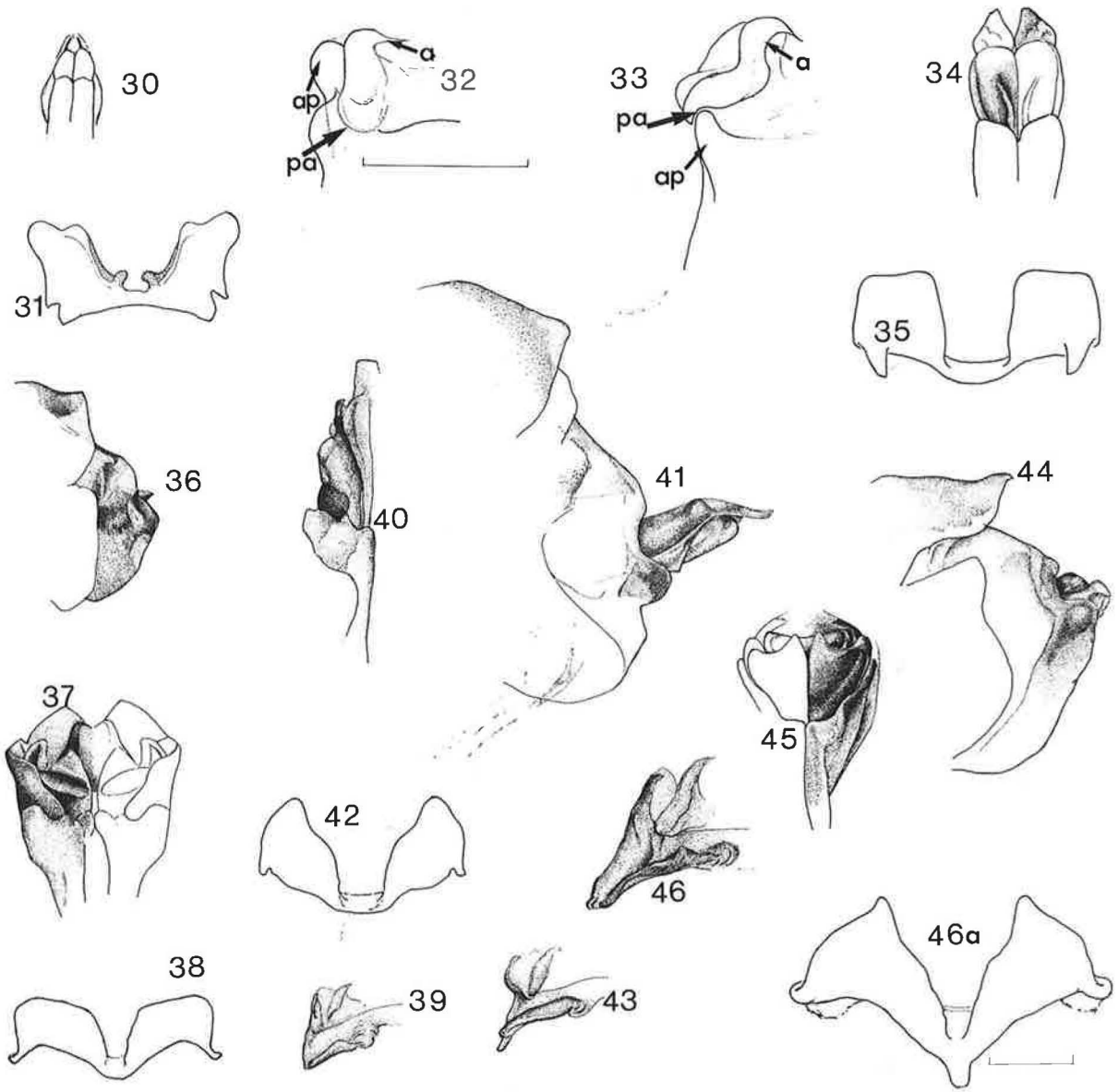
Figures 1-11

Eyprepocnemidinae genera (males). 1-4. *Phyllocercus bicoloripes*; 1, lateral aspect of abdominal tip; 2, lateral aspect of genitalia; 3, posterior aspect of penis valves; 4, epiphallus. 5-7. *Jagoa gwynni*; 5, lateral aspect of abdominal tip; 6, lateral aspect of genitalia with posterior aspect of penis valves; 7, posterior aspect of epiphallus; 8-11. *Amphiprosopia adjuncta*; 8, posterior aspect of penis valves; 9, lateral aspect of abdominal tip; 10, lateral aspect of genitalia; 11, epiphallus. All scale lines represents 1mm; that under Fig. 5 also applies to Figs. 1 and 9; that under Fig. 10 also applies to Figs. 2-3, 6 and 8; that under Fig. 4 also applies to Figs. 7 and 11.



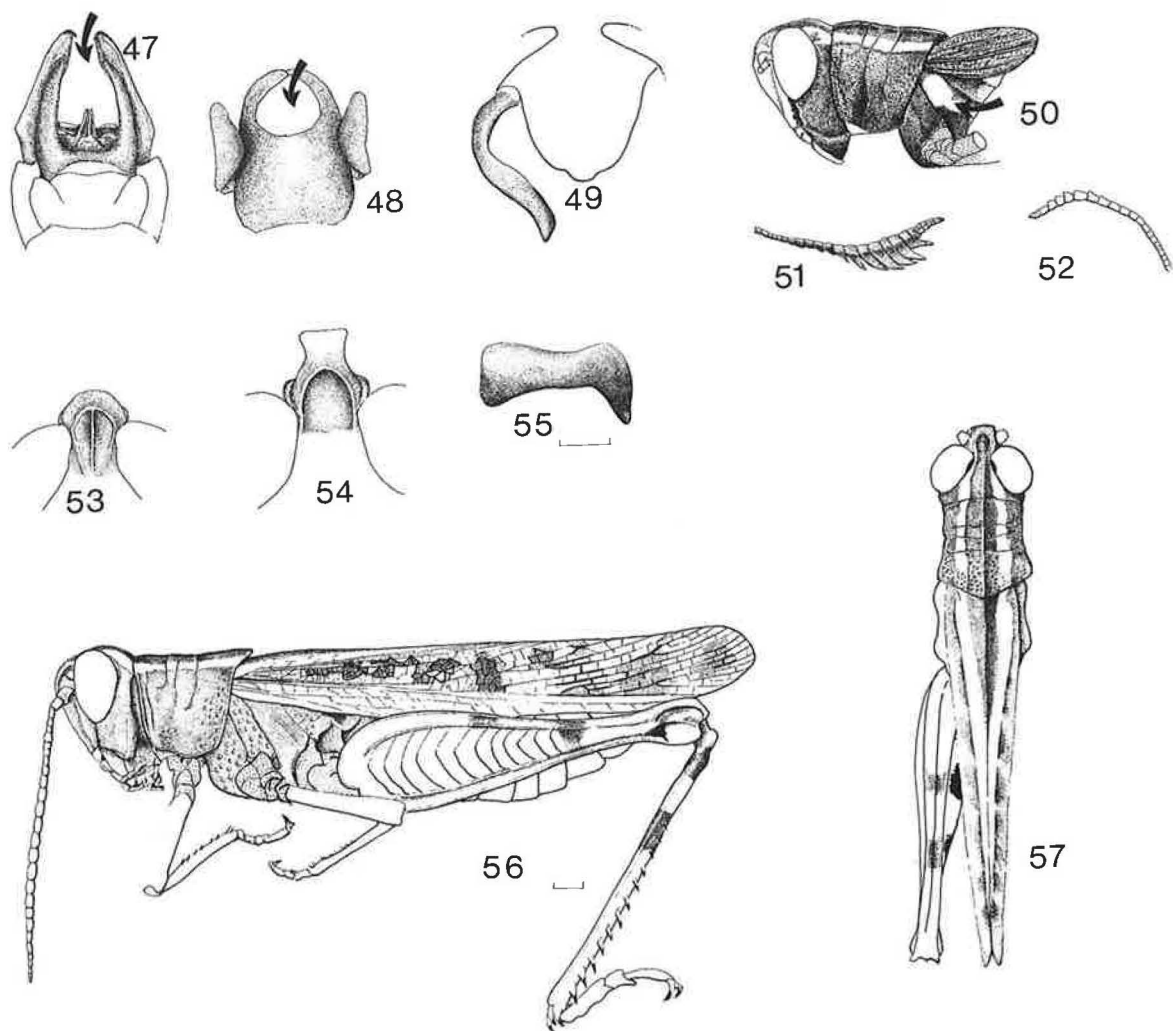
Figures 12-29

Eyreprocnemidinae genera. 12-17, *Cyathosternum*; 12, posterior aspect of male penis valves; 13, ventral aspect of male epiphallus; 14, lateral aspect of male abdominal tip; 15, ventral aspect of male subgenital plate; 16, male antenna, 17, female spermatheca; 18-20, *Taramassus*; 18, posterior aspect of male penis valves; 19, ventral aspect of male epiphallus; 20, female spermatheca; 20a, *Heteracris littoralis*, female spermatheca; 21-24, *Cataloipus*; 21, posterior aspect of male penis valves; 22, ventral aspect of male epiphallus; 23, lateral aspect of male abdominal tip; 24, female spermatheca; 25, *Jucundacris*, inner aspect of male hind femur; 26, *Tylotropidius gracilipes*, outer aspect of male left femur; 27, *Tylotropidius didymus*, left male cercus; 28, *Tropidiopsis undulicercus*, left male cercus; 29, *Tropidiopsis haasi*, same. All scale lines represent 1 mm; that alongside Fig. 18 also applies to Figs. 12 and 21; that under Fig. 22 also applies to Figs. 13, 17, 19, 20, 20a and 24; that under Fig. 25 applies to Figs. 15 and 26; that under Fig. 23 applies to all other figures.



Figures 30-46a

Eyprepocnemidinae genera (males). 30-32, *Tropidiopsis haasi*; 30, posterior aspect of penis valves; 31, ventral aspect of epiphallus; 32, attachment of epiphallic ancora; 33, *Heteracris leani*, same; 34, *Tyloptropidius didymus*, posterior aspect of penis valves; 35, same, ventral aspect of epiphallus; 36-39, *Eyprepocnemis plorans*; 36, lateral aspect of genitalia; 37, posterior aspect of penis valves; 38, ventral aspect of epiphallus; 39, posterior aspect of epiphallus; 40, *Oxyaeida* sp., posterior aspect of left half of penis valves; 41, same, lateral aspect of genitalia; 42, same, epiphallus, ventral aspect; 43, same, posterior aspect; 44-46a, *Jucundacris*; 44, lateral aspect of genitalia; 45, posterior aspect of penis valves; 46, epiphallus, posterior aspect; 46a, same, ventral aspect. All scale lines represent 1mm; that under Fig. 32 also applies to Figs. 30, 33-34, 36-37, 40-41, 44-45; that under Fig. 46a, also applies to all other figures.



Figures 47-57

Eyreprocnemidinae genera (males). 47, *Jagoa*, ventral aspect of subgenital plate; 48, *Amphiprosopia*, same; 49, *Jucundacris*, dorsal aspect of left cercus, 50-52, *Taramassus*; 50, lateral aspect of thorax; 51, antenna, strongly pectinate form; 52, weakly pectinate form; 53, *Oxyaeida*, dorsal aspect of fastigium verticis; 54, *Eyreprocnemis*, same; 55, *Jucundacris*, left cercus; 56, *Heteracris annulosa* (male), lateral aspect; 57, same, dorsal aspect. All scale lines represent 1 mm; that under Fig. 55 also applies to Figs. 49, 53-54; that under Fig. 56 also applies to all other figures

Heteracris is separated from all genera (with the exception of *Cyathosternum* for the reasons mentioned above) by its aedeagi with apical penis valves wider than the cingular valves, lack of apical lateral membranes of the cingular valves and point of articulation of the epiphallic ancorae.

The genus *Brownacris*, formerly allocated to the subfamily Eyreprocnemidinae by Dirsh (1958b), is here transferred to the Catantopinae because the ancorae are not articulated.

Females were found to be of little assistance in providing reliable diagnostic characters and, in general, were like males in coloration but larger. The spermathecae of *Heteracris* species and those of related genera were found to be structurally conservative with the exception of those of *Cataloipus* (see Figs. 17, 20, 20a, 24, 376-378).

KEY TO AFROTROPICAL GENERA OF THE SUBFAMILY EYPREPOCNEMIDINAE

(Based on male characters)

- 1 Abdominal tergites 9 & 10 strongly inflated (Figs. 1, 5, 9) cerci large, not down-curved distally 2
 - Abdominal tergites 9 & 10 not strongly inflated, cerci smaller, usually down-curved distally (Fig. 128) 4
- 2 Subgenital plate without large interspace, sometimes with small apical notch (Fig. 23) **PHYLLOCERCUS**
 - Subgenital plate with large interspace (Figs. 47-48) 3
- 3 Subgenital plate interspace rectangulate (Fig. 47) **AMPHIPROSOPIA**
 - Subgenital plate interspace circular (Fig. 48) **JAGOA**
- 4 Apex of subgenital plate notched (Figs. 14-15) 5
 - Apex of subgenital plate without notch (Fig. 134) 6
- 5 Preapical segments of antennae pectinate (Fig. 16) **CYATHOSTERNUM**
 - Preapical segments of antennae filiform (Fig. 56) or flattened not pectinate (Figs. 382, 391) **CATALOIPUS**
- 6 Posterior femur long, inflated at base, strongly narrowed distally (Fig. 26) 7
 - Posterior femur short, stocky or moderately long, not inflated at base, not strongly narrowed distally (Fig. 56) 8
- 7 Male cercus simple, styliiform (Fig. 27) **TYLOTROPIDIUS**
 - Male cercus highly modified, laterally compressed, apex sometimes twisted, strongly compressed, sometimes with median process on ventral edge (Figs. 28-29) **TROPIDIOPSIS**
- 8 Dorsal aspect of cercus with sharply incurved inner margin (Fig. 49); inner surface of posterior femur with series of discrete small black spots (Fig. 25) **JUCUNDACRIS**
 - Dorsal aspect of cercus with weakly incurved inner margin (Figs. 116, 133); inner surface of posterior femur unicolorous, or with combination of proximal, median or distal black spots or bands, never with series of small black spots (Figs. 129, 388) 9
- 9 Sides of thorax black with a conspicuous, oblique white episternal stripe (Fig. 50); distal antennal segments strongly or weakly pectinate (Figs. 51-52) **TARAMASSUS**
 - Sides of thorax with a white spot running along lower edge of episternum or sides of thorax without a white spot; antennae filiform or with median segments strongly to weakly thickened (Figs. 382, 391) 10
- 10 Paraproct without anterior process 11
 - Paraproct with anterior process (Fig. 132) **HETERACRIS**
- 11 Fastigium of vertex with median carinula (Fig. 53) **OXYAEIDA**
 - Fastigium of vertex without median carinula (Fig. 54) **EYPREPOCNEMIS**

HETERACRIS WALKER, 1870

Heteracris Walker, 1870:655. Type species: *Heteracris herbacea* Serville, 1838:684.

Thisoicetrus Brunner, 1893:150. Type species: *Thisoicetrus littoralis* Rambur, 1838:78. (Syn. Dirsh, 1958a:53)

Bibulus I.Bolivar, 1914:31. Type species: *Tylotropidius brunni* Giglio-Tos 1907:31. (Syn. Popov, 1950:134)

Thisoicetrellus Uvarov, 1921:129. Type species: *Thisoicetrellus recurvus* Uvarov, by monotypy. **Syn.n.**

Parathisoicetrus Ramme, 1929:476. Type species *Parathisoicetrus aethiopicus* Ramme, by monotypy. **Syn.n.**
Thisoicetrinus Uvarov, 1921. Type species *Thisoicetrinus pterostichus* Fischer-Waldheim, 1833:384. **Syn.n.**
Horaecerus Saussure, 1899. Type species *Horaecerus nigricornis* Saussure, 1899:635. (Syn. Wintrebert, 1972:78)
Cyclopternacris Ramme, 1928:113. Type species *Cyclopternacris morbosa morbosa* (Audinet-Serville, 1838:682). [As subgenus of *Heteracris*.] **Syn.n.**
Paraeupreocnemis Brunner, 1893. Type species *Paraeupreocnemis syriaca* Brunner, 1861 2(13):48. [As subgenus of *Heteracris*.] **Syn.n.**
Asmara I. Bolivar 1914:6, 15. Type species *Asmara caloptenoides* I. Bolivar 1914:16. [As subgenus of *Heteracris*.] **Syn.n.**

REDESCRIPTION. Male. Small to medium size (Fig. 56). Head opisthognathous. Antennae filiform, or with median segments weakly or strongly compressed. Fastigium of vertex with or without median carinula. Pronotum flattened or weakly tectiform, median and lateral carina usually well developed. Prosternal tubercle present. Tegmina and wings shortened or insects fully winged. Last abdominal tergite with a pair of small furcula. Apex of subgenital plate broadly rounded, square-shaped, pointed or with finger-shaped process, with or without tubercles. Apical process of cercus widened, lamelliform or tapered with broadly rounded or acute apex; incurved and down curved. Anterior projection of paraproct present. Supra-anal plate shield-shaped.

Genitalia (Figs. 189-197) with aedeagal valves of simple structure; cingular valves sub-tubular, convergent apically, with acute or widened apices, concealed by or surpassing tips of apical penis valves; apical penis valves expanded or reduced. Dorsal ectophallic plate present (Figs. 189a, 192). Distal expansions of cingular rami well developed (Figs. 189a-c). Epiphallus weakly or strongly sclerotized with articulated ancorae; lophi broadly lobate or tooth-like, proximal process of lophal interspace weakly developed or highly developed to form a recess with dorsal lip or with tubercles (Fig. 197); bridge weakly or strongly sclerotized. Oval sclerites present.

General coloration variable, brown-yellow to dark green-black with contrasting dorsal longitudinal light and dark markings (Fig. 57). Sides of head with preocular vertical dirty cream-yellow stripes present or absent, postocular stripes or spots present or absent; head above with dark median longitudinal stripe, delimited by narrower light or dark coloured stripes, continuing along dorsum of pronotum and tegmina (Fig. 57). Sides of pronotum with or without distinctive dirty cream spot in lower posterior corner; thorax with or without lower edge of episternum III, epimeron V picked out with cream-yellow. Sides of abdomen with or without black-brown vertical stripes; external genitalia sometimes boldly marked, shiny black; apical process of cercus dirty white-yellow or red. Tegmen clear, tinged with green-yellow or wine red or infuscate brown with or without spots or bands. Hind wing hyaline, sometimes apically darkened, or yellow-orange or blue at base or whole wing dark wine red. Posterior femur variable, inner and outer surfaces yellow, brown, dark red or black, sometimes proximally green, with or without contrasting combination of proximal, median or distal black-brown spots or transverse, oblique bands; pregenicular annulus lighter coloured. Posterior tibia with or without small black band below knee, followed by combination of light and dark bands, remainder red, blue, dark brown, blue-green or purple.

Female. Similar to male but larger. Cerci reduced to short triangulate structures.

COMMENTS. The genera synonymized above cannot be distinguished from *Heteracris* by their genitalia, which have proved to be the only reliable character set for generic definition. This situation was acknowledged by Popov (1981), who advanced a subgeneric concept for *Heteracris*, in order to

accommodate a revision of the closely related *Cyclopternacris-Paraeuprepocnemis-Asmara* group of genera.

Popov retained these groups as subgenera of *Heteracris*, based on wing shape and degree of brachyptery plus minor differences in head and pronotum morphology, but none of these group features are considered here to deserve formal status, except to define species groups.

All the species previously included in *Cyclopternacris*, *Paraeuprepocnemis*, and *Asmara* have been revised, illustrated and keyed by Popov (1981) and it is not intended to recapitulate that work here. These species can be distinguished from all other species of *Heteracris* by their broadly rounded, shortened or micropterous tegmina. They are only confusable with other brachypterous species, notably *brevipennis* and *aethiopica*, and may be separated from them by their geographic distribution and as follows: only *aethiopica* bears a conspicuous, discrete postocular spot (Fig. 275) which is either lacking or replaced by a vertical running postocular stripe in the above species-groups; the expanded apical process of the cercus, being much wider than the basal stem, differentiates *brevipennis* as this structure in the above groups is not expanded and is only as wide as the basal stem.

KEY TO SPECIES AND SUBSPECIES OF *HETERACRIS* MALES

(Keys, descriptions and illustrations of the *morbosa*, *syriaca* and *caloptenoides* species groups which are not included here, can be found in Popov (1981). Females can be identified reliably only by association with sympatric males and to some extent by resemblance of characters – notably coloration).

- 1 Malagasy species 39
- Non-Malagasy species 2
- 2 Posterior tibia without small black band below knee; subgenital plate strongly elongate (Fig. 375) (Turkey, Iraq, USSR) ***H. pterosticha***
- Posterior tibia always with small black band below knee; subgenital plate with apex weakly elongate (Fig. 64), or broadly rounded, with two tubercles (Fig. 158), or with elongate finger-shaped process (Fig. 269) . 3
- 3 Cingular valves of aedeagus with apical lateral expansions (Fig. 182) .. 4
- Cingular valves of aedeagus without apical lateral expansions 5
- 4 Apical penis valves short, expanded apically (Fig. 182) (East Africa to Saudi Arabia) ***H. coerulescens***
- Apical penis valves longer, slender, parallel (Fig. 187) (Ethiopia) ***H. nefasitensis*** sp.n.
- 5 Fastigium of vertex with distinct median carinula (Figs. 200, 384, 411) ... 30
- Fastigium of vertex without median carinula or replaced by indistinct white striation 6
- 6 Proximal two thirds of outer surface of posterior tibiae with three black bands (Fig. 149), or if with three black bands in proximal third (Fig. 175) then lateral sides of pronotum without white spot in lower distal corner (Ethiopia, Somalia) ***H. juliea*** sp.n.
- Proximal half of outer lateral surface of posterior tibiae with two black bands (Fig. 56), or if with three black bands in proximal third (Fig. 175), then lateral sides of pronotum with distinctive white spot in lower distal corner (Fig. 174) 7

- 7 Apex of subgenital plate broadly rounded with two tubercles (Fig. 158) (West Africa to Pakistan) ***H. adspersa***
- Apex of subgenital plate broadly rounded, slightly attenuate or elongate, without tubercles (Figs. 127, 134, 269) 8
- 8 Apex of subgenital plate elongated to form finger-shaped process (Fig. 269) (Zaire, Tanzania, Zambia, Malawi) ***H. attenuata***
- Subgenital plate broadly rounded or slightly pointed (Figs. 127, 134), never with finger-shaped process 9
- 9 Brachypterous species with tegmen never reaching to supra-anal plate (Fig. 275) 10
- Fully-winged species with tegmen reaching or surpassing supra-anal plate (Fig. 56) 11
- 10 Sides of head behind eye black without small white spot (Kenya) ***H. brevipennis brevipennis***
- Sides of head behind eye black with small white spot (Fig. 275) (Tanzania, Kenya) ***H. aethiopica***
- 11 Hind wings yellow at base 12
- Hind wings blue, red, colourless at base or entirely wine-red 15
- 12 Side of head with post-ocular yellow stripe (Fig. 281) 13
- Side of head without post-ocular stripe 14
- 13 Externomedian area of posterior femur with bold black proximal spot extending to lower carina (Fig. 282) (Tanzania) ***H. trimaculata*** sp.n.
- Externomedian area of posterior femur without black proximal spot (Fig. 267) (Angola, Zimbabwe, Malawi, Mozambique) ***H. pulchripes***
- 14 Posterior edge of epiphallic lophi outwardly stepped (Fig. 327) (Kenya) .. ***H. brevipennis laticercus*** stat. n.
- Posterior edge of epiphallic lophi incurved not stepped (Figs. 331-332) (Kenya) ***H. brevipennis nyambeniensis*** subsp. n.
- 15 Entire hind wing wine-red (Zaire, Uganda, Kenya) ***H. vinacea***
- Hind wing blue, red or red-orange or colourless at base 16
- 16 Externomedian area of posterior femur without black-brown spots or complete transverse bands, with exception of light-coloured pregenicular annulus or indistinct distal spots (Figs. 56, 144, 149) 17
- Externomedian area of posterior femur with black or brown spots or complete oblique transverse bands (Figs. 314, 318) 18
- 17 Cingular valves of aedeagus never surpassing tips of apical penis valves (Fig. 77) (Hind wings colourless at base)(North Africa to Israel) ***H. annulosa***
- Cingular valves of aedeagus just surpassing tips of apical penis valves (Fig. 142) (Hind wings generally blue at base)(East Africa) ***H. cyanescens***
- 18 Side of pronotum brown with distinctive off-white spot in lower distal corner and another smaller one above (Fig. 174) (East Africa to Yemen) .. ***H. rantae***
- Side of pronotum brown-yellow or dark green-black without distinctive white spot in lower distal corner (Fig. 156) 19
- 19 Externomedian surface of posterior femur yellow never green proximally with proximal, median and distal broad, black, oblique bands (Fig. 314) which extend to lower carina. Tegminal cells hyaline or uniformly faint infusate brown, never with spots or mottled pattern 20
- Externomedian surface of posterior femur yellow, brown or green proximally, with or without proximal, median and distal black-brown spots or bands, proximal median bands never reaching to lower carina, except those fused or replaced with dark green (Figs. 318, 288). Tegminal cells

- clear with scattered spots or with large areas of fused infusate brown cells (Figs. 285, 300) 21
- 20 Proximal process of lophal interspace abutting abruptly on to lophus (Fig. 311) (East Africa) ***H. coerulipes***
 – Proximal process of lophal interspace not abutting abruptly onto lophus, almost reaching to posterior margin of lophus (Fig. 307) (West Africa)
 ***H. jeanneli***
- 21 Cingular valves surpassing tips of apical penis valves (Fig. 315) 22
 – Apical penis valves surpassing tips of cingular valves (Fig. 59) 25
- 22 Posterior tibiae blue or dark scarlet-purple to blue-purple distally 23
 – Posterior tibiae crimson distally (West and Central Africa to Uganda)
 ***H. guineensis***
- 23 Externomedian area of posterior femur with broad black, oblique median band extending below median line, fusing with proximal dark green (Fig. 288) (South Africa) ***H. coeruleipennis***
 – Externomedian area of posterior femur with median black spot, never extending below median line or fusing with proximal dark green 24
- 24 Medium size (total length 35.47-41.59 mm), hind wings red-orange at base (Fig. 355) (West Africa) ***H. leani***
 – Small size (total length 23.77-26.61 mm), hind wing pale blue or colourless at base (Angola, Namibia, South Africa) ***H. prasinata***
- 25 Inner side of hind femur with proximal, median and distal black spots or transverse bands (Figs. 66, 72) 26
 – Inner side of hind femur with only median and distal black spots (Fig. 131) 27
- 26 Dorsal ectophallic membrane high-tectiform (Fig. 58) (West and North Africa to India) ***H. littoralis***
 – Dorsal ectophallic membrane low-tectiform (Fig. 67) (Iran, Pakistan)
 ***H. persa***
- 27 Cingular valves pincer-shaped (Fig. 77) (North Africa to Israel)
 ***H. annulosa***
 – Cingular valves U-shaped, (Figs. 124, 111) 28
- 28 Medium size (total length 24.92-31.83 mm), cercus large, apical process wider than basal stem (Fig. 128) (West and North Africa) ***H. harterti***
 – Very small insect (total length 16.69-21.41 mm): cercus small, apical process as wide as basal stem (Fig. 115) 29
- 29 Epiphallus, ventral surface, posterior edge of lophus straight or angled posteriorly (Fig. 120). Posterior tibiae pale pink distally (Sinai, Turkey, Iran) ***H. theodori***
 – Epiphallus, ventral surface, posterior edge of lophus angled anteriorly (Fig. 112). Posterior tibiae red distally (Algeria, Tunisia, Libya) ***H. minuta***
- 30 Tegmina without spots 31
 – Tegmina with spots or band (Fig. 198) 34
- 31 Tegminal cells uniformly infusate brown (South Africa) ***H. zulu*** sp.n.
 – Tegminal cells opaque not infusate brown 32
- 32 Externomedian area of posterior femur with line of black pigment proximally to distally running below upper carina (Fig. 342) (Iraq) ***H. buxtoni***
 – Externomedian area of posterior femur without spots, or with only proximal black stripe running below upper carina (Fig. 361) 33
- 33 Median dorsal pronotal stripe brown, area between first and basal sulci more lightly pigmented (Fig. 368) (Southern India, Sri Lanka) ***H. pulchra***
 – Median dorsal pronotal stripe unicolorous brown along entire length, without more lightly pigmented area between first and basal sulci (Fig. 362) (Pakistan, Northern India) ***H. notabilis***

- 34 Outer surface of posterior femur with diffuse, black, proximal spot merging with median transverse band (Figs. 203). Apical process of cercus expanded with sub-acute apex (Fig. 202) (South Africa) ***H. herbacea***
 – Outer surface of posterior femur with or without narrow, black proximal stripe running below upper carina, merging with small black median spot (Figs. 237, 255). Apical process of cercus tapered to form acute or sub-acute apex (Figs. 236, 243, 247 and 223) 35
- 35 Posterior femur dark red on all surfaces, median and distal spots indistinct (South Africa) ***H. calliptamoides calliptamoides***
 – Posterior femur yellow or yellow suffused with green, median and distal black spots (Figs. 242, 255) 36
- 36 Median area of cercus wider than basal stem (Figs. 229, 243) 37
 – Median area of cercus as wide or narrower than basal stem (Figs. 236, 247) 38
- 37 Apical process of cercus strongly tapered to form upcurved, elongate finger-shaped process with acute apex (Fig. 243) (South Africa)
 ***H. speciosa***
 – Apical process of cercus gently tapered, downcurved, sub-acute or acute, not forming finger-shaped apex (Fig. 217) (South Africa)
 ***H. calliptamoides testacea*** subsp.n.
- 38 Outer surface of posterior femur with small median black spot, extending proximally below upper carina (Fig. 237) (South Africa)
 ***H. acuticercus*** sp.n.
 – Outer surface of posterior femur with small median, black spot, not extending proximally below upper carina (Fig. 242)
 ***H. drakensbergensis*** sp.n.
- 39 Interocular distance wider than maximum width of antenna 40
 – Maximum width of antenna wider than interocular distance (Madagascar)
 ***H. antennata***
- 40 Inner proximal area and ventral surface of posterior femur red 41
 – Inner proximal area and ventral surface of posterior femur yellow or yellow with black markings 42
- 41 Tegmen shortened, not reaching to folded tips of posterior femur (S. Madagascar) ***H. reducta***
 – Tegmen not shortened, reaching to folded tips of posterior femur (Madagascar) ***H. sikorai***
- 42 Tegmen without infusate brown spots or bands 43
 – Tegmen with infusate brown spots or bands (Fig. 428) (Madagascar)
 ***H. zolotarevskyi***
- 43 Median antennal segments, about as wide or wider than long (Fig. 396) (Madagascar) ***H. nigricornis***
 – Median antennal segments, always longer than wide (Fig. 391, 407) . 44
- 44 Lateral edges of epiphallic lophal interspace weakly developed, not folded or recessed (Fig. 404) (Madagascar) ***H. finoti***
 – Lateral edges of epiphallic lophal interspace highly developed, recessed, folded (Fig. 386) (Madagascar) ***H. concinnicrus***

DISTRIBUTION

Heteracris species show a wide range of habitat preference, ranging from semi-arid desert to montane and lowland moist forest with some species colonizing oceanic islands.

Thirty seven of the 44 nominal species of *Heteracris* are Afrotropical, with five of that number, *littoralis*, *annulosa*, *harterti*, *rantae* and *adspersa* showing a trans-Ethiopian/Palaeartic distribution. Among those species *littoralis* is notable in extending its range from the Cape Verde Is. to Northern India. Five species, *minuta*, *persa*, *theodori*, *buxtoni* and *pterosticha*, are exclusively Palaeartic and two species, *pulcher* and *notabilis*, are restricted to the Indian subcontinent.

Among the species endemic to the Afrotropical region, *antennata*, *concinnicrus*, *nigricornis*, *finoti*, *reducta*, *sikorai* and *zolutarevskyi* are known only from Madagascar, whilst *herbacea*, *acuticercus* sp.n., *drakensbergensis* sp.n., *speciosa*, *zulu* sp.n., *coeruleipennis*, *prasinata* and the subspecies of *calliptamoides* are restricted to Southern Africa.

Ten species are exclusively East African: *cyanescens*, *juliea* sp.n., *aethiopica* comb.n., *nefasitensis* sp.n., *trimaculata* sp.n., *coerulipes*, *vinacea*, *coerulescens* and the subspecies of *brevipennis*. Of these *trimaculata* and *coerulipes* are confined to the highlands of Tanzania, whilst the subspecies of *brevipennis* are confined to the Kenyan highlands, and *vinacea* to the forests of Zaire, Uganda and Kenya.

Three species, *leāni*, *jeanneli* and *guineensis* are endemic to West Africa, although only *guineensis* is widespread in this region, extending into parts of Uganda and Angola. The remaining species, *coerulescens*, tends to be East African in distribution with disjunct populations occurring in Mozambique, Zaire and the Arabian Peninsula.

DESCRIPTION OF SPECIES

littoralis species-group

DIAGNOSIS. Apical penis valves of aedeagus large, lightly sclerotized but with edges forming more heavily sclerotized plates (Fig. 59). Cingular valves delicate, sub-tubular with acute apices (often difficult to resolve under the light microscope) much shorter than apical penis valves. Median carinula of fastigium of vertex absent or weakly expressed as a lighter-coloured striation. Dorsal ectophallic plate with distal, median raised thickening. General coloration variable, brown with contrasting light and dark dorsal longitudinal stripe markings. Tegmina with large brown spots merging to form transverse bands. Hind wing colourless or sometimes slightly greenish at base.

COMMENTS. Closely related species that can only be reliably identified by the male internal genitalia. This group is predominantly Palaeartic-Afrotropical in distribution with two species, *littoralis* and *persa*, extending into Northern India. The species of this group are most closely related to the *morbosea* group.

Much of what is known about the biology, economic importance and life history of species in this group can be found in the *Locust and Grasshopper Agricultural Manual*, COPR (1982) and in Fishpool & Popov (1984).

Heteracris littoralis (Rambur)
(Figs. 20a, 58-66)

Gryllus littoralis Rambur, 1838:78. Holotype male, SPAIN (lost). NEOTYPE male, SPAIN (BMNH), here designated [examined].

Cyrtacanthacris notata Walker, 1870:574. Holotype female, EGYPT (BMNH) [examined]. (Syn. Uvarov, 1939:381).

Thisoicetrus littoralis (Rambur); I.Bolivar, 1908:329
Thisoicetrus littoralis similis (Brunner, 1861). Holotype male, EGYPT Type lost.
Syn. n.
Thisoicetrus var. *aethiopica* Carl, 1916:493. Holotype male, SENEGAL (MHN).
Syn. n.
Thisoicetrus littoralis asiaticus Uvarov, 1933:230. Holotype male. IRAN (ZI).
 (Syn. Uvarov, 1939:381)
Thisoicetrus bituberculatus Bei-Bienko, 1948:72. Holotype male. IRAN (ZI).
Syn. n. [examined].
Heteracris littoralis (Rambur); Dirsh, 1958:53.

DIAGNOSIS. Male. Apical penis valves of aedeagus, posterior aspect, at apex, strongly inwardly directed, apices acute (Figs. 58-60); dorsal ectophallic plate (Fig. 58), with median, distal, high-tectiform edge. Epiphallus as in Fig. 61. Subgenital plate with weakly pronounced apex (Fig. 63). Externomedian area of posterior femur with proximal, median and distal black spots, proximal and median spots never extending below median line (Fig. 65): inner surface depicted in Fig. 66. Posterior tibiae, distally light red to red-violet.

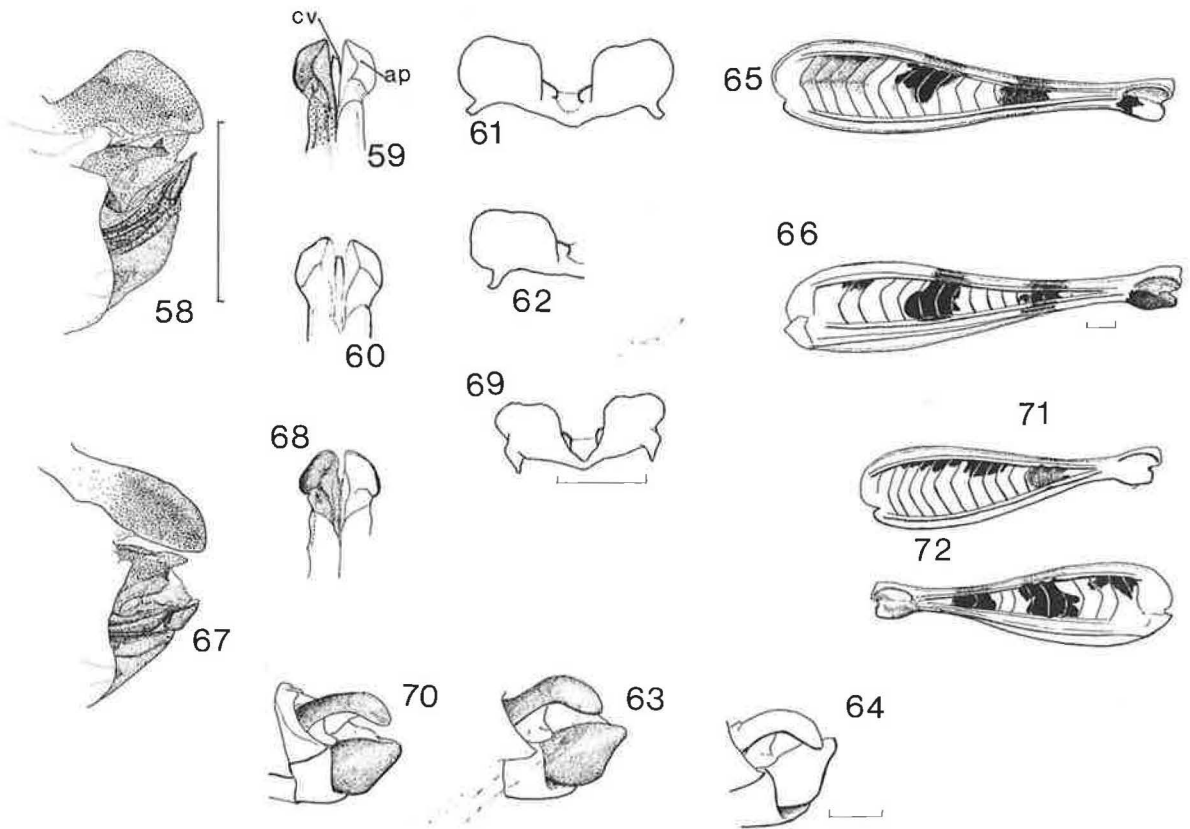
Table 1

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 17 | 0.97 | 0.81-1.24 | 0.11 | 17 | 1.52 | 1.25-1.75 | 0.13 |
| Head width | 17 | 4.30 | 3.89-4.85 | 0.24 | 17 | 5.59 | 5.13-6.00 | 0.28 |
| Pronotal width | 17 | 4.50 | 4.02-5.54 | 0.35 | 17 | 6.99 | 6.00-7.99 | 0.61 |
| Pronotal length | 17 | 4.80 | 4.11-5.22 | 0.41 | 17 | 7.53 | 6.74-8.56 | 0.63 |
| Hind femur depth | 17 | 3.54 | 3.00-4.13 | 0.24 | 17 | 4.93 | 4.45-5.52 | 0.31 |
| Hind femur length | 17 | 15.22 | 11.13-18.40 | 1.72 | 17 | 22.86 | 19.57-26.57 | 2.17 |
| Tegminal length | 17 | 20.66 | 16.90-25.54 | 2.06 | 15 | 30.45 | 25.53-35.18 | 3.40 |
| Antennal length | 13 | 10.04 | 7.32-11.93 | 1.19 | 9 | 13.20 | 10.99-13.87 | 0.88 |
| Total length | 17 | 26.85 | 23.07-31.83 | 2.38 | 17 | 39.45 | 34.25-44.55 | 3.91 |

COMMENTS. *H. littoralis similis* was distinguished from the nominate subspecies by Uvarov (1939), on the basis of tibial coloration and degree of elongation of the subgenital plate. Both these characters are inconsistent (see Figs. 63-64 for subgenital plates), and similar tibial coloration between material from Malaga, Spain and certain localities in Arabia was commonly seen. In some specimens slight colour differences were also noted between the dorsal surface of the tibia (taken as the spined surface) and ventral surface. Moreover, the internal genitalia of topotypical specimens from Malaga, Spain (type locality for nominate subspecies) and from Egypt (designated as the type locality for *littoralis similis* by Uvarov (1939)), are very similar (compare Figs. 59-62), irrespective of tibial coloration. It is for these reasons that *similis* is here synonymized under *littoralis*. The genitalia of the type of *bituberculatus*, which had been dissected previously and glued to a card attached to the specimen, were clearly of *littoralis* form. The tuberculate nature of the subgenital plate may have been caused by deformation, probably during ecdysis. Recent cytological studies by Cano & Santos (1989), on natural populations of *H. littoralis* from Valencia, Spain have established the presence of an accumulation mechanism of the standard B chromosome in *littoralis*.

Since the type material of this species is lost a neotype is here designated from Spain.



Figures 58-72

Heteracris littoralis (males). 58, lateral aspect of genitalia; 59, posterior aspect of penis valves, Egypt; 60, same, Spain; 61, ventral aspect of epiphallus, Iraq; 62, same, Spain; 63, lateral aspect of subgenital plate, Spain; 64, same, Iran; 65, outer aspect of left hind femur; 66, inner aspect of left hind femur. 67-72. *H. persa*. 67, lateral aspect of genitalia, 68, posterior aspect of penis valves; 69, ventral aspect of epiphallus; 70, lateral aspect of subgenital plate; 71, outer aspect of left hind femur; 72, inner aspect of left hind femur. All scale lines represent 1 mm; that alongside Fig. 58 also applies to Figs. 59-60 and 67-68; that under Fig. 69 also applies to Figs. 61-62; that under Fig. 66 also applies to Figs. 65 and 71-72; that under Fig. 64 applies to all other figures.

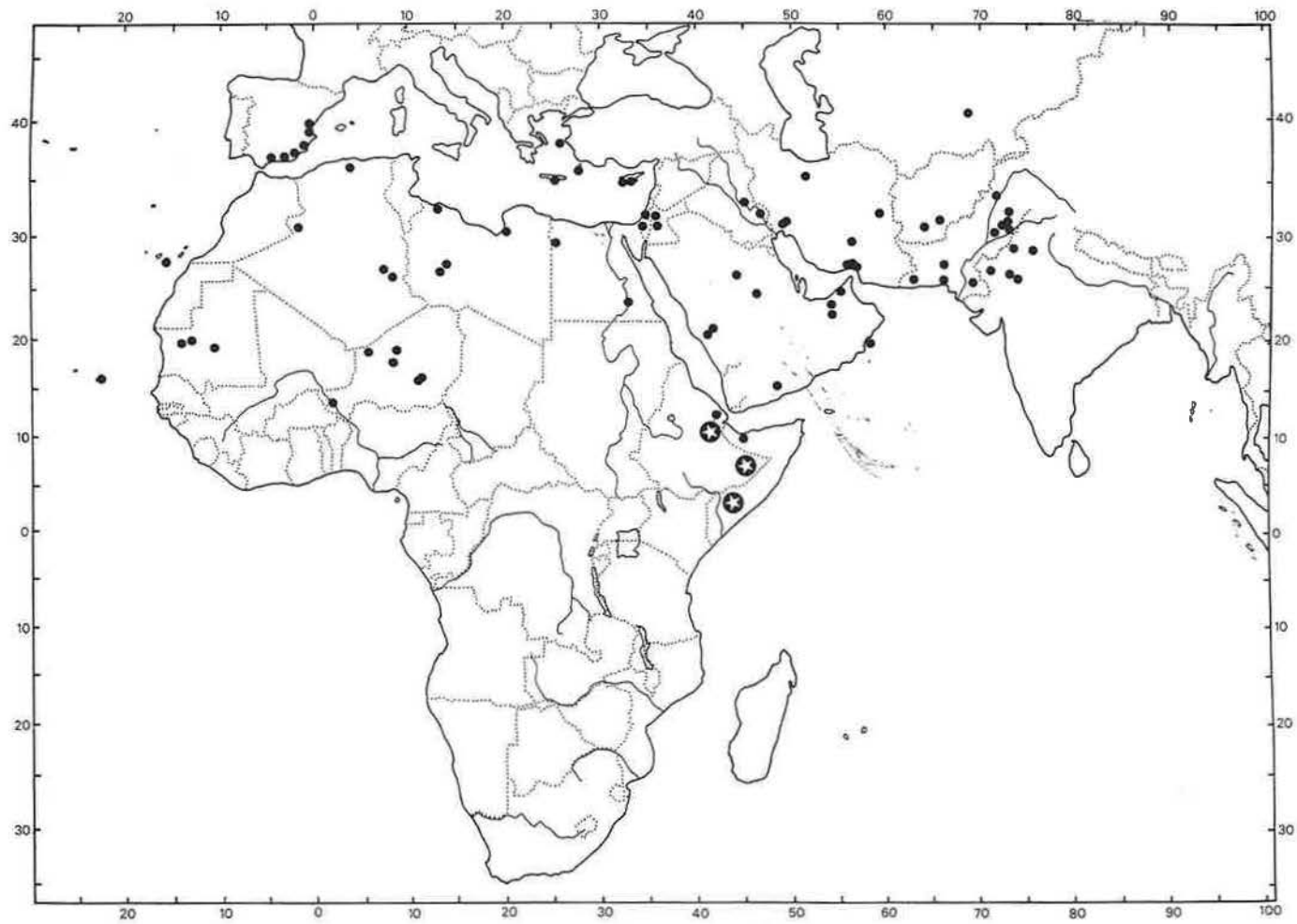
TYPE MATERIAL EXAMINED

Gryllus littoralis Rambur, neotype male, **Spain**, Almeria, nr. Vera, 3.x.1962 (Ragge)(BMNH). *Thisoicetrus littoralis asiaticus* Uvarov, paratype male, **Iraq**: Baghdad, 8.xi.1923 (Hingston)(BMNH). *Thisoicetrus bituberculatus* Bei-Bienko, holotype male, **N. Iran**: Veramin, cotton field, 13.ix.1945 (ZI). *Cyrtacanthacris notata* Walker, holotype female, **Upper Egypt** (BMNH).

ADDITIONAL MATERIAL EXAMINED [all BMNH unless otherwise stated]

USSR: 1 female, Golodnaya, steppe, 160 km S. of Tashkent, 14.viii.1968 (Uvarov)(NRI); **Israel**: 1 male, N. Rubin, 12.8.1954 (Fishelsohn); 1 female, Holon, 16.xi.1962 (Amitai); 1 female, Holon, 9.ii.1957 (Machlis); **Jordan**: 2 males, 3 females, Tabgha, Galilee, 15-17.xi.1935 (no coll.); 1 female, Tell Hum, synagogue, 17.xi.1935 (no. coll.); 1 male, Wadi Ghuzze, 25.xi.1930-30.iv.1931 (Scott); 1 male, 1 female, E. bank, R. Jordan, L. Genazareth, 1938

(*Palmoni*); **Iraq**: 2 males, 1 female, Baghdad, 11-12.vi.1946 (*Brown*); 1 male, Baghdad, 24.x.21 (*Peile*); 8 males, 3 females, Baghdad, 8-18.xi.1923 (*Hingston*); 3 females, Baghdad, summer 1929 (*Hingston*); 2 males, 3 females, 5-30.viii.1923 (*Hingston*); 1 male, Al Amarah, 28.vi.1918 (*Buxton*); 1 male, Al Amarah, R. Tigris, 15.vi.1918 (*Buxton*); 1 females, Al Amarah, R. Tigris, 30.x.1917 (*Buxton*); 1 female, Al Amarah, R. Tigris, 1.xi.1918 (*Buxton*); 1 female, Baguba, R. Diyula, no date (*Buxton*); 1 female, Baghdad, 12.vi.1946 (*Brown*); 1 female, Tanaama, x.1918 (no coll.). **Iran**: 1 male, Hajiabad, N. of Bandar Abbas, iii.1951 (*Popov*); 1 female, Sarkhun, Bandar Abbas, 1.v.1950 (*Popov*); 1 male, 1 female, Negar, S. of Kirman, vii.x.1950 (*Ox. Univ. expdt.*); 1 female, Rizwan, Bandar Abbas, 1.v.1950 (*Popov*); 1 male, 3 female, Minab, 12.v.1950 (*Popov*); 19 males, 14 females, Haft-Gel, xi.- xii.1932 (*Pill*); 18 males, 13 females, x.1932 (*Pill*); 1 male, 1 female, N. Ahwaz, Haft-Gel, 11.viii.1932 (*Pill*); 2 females, Bahram, 7.viii.1948 (*Aellen*); **United Arab Emirates**: 1 female, Ash Shariqah, 1.v.1973 (*Gallagher*); 1 female, Ash Shariqah, xi-xii.1963 (*Redy*). **Saudia Arabia**: 2 males, Al Aqiq, 2.vi.1969 (*Popov*); 1 male, Burayidah, 16.v.1969 (*Popov*)(NRI); 1 male, Turaba, 7.v.1969 (*Popov*)(NRI); 1 male, Hawi Valley, v.1936 (*Philby*); 1 male, Riyadh, 20.v.1968 (*Popov*)(NRI). **Oman**: 1 male, dunes near Nadinat Qaboos, 23°35'N 58°28'E, vii.1982 (*Gallagher*)(NRI); 1 male, Senenah, 19.x.1970 (*Tunstall*)(NRI). **Masirah Is.**: 1 male, NE. part in coastal scrub, 8.vii.1983 (*Gallagher*)(NRI). **Yemen P.D.R.**: 1 female, Hadhramaut, Wadi Amd-Ghouda, vii.1955 (*Hall*). **Afghanistan**: 2 males, nr. Kandahar, 11-12.v.1973 (*Popov*)(NRI); 1 female, Darweshan, 13.v.1973 (*Popov*)(NRI). **Pakistan**: 1 male, Khuzdar, 23, iv.1979 (*Popov*)(NRI); 1 male, 1 female, Mand-Turbat area 21-23.v.1963 (*Popov*); 1 2 males, 1 female, Punjab, Khewra, salt range, 24.ix-x.1930 (*Hora & Pruthi*); 1 female, Peshawar Distr., Taru, 16-29.v.1915 (*Fletcher*); 1 male, 1 female, Pir Malhal, nr. Montgomery, 17.iv.1963 (*Popov*); 1 male, Lyallpur, at light, 9.v.1923 (*Student col.*); 1 male, Bubak, 25.xi.1927 (*Zool.Surv.Ind.*); 1 male, Gurdaspura, 3.xi.1918 (*Bay*); 2 males, 1 female, Bahawalpur, Yasman, 7- (8.vii.1963 (*Popov*); 1 male, Tharparkar, 23.vii.1963 (*Popov*); 1 male, nr. Multan, 3.vii.1963 (*Popov*); 1 female, Ahmadpur, 18.vi.1933 (*Rao*); 1 male, nr. Kalat, 10.x.1963 (*Popov*). **India**: 1 female, Ramgarth, 15.viii.1963 (*Popov*); 1 male, 1 female, Bikaner, 1.xi.1949 (*Uvarov*); 1 female, nr. Bikaner, Udransar, 20.viii.1963 (*Popov*); 1 male, Rajasthan, Jodhpur, 26.v.1959 (*Popov*); 1 male, 1 female, Ambasar, 27.ix.1959 (*Flower*); 2 females, Jodhpur, 24.viii.1968 (*Popov*); 3 females, nr. Bikaner, viii.1963 (*Popov*); 1 male, 1 female, Rajasthan, Jaisalmer, 30.vii.1959 (*Flower*); 1 female, E. Rajasthan, Nanwan, 9.vii.1959 (*Flower*); 2 females, Bikaner, 10.x.1969 (*Popov*). **Spain**: 2 males, 2 females, Malaga, San Julian, golf course, 11.ix.1969 (*Jeekel*)(ZMA); 1 male, Andalucia, Mojacar, 10.ix.1968 (*Brink*)(ZMA); 1 male, Valencia, El Saler, 25.x.1964 (*Straatman*)(ZMA); 2 (males, 1 female, Almeria, nr. Adra, 3.x.1962 (*Ragge*); 1 male, 3 females, Almeria, nr.Vera, 3.x.1962 (*Ragge*); 1 male, 1 female, Alicante, 3 km W. of Denia, 11.ix.1986 (*Reynolds*); 6 males, 6 females, P. de Greda, 22.v.1935 (*Burr*); 10 males, 2 females, P. de Torrenieja, 21.ix.1935 (*Burr*). **Crete**: 2 males, 1 female, Iraklion, Phaistos, 23-26.v.1972 (*Kruseman*)(ZMA). **Cyprus**: 1 male, Kourion beach, 30.ix.-4.x.1983 (*Kruseman*)(ZMA); 1 female, Larnaca, 1902 (*Glaszner*); 1 male, Yiolou, 5.x.1983 (*Kruseman*)(ZMA); 1 male, 1 female, Xeropotamos, beach mouth, Kouklia, 4.x.1983 (*Kruseman*)(ZMA); 1 male, Limassol, 28.ix.-6.x.1980 (*Chrispinjn & Lempke*)(ZMA); 1 female, Mamonía, 29.ix.1983 (*Kruseman*)(ZMA); 1 male, beach, nr. mouth of R. Khapotami, 30.ix.-8.x.1983 (*Kruseman*)(ZMA); 1 male, 3 females, Akrotiri, 6.x.-14.x.1983 (*Kruseman*)(ZMA). **Rhodes**: 1 male, Tsambikas, 26.x.1980 (*Houkes*)(ZMA); 2 males, 1 female, Lindos, 26-28.iii.1970 (*Ellis*)(ZMA); 2 males, 2 females, 10 km N. Malona, 11.iv.1970 (*Ellis*)(ZMA); 1 male, 2 females, Kalathos, 5 km N. Lindos, 7.iv.1970 (*Ellis*)(ZMA); 1 male, 5 km SW. of Lindos, 29.iii.1970 (*Ellis*)(ZMA); 1 male, 1 female, Laerma, 200 m, 14.iv.1970 (*Ellis*)(ZMA); 1 male, 2 females, Ailyssos, 9-25.x.1980 (*Houkes*)(ZMA); 1 male, 1 female, Apolakkia, 12.vi.1979 (*Kruseman*)(ZMA); 1 female, Lindos, 4.iv.1971 (*Van de Goot*)(ZMA); 1 female, Kattavia 4.v.1981 (*Kruseman*)(ZMA); 2 females, nr. Limassol, 3.x.1927 (*Mavromoustakis*); 2 males, 1 female, Orta Keuy,



Map 1

Distribution of *Heteracris* species. Solid circles *H. littoralis*; circles with star *H. juliea* sp.n.

ii.xii.1944 (*Mavromoustakis*); 1 male, Rizokarpuso, 27.iv.1946 (*Mavromoustakis*); 1 male, Zukuki, 24.x.1929 (*Mavromoustakis*). **Salmos**: 1 female, Vathy, 16.v.1983 (*Daan & Laar*)(ZMA). **Turkey**: 2 males, 2 females, Mersin, Tasucu, 12 km SW. of Silifke, 4-7.x.1983 (*Jeekel*)(ZMA). **Canary Is.**: 1 male, Grand Canaria, Maspalomas, 22.ii.1986 (*Kruseman*)(ZMA); 11 males, 2 females, Grand Canaria, Maspalomas, 16.viii.1966 (*Guichard*). **Algeria**: 1 male, Boghari, 28.ix.1937 (*Korsakoff*); 2 females, 65 km S. of Bechar-Menouarar, 4.v.1983 (*Leys & Hurk*)(ZMA); 1 female, Tiguelguemine 170 km, Ain Salah (*Eydhoven*)(ZMA). **Libya**: 1 male, 3 females, Wadi Hira, 10.xii.1976 (*Kruseman*)(ZMA); 1 male, 3 females, 140 km S. of Banghazi, Sultan, 10.viii.1984 (*Persson*); 1 male, 2 females, Fezzan, Tirrhe, 14.iv.1952 (*Guichard*); 2 males, 2 females, Fezzan, Brak, 11.xi.1952 (*Guichard*); 1 male, Tibesti, Wadi Tao, 13.iii.1953 (*Guichard*); 1 male, Fezzan, Tesaua, E. of Murzuq, 9.iv.1952 (*Guichard*). **Egypt**: 1 male, 2 females, Aswan, 24°07'N, 32°52'E, 21.i.1977 (*Bink & Moenen*); 1 male, Siwa, 31.vii.1935 (*Omer-Cooper*); 1 female, Kassassin, 8.x.1915 (*Graves*); 2 females, El Arig, 8.vi.1935 (*Omer-Cooper*). **Cape Verde Is.**: 1 female, St. Vincente, no further data. **Mauritania**: 4 males, 1 female, nr. Akjoujt, 14.v.1959 (*Popov*); 3 males, 3 females, 20°N 13°3'W, 15.iii.1970 (*Popov*)(NRI); 1 male, 19°30'N 10°30'W, at light (*Popov*)(NRI). **Niger**: 1 male, 1 female, Anas Baraka, 14.ix.1965 (*Popov*); 1 female, Abangharit, 12-19.ix.1965 (*Popov*); 3 males, 3 females, Egaro, NE. of Tanout, 15.vii.1966 (*Popov*)(NRI); 1 male, Termit, 12.viii.1965 (*Popov*)(NRI); 1 female, Mibikas, at light, i-iii.1970 (*Davies*)(NRI); 1 female, Air, 100 km N. of Agadez, 25.viii.1967 (*Popov*)(NRI); 1 female, Talak, 26.ii.1970 (*Davies*)(NRI); 1 female, Ifrouane, 22.i.1970 (*Davies*)(NRI); 3 females, 1 female nymph, Niamey, xi.1978 (*Popov*)(NRI); 1 female, Timmersoi, 22.ix.1965 (*Popov*); 1 male, Kandil Bouzou, SW. of Massif of Termit, 14.vii.1966 (*Popov*)(NRI). **Ethiopia**: 1 female, 23.4 km N. of Aseb, 10.iii.1950 (*Bellehu*). **Somali Rep.**: Berbera-Zeila, 24-25.i.1954 (*Popov*).

***Heteracris annulosa* Walker**

(Figs. 56-57, 73-109, 131-134)

Heteracris annulosa Walker, 1870:673. Holotype female (no data)(BMNH). [examined].

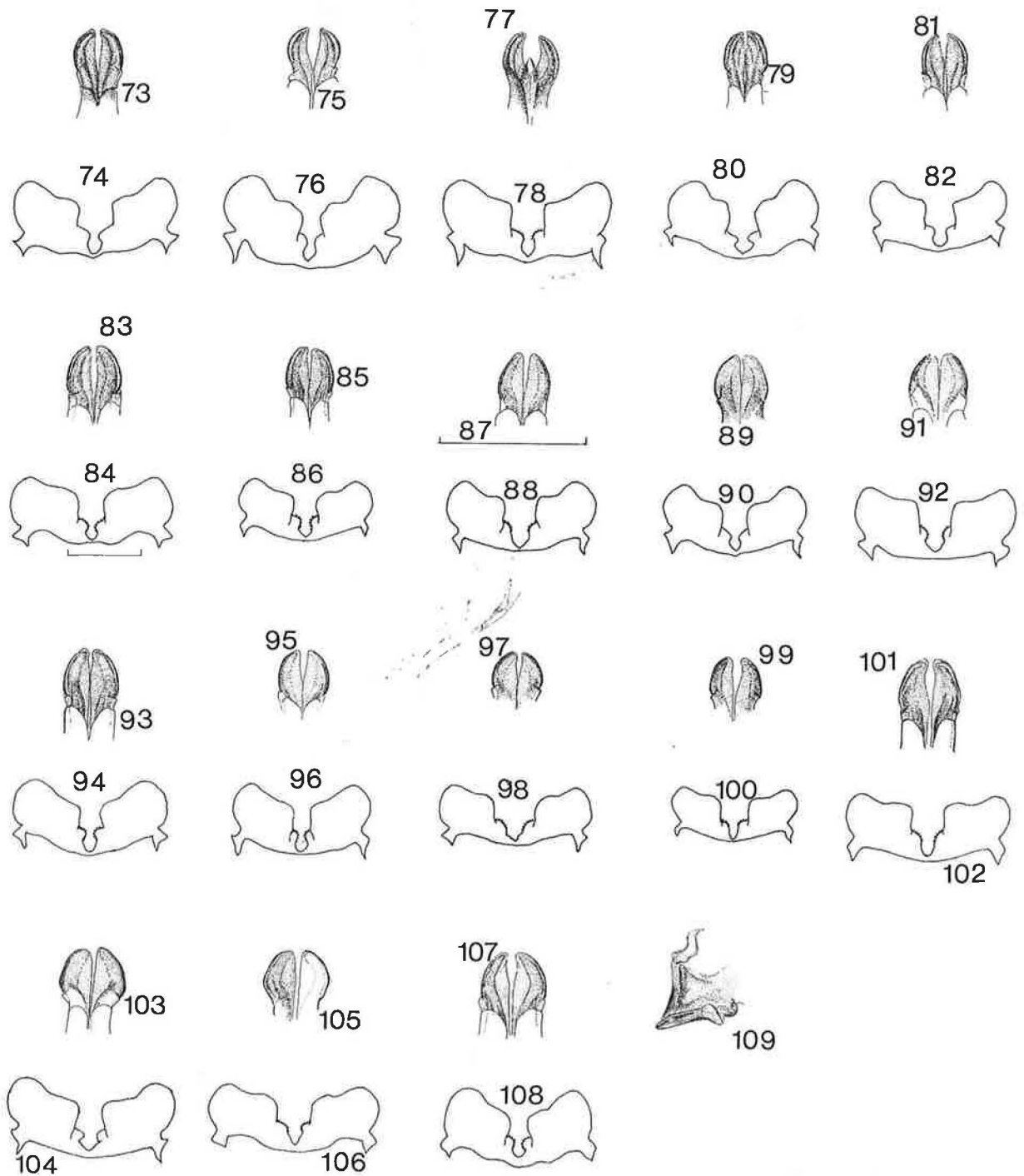
Acridium continuum Walker, 1871:suppl. 5:61. Holotype female, SINAI (BMNH). [examined]. Syn. by Uvarov, 1939.

Pezotettix (Euprepocnemis) charpentieri Stål, 1873:75. LECTOTYPE male, TUNIS (NR, Stockholm). 1939, here designated [examined]. Syn. by Uvarov.

Thisoicetrus brevipes I. Bolivar, 1936:416. Holotype male, MOROCCO (IEE, Madrid) [examined]. **Syn.n.**

DIAGNOSIS. Male. Apical penis valves of aedeagus, posterior aspect, ovoid-shaped, with more heavily sclerotized pincer-shaped lateral plates. Epiphallus with wing-nut shaped lophi (for epiphallic and aedeagal variation see Figs 73-109). Dorsal ectophallic plate, with median, high-tectiform edge, similar to that of *littoralis*. Subgenital plate (Figs. 133-134) broadly rounded without attenuated apex like *littoralis* and *harterti*; apical process of cercus (Fig. 132) slightly more expanded than in *littoralis*. Internomedian surface of posterior femur always with median and distal black spots (Fig. 131), femoral markings on external surface are variable, generally with median and distal spots (Fig. 156) but sometimes absent, or with series of small black spots running along upper and lower carina, if present, median spot never extending to median line.

COMMENTS. Extremely variable and widespread species, often confused with both *harterti* and *minuta* with which it is sympatric. The aedeagi and epiphalli show much intraspecific variation (Figs. 73-109). Populations from N. Africa tend to have smaller, more slender cingular valves (Figs, 73-90) than counterparts from populations in Israel through to Iran (Figs. 101-108). More detailed analysis would be required to establish whether these populations represent subspecies.



Figures 73-109

Heteracis annulosa (males), showing variation in aedeagal (even numbers) and epiphallic (odd numbers) morphology. 73-74, Nigeria; 75-76, Morocco; 77-78, Algeria; 79-80, Chad; 81-82, Libya; 83-84, Egypt; 85-86, Sudan; 87-88, Ethiopia; 89-90, Somalia; 91-92, Abd-Al-Kuri; 93-94, Yemen A.R.; 95-96, Masirah Is.; 97-98, Muscat; 99-100, Bahrain; 101-102, Sinai; 103-104, Israel; 105-106, Jordan; 107-108, Iran; 109, posterior aspect of male epiphallus. All scale lines represent 1 mm; that under Fig. 87 also applies to all odd-numbered figures (with exception of Fig. 109); that under Fig. 84 applies to all other figures.

The aedeagus of this species appears to be most similar in structure to that seen in the *morbosa* group (compare Figs. 77, 135, 139), the apical penis valves of the latter being generally more evenly sclerotized.

Table 2

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 20 | 0.67 | 0.55-0.84 | 0.07 | 12 | 1.22 | 0.96-1.37 | 0.13 |
| Head width | 20 | 4.08 | 3.58-4.72 | 0.25 | 12 | 5.41 | 4.90-6.44 | 0.43 |
| Pronotal width | 20 | 4.02 | 3.43-4.75 | 0.31 | 12 | 6.93 | 5.94-7.90 | 0.70 |
| Pronotal length | 20 | 4.12 | 3.33-5.02 | 0.41 | 12 | 6.88 | 5.61-8.03 | 0.76 |
| Hind femur depth | 20 | 3.33 | 2.79-4.21 | 0.27 | 12 | 5.05 | 4.43-5.40 | 0.31 |
| Hind femur length | 20 | 12.83 | 10.63-14.76 | 1.03 | 12 | 21.06 | 19.08-24.22 | 1.57 |
| Tegminal length | 20 | 15.61 | 13.13-19.01 | 1.56 | 10 | 29.85 | 26.61-34.84 | 2.64 |
| Antennal length | 20 | 9.73 | 8.09-11.58 | 0.97 | 7 | 11.95 | 10.91-12.68 | 0.76 |
| Total length | 20 | 22.80 | 18.66-25.70 | 1.87 | 12 | 36.99 | 33.10-43.26 | 2.65 |

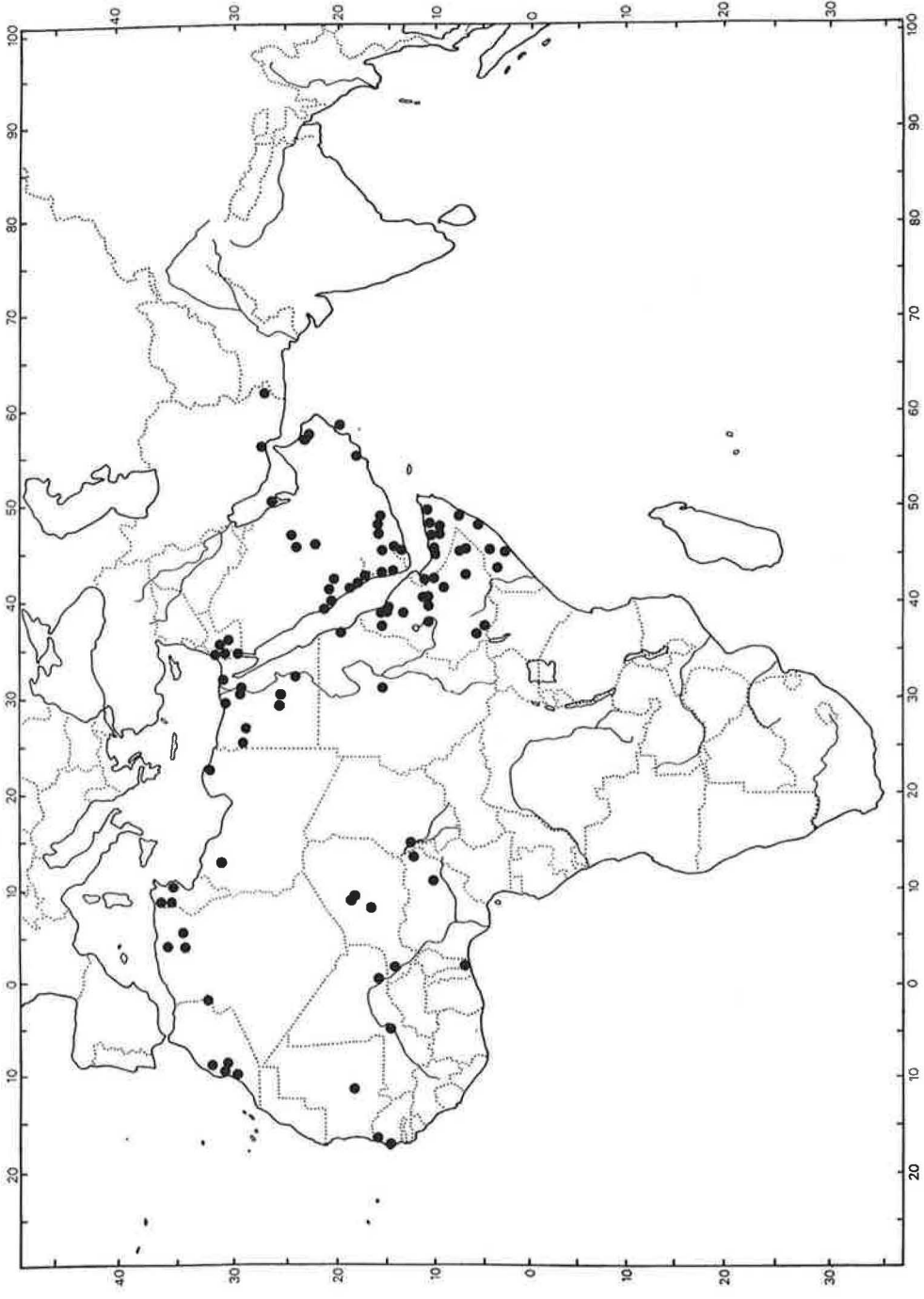
TYPE MATERIAL EXAMINED

Heteracris annulosa Walker, holotype female, (no label data)(BMNH). *Acridium continuum* Walker, holotype female, **Sinai**: no further data (BMNH). *Pezotettix (Euprepocnemis) charpentieri* Stål, lectotype male, **Tunis**: no further data (NR, Stockholm). *Thisoicetrus brevipes* I. Bolivar, holotype male, **Morocco**: Sidi Ifini, vi.1934 (*Escalera*)(IEE).

ADDITIONAL MATERIAL EXAMINED [all BMNH unless otherwise stated]

Israel: 2 males, Eilat, 28.iv.-2.v.1967 (*Jeekel*)(ZMA); 1 male, 1 female, Arad, 7-9.v.1967 (*Jeekel*)(ZMA); 1 female, Beit Nanan, 2.vi, 1967 (*Jeekel*)(ZMA); 1 female, Chof Ashod, Kvutsat Javne, 1961 (*Cohen*)(ZMA); 1 female, Haifa, 4.iv.1922 (*Buxton*); 1 male, Negeb, Sbetta, 31.x.1954 (*Fishelsohn*). **Jordan**: 1 male, Shaumari, 8.iv.1976 (*Clarke*); 1 male, Jariya Bridge, 18.iv.1952 (*Waterston*); 6 males, 1 female, Jericho, among halophytes, salt clay desert, 13.x.1922 (*Buxton*); 2 males, Wadi Zerka, 14.iv.1951 (*Jerash*); 1 female, Jericho, 2.iv.1923 (*Buxton*); 1 female, Jariya Bridge, 12.iv.1951 (*Waterston*); 1 female, Wadi er Ratam, 24.iv.-10.v.1966 (*Fletcher*); 3 females, Shaumari, 2.x.1976 (*Clarke*). **Iran**: 1 male, Saravan, iv.1950 (*Salavatian*), 1 male, Rizwan, Bandar Abbas 24.iv.1950 (*Popov*); 1 male, Hajiaba, Bandar Abbas, iii.1951 (*Popov*); **Saudi Arabia**: 2 males, 1 female, Al Aqiq, 2.vi.1969 (*Popov*)(NRI); 1 male, Bisha, 29.v.1969 (*Popov*); 1 male, Al Aflaj, 26.v.1969 (*Popov*); 1 female, Hawi Valley, v.1936 (*Philby*); 3 males, 1 female, Turaba, 7.v.1969 (*Popov*)(NRI); 1 male, 1 female, Riyadh, 20.v.1969 (*Popov*)(NRI); 1 female, Kieiyd, 8.iv.69 (*Popov*); 1 male, Hada, Acacia bush, 1700 m., 4.v.1969 (*Popov*)(NRI); 1 male, Lith, 10.iii.1969 (*Popov*)(NRI); 3 males, 1 female, Bisha, 29.v.1969 (*Popov*)(NRI); 1 male, 2 females, Quwaiyyah, 10.iv.1969 (*Popov*)(NRI); 1 male, Maraba, 30.ix.1978 (*Buttiker*); 1 male, Abha-Jizan, Wadi Ad Dilla, 300 m. (*Buttiker*); 1 male, Buwabiyat, 24.iv.1978 (*Buttiker*). **Bahrain**: 1 male, 20.xi.1970 (*Gallagher*); 1 male, 20.ii.1971 (*Gallagher*). **Oman**: 5 females, 1 male, Dhofar, Salalah, 4.vi.1967 (*Wherry*)(NRI); 1 male, 1 female, Salalah, 21.ix.1972 (*Guichard*)(NRI); 2 females, As Suwaiq, 22.x.1970 (*Tunstall*)(NRI); 1 male, Behla (500 m), 4.iii.1976 (*Guichard*)(NRI); 1 male, Sib, Batinah, 23.viii.1978 (*Gallagher*)(NRI); 1 male, S. Qara, 23.x.1983 (*Hogarth*)(NRI); Muscat, 2 males, 1 female, Qurum, 11.iv.1976 (*Guichard*)(NRI). **Yemen A.R.**: 5 males, Wadi Sharas, x.1981 (*Larsen*)(NRI); 3 males, 1 female, nr. Al Hudaydah, 1-8.i.1985 (*Popov*)(NRI); 1 female, Zeidiyah, 3.i.1985

(*Popov*)(NRI); 1 female, Al Husayniyah, i.1985 (*Popov*)(NRI); 2 males, 1 female, 50 km N. of Marib, i.1985 (*Popov*)(NRI). **Yemen P.D.R.:** 1 female, Hadhramaut, Wadi-Amd-Ghouda vi.1955 (*Hall*); 1 male, 1 female, Abyan 50 m., 21.v.1967 (*Guichard*)(NRI); 1 male, Abyan, 21.v.1967 (*Popov*)(NRI); 1 male, Zamakh-Seiyun, vi.1954 (*Greathead*); 4 males, Lowdar (800 m.), 16.v.1967 (*Guichard*). **Abdelkuri Is.:** 1 male, 5 females, Saleh, 7.v.1967 (*Guichard*)(NRI). **Masirah Is.:** 4 males, 1 female, RAF camp, 15-19.iv.1976 (*Guichard*)(NRI); 1 male, RAF camp, 1.iii.1976 (no coll.)(NRI). **Morocco:** 1 male, 1 female, Tamri, 10.xi.1984 (*Kruseman*)(ZMA); 1 male, 1 female, Sidi Rahal, 9.xi.1984 (*Kruseman*)(ZMA); 1 males, Agadir, 5.xi.1984 (*Kruseman*)(ZMA); 1 male, Agadir-Tiznit rd., 8.xi.1984 (*Kruseman*)(ZMA); 1 male, 1 female, Tiznit, 6.xi.1984 (*Kruseman*)(ZMA); 1 male, Oulad Berhil, 13.xi.1984 (*Kruseman*)(ZMA); 1 female, Taroudant, 13.xi.1984 (*Kruseman*)(ZMA); 1 male, Fiquiq, 19.x.1955 (*Duhamah*); 1 male, Tiznit, iii.1934 (*Rungs*); **Algeria:** 1 male, Biskra, Ain-ben-Noul, (*Korsakoff*); 1 male, Boghari, 28.ix.1937 (*Korsakoff*); 1 male, Djelfa, 7.x.1938 (*Korsakoff*); **Tunisia:** 1 male, 1 female, Monastir Bir Ettaib, nr. Djemmal, 20.xi.1980 (*Ellis & Thomas*)(ZMA); 1 male, 1 female, Sousse, 16-27.xii.1972 (*Kruseman*)(ZMA); 1 male, 1 female, Monastir Touza, 17-21.xi.1980 (*Ellis & Thomas*)(ZMA); 1 male, 1.iv.1925 (*Omer-Cooper*); 1 male, Chemtou, 15.i.1943 (*Bradley & Fletcher*). **Libya:** 1 male, Cyrenaica, Derna shore, 3.vi.1957 (*Guichard*); 1 female, Suani, 15.x.1975 (*Kruseman*); 2 males, Garian, 25.iii.1951 (*Guichard*); 1 male, Garian Hills, 2.xii.1951(*Guichard*). **Egypt:** 2 males, Kharaga oasis, ii.1912 (no coll.): 1 female, Kassassin, 8.x.1916 (*Graves*); 3 males, 3 females, Dakhla oasis, 14-31.xii.1977 (*Thomas*)(ZMA); 2 males, 2 females, Dakhla oasis, Ewina, 16.xii.1977 (*Thomas*)(ZMA); 1 female, Alexandria, 9.i.1962 (*Piet*)(ZMA); 6 males, 11 females, Khamissa, 22-29.vi.1935 (*Omer-Cooper*); 4 males, 4 females, Aswan, N. end of lake, shrubs on island, 22.iii.1981 (*Ritchie*)(NRI); 1 female, 62 km S. of Cairo, 7 km N. of El Saff, irrigated lucerne fields, 8.iii.1981 (*Ritchie*)(NRI); 1 male, Maragi, 14.viii.1936 (*Omer-Cooper*); 1 male, Aswan, 5.i.1921 (*Hayward*); 12 males, 21 females, Siwa, 12.v.-6.vii.1935 (*Omer-Cooper*); 1 male, Fayum, 30.i.1914 (*Naguib*); 1 female, Fayoum, L. Karum, 2-23.ix.1945 (Coe); 1 male, Ain Nouamissa, 16.vi.1935 (*Omer-Cooper*); 4 males, 3 females, Sitra, 13-15.vi.1935 (*Omer-Cooper*); 1 female, Khor Hanoieit (Red Sea), 23.iv.1920 (*Johnston*); 1 male, Helusa, 20.x.30 (Roszkowski); 1 female, Gara, 3.vii.1935 (*Omer-Cooper*); 1 female, Baharein, 11.vi.1935. (*Omer-Cooper*); 1 male, 1 female, Port Said, 2.i.1962 (*Piet*)(ZMA). **Mauritania:** 1 male, Tidjikja, 24.v.1959 (*Popov*). **Senegal:** 12 km E. of St. Louis, 3.x.1982 (*Fishpool*)(NRI); 4 males, 1 female, Savoigne, St. Louis, 24.ix.1982 (*Fishpool*)(NRI); 2 males, 17 km Dakar-Rufisque rd., 5.x.1982 (*Fishpool*)(NRI); 1 male, 1 female, Lampsar, St. Louis, 11.x.1982 (*Fishpool*)(NRI). **Mali:** 6 males, 18 females, Daoga nr. Gargouna, 4.x.1978 (*Jago*)(NRI); 1 female, Kara, ii-iv.1975 (*Curry*)(NRI). **Burkina Faso:** 1 male, Niamey-Ouagadougou 463 km, 22.vii.1977 (*Jago*)(NRI); 1 male, Belinde, x.1978 (*Popov*)(NRI). **Niger:** 1 male, nr. Agades, 20.viii.1960 (*Popov*); 1 male, 8 km S. of Niamey, 20.iii.1977 (*Jago*)(NRI); 1 male, 2 females, Iferouane, 22.i.1970 (*Davies*)(NRI); 1 female, Air Massif, Wadi Taghmeurt, 27.viii.1983 (*Matteson*); 1 male, Air Massif, Zomo, irrigated riparian, 30.viii.1983 (*Matteson*). **Chad:** 5 females, N'Djamena, vii.-ix.1978 (*Schulten*)(ZMA). **Benin:** 1 male, Abomey, xii.1977-i.1978 (*Popov*)(NRI). **Nigeria:** 1 male, 8 km N. of Krenowa. 11.ix.1979 (*Jago*)(NRI); 1 male, Mallam Gidi, 26.ix.1970 (*Popov*)(NRI); 3 males, 2 females, Mintur, 21-25.x.1970 (*Popov*)(NRI); 2 females, Lake Chad, E. to NE. Mongonu, viii-ix.1979 (*Popov*)(NRI). **Sudan:** 1 male, Um Darag, 19.v.1933 (*Darling*); 1 female, Ngala, 26.iv.1981 (*Ritchie*)(NRI); 2 males, Khor Arbaat delta, iv-v.1928 (*Johnston*); 1 male, Kassala, base of Jebel Kassala, 6-7.iv, 1981 (*Ritchie*)(NMK). **Ethiopia:** 1 male, Debrowein, Borana, vi.1951 (*Bellehu*)(NMK); 1 female, Werdar, 1-14.x.1954 (*Greathead*); 1 female, Gheriogubi, 24.ix.1953 (*Bellehu*); 4 males, Danakil, Sardo, 28-29.vii.1946 (*Guichard*); 2 males, 2 females, Dubti, 28.ix.1969 (*Tunstall*)(NRI); 2 males, 2 females, Garoe, 26.ix.1969 (*Tunstall*)(NRI); 1 female, Batie, 2.x.1968 (*Tunstall*)(NRI); 3 males, Dire-Dawa, i.1935 (*Uhlenhuth*); 1 male, Mille, 21.ix.1968 (*Tunstall*)(NRI); 1 male, nr. Gemani, 8.x.1946 (*Guich-*



Map 2
Distribution of *Heteracris annulosa*.

ard); 10 males, 20 females, Dahlak, Entedebir, 12.iii.1962 (*Stork*)(ZMA); 2 males, Debet, 2.xii.1959 (*Greathead*); 1 male, Wachiro, 27.iii.1952 (*Stower*); 1 male, 2 females Imbareme, ii-iii.1954 (*Greathead*); 1 male, 1 female, Jebel Gheddem, 16 km S. of Mits'iwa, 26.viii.1968 (*Blackith*)(MNHN); 1 male, 1 female, 30 km W. of Mits'iwa, 8-27.viii.1968 (*Blackith*)(MNHN); 1 female, banks of Wadi Wachiro, 24.iii.1950 (*Waloff*); 1 male, Akbanatuf, N. of Mas-sawa, 4.iv.1950 (*Waloff*); 1 female, Assab, 10.iii.1950 (*Bellehu*); 1 female, Gula, vii.1953 (*Stower*); 2 females, Tai Shamar, 21.iv.1950 (*Waloff*); 2 females, Kemechewa, 20.xi.1955 (*Greathead*); 2 males, Imbereme, 3-16.xii.1956 (*Greathead*); 1 male, Cub-Cub, 25.xi.1955 (*Greathead*); 2 males, 1 female, Wachiro, 23-24.x.1956 (*Greathead*); 2 females, El Rago, 10. xii.1953 (*Popov & Greathead*). **Djibouti:** 1 male, 1 female, S. of Jubuti, lava fields, 27.i.1954 (*Popov*); 1 female, Dai Tadjura, Obock, 31.i.1954 (*Popov*). **Somali Rep.:** 6 males, 5 females, W. of Berbera, iii. 1949 (*Guichard*); 1 female, Saleh springs area, 22.ii.1949 (*Guichard*); 2 males, Bihendulah, N. of Berbera, 29.x.1949 (*Guichard*); 2 males, 1 female, Las Dureh Plain, E. of Berbera, 9-30.xii.1953 (*Popov & Greathead*); 2 male, Mijertein, nr. Eil, 1.i.1947 (*Waloff*); 1 male, 7 females, 15 km N. of Erigavo, 15.ix.1958 (*Hussein*); 1 female, Galale, 25.x.1936 (*Peck*); 1 female, Magub, 1.i.1954 (*Popov & Greathead*); 1 female, between Mogadishu and Obbia, 1958 (*Spence*); 1 female, Duduboh, 28.iv.1949 (*Guichard*); 2 females, Senag Plain, 14.v.1949 (*Guichard*); 1 male, 2 females, hills N. of Erigavo, 10.i.1954 (*Popov & Greathead*); 1 male, Tug Ber, 26.iii.1949 (*Guichard*); 2 males, Tug Hodka (E. of Karin), iii.1949 (*Guichard*); 1 female, Belet Uen, 5.xi.1952 (*Waloff*); 2 males, 1 female, Laferrog, 3.xi.1949 (*Guichard*); 1 male, Abdelkader to Salil, 3.iii.1948 (*Uvarov*); 1 male, 3 females, Haded Plain, 24.v.1967 (*Yussuf*); 3 females, El Donfar, 22.v.1969 (*Yussuf*)(NRI); 1 female, Hagal, (*Yussuf*)(NRI); 1 female, 12 km N. of Bulu Burti, 17.ii.1960 (*Roffey*)(NRI); 2 females, Galkayo, at light, 7.xi.1960 (*Roffey*)(NRI); 1 male, Adenival, at light, 16.xi.1960 (*Roffey*)(NRI); 1 female, S. Borama, 5.iii.1935 (*Peck*); 3 males, 3 females, Durdur, 12.vi.1958 (*Hussein*); 1 female, NE. of Jire, (*Roffey*); 4 males, 4 females, Jire Valley, 8.iii.1948 (*Uvarov*); 1 female, Armaleh Tug, 13.vi.1957 (*Roffey*); 1 male, Hudin area, (*Wood*); 1 female, Tug Ago Marodeh, 20.ii.1949 (*Guichard*); 1 male, 12 females, lower Sheikh, 15.i.1954 (*Popov*); 3 females, Berbera to Zeila, 24-25.i.1954 (*Popov*); 30 km E. of Berbera, 31.xii.1966 (*Popov*).

Heteracris harterti (I. Bolivar, 1913)

(Figs. 123-129)

Thisoicetrus harterti I. Bolivar, 1913:614. LECTOTYPE female, ALGERIA: Biskra (BMNH), here designated [examined].

Thisoicetrus littoralis bolivari Uvarov, 1923:76. Holotype male, ALGERIA (BMNH). Syn. by Uvarov, 1939:76.

Heteracris harterti (I. Bolivar); Dirsh, 1958:53.

DIAGNOSIS. Male. Posterior aspect of aedeagus (Fig. 124), with horseshoe-shaped apical penis valves. Epiphallus (Fig. 125) like those of *theodori* and *minuta* but proportionally much larger, posterior edge of lophus less sinuate than that of *annulosa*. Dorsal ectophallic plate with median, high-tectiform edge (Fig. 123). Posterior femur stocky with median and distal spots on both inner and outer surfaces (Fig. 129), sometimes with a faint, obliterated, proximal stripe running just below upper carina (thus resembling *littoralis*) on outer surface only. Apex of subgenital plate (Figs. 126-127), slightly attenuate. Cercus as in Fig. 128.

COMMENTS. The structure of the epiphallus suggests some affinity with *minuta* which, in the latter, is smaller. This species differs principally from *annulosa* in being larger, having a more attenuated subgenital plate, which in *annulosa* is more broadly rounded, and in genital morphology.

Table 3

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 21 | 0.95 | 0.78-1.11 | 0.10 | 11 | 1.71 | 1.58-1.88 | 0.12 |
| Head width | 21 | 4.71 | 4.25-5.08 | 0.23 | 11 | 6.33 | 6.00-6.68 | 0.20 |
| Pronotal width | 21 | 5.02 | 4.47-5.83 | 0.38 | 11 | 8.40 | 7.60-9.37 | 0.50 |
| Pronotal length | 21 | 5.28 | 4.69-5.96 | 0.37 | 11 | 8.90 | 8.03-9.74 | 0.51 |
| Hind femur depth | 21 | 3.87 | 3.47-4.24 | 0.19 | 11 | 5.76 | 5.48-6.29 | 0.26 |
| Hind femur length | 21 | 16.24 | 14.07-18.61 | 1.22 | 11 | 25.47 | 22.65-27.77 | 1.39 |
| Tegminal length | 21 | 21.88 | 18.83-24.46 | 1.72 | 11 | 35.81 | 30.70-40.29 | 2.40 |
| Antennal length | 8 | 12.29 | 10.50-14.07 | 1.04 | 8 | 15.78 | 13.57-16.34 | 1.27 |
| Total length | 21 | 28.87 | 24.92-31.83 | 2.06 | 11 | 44.61 | 41.10-47.24 | 2.23 |

H. harterti was found to be sympatric with *minuta* at Bou Saada, Algeria. Some specimens from this locality, together with specimens from Mon in Morocco, expressed a small proximal stripe on the outer surface of the hind femur, whilst in others from the same populations, this stripe was lacking. The expression of this stripe however, was lacking on the inner surface (always present in *littoralis*).

TYPE MATERIAL EXAMINED

Thisoicetrus harterti I. Bolivar, lectotype female, **Algeria**: Biskra, no further data (BMNH). 1 paralectotype female, same data as lectotype. *Thisoicetrus littoralis bolivari* Uvarov, holotype male, **Algeria**: Biskra, 22.ii.1895 (BMNH).

ADDITIONAL MATERIAL EXAMINED

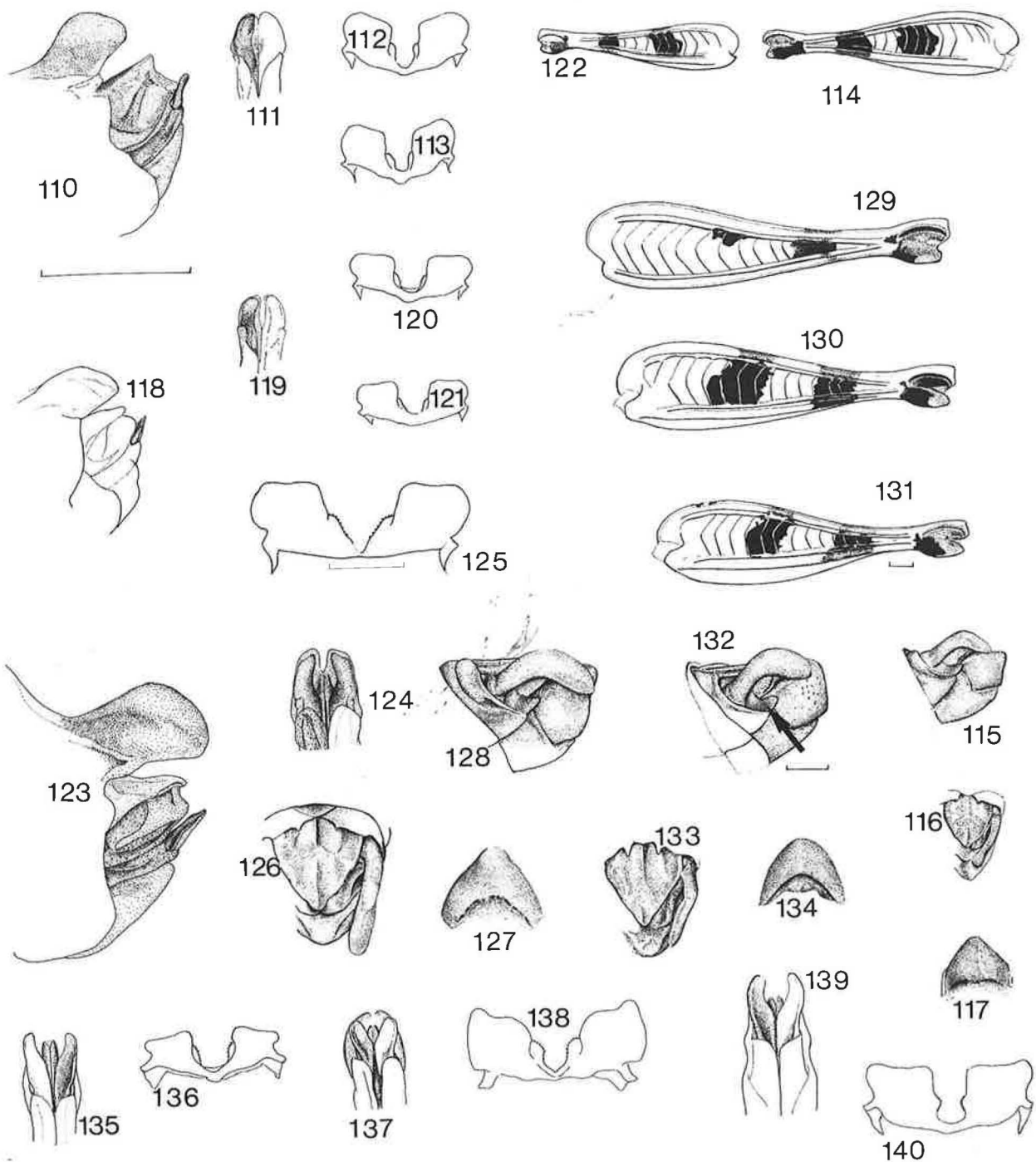
Morocco: 5 males, 8 km S. of Mon?, viii.1968 (*Stubbs*)(BMNH); 2 females, no locality, ix.1968 (*Stubbs*)(BMNH). **Algeria**: El Kantara, 6.vii.1932 (*Zeuner coll.*)(BMNH); 5 males, 10 females, Bou Saada, 3-8.x.1937 (*Korsakoff*)(BMNH); 1 male, Ain-ben-Noui, Biskra, v.1938 (*Korsakoff*)(BMNH); 8 females, Boghari, 28.ix.1937 (*Korsakoff*)(BMNH). **Mauritania**: 1 male, 3 females, 19°30'N, 10°30'W, 28.viii.1973 (*Popov*)(NRI); 1 male, Timbebra, Aioun El Atrouss, 5-6.ix.1961 (*Popov*)(BMNH). **Mali**: 69 males, 68 females, Daoga, to light, 18-26.ix.1978. (*Jago*)(NRI); 1 male, Dogo, viii.1953 (*Davey*)(BMNH); 1 female, Oued Tessalit, 8.x.69 (*Popov*)(NRI); 2 females, Mourdiah, x.1988 (*Grunshaw*)(NRI). **Nigeria**: 1 male, 3 females, 8 km N. of Krenowa, 11.ix.1979 (*Jago*)(NRI); 2 males, 3 females, Lake Chad shore, E to NE Mongonu, viii-ix.1974 (*Jago*)(NRI); 3 males, 2 females, 21-25.x.1970 (*Popov*)(NRI); 1 female, NE Bornu, 18 km S. of Marte, 3.x.1971 (*Jago*)(NRI). **Niger**: 1 male, Gargouna, ix.1978 (*Popov*)(NRI); 1 male, Niamey, vi.1978 (*Popov*)(NRI); 2 males, 2 females, Iferouane, 22.i.1970 (*Davies*)(NRI); 1 male, Termit, 17.x.1965 (*Popov*)(NRI); 1 male, 1 female, nr. Tahoua, 2.ix.1960 (*Popov*)(BMNH).

Heteracris minuta (Uvarov) stat.n.
(Figs. 110-114, Map 3)

Thisoicetrus littoralis minutus Uvarov, 1921:123. Holotype male, ALGERIA (BMNH) [examined].

Heteracris littoralis minuta (Uvarov); Dirsh, 1958: 53.

DIAGNOSIS. Male. Apical penis valves, posterior aspect (Fig. 111) similar to those of *theodori* (Figs. 118-119) but having slightly longer and thicker valves, much shorter than those of *harterti* when viewed laterally. Epiphallus small, weakly sclerotized (Figs. 112-113), posterior edge of lophus angled anteriorly.



Figures 110-140

Heteracris species (males). 110-117, *H. minuta*; 110 lateral aspect of genitalia; 111, posterior aspect of penis valves; 112, ventral aspect of epiphallus, Algeria; 113, same, N. Tunisia; 114, left hind femur, outer aspect; 115, abdominal tip, lateral aspect; 116, same, 117, dorsal aspect; same, posterior aspect. 118-122. *H. theodori*. 118, lateral aspect of genitalia; 119, posterior aspect of penis valves; 120, ventral aspect of epiphallus, *theodori* paratype; 121, same, *H. theodori delicatus* syn.n., holotype; 122, inner aspect of hind femur. 123-130. *H. harterti*. 123, lateral aspect of genitalia; 124, posterior aspect of penis valves; 125, ventral aspect of epiphallus; 126, abdominal tip, dorsal aspect; 127, same, posterior aspect; 128, same, lateral aspect; 129, left hind femur, outer aspect; 130, same, inner aspect. 131-134. *H. annulosa*. 131, inner aspect of right hind femur; 132, abdominal tip, lateral aspect; 133, same, dorsal aspect; 134, same, posterior aspect. 135-136. *H. popovi*. 135, posterior aspect of penis valves; 136, ventral aspect of epiphallus. 137-138. *H. caloptenoides*. 137, posterior aspect of penis valves; 138, ventral aspect of epiphallus. 139-140. *H. morbosa morbosa*. 139, posterior aspect of penis valves; 140, ventral aspect of epiphallus. (All scale lines represent 1 mm; that under Fig. 110 also applies to Figs. 111, 118-119, 123-124, 135, 137 and 130; that under Fig. 125 also applies to Figs. 112-113, 120-121, 136, 138 and 140; that under Fig. 131 applies to Figs. 114, 122, 129-130; that under Fig. 132 also applies to all other figures.)

Table 4

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 9 | 0.60 | 0.53-0.68 | 0.06 | 8 | 0.84 | 0.71-0.89 | 0.07 |
| Head width | 9 | 3.35 | 3.21-3.60 | 0.14 | 7 | 4.04 | 3.75-4.29 | 0.18 |
| Pronotal width | 9 | 3.22 | 3.00-3.51 | 0.19 | 8 | 4.49 | 4.00-5.08 | 0.37 |
| Pronotal length | 9 | 3.45 | 3.08-3.89 | 0.28 | 8 | 5.18 | 4.88-5.66 | 0.27 |
| Hind femur depth | 7 | 2.60 | 2.22-3.03 | 0.26 | 8 | 3.62 | 3.22-4.36 | 0.41 |
| Hind femur length | 7 | 10.72 | 9.66-12.10 | 0.74 | 8 | 14.38 | 13.43-15.48 | 0.78 |
| Tegminal length | 7 | 13.96 | 11.61-16.00 | 1.68 | 6 | 20.23 | 18.11-22.53 | 1.47 |
| Antennal length | 2 | — | 7.49-9.04 | — | 4 | 8.56 | 7.82-9.40 | 0.65 |
| Total length | 7 | 19.09 | 16.98-21.41 | 1.41 | 8 | 26.16 | 24.50-28.31 | 1.21 |

Differs from similar-sized *annulosa* specimens by a combination of slight morphological differences such as: apex of subgenital plate more attenuate (Figs. 115-117); cercus having same depth along its entire length (Fig. 115); apical process widened in *annulosa*; comparatively wider frontal ridge and having more slender posterior femora but with same femoral markings as *annulosa* (Fig. 114); outer surface usually with median and distal black spots; median spot never reaching to lower carina, sometimes with small proximal stripe running below upper carina.

COMMENTS. This small species was originally designated as a subspecies of *littoralis* by Uvarov (1939). However, the apical penis valves and epiphallus differ sufficiently (Compare Figs. 111-113 to Figs. 60-61) to warrant separate species status. *H. minuta* is easily confused with and difficult to separate from both *annulosa* and *theodori*, with which it overlaps both in distribution (in the case of *annulosa*) and in size, being of a similar size to specimens at the smaller end of the *annulosa* range. It is best separated from both *theodori* and *annulosa* by use of the epiphallic character. In *annulosa* this is smaller with the posterior edge of the lophus being less sinuate. In *theodori* the posterior edge of the lophus is angled anteriorly (angled posteriorly in *minuta*) (Figs. 112-113, 120-121).

TYPE MATERIAL EXAMINED

Holotype male, **Algeria**: Annaba, 21.ix.1896(*Eaton*)(BMNH). Paratype male and female, same data as holotype.

ADDITIONAL MATERIAL EXAMINED

Algeria: 7 males, 10 females, Djelfa, 17.xii.1938 (*Korsakoff*)(BMNH); 2 males, 5 females, Bou Saada, 3.xi.1936 (*Korsakoff*)(BMNH). **Tunisia**: 2 males, 1 female, nr. Hamman Lif, Bordj Cedria, 4.viii.1971 (*Huxley*)(BMNH). **Libya**: 2 males, 1 female, 15 km SE. of Banghazi, Abu Fakra, 1.x.1984 (*Persson*)(BMNH).

Heteracris theodori (Uvarov)

(Figs. 118-122, Map 3)

Thisoicetrus theodori Uvarov, 1929:102. Holotype male, SINAI (BMNH) [examined].

Thisoicetrus theodori delicatus Mishchenko 1951:266. Holotype male, IRAN (ZI)[examined]. **Syn.n**

Heteracris theodori (Uvarov); Dirsh, 1958:53.

DIAGNOSIS. Male. Can only be separated from the superficially similar species *minuta* by use of the internal genitalia as already described under *minuta*. Inner surface of posterior femur always with median and distal black bands (Fig. 122). Posterior tibiae pink distally not red as in *minuta*.

Table 5

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|-------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 5 | 0.57 | 0.53-0.60 | 0.026 | 4 | 0.94 | 0.92-0.96 | 0.017 |
| Head width | 5 | 3.21 | 3.10-3.34 | 0.10 | 4 | 4.42 | 4.31-4.56 | 0.11 |
| Pronotal width | 5 | 2.84 | 2.71-2.93 | 0.081 | 4 | 5.12 | 4.97-5.29 | 0.13 |
| Pronotal length | 4 | 3.21 | 3.09-3.29 | 0.090 | 4 | 5.52 | 5.48-5.57 | 0.040 |
| Hind femur depth | 4 | 2.40 | 2.18-2.56 | 0.16 | 4 | 3.80 | 3.60-3.96 | 0.15 |
| Hind femur length | 4 | 10.26 | 9.66-10.84 | 0.50 | 4 | 16.77 | 15.95-17.32 | 0.63 |
| Tegminal length | 5 | 12.72 | 12.50-13.19 | 0.28 | 4 | 22.07 | 21.60-22.38 | 0.34 |
| Antennal length | — | — | — | — | — | — | — | — |
| Total length | 4 | 17.93 | 16.69-19.01 | 0.98 | 4 | 29.01 | 28.15-29.57 | 0.61 |

COMMENTS. Only the male holotype and three specimens from Turkey of this small, delicate species were available for study. The synonymy of *H. theodori delicatus* Mischenko, 1951 is based on its having identical genitalia to those of *theodori* (compare epiphalli Figs. 120-121). *H. theodori* is difficult to separate from *minuta* without recourse to epiphallic examination.

TYPE MATERIAL EXAMINED

Thisoicetrus theodori Uvarov, holotype male, **Sinai**: Wadi Feiran, 1927 (*Bodenheimer & Theodor*)(BMNH). *Thisoicetrus theodori delicatus* Mischenko, holotype male, **Iran**: Kazvin, 7.ix.1931 (*Predtetschensky*)(ZI). Paratype male, same data as holotype (BMNH).

ADDITIONAL MATERIAL EXAMINED

Turkey: 4 males, 4 females, Kars, nr. Ararat, below Serdarbulak 7.ix.1960 (*Guichard & Harvey*)(BMNH).

Heteracris persa (Uvarov)

(Figs. 67-72, map 3)

Thisoicetrus charpentieri persa Uvarov 1933:231. Holotype male: IRAN (ZI).

Thisoicetrus persa Uvarov; Uvarov, 1939:380.

Heteracris persa (Uvarov); Dirsh, 1958:53.

DIAGNOSIS. Male. Apical penis valves, posterior aspect (Fig. 68), like those of *littoralis* but less angulate, apices obtusely rounded; lateral aspect (Fig. 67) thickened at base. Epiphallus (Fig.69) small, similar in shape to that of *minuta* but larger. Dorsal ectophallic plate low-tectiform in profile (Fig. 67). Cercus

Table 6

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 8 | 0.88 | 0.79-0.97 | 0.071 | 4 | 1.30 | 1.17-1.42 | 0.12 |
| Head width | 8 | 3.95 | 3.71-4.21 | 0.14 | 4 | 4.94 | 4.71-5.32 | 0.27 |
| Pronotal width | 8 | 3.94 | 3.75-4.25 | 0.19 | 4 | 5.44 | 5.24-5.82 | 0.26 |
| Pronotal length | 8 | 4.25 | 4.09-4.52 | 0.16 | 4 | 5.81 | 5.34-6.24 | 0.42 |
| Hind femur depth | 8 | 3.23 | 3.08-3.38 | 0.11 | 4 | 4.29 | 3.86-4.73 | 0.32 |
| Hind femur length | 8 | 12.06 | 11.11-13.38 | 0.79 | 4 | 16.19 | 14.85-17.88 | 1.24 |
| Tegminal length | 8 | 13.72 | 10.88-16.46 | 1.99 | 4 | 19.33 | 16.65-21.11 | 1.86 |
| Antennal length | 4 | 7.31 | 6.40-8.63 | 0.95 | 4 | 7.96 | 6.61-8.86 | 1.01 |
| Total length | 8 | 21.73 | 20.65-24.27 | 1.22 | 4 | 29.10 | 26.67-32.49 | 2.22 |

as in Fig. 70. Posterior femoral markings as in Figs. 71-72, like those of *littoralis*, but less clearly delineated on external surface in *persa*; posterior femur generally shorter and more stocky than in *littoralis*.

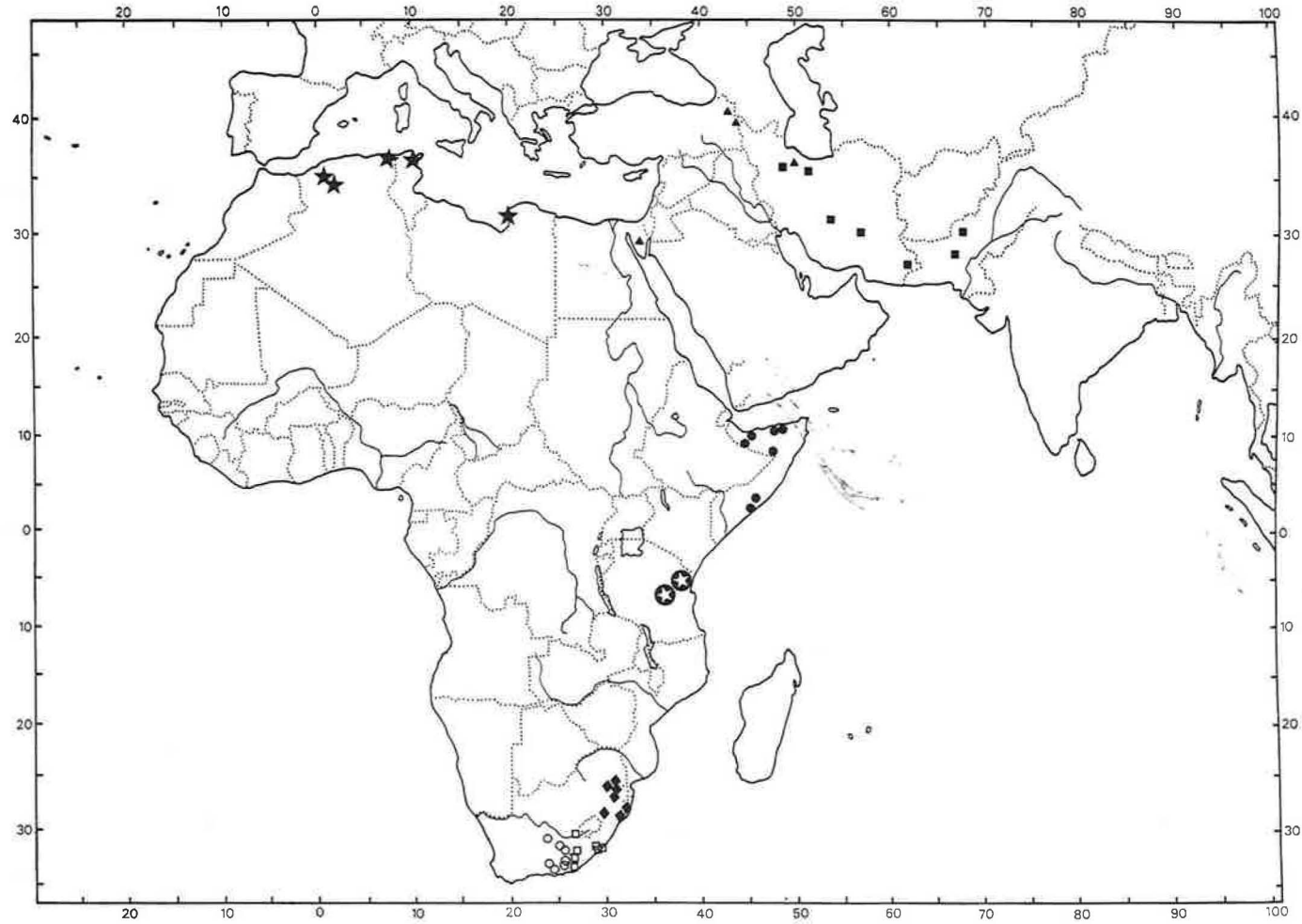
COMMENTS. This species is most closely allied to *H. littoralis* and can only be readily distinguished from that species by examination of the internal genitalia.

TYPE MATERIAL EXAMINED

Thisoicetrus charpentieri persa Uvarov, paratype male, **Iran**: Rudi-Tug, Megas, 14.ii.1901 (*Zarudny*)(BMNH).

ADDITIONAL MATERIAL EXAMINED

Iran: 2 males, Shiraz, Durab, 20.xi.1960 (*Brown*)(BMNH); 1 male, 4 females, Kirman, 16.xi.1960 (*Brown*)(BMNH); 2 males, 1 female, Khane Surkh, 4.vi.1951 (*Popov*)(BMNH); 1 male, 1 female, Saravan, iv.1950 (*Popov*)(BMNH); 1 male, 1 female, Gew, iv.1951 (*Popov*)(BMNH); 3 males, 6 females, nr. Khush, iv.1951 (*Popov*)(BMNH); 1 male, 1 female, Jranchar, 7.iii.1949 (*Scharif coll.*)(NM- Basle). **Pakistan**: 2 males, 1 female, Khuzdar, 23.iv.1979 (*Popov*)(NRI); 3 males, Nushki, iii.1931 (*Rao*)(BMNH); 1 male, 1 female, nr. Quetta, 8.vi.1963 (*Popov*)(BMNH); 1 male, 1 female, Almedaal, 1931 (*Ben coll.*)(BMNH).



Map 3

Distribution of *Heteracris* species. Solid squares, *H. persa*; solid circles, *H. cyanescens*; stars, *H. minuta*; triangles, *H. theodori*; diamonds, *H. speciosa*; open circles, *H. calliptamoides testacea* subsp.n.; open squares, *H. calliptamoides calliptamoides*; circles with star *H. trimaculata* sp.n.

H. cyanescens species-group

DIAGNOSIS. Cingular valves of aedeagus as long as apical penis valves (Figs. 141 and 146). Tegmen predominantly infusate brown, speckled with clear areas. Hind wings blue at base in sexually mature specimens. Fastigium of vertex without median carina or weakly expressed as a lighter-coloured striation.

COMMENTS. Both included species in this group are restricted in their distribution to N.E. Kenya and S. Somalia. The cingular valves of these species are as long as those in *coerulescens*, but their apices are not laterally expanded as in that species.

Heteracris cyanescens (Uvarov) stat.n.
(Figs. 141-145, Map 3)

Thisoicetrus annulosa cyanescens Uvarov, 1939:380. Holotype male, SOMALI REPUBLIC (BMNH) [examined].

Heteracris annulosa cyanescens (Uvarov); Dirsh, 1958:53

DIAGNOSIS. Male. Apical penis valves, posterior aspect, moderately large with slight median thickening (Fig. 142). Posterior edge of epiphallic lophi broadly rounded, medially incurved (Fig. 143). Dorsal ectophallic plate, lateral aspect (Fig. 141), inflated, somewhat bulbous in shape. Lateral surface of head with vertical yellow stripe behind eye. Lateral surface of thorax brown with distinctive lighter spot along lower margin of epimeron IV. Sides of abdomen without distinctive vertical black markings as in *juliea* sp.n. Posterior femur, externomedian surface variable, sometimes unicolorous yellow with only distal black spot or brown or black with more heavily impressed distal band followed by distinctive pre-genicular dirty white annulus; genicular lunules dark brown-black; median black spot restricted to dorsal surface (Fig. 144); inner surface yellow, proximal half with large, diffuse, brown spot variably expressed (Fig. 145), or reduced to smaller median spot; sometimes with red flush at base. Hind wings blue at base. Outer lateral surface of posterior tibia with consecutive, black, dull white-cream bands below knee, remainder red or red-scarlet distally.

Table 7

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|-------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 11 | 0.69 | 0.59-0.85 | 0.080 | 7 | 1.10 | 0.98-1.18 | 0.070 |
| Head width | 10 | 3.77 | 3.54-3.94 | 0.14 | 7 | 4.90 | 4.62-5.16 | 0.19 |
| Pronotal width | 11 | 3.81 | 3.38-4.04 | 0.24 | 7 | 6.03 | 5.40-6.67 | 0.45 |
| Pronotal length | 11 | 3.80 | 3.66-4.09 | 0.22 | 7 | 6.01 | 5.46-6.94 | 0.50 |
| Hind femur depth | 10 | 3.23 | 2.95-3.40 | 0.19 | 7 | 4.63 | 4.24-4.95 | 0.27 |
| Hind femur length | 10 | 13.10 | 12.00-14.72 | 0.79 | 7 | 19.95 | 18.38-21.67 | 1.22 |
| Tegminal length | 11 | 14.56 | 11.43-17.42 | 1.85 | 7 | 25.55 | 22.55-28.69 | 2.30 |
| Antennal length | 7 | 8.44 | 7.48-9.7 | 0.71 | 5 | 10.92 | 9.68-11.82 | 0.85 |
| Total length | 10 | 22.06 | 19.38-25.25 | 1.63 | 7 | 33.33 | 30.59-35.93 | 2.13 |

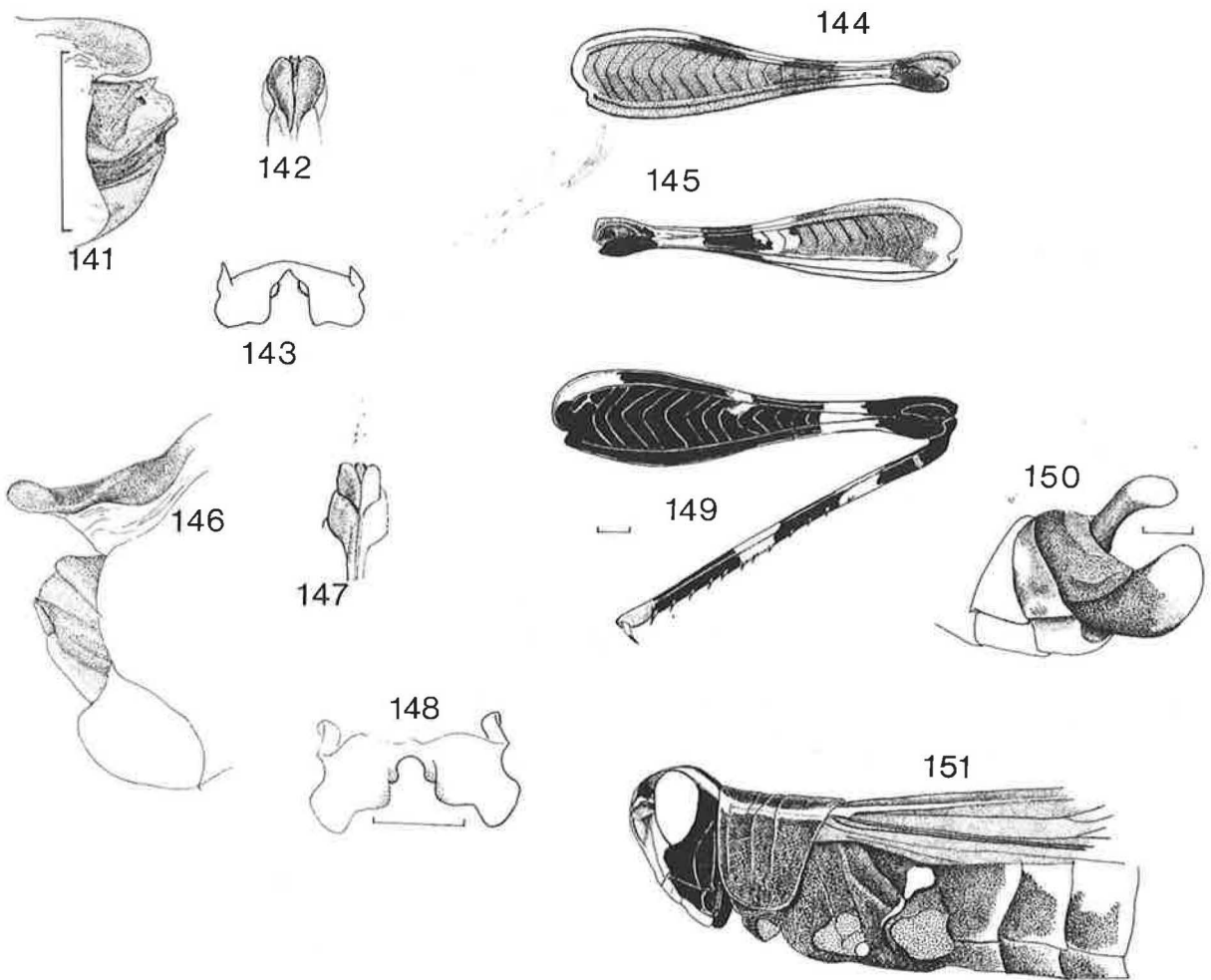
COMMENTS. This species was originally described by Uvarov (1939), as a sub-species of *annulosa*, however the genitalia are quite different from those of *annulosa* (compare Figs. 77, 142). The blue coloration at the base of the hind wing easily distinguishes this species from *annulosa*.

TYPE MATERIAL EXAMINED

Holotype male, **Somali Republic**: Buran, 914 m., 9.ix.1929 (*Collenette*) (BMNH). Paratypes, 4 females, same data as holotype.

ADDITIONAL MATERIAL EXAMINED

Somali Rep.: 1 male, 8 km N. of Erigavo, 11.ix.1956 (*Hussein*)(BMNH); 1 male, Mogadishu, 5.vi.1955 (*Uvarov*)(BMNH); 1 male, W. of Berbera, iii.1949 (*Guichard*)(BMNH); 1 male, 3 females, 41 km SSE. of Silil, sparse *Balanites/ Acacia* bush, on compacted sand, 9.viii.1981 (*Ritchie*)(NRI); 1 male, Hadji Hussein (Mullah's tomb), 82 km E. of Silil, 9.viii.1981 (*Ritchie*)(NRI); 1 female, 100 km NNW. of Hargeisa, gravel silt with dry *Hyparrhenia* bushes (*Ritchie*) (NRI); 2 males, 1 female, 33 km S. of Bulo Burti, 21.vii.1981 (*Ritchie*)(NRI); 11 males, 8 females, 17 km S. of Mogadishu, grazed turf on littoral coral sand dune slack, with succulents, *Acacia/Commiphora/Cordia* scrub, 16-17.vii.1981 (*Ritchie*)(NRI); 1 male, Haud, ix.1932 (*Taylor*)(NRI). **Kenya:** 2 males, 1 female, N.E. Prov., Garissa, low shrubby bush, 26.vi.1981 (*Ritchie & Franks*)(NRI).



Figures 141-151

Heteracris species (males). 141-145 *H. cyanescens* 141, lateral aspect of genitalia; 142, posterior aspect of penis valves; 143, ventral aspect of epiphallus; 144, outer aspect of left hind femur; 145, inner aspect of left hind femur. 146-151. *H. juliea* sp.n. 146, lateral aspect of genitalia; 147, posterior aspect of penis valves; 148, ventral aspect of epiphallus; 149, outer aspect of left hind femur; 150, lateral aspect of abdominal tip; 151, lateral aspect of thorax. All scale lines represent 1mm; that alongside Fig. 141 also applies to Figs. 142, 146-147; that under Fig. 149 also applies to Figs. 144-145, that under Fig. 150 also applies to Fig. 151; that under Fig. 148 also applies to 143.

***Heteracris juliea* sp.n.**

(Figs. 146-155, Map 1)

DIAGNOSIS. Male. Aedeagus as in Fig.147, apical penis valves short, with parallel sides. Epiphallus, ventral surface, with posterior margin of lophus strongly indented medially (Fig. 148). Dorsal ectophallic plate, lateral aspect, not inflated as in *cyanescens*.

Lateral surface of thorax black with lower edge of episternum III and epimeron IV picked out with cream-yellow. Abdominal tergites yellow with black lateral banding pattern (Fig. 151); last abdominal segment black except distal part of cercus and subgenital plate which are cream-yellow (Fig. 150). Externomedian area of posterior femur dark brown-black with cream-yellow pregenicular annulus, genicular lunules dark brown-black (Fig. 149); inner surface like outer. Outer, lateral surface of posterior tibiae with small black band below knee, followed by consecutive dirty white, black, dirty white, black bands, remainder with black-brown suffusion (Fig. 149), similar to *coerulescens*. Hind wings at base blue.

Table 8

Measurements (mm)

| | Males | | Females | |
|-------------------|-------|--------------|---------|--------------|
| | n | | n | |
| Interocular dist. | 2 | 0.85, 0.92 | 2 | 1.39, 1.29 |
| Head width | 2 | 4.28, 4.65 | 2 | 5.75, 5.49 |
| Pronotal width | 2 | 4.67, 4.86 | 2 | 6.70, 6.65 |
| Pronotal length | 2 | 4.41, 4.83 | 2 | 6.94, 6.18 |
| Hind femur depth | 2 | 3.83, 3.96 | 2 | 4.82, 4.93 |
| Hind femur length | 2 | 15.88, 15.24 | 2 | 23.74, 23.67 |
| Tegminal length | 1 | 17.95 | 2 | 28.36, 25.16 |
| Antennal length | — | — | 1 | 12.89 |
| Total length | 2 | 27.95, 28.57 | 2 | 39.43, 37.32 |

COMMENTS. This is a dark-coloured grasshopper with the exception of contrasting lighter thoracic and abdominal markings, which could be implicated in precopulatory courtship behaviour. The hind femur when raised would obscure the distinctive epimeron spot, whilst at the same time revealing the contrasting light and dark markings of the abdominal tip. Rapid flicking of the femur would induce a series of alternate flashes which might attract the attention of receptive females nearby.

TYPE MATERIAL EXAMINED

Holotype male, **Ethiopia**: 1 male, El Rago, 4.xii.1953 (*Popov*) (BMNH). Paratypes. **Ethiopia**: 1 male, nr. Hawash, 12.ix.1945 (*Guichard*) (BMNH). **Somali Republic**: 2 females, Baidoa, 5.xi.1953 (*Popov*) (BMNH).

H. adspersa species-group

DIAGNOSIS. Cingular valves longer than apical penis valves; apical penis valves small, slender, (Figs. 154, 170). Dorsal ectophallic plate tectiform distally. Hind wings colourless.

COMMENTS. The tectiform nature of the dorsal ectophallic plate is also shared by all members of the *littoralis* group.

Heteracris adspersa (Redtenbacher)

(Figs. 152-168, Map 5)

Euprepocnemis adspersa Redtenbacher 1889:30. Lectotype male, USSR (NM) here designated [examined].

Thisoicetrus adspersa (Redtenbacher); I. Bolivar, 1898:34.

Heteracris adspersa (Redtenbacher); Dirsh, 1958:53

Heteracris adspersa massai Galvagni 1978:163. Holotype male, SARDINIA (MCSN). **Syn.n.**

DIAGNOSIS. Male. Apical penis valves very small, slender, cingular valves longer than apical penis valves (Fig. 153). Dorsal ectophallic plate as in Figs. 152, 154. Apex of subgenital plate bituberculate (Fig. 158). Apical process of cercus wider than and about as long as basal stem. Lateral surface of head yellow-brown or light green with distinctive dirty-white, postocular stripe (Fig. 156). Tegmina hyaline, speckled with small brown spots, sometimes fusing to form larger blotches or transverse bands. Femoral markings as in Figs. 159-169. Posterior tibiae orange-red or red distally.

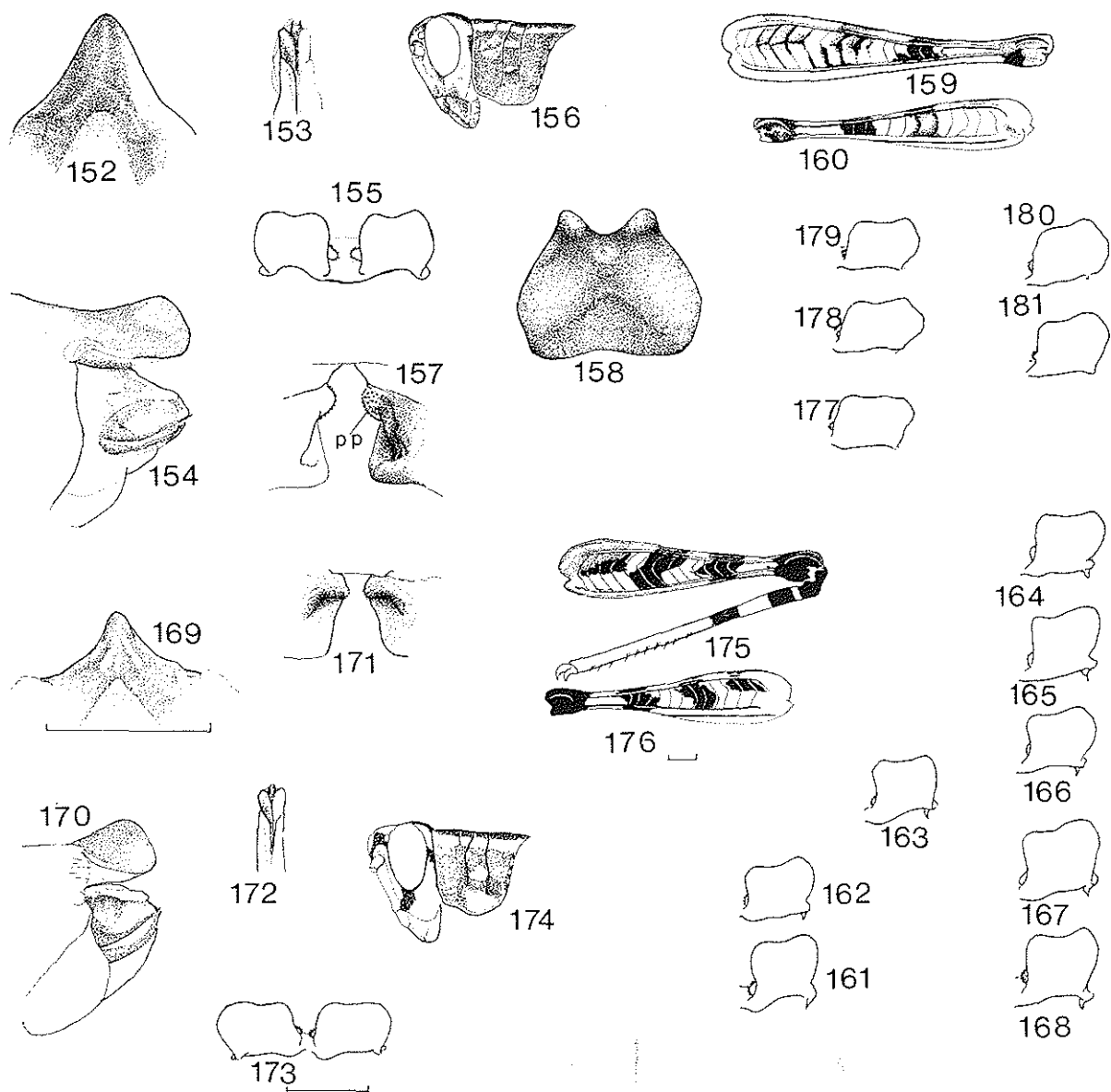
Table 9

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|-------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 15 | 0.62 | 0.47-0.76 | 0.080 | 12 | 0.94 | 0.76-1.05 | 0.086 |
| Head width | 15 | 3.63 | 3.00-4.15 | 0.27 | 12 | 4.55 | 4.05-4.96 | 0.3 |
| Pronotal width | 15 | 3.23 | 2.98-4.02 | 0.90 | 12 | 5.28 | 4.00-5.93 | 0.62 |
| Pronotal length | 15 | 3.56 | 3.02-4.28 | 0.40 | 12 | 5.48 | 4.38-6.2 | 0.66 |
| Hind femur depth | 15 | 2.48 | 2.18-3.07 | 0.30 | 12 | 3.54 | 3.19-3.95 | 0.31 |
| Hind femur length | 15 | 12.46 | 11.12-14.71 | 1.13 | 12 | 18.31 | 16.12-20.30 | 1.35 |
| Tegminal length | 15 | 15.4 | 12.18-20.14 | 2.53 | 12 | 23.87 | 18.62-27.39 | 3.42 |
| Antennal length | 8 | 8.79 | 7.49-9.91 | 0.71 | 8 | 9.00 | 8.25-9.87 | 0.81 |
| Total length | 15 | 21.75 | 18.68-25.28 | 2.02 | 12 | 31.01 | 26.25-34.86 | 2.81 |

COMMENTS. This species is fairly widespread and variable, especially in size and colour, ranging from small, dark brown specimens collected from Tunb Island, Persian Gulf, to larger, yellow-green specimens from Senegal (see also Figs. 161-168 for epiphallic variation). This variation is responsible for the proposed synonymy of *adspersa massai*, the type of which (Fig. 163) falls within a range of variation exhibited by specimens from the type series of *H. adspersa*. Although superficially similar to its near relative *rantae*, it is easily recognized by its bituberculate subgenital plate.

I have examined 11 specimens of *adspersa* from Vienna, which I believe are Redtenbacher's syntype series or part of it. This series consists of two males, four females from Kirovabad (Elisabetpol) and two males, three females from Ashkhabad and are all labelled 'coll. of B.v.W'. The original series of *adspersa* collected from the same localities as those above was stated by Redtenbacher to be in Brunner's collection. Measurements taken from this



Figures 152-181

Heteracris (males). 152-168 *H. adspersa* 152, dorsal aspect of ectophallic plate; 153, posterior aspect of penis valves; 154, lateral aspect of genitalia; 155, ventral aspect of epiphallus; 156, lateral aspect of head; 157, dorsal aspect of lophal interspace; 158, posterior aspect of subgenital plate; 159, left hind femur, outer aspect; 160, same, inner surface (showing variation in size); 161, ventral aspect of epiphallus, Tunisia; 162, same; Cyprus; 163, same, *adspersa massai* syn.n.; 164, same, Turkey; 165, same, Eritrea; 166, same, USSR, Tashkent; 167, same, Senegal, Savoigne; 168, lectotype, *H. adspersa*. 169-181. *H. ranta*. 169, dorsal aspect of ectophallic plate; 170, lateral aspect of genitalia; 171, dorsal aspect of lophal interspace; 172, posterior aspect of penis valves; 173, ventral aspect of epiphallus; 174, lateral aspect of head; 175, left hind femur, outer aspect; 176, same, inner aspect; 177, ventral aspect of epiphallus, Somalia; 178, same, Israel; 179, same, Saudi Arabia, Khulab; 180, same, Khulab; 181, same, Lith. All scales lines represent 1 mm; that under Fig. 169 also applies to Figs. 152-154, 157, 170-172; that under Fig. 173 also applies to Figs. 155, 158, 173, 179-181, 161-168; that under Fig. 176 also applies to Figs. 159-160 and 175.

series of specimens also agree with those given in Redtenbacher's paper. For these reasons a male from Kirovabad is here designated lectotype. In addition to the remaining paralectotypes, a single female found in the collections of the BM(NH) (bearing identical labels to the Vienna series) has also been included in the paralectotypes.

TYPE MATERIAL EXAMINED

Euprepocnemis adspersa Redtenbacher. Lectotype male. **USSR**: Kirovabad, no further data (*Coll. Br.v. W.*)(NM). Paralectotypes 1 male, 4 females, same data as lectotype; 2 males, 4 females, Ashkhabad, no further data (*coll. Br.v.W.*)(2 males, 3 females, NM, 1 female BMNH). *Heteracris adspersa massai* Galvagni, paratypes, **Sardinia**: 2 males, Quartu S. Elena, Stagno Simbirizzi, 4.ix.77 (*Galvagni*) (MCSN).

ADDITIONAL MATERIAL EXAMINED [all BMNH unless otherwise stated]

Spain; 3 males, 3 females, Alicante, viii.1971 (*Popov*)(NRI); 2 males, 2 females, Almeria, nr. Adra, 3.x.1962 (*Ragge*). **Cyprus**: 4 males, Akrotiri, 6-14.x.1983 (*Kruseman*)(ZMA); 31 males, 15 females, Zakaki, viii.1935 (*Mavromoustakis*); 1 male, Famagusta, v.1933 (*Shiakides*). **Turkey**: 4 males, 1 female, Mersin, Tasucu, 12 km S.W. of Silifke, 4-7.x.1983 (*Jeekel*)(ZMA); 9 males, 4 females, Kars, nr. Ararat, Kara su Springs, 28-30.viii.1960 (*Guichard & Harvey*); 2 females, Kars, Igdir, 30.viii.1960 (*Guichard & Harvey*); 2 females, Kars, nr. Ararat, Erhac, Golu, 30.viii.1960 (*Guichard & Harvey*); 1 female, Kars, Peyhanyl, 31.viii.-10.ix.1960 (*Guichard & Harvey*). **USSR**: 1 male, Golodnaya, steppe, 160 km S. of Tashkent, 14.viii.1968 (*Uvarov*)(NRI); 1 male, 2 females, Aresh, Geok-Tepe, steppe, 3-15.ix.1912 (*Burr coll.*); 1 male, 2 females, Daghستان, Rubas-Chou, 17.viii.1924 (*Riabov*). **Iraq**: 5 males, 2 females, Amara, R. Tigris, 26.vi.1918 (*Buxton*); 1 female, Basra, 15.x.1943 (*Wiltshire*). **Iran**: 1 female, Minab, 12.v.1950 (*Popov*); 1 male, Keredi, 17.ix.1948 (*Aellen*). **Pakistan**: 1 female, Sibi, 11.vi.1937 (*Bhatia*); 1 female, nr. Multan, 3.vii.1963 (*Popov*). **Jordan**: 1 male, 1 female, Jericho, among halophytes, (*Buxton*). **Saudi Arabia**: 1 male, Al Rawshan, v.1936 (*Philby*); 2 males, 1 female, Unazah 17.v.69 (*Popov*)(NRI); 2 males, Riyadh, 20.v.1969 (*Popov*)(NRI); 2 males, 1 female, Al Aqiq, 2, vi.1969 (*Popov*)(NRI); 2 males, 1 female (nymphs), Burayadah, 16.v.1969 (*Popov*)(NRI); 1 female, Wagar, Al Faqiah, vi.1936 (*Philby*). **Tanb Is.**: (Persian Gulf), 2615N 5510E, 18.xii.1949 (*Popov*)(NRI). **Senegal**: 16 males, 8 females, Savoigne, St. Louis, 12.10.1982 (*Fishpool*)(NRI). **Algeria**: 1 male, 1 female, El Mesrane, 3.x.1929 (*Zerny*). **Tunisia**: 1 male, Zarzis, 26.ix.1976 (*Kruseman*)(ZMA). **Libya**: 2 males, 1 female, Labdah, salt marsh, 30.vi.1955 (*Guichard*); 3 males, 1 female, Cyrenaica, Tmimi salt marsh, 9.viii.1957 (*Guichard*). **Ethiopia**: 4 males, 10 females, Dahlak Arch. Entedbir, 12.iii.1962 (*Stock*)(ZMA). **Socotra**: 2 females, Kalansiya, 25.iii.1967 (*Guichard*)(NRI).

Heteracris rantae (Uvarov)

(Figs. 169-181, Map 5)

Thisoicetrus rantae Uvarov, 1936:549. Holotype male, YEMEN PDR (BMNH) [examined].

Heteracris rantae (Uvarov); Dirsh, 1958:53.

DIAGNOSIS. Male. For aedeagal morphology see Fig. 172; epiphallus (Fig. 173) similar to *adspersa* but with proximal process of epiphallic lophal interspace more extended along margin in *rantae* (compare Figs. 157, 171) (epiphallic variation is given in Figs. 177-181). Apex of subgenital plate broadly rounded, not bituberculate as in *adspersa*. Sides of pronotum chocolate brown with distinctive white spot in lower posterior corner, above which is a smaller, white spot (Fig. 174). Femoral markings of characteristic pattern, externomedian surface dull yellow with black proximal stripe running along midline, followed

Table 10

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|-------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 8 | 0.59 | 0.52-0.69 | 0.058 | 8 | 0.81 | 0.68-0.90 | 0.070 |
| Head width | 8 | 3.54 | 3.28-3.85 | 0.20 | 8 | 4.31 | 4.00-4.63 | 0.24 |
| Pronotal width | 8 | 3.41 | 3.08-3.80 | 0.26 | 8 | 4.93 | 4.61-5.31 | 0.26 |
| Pronotal length | 8 | 3.57 | 3.15-3.99 | 0.34 | 8 | 5.08 | 4.63-5.49 | 0.3 |
| Hind femur depth | 8 | 2.72 | 2.35-3.07 | 0.28 | 8 | 3.61 | 3.25-4.04 | 0.32 |
| Hind femur length | 8 | 11.81 | 10.54-13.17 | 0.99 | 8 | 15.93 | 14.81-17.63 | 1.00 |
| Tegminal length | 8 | 10.83 | 9.10-12.16 | 1.18 | 8 | 14.85 | 13.06-16.46 | 1.33 |
| Antennal length | 4 | 7.01 | 6.25-7.6 | 0.57 | 7 | 7.46 | 6.64-7.98 | 0.42 |
| Total length | 8 | 21.04 | 19.24-23.27 | 1.59 | 8 | 27.82 | 25.83-30.71 | 1.57 |

by black chevron-shaped, median transverse band and broad, black, transverse distal band (Fig. 175), inner surface as in Fig. 176. Posterior tibiae with following band sequence in proximal third, black, narrow yellow, black, yellow, black, remainder red.

COMMENTS. *H. rantae* is characterized by the presence of distinctive white pronotal spots and by its characteristic hind femoral markings; it is unlikely to be confused with any other species. The male type of *rantae africanus* is in a poor state of preservation. Most of the head, subgenital plate and both posterior femora have disintegrated. The remains of the internal genitalia were dissected and found to be those of *coerulescens*. This sub-species has accordingly been synonymised under *coerulescens*. *H. rantae* is closely associated with the salt bush *Suaeda monoica*.

TYPE MATERIAL EXAMINED

Holotype male, **Yemen PDR**: 16 km N. of Aden, 24.x.1932 (*Rant*) (BMNH). Paratypes, **Yemen PDR**: 1 male, 7 females same data as holotype, 1 male, 3 females Aden, vii.1932 (*Rant*) (BMNH); 4 females, 16 km N. Aden, 5.x.1932 (*Rant*) (BMNH); 3 males, 8 females, 22.ix.1932 (*Rant*) (BMNH); Sheikh-Othman, 1 female, 29.iv.1932 (*Rant*) (BMNH); 2 females, viii.1932 (*Rant*) (BMNH).

ADDITIONAL MATERIAL EXAMINED

Israel: 1 male, Eilat, 28.iv.-2.v.1967 (*Jeekel*)(ZMA). **Saudia Arabia**: 1 male, 4 females, Al lith, 10.iii.1968 (*Popov*)(NRI); 1 female, Dawqah, 8.iii.1968 (*Popov*)(NRI). **Yemen A.R.**: 1 female, Al Hudaydah, 1-8.i.1985 (*Popov*)(NRI). **Ethiopia**: 12 males, 9 females, Imbereme, nr. Mits'iwa, 8.ii.1954 (*Popov*)(BMNH); 2 females, Imbereme, ii-iii.1954 (*Greathead*)(BMNH); 2 males, 1 female, Wachiro, 23-24.xi.56 (*Greathead*)(BMNH). **Somali Rep**: 10 males, 7 females, Bulhar, *Sueda* bush, on beach, 10.viii.1981 (*Ritchie*)(NRI); 2 males, 2 females, nr. Berbera, 26.xii.1953 (*Popov & Greathead*)(BMNH).

***H. coerulescens* species-group**

DIAGNOSIS. Tip of cingular valves laterally expanded (Figs. 182, 187). Hind wings blue at base. Externomedian area of hind femora without boldly marked spots or bands.

COMMENTS. The affinity of this group is doubtful because of the laterally expanded tips of the cingular valves, which occur in no other group of species. The cingular valves of *Heteracris somalica*, comb. n. however, show some intermediate development towards this condition.

***Heteracris coerulescens* (Stål)**

(Figs. 182-186, Map 4)

Euprepocnemis coerulescens Stål, 1876:16. Holotype male, ERITREA (NM)[examined].

Tylotropidius brunni Giglio-Tos, 1907:31. Holotype male, SOMALI REPUBLIC (MIZSU). Syn. by Popov, 1950:134.

Bibulus desertus Uvarov 1921:131. Holotype male, SAUDI ARABIA (BMNH) [examined]. Syn. by Popov, 1950:134.

Heteracris coerulescens (Stål); Dirsh, 1958:53.

Heteracris rantae africanus Schmidt, 1982:76 [in Johnsen & Schmidt, 1982]. Holotype male, SOMALI REPUBLIC (ZMUF) [examined]. **Syn.n.**

DIAGNOSIS. Male. Apical penis valves, short, broad, divergent apically, cingular valves just surpassing tips of apical penis valves, at tip with lateral expansions (Fig. 182). Dorsal ectophallic plate broad with median longitudinal depression margined by low ridges, posterior margin obtusely rounded, without median, raised thickening. Epiphallus (Fig. 183) with short lobate lophi, posterior margin variable, weakly to strongly incurved medially, proximal process of lophal interspace weakly developed. Lateral surface of head without postocular spot or stripe markings. Fastigium of vertex with weakly developed median carinula, sometimes absent. Apical process of cercus about as wide as basal stem, weakly downcurved, much shorter than basal stem (Fig. 186).

General coloration brown variably expressed with yellow or yellow-green stripe markings typical for genus. External surface of posterior femur dull brown without boldly marked spots or transverse bands (with exception of small spots sometimes running along upper and lower carina), sometimes with indistinct distal band before dull cream-yellow pre-genicular annulus (Fig. 184). Inner surface of femur with boldly marked upper proximal, median and distal black bands, with upper proximal and median bands often merging (Fig. 185), similar to *cyanescens*, but inner upper proximal spot absent in *cyanescens*. Tegmina unicolorous infuscate brown with more darkly impressed spots or bands, dorsal longitudinal stripe pale yellow-green to light brown. Hind wing blue basally or rarely colourless, radial sector cells slightly infumate, bordered by darkened veins. Posterior tibiae, outer lateral surface below knee, with consecutive black, dirty white, black, dirty cream-yellow or white bands, remainder variable black-brown or with red-purple suffusion (Fig. 184).

COMMENTS. Apart from *nefasitensis*, this species is only confused with *cyanescens* from which it is distinguished by hind femur with a conspicuous, upper proximal, bold black spot on inner, dorsal surface (absent or very weakly expressed in *cyanescens*). Chromosomal characteristics of this species, from Kenyan material, have been reported by Ritchie (1987), to include a neo-XY system.

Table 11

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 13 | 0.84 | 0.76-0.98 | 0.094 | 11 | 1.66 | 1.45-1.82 | 0.12 |
| Head width | 13 | 4.44 | 4.03-4.84 | 0.30 | 11 | 6.52 | 6.05-6.92 | 0.28 |
| Pronotal width | 13 | 5.02 | 4.34-5.55 | 0.35 | 11 | 9.47 | 8.23-10.43 | 0.61 |
| Pronotal length | 13 | 5.23 | 4.74-5.88 | 0.45 | 11 | 9.31 | 8.35-10.20 | 0.57 |
| Hind femur depth | 12 | 4.27 | 3.78-4.82 | 0.32 | 11 | 6.62 | 6.15-7.00 | 0.37 |
| Hind femur length | 13 | 16.81 | 15.57-19.65 | 1.47 | 11 | 29.79 | 26.54-31.49 | 2.22 |
| Tegminal length | 13 | 21.12 | 17.23-24.24 | 2.23 | 10 | 40.75 | 34.03-49.69 | 4.28 |
| Antennal length | 7 | 11.74 | 10.95-12.74 | 0.65 | 9 | 15.97 | 13.68-17.49 | 1.19 |
| Total length | 13 | 28.45 | 24.02-32.44 | 2.64 | 11 | 49.41 | 43.77-55.13 | 3.17 |

TYPE MATERIAL EXAMINED

Euprepocnemis coerulescens Stål, holotype male, **Eritrea**: Massawa, (*Hildebrandt*) (NM); *Bibulus desertus* Uvarov, holotype male, **Arabia**: no further data (*Percival & Dodson*) (BMNH). Paratypes, 2 females, **Arabia**: Ktubu, 1902 (*Bury*) (BMNH).

ADDITIONAL MATERIAL EXAMINED [all BMNH unless otherwise stated]

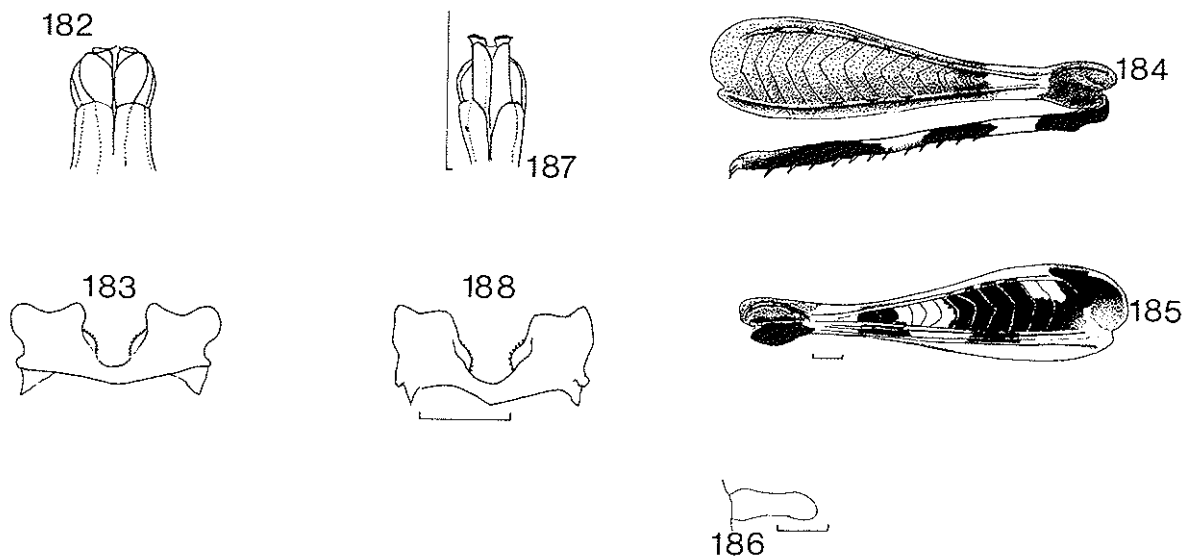
Saudi Arabia: 2 males, Asir Jaheri, 29.xi.1947 (*Popov*). **Yemen**: 3 males, 2 females, 48 km N. of Aden, 6.ii.1933 (*Rant*); 1 male, Lahej, 10.i.1932 (*Betts*); 2 females, Um Fagara, x.1935 (*Darling*); 1 female, Um Rija, x.1935 (*Darling*); 3 males, Ta'izz-Al Mukha, 30 km, i.85. (*Popov*) (NRI); 1 female, Usaifra, nr. Ta'izz, 7.viii.1946 (*Waterston*). **Socotra**: 7 males, 5 females, Hadiboh Plain, 11.4.1967 (*Guichard*) (NRI). **Senegal**: 1 female, Santiaba, Mandjak, 16.ii.1986 (*Mestre*) (NRI). **Nigeria**: 1 female, Filayi, 25.ix.1970 (*Popov*) (NRI); 1 male, 1 female, Gombe, 17-ix.1970 (*Popov*) (NRI); 2 females, Ibadan, ix.1942 (*Golding*); 2 females, Kalkala, 22.vi.1923 (*Golding*); 1 male, Kalkala, 5.vii.1934 (*Gwynn*). **Ethiopia**: 1 female, Ogaden, Wardere, 12-14.x.1953 (*Popov*); 2 females, Werdar, 1-14.x.1954 (*Greathead*); 1 male, Gemu Gofa, Arba Minch, 1250 m., 22.x.1976 (*Jago*) (NRI); 1 male, E. of Nazret, 20.viii.1976 (*Jago & Stretch*) (NRI); 2 males, 5 females, Gedlegube, 29.ix.1953 (*Bellehu*); 1 male, Imbereme, ii.-iii.1954 (*Greathead*); 1 male, Danakil, Sardo, 29.vii.1945 (*Guichard*) (NRI); 1 male, Dire-Dawa, vii.1942 (*Meneghetti*) (NMK); 1 male, Welo, Yeju escarpment, 20.ix.1949 (*Bellehu*); 1 female, El Rago, 5.xii.1953 (*Popov*); 6 males, 4 females, Dire-Dawa, compared to syntype of *Tylotropidius brunni* by Hollis, 1970, i.1935 (*Uhlenhuth*); 1 male, 1 female, Didessa R., v.1946 (*Guichard*). **Sudan**: 1 male, Medani, vii.1925 (*Johnston*); 1 male, Gedaref, 16.vii.1949 (*Com.Inst.Ent.Coll.No.14116*); 1 female, Meshra el Khalleh, 31.i.1930 (*Johnston*); 2 females, Laluba Hills, at light, 29.iv.1932 (*Johnston*). **Somali Rep.**: 2 females, Garoe, 9.x.1947 (*Miller*); 1 male, Merca, 24.xii.1950 (*Wood*); 1 male, N. of Erigavo, 15.ix.1958 (*Hussein*); 1 male, Adebifraad, 4.v.1958 (*Hussein*); 1 male, Bohotleh, xi.1935 (*Peek*); 1 female, Faroweina, ii.1947 (*Wood*); 1 female, Burao-Erigavo rd., 64 km from Burao, 14.i.1954 (*Popov & Greathead*); 1 male, 1 female, Borama, 13.vi.1952 (*Popov*); 1 male, nr. Borama, 1934 (*Taylor*); 2 females, Hargeisa, 14.x.1949 (*Guichard*); 1 male, N. of Borama, 6.v.1958 (*Hussein*); 1 male, 3 females, Haud, 29.vii.1932 (*Taylor*); 3 males, 5 females, Durdur, 21.vi.1958 (*Hussein*); 1 female, Nadi, nr. Borama, 6.v.1958 (*Hussein*); 1 male, Nabadid, 7.vi.1958 (*Hussein*); 1 male, Jire valley, 5.iii.1948 (*Uvarov*); 1 female, Baydhabo, 5.xi.1953 (*Popov*); 2 males, 1 female, Belet Uen, 20.x.1953 (*Popov*); 1 female, Banka Damal, 1.1947 (*Wood*); 1 male, 1 female, Lower Sheikh, 15.i.1954 (*Popov*); 1 female, Mijertein, nr. Bendar Beyla, 19.i.1957 (*Popov*); 5 males, 17 females, Burao, 1936 (*Peek*); 4 females, Laascaanod, 8.i.1936 (*Peek*); 4 males, 7 females, Salah Springs area, 5-15.iii.1949 (*Guichard*); 1 male, 1 female, Mijertein Domo, 4-5.xi.1947

(*Waloff*); 1 male, 1 female, Balesa-Kulal, 7.viii.1979 (*Simatini*)(NRI); 2 males, 2 females, 2 km SW. of Merca, dune behind beach, 26.vii. 1981 (*Ritchie*)(NRI); 3 males, 3 females, Mogadishu, xi.1978 (*Mitchell*)(NRI); 1 male, Sheikh, 3.iv.1967 (*Popov*)(NRI); 1 female, Adeniaval, at light, 16.xi.1960 (*Curry*)(NRI); 1 female, Libissar, 16.xi.1960 (*Roffey*)(NRI); 1 female, Bulu Burti. 19.ii.1960 (*Roffey*)(NRI); 1 female, Hargeisa, 9.vi.1967 (*Yusuf*)(NRI); 3 females, Hargeisa, 11.ix.1967 (*Tunstall*)(NRI); 1 male, 1 female, Mogadishu, 13.xi.1960 (*Roffey*)(NRI); 1 male, 3 females, 25 km S. of Mogadishu, in *Cordia* bushes on littoral dune slack, 18.vii.1981 (*Ritchie*)(NRI). **Kenya:** 4 males, 3 females, Lukenia Hill, Mombasa rd., 35 km from Mombasa, 30.iv.1975 (*Robertson & Robertson*)(NRI); 3 males, 1 female, Mwangaro (Lion Rock), Taita Hills, 7.v.1975 (*Robertson & Robertson*)(NRI); 1 male, Rukinga Ranch, Maungu, i-ii.1985 (*Rasa*)(NMK); 1 male, Kora Nat. Res., Mwetimba Hill rd., 30.vii.1983 (*Collins*)(NMK); 1 male, Lokori, Turkana, vii.1968 (*Hemming*)(NMK); 1 male, Thika, 1949 (*Pinney*)(NMK); 1 male, 1 female, 15 km E. of Narok i.xi.1982 (*Jago*)(NRI); 4 females, Mombassa, x.1950 (*Phipps*): 1 male, NMK. lab. reared from female ex. Pate Island, 26.vi.1987 (*Ritchie*)(NMK); 1 male, Kilifi Distr. Mangea Hill, clearings & forest (*Ritchie & Robertson*)(NMK); 1 male, 1 female, Malindi, 5-6.i.1968 (*Gillissen & Blommers*)(ZMA); 1 male, 1 female, Kindaruma, 16.1.1972 (*Robertson*)(NRI); 1 female, Hola, 11.vii.1972 (*Robertson*)(NRI); 1 male, 1 female, Hola, 26.x.1972 (*Robertson*)(NRI); 4 males, 1 female, Murinduko Hill, summit, S. of Embu, 8.vi.1975 (*Robertson*)(NRI); 5 males, 1 female, N. of Diani beach, S. of Mombasa, 16.iv.1975 (*Robertson*)(NRI); 2 females, Tebere Cotton Res. Statn., 22.vi.1971 (*Robertson*)(NRI); 1 female, Kibwezi, 5.v.1975 (*Robertson*)(NRI); 1 male, 2 females, Samburu Game Res., 15.v.1971 (*Robertson*)(NRI); 1 female, Ngong Hills, 23.vi.1975 (*Popov*)(NRI); 2 males, Ngong Hills, 16.v.1971 (*Robertson*)(NRI); 1 female, Mtunguni Hill-Kyawea Hill nr. Tulia, Kitui Distr., 10.v.1975 (*Robertson*)(NRI); 1 female Taita Hills, viii.1947 (*Van Someren*); 1 female, Lukenia, xii. 1931 (*Van Someren*); 1 female Turkana, v.1954 (*Popov*); 1 female, Athi, vi.1941 (*Van Someren*); 1 male 5 females, Damassa, Mandera Distr., 24.v.1947 (*Van Someren*); 1 male, Mombasa, x.1950 (*Phipps*); 1 male, Garissa, Bura, Tana R., ii.1948 (*Van Someren*); 1 male, Kasigau, xi.1938 (*Van Someren*); 1 female, Watamu, 13-19.xii.1971 (*Huggins*); 1 female, Tindiga, 20.xi.1926 (*Miller*); 1 female, 60 km SW. of Wajir, 17.xi.1952 (*Waloff*); 5 males, Wajir, 12.vi.1947 (*Kevan*). **Tanzania:** 1 male, Serengeti Nat. Park., upper pediment of Nyaraswiga, stoney ground, 10.vi.1986 (*Harvey*)(NRI); 6 males, Dar-es-Salaam, 26-31.xii.1967 (*Gillissen & Blommers*)(ZMA); 1 male, Mwanza, 18-19.1.1968 (*Gillissen & Blommers*)(ZMA); 1 female, Mbulu to S. end of L. Manyara, 16, vi.1967 (*Jago*)(NRI); 1 male, Dar-es-Salaam, 17.vi.1966 (*Jago*)(NRI); 1 male, 2 females, Kissaki, 4.i.1927 (*Miller*); 2 males, 6 females, Old Shinyanga, 18.iv.1937 (*Burt*); 1 male, 1 female, Morogoro, xi.1937 (*Harris*); 1 female, Mkomazi, W. of Amani, 20.vi.1937 (no coll.); 1 male, Isanza highlands, E. of Mkalama, 21.iv.1936 (*Burt*); 1 male, 3 females, Mlingano, Ngomeni Sisal estate, 30.ix.1950 (*Phipps*); 3 females, Tanga, viii.1950 (*Phipps*); 1 male, 3 females, Morogoro, x.1954 (*Phipps*); 1 female, L. Rukwa, 1949 (*Burnett*); 1 female, Milepa Plain, 11.1949 (*Burnett*); 10 males, Uluguru Mts., ii.1927 (*Miller*); 8 males, 5 females, Kilosa, xii.1925 (*Miller*); 1 female, Mkalama, 16.xi.1926 (*Miller*). **Zanzibar:** 1 female, Chukwani, v.1954 (*Brown*). **Zaire:** 1 male, Lumu, 7-15.iv.1975 (*Leg.SBZ*)(NRI). **Mozambique:** 1 male, 1 female, Chinde, xi. 1957 (*Usher*).

***Heteracris nefasitensis* sp.n.**

(Figs. 187-188, Map 4)

DIAGNOSIS. Male. Differs from *coerulescens* only in having longer and more slender apical penis valves (Fig. 187). Epiphallus (Fig. 188) like *coerulescens* but with slightly longer lophi. Outer lateral surface of posterior tibiae with only two small black bands in proximal half, remainder violaceous distally.



Figures 182-188

Heteracris species (males). *H. coerulescens*. 182, posterior aspect of penis valves; 183, ventral aspect of epiphallus; 184, left hind femur, outer aspect; 185, same, inner aspect; 186, left cercus.

187-188. *H. nefasitensis* sp.n. 187. posterior aspect of penis valves; 188, ventral aspect of epiphallus. All scale lines represent 1mm; that under Fig. 187 also applies to 182; that under Fig. 185 also applies to 184; that under Fig. 188 also applies to 183; that under 186 applies only to that figure.

Table 12

Measurements (mm)

| | Males only | |
|-------------------|------------|--------------|
| | n | |
| Interocular dist. | 2 | 0.83, 0.80 |
| Head width | 2 | 4.63, 4.75 |
| Pronotal width | 2 | 5.00, 4.91 |
| Pronotal length | 2 | 4.79, 4.95 |
| Hind femur depth | 2 | 4.15, 4.11 |
| Hind femur length | 2 | 15.34, 16.32 |
| Tegminal length | 2 | 18.26, 19.07 |
| Antennal length | 1 | 11.92 |
| Total length | 2 | 28.55, 27.03 |

COMMENTS. This species is known only from two males collected at Nefasit (Eritrea) at an altitude of 1600 m and together with *coerulescens* forms a close species pair.

TYPE MATERIAL EXAMINED

Holotype male, **Eritrea**: Nefasit, 1500 m., 21.viii.1968 (*Blackith*) (MNHN).
Paratype male, same data as holotype (BMNH).

***H. herbacea* species-group**

DIAGNOSIS. This group is characterized by having broad, short cingular valves, about as long as or just surpassing tips of apical penis valves (Figs. 194-195). Epiphallus large, with heavily sclerotized lophi (Fig. 196), proximal process of lophal interspace margins highly modified (Fig. 197). Fastigium verticis with median carinula (Fig. 200). Antennae, usually red proximally. Tegmina usually tinged with green or brown, with scattered small black spots, sometimes fusing to form bands near wing tips (Fig. 198). Hind wing blue at base, wing tips infusate brown (Fig. 201).

COMMENTS. This well-defined group appears restricted in its distribution to southern Africa. Aedeagal morphology is fairly uniform between species, many of which are sympatric. The main differences between species are found in the morphology of the epiphallic lophal interspace margins. Externally, the cerci are useful in recognising species. The apical process of the cercus shows a transformation in shape from short, broadly rounded, as in *herbacea*, to more elongate and acute as in *acuticercus* sp.n.

***Heteracris herbacea* (Serville)**

(Fig. 189a-203, Map 4)

Acridium herbaceum Serville, 1838:684. Holotype female, REP. OF SOUTH AFRICA (lost). NEOTYPE male, REP. OF SOUTH AFRICA (BMNH), here designated [examined].

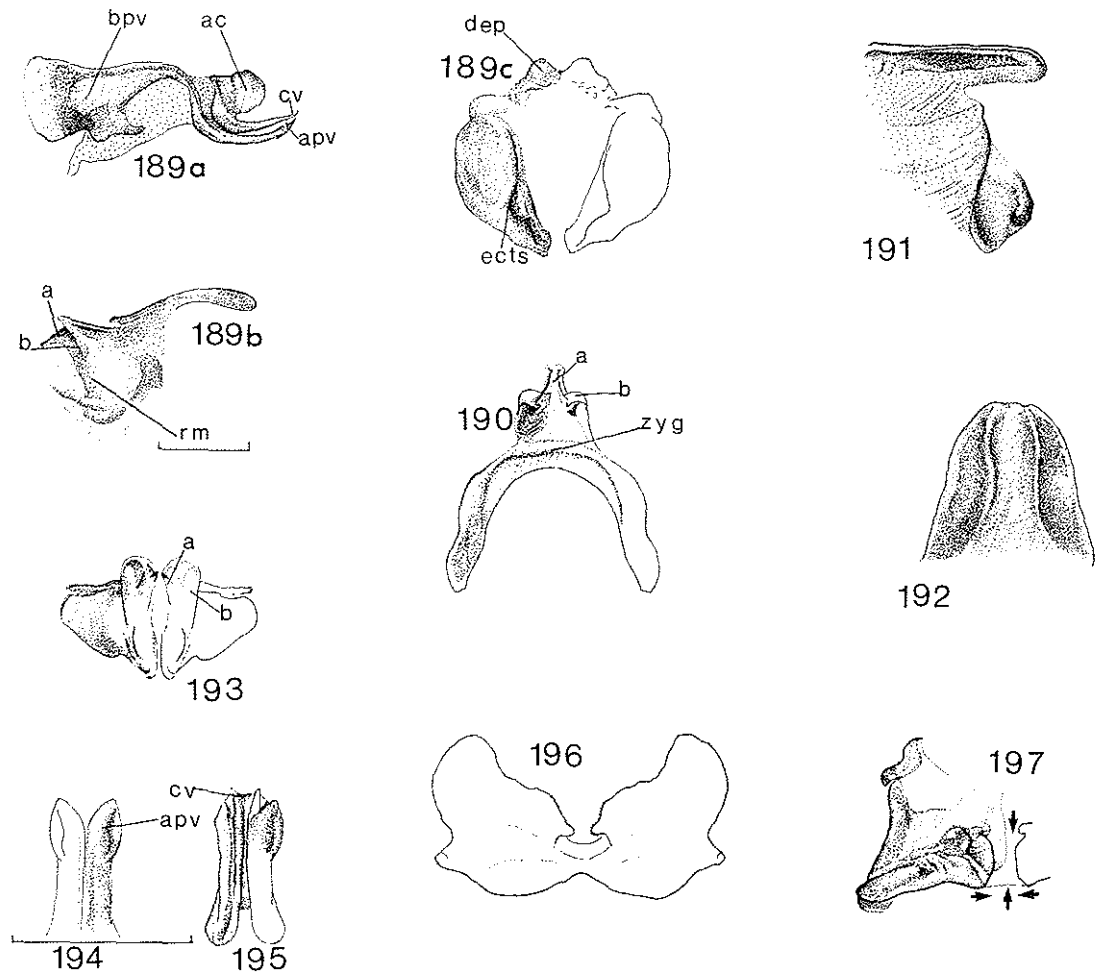
Heteracris herbacea (Serville) Kirby, 1910:555

DIAGNOSIS. Male. Aedeagus as in Figs. 194-195. Ventral aspect of epiphallic lophi as in Fig. 196; distance between lophal interspace narrow (see arrows Fig. 196), inner margins of lophal interspace recessed, proximal process expanded when viewed edge on, depth greater than that in *calliptamoides calliptamoides* (compare Figs. 197 and 209), dorsal surface with strongly developed; inwardly projecting tubercle (Fig. 199). Apical process of cercus short, roundly expanded, forming slightly angulate apex (Fig. 202); apex of subgenital plate somewhat square-shaped.

General coloration green-brown suffused with yellow, longitudinal dorsal stripes of head and tegmen pale yellow-green. Tegmina tinged with green-yellow or brown hue, speckled with discrete small brown spots which tend to merge near tegminal tips to form small bands, tips of tegmen composed of fused brown cells (Fig. 198). Hind wings with basal blue tinge, wing tips composed of fused infusate brown cells (Fig. 201). Last abdominal tergite, subgenital plate shiny black; cercus black becoming dull cream-yellow distally. Externomedian surface of posterior femur yellow with distal black band and broad, diffuse, median black spot, extending proximally, often extending to lower carina (Fig. 203). Inner surface yellow with boldly marked black median and distal spots. Posterior tibiae, outer lateral surface, with following band sequence below knee lunule black, yellow, remainder green-blue, rarely yellow-brown. Tibial spines white with black tips.

COMMENTS. The type of *H. herbacea* (Serville) has been lost and the identity of the species cannot be definitely established from Serville's original description. This is based on a female specimen from the Cape of Good Hope and could apply equally well to all other species in this group.

Uvarov (1921) stated that the specimens upon which Bolivar (1914) based his own concept of *herbacea* could not be conspecific with Serville's *herbacea*. He noted that Bolivar (1914) had described his own material as having 'cerci (male) compressed, gradually attenuate towards the apex, curved, slightly pointed' whereas Sjöstedt (1913) had re-examined specimens which Stål believed conspecific with *herbacea* (Serville) and had observed that these had cerci which were 'apically fairly short and broad, attenuate'.



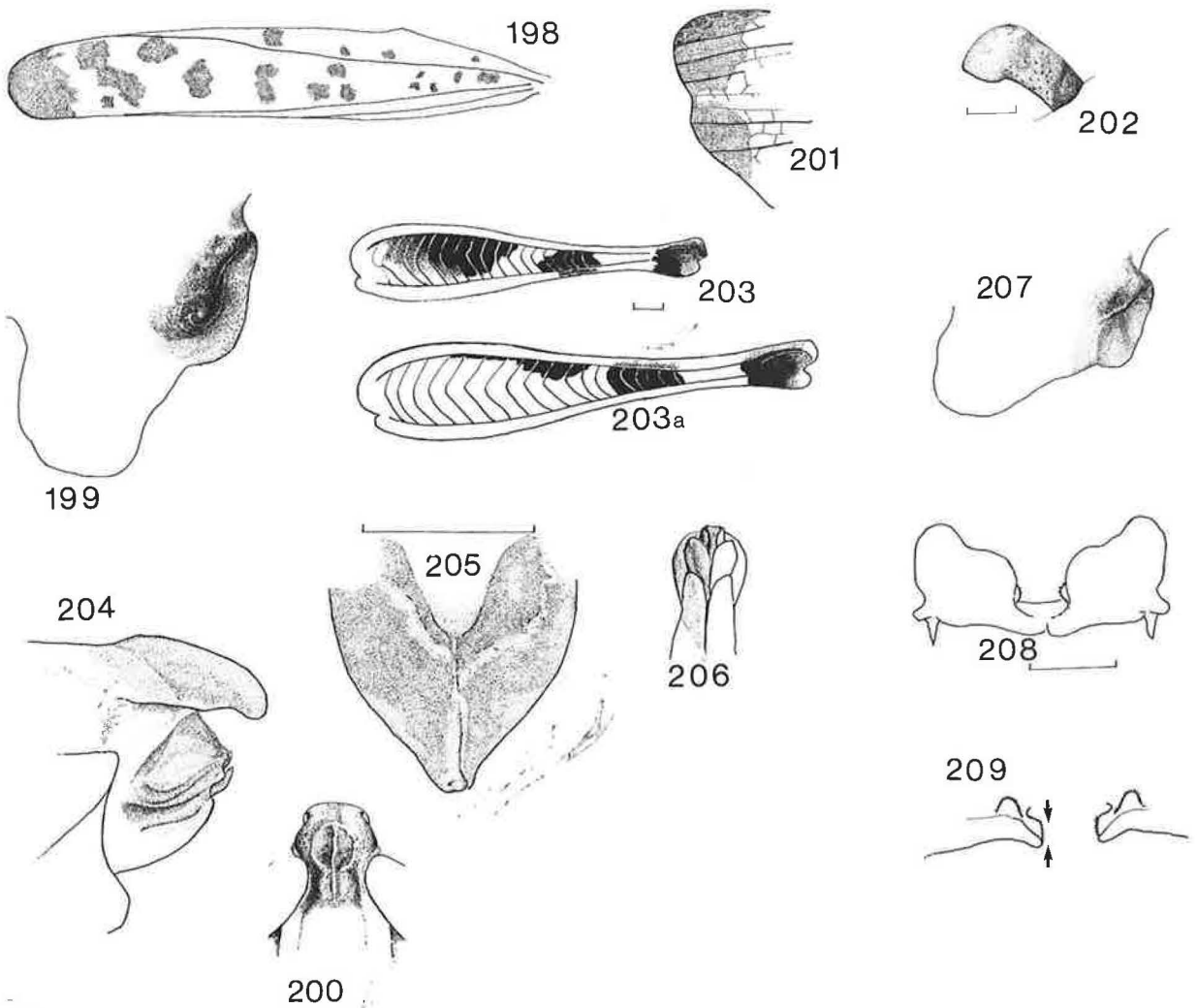
Figures 189a-197

Heteracris herbacea (male). 189a, lateral aspect of endophallus; 189b, endophallus, lateral aspect showing distal expansions of cingular ramus; 189c, same, posterior aspect with aedeagus removed; 190, dorsal aspect of distal expansion of cingular ramus; 191, lateral aspect of ectophallic membrane with aedeagus removed; 192, dorsal aspect of ectophallic plate; 193, posterior aspect of distal expansions of cingular ramus; 194, apical penis valves of aedeagus; 195, cingular valves of aedeagus; 196, epiphallus, ventral aspect; 197, same, posterior aspect. All scale lines represent 1 mm; that under Fig. 194 also applies to 195; that under Fig. 189b also applies to Figs. 189-193, 196-197.

Table 13

Measurements (mm)

| | Males | | | |
|-------------------|-------|-------|-------------|-------|
| | n | Mean | Range | SD |
| Interocular dist. | 13 | 0.92 | 0.79-1.07 | 0.090 |
| Head width | 13 | 4.17 | 3.97-4.50 | 0.19 |
| Pronotal width | 13 | 4.45 | 4.14-4.83 | 0.23 |
| Pronotal length | 13 | 4.51 | 4.15-4.91 | 0.24 |
| Hind femur depth | 13 | 3.39 | 3.00-3.87 | 0.29 |
| Hind femur length | 13 | 15.59 | 14.65-17.26 | 0.74 |
| Tegminal length | 13 | 18.12 | 16.47-20.53 | 1.23 |
| Antennal length | 5 | 9.50 | 9.37-9.65 | 0.11 |
| Total length | 13 | 26.69 | 24.85-29.23 | 1.39 |



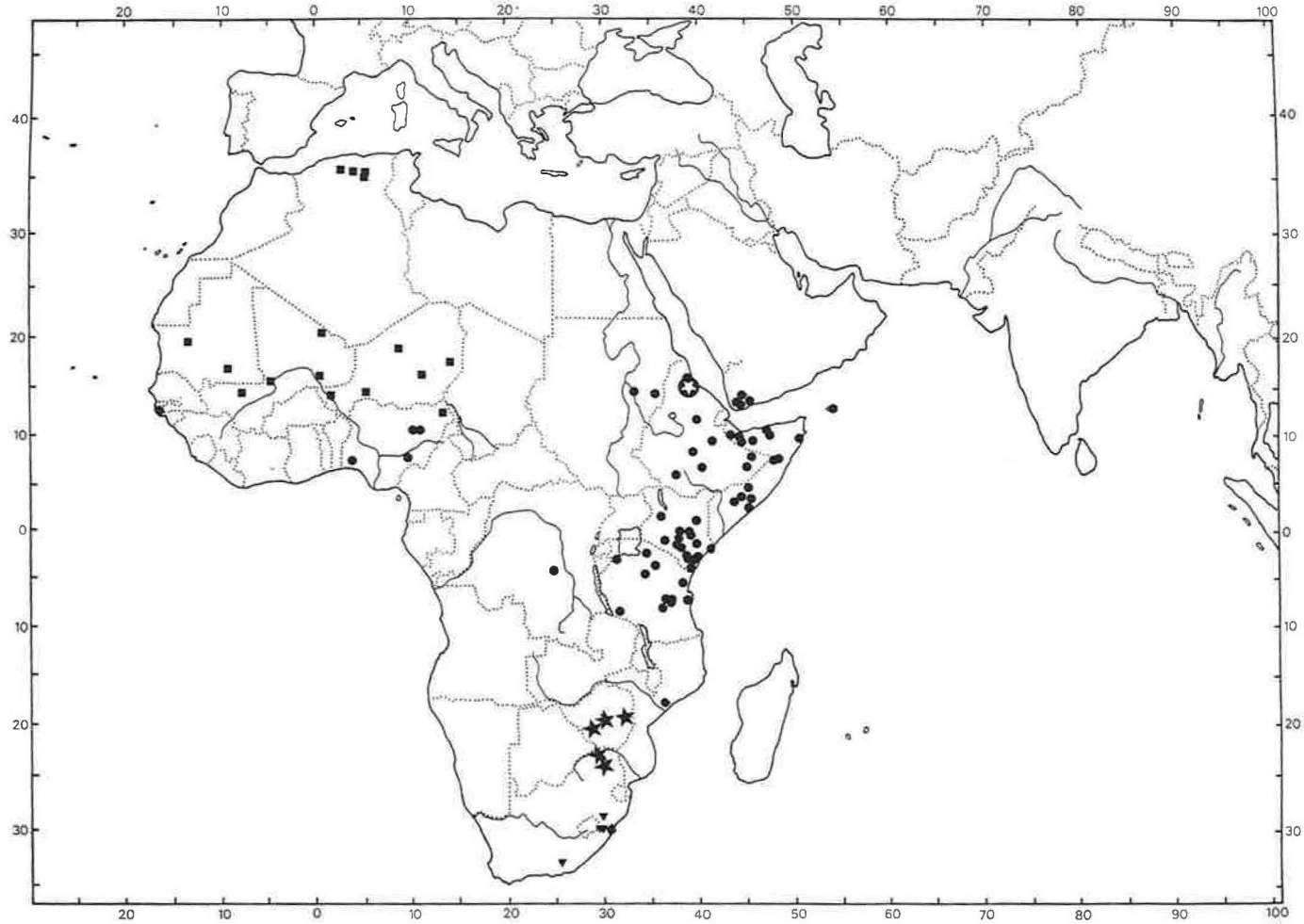
Figures 198-209

Heteracris species (males). 198-203 *H. herbacea* 198, right tegmen; 199, dorsal aspect of lophal interspace; 200, dorsal aspect of fastigium verticis; 201, apical cells of hind wing tip; 202, lateral aspect of right cercus; 203, outer aspect of left hind femur. 203a-209. *H. calliptamoides calliptamoides*. 203a, outer aspect of left hind femur; 204, lateral aspect of genitalia; 205, dorsal aspect of ectophallic plate; 206, posterior aspect of penis valves; 207, dorsal aspect of lophal interspace margin; 208, ventral aspect of epiphallus; 209, posterior aspect of lophal interspace. All scale lines represent 1 mm; that under Fig. 203 also applies to 198, 203a; that under Fig. 202 also applies to 200-201; that above Fig. 205 applies to 199, 204-207; that under Fig. 208 also applies to 209 only.

The true identity of *herbacea* (Serville) however is still in doubt unless it is discovered that Sjöstedt compared Stål's material with Serville's holotype female. What is clear is that only one species in this group agrees with Stål's definition of *herbacea*, whereas all the others have cerci which conform to Bolivar's description of his material. Because of the uncertainty described above and to establish the identity of this species, one male specimen from South Africa is hereby designated as the neotype of *H. herbacea* (Serville) based subjectively on Stål's definition.

TYPE MATERIAL EXAMINED

Heteracris herbacea (Serville), neotype male, **Rep. of South Africa**: Drakensberg Mts., Giants Castle Nat. Res., 8-9.iii.1967 (Gillissen & Blommers)(ZMA).



Map 4

Distribution of *Heteracris* species. Circles, *H. coerulescens*; squares, *H. harterti*; stars, *H. acuticercus*; triangles, *H. herbacea*; diamond, *H. zulu* sp.n.; circle with star, *H. nefasitensis* sp.n.

ADDITIONAL MATERIAL EXAMINED

Rep. of South Africa: 3 males, Natal Nat. Park, iii.1932 (*Ogilvie*)(BMNH); 1 male, Natal, Giant's Castle, Drakensberg Mts., no. date, (*Jago*)(NRI); 1 male, Giant's Castle Nat. Res., Drakensberg, 8-9.iii.1967 (*Gillissen & Blommers*)(ZMA); 3 male, Natal, Drakensberg Mts., Hlatikulu, 7.iii.1967 (*Gillissen & Blommers*)(ZMA); 3 males, Natal, Drakensberg Mts., Kamberg Nat. Res., 5-6.iii.1967 (*Gillissen & Blommers*)(ZMA); 1 male, P.Maritzberg, 9.iv.1963 (*Brown*)(NCIP); 1 Male, Sunday's River, nr. Addo, 21.11.1954 (*Balfour-Brown*)

Heteracris acuticercus sp.n.

(Figs. 232-236, Map 4)

DIAGNOSIS. Male. Ventral surface of epiphallus (Fig. 232), like *speciosa* but smaller, but with lophal-interspace more extensive in *acuticercus*; posterior edge of epiphallic lophi with slightly upcurved inner and outer processes when viewed edge on (Fig. 233). Inner edges of lophal interspace less well developed than in rest of group, dorsal lip reduced to small tubercle (Fig. 235). Dorsal ectophallic plate, roundly triangulate, with distal, median longitudinal thickening (Fig. 234), shape like that of *calliptamoides calliptamoides*, not rectangulate as in *herbacea*. Cercus less widened and more elongate form of that seen in *speciosa* (compare Figs. 236 and 243). Basal segments of antennae red, posterior femur and tibial markings same as in *speciosa*.

Table 14

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|-------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 7 | 1.01 | 0.89-1.09 | 0.07 | 5 | 1.53 | 1.48-1.57 | 0.037 |
| Head width | 7 | 4.62 | 4.42-4.85 | 0.15 | 5 | 5.89 | 5.68-5.97 | 0.11 |
| Pronotal width | 7 | 4.87 | 4.58-5.07 | 0.29 | 5 | 7.45 | 7.05-7.76 | 0.31 |
| Pronotal length | 7 | 5.12 | 4.73-5.71 | 0.32 | 5 | 7.32 | 6.63-7.53 | 0.42 |
| Hind femur depth | 7 | 4.02 | 3.70-4.57 | 0.31 | 4 | 5.55 | 5.24-5.94 | 0.31 |
| Hind femur length | 7 | 17.28 | 15.95-18.65 | 0.91 | 4 | 24.93 | 24.25-25.87 | 0.74 |
| Tegminal length | 7 | 18.03 | 16.30-21.08 | 1.66 | 4 | 24.28 | 22.36-26.22 | 1.58 |
| Antennal length | 1 | 12.22 | — | — | 2 | — | 13.48-14.49 | — |
| Total length | 7 | 30.11 | 27.94-32.69 | 1.79 | 4 | 42.95 | 41.10-45.04 | 1.73 |

TYPE MATERIAL EXAMINED

Holotype male, **Rep. of South Africa:** Louis Trichardt, 42 km E. of N.Tvl, 14.ii.1963 (*White*) (NCIP). Paratypes, 1 male, same data as holotype, (*Brown & Furst*) (NCIP); 1 male, Magoebaskloof, N.Tvl, 12.iii.1963 (*Brown & Furst*) (NCIP); 1 male, Magoebaskloof, N.Tvl, 12.iii.1963 (*Brown & Furst*) (BMNH); 1 male, 2 females, Transvaal, Louis Trichardt, iv. 1932, (*Mackie*)(BMNH).

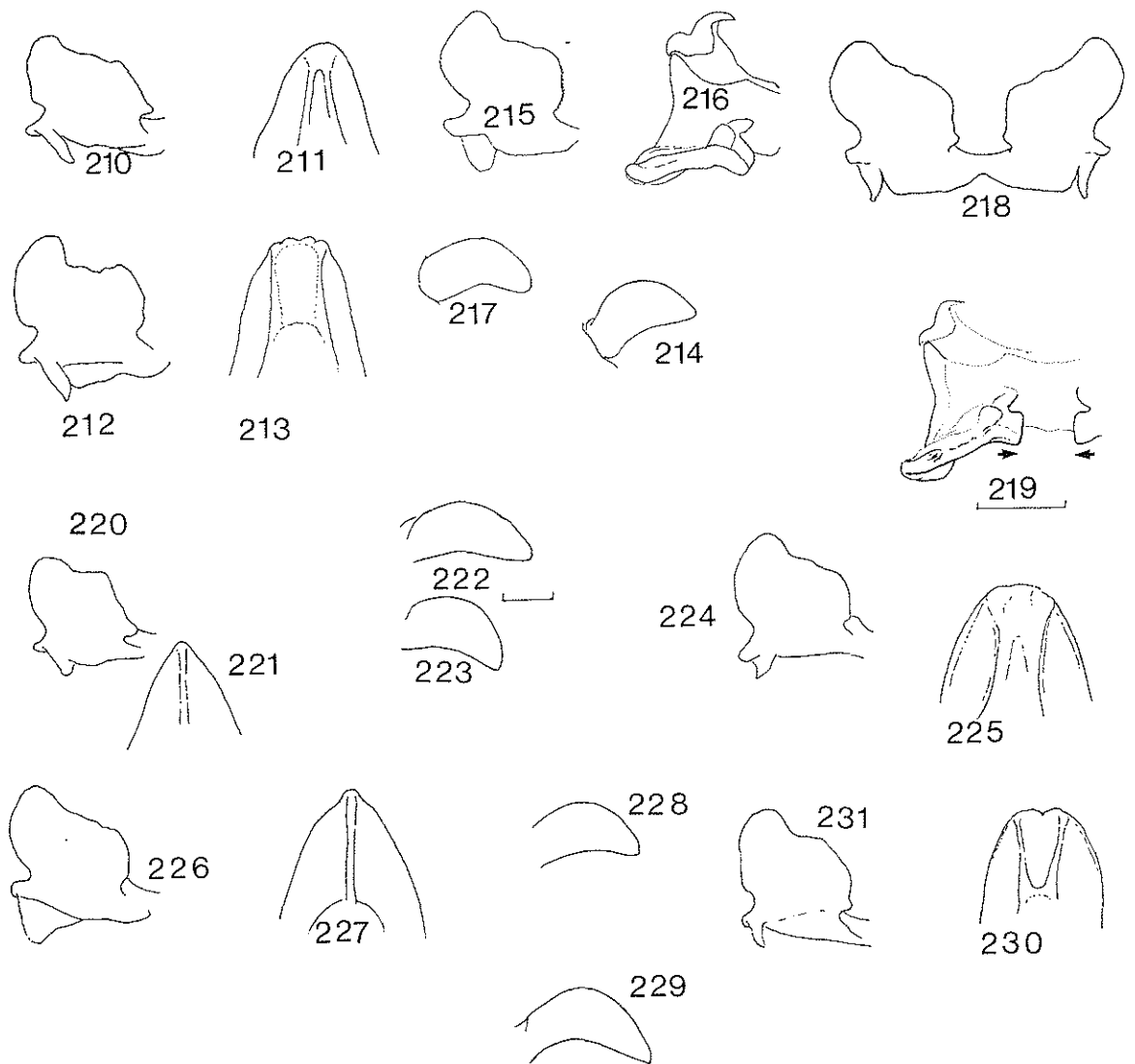
Zimbabwe: 1 male, Matopo Hills, iv.1932 (*Mackie*)(BMNH); 2 males, 1 female, Monarch mine, Umtali, 7.iv.1945 (*Miller*)(BMNH); 1 female, Selukwe, 19.iv.1935 (*Miller*)(BMNH).

Heteracris calliptamoides Uvarov

(Figs. 203a-231, Map 3)

Heteracris calliptamoides Uvarov, 1921:134

DIAGNOSIS. Male. Aedeagal valves as in Fig. 206 with cingular valves slightly longer and narrower than those of *herbacea*. Ventral aspect of epiphallus similar in shape to that of *herbacea* but with lophi generally shorter, more



Figures 210-231

Heteracris calliptamoides testacea subsp.n. (males). 210, ventral aspect of epiphallus, South Africa, Zuurberg Pass, intermediate form; 211, dorsal ectophallic plate, South Africa, Zuurberg Pass; 212, ventral aspect of epiphallus, Zuurberg Pass; 213, holotype, dorsal ectophallic plate; 214, left cercus, Zuurberg Pass; 215, holotype, ventral aspect of epiphallus; 216, same, posterior aspect of lophal interspace; 217, same, left cercus; 218, ventral aspect of epiphallus, Coffee Bay; 219, posterior aspect of epiphallus, Coffee Bay; 220, ventral aspect of epiphallus, W. Port Elizabeth; 221, dorsal ectophallic plate, same; 222, left cercus, same; 223, left cercus, Grahamstown; 224, ventral aspect of epiphallus, same; 225, dorsal ectophallic plate, same; 226, ventral aspect of epiphallus, Fish River Valley; 227, dorsal ectophallic plate, same; 228, left cercus, same; 229, left epiphallus, Middleberg; 230, dorsal ectophallic plate, same; 231, ventral aspect of epiphallus, same. All scale lines represent 1mm; that under Fig. 222 also applies to 214, 217, 223, 228-229; that under Fig. 219 also applies to all other figures.

widely spaced apart in *calliptamoides* (Fig. 208), depth of proximal process when viewed edge on shorter than that in *herbacea* (Fig. 209), dorsal surface, with margins of lophal interspace expanded, strongly recessed with heavily sclerotized dorsal lip, with or without tubercles as in *herbacea* (Fig. 207).

Dorsal ectophallic plate, shield-shaped with median, distal thickening (Fig. 205) or rectangulate, at apex truncate, similar in shape to that of *herbacea* (Fig. 213). Cercus (Fig. 217) medially expanded, tapering distally to form downcurved apical process, apex subacute. Antennae, median segments, slightly widened, compressed. Ventral surface of antennae red proximally, median segments black, distal segments dirty white. Dorsal stripe markings of head, pronotum and tegmen absent, or indistinctly marked with dark green or with more distinct light green-yellow markings. Posterior femur dark red-orange, with indistinct or absent median and distal black spots or green or yellow suffused with green, with distinct black median and distal transverse markings on inner and outer surfaces (Fig. 203a). Posterior tibiae, outer lateral surface with small black band below knee followed by yellow annulus, remainder with green-blue suffusion.

COMMENTS. This species is divided into two subspecies. The nominate subspecies is characterized by having a subconical-shaped dorsal ectophallic plate (Fig. 205), and red hind femora. *H. calliptamoides testacea* subsp.n. is characterized by having a rectangulate ectophallic plate (Figs. 213) and yellow-green hind femora with more distinct black markings (Fig. 203a).

The nominate subspecies occupies the western side of the species' range extending into the Karoo, while *testacea* occurs in the eastern part, extending to the coastal areas of Grahamstown and Port Elizabeth.

***Heteracris calliptamoides calliptamoides* Uvarov stat.n.**

Heteracris calliptamoides Uvarov, 1921:134. Holotype male, REP. SOUTH AFRICA (BMNH) [examined].

DIAGNOSIS. Male. Differs from new subspecies in having red-orange posterior femora, absence (if present, indistinctly marked) of dorsal stripe markings of head, pronotum and tegmen. General body colour dark brown-red suffused with black. Tubercle on inner, dorsal surface of epiphallal lophi variable, generally less developed than in *testacea* subsp.n. or absent. Dorsal ectophallic plate sub-conical in shape, apex attenuated, low-tectiform Figs. 204-205.

COMMENTS. Material collected from around Zuurberg Pass exhibited somewhat transitional character states as follows: red outer and yellow inner surfaces to hind femora, dorsal ectophallic plate somewhat intermediate in shape (Fig.211). Specimens of more typically coloured *calliptamoides calliptamoides* populations around Middleberg and Fish River Valley also exhibited ectophallic plates of intermediate structure (see Figs. 220-230).

Table 15

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|-------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 9 | 1.01 | 0.90-1.18 | 0.08 | 7 | 1.54 | 1.45-1.64 | 0.096 |
| Head width | 9 | 4.71 | 4.21-5.06 | 0.25 | 7 | 5.95 | 5.68-6.36 | 0.28 |
| Pronotal width | 9 | 4.87 | 4.19-5.42 | 0.36 | 7 | 7.43 | 6.45-8.13 | 0.71 |
| Pronotal length | 9 | 5.20 | 4.25-5.83 | 0.48 | 7 | 7.60 | 6.78-8.51 | 0.68 |
| Hind femur depth | 9 | 4.06 | 3.20-4.58 | 0.39 | 7 | 5.59 | 4.95-6.11 | 0.41 |
| Hind femur length | 9 | 16.46 | 15.38-17.72 | 0.69 | 7 | 21.99 | 19.90-23.90 | 1.46 |
| Tegminal length | 8 | 17.02 | 14.48-19.53 | 1.49 | 6 | 23.28 | 20.05-26.38 | 2.66 |
| Antennal length | 1 | 13.37 | — | — | 4 | 12.37 | 11.01-13.95 | 1.43 |
| Total length | 9 | 28.76 | 27.53-30.94 | 1.45 | 7 | 38.01 | 35.10-40.98 | 2.51 |

TYPE MATERIAL EXAMINED

Heteracris calliptamoides Uvarov, holotype male, **Rep. of South Africa**: no further data (BMNH). Paratype female, same data as holotype.

ADDITIONAL MATERIAL EXAMINED

Rep. of South Africa: 2 males, Karoo Region, Miller Statn., 24.iii.1957 (*Brown*)(NCIP); 2 males, Karoo Region, 20 km NE. of De Arr, 17.ii.1986 (*Brown, Price & Bax*)(NCIP); 3 males, Middleberg, ii-iii.1957 (*Reyneke*)(NCIP); 1 male, Steytlerville, iii.1933 (*Naude*)(BMNH); 1 male, Somerset East, 27-31.i.1931 (*Turner*)(BMNH); 1 male, Fish River Valley, 4.iv.1955 (*Greathead*)(BMNH); 2 males, Zuurberg Pass, 22.iii.1954 (*Balfour-Browne*)(BMNH).

Heteracris calliptamoides testacea subsp.n.

DIAGNOSIS. Male. Differs from the nominate subspecies in having hind femora yellow-brown or yellow suffused with green, with distinctive median, distal, black markings (Fig. 203a), and lighter green dorsal stripe markings of head, pronotum and tegmen.

COMMENTS. The external morphology and epiphallic structure of this subspecies is variable. A single male specimen collected from Coffee Bay, for example, shared similar epiphallic and cercal structure to those of *herbacea* yet the width of the epiphallic lophal interspace and depth of the proximal process were typical of *calliptamoides testacea* subsp.n. as in Figs. 218-219. Externally, this subspecies is similar to *herbacea* with which it may be confused. It may be separated from *herbacea* by larger size, apical process of cercus generally more attenuate, externomedian area of posterior femur without large, diffuse black, proximal-median spot, depth of proximal process of lophal interspace much reduced.

Table 16

Measurements (mm)

| | Males | | | | Females | |
|-------------------|-------|-------|-------------|-------|---------|-------|
| | n | Mean | Range | SD | n | |
| Interocular dist. | 6 | 1.06 | 0.97-1.18 | 0.060 | 1 | 1.89 |
| Head width | 6 | 4.78 | 4.57-5.01 | 0.17 | 1 | 6.22 |
| Pronotal width | 6 | 5.08 | 4.77-5.53 | 0.25 | 1 | 8.20 |
| Pronotal length | 6 | 5.43 | 5.06-5.73 | 0.28 | 1 | 8.42 |
| Hind femur depth | 6 | 4.03 | 3.82-4.36 | 0.20 | 1 | 5.97 |
| Hind femur length | 6 | 18.10 | 16.57-19.28 | 1.08 | 1 | 28.05 |
| Tegminal length | 6 | 19.58 | 16.90-21.61 | 1.75 | 1 | 28.64 |
| Antennal length | 5 | 11.44 | 10.59-12.51 | 0.69 | - | |
| Total length | 6 | 31.27 | 28.81-34.24 | 2.01 | 1 | 45.80 |

TYPE MATERIAL EXAMINED

Holotype male, **Rep. of South Africa**: Transkei, Umtata, 18.ii – 18.iii.1923 (*Turner*)(BMNH). Paratypes, **Rep. of South Africa**: 1 male, same data as holotype; 7 males, Grahamstown, 14.iii.1955 (*Greathead*)(BMNH); 1 male, Katberg, 19-26.ii.1933 (*Turner*)(BMNH); 1 male, Van Stadenspas, West Port Elisabeth, 4.iii.1951 (*Brinck & Rudebeck*)(BMNH); 1 male, Coffee Bay, 9.i.1974

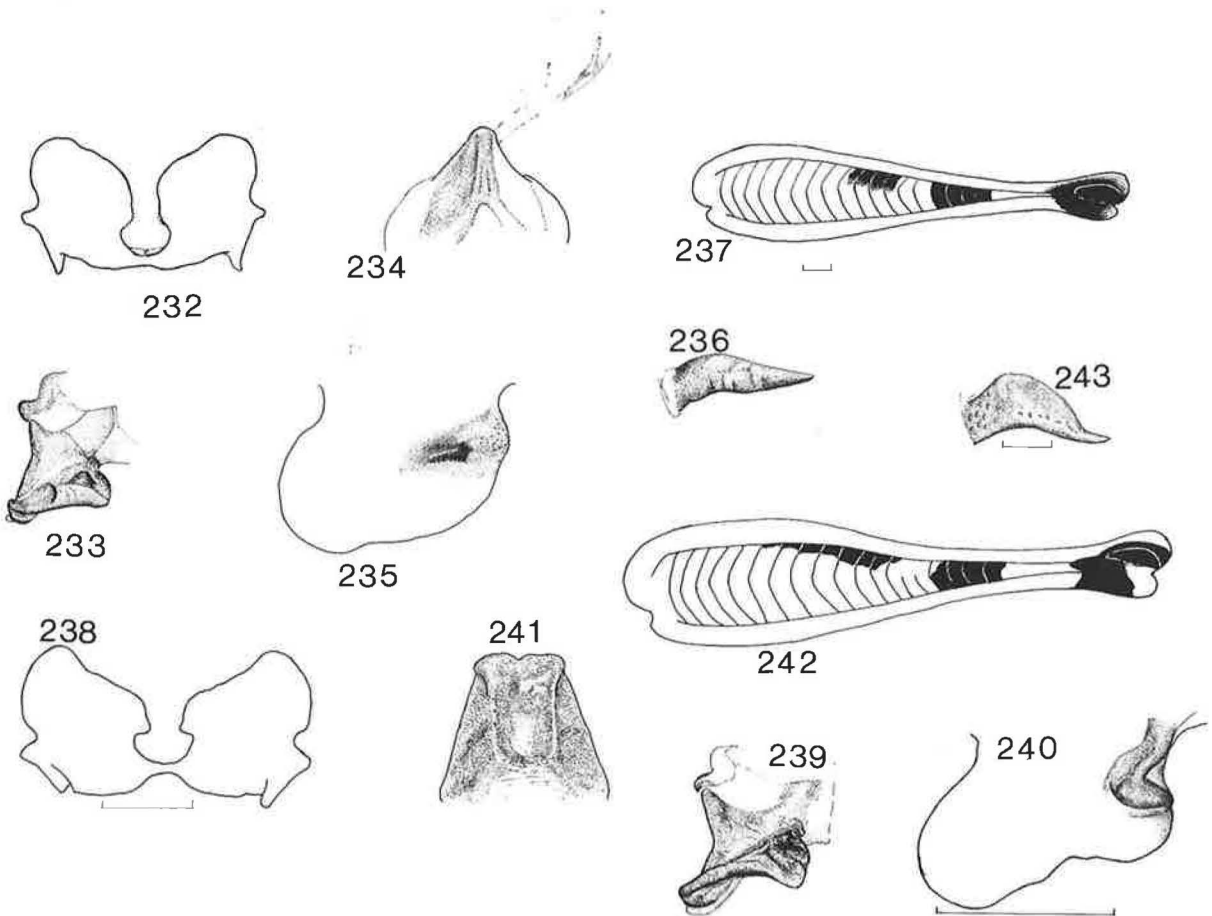
(*Reenen*)(NCIP); 1 male, Queenstown, 16.i-10.ii.1923 (*Turner*)(BMNH); 1 male, Fort St. John, 1-17.iii.1924 (*Turner*)(BMNH);

***Heteracris drakensbergensis* sp.n.**

(Figs. 244-248, Map 6)

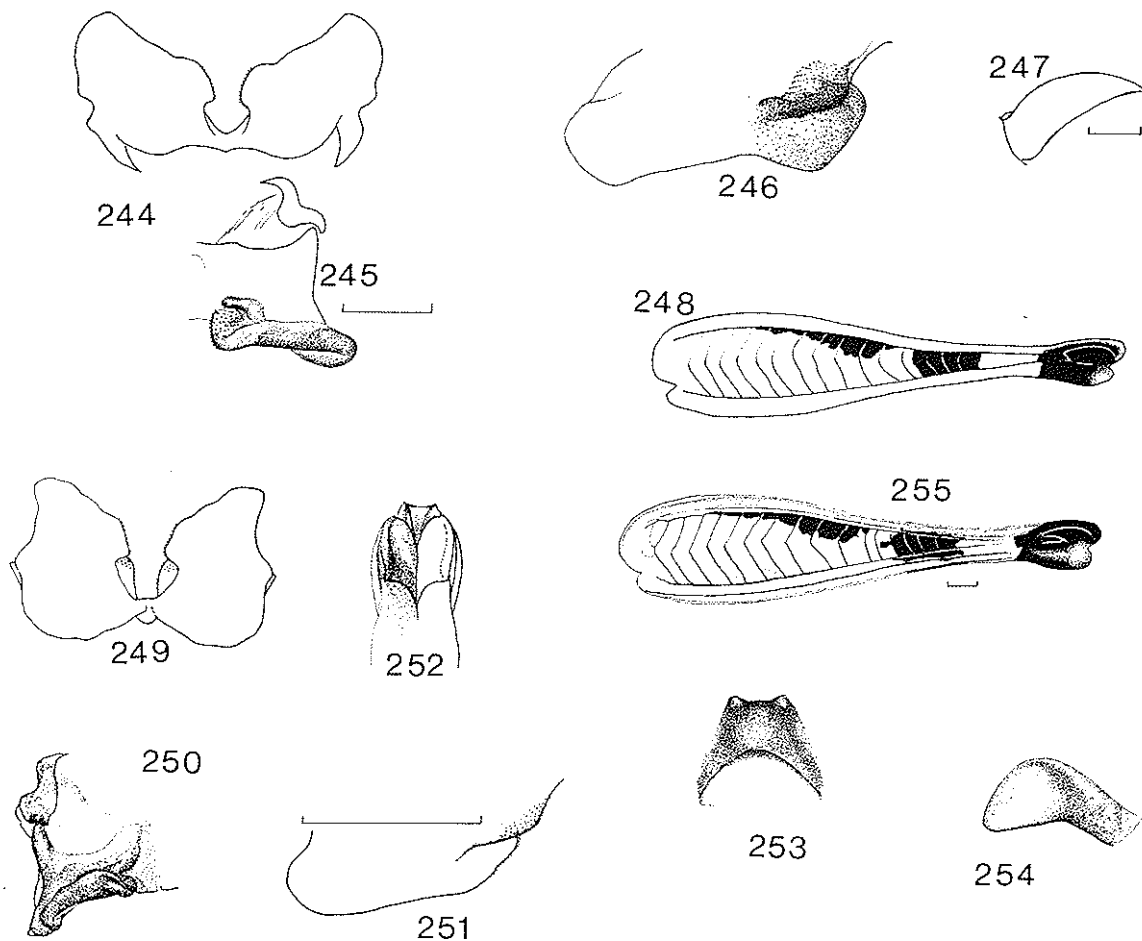
DIAGNOSIS. Male. Ventral surface of epiphallus (Fig. 244), similar to *herbacea*; dorsal surface, with inner edges of lophal interspace deeply recessed, forming sclerotized, horizontally folded, proximal lip (Fig. 245). Cercus similar to *calliptamoides* but proportionately longer, slender, apex acute (Fig. 247). Both inner and outer surfaces of hind femora yellow (proximally suffused with green) with median and distal black spots, median spot on outer surface continuing proximally along upper carina (Fig. 248). Posterior tibiae outer, lateral surface with small black annulus below knee, followed by consecutive yellow-cream, black, dirty white bands, remainder becoming more blackened distally toward tarsus, usually green-blue in remainder of group.

COMMENTS. The shape of the cercus and coloration of the hind tibiae readily separate this species from all others in the group. This species is sympatric with both *herbacea* and *speciosa* at Giants Castle Nat. Res., Drakensberg.



Figures 232-243

Heteracris species (male). 232-237. *H. acuticercus* sp.n. 232, ventral aspect of epiphallus; 233, posterior aspect of epiphallus, 234, dorsal ectophallic plate; 235, dorsal aspect of lophal interspace margin; 236, left cercus, 237, outer aspect of left hind femur. 238-243. *H. speciosa*. 238, epiphallus, ventral aspect; 239, same, posterior aspect; 240, same, dorsal aspect of lophal interspace margin; 241, dorsal ectophallic plate; 242, outer aspect of left hind femur; 243, left cercus. All scale lines represent 1 mm; that under Fig. 237 also applies to 242; that under Fig. 243 also applies to 236; that under Fig. 238 also applies to 232-234, 239 and 241; that under Fig. 240 also applies to 235.



Figures 244-255

Heteracris species (males). 244-248. *H. drakensbergensis* sp.n. 244, epiphallus, ventral aspect; 245, same, posterior aspect; 246, dorsal aspect of lophal interspace margin; 247, left cercus; 248, outer lateral aspect left hind femur. 249-255. *H. zulu* sp.n. 249, epiphallus, ventral aspect; 250, same posterior aspect; 251, dorsal aspect of lophal interspace margin; 252, posterior aspect of penis valves; 253, posterior aspect of subgenital plate; 254, right cercus; 255, outer lateral aspect left hind femur. All scale lines represent 1 mm; that under Fig. 247 also applies to 253-254; that under Fig. 255 also applies to 248; that under Fig. 251 also applies to 246 and 252; that under Fig. 245 also applies to 244, 249-250.

Table 17

Measurements (mm)

| | Males | | | | Females | |
|-------------------|-------|-------|-------------|-------|---------|--------------|
| | n | Mean | Range | SD | n | |
| Interocular dist. | 9 | 1.24 | 1.10-1.37 | 0.090 | 2 | 1.84, 2.02 |
| Head width | 9 | 4.59 | 4.43-4.79 | 0.15 | 2 | 5.17, 5.16 |
| Pronotal width | 9 | 4.94 | 4.75-5.17 | 0.13 | 2 | 7.81, 8.48 |
| Pronotal length | 9 | 5.22 | 4.70-5.69 | 0.29 | 2 | 8.14, 8.39 |
| Hind femur depth | 9 | 3.97 | 3.75-4.16 | 0.18 | 2 | 5.54, 6.11 |
| Hind femur length | 9 | 17.49 | 16.16-18.60 | 0.82 | 2 | 24.97, 25.92 |
| Tegminal length | 9 | 19.51 | 17.94-20.51 | 1.24 | 2 | 25.30, 27.79 |
| Antennal length | 2 | — | 11.55-11.64 | — | — | — |
| Total length | 9 | 30.50 | 28.66-31.90 | 1.29 | 2 | 41.10, 45.24 |

TYPE MATERIAL EXAMINED

Holotype male, **Rep. of South Africa**: Natal, Drakensberg, Van Reenen, xii.1926 (Turner)(BMNH). Paratypes, **Rep. of South Africa**: 2 males, Natal, Giant's Castle, Drakensberg, 1965 (Widdecomb)(NRI); 2 males, Natal, Giant's Castle Nat. Res., Drakensberg, 1800 m, 8-9.iii.1967 (Gillissen and Blommers) (ZMA); 1 male, Orange Free State, Clarens, 16 km E. Villaga, 12.i.1956 (Brown)(NCIP); 3 males, 1 female, S. Johannesburg, 2.iv.1935 (Ramsey)(BMNH); 1 male, Sunday's River, nr. Addo, 21.iii.1954 (Balfour-Browne)(BMNH); 1 male, Kliprieversberg, S. of Johannesburg, 3.v.1938 (Burt)(BMNH); 1 male, Natal Nat.Park, 7-11.iv.1951 (Brinck & Rudebeck)(BMNH); 2 males, Natal Nat. Park, iii.1932 (Mackie)(BMNH); 1 male, Witzieshoek, 22.ii.1929 (Scott)(BMNH)

Heteracris speciosa (Sjöstedt)

(Figs. 238-243, Map 3)

Eupreopcnemis speciosa Sjöstedt, 1913:23. Lectotype male, REP. OF SOUTH AFRICA (NR, here designated [examined]).

Heteracris speciosa (Sjöstedt) Uvarov, 1921:133.

Heteracris acuminata Uvarov, 1921:134. Holotype male, REP. OF SOUTH AFRICA (BMNH) [examined]. **Syn.n.**

DIAGNOSIS. Male. Ventral surface of epiphallus similar to *herbacea* but with proportionately shorter lophi (Fig. 238); no obvious tubercle present when viewed edge on (Fig. 239), dorsal lip of lophal interspace sharply folded distally (Fig. 240). Cercus expanded medially, tapering distally to form acutely pointed, finger-shaped apex (Fig.243), reminiscent of that seen in *drakensbergensis* sp.n. General coloration, femoral and tibial markings similar to *drakensbergensis* sp.n.

Table 18

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|-------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 9 | 1.19 | 1.10-1.34 | 0.080 | 6 | 1.91 | 1.80-1.97 | 0.060 |
| Head width | 9 | 4.91 | 4.70-5.38 | 0.22 | 6 | 6.15 | 6.06-6.27 | 0.080 |
| Pronotal width | 9 | 5.24 | 4.89-5.76 | 0.28 | 6 | 7.77 | 7.63-7.98 | 0.18 |
| Pronotal length | 9 | 5.37 | 5.10-5.97 | 0.33 | 6 | 8.16 | 7.90-8.49 | 0.32 |
| Hind femur depth | 8 | 4.35 | 4.02-4.78 | 0.28 | 6 | 5.67 | 5.55-5.77 | 0.098 |
| Hind femur length | 8 | 18.54 | 17.51-20.53 | 1.17 | 6 | 25.95 | 25.48-26.08 | 0.31 |
| Tegminal length | 8 | 18.78 | 17.17-22.41 | 2.11 | 6 | 23.88 | 21.42-26.00 | 1.95 |
| Antennal length | — | — | — | — | 2 | — | 12.71-13.07 | — |
| Total length | 8 | 32.23 | 29.61-35.72 | 2.17 | 6 | 43.33 | 42.06-45.16 | 1.20 |

COMMENTS. The internal male genitalia of the type of *acuminata* are identical to those of *speciosa*. Uvarov (1921) has stated that all morphological characters and coloration of *acuminata* were like those of *speciosa*, except for the cerci which were prolonged into very acute long spines. It appears that Uvarov may have used the new species *drakensbergensis* in his comparisons, mistaking it for *speciosa*.

TYPE MATERIAL EXAMINED

Eupreopcnemis speciosa, Sjöstedt, lectotype male, **Rep. of South Africa**: Natal, Appelsbosch (*Ljungqvist*) (NR). Paralectotype female, same data as holotype. *Heteracris acuminata*, male holotype, **Rep. of South Africa**: Eureka, Barberton, no date (Randell) (BMNH). Paratypes, 1 male, Natal, iii.1867, (labelled by Walker as *H. herbacea* Serv.) (BMNH); 1 female, Johannesburg, no date (BMNH).

ADDITIONAL MATERIAL EXAMINED

Rep. of South Africa: 1 male, Nalshoogtep, W. of Barberton, 24.iv.1963 (*Furst*)(NCIP); 2 males, 7 km NE. of Kaapsehoop, E.Tvl, 25.iv.1963 (*Furst*)(NCIP); 1 male, 14 km NW.of Bedford, E. Tvl, 12.iv.1967 (*Brown*)(NCIP); 1 male, 3 females, Natal, Weenen, iii.1925 (*Thomasset*)(BMNH); 1 male, Natal, L. St. Lucia, Banghazi Pan, 10.ii.1967 (*Gillissen & Blommers*)(ZMA); 1 male, Natal, Hluhluwe Game Res., 27-28.ii.1967 (*Gillissen & Blommers*)(ZMA).
Swaziland: 2 males, 1 female, Mbabane, Highveld, 8.iv.1979 (*Schulten*)(ZMA); 1 male, Usutu Forest, Highveld, 13.iv.1979 (*Schulten*)(ZMA).

Heteracris zulu sp.n. (Figs. 249-254, Map 4)

DIAGNOSIS. Male. Aedeagus (Fig. 252) comparatively larger than that of *herbacea*; epiphallus, ventral surface (Fig, 249), outer edges of lophi excurved, posterior edge slightly up-curved, base of epiphallic bridge extended anteriorly; dorsal surface of lophal interspace with tubercles (Fig. 251). Cercus strongly expanded medially, forming sub-triangular apical process (Fig. 254). Apex of subgenital plate somewhat square-shaped with two small tubercles (Fig. 253). Tegmen unicolorous brown with pale green stripe in precostal and anal areas; otherwise general coloration and femoral markings like those of *speciosa* (see Fig. 242 for *speciosa*).

Table 19

Measurements (mm)

| | holotype male | paratype female |
|-------------------|---------------|-----------------|
| Interocular dist. | 1.07 | 1.52 |
| Head width | 5.55 | 6.39 |
| Pronotal width | 5.78 | 7.87 |
| Pronotal length | 5.90 | 7.92 |
| Hind femur depth | 4.35 | 5.60 |
| Hind femur length | 18.61 | 24.11 |
| Tegminal length | 20.65 | 27.49 |
| Antennal length | 14.17 | — |
| Total length | 32.78 | 42.63 |

COMMENTS. The shape of the cercus and coloration of the tegmen readily distinguish this species from all other members of the group. This species is only known from a single male and female specimen collected around Durban.

TYPE MATERIAL EXAMINED

Holotype male, **Rep. of South Africa:** Umhlanga Rocks, 14.ii.1960 (*Dickson*) (BMNH). Paratype female, **Rep. of South Africa:** Durban. 1-6.iii.1960 (*Van Someren*) (BMNH).

***H. pulchripes* species-group**

DIAGNOSIS. Male. Aedeagus small, (Fig. 256), cingular valves longer than apical penis valves (Fig. 255); apical penis valves slender, weakly sclerotized fairly uniform, indistinguishable between species. Epiphallus lightly sclerotized with lobate lophi, lophal interspace with proximal process; posterior margin sinuate with slightly attenuate inner corners (see arrow Fig. 308). Fastigium verticis without median carinula. Inner surface of posterior femur (with exception of *aethiopica*) always with upper proximal spot. With exception of *attenuata*, apex of subgenital plate broadly rounded.

General coloration black-olivaceous or brown with yellow markings typical for genus. Tegmina with or without boldly marked spot or band pattern.

COMMENTS. The majority of species in this group were regarded by Uvarov (1921) as being sub-species of *pulchripes*. It is still not clear whether this is the case, but lack of intermediate forms suggests that this group consists of a natural grouping of very closely related, predominantly forest dwelling species, all with very similar genitalic structures. The affinity between *aethiopica* and the new species *trimaculata* appears to endorse this view.

***Heteracris attenuata* (Uvarov)**

(Figs. 255-269, Map 5)

Thisoicetrus attenuatus Uvarov, 1921. Holotype male, ZIMBABWE (BMNH) [examined].

Thisoicetrus caudatus Ramme, 1929:474. Holotype male, TANZANIA (MNHU) [examined]. Syn. by Ramme, 1931:942.

Thisoicetrus similis Ramme, 1929. (Homonym of *T. similis* Brunner, 1861). Holotype male, ZAIRE (MNHU) [examined]. Syn. by Dirsh, 1970:209.

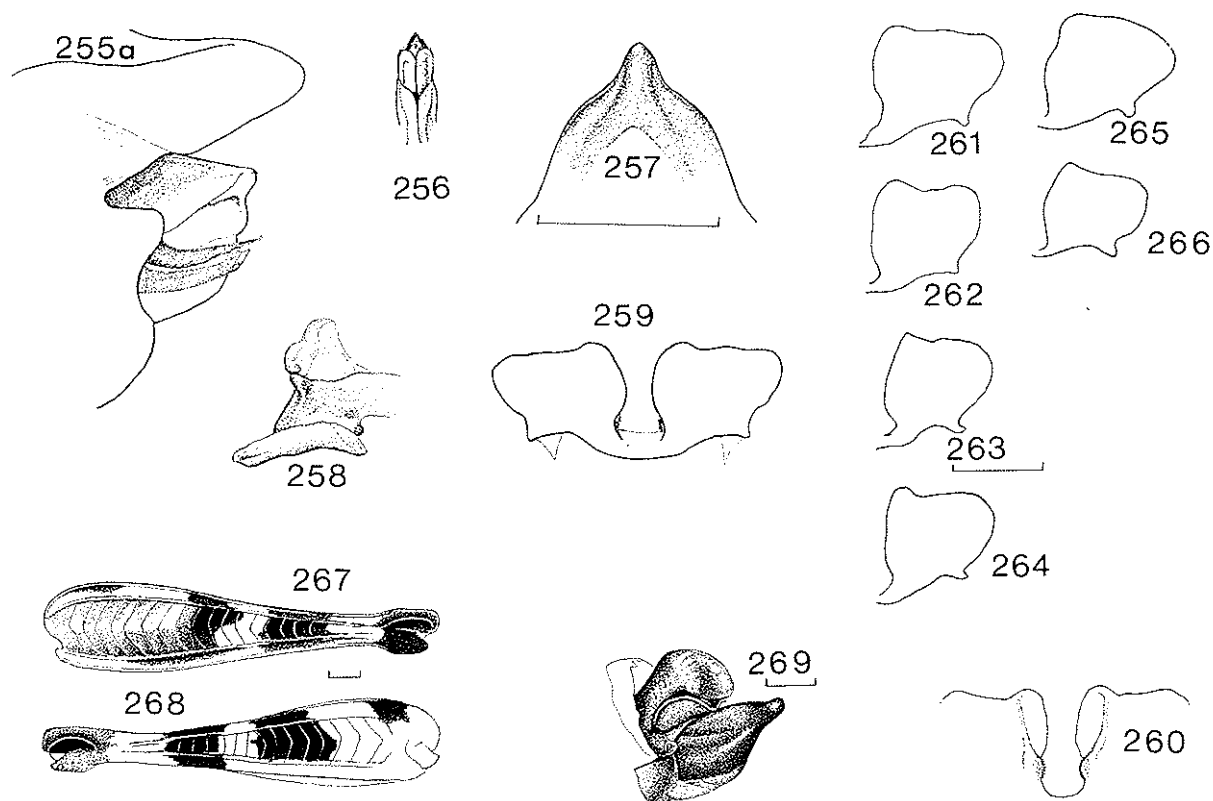
Thisoicetrus oxyurus Ramme. (Replacement name for *T. similis* Brunner, 1861 by Uvarov, 1939:382).

Heteracris attenuatus (Uvarov) Dirsh, 1958:53.

DIAGNOSIS. Male. Epiphallus, ventral aspect (Fig. 259), with broadly rounded, sub-rectangulate, lobate lophi (see Figs. 261-266 for variation), overlapping in shape and size with those of *pulchripes*; proximal process reduced in size, lophal interspace margins bevelled (Figs. 258, 260). Aedeagus as in Fig. 256. Dorsal ectophallic plate (Fig. 257) roundly triangulate in shape, posterior margin forming slightly inflated, attenuate apex (Fig. 255). Apical process of cercus strongly downcurved, enlarged, much wider than basal stem (Fig. 269). Subgenital plate with elongate, finger-shaped apex (Fig. 269). Posterior femur, outer surface yellow, at base green with median and distal black transverse band, continuing onto inner surface; median band sometimes reaching to lower carina, median band fusing with basal green ventrad (Fig. 267). Inner surface yellow with strongly marked, black upper proximal, median and distal spots (Fig. 268). Outer lateral surface of posterior tibiae with following band sequence black, yellow, black, remainder bright red to scarlet or purple. Tegmina shortened, usually only reaching to supra-anal plate, cells hyaline bordered by darker veins, without boldly expressed dark brown-black spots or bands. Hind wings yellow at base.

COMMENTS. Shows some intraspecific variation in the shape of the epiphallic lophi, elongation of the subgenital plate process (ranging from slightly to greatly elongated) and coloration of the hind tibiae. A single male specimen from the Mkwadzi Forest, Malawi had purple tibiae with tegmina reaching to the tips of the folded hind femur.

This species appears to be most closely related to *pulchripes*, differing only in having shortened wings (apart from exception above) and in the attenuate form of the subgenital plate.



Figures 255a-269

Heteracris attenuata (male). 255a, lateral aspect of genitalia; 256, posterior aspect of aedeagus; 257, dorsal ectophallic plate; 258, epiphallus, posterior aspect; 259, same, ventral aspect; 260, same, lophal interspace margin; 261-266, epiphallus, ventral aspect, right side, showing variation, 261, Tanzania, 262, Malawi, Nkata Bay; 263, Zaire; 264, Malawi, Lilongwe; 265, Zambia Nyika; 266, Zambia, Mbala; 267, left hind femur, outer aspect; 268, same, inner aspect; 269, lateral aspect of abdominal tip. All scale lines represent 1 mm; that under Fig. 257 also applies to 255-256; that under Fig. 267 also applies to 268; that under Fig. 263 also applies to 258-259, 260-262, 264-266; that under Fig. 269 applies to that figure only.

Table 20

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 11 | 0.95 | 0.83-1.07 | 0.080 | 5 | 1.45 | 1.27-1.62 | 0.14 |
| Head width | 11 | 4.54 | 4.15-5.04 | 0.23 | 5 | 5.68 | 5.55-5.85 | 0.13 |
| Pronotal width | 11 | 4.40 | 3.94-4.74 | 0.25 | 5 | 7.12 | 6.76-7.55 | 0.29 |
| Pronotal length | 11 | 4.60 | 4.14-5.06 | 0.26 | 5 | 7.14 | 6.71-7.54 | 0.30 |
| Hind femur depth | 11 | 3.38 | 3.12-3.90 | 0.22 | 5 | 4.72 | 4.57-4.89 | 0.15 |
| Hind femur length | 11 | 15.26 | 14.44-16.68 | 0.88 | 5 | 22.74 | 21.80-23.06 | 0.56 |
| Tegminal length | 10 | 14.60 | 12.80-20.49 | 2.18 | 5 | 19.45 | 18.40-20.52 | 0.86 |
| Antennal length | 5 | 10.73 | 10.32-11.22 | 0.33 | 2 | - | 13.05-14.72 | - |
| Total length | 11 | 27.16 | 25.10-30.69 | 1.78 | 5 | 38.16 | 36.74-39.14 | 1.01 |

TYPE MATERIAL EXAMINED

Thisoicetrus attenuatus Uvarov, holotype male, **Tanzania**: Fwambo, no other data, (BMNH). *Thisoicetrus caudatus* Ramme, holotype male, **Tanzania**: Manow, no other data (MNHU). *Thisoicetrus similis* Ramme, holotype male, **Zaire**: Lubumbashi, (T.3097) i.1930 (*Seydel*) (MNHU).

ADDITIONAL MATERIAL EXAMINED

Zaire: 1 male, Lubumbashi, no date (*Bouvy*)(NRI). **Tanzania**: 1 male, Ufipa Plateau, summit, Mibisi For. Res., 25.v.1966 (*Jago*)(NRI); 39 males, 8 females, Tukuyu, i.1924 (*Miller*)(BMNH). **Zambia**: 2 males, 1 female, Mbala-Kalambo Falls rd., Sizi For. Res., (*Jago*)(NRI); 2 males, Mbala, L. Chila, 9.i.1952 (*Backlund*)(BMNH); 1 male, Nyika, Chewo For., 20.iii.1967 (*Whellan*)(NRI); 1 male, 1 female, East Loangwa, Petanke, 4.i.1905 (*Neave*)(BMNH). **Malawi**: 1 female, Ncheu, Balaka Rd., i.1911 (*Old*)(BMNH); 1 male, Lilongwe, 14.2.1935 (*Smee*)(BMNH); 1 male, Mkwadzi For., Nkata Bay, 21.iii.1967 (no coll.)(BMNH).

Heteracris aethiopica (Ramme) comb.n.

(Figs. 270-275, Map 5)

Parathisoicetrus aethiopicus Ramme, 1929:476. Holotype male, E. AFRICA (MNHU).

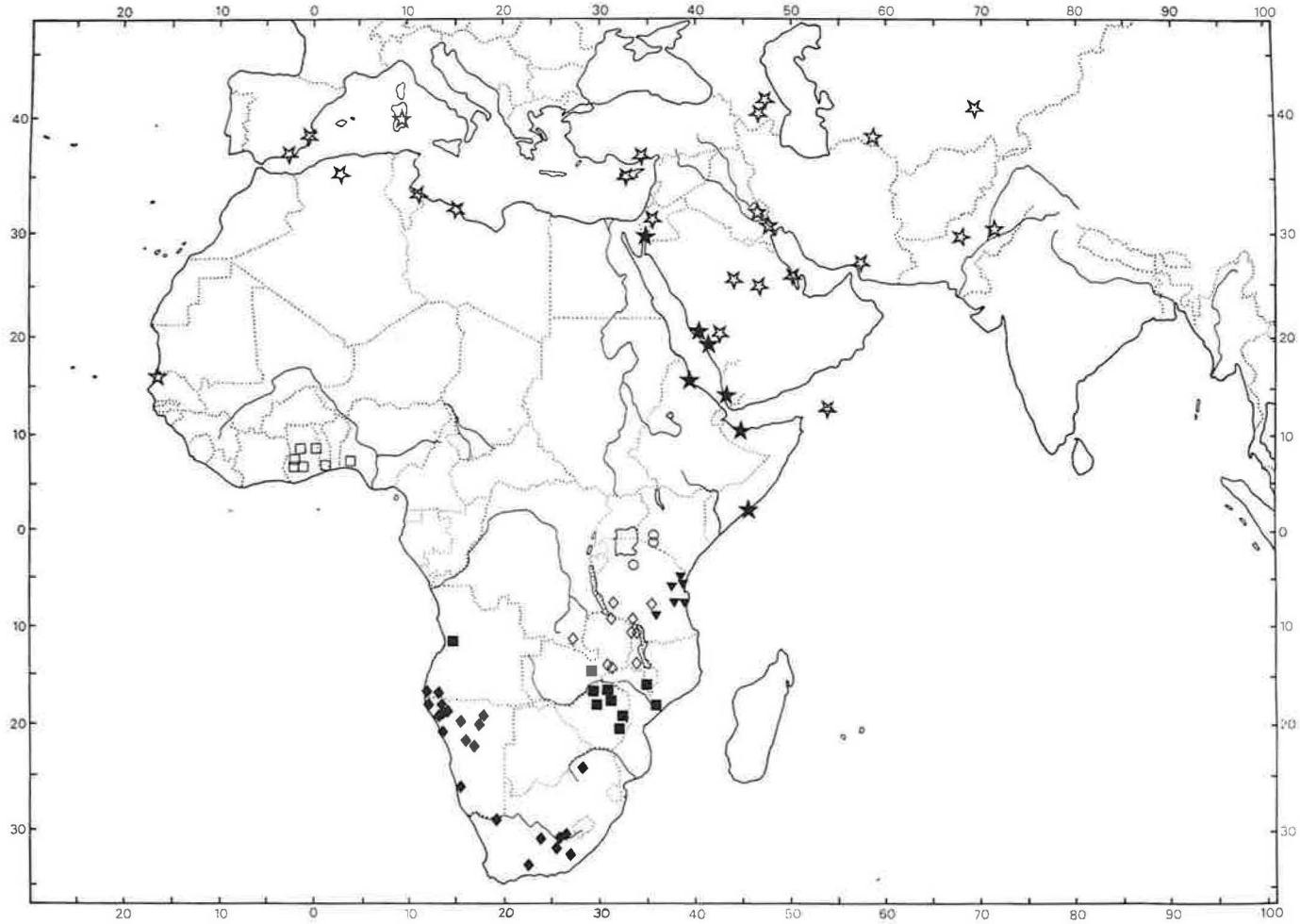
DIAGNOSIS. Male. Brachypterous species with tegmina and wings about as long as pronotum, just surpassing typanum (Fig. 275), touching dorsally. Cingular valves very slender with acute apices, surpassing tips of apical penis valves (Figs.270-271). Ventral aspect of epiphallus as in Fig. 273; very similar in shape to *prasinata* but somewhat smaller, proximal process larger than in *attenuata*. Dorsal ectophallic plate (Fig. 272) with obtuse, angulate, posterior margin, forming small, median bulbous apex. Apical process of cercus (Fig. 274) slightly wider and shorter than proximal stem. Lateral surface of head black with small yellow post-ocular spot (Fig. 275). Posterior femur with yellow-green suffusion, black femoral markings absent.

Table 21

Measurements (mm)

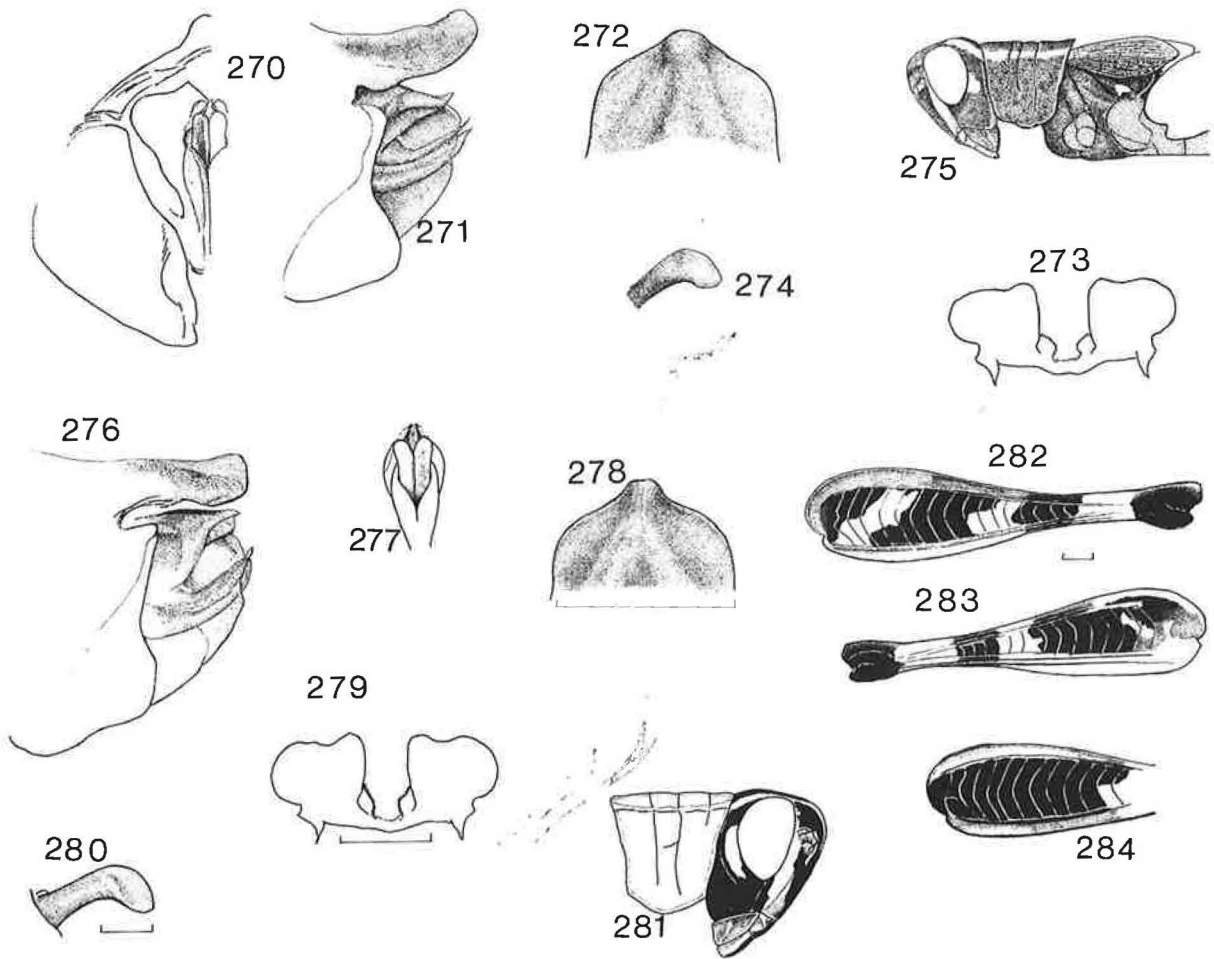
| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 8 | 0.88 | 0.79-0.97 | 0.069 | 5 | 1.57 | 1.44-1.68 | 0.10 |
| Head width | 8 | 4.11 | 3.64-4.36 | 0.27 | 5 | 5.47 | 5.09-5.72 | 0.25 |
| Pronotal width | 8 | 4.05 | 3.47-4.39 | 0.34 | 5 | 7.04 | 6.67-7.42 | 0.36 |
| Pronotal length | 8 | 3.96 | 3.63-4.29 | 0.21 | 5 | 6.27 | 5.84-6.61 | 0.39 |
| Hind femur depth | 8 | 3.29 | 3.05-3.56 | 0.17 | 5 | 4.70 | 4.31-4.96 | 0.25 |
| Hind femur length | 8 | 12.74 | 11.42-13.55 | 0.76 | 5 | 20.01 | 18.16-21.31 | 1.17 |
| Tegminal length | 8 | 4.39 | 4.19-4.65 | 0.15 | 5 | 6.83 | 6.04-7.69 | 0.65 |
| Antennal length | 6 | 10.10 | 9.00-10.79 | 0.59 | 5 | 11.54 | 10.59-13.72 | 1.14 |
| Total length | 8 | 23.14 | 21.27-25.29 | 1.32 | 5 | 35.50 | 32.79-37.70 | 1.87 |

COMMENTS. Ramme (1929) erected the monotypic genus *Parathisoicetrus* for his East African species *aethiopicus*. However, the internal male genitalia of this species are remarkably similar to those of the *pulchripes* species-group. The synonymy and inclusion of this small brachypterous species in this group is based upon the following criteria: aedeagal valves small, slender; cingular valves longer than apical penis valves; posterior margin of epiphallus sinuate with slightly attenuated inner corners; similarity in female spermathecal structure; similarity in general coloration.



Map 5

Distribution of *Heteracris* species. Open stars, *H. adspersa*; solid stars, *H. rantae*; solid diamonds, *H. prasinata*; open diamond, *H. attenuata*; open squares *H. jeanneli*; solid squares, *H. pulchripes*; open circle, *H. aethiopica* comb.n.; triangles, *H. coerulipes*.



Figures 270-284

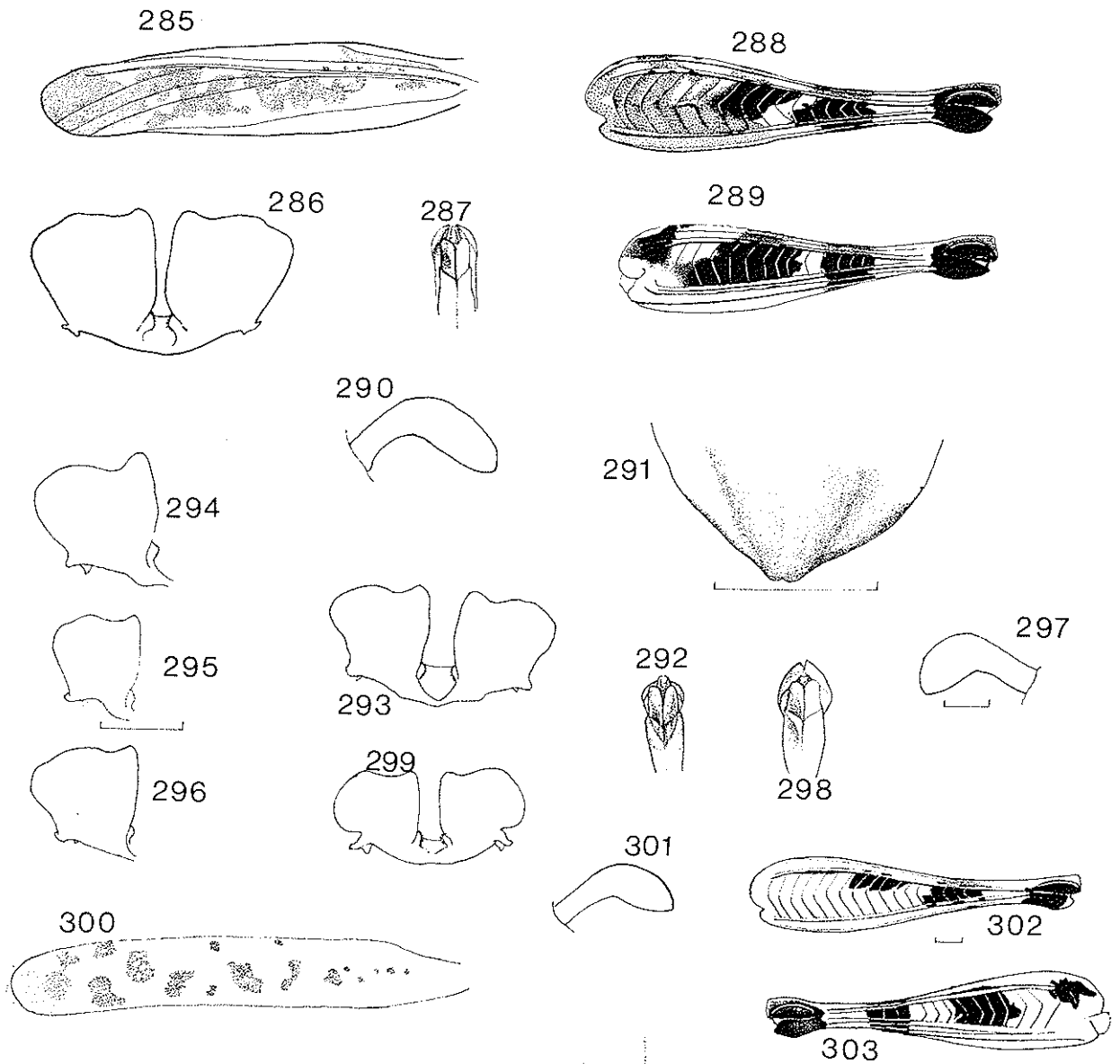
Heteracris species (males). 270-275. *H. aethiopica* comb.n. 270, posterior aspect of aedeagus; 271, lateral aspect of genitalia; 272, dorsal ectophallic plate; 273, ventral aspect of epiphallus; 274, left cercus; 275, lateral aspect of head. 276-284. *H. trimaculata* sp.n. 276, lateral aspect of genitalia; 277, posterior aspect of aedeagus; 278, dorsal ectophallic plate; 279, ventral aspect of epiphallus; 280, left cercus; 281, lateral aspect of head; 282, left hind femur, outer aspect; 283, same, inner aspect; 284, same, outer aspect showing variation. All scale lines represent 1 mm; that under Fig. 278 also applies to 270-272, 276-277; that under Fig.280 also applies to 274; that under Fig. 279 also applies to 273; that under Fig.282 also applies to 275, 281 and 283-284.

The internal male genitalia of this species are indistinguishable from the otherwise morphologically dissimilar and allopatric new species *trimaculata*. It is difficult to explain their remarkable similarity in genitalic morphology other than assuming very recent evolutionary divergence.

Specimens collected from Serena lodge, Masai Mara, were generally smaller than specimens collected around Shinyanga.

MATERIAL EXAMINED

Kenya: 1 male, Masai Mara Res., around Serena Lodge, v.1984 (*Ritchie*)(NMK); 2 males, Masai Mara, 104 km W. of Narok, 7.v.1962 (*Glover*)(BMNH). **Tanzania:** 8 males, 10 females, Old Shinyanga, 18-30.iii.1952 (*Burt*)(BMNH); 3 males, 3 females, Old Shinyanga, 4-5.iv.54 (*Burt*)(BMNH).



Figures 285-303

Heteracris species (males). 285-290. *H. coeruleipennis*. 285, left tegmen; 286, ventral aspect of epiphallus; 287, posterior aspect of penis valves; 288, left hind femur, outer aspect; 289, same, inner aspect; 290, left cercus. 291-297. *H. pulchripes*. 291, dorsal ectophallic plate; 292, posterior aspect of penis valves; 293, epiphallus, ventral aspect; 294, same, same, showing variation, Zimbabwe, Luano Valley; 295, same, Malawi; 296, same, Zimbabwe, Harare; 297, left cercus. 298-303. *H. prasinata*. 298, posterior aspect of penis valves; 299, ventral aspect of epiphallus; 300, left tegmen; 301, left cercus; 302, left hind femur, outer aspect; 303, same, inner aspect. All scale lines represent 1 mm; that under Fig. 291 also applies to 287, 292 and 298; that under Fig. 297 also applies to 290 and 301; that under Fig. 302 also applies to 285, 300 and 303; that under Fig. 295 also applies to 286, 294, 296, 293 and 299.

Heteracris coeruleipennis (Uvarov) sp. rev. et stat.n.
(Figs. 285-290, Map 6)

Thisoicetrus pulchripes ab. *coeruleipennis* Uvarov, 1921:125. Holotype male, REP. OF SOUTH AFRICA (BMNH) [examined]. (Syn. under *jeanneli* by Dirsh, 1970:208).

DIAGNOSIS. Male. Aedeagus as in Fig. 290. Epiphallus with large, lobate lophi; inner edges of lophi straight, outer edges convex, posterior edge sinuate (Fig. 286). Dorsal ectophallic plate similar to that of *jeanneli*. Tegminal cells entirely infuscate brown (with exception of leading and trailing edges) or hyaline with weakly expressed large, fused, infuscate blotches (Fig. 285). Hind wings at base red, blue or colourless in immature forms. Apical process of cercus wider than basal stem, as long as, or longer than, basal stem (Fig. 290).

Externomedian area hind femur yellow, at base dark green (replacing black proximal spot), with boldy marked black median, distal spots; median spot always fusing with basal green ventrad (Fig. 288); inner surface with inner upper proximal, median and distal black spots (Fig. 289). Hind tibiae below knee with successive small black, yellow, black bands, remainder scarlet-violet or purple-blue.

Table 22

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 12 | 1.00 | 0.91-1.10 | 0.058 | 6 | 1.44 | 1.30-1.65 | 0.13 |
| Head width | 12 | 5.17 | 4.95-5.57 | 0.23 | 6 | 6.24 | 5.98-6.64 | 0.23 |
| Pronotal width | 12 | 5.22 | 4.83-5.64 | 0.29 | 6 | 8.00 | 7.47-8.43 | 0.41 |
| Pronotal length | 12 | 5.44 | 5.00-5.84 | 0.27 | 6 | 7.68 | 7.34-8.05 | 0.30 |
| Hind femur depth | 12 | 4.09 | 3.89-4.26 | 0.15 | 6 | 5.68 | 5.25-6.29 | 0.36 |
| Hind femur length | 12 | 17.17 | 15.77-19.44 | 1.18 | 6 | 24.02 | 22.50-26.05 | 1.40 |
| Tegminal length | 10 | 19.34 | 18.34-21.10 | 1.40 | 6 | 26.99 | 25.12-29.06 | 1.33 |
| Antennal length | 8 | 13.25 | 12.10-14.96 | 0.34 | 4 | 14.81 | 14.42-15.17 | 0.34 |
| Total length | 12 | 30.56 | 28.46-33.48 | 1.98 | 6 | 41.95 | 40.00-44.55 | 1.98 |

COMMENTS. This species appears to be most closely allied to *pulchripes*, with which it shares similar coloration, but differs principally in having a proportionately larger epiphallus and more contrasting hind femoral markings.

TYPE MATERIAL EXAMINED

Holotype male, **Rep. of South Africa:** Barberton, no other data (named by Kirby, as *Euprepocnemis pulchripes*), (BMNH).

ADDITIONAL MATERIAL EXAMINED

Mozambique: 2 males, Namaacha, 1.v.1980 (*Schulten*)(ZMA); 2 males, Goba, 13.iv.1980 (*Schulten*)(ZMA). **Rep. of South Africa:** 5 males, Natal, L.Sibayi, 15-18.i.1967 (*Gillissen*)(ZMA); 8 males, 3 females, Natal, Hluhluwe Game Resv., 27-28.ii.1967 (*Gillissen & Blommers*)(ZMA); 2 males, 1 female, Ndumu Game Resv., 20-24.ii.1967 (*Gillissen & Blommers*)(ZMA); 2 males, Blyde Riv. Canyon, Mariepskop, E. Tvl, 11.vi.1967 (*Snyman*)(NCIP); 1 male, 16 km SW. of Ofoolaco, E. Tvl, 14.iv.1967 (*Brown*)(NCIP); 3 males, 1 female, Natal, Cape Vidal, Lucia, ii.1971 (*Brown*)(NCIP); 1 male, 2 females, Natal, L. St. Lucia, False Bay, 13-17.ii.1967 (*Gillissen & Blommers*)(ZMA); Swaziland: 5 males, 7 females, Malkens Res. Statn., Middleveld, 1.v.1979 (*Schulten*)(ZMA).

Heteracris coerulipes (Sjöstedt) stat. n.

(Figs. 309-314, 5)

Euprepocnemis coerulipes Sjöstedt, 1909:189. Holotype male, TANZANIA (NR) [examined].

Thisoicetrus pulchripes coerulipes (Sjöstedt). (Syn. under *pulchripes* by Uvarov, 1921:125).

Thisoicetrus usambaricus I. Bolivar, 1914:27. Holotype female, TANZANIA (IEE) [examined]. Syn. by Dirsh, 1958:53.

Heteracris pulchripes coerulipes (Sjöstedt) Dirsh, 1958:54.

DIAGNOSIS. Male. Aedeagus as in Fig. 309. Ventral surface of epiphallus (Fig. 308) very similar in shape to that of *pulchripes*, proximal process of lophal interspace more prominent than those in *attenuata*. Dorsal ectophallic plate (Fig. 313), apex slightly more narrow than in *jeanneli*. Cercus as in Fig. 312. Tegminal cells, uniformly infusate brown, bordered by darkened veins, without distinctive spot or band formations, sometimes tinged by underlying hind wing colour. Hind wings orange or blue or rarely colourless, apical cells bordered by darkened veins. Hind femur yellow with boldly contrasting black, oblique, transverse proximal, median and distal bands, continuing onto inner surface (Fig. 314). Outer lateral surface of posterior tibiae with following band sequence black, yellow, black (coinciding with femoral yellow/black pattern), remainder blue-green often with small median white spot on spined surface.

Table 23

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 13 | 1.10 | 0.91-1.21 | 0.081 | 10 | 1.67 | 1.33-1.89 | 0.17 |
| Head width | 13 | 5.52 | 5.10-5.87 | 0.25 | 10 | 6.74 | 6.10-7.08 | 0.36 |
| Pronotal width | 13 | 5.31 | 4.89-5.79 | 0.24 | 10 | 9.20 | 7.40-10.89 | 1.12 |
| Pronotal length | 13 | 5.60 | 5.02-6.14 | 0.36 | 10 | 8.83 | 7.34-9.90 | 0.89 |
| Hind femur depth | 13 | 4.16 | 3.56-5.01 | 0.35 | 10 | 5.76 | 5.03-6.27 | 0.44 |
| Hind femur length | 13 | 18.00 | 15.81-19.87 | 1.01 | 10 | 26.60 | 23.71-29.01 | 1.92 |
| Tegminal length | 13 | 22.20 | 20.41-24.03 | 1.34 | 10 | 33.87 | 27.05-37.62 | 4.06 |
| Antennal length | 8 | 13.82 | 13.03-14.75 | 0.67 | 5 | 16.40 | 14.82-19.20 | 1.73 |
| Total length | 13 | 31.94 | 29.06-34.02 | 1.46 | 10 | 45.98 | 39.47-51.52 | 4.13 |

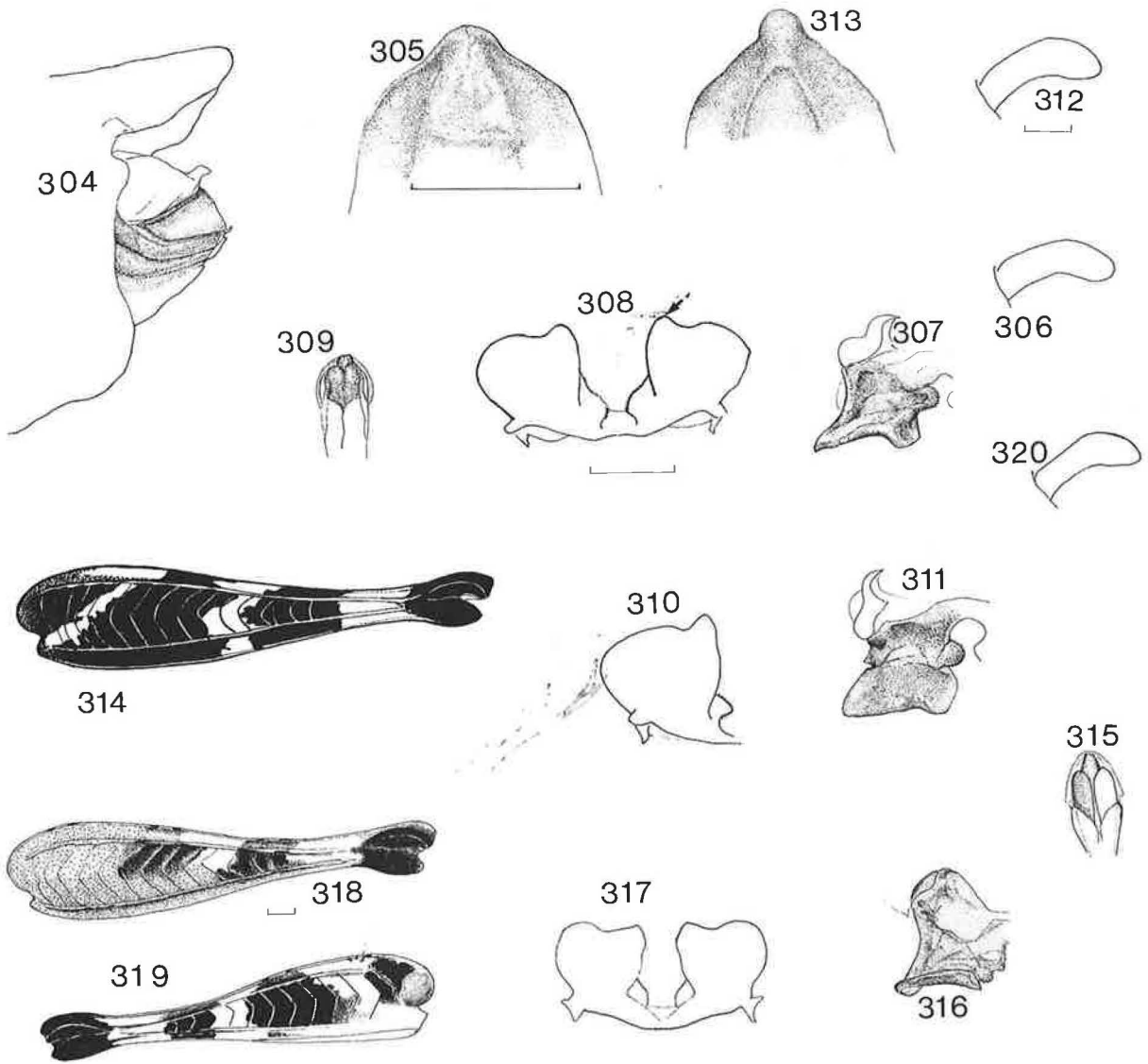
COMMENTS. See under *jeanneli*.

TYPE MATERIAL EXAMINED

Euprepocnemis coerulipes Sjöstedt, holotype male, **Tanzania**: Usambara, Mombo, no date, (*Sjöstedt*) (NR). *Thisoicetrus usambaricus*, Holotype female, **Tanzania**: Usambara, Bulwa, no date, (*Rolle*) (IEE).

ADDITIONAL MATERIAL EXAMINED

Tanzania: 1 male, 2 females, Pugu Hills, SW. of Dar es Salaam, 11.iii.1967 (*Jago*)(NRI); 2 males, Nguru Mts., montane forest abv. Turiani, 5-7.xi.1964 (*Jago*)(NRI); 2 males, 2 females, E. Usambara Mts., Sigi nr. Amani, 2-11.iv.1966 (*Jago*)(NRI); 3 males, Kizugu, Amani, 18.31.xii.1965 (*Jago*)(NRI); 1 male, E. Uluguru's, Kimboza For., Mkaguri, 30.x.1983 (*Jago*)(NMK); 1 female, E. Usambara Mts., Kwa m'koro For. Resv., 7.iv.1966 (*Jago*)(NRI); 1 male, 4.8 km E. of Amani, 15.v.1937 (*Burt*)(BMNH); 8 males, 2 females, Sigi, nr. Amani, 24.v.1937 (*Burt*)(BMNH); 1 female, Morogoro iii.1921 (*Miller*)(BMNH); 6 males, 4 females, Mlingano, Ngomeni, iv.1952 (*Phipps*)(BMNH); 2 males,



Figures 304-320

Heteracris species (males). 304-309. *H. jeanelli*. 304, lateral aspect of genitalia; 305, dorsal ectophallic plate; 306, left cercus; 307, epiphallus, posterior aspect; 308, same, ventral aspect, 309, posterior aspect of penis valves. 310-314. *H. coerulipes*. 310, epiphallus, ventral aspect, 311, posterior aspect; 312, left cercus; 313, dorsal ectophallic plate; 314, outer aspect of hind femur. 315-320. *H. guineensis*. 315, posterior aspect of penis valves; 316, epiphallus, posterior aspect; 317, same, ventral aspect; 318, left hind femur, outer aspect; 319, same, inner aspect; 320, left cercus. All scale lines represent 1 mm; that under Fig. 305 also applies to 304, 309, 313 and 315, that under Fig. 318 also applies to 314 and 319; that under Fig. 308 also applies to 307, 310-311, 316-317; that under Fig. 312 also applies to 306 and 320.

Pangani Distr., Kigombe estate, (*Phipps*)(BMNH); 1 male, Morogoro, xi.1939 (*Burt*)(BMNH); 6 males, 1 female, Sigi, nr. Amani, 28.x-20.xi.1937 (*Burt*)(BMNH), 2 males, Ukami, no date (*Miller*)(BMNH).

Heteracris guineensis (Krauss)

(Figs. 315-320, Map 6)

Euprepocnemis guineensis Krauss, 1890:659. Holotype male, GHANA (SMNS).

Euprepocnemis guineensis var. *maculosa* Krauss, 1890:660. Holotype female, SAO THOME IS. (SMNS) [examined].

Heteracris guineensis (Krauss) Dirsh, 1958:53.

Thisiocetrus pulchripes aurantiaca Uvarov, 1921:126. Holotype male. SIERRA LEONE (BMNH) [examined]. **Syn.n.**

DIAGNOSIS. Male. Internal genitalia very similar to *coerulipes*, differing mainly in having proportionately smaller epiphallus (compare Figs. 310 and 317), posterior margin of lophus when viewed edge-on almost flat (Fig. 316). Basal stem of cercus longer than apical process (Fig. 230). Tegminal markings variable, similar to those of *coeruleipennis*, tegminal tips with infuscate brown cells, remainder opaque with few or many fused infuscate brown cells forming spots or bands. Hind wings colourless, apical cells bordered by darkened veins. Posterior femur, outer surface, yellow-brown or with proximal light-green suffusion (never dark-green as in *coeruleipennis*), upper proximal spot absent, black-brown median spot present, sometimes weakly expressed, never reaching to lower carina, distal black-brown band present (Fig. 318). Inner surface yellow with upper proximal, median and distal black-brown spots (Fig. 319). Lateral, outer surface of posterior tibiae with following band sequence, black, yellow, black, remainder bright red.

Table 24

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 31 | 1.02 | 0.85-1.25 | 0.090 | 8 | 1.43 | 0.72-1.89 | 0.51 |
| Head width | 31 | 4.88 | 4.36-5.36 | 0.22 | 8 | 6.39 | 6.03-6.83 | 0.24 |
| Pronotal width | 31 | 4.78 | 4.18-5.28 | 0.33 | 8 | 8.06 | 7.45-8.74 | 0.47 |
| Pronotal length | 31 | 5.00 | 4.23-5.52 | 0.34 | 8 | 8.34 | 7.59-8.99 | 0.51 |
| Hind femur depth | 31 | 3.68 | 3.34-4.11 | 0.22 | 8 | 5.59 | 5.20-5.93 | 0.27 |
| Hind femur length | 31 | 16.45 | 14.73-18.16 | 0.90 | 8 | 26.85 | 25.79-27.84 | 0.98 |
| Tegminal length | 31 | 18.91 | 15.87-20.85 | 1.22 | 8 | 30.49 | 25.20-32.84 | 2.73 |
| Antennal length | 15 | 13.64 | 12.62-15.73 | 1.02 | 2 | — | 17.14-18.22 | — |
| Total length | 31 | 28.55 | 25.33-32.07 | 1.86 | 8 | 44.38 | 42.16-46.16 | 1.44 |

COMMENTS. Externally similar to *coeruleipennis*, but may be distinguished from that species by having a generally lighter body colour, red posterior tibiae, hindwings colourless at base and differences in the hind femur as mentioned in the key to species.

TYPE MATERIAL EXAMINED

Euprepocnemis guineensis var. *maculosa* Krauss, holotype female, **Sao Thomé Is.**, no other data, (SMNS). *Thisiocetrus pulchripes aurantiaca* Uvarov, holotype male, **Sierra Leone**: Kayima, 25.vi.1912 (*Simpson*) (BMNH); paratype female, Bendu, 14.viii.1912 (*Simpson*) (BMNH).

ADDITIONAL MATERIAL EXAMINED [all BMNH unless otherwise stated]

Sierra Leone: 1 female, Freetown, i.1956 (*Phipps*); 1 male, Kenena, Bojene Hill, ix.1958 (*Phipps*); 1 female, Freetown, Mt. Aureol Statn., i.1964 (*Todd*); 1 male, Gola, viii.1963 (*Phipps*); 1 male, Bendu, 14.viii.1912 (*Simpson*). **Ivory Coast**: 4 males, Adiopodoumé, forest, ORSTOM, 5.iv.1987 (*Fishpool*)(NRI). **Togo**: 1 male, Kpandu, 17.v.1958 (*Chapman*); **Benin**: 1 male, Abomey, xii.1977-1.1978 (*Popov*)(NRI). **Ghana**: 1 male, Kumasi, 21.v.1971

(*Bannerjee*)(NRI); 1 male, Kibi Hills, Pusa Pusa R., 20.iv.1963 (*Jago*)(NRI); 1 male, forest clearing near Bunru, 24.3.1969 (*Richards*)(NRI); 1 female, Akosombo, 23.iii.1969 (*Norris*)(NRI); 1 female, Techiman, cultivation in forest clearing, 1.iv.1969 (*Richards*)(NRI); 1 female, Shiare to Nkwanta, 3.2 km from Shiare, 20.v.1961 (*Jago*)(NRI); 1 female, W. slopes of Togo plat., abv. Ntumeda, 17.v.1960 (*Jago*)(NRI); 1 female, NE. of Kete-Krachi, 3 km Chiare to Chiringa path, 21.v.1960 (*Jago*); 1 male, Bobiri For. Res., nr. Kubease, 35.2 km Kumasi-Accra rd., 29.vii.1957 (*Jago*); 1 male, Ojubi, Winneba, (*Chapman*); 2 males, Shai Hills, 23.iv.1958 (*Chapman*); 1 male, Elmina, 16.v.1959 (*Chapman*); 1 male, 4 females, Mpraeso, forest clearing, 5.ii.1958 (*Chapman*); 1 male, Dawhwe R., 7.xi.1958 (*Chapman*); 1 male, Amontul, 2.x.1958 (*Chapman*); 1 male, Swedru, 2.x.1958 (*Chapman*); 1 male, Kintampo, 17.iv.1959 (*Chapman*); 1 male, Otekro, 1.iv.1958 (*Chapman*); 1 male, btwn. Akwatia & Pusa Pusa R., 21.vi.1961 (*Jago*); 1 male, Kibi Hills, Pusa Pusa R., 20.iv.1963 (*Jago*); 1 female, Bobiri For. Res., Kumasi, ix.1958 (*Taylor*); 1 male, Nyinahin, Aya Hills & For. Res., 9.vii.1962 (*Jago*); 1 male, Dadieso, Dadieso-Enchi rd., 27.ix.1962 (*Jago*); 1 male, Prince's Town, 2.xii.1961 (*Jago*). **Nigeria:** 2 males, 3 females, Ogun R., 12.ii.1966 (*Phipps*). **Cameroon:** 1 male, 1 female, Bitye, Ja R., iv.1909 (no coll); 1 male, 2 females, Yaounde, Nkolobisson, 1975 (*Jago*)(ODNRI); 1 male, Yaounde, 20.xii.1973 (*Popov*)(NRI). **Zaire:** 1 male, Semliki Valley, Geti Falls, x.1935 (*Johnston*); 1 male, 2 females, Lake Edward, mouth of R. Semliki, vii.1935 (*Bredo*); 2 females, Bambesa, vii.1934 (*Bredo*); 3 females, Semliki Valley, Atibi Falls, x.1935 (*Johnston*); 3 females, Uele Distr., Bambessa, x.1937 (*Darling*); 1 male, Kawa, L. Albert, 23.viii.1935 (*Johnston*). **Uganda:** 4 males, 2 females, Entebbe, vi.1912, 1 male, 12-14.x.1914, 3 males, 1 female, 20.viii.1911, 1 male, 13.iii.1913, 1 female, 17.iv.1918 (*Gowdey*); 1 male, Entebbe, Mityana, 31.vii.1913, 1 female, 18.vi.1913, 14-25.v.1912, 1 female, 18.viii.1911 (*Gowdey*); 3 females, 1 male, Bunyoro, Budongo For., 5.vi.1935 (*Johnston*); 1 female, Budongo For., Masindi, xi.1931 (*Hill*); 11 males, 9 females, Mabira For., iv.1934 (*Johnston*); 1 male, 3.vii.1913 (*Gowdey*); 1 male, 4 females, Kampala, iv.1934, 1 male, v.1933, 1 female, iii.1933, 1 female, 11.iv.1933 (*Johnston*); 7 males, 2 females, Bugoma For., 21.vi.1933 (*Johnston*); 1 male, Namanve, forest, 17.ix.1933 (*Johnston*); 1 male, Entebbe, 28.vii.1933 (*Johnston*); 3 males, Budongo For., Masindi xi.1931 (*Johnston*); 1 female, Mabira For., Chagwe, 17-20.vii.1911 (*Gowdey*); 2 females, Banda Chagwe, 28- (29, iii.1913 (*Gowdey*); 1 female, Bukoba, 9-11.vi.1912 (*Gowdey*); 1 female, Tororo, Sukulu, 29.i.1960 (*Burtt*); 1 male, Kampala, 3-20.iv.1918 (*Gowdey*); 1 female, Katunguru, 5.xi.1934 (*Burton*); 2 males, Bwamba, 2.viii.1946, 2 males, 15.iv.1944 (*Van Someren*); 8 males, 1 female, Toro, Bwamba For. Res., 27.v.1967 (*Jago*)(NRI); 2 males, W. Bugwe For., Tororo, 17.vii.1970 (*Brown*)(NRI); 1 male, Kampala, 23.vi.1932 (*Hopkins*)(NMK); 1 male, 1 female, Toro, Fort Portal-Bundebugyo rd., 10.viii.1964 (*Jago*)(NRI); 7 males, Bunyoro, Bugoma For. Res., S of Hoima, 29-31.viii.1964 (*Jago*)(NRI); 4 males, Bunyoro, W. of Masindi, Budongo For. Res., viii.1964 (*Jago*)(NRI); 1 female, Mubende, reservoir, 19.viii.1964 (*Jago*)(NRI); 1 male, Bunyoro, L. Albert, Butiaba, 28.viii.1964 (*Jago*)(NRI). **Angola:** 4 males, 4 females, Salazar, 9-15.iii.1972 (*BMNH-SA expedit.*). **Sao Thomé:** 2 females, Roca Zampaima, ix.1949 (*Gradwell & Snow*); 2 males, Roca Infanta Dom. Henrique, 17.ix.1949 (*Gradwell & Snow*); 1 female, betwn., Roca Esperanza-Roca Sundi, 22.i.1949 (*Gradwell & Snow*). **S. Principe:** 3 males, 19.xii.1932 (*Tams*).

Heteracris jeanneli (I. Bolivar) stat.n.

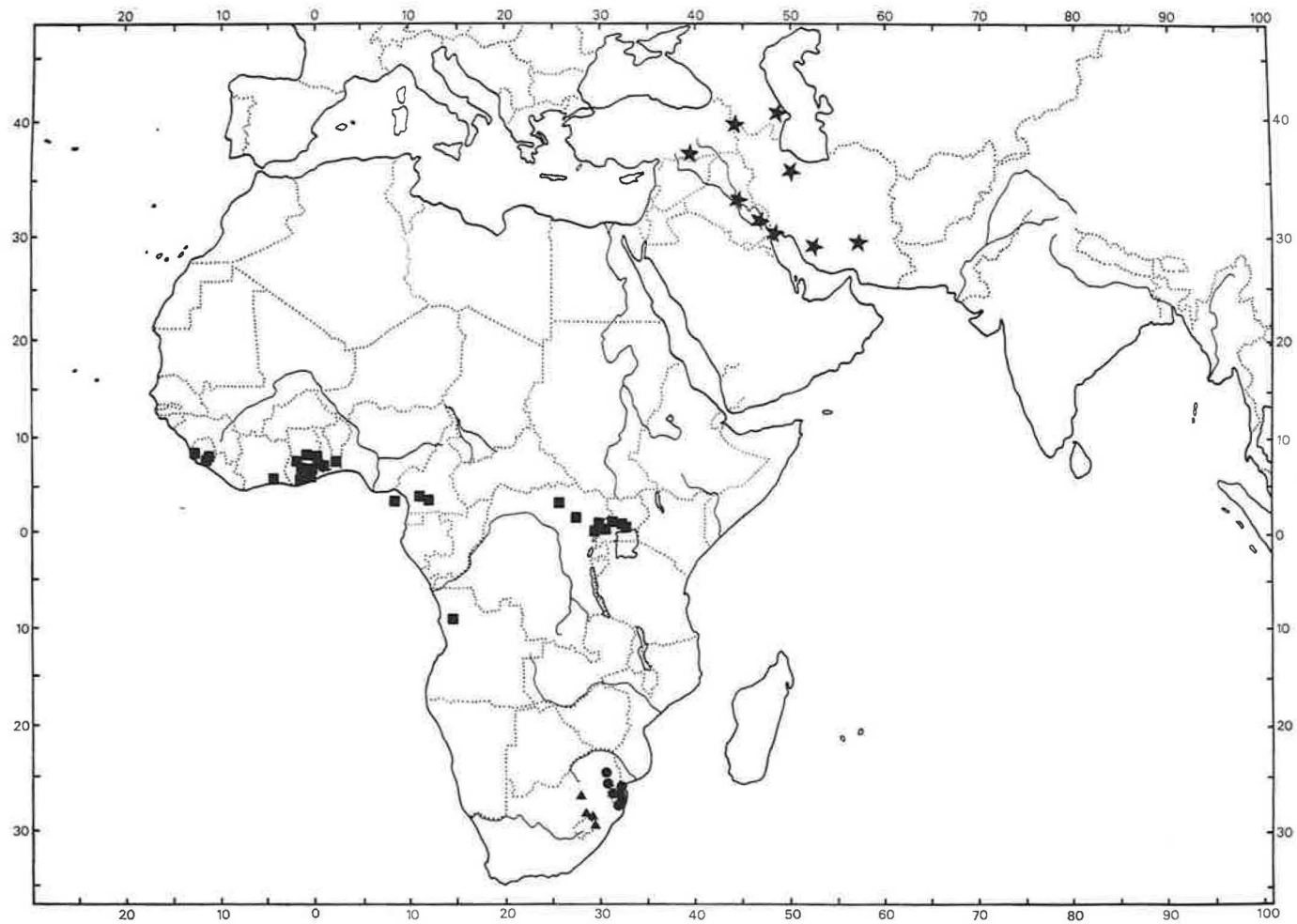
(Figs. 304-308, Map 5)

Thisoicetrus jeanneli I. Bolivar 1914:26. Lectotype female, TOGO (IEE) [examined]. Lectotype designated by Dirsh 1958:54.

Thisoicetrus pulchripes jeanneli I. Bolivar. (Uvarov 1921:125).

Thisoicetrus nigrovittatus I. Bolivar. Holotype female, CONGO? (IEE) [examined]. Syn. by Dirsh, 1970:208.

Heteracris pulchripes jeanneli (I. Bolivar) Dirsh, 1958:53.



Map 6

Distribution of *Heteracris* species. Circles, *H. coeruleipennis*; squares, *H. guineensis*; stars, *H. pterosticha* comb.n., triangles, *H. drakensbergensis* sp.n.

DIAGNOSIS. Male. Epiphallallic morphology like that of *coerulipes*, differs only in attachment of proximal process to inner lophal margins, which in *coerulipes* abuts inner margin abruptly whereas in *jeanneli* attachment is more extended distally almost reaching to posterior edge of lophus as in *pulchripes* (compare Figs. 307 and 311). Apex of dorsal ectophallic plate wider than that of *coerulipes*.

Table 25

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 10 | 1.21 | 1.12-1.25 | 0.038 | 8 | 1.78 | 1.75-1.88 | 0.12 |
| Head width | 10 | 5.61 | 5.39-5.94 | 0.18 | 8 | 6.84 | 6.55-7.30 | 0.33 |
| Pronotal width | 10 | 5.19 | 5.00-5.55 | 0.19 | 8 | 8.56 | 8.14-9.20 | 0.43 |
| Pronotal length | 10 | 5.61 | 5.32-5.92 | 0.18 | 8 | 8.45 | 8.07-9.08 | 0.43 |
| Hind femur depth | 10 | 3.92 | 3.57-4.06 | 0.16 | 8 | 5.35 | 4.96-5.70 | 0.47 |
| Hind femur length | 10 | 17.22 | 15.93-18.62 | 0.84 | 8 | 24.83 | 24.42-26.84 | 1.71 |
| Tegminal length | 10 | 21.11 | 19.10-22.09 | 0.90 | 8 | 31.04 | 30.39-33.17 | 2.08 |
| Antennal length | 1 | — | 15.35 — | — | 2 | — | 18.23-18.26 | — |
| Total length | 10 | 31.45 | 29.88-33.09 | 1.03 | 8 | 45.00 | 42.68-46.73 | 1.40 |

COMMENTS. Although these differences are slight they are nevertheless consistent. As in the *herbacea* species group, development of the inner margins of the lophal interspace plays an important part in species differentiation and needs careful examination.

Both blue/orange-red wing morphs were seen in the material examined, but unlike *coerulipes*, the majority of specimens examined exhibited blue hind wings (mainly red in *coerulipes*).

A series of four young males with blue hind wing collected from Nigeria (Ogun R.) had more acutely pointed subgenital plates than the more broadly rounded plates seen in specimens from Ghana and Togo. The epiphallus of these specimens was weakly sclerotized and showed some slight differences in the shape of the epiphallus indicating immaturity. Another male with orange hind wings, collected on the same day and at the same locality as the blue-winged males, exhibited a more broadly rounded subgenital plate.

TYPE MATERIAL EXAMINED

Thisoicetrus jeanneli lectotype female, **Togo**: 1892-1893 (*Conradt*) (IEE). *Thisoicetrus nigrovittatus* holotype female, **Congo**:? Lukulu, 1907 (*Wilverth*) (IEE).

ADDITIONAL MATERIAL EXAMINED

Nigeria: 5 males, 1 female, Ogun R., 12.xi.1966 (*Phipps*)(BMNH); 1 female, Ibadan, 6.v.1967 (*Phipps*)(BMNH). **Togo**: 4 males, betwn. Lome and Atakpame, viii.1973 (*Jago*)(NRI); 2 males, Palime mt. rd., 11 km from Palime, 13.v.1973 (*Jago*)(NRI). **Ghana**: 6 males, 2 females, Techiman, cultivation in forest clearing, 1.iv.1969 (*Richards*)(NRI); 1 male, Kumasi, 25.v.1971 (*Bannerjee*)(NRI); 1 male, Ashanti, Mabang, 29.iii.1959 (*Chapman*)(BMNH); 1 female, 3.2 km E. of Nkwanta, 21.v.1960 (*Jago*)(BMNH); 1 female, Nkwanta-Shiare, 19.v.1960 (*Jago*)(BMNH); 1 male, 1 female, Kibi Hills, Pusa-Pusa ravine, 16.v.1960 (*Jago*)(BMNH); 1 female, Bejoro, 20.v.1959 (*Jago*)(BMNH); 2 males, 1 female, Shiare-Chiringa, 4 km from Shiare (*Jago*)(BMNH); 1 male, 1 female, Ashanti, N.W. of Nyinahin, Aya Hill For. Res., iii.1962 (*Jago*)(BMNH); 1 female, 3.2 km N. of Asiakwa, nr. Pusa Pusa R., 16.iii.1962 (*Jago*)(BMNH); 1 female, nr. Nsiana, 40 km W. of Bekwai, 9.vi.1962 (*Jago*)(BMNH); 1 male, Dominasi, 20.iii.1959 (*Chapman*)(BMNH); 1 male, Kintampo, 17.iv.1959 (*Chapman*)(BMNH); 1 male, 2 females, Esuboni, 29.iii.1958 (*Chapman*)(BMNH).

Heteracris prasinata (Stål)

(Figs. 298-303, Map 5)

Euprepocnemis prasinata Stål, 1876:44. LECTOTYPE male, NAMIBIA (NR), here designated [examined].

Thisoicetrus sjostedti Karny, 1910:69. Lectotype male, NAMIBIA (MNHU) [examined]. Lectotype designated by Uvarov, 1929:71. (Syn. by Uvarov, 1929:71).

Heteracris prasinata (Stål) Dirsh, 1958a:54.

DIAGNOSIS. Male. Aedeagus as in Fig. 298, cingular valves slightly shorter than those in rest of group. Ventral surface of epiphallus (Fig. 299) very similar to that of *guineensis*. Dorsal ectophallic plate, like that of *pulchripes* but proportionately smaller. Apical process of cercus wider and about as long as basal stem (Fig. 301). Apical cells of tegmen infusate brown, remainder of tegmen opaque with distinctive infusate brown spots, tegminal markings similar to those of *herbacea* group, but with fewer and larger spots in *prasinata* (Fig. 300). Hind wings blue at base or colourless, apical cells infusate brown. Posterior femur, outer surface yellow with small median and complete distal black spots, sometimes with indistinct black marking running below upper carina proximal to median spot (Fig. 302), outer femoral markings like those in *herbacea* group. Inner surface yellow with upper proximal spot, complete median and distal black transverse bands (Fig. 303). Posterior tibiae, below knee with successive small black, yellow, black bands, remainder light blue or blue-green. Apical process of cercus widened, about as long as basal stem.

Table 26

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 12 | 0.85 | 0.76-0.93 | 0.06 | 8 | 1.53 | 1.33-1.77 | 0.14 |
| Head width | 12 | 4.13 | 3.77-4.34 | 0.18 | 8 | 5.67 | 5.11-6.06 | 0.28 |
| Pronotal width | 12 | 4.49 | 3.83-4.51 | 0.28 | 8 | 7.32 | 6.79-8.08 | 0.49 |
| Pronotal length | 12 | 4.47 | 4.02-4.84 | 0.30 | 8 | 7.50 | 6.86-8.12 | 0.37 |
| Hind femur depth | 12 | 3.22 | 2.89-3.52 | 0.23 | 8 | 5.03 | 4.66-5.47 | 0.28 |
| Hind femur length | 12 | 14.40 | 12.77-15.07 | 0.72 | 8 | 23.44 | 21.13-25.60 | 1.58 |
| Tegminal length | 12 | 16.40 | 14.85-18.31 | 1.15 | 8 | 27.86 | 25.85-29.87 | 1.42 |
| Antennal length | 7 | 11.70 | 10.90-12.56 | 0.70 | 5 | 14.15 | 13.42-14.84 | 0.61 |
| Total length | 12 | 25.31 | 23.77-26.61 | 1.24 | 8 | 40.10 | 36.88-43.83 | 2.07 |

COMMENTS. The general coloration and size of this species are reminiscent of members of the *herbacea* group. The internal genitalia however, are like those of *guineensis* and *trimaculata* sp.n. The colourless condition of the hind wing of *sjostedti* was probably leached out by preservation in alcohol (as noted by Uvarov, 1929:71).

TYPE MATERIAL EXAMINED

Euprepocnemis prasinatus Stål, lectotype male, **Namibia**: Damara, no date (*Van Vylde*) (NR) paralectotype female, same data as lectotype. *Thisoicetrus sjostedti* Karny, Lectotype male, **Namibia**: Okahandja, no date, (*Peters*) (MNHU); paralectotype female, same data as lectotype.

ADDITIONAL MATERIAL EXAMINED

Angola: 2 males, Huila Distr., Pediva, 48 km E. of Porto Tombua, 24-27.vii.1954 (*Balfour-Brown*) (BMNH); 2 males, Foz do Cunene, Namibe, Distr., 6.iv.1971 (*Brown*) (NIC, Pretoria); 2 males, 2 females, R. Curoca, 11.2 km NE.

P. Tombua, 25-26.ii.1972 (*BMNH-SA expedit.*)(BMNH). **Rep. of South Africa:** 20 males, 12 females, Cape Province, Middleburg, 16-18.vi. 1955 (*Botha*)(BMNH); 1 male, Kaokoveld, Anabib (*Orupembe*), 160 km W. Ohopoho, 12-13.vi.1951 (*Brinck & Rudebeck*)(BMNH); 3 males, Mooiriver, Melta-hohé Distr., 6.v.1969 (*Brown*)(NCIP); 1 male, Kango Caves, Oudtshoorn, 20.iii.1973 (*Brown*)(NCIP); 3 males, Karoo reg., 20 km NE. De Aar, 17.ii.1986 (*Brown, Bax & Price*)(NCIP); 1 male, Bethulie, 18.4.1918 (no coll.)(BMNH); 2 males, North Bank Halt, Norvals Pont, 16.iv.1934 (*Ogilvie*)(BMNH); 1 male, nr. Onssepkans, Orange R, banks, 8-10.i.1972 (*BMNH-SA expedit.*). **Namibia:** 1 male, Awasib sand dunes, S. Namib, 8.5.1969 (*Brown*)(NCIP); 1 male, Ombomobo, ii.1926 (*BMNH expedit.*); 1 female, Okorosawe, iii.1926 (*BMNH expedit.*); 1 male, 1 female, Zesfontein, ii.1925 (*BMNH expedit.*); 2 males, Tsumeb, xii.1912 (*BMNH expedit.*); 1 male, Warmbad, Koakoveld, ii.1925 (*BMNH expedit.*); 1 male, Hoffnung, 11.i.1934 (*Jordan*)(BMNH); 1 male, Okahandja, 13-19.i.1928 (*Turner*)(BMNH); 7 males, 3 females, Otjikoko Sud fm., 53 km ENE. Omaruru, 10-13.ii.1972 (*BMNH-SA. expedit.*)(BMNH); 1 male, Otjitambi fm., 43 km E.S.E. Kamanjab, 13-15.ii.1972 (*BMNH-SA. expedit.*); 1 male, Noachabeb, 43 km N.N.E. of Grunau, 10-12.i.1972 (*BMNH-SA. expedit.*).

Heteracris pulchripes (Schaum) stat.n.

(Figs. 291-297, Map 5)

Caloptenus pulchripes Schaum, 1853:779. Holotype female, MOZAMBIQUE (MNHU) [examined].

Thisoicetrus pulchripes pulchripes (Schaum) Uvarov, 1921:124.

Heteracris pulchripes (Schaum) Dirsh, 1958a:54.

DIAGNOSIS. Male. Aedeagus as in Fig. 292. Ventral surface of epiphallus showing some intraspecific variation (see Figs, 293-296), very similar to that of *attenuata*. Dorsal ectophallic plate (Fig. 291), larger than *attenuata* and with less attenuate apex. Apical process of cercus generally wider and as long as or longer than basal stem (Fig.297). Tegmina reaching to tips of folded hind femur, cells opaque, without bold spot or band formation, but showing weakly infuscate areas margined by more heavily darkened veins similar to that depicted in Fig. 285 for *coeruleipennis*. Hind wings yellow-orange at base, apical cells opaque, bordered by darkened veins. Outer surface of posterior femur yellow, at base suffused with green, fusing with boldly marked black median spot, distal band black. Femoral markings similar to those of *attenuata*. Posterior tibiae below knee with successive small black, yellow, black bands, remainder scarlet-red.

Table 27

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 10 | 1.02 | 0.89-1.10 | 0.066 | 8 | 1.69 | 1.48-1.92 | 1.16 |
| Head width | 10 | 4.96 | 4.66-5.50 | 0.28 | 8 | 6.50 | 5.71-7.11 | 0.60 |
| Pronotal width | 10 | 4.85 | 4.43-5.50 | 0.29 | 8 | 8.48 | 7.56-9.69 | 0.84 |
| Pronotal length | 10 | 5.26 | 4.68-5.85 | 0.39 | 8 | 8.61 | 7.56-10.00 | 0.87 |
| Hind femur depth | 10 | 3.88 | 3.59-4.34 | 0.21 | 8 | 5.66 | 5.14-6.36 | 0.42 |
| Hind femur length | 10 | 16.48 | 15.02-17.81 | 0.83 | 8 | 25.87 | 22.37-28.43 | 2.45 |
| Tegminal length | 10 | 18.99 | 17.68-20.20 | 1.17 | 8 | 28.36 | 26.00-30.02 | 1.76 |
| Antennal length | 6 | 13.17 | 12.22-14.02 | 0.80 | 3 | 14.42 | 13.85-16.38 | 1.31 |
| Total length | 10 | 29.10 | 26.23-32.10 | 1.69 | 8 | 44.42 | 40.04-48.62 | 3.46 |

COMMENTS. See under *attenuata*.

TYPE MATERIAL EXAMINED

Holotype female, **Mozambique**: Tette, no date (*Peters*) (MNHU).

ADDITIONAL MATERIAL EXAMINED

Angola: 1 male, 3 females, N'dalatando, 9-15.iii.1972 (*BMNH-SA. expedit.*).
Zambia: 11 males, 15 females, Luano Valley, Chisorwe, 7.ii.1928 (*Burr*)(BMNH); 1 male, Kalulu, 8.iv.1928 (*Burr*)(BMNH). **Zimbabwe**: 1 male, Mount Selinda, Chirinda For., 15-26.i.1959 (*Bruggen*)(NCIP); 1 male, 1 female, Vumba, 29.ii.1959 (*Van Someren*)(BMNH); 1 male, 1 female, Harare, ii.1905, 1 female, iii.1904 (*Marshall*)(BMNH); 1 male, Magunge, 1.ii.1953 (*Boyd*)(BMNH); 1 male, nr. Umtali, Battery Spruit, v.1932 (*Mackie*); 1 male, Chirinda For., 1919 (*Swinnerton*)(BMNH); 1 male, 1 female, Mt. Chirinda, 1.ii.1907 (*Odenaal*)(BMNH); 1 female, Amandas, 8.iii.1935 (*Miller*)(BMNH).
Malawi: 1 male, Cholo, 15.v.1967 (no coll.)(NRI). **Mozambique**: 1 female, Luabo, x.1957 (*Usher*)(BMNH).

Heteracris trimaculata sp.n.

(Figs. 276-284, Map 3)

DIAGNOSIS. Male. A proportionately smaller version of *coerulipes* but with yellow wings (being red or blue in *coerulipes*). Internal genitalia indistinguishable from those of *aethiopica* (contrast Figs. 270-280). Differs from *aethiopica* in being fully winged, hind wing yellow at base, and by having proximal, median and distal black transverse bands on outer surface of hind femur (Figs. 282-283), as in *jeanneli* and *coeruleipes*. Lateral surface of head with postocular stripe (Fig. 281) replaced in *aethiopica* by a small spot.

Table 28

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|-------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 6 | 0.95 | 0.9-1.09 | 0.073 | 3 | 1.50 | 1.47-1.53 | 0.031 |
| Head width | 5 | 4.64 | 4.53-4.89 | 0.15 | 3 | 5.89 | 5.81-6.02 | 0.11 |
| Pronotal width | 6 | 4.33 | 4.24-4.48 | 0.087 | 3 | 7.21 | 6.94-7.46 | 0.26 |
| Pronotal length | 5 | 4.71 | 4.61-4.82 | 0.079 | 3 | 7.25 | 6.97-7.43 | 0.24 |
| Hind femur depth | 6 | 3.57 | 3.19-3.86 | 0.22 | 3 | 5.25 | 5.15-5.37 | 0.11 |
| Hind femur length | 6 | 15.07 | 14.52-15.73 | 0.41 | 3 | 23.98 | 23.12-24.76 | 0.82 |
| Tegminal length | 6 | 13.41 | 11.68-14.79 | 1.20 | 3 | 19.70 | 19.37-19.97 | 0.31 |
| Antennal length | 5 | 11.68 | 10.66-12.90 | 0.84 | 3 | 14.23 | 13.88-14.65 | 0.39 |
| Total length | 6 | 26.35 | 25.55-27.31 | 0.56 | 3 | 41.07 | 40.06-42.57 | 1.32 |

COMMENTS. Only known from the relict forest of Mazumbai, West Usambara Hills and from Kikombo in Tanzania. Two male specimens collected from the latter locality exhibited hind femora with fused proximal and median bands as in Fig. 284.

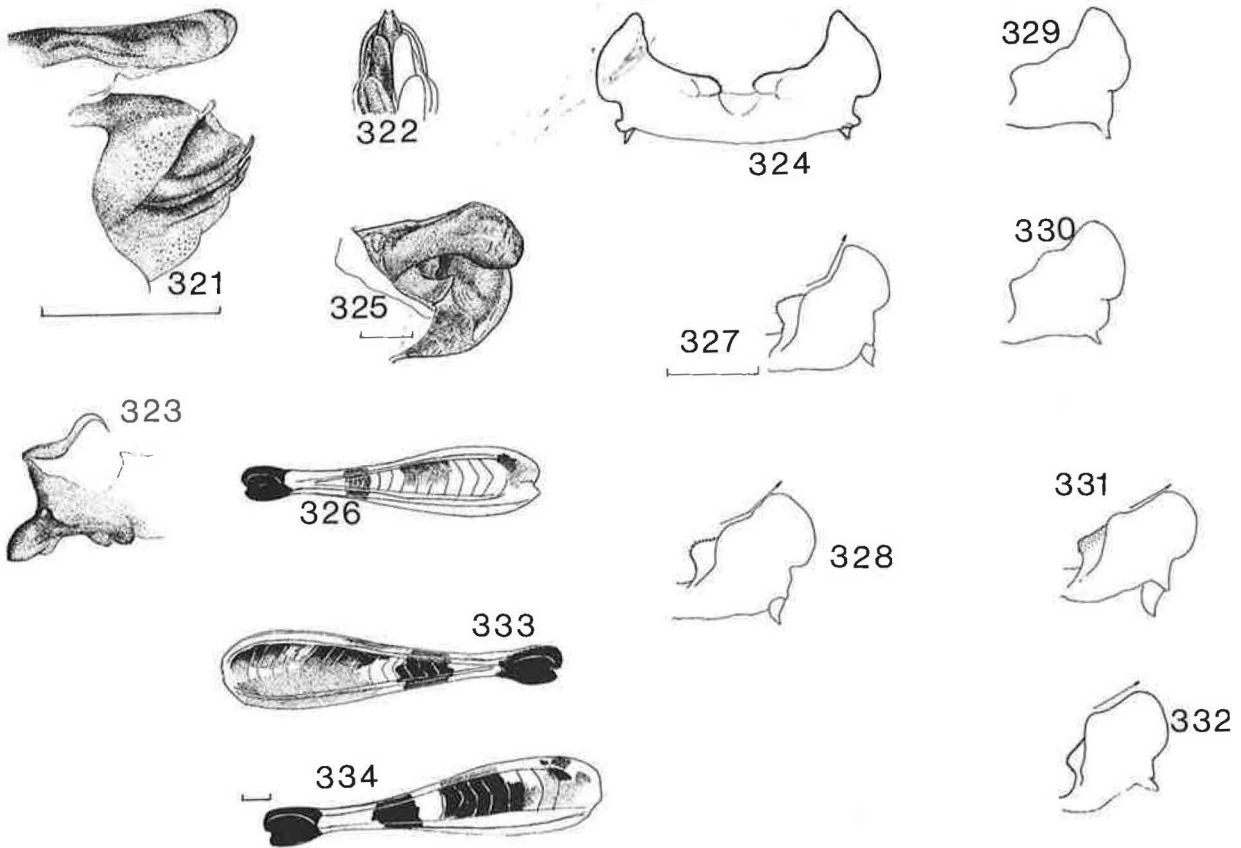
TYPE MATERIAL EXAMINED

Holotype male, **Tanzania**: W. Usambara Mts., Mazumbai For. Res., vi.1967 (*Jago*) (BMNH). Paratypes, 2 males, 3 females, same data as holotype (1 male, 1 female, NRI); 1 male, W. Usambara Mts., Mazumbai, upper forest, at night, 8.vii.1967 (*Jago*) (BMNH); 2 males, Mpwapwa, Kikombo, 1100 m. 22.iv.1947 (*Burt*) (BMNH); 1 female, Morogoro, 1963 (*Ananias*)(ZMA).

brevipennis species-group

DIAGNOSIS. Male. Cingular valves long, slender, longer than apical penis valves (Fig. 321); apical penis valves slightly widened apically, approaching those of *herbacea* in size (Fig. 322). Epiphalli wide, heavily sclerotized, but lophal interspace margins unmodified. Tegmina shortened or fully-winged. Hindwing coloured or colourless. Last abdominal segment slightly expanded. Fastigium verticis without median carinula.

COMMENTS. The shape and heavily sclerotized structure of the epiphallus suggests some affinity to the *herbacea* group, whilst the relative length of the cingular valves is similar to that of *leani*.



Figures 321-334

Heteracris brevipennis subspecies (males). 321-326. *brevipennis*. 321, lateral aspect of genitalia; 322, posterior aspect of penis valves; 323, epiphallus, posterior aspect; 324, same, ventral aspect; 325, lateral aspect of abdominal tip; 326, inner aspect of left hind femur. 327-330. *laticercus*. 327, epiphallus, ventral aspect, Chyulu Hills; 328, same, intermediate form, Kenya, Kitui; 329, same, *nairobiensis*, holotype; 330, same, *laticercus* holotype. 331-334. *nyambeniensis* subsp.n. 331, epiphallus, ventral aspect, Kenya, Kathita R.; 332, same, Kenya, Nyambeni Hills; 333, left hind femur, outer aspect; 334, same, inner aspect. All scale lines represent 1mm; that under Fig. 321 also applies to 322; that under Fig. 327 also applies to 323-324, 328-332; that under 334 also applies to 326 and 333; that under 325 applies to that figure only.

Heteracris brevipennis (I. Bolivar)

(Figs. 321-334, Map. 7)

Thisoicetrus brevipennis I. Bolivar, 1914:23. Holotype male, KENYA (lost).

Thisoicetrus nairobiensis Sjöstedt, 1933:216. Holotype male, KENYA (NR) [examined]. Syn. by Uvarov and Van Someren, 1941:177.

Thisiocetrellus recurvus Uvarov, 1921:130. Holotype male, KENYA (BMNH) [examined]. **Syn. n.**

Heteracris brevipennis (I. Bolivar) Dirsh, 1958a:54.

DIAGNOSIS. Male. Cingular valves moderately long, surpassing tips of apical penis valves (Fig. 321), broad at base, narrowing apically, at tip slightly notched; apical penis valves moderately large, approaching those of *herbacea* group in size (Fig. 322). Dorsal ectophallic plate sub-parabolic in shape. Epiphallus large, wide, heavily sclerotized, lophi teeth-like or more roundly lobate in shape (contrast Figs. 324-332). Apical process of cercus expanded, sub-circular in shape, much wider than basal stem; apex of subgenital plate broadly rounded, slightly expanded (Fig. 325). Tegmina, hind wings reaching to supra-anal plate or reduced to about combined length of head and pronotum together.

General coloration black-olivaceous with blue suffusion, longitudinal stripe markings yellow or green, typical for genus. Hindwing colourless or yellow at base. Lateral surface of head without light coloured spot or vertical stripe behind eye. Posterior femur yellow or orange-brown to red-orange on all surfaces, outer surface with distinct or indistinct distal black band, sometimes proximally suffused with dark green; inner surface with upper proximal spot, median spot and distal black band (Figs. 326, 333-334). Genicular lunules black on all surfaces, with pre-genicular yellow or orange annulus. Outer surface of posterior tibiae below knee, with successive small black, yellow-orange, black bands, remainder dirty grey-green to blue sometimes masked by orange colour of hind femur.

COMMENTS. The grossly enlarged apical process of the cercus and slightly inflated last abdominal tergite help to distinguish members of the *brevipennis* subspecies complex from other species groups. The subspecies of *brevipennis* appear to be restricted in their distribution to the highlands of Kenya.

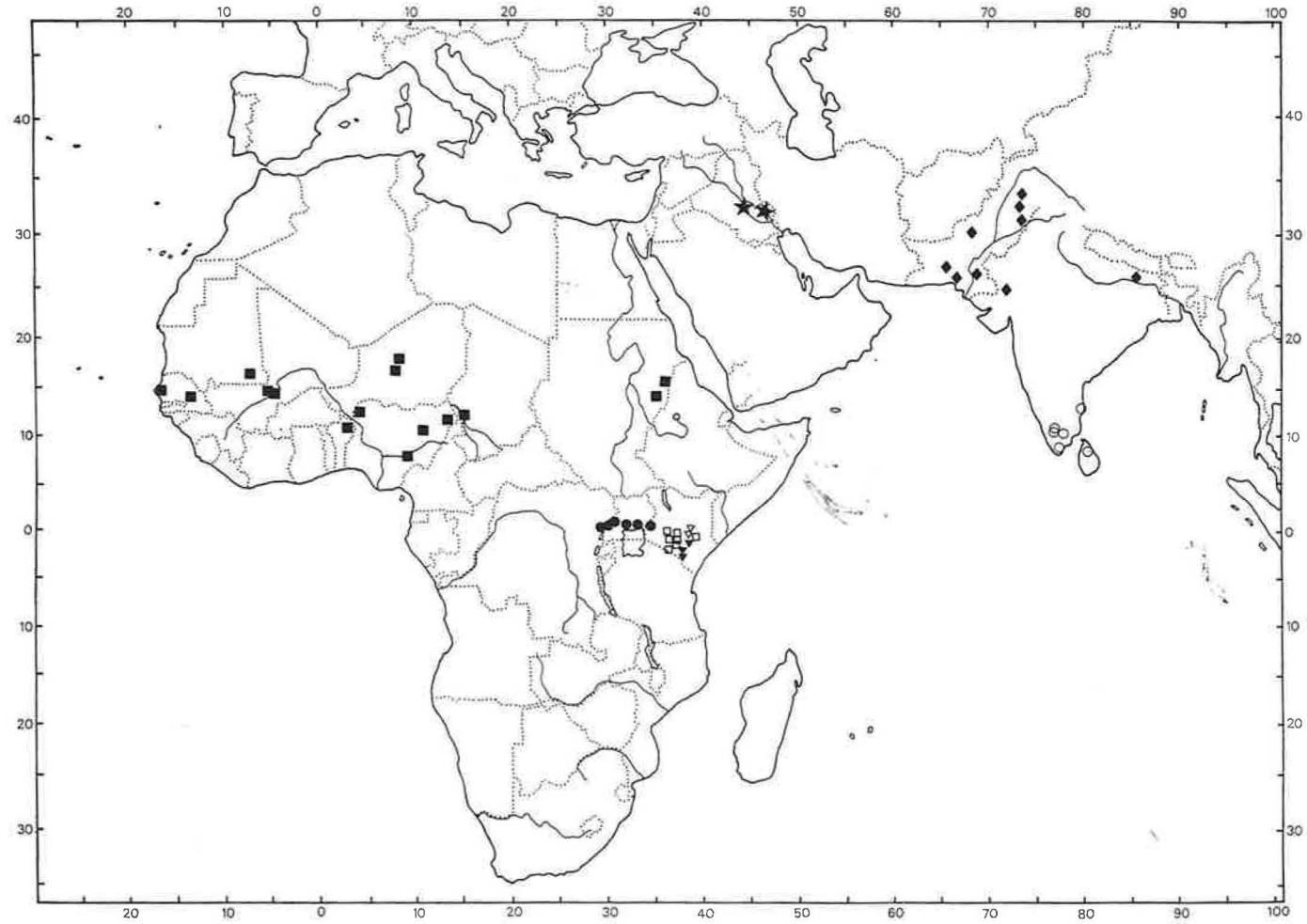
Heteracris brevipennis brevipennis (I. Bolivar) stat. n.

DIAGNOSIS. Small, black-olivaceous, brachypterous insect. Epiphallus with outer pair of heavily sclerotized teeth-like lophi (Figs. 324, 329). Tegmina reduced, about as long as combined lengths of head and pronotum together. Hind wings at base colourless. Outer surface of posterior femur orange brown to red with indistinct black distal band, proximal, medial areas suffused with black; inner surface like outer but with more distinctive upper proximal, median spots and distal black band (Fig. 326).

COMMENTS. Brachyptery, lack of bold, black markings and red coloration on outer surface of the hind femur easily distinguishes this subspecies. The genitalia of both *recurvus* and *nairobiensis* were typical of *brevipennis brevipennis*.

TYPE MATERIAL EXAMINED

Thisoicetrus nairobiensis, Sjöstedt, holotype male, **Kenya**: Nairobi, no further data (NR). *Thisiocetrellus recurvus*, Uvarov, holotype male, **Kenya**: Kavaluki valley, no date (*Gregory coll.*) (BMNH).



Map 7

Distribution of *Heteracris* species. Solid squares, *H. leani*; open squares, *H. brevipennis brevipennis*; solid triangle, *H. brevipennis laticercus*; open triangle, *H. brevipennis nyambeniensis* subsp.n.; solid circles, *H. vinacea*; stars, *H. buxtoni*; diamonds, *H. notabilis*; open circles, *H. pulchra*;

Table 29

Measurements (mm) *brevipennis brevipennis*

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 11 | 0.79 | 0.69-0.90 | 0.065 | 9 | 1.24 | 1.30-1.53 | 0.47 |
| Head width | 11 | 4.02 | 3.77-4.22 | 0.12 | 9 | 5.30 | 4.37-5.83 | 0.42 |
| Pronotal width | 11 | 3.60 | 3.39-3.83 | 0.14 | 9 | 6.89 | 6.28-7.48 | 0.44 |
| Pronotal length | 10 | 3.98 | 3.81-4.42 | 0.19 | 9 | 6.95 | 6.38-7.45 | 0.37 |
| Hind femur depth | 11 | 2.97 | 2.79-3.24 | 0.13 | 9 | 4.61 | 4.36-4.86 | 0.18 |
| Hind femur length | 11 | 12.56 | 11.46-13.65 | 0.72 | 9 | 21.65 | 19.59-22.76 | 1.27 |
| Tegminal length | 11 | 7.38 | 6.10-8.55 | 0.80 | 9 | 13.17 | 11.74-13.72 | 1.26 |
| Antennal length | 8 | 8.14 | 7.04-8.53 | 0.96 | 6 | 11.95 | 10.82-13.66 | 1.07 |
| Total length | 11 | 22.50 | 21.13-23.91 | 0.95 | 9 | 35.9 | 34.40-37.93 | 1.20 |

Measurements (mm) *brevipennis laticercus*

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 11 | 1.03 | 0.94-1.16 | 0.063 | 6 | 1.64 | 1.45-1.72 | 0.10 |
| Head width | 11 | 4.60 | 4.38-5.09 | 0.22 | 6 | 5.83 | 5.53-6.11 | 0.23 |
| Pronotal width | 11 | 4.12 | 3.92-4.47 | 0.16 | 6 | 7.35 | 6.96-7.75 | 0.29 |
| Pronotal length | 11 | 4.55 | 4.17-4.98 | 0.26 | 6 | 7.52 | 7.40-8.30 | 0.35 |
| Hind femur depth | 10 | 3.24 | 3.04-3.59 | 0.17 | 6 | 4.77 | 4.14-5.48 | 0.43 |
| Hind femur length | 10 | 14.49 | 13.61-16.58 | 0.88 | 6 | 23.37 | 22.23-25.81 | 1.29 |
| Tegminal length | 10 | 13.90 | 12.60-15.61 | 1.04 | 6 | 21.43 | 19.81-23.86 | 1.5 |
| Antennal length | 4 | 10.29 | 9.96-10.49 | 0.39 | 3 | 12.66 | 12.47-12.97 | 0.27 |
| Total length | 10 | 25.98 | 24.29-29.32 | 1.53 | 6 | 40.72 | 37.67-42.08 | 2.32 |

ADDITIONAL MATERIAL EXAMINED

Kenya: 2 males, 1 female, Ololua Forest, Karen, Kajiado distr., nr. Nairobi, 31.v.1981 (*Ritchie*)(NMK); 2 males, Kiambu, distr., Kerita Forest, 3.iii.1983 (*Richie & Mungai*)(NMK); 1 male, 2 females, Mafaaro, Gatundu (*Mungai*)(NMK); 1 male, Muthaiga, Nairobi, ii.1950 (*Pinhey*)(NMK); 3 males, Emali Range, Sultan Hamud, iii.1940 (no coll.) (NMK); 1 female, Ngong, iv.1939 (*Van Someren*)(NMK); 1 female, Namanga, swamp in forest, 18.ii.1986 (*Darlington*)(NMK); 3 females, Nakuru rd., Kenya Nat. Agric. Inst., relict forest, 8.ix.1982 (*Jago*)(NRI); 4 males, Karura For. Res., W. of Nairobi, 26.vii.1964 (*Jago*)(NRI); 10 males, 9 females, Ol Doinyo Sapuk, nr. summit, (*Robertson & Robertson*)(NRI); 2 males, 2 females, Ololua Forest, Karen, Kajiado distr., 30.x.1982 (*Jago*)(NRI); 3 males, 3 females, Nairobi, For. Dept. Aboretum, 22.v.1971 (*Robertson & Robertson*)(NRI); 1 male, 1 female, N. Nairobi, Sigiri For. Res., guard statn., Limuru rd., 7.ix.1982 (*Jago*)(NRI); 6 males, 5 females, Nairobi, Muguga, 7.v.1970 (*Brown*)(NRI); 3 males, 1 female, Muguga, 26.xii.1971 (*Robertson*)(NRI); 7 males, 8 females, Kitito Coffee Estate, Makuyu, 26.iii.1975 (*Robertson & Robertson*)(NRI); 1 male, Embu, Irangi For. Statn. rd., 13 km from junction with route B6, 15.ii.1988 (*Jago & Grunshaw*)(NRI); 5 males, 1 female, Nyeri, x.1948 (*Van Someren*)(NRI); 5 males, 6 females, Emali Range, Sultan Hamud, iii.1940 (*Van Someren*)(BMNH); 2 females, Ngong, iv.1939 (*Van Someren*)(BMNH); 1 male, Aberdare Range, Mt. Kinangop, 29-30.x.1934 (*Ford*)(BMNH); 1 male, 1 female, Nairobi (*Jackson*)(BMNH); 2 females, Katamayu, iii.1942 (*Van Someren*)(BMNH); 1 male, Nairobi, Karen, Ngong Road Forest, 27.ii.1988 (*Jago, Grunshaw & Ritchie*)(NRI).

Heteracris brevipennis laticercus (Uvarov) stat.n.

Thisoicetrus laticercus Uvarov 1941:175. Holotype male, KENYA: Chyulu Hills (BMNH) [examined].

Heteracris laticercus (Uvarov) Dirsh, 1958a:54.

DIAGNOSIS. Male. Aedeagus and dorsal ectophallic plate similar to that of nominate subspecies. Epiphallic lophi tending to become more rounded than nominate subspecies (compare Figs. 324 and 330). Length of tegmina reaching to supra-anal plate. Hind wings yellow at base. Posterior femur, both inner and outer surfaces, yellow with distinct upper proximal, median and distal bold black spots, proximal and median spots sometimes fused with green-black; ventral surface, sometimes bright red (Figs. 333-334).

COMMENTS. The epiphallic lophi of *brevipennis laticercus* are marginally more rounded than those of the nominate subspecies. The existence of intermediate forms between the extremes in lophal morphology, suggests that subspecies are involved.

TYPE MATERIAL EXAMINED

Holotype male, Uvarov, **Kenya**: Chyulu Hills, 1680 m., vi.1938 (*Coryndon Mus. expdt.*) (BMNH). Paratypes, 1 male, 2 females, same data as holotype, 1560 m., iv.1938 (*Coryndon Mus. expdt.*) (BMNH); 1 male, same data as holotype, v.1938 (NMK).

Heteracris brevipennis nyambeniensis subsp. n.

DIAGNOSIS. Differs from *brevipennis laticercus* only in having marginally smaller epiphalli, more rounded lophi and less curved or stepped margins of lophal interspace (Figs. 331-332).

Table 30

Measurements (mm)

| | Males | | | | Females | |
|-------------------|-------|-------|-------------|-------|---------|--------------|
| | n | Mean | Range | SD | n | |
| Interocular dist. | 10 | 0.91 | 0.84-1.00 | 0.060 | 2 | 1.47, 1.45 |
| Head width | 10 | 4.39 | 4.22-4.59 | 0.12 | 2 | 5.50, 5.46 |
| Pronotal width | 10 | 3.93 | 3.77-4.21 | 0.14 | 2 | 6.78, 6.63 |
| Pronotal length | 10 | 4.30 | 4.03-4.54 | 0.16 | 2 | 6.54, 6.97 |
| Hind femur depth | 9 | 3.08 | 2.86-3.34 | 0.21 | 2 | 4.50, 4.59 |
| Hind femur length | 9 | 13.52 | 12.52-14.29 | 0.51 | 2 | 20.61, 21.19 |
| Tegminal length | 10 | 11.76 | 11.10-12.23 | 0.44 | 2 | 18.48, 17.27 |
| Antennal length | 2 | — | 8.97-9.56 | — | 1 | 12.21 |
| Total length | 9 | 23.55 | 22.21-25.33 | 1.03 | 1 | 35.96 |

COMMENTS. This new subspecies is described here from two populations collected from the Nyambeni Hills and by the Kathita river, near Meru.

TYPE MATERIAL EXAMINED

Holotype male, **Kenya**: Nyambeni Hills, v.1947 (*Van Someren*) (BMNH).

Paratypes, 1 male, same data as holotype; 1 male, Meru, vii.1943 (*Van Someren*) (BMNH); 7 males, 2 females, Meru, Kathita R., iii.1979 (*Meru ent. unit*) (NMK).

Ungrouped species

Heteracris buxtoni (Uvarov)

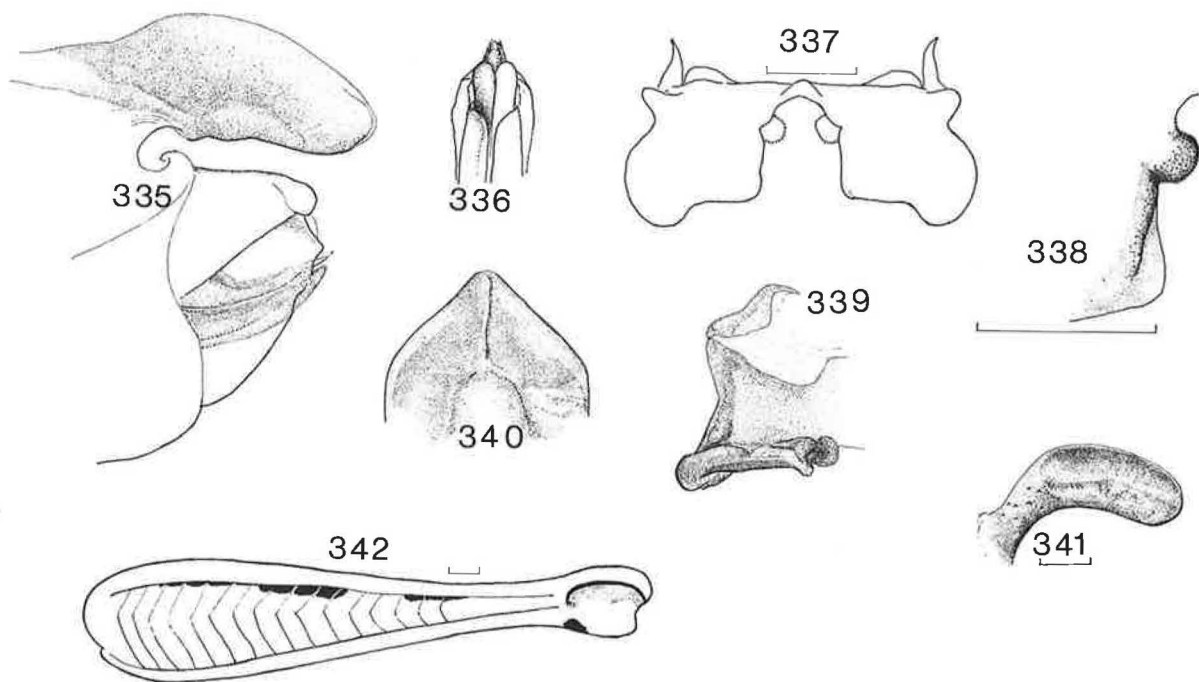
(Figs. 335-342, Map 7)

Thisoicetrus buxtoni Uvarov, 1921:65. Holotype male, IRAQ (BMNH) [examined].

Heteracris buxtoni (Uvarov) Dirsh, 1958a:54.

DIAGNOSIS. Male. Large size for genus. Cingular valves slender, longer than apical penis valves (Fig. 335). Epiphallus, ventral surface, large, moderately sclerotized (Fig. 337) similar to *leani*, inner margins of lophal interspace recessed, without tubercles; lophi not inflated when seen edge on as in *leani* (Fig. 339). Dorsal ectophallic plate roundly triangulate (Fig. 340), with raised, longitudinal, median thickening (Fig. 335). Fastigium of vertex with median carinula. Cercus with greatly elongated apical process, much longer than basal stem (Fig. 341).

General coloration light brown with yellow-cream stripe markings typical for genus. Tegminal cells hyaline, like those of *notabilis*, without spots or bands; hind wing colourless. Posterior femur light brown-yellow on all surfaces with small, black, proximal stripe running below outer, upper carina, fusing with median stripe, distal band reduced to small stripe below upper carina, ventral surface more orange-yellow (Fig. 342). Outer lateral surface of posterior tibiae below knee, with successive, small black, yellow, black bands, remainder same colour as for hind femur. Sides of tergites 9+10 yellow, without black pigmentation.



Figures 335-342

Heteracris buxtoni (male). 335, lateral aspect of genitalia; 336, posterior aspect of penis valves; 337, epiphallus, ventral aspect; 338, same, dorsal aspect of lophal interspace margin; 339, same, posterior aspect; 340, dorsal ectophallic plate; 341, left cercus; 342, outer aspect of left hind femur. All scale lines represent 1 mm; that under Fig. 337 also applies to 339-340; that under Fig. 338 also applies to 335-336; that under Fig. 341 applies to that figure only; that above Fig. 342 applies to that figure only.

Table 31

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 4 | 1.31 | 1.24-1.39 | 0.06 | 4 | 1.87 | 1.71-1.94 | 0.11 |
| Head width | 4 | 5.63 | 5.27-5.81 | 0.25 | 4 | 6.62 | 6.35-6.79 | 0.20 |
| Pronotal width | 4 | 6.68 | 6.49-6.94 | 0.22 | 4 | 10.26 | 9.52-10.77 | 0.59 |
| Pronotal length | 4 | 7.74 | 7.63-7.99 | 0.22 | 4 | 10.39 | 10.26-10.52 | 0.11 |
| Hind femur depth | 4 | 4.82 | 4.39-5.21 | 0.34 | 3 | 6.47 | 6.22-6.75 | 0.27 |
| Hind femur length | 4 | 21.83 | 21.35-22.50 | 0.52 | 3 | 30.82 | 28.83-32.00 | 1.39 |
| Tegminal length | 4 | 29.66 | 28.17-30.73 | 1.24 | 3 | 40.52 | 39.31-41.38 | 1.08 |
| Antennal length | 1 | 15.12 | — | — | 3 | 15.48 | 14.53-16.00 | 0.82 |
| Total length | 4 | 38.74 | 37.15-40.95 | 1.60 | 3 | 53.21 | 50.09-55.32 | 2.76 |

COMMENTS. This species is the largest member of the genus. It appears to be related to more than one group but does not easily fall into any one of them. The internal genitalia of *buxtoni*, for example, appear to be most closely allied to *leani*, in general shape of the epiphallus and aedeagus, but differ principally in having reduced cingular valves. It also differs from *leani* in its general coloration, shape of cerci and form of the fastigium verticis which has a median carinula. This latter character when taken together with the unmarked form of the tegmina and size suggests some affinity to *notabilis*.

TYPE MATERIAL EXAMINED

Holotype male, **Iraq**: Amara, Masharra canal, 8.vi.1918 (*Evans*) (BMNH). Paratype, 1 male, Amara, R. Tigris, 28.v.1918 (*Buxton*) (BMNH).

ADDITIONAL MATERIAL EXAMINED

Iraq: 2 females, Baghdad, 12.vi.1946 (*Brown*)(NRI); 2 males, 1 female, Baghdad, 4.vi.1923 (*Hingston*)(BMNH).

Heteracris leani (Uvarov)

(Figs. 349-355, Map 7)

Thisoicetrus leani Uvarov, 1941:64. Holotype male, NIGERIA (BMNH) [examined].

Heteracris leani (Uvarov) Dirsh, 1958a:54.

DIAGNOSIS. Male. Cingular valves of aedeagus strongly elongate, slender (Fig. 350), much longer than apical penis valves (Fig. 349). Dorsal ectophallic plate shield-shaped with raised, median, longitudinal thickening, similar to *calliptamoides*. Epiphallus ventral surface (Fig. 352), large, moderately sclerotized, lophi somewhat inflated when viewed edge on (Fig. 351), posterior margin of lophus obtusely rounded, with outer tooth-like lobes, inner margin of lophal interspace recessed, without tubercle development as in *nigricornis* group.

General coloration brown, variably expressed with bright yellow-green markings typical for genus. Tegmen tinged with yellow or green, costal and first anal areas with distinct yellow or light green stripes; tegminal cells clear with scattered infusate brown spots, spots near wing tips sometimes fusing to form small transverse bands (Fig. 354). Hind wings at base red to orange-red, wing tips slightly infumate. Externomedian surface of posterior femur yellow with small, black proximal stripe below upper carina, incomplete black median transverse spot, complete black distal band (Fig. 355); inner surface, yellow with small upper proximal spot, black median spot reaching to lower carina, and complete black distal band, genicular lunule black on all surfaces.

Outer lateral surface of posterior tibia with successive, small black, yellow, black bands below knee, remainder blue, unspined surface with median white spot. Abdominal segments yellow with lateral sides of tergites 9+10 black. Basal stem, apical process of cercus cream-yellow, apical process about as long as basal stem (Fig. 353).

Table 32

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 8 | 1.50 | 1.35-1.60 | 0.10 | 11 | 2.47 | 2.10-2.71 | 0.19 |
| Head width | 8 | 5.53 | 5.10-5.89 | 0.29 | 11 | 7.49 | 6.92-8.16 | 0.41 |
| Pronotal width | 8 | 5.96 | 5.37-6.56 | 0.42 | 11 | 10.33 | 9.54-11.34 | 0.58 |
| Pronotal length | 8 | 6.77 | 6.40-7.59 | 0.38 | 11 | 10.65 | 9.52-11.61 | 0.69 |
| Hind femur depth | 8 | 4.68 | 4.39-4.90 | 0.18 | 11 | 6.91 | 5.89-7.60 | 0.48 |
| Hind femur length | 8 | 21.76 | 20.21-24.55 | 1.45 | 11 | 33.50 | 29.17-36.21 | 2.33 |
| Tegminal length | 8 | 25.03 | 22.70-26.42 | 1.12 | 11 | 40.11 | 33.66-43.76 | 2.87 |
| Antennal length | 3 | 15.72 | 15.26-16.09 | 0.42 | 3 | 18.64 | 18.40-18.87 | 0.24 |
| Total length | 8 | 38.07 | 35.47-41.59 | 2.00 | 11 | 58.27 | 51.25-61.64 | 3.52 |

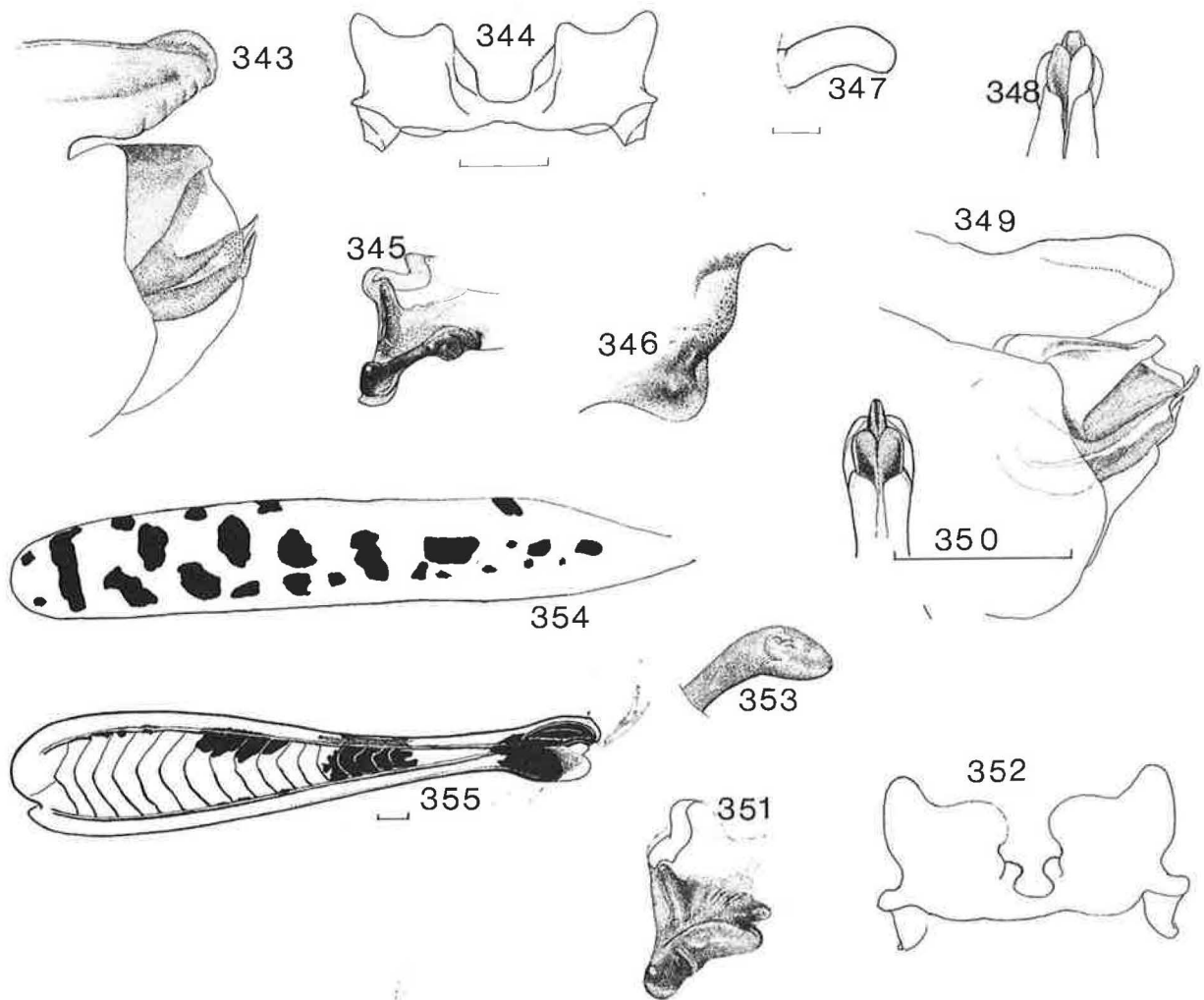
COMMENTS. This species appears to be most closely allied to the *nigricornis* group, from which it differs principally in the form of the fastigium verticis and in its general coloration. It also bears some resemblance to *buxtoni* in the form of the epiphallus but differs from it in general coloration and in having elongated cingular valves. The shape of the dorsal ectophallic plate is similar to that of *calliptamoides*. It also shares with other members of the *herbacea* group possession of similar tegminal markings.

TYPE MATERIAL EXAMINED

Holotype male, *Thisoicetrus leani* Uvarov, **Nigeria**: Kalkala, 21.ix.1934 (*Gwynn*) (BMNH). Paratypes, 1 male, 1 female, same data as holotype, 15-21.ix.1934 (*Gwynn*) (BMNH); 2 males, Bauchi, 8-10.viii.1936 (BMNH); 1 male, Bida, viii.1936 (BMNH); 1 male, Kano, 27.vii.1936 (BMNH); 1 female, Zaria, viii.1936 (*Golding*) (BMNH); 1 male, 1 female, Kukuma, Bornu prov., ix.1930 (*Lean*) (BMNH). MALI, 1 male, 3 females, Sokolo, Macina distr., viii-ix.1933 (*Miss. d'Etudes de la Biologie des Acridiens*) (BMNH).

ADDITIONAL MATERIAL EXAMINED

Mauritania: 3 females, nr. Nema, 4.ix.1961 (*Popov*) (BMNH). **Mali**: 1 male, Dioura, 26.8.1954 (*Demange*) (BMNH); 2 males, 1 female, Sangha, 24.viii.1962 (*Jago*) (BMNH). **Senegal**: 1 female, Thies, 28.ix.1962 (*Farrow*) (BMNH); 1 female, Tambacounda, 10-18.ix.1962 (*Farrow*) (BMNH); 1 male, Dakar, 21.ix.1925 (BMNH). **Benin**: 1 male, Malanville, viii.1978 (*Popov*) (NRI). **Nigeria**: 1 female, Maiduguri, 21.x.1950 (*Johnston*) (BMNH); 1 male, 1.3 km S. of Dikwa, riverine woodlands (*Jago*) (BMNH); 1 female, Bajoga, 28.ix.1970 (*Popov*) (BMNH); 3 females, Maiduguri, at light, 19.ix.1979 (*Jago*) (NRI); 1 female, Zambuk, nr. Gombe, 18-21.ix.1970 (*Popov*) (NRI); 1 male, Gulumbe, N. of Village, 17.x.1979 (*Jago*) (NRI); 1 male, 4.3 km SW. of Dikwa (*Jago*) (NRI); 1 male, 1 female, N.E. of Bornu, Maiduguri, 19.x.1980 (*Amatobi*) (NRI); 1 male, 2 females, Bajoga, 28.ix.1970 (*Popov*) (NRI); 1 male, nr. Gombe, 29.ix.1970 (*Popov*) (NRI); 1 male, Mallam Gidi, 26.ix.1970 (*Popov*) (BMNH); 1 female, Filayi, 25.ix.1970 (*Popov*) (NRI). **Niger**: 3 females, 30 km E. of Agadez, 29.ix.1965 (*Popov*) (BMNH); 1 male, 30 km E. of Agadez, 29.ix.1965 (*Popov*) (NRI); 1 male, 1 female, Air, 100 km N. of Agadez, 25.viii.1967 (*Popov*) (NRI). **Chad**:



Figures 343-355

Heteracris species (males). 343-348. *H. vinacea*, 343, lateral aspect of genitalia; 344, epiphallus, ventral aspect; 345, same, posterior aspect; 346, same, dorsal aspect of lophal interspace margins; 347, left cercus; 348, posterior aspect of penis valves. 349-355. *H. leani*. 349, lateral aspect of genitalia; 350, posterior aspect of penis valves; 351, epiphallus, posterior aspect; 352, same, ventral aspect; 353, left cercus; 354, left tegmen; 355, outer aspect of left hind femur. All scale lines represent 1 mm; that under Fig. 350 also applies to 343, 346, 348-349; that under Fig. 344 also applies to 345, 351-352; that under Fig. 347 also applies to 353; that under Fig. 355 also applies to 354.

5 females, N'Djamena, 25.viii.1978 (Schulten)(ZMA). **Sudan**: 1 male, 1 female, 48 km W. of Gedaref, x.1948 (Joyce)(BMNH); 2 females, Gedaref, 5.vi.1946 (Joyce)(BMNH); 1 female, Kassala, iv-ix.1923 (Cantlie)(BMNH).

Heteracris notabilis (Uvarov) (Figs. 356-361, Map 7)

Thisoicetrus nobilis Uvarov, 1942:596. Holotype male, PAKISTAN (BMNH) [examined]. (Homonym of *Thisoicetrus nobilis* Brancsik, 1893).

Thisoicetrus notabilis Uvarov, 1942:596 (proposed replacement name for *Thisoicetrus nobilis* Brancsik, 1893).

Heteracris notabilis (Uvarov) Dirsh, 1958a:54.

DIAGNOSIS. Male. Aedeagus similar to that of *pulchra*, but with cingular valves only slightly longer and broader in *notabilis* (Fig. 357). Epiphallus as in Fig. 360. Apex of dorsal ectophallic plate somewhat square-shaped, with median, distal concavity (Fig. 358). Median carinula of fastigium verticis present. Cercus similar to that of *pulchra* (see Fig. 370). Pronotal markings as in Fig. 362, median dorsal stripe unicolorous brown, without lighter area between first and second sulci as in *pulchra*. Tegminal cells hyaline without spots or bands; wings generally pale blue at base. Femoral markings variable, external surface without spots or bands, but with pale black stripe running below upper carina in proximal-median region (exhibited only in the type) (Fig. 361), inner surface with small upper proximal spot, small median stripe, distal spot sometimes absent or weakly marked.

Table 33

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 8 | 1.03 | 0.86-1.10 | 0.14 | 3 | 1.98 | 1.82-2.06 | 0.14 |
| Head width | 8 | 4.82 | 4.43-5.50 | 0.33 | 3 | 6.91 | 6.55-7.08 | 0.31 |
| Pronotal width | 6 | 5.22 | 4.56-6.04 | 0.50 | 3 | 10.06 | 8.83-11.04 | 1.12 |
| Pronotal length | 5 | 5.59 | 4.93-7.08 | 0.78 | 3 | 10.56 | 9.26-11.66 | 1.21 |
| Hind femur depth | 6 | 4.16 | 3.75-5.06 | 0.52 | 3 | 6.92 | 6.00-7.70 | 0.86 |
| Hind femur length | 5 | 18.45 | 15.53-22.42 | 2.50 | 3 | 33.73 | 30.45-36.04 | 2.92 |
| Tegminal length | 5 | 25.19 | 20.38-29.46 | 3.45 | 3 | 44.83 | 39.33-50.44 | 5.56 |
| Antennal length | 1 | 13.21 | — | — | 1 | 15.40 | — | — |
| Total length | 6 | 29.96 | 27.47-38.35 | 2.40 | 3 | 56.15 | 50.87-58.90 | 4.58 |

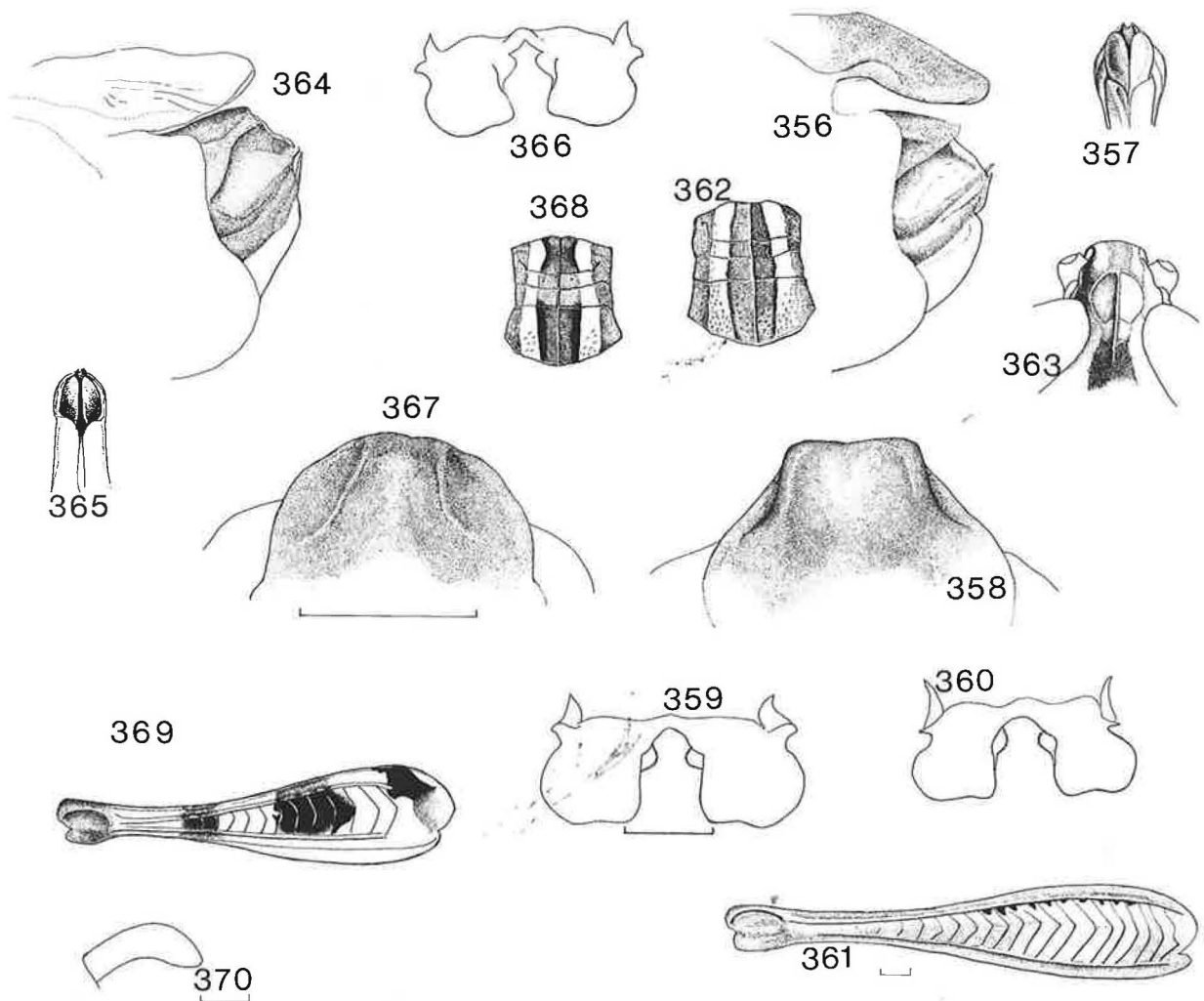
COMMENTS. This species appears to replace its near relative *pulchra* in Pakistan and the sub-Himalayan plains of India. The type from Harnai, Pakistan is light brown in general coloration, whereas specimens from around Rawalpindi were unicolorous dirty green. The black stripe running below the upper carina of the posterior femur, as in the type, was not seen in any other male specimen of this species, with the exception of a single female collected from Rawalpindi. Two large male specimens from Pusa, Bengal and Gajar, Mashkai respectively, differed slightly in having a more widened apex of the dorsal ectophallic plate, and proportionately large epiphalli (Fig. 359). It is possible that these specimens may represent subspecies but further material needs to be studied to establish this.

TYPE MATERIAL EXAMINED

Holotype male Uvarov, **Pakistan**: Sibi distr., Harnai, 9.viii.1931 (*Sharif*)(BMNH). Paratypes, 1 male, Faisalabad, 26.vii.1921 (BMNH); 1 female, Ambagh, Lasbela, 29.vi.1935 (BMNH); 1 female, Sind, Sakrand, 24.vi.1938 (*Khan*)(BMNH).

ADDITIONAL MATERIAL EXAMINED

Pakistan: 3 males, 2 females, Rawalpindi, 3.xi.1935 (*Whistler*)(BMNH); 1 male, Choa, 15 km from Khewra, Salt Range, 15-21.x.1930 (*Hora & Pruthi*)(BMNH); 1 male, Gajar, Mashkai, 1.ix.1917 (no coll.)(BMNH); 1 female, Deesa, x.1899 (*Nurse*)(BMNH). **India**: 1 male, Bengal, Pusa, 12.viii.1908 (no. coll.)(BMNH).



Figures 356-370

Heteracris (males). 356-363. *H. notabilis*. 356, lateral aspect of genitalia; 357, posterior aspect of penis valves; 358, dorsal ectophallic plate; 359, epiphallus, ventral aspect, Gajar, Pakistan; 360, same, same, holotype; 361, right femur, outer aspect (holotype); 362, dorsal aspect of pronotum; 363, dorsal aspect of fastigium verticis. 364-370. *H. pulchra*. 364, lateral aspect of genitalia; 365, posterior aspect of penis valves; 366, ventral aspect of epiphallus; 367, dorsal ectophallic plate; 368, dorsal aspect of pronotum; 369, inner aspect of left hind femur; 370, left cercus. All scale lines represent 1 mm; that under Fig. 367 also applies to 356-358, 364-365; that under Fig. 359 also applies to 360 and 366; that under Fig. 361 also applies to 362, 368-369; that under Fig. 370 also applies to 363.

Heteracris pterosticha (Fischer de Waldheim) comb.n. (Figs. 371-375, 378, Map 6)

Oedipodia pterosticha Fischer de Waldheim, 1833: Holotype male, USSR (ZI)[lost].

Acridium dorsatum Fischer de Waldheim, 1839:301. Holotype female, USSR (ZI) [examined]. (Syn. by Uvarov, 1921:129).

Thisoicetrus dorsatus (Fischer de Waldheim) Kirby, 1910:559.

Thisoicetrus pterosticha (Fischer de Waldheim) I. Bolivar, 1914:23.

Thisoicetrinus dorsatus (Fischer de Waldheim) Uvarov, 1921:129.

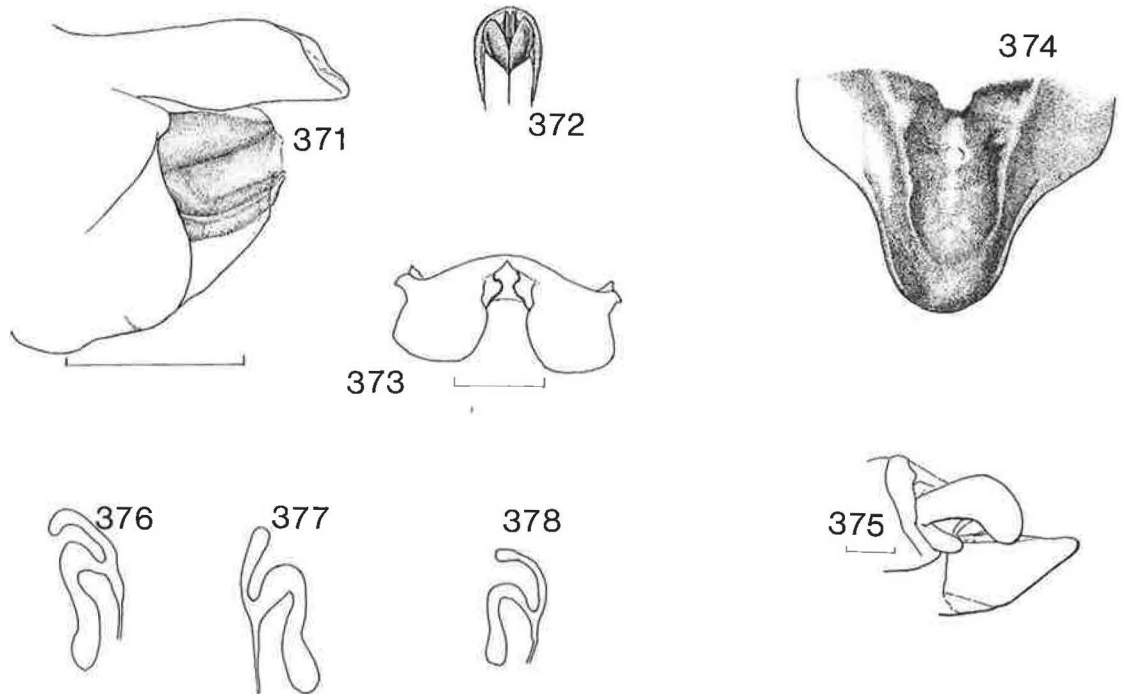
DIAGNOSIS. Male. Aedeagus (Figs. 371 and 372), with cingular valves just surpassing tips of apical penis valves, like those in *adspersa* group; apical penis valves divergent apically. Epiphallus (Fig. 373), ventral surface weakly sclerotized, with broadly rounded, lobate lophi, like those of *pulchra*. Dorsal ectophallic plate as in Fig. 374. Fastigium verticis with median carinula as in *buxtoni* and *pulchra*. Apical process of cercus wider than basal stem, about as long as basal stem. Apex of subgenital plate distinctly elongate, in this respect like *littoralis*, but considerably more pronounced (Fig. 375).

General coloration, exhibits brown/green polymorphism, with stripe markings typical for genus. Tegminal cells hyaline tinged with green or brown, with few scattered, small, brown spots, like in *adspersa*, but not fusing or forming bands. Posterior femur light green or brown on all surfaces without

Table 34

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|-------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 8 | 0.89 | 0.77-0.95 | 0.063 | 8 | 1.56 | 1.38-1.65 | 0.097 |
| Head width | 8 | 4.61 | 4.32-4.85 | 0.21 | 8 | 6.02 | 5.54-6.25 | 0.24 |
| Pronotal width | 8 | 4.66 | 4.33-5.22 | 0.31 | 8 | 7.68 | 6.67-8.30 | 0.53 |
| Pronotal length | 8 | 5.37 | 5.03-5.82 | 0.28 | 8 | 8.65 | 8.05-9.34 | 0.48 |
| Hind femur depth | 8 | 3.49 | 3.26-3.72 | 0.15 | 8 | 4.94 | 4.45-5.42 | 0.33 |
| Hind femur length | 8 | 16.67 | 15.65-18.19 | 0.84 | 8 | 25.59 | 22.84-28.31 | 1.79 |
| Tegminal length | 8 | 20.25 | 18.23-23.05 | 1.67 | 8 | 31.31 | 27.80-34.18 | 2.34 |
| Antennal length | 6 | 29.46 | 27.53-32.57 | 1.77 | 4 | 17.92 | 17.51-18.29 | 0.32 |
| Total length | 8 | 14.37 | 13.06-15.33 | 1.06 | 8 | 45.02 | 40.66-50.64 | 3.36 |



Figures 371-378

Heteracris species. 371-375. *H. pterosticha* comb. n. (male). 371, lateral aspect of genitalia; 372, posterior aspect of penis valves, 373, ventral aspect of epiphallus; 374, dorsal ectophallic plate; 375, lateral aspect of abdominal tip. 376-378. Female spermatheca. 376, *trimaculata* sp.n.; 377, *aethiopica* comb.n.; 378, *pterosticha* comb.n. All scale lines represent 1 mm; that under Fig. 371 also applies to 372 and 374; that under Fig. 373 also applies to 376-378; that under Fig. 375 applies to that figure only.

spots or bands, sometimes with indistinct dorsal band. Posterior tibiae uniformly light red-crimson on all surface, no evidence of banding below knee as in all other members of the genus.

COMMENTS. The monotypic genus *Thisoicetrinus* was erected by Uvarov (1921) for *dorsatus* Fischer de Waldheim, 1839, however *pterosticha* Fischer de Waldheim, 1833 has priority.

His new genus was characterized by having long antennae, strongly rounded pronotum and attenuated subgenital plate. None of these characters are considered here to be of any generic importance. Furthermore an examination of the male genitalia has shown them to be typically *Heteracris* in structure. The aedeagal structure of *pterosticha* shares some affinities with that in *pulchra*, *adspersa* and *caloptenoides*, differing from the latter in having more elongate cingular valves. The structure of the female spermatheca (Fig. 378), although smaller, does not depart radically from the rather conservative structure seen in females of other species of *Heteracris* (compare Figs. 20, 20a, 376-378).

Dr. Gorochov has kindly informed me that the type of *pterosticha*, which was thought to be deposited at Leningrad, cannot be traced there; possibly the original material is destroyed. The above diagnosis is based on material from Turkey in the collections of the BMNH.

This species is easily distinguished from other Palaearctic members of the genus by the pattern of the tegmen, posterior tibiae lacking proximal banding, presence of fastigium verticis with a median carinula and elongate structure of the subgenital plate. Internally the aedeagal structure appears most closely allied to *H. adspersa*, but differs in not having a tectiform dorsal ectophallic plate. The overall size of this species and presence of a fastigium verticis with a median carinula is also shared with *notabilis*.

TYPE MATERIAL EXAMINED

Acridium dorsatum Fischer de Waldheim, holotype female, **USSR** (no further label data) (ZI).

ADDITIONAL MATERIAL EXAMINED

Turkey: 3 males, Kars, Kara Su Springs, 28-30.viii.1960 (*Guichard & Harvey*)(BMNH); 2 males, 3 females, Kars, Peyhanli, 31.viii-10.ix.1960 (*Guichard & Harvey*)(BMNH); 1 male, 6 females, Kars, nr. Ararat, Erhaci Golu, 30.viii.1960 (*Guichard & Harvey*) (BMNH); 21 males, 31 females, Urfa, vii.1931 (*Bey*)(BMNH). **Iraq:** 1 male, 3 females, Baghdad, summer 1923 (*Hingston*)(BMNH); 1 male, 1 female, Basra, Du'Aiji, 15.vi.1937 (*Meymarian*)(BMNH). **Iran:** 2 females, Fars, nr. Shiraz, 20.vii.1950 (*Wiltshire*)(BMNH); 3 males, 1 female, Kuh Bamu, nr. Shiraz, 7.ix.1949 (*Wiltshire*)(BMNH); 1 male, 1 female, Uaranek, 13.viii.1948 (*Aellen*)(BMNH); 1 male, Negar, S. of Kirman, vii-x.1950 (*Ox. Univ. expedit.*)(BMNH). **S. USSR:** 1 female, Astrakhan, 1916 (*Sacharow*)(BMNH).

Heteracris pulchra (I. Bolivar)

(Figs. 364-370, Map 7)

Euprepocnemis pulchra I. Bolivar, 1902:630. Holotype male, INDIA (MNHN) [examined].

Thisoicetrus pulcher (I. Bolivar) I. Bolivar, 1914:23.

Heteracris pulchra (I. Bolivar) Dirsh, 1958a:54.

DIAGNOSIS. Male. Aedeagus (Fig. 365) with cingular valves just surpassing tips of apical penis valves. Epiphallus, ventral aspect, with lobate lophi, posterior margin sinuate (Fig. 366). Posterior edge of dorsal ectophallic plate broadly rounded with apical concavity (Fig. 367). Fastigium of vertex with weak median carinula, less developed than that seen in Malagasy species.

General coloration brown with yellow-green stripe markings typical for genus. Pronotum with broad median stripe, margined by darker narrow stripes, incurved between anterior edge of pronotum and first sulcus; median stripe between first and second sulci more lightly pigmented with darker marginal narrow stripes absent (Fig. 368). Tegminal cells clear, or slightly infumate brown with only few more heavily pigmented cells. Hind wings with basal blue tinge. Externomedian area of posterior femur brown-yellow without black-brown spots or bands; inner surface with upper proximal, median and distal brown-black spots (Fig. 369). Dorsal surface with corresponding proximal, median and distal transverse bands, lacking or weakly developed in *notabilis*. Outer lateral surface of posterior tibiae with consecutive small dark brown, dirty yellow, brown bands, remainder scarlet. Apical process of cercus wider than basal stem, about as long as or slightly shorter than basal stem (Fig. 370).

Table 35

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 12 | 0.89 | 0.79-1.10 | 0.083 | 9 | 1.70 | 1.44-1.85 | 0.14 |
| Head width | 12 | 4.83 | 4.43-5.58 | 0.32 | 9 | 6.84 | 6.07-7.19 | 0.35 |
| Pronotal width | 12 | 5.03 | 4.44-5.85 | 0.36 | 9 | 9.19 | 8.25-9.75 | 0.49 |
| Pronotal length | 12 | 5.19 | 4.70-5.39 | 0.45 | 9 | 9.14 | 8.35-9.73 | 0.43 |
| Hind femur depth | 11 | 4.03 | 3.69-4.85 | 0.36 | 8 | 6.62 | 6.26-7.71 | 0.48 |
| Hind femur length | 12 | 17.19 | 15.28-20.80 | 1.45 | 8 | 29.87 | 27.94-31.58 | 1.18 |
| Tegminal length | 10 | 20.28 | 18.07-24.80 | 2.12 | 8 | 36.47 | 33.26-38.78 | 1.61 |
| Antennal length | 8 | 11.49 | 9.82-13.30 | 1.03 | 6 | 16.22 | 14.68-17.15 | 1.03 |
| Total length | 11 | 29.60 | 26.62-35.79 | 2.49 | 8 | 49.81 | 46.16-50.94 | 1.89 |

COMMENTS. This species is clearly very closely related to *notabilis*. It also appears to share some affinity with the *cyanescens* group on the basis of its aedeagus having cingular valves which just surpass the apical penis valves. The presence of the fastigium of vertex with a median carinula suggests a link with the Malagasy species, in particular *zlotarevskyi*, with which it also shares similar epiphallic structure. *H. pulchra* appears to be confined in its distribution to Southern India and Sri Lanka. It may be distinguished from *notabilis* by the presence of the dorsal pronotal stripe with a lighter coloured spot between the first and second sulci.

TYPE MATERIAL EXAMINED

Holotype male *Euprepocnemis pulchra* I. Bolivar, **India**, no further data (*Castes*) (MNHN).

ADDITIONAL MATERIAL EXAMINED

India: 1 male, Sethumadai, 20 km S.W. of Pollachi, 25.iv.1937 (*BMNH.-CM. expedit*)(BMNH); 3 males, 1 female, Dohnavur, Tirunelveli, 3.x.1938 (*BMNH.-CM. expedit*)(BMNH); 11 males, 11 females, Alagar Kovil, Madurai, 19.iii.1936 (*BMNH.-CM. expedit*); 1 male, 1 female, Coimbatore, 24.iii.1915 (*C.K.S. coll.*)(BMNH); 3 males, Anaimala Village, nr. Pollachi, 25.iv.1937 (*BMNH.-CM. expedit*); 4 males, 2 females, Madras State, Coimbatore, ix.1965 (*Nathan*)(BMNH); 1 female, Madras, viii.1924 (BMNH); 1 female; 1 male, Coimbatore, 29.vii.1910 (*Roa*)(BMNH). **Sri Lanka:** 2 males, 2 females, 1912 (*Green*)(BMNH); 1 male, Anu distr., Padayiya, 2-8.xi.1970 (*Flint*)(NRI); 1 male, Horowupotana, no coll., 9.x.1924 (BMNH); 1 female, Trincomalie, ix.1909, no coll., (BMNH).

Heteracris vinacea (Sjöstedt)

(Figs. 343-348, Map 7)

Thisiocetrus coerulipes var. *vinacea* Sjöstedt 1923:37. Holotype male, ZAIRE (NR) [examined].

Heteracris vinaceus (Sjöstedt) Dirsh, 1970:208

DIAGNOSIS. Male. Aedeagus as in Fig. 348 with cingular valves slightly shorter and wider than those of *brevipennis*. Posterior margin of dorsal ectophallic plate broadly rounded with small median, bulbous apex. Epiphallus, ventral aspect, heavily sclerotized with bilobed, tooth-like lophi, outermost longer than inner pair (Fig. 345); proximal process of inner lophal interspace reduced, extending distally, showing dorsal lip development as in *herbacea* group, but without tubercles (Fig. 346). Tegmina without spots or bands but tinged by underlying wine-red coloration of hind wing. Whole surface of hind wing wine-red. Posterior femur with markings similar to those of *attenuata*. Outer, lateral surface of posterior femur with successive small black, yellow, black bands below knee, remainder wine-red. Cercus (Fig. 347) same width along entire length, basal stem longer than apical process.

Table 36

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 23 | 1.09 | 0.94-1.25 | 0.070 | 6 | 1.61 | 1.44-1.79 | 0.13 |
| Head width | 23 | 5.18 | 4.70-5.58 | 0.22 | 6 | 6.39 | 6.06-6.95 | 0.34 |
| Pronotal width | 23 | 4.82 | 4.18-5.16 | 0.28 | 6 | 7.76 | 7.11-9.09 | 0.71 |
| Pronotal length | 23 | 5.04 | 4.38-5.51 | 0.33 | 6 | 7.96 | 7.20-9.04 | 0.68 |
| Hind femur depth | 22 | 3.73 | 3.27-4.01 | 0.19 | 6 | 5.24 | 4.88-6.17 | 0.52 |
| Hind femur length | 22 | 16.29 | 14.64-17.48 | 0.75 | 6 | 23.62 | 21.68-26.31 | 1.65 |
| Tegminal length | 23 | 19.79 | 19.10-22.13 | 4.17 | 6 | 28.36 | 25.25-31.62 | 2.61 |
| Antennal length | 12 | 15.11 | 14.49-16.45 | 4.32 | 5 | 17.48 | 16.34-19.24 | 1.44 |
| Total length | 22 | 28.35 | 24.66-30.20 | 1.33 | 6 | 41.29 | 38.00-47.19 | 3.97 |

COMMENTS. The wine-red coloration of the hind wings distinguishes this species from any other member of the genus. The size and general coloration of *vinacea* is also shared by some members of the *pulchripes* group, yet the structure of the internal genitalia indicates some affinity to elements within other groups. The aedeagal structure is similar to that seen in both *brevipennis* (Fig. 322) and *calliptamoides* (Fig. 206), however the latter differs by the presence of a median carinula along the fastigium verticis. The epiphallus is heavily sclerotized with tooth-like lophi, again suggesting links with *brevipennis*. The margins of the lophal interspace shows similar development to that seen in the *nigricornis* group, which however is not the case in *brevipennis*.

TYPE MATERIAL EXAMINED

Thisiocetrus coerulipes var. *vinacea* Sjöstedt, holotype male, **Zaire**: Ituri, no date (*Gyldenstolpe*) (NR).

ADDITIONAL MATERIAL EXAMINED

Zaire: 3 males, 1 female, La Chute Forest, Rutchuru, 9.viii.1949 (*Burt*) (BMNH); 1 male, Beni Forest, ix.1947 (*Gedye*) (BMNH). **Uganda**: 1 male, Toro, Bwamba For. Res., 2.v.1962 (*Jago*) (NRI); 10 males, 1 female, Bunyoro, Bugoma For. Res., S. of Hoima, 29-31.v.1964 (*Jago*) (NRI); 1 male, Toro, SE. of Fort Portal, Kibale For. Res., 13-16.viii.1964 (*Jago*) (NRI); 2 males, Toro, Fort-Portal-Bundebugyo rd., 10.viii.1964 (*Jago*) (NRI); 1 male, 2 females, Kibale Forest, 12.ix.1986 (*Ritchie*) (NMK); 2 males, Buganda, Mpanga For. Res., 33.6 km Kampala-

Masaka rd., 2-3.viii.1964 (*Jago*)(NRI); 2 males, W. of Masindi, Budongo For. Res., 25-27.viii.1964 (*Jago*)(NRI); 2 males, 2 females, Buganda, Mabira For. Res., nr. Tinija, (*Jago*)(NRI); 1 male, 32 km W. of Kampala, x.1952 (*Pinhey*)(NMK); 1 female, Kibale For. Res., 10.iii.1985 (*Nummein*)(NMK); 14 males, 1 female, Mabira Forest; 1.iv.1934 (*Johnston*)(BMNH); 1 female, Mabira Forest, 28.vi.1913 (*Gowdey*)(BMNH); 2 males, Budongo Forest, Masindi, xi.1931 (*Johnston*)(BMNH); 1 male, Bunyoro, Budongo Forest, 5.vi.1935 (*Johnston*)(BMNH); 2 males, x.1912 (*Gowdey*)(BMNH); 4 males, 1 female, Katera Forest, Masaka, x-xi.1953 (*Van Someren*)(BMNH); 3 females, Tero Forest, vii.1912 (*Gowdey*)(BMNH); 1 female, Entebbe, 12-16.v.1914, 13-17.1.1913 (*Gowdey*)(BMNH). **Kenya:** 1 male, Kaimosi Tea Estate, forest relic, 28.x.1982 (*Jago*)(NRI); 1 male, Kakamega, viii.1958 (*Goodall*)(NMK).

H. nigricornis species-group

DIAGNOSIS. Male. Cingular valves longer than apical penis valves (Figs. 381, 385, 394). Inner margins of lophal interspace with highly modified proximal process (Figs. 380, 386, 397), like those of *herbacea* group, but without tubercles. Median carinula of fastigium verticis prominent, raised (Fig. 384). General coloration brown variably expressed with yellow markings typical for genus. Tegmen hyaline, without spots. Hind wings with blue tinge at base, apical cells slightly infumate, bordered by darkly pigmented veins.

COMMENTS. The fastigium verticis in all indigenous Madagascar species has a distinct median carinula (Figs. 384, 411). The following species, *nigricornis*, *antennata*, and *concinnicrus* form a natural grouping of closely related species characterized as follows: very long cingular valves; heavily sclerotized epiphalli with highly developed lophal interspace margins; similar coloration and femoral markings; progressive widening of the median antennal segments, and raised median carinula of fastigium verticis. The structure, sclerotization and development of the epiphallal lophal interspace margins and presence of a median carinula of the fastigium verticis suggest affinities to members of the South African *herbacea* species-group. Yet the very long cingular valves (short and wide in the *herbacea* group) are reminiscent of the type seen in *leani* and *brevipennis*. The epiphallal lophi show a sequential elongation in the outer posterior lobe from *concinnicrus* through to *antennata*.

The ungrouped species *zolutarevskyi*, *sikorai* and *reducta* by implication, (genitalia missing) are characterized by the possession of similar-shaped epiphalli. The lophal interspace margins of the epiphallus of this group are not recessed or folded, and are generally less robust and sclerotized than in the previous group. The cingular valves are also considerably shorter, being of a similar structure to those of the *pulchripes* group (compare Figs. 315 and 421).

Heteracris finoti, also ungrouped, is the largest known species from Madagascar. It is a distinctive species of uncertain affinity. It resembles *concinnicrus* in tegminal and femoral coloration, shape of fastigium verticis and having antennae with median segments longer than wide, but differs principally in genitalic morphology. The genitalia are not of the type seen in the *nigricornis* group, which are characterized by having long cingular valves and more heavily sclerotized epiphalli. Although the endophallus is comparatively larger than that of *zolutarevskyi*, some similarity is evident in the structure of their aedeagi, both being of similar size and having shorter cingular valves than in the *nigricornis* group. The epiphallus of *finoti* differs from that of *zolutarevskyi* principally in size and shape, being larger and with more square-shaped lophi in the former species.

The species *nobilis* Brancsik (1893) has not been included in this discussion because no material is available for study. Dirsh (1962) has stated that the unique female type was lost and went on to say that it differed from *finoti* by the absence of the dark longitudinal stripe on the dorsum of the pronotum and by the single transverse stripe on the external side of the posterior femur. In that same paper, he described two new monotypic epyreopneimidine genera, the brachypterous *Malagacetrus* and the fully-winged *Tenebracris*. The former is easily distinguished by its brachypterous condition, whilst *Tenebracris* is distinguished by its very distinctive alternate red and black oblique posterior femoral markings.

The available data on the life history, distribution, ecology and economic importance of some of these species have been reviewed elsewhere (Wintrebert 1972; Descamps & Wintrebert 1966).

Heteracris antennata (I. Bolivar)
(Figs. 379-384, Map 8)

Horaeocerus antennata I. Bolivar 1914:30. Holotype male, MADAGASCAR (MCSN). Syn. by Wintrebert, 1972:78. [examined]

DIAGNOSIS. Male. Cingular valves very long, slender, tips slightly bifurcate, partially protected by extensive hood derived from cingular rami; apical penis valves divergent apically (Fig. 381). Epiphallus (Fig. 379), large, robust, sclerotized; lophal interspace modified, recessed, folded distally (Fig. 380). Dorsal ectophallic plate (Fig. 399), posterior margin, more square-shaped than *concinnicrus*, slightly emarginate. Median antennal segments compressed, widened (Fig. 382), being much wider than interocular distance. Median carinula of fastigium of verticis elevated (Fig. 384). Cercus (Fig. 383) short, stocky, apical process slightly wider than basal stem, about as long as basal stem.

General coloration brown-green with light yellow-green stripe markings typical of genus. Antennae black on both surfaces with dorsal third white-grey. Sides of abdomen yellow with vertical black bands; cercus dark red-purple. Cells of tegmen clear without infuscate brown spots or bands, base of hind wings generally blue. External and inner surface of posterior hind femur yellow with boldly marked contrasting black upper proximal spot, oblique median transverse band (often merging with proximal band), and distal band, same as in *concinnicrus* (see Figs. 388-389). Posterior tibiae, outer lateral surface, below knee with small black, yellow, black band sequence, remainder pale purple.

Table 37

Measurements (mm)

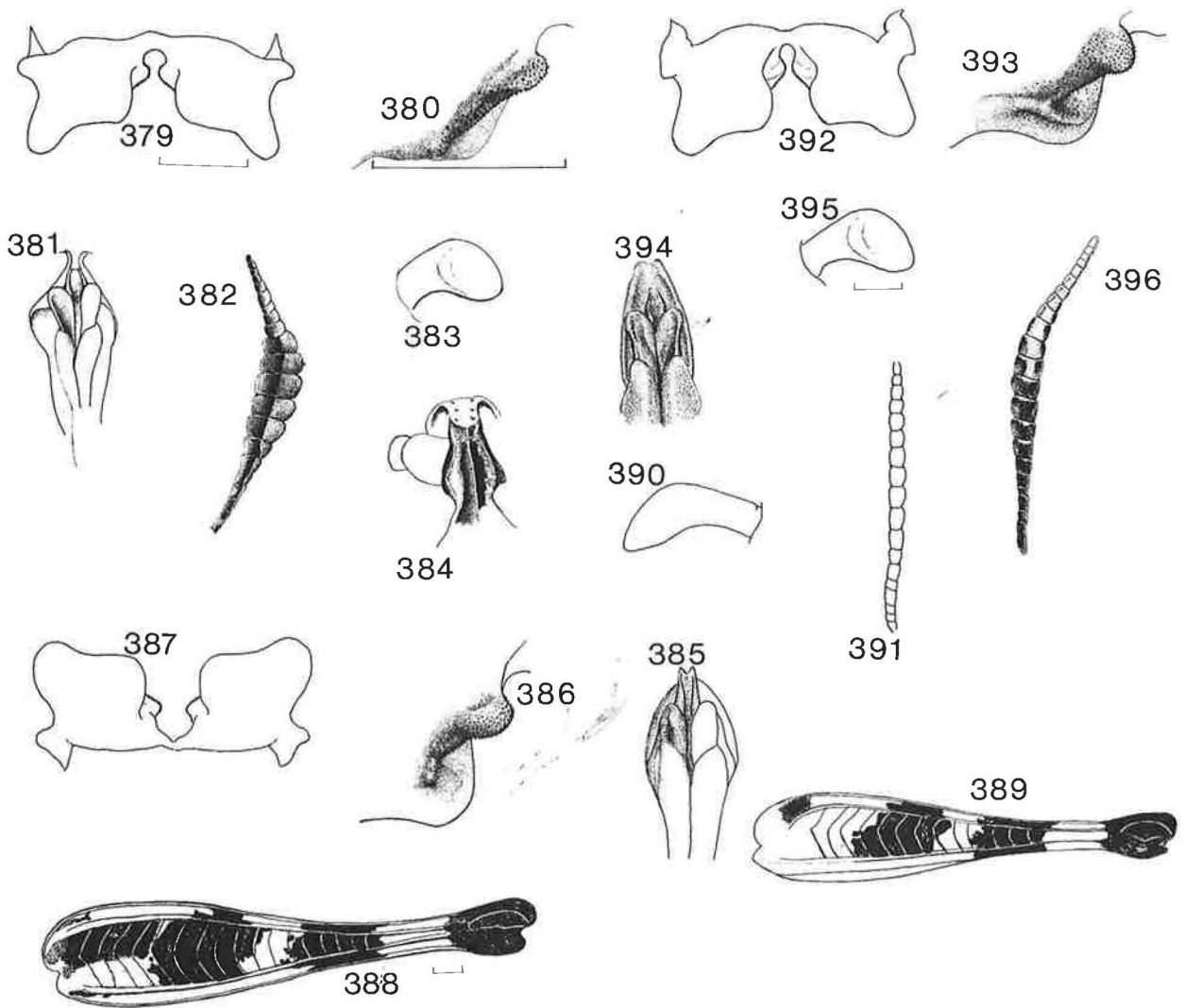
| | Males | |
|-------------------|-------|-------|
| | n | |
| Interocular dist. | 1 | 0.96 |
| Head width | 1 | 5.04 |
| Pronotal width | 1 | 5.22 |
| Pronotal length | 1 | 5.65 |
| Hind femur depth | 1 | 3.83 |
| Hind femur length | 1 | 17.44 |
| Tegminal length | 1 | 21.91 |
| Antennal length | 1 | 12.53 |
| Total length | 1 | 30.68 |

COMMENTS. The male holotype has been somewhat discoloured because of previous preservation in spirit.

After examining both the types of *Horaeocerus antennata* and *H. nigricornis* I am in agreement with Wintrebert's synonymy of *Horaeocerus* under *Heteracris*. As mentioned above, the internal genitalia show some affinity to the *herbacea* group and also to the species *H. vinacea*.

TYPE MATERIAL EXAMINED

Holotype male I. Bolivar, **Madagascar**, no date (*Brunner coll.*) (MCSN).

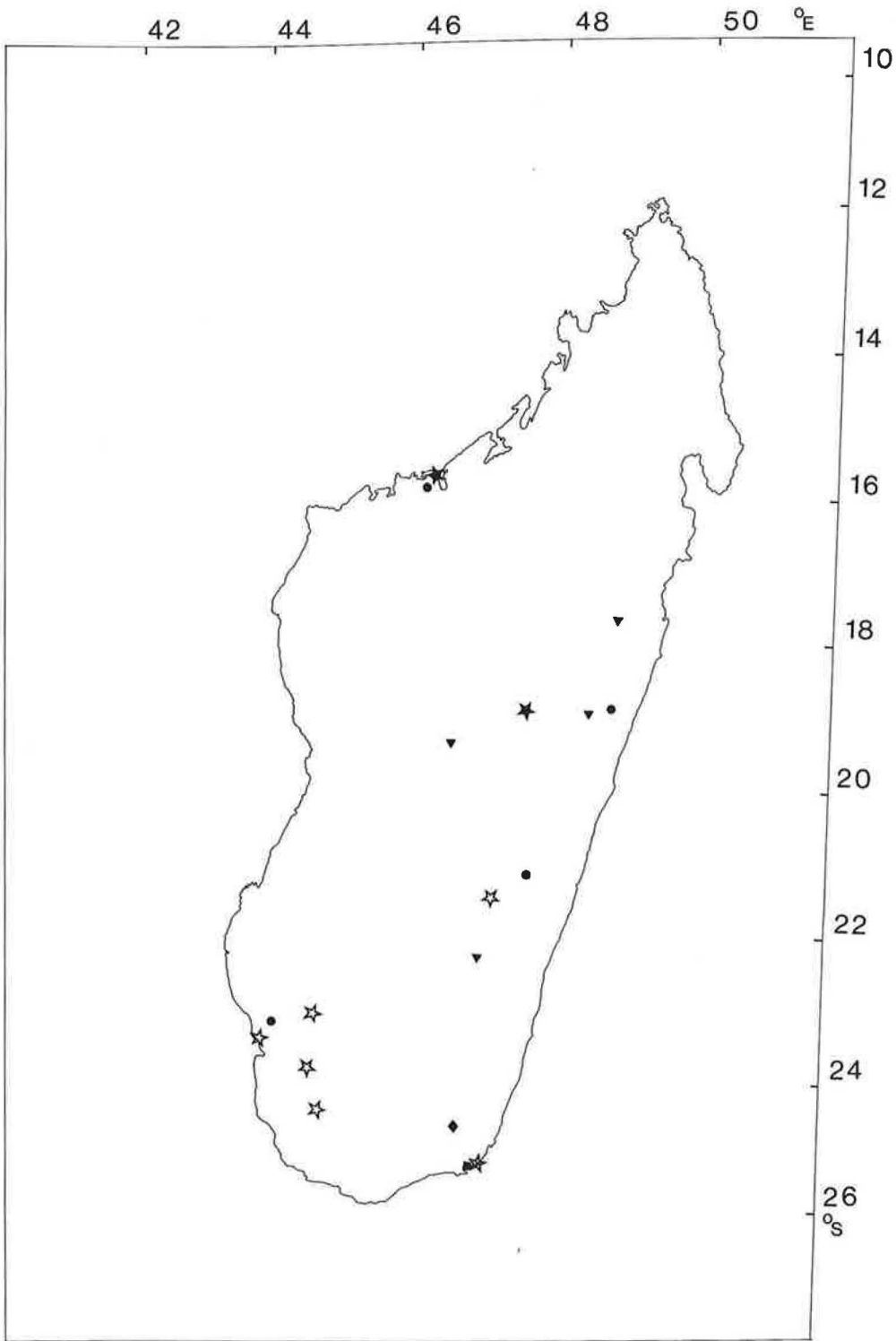


Figures 379-396

Heteracris species (males). 379-384. *H. antennata*. 379, epiphallus, ventral aspect; 380, same, dorsal aspect of lophal interspace margin; 381, posterior aspect of penis valves; 382, dorsal aspect of right antenna; 383, left cercus; 384, dorsal aspect of fastigium verticis. 385-391. *H. concinnicus*. 385, posterior aspect of penis valves; 386, epiphallus, dorsal aspect of lophal interspace margin; 387, same, ventral aspect; 388, left hind femur, outer aspect; 389, same, inner aspect; 390, left cercus; 391, dorsal aspect of right antenna (apical segments missing). 392-396. *H. nigricornis*. 392, epiphallus, ventral aspect; 393, same, dorsal aspect of lophal interspace margin; 394, posterior aspect of penis valves; 395, left cercus; 396, dorsal aspect of right antenna. All scale lines represent 1 mm; that under Fig. 379 also applies to 392, 387; that under Fig. 380 also applies to 381, 393-394, 385-386; that under Fig. 395 also applies to 383-384 and 390; that under Fig. 388 also applies to 382, 391, 396 and 389.

Heteracris concinnicus Descamps & Wintrebert 1966
(Figs. 385-389, 397-398, Map 8)

Heteracris concinnicus Descamps & Wintrebert 1966:30. Holotype male, MADAGASCAR (MNHN) [examined].



Map 8

Distribution of *Heteracris* species in Madagascar. Open stars *H. zolotarevskyi*; circles, *H. nigricornis* (combined star and circle signify sympatric localities); square, *H. concinnicus*, diamond, *H. reducta*; triangle, *H. sikorai*. The distributions of *H. finoti* and *H. antennata* were omitted because of insufficient locality data.

DIAGNOSIS. Male. Aedeagus as in Fig. 385, cingular valves slender, long, apically bifurcate, much longer than apical penis valves (Fig. 397). Dorsal ectophallic plate as in Fig. 398. Epiphallus moderately sclerotized, inner margins of lophal interspace recessed (Fig. 386); ventral surface as in Fig. 387. Interocular distance wider than maximum width of antennae, median segments of antenna longer than wide (Fig. 391). Tegminal cells clear, bordered by darkened veins, without spots or pattern; hind wings with blue tinge at base. External surface of posterior femur yellow with a bold black upper proximal stripe (fusing with median oblique band) and with distal black band; inner surface with small black proximal spot, median and distal black bands (Figs. 388-389). Outer, lateral surface of posterior tibiae below knee, with consecutive small black, yellow, black bands, unspined surface dirty yellow, spined surface faded red-violet. Apical process of cercus wider than basal stem, about as long as or slightly longer than basal stem (Fig. 390). General body colour brown-yellow with yellow stripe markings typical for genus.

Table 38

Measurements (mm)

| | Males | |
|-------------------|-------|-------|
| | n | |
| Interocular dist. | 1 | 1.20 |
| Head width | 1 | 5.09 |
| Pronotal width | 1 | 6.74 |
| Pronotal length | 1 | 6.87 |
| Hind femur depth | 1 | 4.50 |
| Hind femur length | 1 | 19.77 |
| Tegminal length | 1 | 25.59 |
| Antennal length | — | — |
| Total length | 1 | 34.93 |

COMMENTS. Only the male holotype was available for study.

TYPE MATERIAL EXAMINED

Holotype male Descamps & Wintrebert, **Madagascar**: Andrahomana, (entre Cap Ste Marie et Fort-Dauphin), vi.1926 (*Decary*) (MNHN).

Heteracris nigricornis (Saussure)

(Figs. 390-396, Map 8)

Horaecerus nigricornis Saussure, 1899:635. (Unknown number of syntypes) (MHN?).

Heteracris nigricornis (Saussure) Wintrebert 1972:78

DIAGNOSIS. Male. Differs from *antennata* in having: interocular distance wider than maximum width of antenna, median antennal segments about as wide as long (Fig. 396), and in the shape of epiphallic lophi, (compare Figs. 392, 379).

COMMENTS. Type material of this species, thought to be deposited at Geneva, was unavailable for study. Dr. Amedegnato (Paris) has kindly informed me that three specimens deposited at Paris may also be part of the syntype series. One male has been examined.

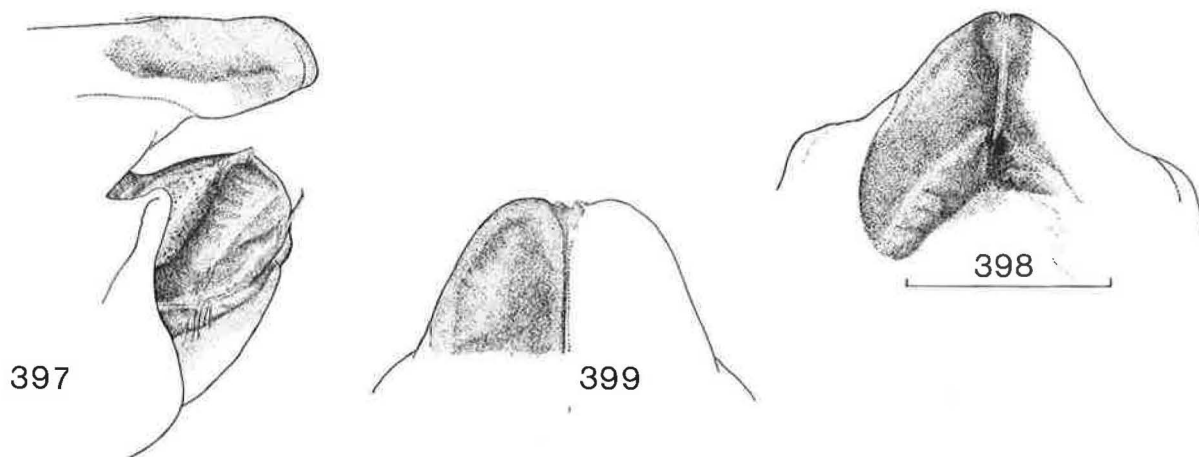
Table 39

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|-------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 13 | 1.11 | 0.96-1.21 | 0.090 | 8 | 1.62 | 1.44-1.82 | 0.13 |
| Head width | 13 | 5.24 | 5.04-5.57 | 0.18 | 8 | 6.44 | 5.70-7.54 | 0.52 |
| Pronotal width | 13 | 5.64 | 5.41-5.78 | 0.15 | 8 | 8.26 | 7.47-8.70 | 0.36 |
| Pronotal length | 13 | 5.77 | 5.49-6.09 | 0.21 | 8 | 8.49 | 7.68-9.73 | 0.64 |
| Hind femur depth | 13 | 3.89 | 3.57-4.18 | 0.19 | 8 | 5.26 | 4.86-5.87 | 0.32 |
| Hind femur length | 13 | 19.07 | 17.87-20.76 | 0.84 | 8 | 26.10 | 24.89-27.19 | 0.85 |
| Tegminal length | 13 | 23.02 | 20.88-26.20 | 1.45 | 8 | 35.74 | 32.16-39.88 | 2.28 |
| Antennal length | 7 | 12.29 | 10.91-13.68 | 0.83 | 4 | 15.84 | 14.22-17.35 | 1.38 |
| Total length | 13 | 33.05 | 31.31-36.07 | 1.23 | 8 | 44.57 | 41.20-49.17 | 2.47 |

MATERIAL EXAMINED

Madagascar: 8 males, 3 females, Majunga, 25.ii-3.iii.1968 (*Guichard*)(NRI); 1 male, Andobo, forest, ii.1957 (*Grivaud*)(NRI); 5 males, 2 females, Tananarive, 27.i.1972 (*Blommers*)(ZMA); 1 male, 1 female, Ifanadiana, Ranomafana, 900 m, 1.i.1972 (*Blommers*)(ZMA); 1 male, 1 female, Rogez, xii.1931 (*Seyrig*)(NRI); 1 male, 2 females, Tananarive, 10.iii.1958 (*Guichard*)(NRI); 2 females, Tananarive, ii.1966 (*Allard*)(NRI); 2 females, Anjamala, 1.v.1927 (*Zolotarevsky*)(BMNH); 1 female, Beiteta, 28.xii.1927 (*Zolotarevsky*)(BMNH).



Figures 397-399

Heteracris species (males). 397, *H. concinnicrus*, lateral aspect of genitalia; 398, same, dorsal ectophallic plate; 399, *H. antennata*, dorsal ectophallic plate. Scale line under Fig. 398 represents 1mm and also applies to 397 and 399.

Ungrouped species

Heteracris finoti (I. Bolivar)

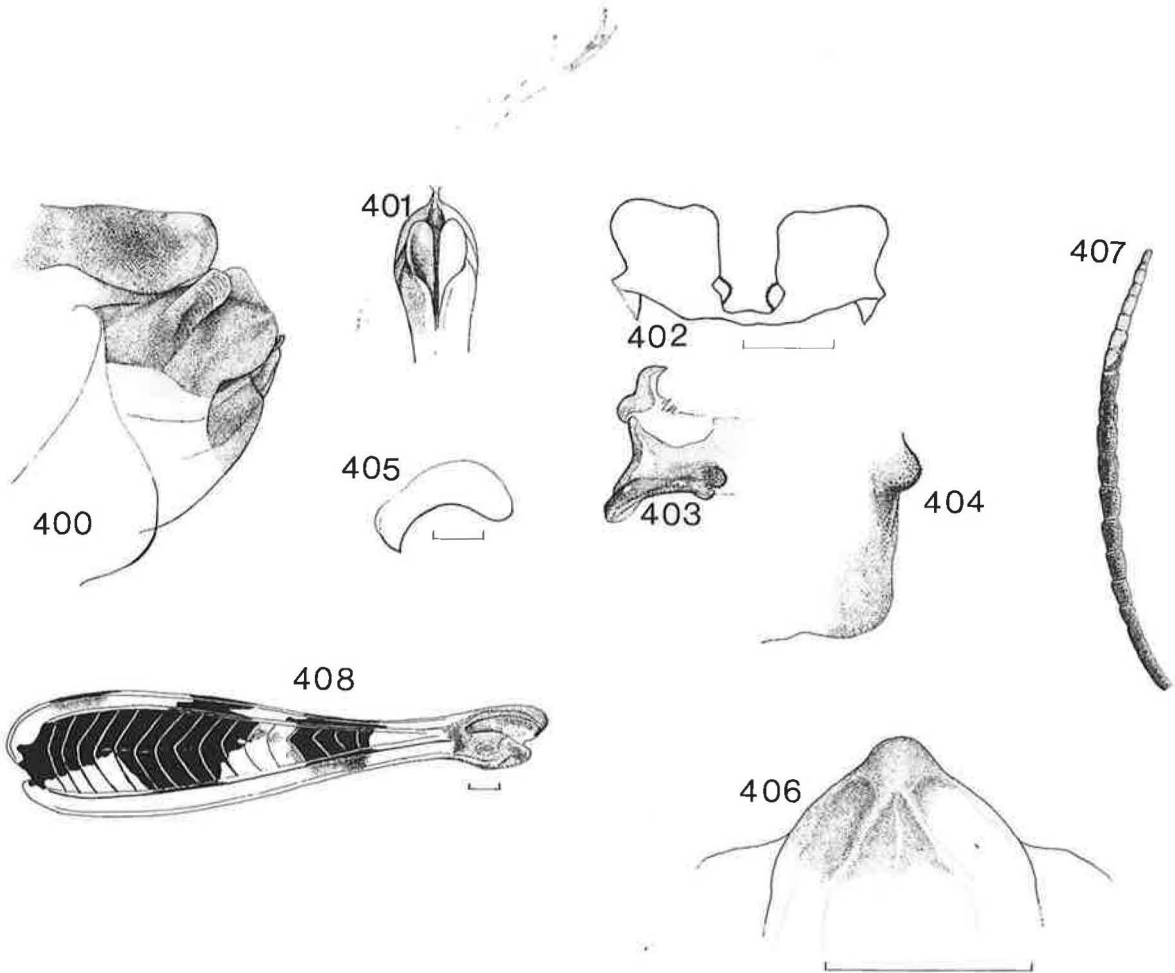
(Figs. 400-409)

Thisoicetrus finoti I. Bolivar, 1914:24. Holotype male, MADAGASCAR, Sainte Marie, (IEE) [examined].

Thisoicetrus praestans Carl, 1916:500. Holotype male, MADAGASCAR (MHN).
Syn. Dirsh, 1962:319

Heteracris finoti (I. Bolivar) Dirsh 1958a:54

DIAGNOSIS. Male. Aedeagus (Figs. 400-401), cingular valves surpassing apical penis valves but much shorter than those of *nigricornis* group. Posterior edge of epiphallus almost straight (ventral aspect Fig. 402), less angled than those of *concinnicrus*; slightly indented medially. Inner margin of lophal-interspace weakly recessed (Fig. 404), without tubercles (Fig. 403), in this respect resembling that of *zlotarevskyi*. Antennal segments longer than wide (Fig. 407), like *concinnicrus*. Dorsal ectophallic plate (Fig. 406) roundly triangulate, apex slightly bulbous. Tegminal and femoral markings like those of *concinnicrus*; posterior tibiae below knee lunule with consecutive small, black, yellow, black-red bands, remainder bright crimson. Apical process of cercus wider than basal stem, about as long as basal stem (Fig. 405).



Figures 400-408

Heteracris finoti (male). 400, lateral aspect of genitalia; 401, posterior aspect of penis valves; 402, epiphallus, ventral aspect; 403, same, posterior aspect; 404, same, dorsal aspect of lophal interspace margin; 405, left cercus; 406, dorsal ectophallic plate; 407, dorsal aspect of right antenna (apical segments missing); 408, outer aspect of left hind femur. All scale lines represent 1 mm; that under Fig. 406 also applies to 400-401 and 404; that under Fig. 402 also applies to 403; that under Fig. 405 applies to that figure only; that under Fig. 408 also applies to 407.

Table 40

Measurements (mm)

| | Males | |
|-------------------|-------|-------|
| | n | |
| Interocular dist. | 1 | 1.27 |
| Head width | 1 | 6.21 |
| Pronotal width | 1 | 6.34 |
| Pronotal length | 1 | 7.39 |
| Hind femur depth | 1 | 5.08 |
| Hind femur length | 1 | 21.31 |
| Tegminal length | 1 | 27.69 |
| Antennal length | 1 | 17.61 |
| Total length | 1 | 40.86 |

COMMENTS. Only the badly discoloured male holotype was available for study. The synonymy of *praestans* cannot be confirmed because the type of this species was unavailable for study.

Heteracris reducta Dirsh

(Figs. 409-412, Map 8)

Heteracris reducta Dirsh, 1962:323. Holotype male, MADAGASCAR (MNHN) [examined].

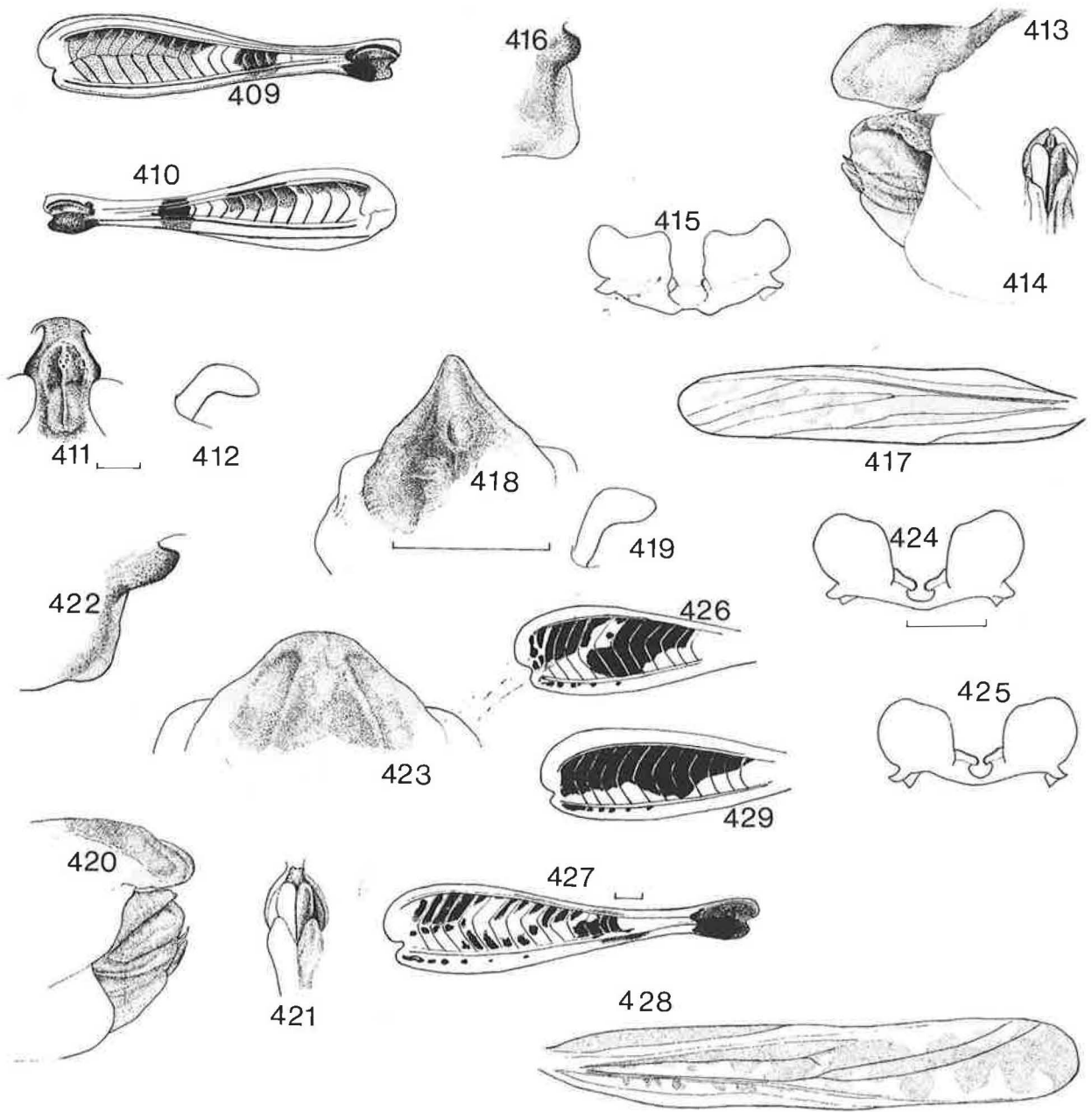
DIAGNOSIS. Male. Internal genitalia missing. Tegmen and wings shortened, only reaching to supra-anal plate; tegminal cells hyaline, bordered by darkened veins, costal area with yellow stripe, hind wings blue at base, apical cells slightly infumate, bordered by darkened veins. Antennae filiform, shorter than length of head and pronotum together. Posterior femur, external surface, yellow with weak brown proximal stripe running below upper carina, small brown distal spot present (Figs. 409-410); inner surface like external surface but with proximal red flush continuing distally along ventral surface. Genicular lunules brown-black on all surfaces. Posterior tibiae with small black band below genicular lunule followed by consecutive yellow, red-brown bands, remainder bright red. Apical process of cercus as wide as or wider than basal stem, about as long as basal stem (Fig. 412).

Table 41

Measurements (mm)

| | Males | | Females | |
|-------------------|-------|-------|---------|-------|
| | n | | n | |
| Interocular dist. | 1 | 1.02 | 1 | 1.51 |
| Head width | 1 | 4.84 | 1 | 5.28 |
| Pronotal width | 1 | 4.96 | 1 | 6.91 |
| Pronotal length | 1 | 5.19 | 1 | 7.22 |
| Hind femur depth | 1 | 3.56 | 1 | 4.52 |
| Hind femur length | 1 | 15.77 | 1 | 21.77 |
| Tegminal length | 1 | 12.63 | 1 | 18.25 |
| Antennal length | — | — | 1 | 9.74 |
| Total length | 1 | 27.30 | 1 | 35.89 |

COMMENTS. Because the internal genitalia are missing from the male holotype, and as no other specimens were available for study, this species cannot be accurately classified. It appears to be most closely related to *zlotarevskyi* judging by a drawing of the epiphallus in Dirsh (1962). This species is easily distinguished from other Malagasy species by its reduced tegmina.



Figures 409-429

Heteracris species (males). 409-412. *H. reducta*. 409, left hind femur, outer aspect; 410, same, inner aspect; 411, dorsal aspect of fastigium verticis; 412, left cercus. 413-419. *H. sikorai*. 413, lateral aspect of genitalia; 414, posterior aspect of penis valves; 415, epiphallus, ventral aspect; 416, same, dorsal aspect of lophal interspace margin; 417, lateral aspect of right tegmen; 418, dorsal ectophallic plate; 419, left cercus. 420-429. *H. zolotarevskyi*. 420, lateral aspect of genitalia; 421, posterior aspect of penis valves; 422, dorsal aspect of lophal interspace margin; 423, dorsal ectophallic plate; 424, epiphallus, ventral aspect, *H. zolotarevskyi* holotype; 425, same, *H. uvarovi* paratype; 426, left hind femur, outer aspect; 427, same, showing variation; 428, left tegmen; 429, outer aspect of hind femur, showing variation. All scale lines represent 1 mm; that under Fig. 411 also applies to 412 and 419; that under Fig. 418 also applies to 413-414, 416, 420-423; that under Fig. 424 also applies to 415 and 425; that above Fig. 427 also applies to 409-410, 417, 426-429.

TYPE MATERIAL EXAMINED

Holotype male, **S. Madagascar**: Andohahela Nat. Res., 1800 m. (MNHN).
Paratype female, as data as holotype (BMNH).

Heteracris sikorai (I. Bolivar)
(Figs. 413-419, Map 8)

Thisoicetrus sikorai I. Bolivar, 1914:25. Holotype male, MADAGASCAR (IEE) [examined].

Thisoicetrus brevicornis Carl, 1916:498. Lectotype male, MADAGASCAR (MHN) designated by Dirsh, 1962:321. Syn. Dirsh 1962:321.

Heteracris sikorai (I. Bolivar) Dirsh, 1958a:54.

DIAGNOSIS. Male. Cingular valves moderately long, surpassing tips of apical penis valves, but comparatively shorter than those of *concinnicus* (Figs. 413-414). Dorsal ectophallic plate tectiform, triangular in shape as in *littoralis* group (Fig. 418), in this respect it differs from all other Malagasy species of *Heteracris*. Posterior edge of epiphallus (viewed ventrally) weakly bilobate (Fig. 415); inner margins of lophal interspace not recessed as in *nigricornis* group (Fig. 416). Tegmina reaching to tips of folded hind femur; hyaline, mottled with few faintly expressed, fused infusate cells (Fig. 417). Femoral markings similar to those of *reducta* (see Fig. 409); inner surface at base red-orange, continuing distally along ventral surface. Posterior tibiae below knee, with consecutive small black, yellow, black bands, remainder blue-purple. Cercus as in Fig. 419.

Table 42

Measurements (mm)

| | Males | | Females | |
|-------------------|-------|--------------|---------|--------------|
| | n | | n | |
| Interocular dist. | 2 | 0.95, 1.14 | 2 | 1.79, 1.92 |
| Head width | 2 | 4.15, 4.70 | 2 | 6.57, 5.81 |
| Pronotal width | 2 | 4.18, 4.55 | 2 | 8.05, 7.61 |
| Pronotal length | 2 | 4.31, 4.81 | 2 | 8.42, 8.27 |
| Hind femur depth | 2 | 2.98, 3.22 | 2 | 5.52, 5.26 |
| Hind femur length | 2 | 13.74, 15.35 | 2 | 29.77, 23.42 |
| Tegminal length | 2 | 16.68, 19.41 | 2 | 34.42, 31.84 |
| Antennal length | 1 | 8.67 | — | — |
| Total length | 2 | 23.07, 28.32 | 2 | 48.87, 41.04 |

COMMENTS. The tectiform shape of the dorsal ectophallic plate appears to have arisen independently in this species from those seen in the *littoralis* and *adspersa* groups. The diagnosis of this species was obtained from male material which had been compared with the female holotype.

TYPE MATERIAL EXAMINED

Thisoicetrus sikorai I. Bolivar, holotype female, **Madagascar**: Sikorai, no further data (IEE).

ADDITIONAL MATERIAL EXAMINED

Madagascar: 1 male, Nosivola (no further data)(compared with type of *brevicornis* by Dirsh, 1962) (BMNH), 1 female, Cirque Boby, 200 m, Andringitra-Amhalavao, 12.i.1958 (*Paulian*)(BMNH); 1 female, Perinet, Sahamaloto, 13-17.i.1949 (*Cachan*)(BMNH); 1 male, Ambatolampy, Manjakatempo, 2100 m, xi.59 (*Andria*)(BMNH).

***Heteracris zolotarevskyi* Dirsh**

(Figs. 420-429, Map 8)

Heteracris zolotarevskyi Dirsh, 1962:322. Holotype male, MADAGASCAR (BMNH) [examined].

Heteracris uvarovi Wintrebert, 1972:83. Holotype male, MADAGASCAR (MNHN) [examined]. **Syn. n.**

DIAGNOSIS. Male. Aedeagus as in Figs. 420-421 similar to that of *sikorai*. Epiphallus, ventral aspect (Fig. 424) with broadly lobate lophi, like that of *sikorai*, but more rectangulate in latter species; margins of lophal interspace unmodified. Dorsal ectophallic plate broadly rounded with triangular depression. Antennae filiform, segments only slightly widened and compressed, longer than head and pronotum together. Cercus similar to that of *reducta*.

General coloration variably expressed brown-olivaceous with yellow markings typical for genus. Sides of abdomen yellow with medial black markings. Tegmina reaching to tips of folded hind femur; tegminal cells clear with large areas of fused infusate, brown cells (Fig. 428); costal area of wing with yellow stripe. Hind wings with blue at base, apical cells slightly infumate, bordered by darkened veins. Posterior femur, external surface, yellow with boldly marked black-brown proximal, median and distal spots; ventral surface, at base with short series of small black spots; inner surface yellow with upper proximal spot, median and distal transverse black bands. Posterior tibiae below knee, with consecutive small black, cream-yellow and black bands, remainder blue.

Table 43

Measurements (mm)

| | Males | | | | Females | | | |
|-------------------|-------|-------|-------------|------|---------|-------|-------------|------|
| | n | Mean | Range | SD | n | Mean | Range | SD |
| Interocular dist. | 6 | 0.81 | 0.72-0.89 | 0.07 | 6 | 1.27 | 1.16-1.40 | 0.10 |
| Head width | 6 | 4.79 | 4.60-5.08 | 0.17 | 6 | 5.96 | 5.65-6.44 | 0.28 |
| Pronotal width | 6 | 4.86 | 4.64-5.17 | 0.21 | 6 | 7.83 | 7.50-8.90 | 0.54 |
| Pronotal length | 6 | 5.00 | 4.76-5.26 | 0.18 | 6 | 7.54 | 6.80-9.09 | 0.84 |
| Hind femur depth | 6 | 3.68 | 3.43-3.82 | 0.14 | 6 | 5.05 | 4.82-5.42 | 0.22 |
| Hind femur length | 6 | 16.35 | 14.62-18.00 | 1.24 | 6 | 23.80 | 22.27-25.19 | 0.99 |
| Tegminal length | 6 | 20.83 | 19.37-22.40 | 1.08 | 6 | 33.43 | 31.51-36.52 | 1.85 |
| Antennal length | 4 | 12.55 | 12.27-12.80 | 0.28 | 4 | 14.23 | 12.35-15.25 | 1.36 |
| Total length | 6 | 28.37 | 25.83-30.61 | 1.78 | 6 | 41.18 | 38.28-44.74 | 2.15 |

COMMENTS. This species is easily differentiated from other Madagascan species of *Heteracris* by the presence of clearly defined tegminal markings.

H. uvarovi is synonymized under *zolotarevskyi* because the genitalic structure of this species falls within an acceptable range of variation exhibited in the latter species (compare epiphalli Figs. 424-425).

The markings of the hind femur are variable. The proximal and median markings in the type were somewhat disintegrated into spots as in Fig. 427. In other specimens, from the type series, the proximal and median markings were separated or fused together, the latter being the case in the newly synonymized species *uvarovi* (Figs. 426, 429).

TYPE MATERIAL EXAMINED

Heteracris zolotarevskyi Dirsh, holotype male, **Madagascar**: Ejeda, Betioky-Tulear, 16.ii.1928 (*Zolotarevsky*) (BMNH). Paratypes, 1 male, same data as holotype, 27.i.1928 (BMNH); 1 female same data as holotype; 1 female, same data as holotype, 5.v.1928 (BMNH); 1 male, same data as holotype, 1.iv.1927

(BMNH); 1 male, no further data (BMNH). *Heteracris uvarovi* Wintrebert, paratype male, **Madagascar**: Berangotra, 26 km S. of Fianarantsoa, 1.iv.1968 (Wintrebert)(MHN).

ADDITIONAL MATERIAL EXAMINED

Madagascar: 1 male, Majunga, 25.ii-3.iii.1968 (Guichard)(NRI); 1 male, Tananarive, ii.1966 (Allard)(NRI); 2 males, Tulear Pr., Sakavaha, 20.iii.1968 (Guichard)(NRI); 2 males, 3 females, Tulear Pr., Betioky, 275 m., 15.iii.1968 (Guichard)(NRI); 1 female, Fort Dauphin, 19.iv.1968 (Guichard)(NRI); 1 female, Isalo, 900 m, 18.iii.1969 (Guichard)(BMNH); 1 female, Tulear Pr., Manomobo, 31.iii.1968 (Guichard)(BMNH).

References

- BEI-BIENKO, G.Y.A. (1948) On some new interesting Iranian Acrididae (Orthoptera). *Proceedings of the Royal Entomological Society of London B*, **17** (5-6): 67-72.
- BEI-BIENKO, G.Y.A. and MISHCHENKO, L.L. (1951) Locusts and grasshoppers of the USSR and Adjacent Countries (Part 1). [In Russian]. [English translation: Israel Programme for Scientific Translations, Jerusalem, IPST Cat. no.834, published 1963 1: 1-135].
- BOLIVAR, I. (1902) Les Orthoptères de St Joseph's Collège à Trichinopoly (Sud de l'Inde). 3 me partie. *Annales Société Entomologique de France*, **70**: 580-635.
- BOLIVAR, I. (1913) Ernst Hæfner's expedition to the Central Western Sahara. xvii, Orthoptères. *Novitâtes Zoologicae*, **20**: 603-15.
- BOLIVAR, I. (1914) Estudios entomológicos, Segunda parte. *Trabajos Museo Nacional de Ciencias Naturales* (Ser. zool.), no. 20: 1-110.
- BOLIVAR, I. (1936) Apuntes para la fauna entomológica de Ifni (Ortópteros). *Eos. Revista Española de Entomología*, **11**: 395-426.
- BRUNNER VON WATTENWYL, C. (1861) Orthopterologische Studien. 4a. *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien*, **11**: 221-8.
- BRUNNER VON WATTENWYL, C. (1893) Revision du Système des Orthoptères et description des espèces rapportées par M. Leonardo Fea de Birmanie. *Annali del Museo Civico di Storia Naturale* (di Genova), Giacomo Doria (2), **13**: 1-230.
- CANO, M.I. and SANTOS, J.L. (1989) Cytological basis of the B chromosome accumulation mechanism in the grasshopper *Heteracris littoralis* Ramb. *Heredity*, **62**(1): 91-96.
- CARL, J. (1916) Acridides nouveaux ou peu connus du Muséum de Genève. *Revue Suisse de Zoologie*, **24**(6): 416-518.
- CENTRE FOR OVERSEAS PEST RESEARCH. 1982. *The locust and grasshopper agricultural manual*. London. 690pp.
- DESCAMPS, M. and WINTREBERT, D. (1966) Revue et diagnose préliminaire de quelques Pyrgomorphidae et Acrididae de Madagascar. *Bulletin de la Société Entomologique de France*, **71**: 24-34.
- DIRSH, V.M. (1958a) Acridological Notes. *Tijdschrift voor Entomologie*, **101**: 51-63.
- DIRSH, V.M. (1958b) New Acridoidea (Orthoptera) from the Karoo Region, South Africa. *Journal of the Entomological Society of South Africa*, **21**: 323-32.
- DIRSH, V.M. (1961) A preliminary revision of the families and sub-families of Acridoidea (Orthoptera, Insecta). *Bulletin of the British Museum (Natural History)* (Entomology), **10**(9): 351-419.
- DIRSH, V.M. (1962) The Acridoidea (Orthoptera) of Madagascar. 1. Acrididae (except Acridinae). *Bulletin of the British Museum (Natural History)* (Entomology), **12**(6): 275-350.

- DIRSH, V.M. (1970) Acridoidea of the Congo (Orthoptera). *Annales. Muséé Royal de l' Afrique Centrale ser. 8vo, no. 182.* 605 pp.
- FISCHER DE WALDHEIM, G. (1833) Conspectus Orthopterorum Rossicorum. *Bulletin de la Société Impériale des Naturalistes de Moscou*, **6** :384.
- FISCHER DE WALDHEIM, G. (1839) Addenda ad Orthoptera Rossica. *Bulletin de la Société Impériale des Naturalistes de Moscou*, **12**: 301.
- GALVAGNI, A. (1978) Terzo contributo alla conoscenza degli Ortotteroidei di Sardegna con descrizione di *Heteracris adspersa massai* n. subsp. *Atti dell' Accademia Roveretana Degli Agiati*, pp. 226-227 (1976-77), Serie vi. vol. xvi-xvii: 163-186.
- GIGLIO-TOS, E. (1907) Ortotteri Africani. Parte 1. *Bollettino dei Musei di Zoologia ed Anatomia Comparata della R. Università di Torino*, **22**: 554: 1-35.
- GRUNSHAW, J.P. (1986) Revision of the East African grasshopper genus *Kassongia* with a description of a new closely related taxon *Labidioloryma* gen.n. (Orthoptera: Acrididae: Hemiacridinae). *Systematic Entomology*, **11**: 33-51
- GRUNSHAW, J.P. (1988) A taxonomic revision of the grasshopper genus *Spathosternum* (Orthoptera: Hemiacridinae). *Journal of the East African Natural History Society and National Museum*. **78**(191): 1-21.
- JOHNSON, P. and SCHMIDT, G.H. (1982) Notes on, and a checklist of, Acridoidea (Saltatoria) collected in Somalia (East Africa). *Monitore Zoologico Italiano* (suppl), **16**(3): 69-119.
- JOHNSTON, H.B. (1956) *Annotated Catalogue of African Grasshoppers*. London. xxii+833 pp.
- KARNY, H. (1910) Orthoptera (s.str.). In Schultze, L., *Zoologische und anthropologische Ergebnisse einer Forschungsreise im westlichen und zentralen Sudafrica, ausgeführt in den Jahren 1903-1905*, vol. 4 pp. 35-90.
- KIRBY, F.W. (1902) Report on a collection of African Locustidae formed by Mr W.L. Distant, chiefly from the Transvaal. *Transactions of the Entomological Society of London* 1902: 57-114.
- KIRBY, F.W. (1910) *A Synonymic Catalogue of the Orthoptera*. Vol.3. Orthoptera Saltatoria. Part ii. Locustidae vel Acridiidae. London.
- KRAUSS, H.A. (1890) Beitrag zur Kenntniss westafrikanischer Orthopteren. 2. Orthopteren der Guinea-Inseln Sao-Thomé und Rolas gesammelt von Prof. Dr Richard Greef. *Zoologische Jahrbücher* (Syst), **5**: 647-68.
- POPOV, G.B. (1950) Note on the genus *Bibulus* I. Bolivar, 1914 (Orthoptera, Acrididae). *Proceedings of the Royal Entomological Society of London B*, **19**: 133-5.
- POPOV, G.B. (1981) Insects of Saudi Arabia. Orthoptera superfam. Acridoidea. A revision of the *Cyclopternacris-Paraeuprepocnemis-Asmara* group of genera allied to *Heteracris* Walker, 1870 and a description of the new genus *Clomacris*. *Fauna of Saudia Arabia*, **3**: 149-200.
- FISHPOOL, L.D.C. and POPOV, G.B. (1984) The grasshopper faunas of the savannahs of Mali, Niger, Benin and Togo. *Bulletin de l' Institut Fondamental d' Afrique Noire*, **43**(A)(3-4): 149-222
- RAMBUR, J.P. (1838) Faune entomologique de l'Andalousie. *Orthoptera*, **2**: 12-94.
- RAMME, W. (1928) Orthoptera palaeartic critica. V. Ein neues Genus der *Euprepocnemini* (Acrid.). *Eos. Revista Española de Entomología*, **4**: 113-16.
- RAMME, W. (1929) Afrikanische Acrididae. Revisionen und Beschreibungen wenig bekannter und neuer Gattungen und Arten. *Mittheilungen aus dem Zoologischen Museum in Berlin*, **15**: 247-492.

- RAMME, W. (1931) Ergänzungen und Berichtigungen zu meiner Arbeit 'Afrikanische Acrididae'. *Mitteilungen aus dem Zoologischen Museum in Berlin*, **16**(6): 918-45.
- REDTENBACHER, J. (1889) Beitrag zur Orthopteren-fauna von Turkmenien. *Wiener Entomologische Zeitung*, **8**: 23-32.
- RITCHIE, J.M. (1987) Taxonomy of the African acridoid fauna: progress and prospects 1970-1985. (Chapter 24.) pp. 455-470. In *Evolutionary biology of Orthopteroid insects*. (Ed. B. Baccetti) Chichester: Ellis Horwood. 612 pp.
- SAUSSURE, H. DE. (1899) Orthoptera. In *Wissenschaftliche Ergebnisse der Reisen in Madagascar und Ostafrika in den Jahren 1889-95 von Dr A. Voeltzkow. Abhandlungen hrsg. von der Senckenbergischen Naturforschenden Gesellschaft*, **21**: 567-664.
- SERVILLE, J.G.A. (Dec. 1838) Histoire naturelle des Insectes. In Roret, *Collection des Suites à Buffon. Orthoptères*, 776 pp. Paris.
- SCHAUM, H.R. (1853) Uebersicht der von ihm in Mossambique beobachteten Orthopteren nebst Beschreibung der neu entdeckten Gattungen und Arten durch Herrn Dr Herman Schaum. *Bericht über die zur Bekanntmachung geeigneten Verhandlungen der Konigl. Preuss. Akademie der Wissenschaften zu Berlin*, **2**: 775-80.
- STÅL, C. (1873) *Recensio Orthopterorum*, vol. 1, pp. 1-154.
- STÅL, C. (1876a) Observations Orthopterologiques. (2) *Kungliga Svenska Vetenskapsakademiens Handlingar*, **4**(5): 1-58.
- STÅL, C. (1876b) Bidrag till södra Afrikas Orthopter-fauna. *Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar*, **33**(3): 31-58.
- SJÖSTEDT, Y. (1909) *Wissenschaftliche Ergebnisse der schwedischen Zool. Exped. nach dem Kilimandjaro, dem Meru und den umgebenden Masaisteppe deusch-Ostafrikas, 1905-1906* **17**: 149-199.
- SJÖSTEDT, Y. (1913) Neue Orthopteren aus Ost- und Westafrika nebst einigen anderen zugehörigen Formen. *Arkiv für Zoologi*, **8**(6): 1-26.
- SJÖSTEDT, Y. (1923) Zoological results of the Swedish Expedition to Central Afrika 1921. Insecta 1. Acridoidea. *Arkiv für Zoologi*, **15**(6): 1-39.
- SJÖSTEDT, Y. (1933) Neue Acrididen von dem Mt. Elgon und dem Brit. Ostafrika. Vorläufige Diagnosen. *Entomologisk Tidskrift*, **54**: 215-16.
- UVAROV, B.P. (1921a) Notes on the Orthoptera in the British Museum. 1. The group Euprepocnemini. *Transactions of the Entomological Society of London* 1921: 106-44
- UVAROV, B.P. (1921b) A contribution to our knowledge of the Orthoptera of Mesopotamia and N.W. Persia. *Journal of the Bombay Natural History Society*, **27**: 61-70.
- UVAROV, B.P. (1923) Records and descriptions of Orthoptera from North West Africa. *Novitates Zoologicae*, **30**: 59-78
- UVAROV, B.P. (1929) Orthoptera collected in Sinai by Dr F.S. Bodenheimer and Dr O. Theodor. In *Ergebn. Sinai-Exped. Leipzig*. pp. 90-103.
- UVAROV, B.P. (1933) Studies in the Iranian Orthoptera. 11. Some new or less known Acrididae. *Trudy Zoologicheskogo Instituta. Akademiya Nauk SSSR. Leningrad*, **1**: 187-233.
- UVAROV, B.P. (1936) Studies in the Arabian Orthoptera. I. Description of new genera, species and subspecies. *Journal of the Linnean Society of London (Zoology)*, **39**: 531-554.
- UVAROV, B.P. (1939) A preliminary revision of the palaeartic species and subspecies of *Thisoicetrus* Br.W. *Novitates Zoologicae*, **41**: 377-82.

- UVAROV, B.P. (1941) New African Acrididae. *Journal of the Entomological Society of South Africa*, **4**: 47-71.
- UVAROV, B.P. (1942) New Acrididae from India and Burma. *Annals and Magazine of Natural History*, (11) **9**: 587-607.
- UVAROV, B.P. and VAN SOMEREN, V.G.L. (1941) Coryndon Memorial Museum expedition to the Chyulu Hills, 1938. *Journal of the East Africa and Uganda Natural History Society*, **15**: 171-80.
- WALKER, F. (1870) *Catalogue of the specimens of Dermaptera Saltatoria in the collections of the British Museum*. Part iv. pp. 605-801. London.
- WALKER, F. (1871) *Catalogue of the specimens of Dermaptera Saltatoria in the collections of the British Museum*. Part v & suppl., pp. 811-850, 1-116.
- WINTREBERT, D. (1972) Nouvelles contributions a l'étude des Acridoidea Malgaches. *Annales Musée Royal de l'Afrique Centrale*, ser. 8° no. 198: 1-129.

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