MINISTERIE VAN ONDERWIJS, KUNSTEN EN WETENSCHAPPEN

ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN

DEEL XXXVI, No. 22 16 december 1959

NOTES ON THE CLASSIFICATION OF SALDIDAE WITH THE DESCRIPTION OF A NEW SPECIES FROM SPAIN

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In the keys to the palaearctic Saldidae, which will be published before long in Dr. W. Stichels: "Illustrierte Bestimmungstabellen der Wanzen Europas", I shall use systematic conceptions, deviating from those which were up till now generally used. The character of the work mentioned does not permit a motivation. The following notes serve as an introduction to the system, as proposed in Stichel.

CONTENTS

I. MAJOR CLASSIFICATION

A. Relation to other families

A study of the egg development (position of germband, blastokinesis and eclosion) of Saldidae and other families (not published) has shown that the hypothesis of China (1950) that the saldids should belong to the Amphibicorisae, is justified. Of old they have been treated as representatives of the Geocorisae.

B. Subfamilies

Up till now the division in Saldinae Van Duzee 1917 and Saldoidinae Reuter 1912 has always been in use. To the latter belongs only the genus *Saldoida* Osborn 1901, while under the former all remaining (momently 15) genera are grouped. The three species of *Saldoida* have always attracted attention because of their remarkable appearance and recently Drake and Chapman (1958) have selected a combination of exterior characters, on which they base the right of subfamily-status for *Saldoida*. Slater (1955), however, considered the existing subdivision as artificial. It is peculiar indeed, that such an essential value has been attached to the dorsal outgrowths of the pronotum, although there are abundant examples in other families, which demonstrate how unstable and of minor phylogenetical importance such characters normally are. A dissection of the male genitalia of *Saldoida,* especially the median sklerotized structure of the penis, showed in fact that the difference between this genus and for instance *Chartoscirta* is not greater than that between *Chartoscirta* and for instance *Saldula*. An analysis of the genera of the Saldinae, however, brought to light that there exist two phylogenetically different groups, which justify a new subfamily division. The marine-bug *Aepophilus* has been placed by Leston (1956) within the Saldidae and he formed a new tribe for it. *Aepophilus* falls outside the two subfamilies proposed here and therefore a third subfamily for it gives probably more soundly its relation within the group. *Omania,* known only from the Red Sea and Arabic Sea region and from Australia is considered by Woodward (1958) as representative of a new saldid tribe. It falls beyond the scope of these notes, as I don't consider it as a typical saldid. The description of a new family for it will be given elsewhere.

Summarizing the proposed major classification of the family runs as follows.

1. Aepophilinae Puton stat. nov.

Characters: larval organ absent,
dilatation of ductus ejaculatorius of ♂ without accessory glands,
base of penis-filum not curled,
sclerotized structures of penis absent,
female subgenital plate square-shaped as a normal abdominal sternit,
head without ocelli and without any indication of post-clypeus and maxillary plates.

Genus: *Aepophilus*.

2. Chiloxanthinae subfam. nov.

Characters: larval organ very simple,
dilatation of ductus ejaculatorius with two ventral accessory glands,
base of penis-filum curled up in a bow or at most forming one closed ring,
median sclerotized structure of penis paired,
apicolateral sclerotized structures of penis absent,
female subgenital plate square-shaped, mid-part of hind margin weakly differentiated,
head without any indication of a postclypeus,
membrane with five cells.

Genera: *Chiloxanthus* Reuter, *Pentacora* Reuter.

3. Saldinae conc. nov. (= Saldinae Van Duzee 1917 in parte, included Saldoidinae Reuter 1912).

Characters: larval organ present in different stages of development or secondary absent,
dilatation of ductus ejaculatorius without accessory glands,
base of penis-filum coiled like a watch-spring,
median sclerotized structure of penis not paired,
apicolateral sclerotized structure of penis present,
female subgenital plate lengthened caudad,
head with a more or less clearly defined postclypeus,
membrane with four cells.

Genera: all genera except *Aepophilus, Chiloxanthus* and *Pentacora* (*Oiosalda* Drake and Hoberlandt is the only genus, that could not be investigated).

C. Tribes

The only tribi, which are described within the Saldidae, are those for *Aepophilus* (Leston op. c.) and for *Omania* (Woodward, op. c.), but as mentioned in the foregoing, my opinion is that both genera must be placed in other categories.

The Chiloxanthinae form a homogeneous group; in the Saldinae, however, two branches have arisen which can be defined as the following tribes:

1. Chartoscirtini trib. nov.

Characters: median sclerotized structure of penis of a simple nature (p.e. fig. 7),

base of penis-filum with 1-3 windings,
larval organ mostly present, in a few cases totally lost.
Genera: *Calacanthia, Chartoscirta, Halosalda, Ioscytus, Micracanthia, Orthophrys, Saldula* s.l., *Saldoida, Salduncula.*

2. Saldini trib. nov.

Characters: median sclerotized structure of penis of a complicated nature,
base of penis-filum with 2½-4 windings,
larval organ always absent.
Genera: *Salda, (Lampracanthia), (Teloleuca).*

II. THE PROBLEM OF GENERIC DIVISIONS

The systematics of the Saldidae still relies entirely on the genus conceptions of Reuter (1912), though several authors as for instance Usinger (1956) have pointed out the inadequacy of this system. It appears from many descriptions after Reuter, how the respective authors have had difficulty with placing a new species in a given genus. Finally a choice has been made with some reserve and mostly the species ended up in the heterogeneous genus *Saldula.* In studying about a half of the described species, I am confronted with one of the most difficult systematic problems, of which scarcely an equivalent can be found in the Heteroptera. The characters, to which Reuter (op. c.) attached the greatest importance, appear to be unreliable in the sense, that they emerge independently in different genera. To cite just a single example: the species *lugubris* Say 1832 and *sahlbergi* Reuter 1870 have been placed within the genus *Saldula* on account of the length of the inner cell of the membrane. A study of the genitalia shows that both species undoubtedly belong to *Salda* (*Salda lugubris* (Say) comb. nov. and *Salda sahlbergi* (Reuter) comb. nov.). On the other hand the species *nobilis* Horváth 1884 has to be removed from the genus *Salda* (*Teloleuca*) and must provisionally be placed under *Saldula.*

The genus *Saldula* has further become a mixture of groups of species, of which some belong rightly to new genera. On the other hand there are groups which morphologically and geographically shade off into one another so that no sharp criteria for genus or even subgenus divisions can be chosen.

Whether the veins of the corium are obsolete or distinct and whether the inner cell of the membrane is prolonged at the base or not, can often be so closely correlated with the pterygo-polymorphism that they become worthless as genus characters. With this knowledge and the new facts, which the investi-

gation of the genitalia brought to light, I no longer see any reason to hold over *Teloleuca* as valid genus. I consider it provisionally at most as a subgenus of *Salda*. The same holds for *Lampracanthia*, notwithstanding its deviating exterior characters.

The evaluation and combination of all characters will be fully treated and illustrated elsewhere.

III. ON THE STATUS OF SOME PALAEARCTIC FORMS

a. *Pentacora sphacelata* (Uhler), 1877 (= *iberica* E. Wagner, 1953, **syn. nov.**).

Professor A. Giordani Soika was kind enough to send me 1 ♂ and 1 ♀ of *P. iberica* E. Wagner 1953 from Morocco. Comparing it with a great number of *P. sphacelata* from the Antillean Islands, it appeared that the European form is identical with *sphacelata*, an in North America and the West Indies widely distributed species. The mediterranean form is somewhat larger than the Antillean one, but this may not be a reason to consider it as a subspecies. First, all remaining characters are entirely the same and second, the American *sphacelata* varies conspicuously depending on a different habitat (Cobben, in press).

Of the two remaining *Pentacora* species from the Old World, viz. *P. malayensis* (Dover), 1929, comb. nov. from Malaya and *P. sonneveldti* Blöte, 1947, from Celebes the latter is more closely related with *sphacelata* than the former.

b. *Saldula arenicola* (Scholtz), 1847.

Besides abundant material from Holland I had the opportunity to study specimens from Germany, France, Italy, Corsica, Greece, Morocco and Madeira. Of many specimens the variability of the genital structures and of the ratios of dimensions of body and extremities and parts thereof have been investigated; a complete series of the eunomy of the wing pigment has been composed.

Apparently there is a tendency in *arenicola* to become smaller to the south and to produce more light-coloured forms there.

All characters which Wagner (1954, p. 116-118) gives for his subsp. *cataniana* from Sicily, fall within the variation-spectrum of *arenicola*. Wagner described in 1958 a new species *S. deserticola* from the Sahara. For the same reason I can consider this species presently only as the light form of *S. arenicola*, of which Filippi in 1957 pictured the extreme as f. *sahariana* with entirely light clavus; this form has often been found in North-Africa together with the darker form *connectens* Reuter. I saw both forms also from the same

locality from Greece. As unique discontinuity can be brought to the fore, that specimens with a basally light clavus have not yet been mentioned from Europe, even not from Italy or Spain. Anyway, all morphological differences given by Wagner for *deserticola* fall within the variationspectrum of *arenicola* [1]). The clasper of the Greek *sahariana* ♂ is identical with that of European specimens. The claspers as drawn by Wagner, are depicted inaccurately. His figure of the paramere of the European *S. arenicola* (Fig. 66, 1954 and Fig. 18, 1958) does not fit the facts. His formerly pictured paramere of *S. saltatoria* (Fig. 2E, 1947) shows a shape, that I never have encountered in the many tens of specimens, which I studied especially on that character. Still Wagner considers the presence of a second processus on the inner side of the paramere, which actually is only accidental, as an important specific character. From my own experience I know how difficult it is to represent the small differences of the parameres out of the *pallipes* and *saltatoria* group accurately, as these structures vary within certain limits. Furthermore, they are not absolutely flat and it should always be checked that they are compared with each other under the same angle.

c. *Saldula pilosella hirsuta* (Reuter), 1888, stat. nov.

Since Reuters time, his species *S. hirsuta,* described from Illyria, has not been restudied and its status remained uncleared. As Reuter typified it as: "*A. pilosellae* maxima affinis", it was surmised that we have to do with a form of *pilosella.* In the collections of the British Museum one male is placed under *S. pallipes* (F), that bears a label with the name *A. hirsuta* Reut., probably written by Reuter himself. It comes from the type-locality Illyria (Gorice, leg. G. Schreib; Saunders Coll. Brit. Mus. 1910-357). Though it is doubtless *pilosella,* the specimen is in too bad condition to find back the *hirsuta*-characters indicated by Reuter. From the late professor N. Filippi I received 2 ♂♂ and 1 ♀ of *pilosella* from Italy and they appeared to square entirely with the description of *hirsuta* Reuter. I consider it as a subspecies of *pilosella.* It differs from *S. pilosella pilosella* (Thomson), 1871 in the following respects:
also the apical part of the elytra rather densely clothed with long, erect hairs; the short pubescence on the elytra not dense; the prostrate short pubescence on pronotum, scutellum and clavus very dense, on pronotum and scutellum

1) In the meantime I received 1 ♂ and 1 ♀ paratypes of subsp. *cataniana* and 1 ♂ paratype of *deserticola* from Mr. E. Wagner, for which I express my sincere thanks. The investigation of these specimens has confirmed my point of view, above mentioned. It may be that *sahariana* represents a subspecies of *arenicola,* but for the moment this cannot be demonstrated unequivocally.

silvery, on clavus more golden. The long erect hairs on the pronotum extend beyond the whole lateral margins. Outer side of the first tibia basally with 3-4 long hairs, which are longer than the ti-section.

The *hirsuta* from Turkey, reported by Hoberlandt (1948), is a new species. The first records of this species for America were given by Drake (1950) and at the same time he described a new form, var. *pexa* of it.

Dr. Hoberlandt and Dr. Drake were so helpful to send me specimens of the concerning saldid from Turkey and America respectively. Both forms may be identical indeed, though there are small differences. However, the three as f. *pexa* labeled specimens, which I could study, belong to another species. On account of the established differences and also owing to the fact, that the sample from Turkey amounts only two females, it is too premature to describe the new species already now. As it is on the one hand related with the difficult *pallipes*-group, on the other hand with the *saltatoria*-group, a series of specimens is needed to separate it clearly from the related species.

d. *Saldula palustris* (Douglas & Scott), 1874 (= *mutabilis* (Reuter), 1891, **syn. nov.**; = *pallidipennis* (Reuter), 1888, **syn. nov.**).

Material has been studied from Sweden, England, Holland, Germany, France, Spain, Portugal, Italy, Greece, Crete, Egypt, Morocco, Madeira and Newfoundland. On the basis of a great number of measurements, genital study and construction of eunomic series the above-mentioned synonymy was determined. Through the kind co-operation of Dr. Kontkanen the types of *mutabilis* Reuter and its varieties (no. 9181, 9182, 9591-9600, coll. Reuter, Mus. Zool. Helsingfors) and the types of *pallidipennis* Reuter from Greece (1 ♂ and 1 ♀, no. 9183, 9184, idem) could be studied.

S. palustris is exclusively halophilous. It is a highly variable species, which is more closely related to *S. opacula* than to *S. pallipes*. The variability within a population of one and the same locality is expressed through a mixture of pigment variants, in which, however, a restricted section out of the eunomy is dominating. Even in populations of northern origins specimens with totally light second antennal joint (f. *mutabilis* Reut) are not rare. Furthermore, it is striking how populations, which are separated from each other just a few miles, bear their own stamp in having different mean body length and/or having other dominating pigment variants. Towards the south and especially the south-east of Europe the light forms normally prevail. From Egypt, Greece and Crete I saw samples which nearly totally consist of light extremes. One sample of 23 specimens from Morocco on the other hand contained mostly dark forms. As will be discussed later on, the sen-

sitivity during larval life to macro- and micro-environment factors makes its influence felt here too. The subspecies *sardoa* Filippi 1957, based upon only one male, is merely a pigment variety which occurs rather rarely, but which is not only restricted to Southern Europe.

Another tendency, which manifests itself from north to south, is the regularly decreasing body-length and the relatively still greater decrease of its width. Populations of northern latitude are mostly submacropterous, those of the South macropterous. Some numbers and ratios may illustrate this phenomenon. The Newfoundland population deviates somewhat in this respect.

TABLE I

	male			
	no. of specimens	total length (extremes and mean)	total width	ratio mean length/ mean width
Egypt	10	2.95 *3.23* 3.37	1.36 *1.48* 1.52	*2.19*
Morocco	14	2.98 *3.17* 3.36	1.30 *1.44* 1.55	*2.20*
Portugal	5	3.70 *3.79* 3.91	1.69 *1.72* 1.76	*2.20*
S.W. coast of France	12	3.50 *3.75* 3.90	1.63 *1.74* 1.86	*2.15*
Holland	20	3.40 *3.58* 3.81	1.65 *1.79* 1.85	*2.00*
England	13	3.40 *3.65* 4.12	1.70 *1.82* 2.01	*2.00*
Newfoundland	13	3.72 *4.18* 4.49	1.72 *1.94* 2.09	*2.15*
	female			
	no. of specimens	total length	total width	ratio mean length/ mean width
Egypt	10	3.39 *3.59* 3.80	1.61 *1.71* 1.88	*2.09*
Morocco	8	3.30 *3.41* 3.58	1.58 *1.62* 1.65	*2.10*
Portugal	6	3.97 *4.04* 4.39	1.62 *1.95* 2.09	*2.09*
S.W. coast of France				
Holland	16	3.58 *3.93* 4.20	1.81 *2.04* 2.21	*1.92*
England	9	3.78 *4.16* 4.50	1.92 *2.10* 2.30	*1.90*
Newfoundland	15	4.18 *4.71* 4.99	1.99 *2.22* 2.42	*2.12*

A third tendency of geographic change is the pubescence of the dorsal side. In northern specimens this pubescence is denser and a little longer than in specimens of southern origin.

e. *Saldula opacula* (Zetterstedt), 1840.

This species is still more variable than *S. palustris*. A population from Sphagnum in moorland pools and that of a salt marsh along the coast can be so homogeneous per se and so strikingly different from each other that the present author considered them to be two valid species, provisionally named species A and B (Cobben, 1957). Now after the biometrical treat-

ment of a large collection of specimens from the whole of Europe, from Lapland to Italy and Portugal, I have to treat all as one species; there are even no grounds for splitting the species up into subspecies. Specimens from the South are much smaller than those from the north (length of males varying from 3.0-4.8 mm!) and as in *S. palustris* the light-coloured forms are dominating there. The diversity of specimens from the same latitude is still larger than in *palustris* because of the fact that *opacula* is more eurytropic and inhabits both salt- and fresh-water localities. The special character of the populations from peat pools, viz. the high degree of melanism and submacropterism, must be ascribed to the action of environmental factors. At any rate the numerous measurements and comparisons of structures of specimens out of the whole distribution area give no discrimination data for infra-specific taxa. I shall revert to the ecological and morphological plasticity of *S. opacula* later on.

f. *Saldula melanoscela* (Fieber), 1859.

The division in two races *melanoscela melanoscela* Fieb. and *melanoscela brachynota* Fieb., carried through by Wagner (1957) has not been confirmed by the results of my study. The species cannot be splitted neither for geographical, nor for structural-morphological or biometrical reasons. The only reliable point that follows from Wagners data is the fact that different populations have their own character concerning the body dimensions and concerning the dominancy of a particular region of the pigment spectrum of the wing. My material, divided after the principles of Wagner, gives a random geographical distribution with only a weak tendency to an increase of the number of bigger and darker specimens towards the South-East of Europe. The genital differences which are given by Wagner, are out of proportion. Even in strikingly different species it appeared often impossible to me to trace useful differences in the shape of the male genital segment. As a minimum number for measuring the length-width ratio of this segment always 10 males were used. Because of the great variability a significant difference can only be established by means of measurements and never outwardly; that is why there is no point to try to picture differences, whose existence can be demonstrated statistically only with difficulty.

g. *Micracanthia marginalis* (Fallen), 1818.

Linnavuori (1951) found it desirable to consider the *Micracanthia* from Germany as a valid species, to which he gave the name *imitator*. When one goes through his description and considers the only very small differences between this form and the real northern *M. marginalis*, then one would

think with good reason only of a splitting on subspecies level. Even this lower status cannot be hold up by me after having compared about fifty specimens from Holland and Germany with one male and one female from Finland (coll. Linnavuori).

The most important character for *Micracanthia marginalis* should be the dense silver-white hair covering on the pronotum and scutellum. Such a hair covering should be absent in *M. imitator,* but it appeared to me that it is lacking too in one of the two specimens from Finland, which are at hand. Other saldids show sometimes a varying pubescence on the pronotum and scutellum, both in density and colour. Furthermore there can be a difference in thickness of the hairs in immature and in older adults and consequently the effect made by a source of light which is focused upon them, will be different. Paying attention to the remaining characters given by Linnavuori, I did not succeed in selecting the two Finnish specimens out of the Dutch material in spite of repeated attempts. Even the body dimensions are not discriminatory. The range of total lengths as given for *M. marginalis* falls entirely within the range of the Dutch population from one locality, which amounts to 2.41-*2.97*-3.29 mm for the females and to 2.39-*2.73*-2.99 mm for the males. Populations from one and the same locality can vary from one year to another, as for example the mean length of the females, which amounted to 2.79 mm in 1957 and 2.13 mm in 1958.

All these facts are reasons for me to consider *Micracanthia imitator* Linnavuori as a synonym of *marginalis Fall.*

h. *Chartoscirta elegantula longicornis* (Jakovlev), 1882, stat. nov.

One male and two females from the Caucasus (Coll. Reuter, Helsingfors) could be studied. This form differs only from *C. elegantula elegantula* (Fallen), 1807, in having the second antennal joint totally lightish red-brown; the body dimensions are stouter, caused by macroptery. In spite of the name *longicornis* the relative length of the antennae is not significantly longer than that of *C. elegantula elegantula*; in the latter subspecies the antennal length is very variable.

i. *Calacanthia alpicola* (J. Sahlberg), 1880, stat. nov.

This form, up till now considered in the literature as a colour variety of *C. trybomi* J. Sahlb., appears to be a valid species. Both species, which evidently have the same arctic distribution, can be distinguished from each other by way of the different configuration of the ocelli. In *trybomi* these are big (ca. 0.1 mm in section) and touch each other along the whole median line (number of studied specimens 7). In *alpicola* they are smaller (0.06-0.08 mm) and medially separated through a strip of ca 0.025-0.050 mm width

(number of studied specimens 13). Furthermore, *alpicola* is distinct from the other species in having shorter antennae, more shining pronotum and scutellum and a lesser density of the short lightish pubescence.

IV. *SALDULA HEIJNINGENI* SPEC. NOV.

Description.

Body

Shape: stout rather slender species, macropterous, lateral margins of pronotum quite straight or weakly concave.

Colour: entirely black; exocorium apically with a large conspicuous orange area, membrane with a basal lightish spot in the second cell (fig. 1); head black, lateral ends of postclypeus lightish (♂), postclypeus, anteclypeus, maxillary plates and labrum whitish, median part of postclypeus and base of anteclypeus darkened (♀); parandria (♂) and subgenital plate (♀) entirely black.

Structure of integument: head, pronotum and scutellum smooth, shining; elytra dull, when lightened from frontside, basal part of exocorium shining.

Hairs: whole body dorsally covered with long erect black hairs and an inconspicuous short semi-erect silvery pubescence: ventrally with half-long silvery hairs.

Extremities

Antennae: black, innerside of joint 1 testaceous (♂), entirely black (♀); all joints shortly pilose, in addition joint 1 with some black stout hairs, joint 2 with a few half-long hairs, joint 3 and 4 with the for saldids common erect bristles.

Rostrum: dark ferrugineous, extending between base of hind coxae.

Legs: femora black, apex whitish, tibiae black with subapical light band, blackish spined and with a dense short silvery pubescence; tarsal segments dark, second joint pale with dark base (♂), entirely black (♀).

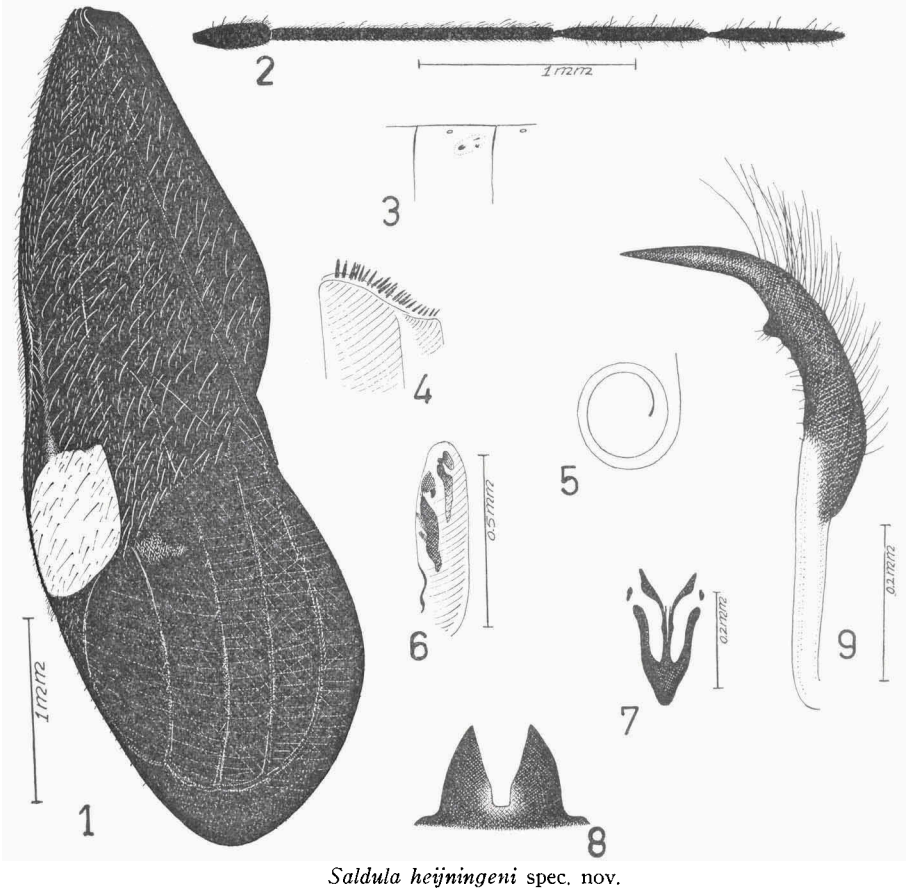
Genital and other structures

The genital structures of one male are depicted (fig. 5-9). The male grasping organs on the base of the abdomen bear semi-long pegs (fig. 4). Rudiments of the larval organ on the latero-ventral sides of the third abdominal segment are present (fig. 3).

Measurements (in mm).

TABLE

sex	total length	total width	head				
			width	vertex at level of ocelli	frons at narrowst width	ocellus width	distance between ocellus
♂	5.61	2.34	1.39	0.54	0.40	0.075	0.050
♂	5.60	2.35	1.42	0.53	0.42	0.090	0.050
♀	6.50	2.70	1.48	0.60	0.48	0.100	0.050
♀	6.50	2.71	1.49	0.60	0.46	0.080	0.060



Saldula heijningeni spec. nov.

1. Left hemielytron of ♀. — 2. Antenna of ♂. — 3. Lateral part of third abdominal sternit of the adult. Rudiments of larval organ near stigma. — 4. Left grasping organ of ♂. — 5. Base of penis-filum. — 6. Left side of penis. — 7. Median sclerotized structure of penis. — 8. Parandria. — 9. Left paramere.

II

	pronotum		antennna				leg 3	
length	width of collar	width at the base	2	3	4	tib.	2 ta.	3 ta.
0.71	0.84	1.83	1.33	0.73	0.65	2.90	0.48	0.40
0.68	0.83	1.86	1.38	0.75	0.65	2.90	0.53	0.45
0.78	0.93	2.17	1.48	0.78	0.64	3.10	0.55	0.45
0.75	0.91	2.19	1.50	0.80	0.80	3.06	0.53	0.43

Length of 10 ♀♀: 6.11-*6.48*-6.71 mm; width: 2.63-2.74-2.85 mm.

Holotype (♂), allotype (♀) and paratypes (1 ♂, 9 ♀♀) in Coll. Mus. Nat. Hist., Leiden; paratypes (1 ♂, 1 ♀) in authors collection.

Type-locality: Spain, Rio Grio, near Morata de Jalón (Zaragoza), 600 m, stony banks of river, 28.V.1958; collectors: H. C. Blöte, C. van Heijningen, I. Teegelaar and Ph. Pronk. The new species is named in honour of the technical chief assisstant of the Leiden Museum, who found it first and called attention to its striking appearance.

General remarks: *S. heijningeni* sp. n. is one of the most conspicuous *Saldula* species known, because of the large orange-coloured apical area on the corium, which contrasts highly with the unicoloured black appearance of the whole insect. It belongs to the *scotica*-group, which is characterized by stout body dimensions, long antennae (ratio: joint 2 + 3 + 4 / collar width of pronotum amounts to 3.1-4.1) and the same type of median sclerotized structure of the penis (fig. 7). Besides the new species and *S. scotica* (Curtis), the likewise palaearctic *S. variabilis* (Herrich-Schaeffer), the Turkestan *S. jakovlevi* (Reuter) and *S. nivalis* (Lindberg) from the Karakorum mountains belong to the same group.

Acknowledgements.

Dr. H. C. Blöte left to me the study of the new species, for which I am mostly indebted to him. The many hemipterologists and musea, who supplied material for my saldid-work, will be acknowledged in a subsequent comprehensive paper.

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