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REVISION OF THE  
ANT GENUS *SERRASTRUMA*

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No. 2. — *Revision of the Ant Genus Serrastruma*

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INTRODUCTION

When, in my division of the large and heterogeneous group which had long been known as *Strumigenys*, I demonstrated the essential differences between the "long-mandibulate" or *sensu stricto* species and the shorter-jawed forms, the latter were mostly placed in the genus *Smithistruma*, which was divided in turn into four subgenera. An African group of species which seemed distinctive was assigned the subgeneric name, then new, of *Serrastruma* (Brown, 1948, *loc. cit. infra*). At that time, the possibility still remained that previously-described but obscure short-mandibulate species might be annectant between these two groups (*Smithistruma sensu stricto* and *Serrastruma*). By 1949 (Brown, *loc. cit. infra*) all the described species but one or two were well enough known to permit the clean separation of the latter group as a genus in its own right. Subsequent investigation of strumigenite genera has amply confirmed this separation. *Serrastruma* stands as a very compact and homogeneous group, distinct from all other related genera both in the essential plan of mandibular structure and in general habitus.

The present study was initiated with the inclusion of 26 specific, subspecific and varietal names, none of which had been seriously challenged previously. This number is now reduced by synonymy to seven reasonably distinct species and two *species inquirendae*. It appears doubtful that many more new species will be recognized in this group during the strictly morphological period of investigation, and synonymy will probably still further reduce the number when certain types are made available for study.

MATERIAL STUDIED AND ACKNOWLEDGEMENTS

Specimens seen during the present investigation include types of most of the previously described forms, which I have fortunately been able to borrow or gain through exchange with various European collections. In addition, previously unstudied material in abundance has arrived from several sources. The largest single group of material is that collected during two extensive tours in Africa by Dr. Neal A. Weber of Swarthmore College and the American Museum of Natural History. Dr. Weber's material probably equals by itself the entire array of material seen by all previous authors taken together.

Future additions of material in *Serrastruma* collections will probably lead to the further reduction of the number of species rather than to proliferation. Further collection of females and males in association with workers is highly desirable, for these castes, when known, may dissolve certain doubts remaining after the present treatment. The females seem to show particular promise as a systematic aid.

I owe thanks to the following individuals and institutions for their invaluable aid in the matter of types, etc.

Dr. H. Bischoff, Zoologisches Museum der Universität, Berlin, camera lucida sketches and measurements of *reticulata* types.

Dr. Charles Ferrière, Museum d'Histoire Naturelle, Geneva, loans and sketches of Forel types.

Dr. George Arnold, National Museum of Southern Rhodesia.

M. Pierre Basilewsky, Musée du Congo Belge, Tervuren, Forel and Santschi types.

Sig. Mario Consani, Florence, Italy, Santschi and Menozzi types.

Father J. van Boven, Roermond, Netherlands, Wasmann types.

Dr. Delfa Guiglia, Museo Civico di Storia Naturale, Genoa, Emery types.

Dr. J. C. Faure, University of Pretoria.

Mr. H. St. J. K. Donisthorpe, British Museum (Natural History), Donisthorpe types.

Dr. M. R. Smith, United States National Museum.

Dr. E. S. Ross, California Academy of Sciences.

Special thanks are also due Dr. Weber and Dr. J. C. Bequaert for aid both in the matter of material and in other means essential to the success of this paper.

Other than the collections indicated above, the only important depository is the Santschi Collection in the Natural History Museum at Basle. Unfortunately, it has not been possible to view material from this latter source. Through exchange, the first important collections of *Serrastruma* have been built up in the United States at the Museum of Comparative Zoology, Harvard University, at the American Museum of Natural History, and at the U. S. National Museum. Other collections have also been augmented.

#### GEOGRAPHICAL DISTRIBUTION

The natural range of *Serrastruma* embraces the whole of the Ethiopian Region, except for the most arid portions. Certain species, like *lujae* and *serrula*, appear to be restricted to rain- and gallery-forest, in which they are widely distributed. *S. bequaerti* prefers the cool, humid montane forests of central parts of the continent, while *S. simoni*

has an extraordinary distribution, ranging from the dry belt just south of the Sahara to the Cape region, but avoiding most rain-forest areas. We have too little data concerning the other species at present, but *lotti* and *maynei* appear to be moist-forest inhabitants, while *alluaudi* seems to range widely in several vegetational zones, but avoids or is rare in the Congo forests.

The probable youth and dominance of the genus is reflected in the collection rate, for to date more records of *Serrastruma* captures are known from Africa than for all other dacetine genera combined. *Smithistruma* is weak in species and numbers of colonies as compared to other faunas, and this is also true to a lesser extent of *Strumigenys*. The latter genus has developed a special group (group *rogeri* Emery) with high dominance, able to withstand competition from most dacetine genera, but it still seems subordinate to *Serrastruma* within its natural range. In discussing competition, it is assumed that *Serrastruma*, like related genera, feeds on collembolans captured by stalking. No confirmation of this assumption has yet come forth, but it still seems very likely to be correct in view of the basic tendency to collembolan predation in all dacetine genera so far studied.

The colonies are reported from much the same situations as are chosen by *Smithistruma*—in rotten logs, moss, under bark, under stones, in leaf litter, etc. Nest series I have studied, accompanied sometimes by collectors' remarks on their completeness, indicate that up to 300 workers and 5 queens are not uncommon colony-populations.

Outside continental Africa, flourishing populations of *Serrastruma* are known from the islands in the Gulf of Guinea and from Mauritius. One species, *ludovici*, occurs on Madagascar, but we know nothing about the abundance of the genus on this island. The Mauritius populations (*S. simoni* and *S. alluaudi*) certainly, and the Madagascar record possibly, represent recent introductions through human commerce from an African source. The possibility of "tramping" is demonstrated by the recent removal of a colony, containing males and workers at least, of *S. lujae* from plants arriving at Honolulu in U. S. Plant Quarantine. The origin of this shipment was the Belgian Congo. Probably *Serrastruma* species have been introduced elsewhere outside Africa in the tropics, but no further records have yet turned up. The tramping ability of this genus gives another hint of its dominance under varied conditions.

## SERRASTRUMA BROWN

*Smithistruma* (*Serrastruma*) Brown, 1948, Trans. Amer. Ent. Soc., **74**: 107-108.

*Strumigenys* of authors, *part, nec* Fred. Smith.

*Strumigenys* (*Cephaloxys*) of authors, *part, nec* Fred. Smith.

*Strumigenys* (*Trichoscapa*) of authors, *part, nec* Emery, 1869.

*Serrastruma* Brown, 1949, Mushi, **20**: 6, 7.

*Genotype.* *Strumigenys simoni* Emery, by designation of Brown, 1948, as subgenotype.

## Gross External Morphology and Generic Characters

*Worker.* Resembling in size, color, sculpture and most structural features the same caste of *Smithistruma* Brown. Head together with the closed mandibles almost perfectly and rather broadly cuneiform seen in dorsal view, the sides nearly straight, evenly converging anteriorly; posterior occipital border feebly to moderately and rather broadly excised. Head seen from the side subcuneiform, rather thick posteriorly and tapering anteriorly, dorsum convex; antennal scrobes long and broad, shallow to moderately deep. Eyes small, placed just dorsad of the ventral scrobe margins posterior to the cephalic mid-length, exposed to direct dorsal view.

Antennae as in other short-mandibulate strumigenite genera, with similar segmentation; scapes slender, or at most very feebly incrassate. Clypeus with a broadly triangular disc having a transverse, more or less arcuate to approximately straight "false margin" which bears the principal hairs of fringing pilosity if present. Anterior to and depressed below the level of the false margin is a translucent median lobe or apron with rounded free margin, the latter normally covering or fitting between the bases of the mandibles. This lobe has frequently been misinterpreted as an intermandibular space or other structure.

The mandibles are narrowly triangular or subtriangular, their exposed length slightly to very much longer than the clypeus; seen from the side, they are weakly arched. The armament consists of very fine serial denticulation, directly opposable throughout and occupying the entire inner (apical or masticatory) margins; at least 30 denticulations on each mandible. Most specimens show clear development of a small but stout apical and one to three minute subapical teeth, these acute, alternating with and projecting slightly beyond the even level of the denticulation as seen at high magnifications. The basalmost denticle is slightly larger and more rounded than the succeeding series, and in certain species (Group A, see below), the five or six most basal denticulae are distinctly larger, coarser and more acute than the succeeding ones and are sometimes alternate with extremely

minute (intercalary) denticulae. The majority of the denticulation appears to represent secondary erosion of a very long, narrow basal lamella such as is found in *Smithistruma alberti* (Forel). If this homology is correct, it becomes apparent at once that the diminutive acute subapical teeth (alternating with lower denticles) are strictly comparable with the similarly alternating teeth of the apical series as seen in *Smithistruma* of groups *alberti* and *capitata* (Fred. Smith). In comparison with these groups of the related genus, one can find many reasons for assuming that they represent the primitive stock from which *Serrastruma* arose. I presently consider this assumption to be correct. Neither *Smithistruma* group is now found in Africa, but it appears probable that their ancestral stock once inhabited the Ethiopian Region. At any rate, the form and armature of the *Serrastruma* mandible is presently very distinctive in its modifications.

Labral lobes small and inconspicuous, but projecting and conical, much as in *Smithistruma*. The palpal segmentation (1, 1) is as in *Smithistruma*, and the maxillary palpi are similarly reduced to minute vestiges.

Alitrunk with a robust and convex promesonotum, the promesonotal suture weakly indicated or obsolete; metanotal groove strong and deeply impressed; propodeal dorsum rising from the groove and usually more or less convex, at least anteriorly. Propodeal teeth subtriangular, acute, laterally compressed, small to fairly large (obtuse and more or less vestigial in *S. bequaerti*), continued below by a narrow to cariniform infradental lamella on each side of the propodeal declivity.

Petiole with slender peduncle and distinct, raised, more or less dorsally-rounded node. Postpetiole transversely elliptical, convex dorsally, always distinctly broader than the petiolar node. Spongiform appendages vestigial to only moderately well-developed, especially on the petiole. Contrary to the observations of former authors, however, I have found *all species* to possess at least some remnants of appendages on the postpetiole. The midventral strip of the petiole is most often weak or obsolete.

Gaster as in related genera of the Strumigeniti; not markedly depressed; anterodorsal spongiform margin feeble or absent, but the usual basal costulae present, variably distinct; sting developed.

Sculpture paralleling that of *Smithistruma*. Head, mesonotum, propodeal dorsum, and usually the petiole finely and densely reticulate punctate and opaque. Gaster, except for basal costulae, smooth and shining. Pronotum and postpetiole varying in sculpture with the species, as do the sides of the alitrunk. Mandibles smooth; clypeus extremely finely punctulate-granulose, opaque, as are also the scapes and legs to a greater or lesser degree.

Pilosity basically as in *Smithistruma*. Ground hairs short, reclinate or subreclinate, fine to spatulate or spoon-shaped. Fringing hairs of scapes and false clypeal margin usually larger and more conspicuous; ground hairs of pronotum dorsum small and usually inconspicuous. Specialized erect hairs more or less stiff, fine or narrowly spatulate, oar-shaped, or clavate, those on the nodes and gaster usually larger and heavier than those on the head; 2 to 8 on head, situated well back on occiput; mesonotum with one or two pairs, usually situated on dorsolateral tubercles; nodes and gaster with a more numerous, but still limited set each. In addition, the lateral border of each occipital lobe bears a fine, outstanding flagellate or subflagellate hair, while each humerus bears a long flagellate or spatulate hair.

Color yellow to dark ferruginous.

*Female*. Similar to worker, with the usual full sexual characters. In *Serrastruma*, this caste is usually larger and darker in color relative to the accompanying workers than in related strumigenite genera.

*Male*. Known only for a few species. Mandibles small, but opposable; triangular, the inner margins weakly produced as broadly rounded lamellae; apices acute (*S. lujae*). Otherwise paralleling the male of *Smithistruma*, especially in dark color, sculpture, etc.

#### Specific Characters, Variability, etc.

*Serrastruma* betrays its relative youth as a genus and differs from most other dacetine genera in the decided variability of some of its species and in the concomitant slightness of specific distinctions. Because of these qualities, it is a "difficult" genus from the taxonomist's point of view. Most of the past taxonomic confusion in the group, however, cannot be blamed entirely upon variation or slightness of specific distinctions. This confusion was due partly to the fact that *Strumigenys*, in the old, portmanteau sense, has effectively concealed, one might say "swallowed up", the group, so that efforts to distinguish the species have been dissipated in comparison with a much larger number of short-mandibulate forms actually having only a distant relationship to *Serrastruma*. Thus, the two species *ludovici* Forel and *reticulata* Stitz were effectively lost into *Strumigenys sensu stricto* when subsequent classifiers interpreted too literally the uncannily misleading original descriptions. Camera lucida drawings of types enable me to place these two forms quite certainly in *Serrastruma*.

Beyond this, the extensive synonymy must be laid to pure carelessness in construction and subsequent interpretation of descriptions. Apparently, when authors were describing a "new" form, reference was had almost entirely to previous descriptions instead of to types or

reliably identified material, even though the latter might be readily available, or even in the specialist's own collection. That many of the older descriptions were seriously in error is now clear. The lack of critical appraisal of descriptions in the past is amazingly general, as one can determine from reference to the discussion of the synonymy of *S. simoni* Emery, below. Unfortunately, the poor systematic work visted upon *Serrastruma* has also been widespread among other, much larger formicid groups that will not be so easy to untangle. A conclusion to be drawn from *Serrastruma* is that, though a given group of ant species may show variation and blurring of interspecific characters, these "difficult" qualities are seldom of the degree of seriousness indicated by the usually excessive number of synonyms and infraspecific variants named in the group. Thus, in the case of *S. simoni*, Santschi repeatedly described forms the types of which, under present direct comparison, fail utterly to show the differences cited in the original descriptions.

In my own attempt to sort *Serrastruma* material into species, a very careful search of the worker caste was made in an attempt to recognize features of consistent value in separating species. Few were found, and this fact is reflected in the very large new synonymy. However, one seemingly constant and most useful character concerns the mandibular dentition, falling into two sorts as follows:

#### Group A

In *alluaudi*, *lotti* and *ludovici*, the mandibles are long (MI 40 or more), relatively slender and evenly tapered toward their apices; basal quarter or fifth of the apical margins each with the denticulae suddenly and decidedly larger, coarser, more irregular and more acute than those following distally. This coarse basal series usually numbers 5-6 units on each mandible; each unit may alternate with an indefinite minute denticle.

#### Group B

In *lujae*, *serrula*, *maynei*, *bequaerti* and *simoni* the mandibles are a bit more robust and are usually under MI 40, rarely slightly more. The apices are somewhat more blunted in dorsal view. The denticulation is fine (*lujae*, *maynei*, *bequaerti*) or extremely fine (*serrula*, *simoni*), and the denticulation toward the base of the apical border is not or only very slightly and *gradually* coarsened, regular and not acute; the basalmost denticle may, however, be slightly enlarged and sublamelliform.



In doubtful cases, the denticulation is best examined by placing the mandibles in dark contrast over a brightly lighted white background. The differences are so plainly apparent that, if magnification is at the necessary 60–80 diameters, contrast lighting should rarely be necessary.

Other characters of use in distinguishing species concern the sculpture, especially of the pronotum and nodes of the pedicel; relative head width; pilosity; development of propodeal teeth and lamellar or spongiform appendages, etc. Measurements and proportions given are considered the bare minimum essentials, here cited for the first time. Former statements of "total length" have been highly inaccurate and are not at all comparable, even in the consecutive descriptions of one author.

Abbreviations:

HL — Maximum measurable length of head from dorsal view, mandibles excluded. Measurement is made from the center of the *true* anterior clypeal margin to a line connecting the posterior occipital extremities.

CI — Cephalic index: maximum measurable width of head expressed as a percentage of the head length, or head width/HL  $\times$  100.

MI — Mandibulo-cephalic index: "exposed length" of mandibles expressed as a percentage of the head length. Measurement is made in the fully closed condition from the center of the true anterior clypeal margin to the extreme apex of the most advanced mandible. Exposed mandibular length/HL  $\times$  100.

These measurements and proportions are standard in my works on the Dacetini.

#### SYSTEMATIC TREATMENT BY SPECIES

In the synonymies below, only essential references are cited, and those appearing subsequent to about 1920. Full synonymies are cited in:

Emery, C., 1922, in Wytzman's *Genera Insectorum*, Fasc. 174, pp. 320, 324 (as *Strumigenys*).

Wheeler, W. M., 1922, *Bull. Amer. Mus. Nat. Hist.*, **45**: 918–920, 1034 (as *Strumigenys*).

An early key to African *Strumigenys* is of interest only as an illustration of the early confusion of the taxonomy of the group:

Santschi, 1913, *Bull. Soc. Ent. France*, pp. 257–259.

The best habitus figures of *Serrastruma* (though portraying the mandibular dentition as a somewhat inaccurate convention) are those

of Eidmann, for which references are given in the synonymy of *S. lujae*, below.

Cited with the descriptions below are all type localities, whether or not types have been examined. All other records represent specimens actually seen during the course of this work.

#### SERRASTRUMA ALLUAUDI (Santschi) new combination

- Strumigenys (Trichoscapa) alluaudi* Santschi, 1910, Ann. Soc. Ent. France, **79**: 360, worker, female; original description.
- Strumigenys rothkirchi* Wasmann, 1918, Ent. Mitt., Berlin, **7**: 142, Pl. 2, figs. 9, 10, worker. NEW SYNONYMY.
- Strumigenys (Cephaloxys) raymondi* Donisthorpe, 1945, Ann. Mag. Nat. Hist., (11) **12**: 779, part., worker. 1946, *Ibid.*, **13**: 32; part. NEW SYNONYMY.

*Worker.* HL 0.55–0.60 mm., CI 75–78, MI 40–44. Mandibles of Group A form. Postpetiole swollen and very convex, its surface weakly to distinctly sculptured, more or less opaque. Sides of alitrunk with at least some punctulate-reticulate sculpture; not completely smooth and shining as in *simoni*, and the propodeal teeth slightly less well-developed than in *simoni*. Otherwise, this species is very much like *simoni* and likely to be confused with that species (*q. v.*).

Pilosity variable, especially the shorter ground hairs. At least part of the variation, both in erect and ground pilosity, seems to be due to differing amounts of adherent foreign matter, possibly a hardened secretion, which makes the hairs appear thicker at their apices when abundant. Color variable as in *simoni*; vertex often infuscated.

I have not seen types of *alluaudi*, but specimens determined by Dr. Arnold and stemming from Natal are considered near-typical or typical. Dr. Arnold was in close contact with Santschi for many years, and his specimens agree closely with Santschi's characterization. A *rothkirchi* type from the Wasmann Collection, kindly sent by Father van Boven, agrees closely with the Natal specimens and with a cotype of *raymondi* sent by Mr. Donisthorpe. Mr. Donisthorpe has disagreed (*in litt.*) with my synonymy of *raymondi*, and a subsequent visit to the British Museum may possibly explain his disagreement. The specimen labelled "type" in the British Museum is actually a specimen referable to *simoni*, while those labelled "cotypes" (= paratypes in American usage) are divided between *simoni* and *alluaudi* specimens. Evidently both species are well established on Mauritius, and Mr. Donisthorpe has confused them under a new name. Specimens taken by Weber at Kampala, Uganda are the most atypical I

have seen, but even here the difference is largely one of pilosity and is not considered taxonomically significant.

*S. alluaudi* is widely spread in Africa, and seems to have been carried about a great deal by human commerce. The "*rothkirchi*" specimens from Mt. Kamerun may, as Dr. Bequaert has suggested, have been taken in or near the former German horticultural experiment station. During the period of German administration, plants were brought here from all parts of Africa, and might easily have harbored migrant *Serrastruma*. Otherwise, *alluaudi* seems to have its main natural range in eastern Africa. The Mauritius records must be put to tramp migration, while the Madagascan *ludovici*, quite possibly identical with *alluaudi*, may have come from Africa in the same way. *Alluaudi* has not yet been taken in the Congo rain-forests, and in this respect it resembles distributionally the related *simoni*. However, further investigation may show that *lotti*, a smaller but similar species which ranges into the eastern Congo Basin, is only an extreme variant of *alluaudi*.

The male and female of *alluaudi* have not been studied by me.

*Type locality.* Grotto of Tanga, "Kulumuzi," German East Africa (C. Alluau). Types are probably in the Paris Museum and the Santschi Collection.

*Localities for material examined.* Kampala, Uganda (N. A. Weber, series no. 1503). Eshowe, Natal (G. Arnold). Soppo, 730 m., Kamerunberg (von Rothkirch); cotype of *rothkirchi*. Cocotte Mt., Mauritius (R. Mamet); cotype of *raymondi*. Other *raymondi* cotypes from Mauritius briefly examined in the British Museum, several series.

#### SERRASTRUMA LOTTI (Weber) new combination

*Strumigenys (Cephaloxys) escherichi* subsp. *lotti* Weber, 1943, Bull. Mus. Comp. Zool. Harvard, 93: 327, 378-379, Pl. 15, fig. 13, worker, female, biology; original description.

*Worker.* HL 0.46-0.49 mm., CI 80-84, MI 42-46. *Female* considerably larger than the worker and darker in color, but not large enough to fit readily as the female of *alluaudi*, considering the workers of the latter species. Cotypes have been compared directly with additional specimens from the localities cited below, and agreement is close. This form is essentially a smaller and lighter-colored version of *alluaudi* with finer pilosity. The form and denticulation of the mandibles in the two species are quite similar, although those of *lotti* seem slightly longer relatively. The sculpture of the pronotum is similar and equally variable in both species. Future collections may show that intergrades occur and that synonymy is indicated, but the present material does

not support this. The species *calypso* (*species inquirendae* section below) is poorly described, and may quite possibly be the same as *lotti*, over which it has nomenclatorial precedence.

Errors in Weber's description should be noted. *S. lotti* is not attachable to "*escherichi*" because of the dentitional differences. The figure shows the shape of the scape quite wrongly, and depicts the funiculus as seven-segmented, whereas the funiculus, as in all *Serrastruma*, is really five-segmented.

This species has been taken in the eastern Congo and in the adjacent gallery-forests of the Sudan; it is probably widespread in eastern Africa.

*Type locality.* Lotti Forest, west slope of Imatong Mts., Anglo-Egyptian Sudan (N. A. Weber, series no. 1451). Cotypes are in Dr. Weber's collection and in the Museum of Comparative Zoology, Harvard University, as well as in other institutions. Several workers and a dealate female have been examined from the type series.

*Material examined from other localities.* Belgian Congo: Stanleyville (A. Collart). Beni to Irumu (N. A. Weber, no. 2124). Anglo-Egyptian Sudan: Kagelu, Equatoria (Weber, no. 1284).

#### SERRASTRUMA MAYNEI (Forel) new combination

*Strumigenys maynei* Forel, 1916, Rev. Suisse Zool., **24**: 427, worker, female, male; original description.

*Strumigenys maynei* var. *latiuscula* Forel, 1916, *Ibid.*, p. 428, worker. NEW SYNONYMY.

*Worker.* HL 0.52–0.56 mm., CI 83–87, MI 36–40. Color yellowish-to medium ferruginous. Mandibular dentition of Group B, and closely resembling that of *lujae*. Readily distinguished by means of the sharp, definite, fine and close longitudinal costulation (or striation) of the pronotum, by the broad head, with pronounced, thin lamelliform borders along the upper margins of the antennal scrobes, and by the small but conspicuous, broadly spoon-shaped hairs of the cephalic and promesonotal ground pilosity. The differences in head width and color between the types of *maynei* and its variety *latiuscula* presently before me are perceptible, but scarcely significant for taxonomic purposes. The very much greater variation shown by different series of the related *lujae* confirms for me the opinion that *latiuscula* should never have originally received nomenclatorial distinction.

*Type locality.* Stanleyville, Belgian Congo (Kohl); three cotypes examined from the Forel Collection, one of which has been retained as an exchange in the Museum of Comparative Zoology.

A single cotype worker of var. *latiuscula* has been received in exchange from the Musée du Congo Belge; the type locality for this form is Eala, Belgian Congo (R. Mayné). No other material has been seen.

SERRASTRUMA LUJAE (Forel) new combination

*Strumigenys lujae* Forel, 1902, in Wasmann, Allg. Zeitschr. Ent., **7**: 51, nota, Pl. 1, fig. 1, worker; original description.

*Strumigenys reticulata* Stütz, 1910, Mitt. Zool. Mus. Berlin, **5**: 141, worker. NEW SYNONYMY.

*Strumigenys (Cephaloxys) glanduscula* Santschi ("new var."), 1919, Rev. Zool. Afr., **7**: 88, worker. Bequaert, 1925, *Ibid.*, **8**: 146, biology. NEW SYNONYMY.

*Strumigenys (Cephaloxys) gerardi* Santschi, 1923, Rev. Zool. Afr., **11**: 287-288, worker. NEW SYNONYMY.

*Strumigenys (Cephaloxys) aequalis* Menozzi, 1942, Zool. Anz., **140**: 177-178, worker, female; original description. Eidmann, 1943, Mitt. H. Göring Akad. Deutsch. Forstwiss., **1**: 262, fig. 25, worker, biology; 1944, Zool. Jahrb. Syst., **76**: 457-458, figs. 15, 16, worker, biology. NEW SYNONYMY.

*Worker.* HL 0.52-0.71 mm., CI 77-83, MI 37-42. Distinguished from all other species except *serrula* and *bequaerti* (*q. v.*) by virtue of its Group B mandibles, evenly rounded, densely reticulo-punctulate pronotum, its fine erect and ground pilosity of the head, and its spongiform appendages, which are strongly reduced, especially the mid-ventral petiolar strip; the latter appears as a low, blunt, non-spongiform, carina-like vestige. Funicular segments II and III varying from slightly to considerably longer than thick. Postpetiole with weak appendages; dorsal surface usually reticulate-punctulate and opaque, but occasionally having the sculpture effaced and the surface nearly completely smooth, shining. Median carinula of the pronotum absent or feeble. Color somewhat variable, but usually lighter or darker yellowish-ferruginous.

*Female* larger than workers from the same nest, and usually a bit darker. Lateral occipital hairs borne on very low, weakly convex lamellae or carinae which do not occur, or at least are not readily apparent, in the workers.

The *males* vary in sculptural and other details, even within one nest series. The color is variable, but usually is predominantly dark castaneous or brownish-black, with the alitrunk lighter. The volsellae-laciniae are not markedly different from those of many *Smithistruma* species; these will be figured in another paper.

The extensive synonymy proposed here for *lujae*, unlike that of *simoni*, is at least partly a reflection of the considerable variation

shown by different nest series. Forel originally described the petiole and postpetiole as without spongiform appendages, although a type received from the Wasmann Collection shows a fine posterodorsal collar on the petiole and small but distinct ventral postpetiolar appendages of spongiform consistency. This misdescription threw later authors off the track rather badly, as Santschi's hesitant description of *glanduscula* clearly shows. A cotype of *glanduscula* in the Museum of Comparative Zoology (on loan from the Musée du Congo Belge) compares well with the *lujae* cotype, but is slightly smaller.

Stitz described *reticulata* so poorly that all subsequent workers were led to include it among the species of *Strumigenys sensu stricto*. A camera lucida sketch and measurements of a type, kindly furnished by Dr. Bischoff, show that this species is only a small variant of *lujae* like those taken in the Honolulu Plant Quarantine.

Beyond rectification of these obvious errors, the treatment of *lujae* becomes more subject to theoretical considerations. The series I have actually seen represent 17 separate nests from nearly as many localities. While each nest series is relatively homogeneous in size and proportions, certain of the series appear very different, especially in size, when directly compared. The various series may be arranged into a completely intergradient row, each broadly overlapping the next in all variable characters, and connecting the extremes. Such slight differences as occur in proportions, mandibular denticulation, pilosity, development of propodeal teeth and pronotal carinula, etc. seem to be correlated with overall size, and one cannot escape the impression that the very noticeable size difference, would, if known only from the inspection of a few series, form the most striking means of distinguishing taxonomic entities. Nevertheless, the intergradation is solidly established in the present material, and this alone will serve to negate any separation in the absence of evidence for geographical apportionment.

Large specimens convene well with a type of *gerardi*, medium ones with types of *lujae* and *glanduscula*, and the smallest ones with *reticulata* and the specimens from Hawaiian Plant Quarantine. The largest specimens I have seen (São Tomé) are larger than the *gerardi* types, while the smallest (Burunga and Honolulu) are smaller than cotypes of *aequalis* examined through the courtesy of Signor Consani. The essential relationship (and non-distinctness) of all these series seems to me more striking than the known variable "specific characters," and I have emphasized the former quality in the synonymy. The variability is such that future investigation may well show that *serrula* and even *bequaerti* are to be included.

*S. lujae* is clearly a sylvicolous species, and the most commonly-collected form of *Serrastruma* in the equatorial forest belt and adjacent

gallery-forests. Its presence on the islands in the Gulf of Guinea and in plant shipments at Honolulu indicates with what ease it can spread to new areas. The nests are made in rotten wood or in the soil or soil cover. I have examined series from nests containing up to 300 workers and four or five queens plus numerous winged forms of both sexes, males predominating. Males are often present as fully-pigmented free imagoes while the majority of the females are still in the pupal stage. Large nests are often infested with an apparent myrmecophile- a small ferruginous staphylinid beetle.

*Type locality.* Morumballe, on the Zambesi River, Portuguese East Africa (E. Luja). Types are in the Forel and Wasmann Collections; I have seen one worker from the latter source.

*Additional localities for material seen.* Belgian Congo: South of Watsa, Ituri Forest. West side of Ruwenzori (N. A. Weber, nos. 2139, 2112). Burunga (J. C. Bequaert). Yambuya (J. C. Bequaert); cotype of *glanduscula*. Manyema (Gerard); cotypes of *gerardi*. Precise source unknown, via U. S. Plant Quarantine, Honolulu, Hawaii; workers and males, in plants. Cameroon: Gross Batanga (G. Schwab). Saõ Tomé Island: Makambrera, 4000 feet. Roca Zampalma, 2500 feet (B. Malkin); three colonies and a stray worker. Fernando Po Island: Concepcion (H. Eidmann); cotypes of *aequalis*. Uganda: Fort Portal (N. A. Weber, nos. 2095, 2102, 2103); several collections, including females.

#### SERRASTRUMA BEQUAERTI (Santschi) new combination

*Strumigenys (Xephaloxys) [sic] bequaerti* Santschi, 1923, Rev. Zool. Afr., **11**: 286-287, worker; original description.

*Strumigenys (Cephaloxys) bequaerti* Bequaert, 1925, Rev. Zool. Afr., **13**: 146, biology.

*Worker.* HL 0.58-0.61 mm., CI 73-78, MI 35-37. Quite similar to medium-sized specimens of *lujae*, but with the head narrower on the average. Second and third funicular segments long and cylindrical, nearly or quite twice as long as thick. The chief distinction of *bequaerti* lies with its vestigial propodeal teeth; these are extremely reduced, little more than pronounced angles, obtuse or subrectangular in profile. Other characters as in *lujae*.

This form may eventually prove to be a montane subspecies or even a synonym of *lujae*. Dr. Bequaert says (*loc. cit.*) of the type collection (in translation):

"The nest of this ant was found at about 2200 meters altitude in the humid montane forest of the Butagu Valley, on the west side of Ruwenzori. It was situated in the humid and strongly shaded soil."

Additional specimens, which convene well with the cotypes at my

disposal, were taken by F. Meneghetti in the similar cool montane forest (Mau Forest) of the Kenya Colony. This series, which contains winged females, reached me through the courtesy of Signor Consani, who has indicated his desire to prepare the description of this winged caste.

Cotypes are in the Musée du Congo Belge, Museum of Comparative Zoology, Consani Collection, and presumably in the Santschi Collection.

SERRASTRUMA SERRULA (Santschi) new combination

*Strumigenys lujae* var. *serrula* Santschi, 1909, Ann. Soc. Ent. France, **78**: 390-391, worker; original description.

*Strumigenys (Cephaloxys) serrula* Santschi, 1923, Rev. Zool. Afr., **12**: 288, fig. 4c, worker.

*Strumigenys (Trichoscapa) concolor* Santschi, 1914, Boll. Lab. Zool. Portici, **8**: 375, worker. NEW SYNONYMY.

*Strumigenys (Cephaloxys) uelensis* Santschi, 1923, Rev. Zool. Afr., **12**: 289-290, fig. 4b, worker. NEW SYNONYMY.

*Worker.* HL 0.45-0.52 mm., CI 80-89, MI 34-39. The distinctions between the worker of this species and that of small *lujae* series is not very satisfactory. The smaller size, shorter mandibles, and usually broader head will serve to distinguish most *serrula* specimens. Even the smallest *lujae* specimens will not show these dimensions and proportions all within the *serrula* range and simultaneously. Many *serrula* specimens from French Equatorial Africa and from West Africa (*concolor* cotype) show a well-developed lamelliform margin along the dorsal scrobal borders. On each side at the point of greatest lateral expansion of the occipital borders, these margins end rather suddenly at a gentle depression, from which arises the lateral flagelliform hair. Specimens from the Belgian Congo and Uganda often lack the lateral occipital depression or show it in very weak form, while others from these localities have it distinctly developed. Females from all localities seen so far all have the depressions distinctly developed. This character will serve to distinguish the females and most workers of *serrula* from *lujae*, in which the female, it will be remembered, has the lateral occipital hair arising from a low, convex ridge. Both female castes of *serrula* seen in full-face view tend to have the external mandibular margins very feebly convex to straight; in *lujae* the same margins are straight to feebly concave. A *serrula* female from south of Watsa in the Belgian Congo (Weber, no. 2139) shows a total (synthetic aggregate) length, mandibles included, 2.47 mm., HL 0.52 mm., CI 87, MI 35. Other females from various localities showed scant variation away from these values. The difference in size from the *lujae* female is considerable.



In sculpture, the worker is like that of *lujae*, but some specimens have the punctulation of the pronotum overlain with feebly-suggested longitudinal striation or costulation. The hairs of the ground pilosity are usually slightly broader than those of *lujae*, and the punctulation of the upper occipital region appears relatively coarser. The node of the petiole is not so high or so steep anteriorly as in *lujae*. The denticulation of the mandibles appears to be finer than in small *lujae* specimens, and a magnification of 80–100 diameters is needed to resolve the separate units with any clarity. Color varying from pale yellow to medium ferruginous. In spite of all the characters cited, the species remains doubtfully distinct from *lujae*. In the series collected by Dr. Weber, specimens of *lujae* and *serrula* were on at least three occasions (nos. 2095, 2103 and 2139) presumably taken together or in close proximity. Dr. Weber's field notes, not presently available, will be of considerable interest when published. Were it not for the seemingly clearcut differences in the female caste, I should be tempted to combine the small and large forms under the name *lujae*.

A *concolor* type sent by Sig. Consani, mentioned above, seems to fall within the limits of (continuous) variation of the abundant series here referred to *serrula*, and nothing in Santschi's descriptions will serve to force separation of the two. The form *uelensis* is separated on the basis of the supposedly straight anterior clypeal margin. I have seen no specimens from the type series, but review of Santschi's description and figure convinces me that he overlooked the anterior clypeal lobe or apron; his anterior border is actually the false border. Santschi was unsure of the distinctness of this form himself, and it seems certain that we owe the name to his hasty examination of the types.

*Type locality.* Brazzaville, Congo (Weiss). Type not seen.

*Additional material seen.* Abundant material collected by Dr. Weber at virtually all of the localities in the Belgian Congo and Uganda from which he also secured *S. lujae*, also a series collected by him at Haut Mbomu in French Equatorial Africa. A cotype of *concolor* Santschi: type locality, Aburi, Gold Coast (Silvestri).

#### SERRASTRUMA SIMONI (Emery) new combination

*Strumigenys simoni* Emery, 1895, Ann. Soc. Ent. France, **63**: 42, Pl. 2, fig. 21, worker; original description.

*Strumigenys escherichi* Forel, 1910, Zool. Jahrb. Syst., **29**: 261, worker. NEW SYNONYMY.

*Strumigenys cognata* Santschi, 1910, Ann. Soc. Ent. France, **79**: 362, worker. NEW SYNONYMY.

- Strumigenys (Trichoscapa) cognata* st. *boerorum* Santschi, 1913, Bull. Soc. Ent. France, p. 259, worker. NEW SYNONYMY.
- Strumigenys (Trichoscapa) biconvexa* Santschi, 1913, Bull. Soc. Ent. France, p. 258, worker. NEW SYNONYMY.
- Strumigenys escherichi* subsp. *limbata* Forel, 1913, Deutsche Ent. Zeitschr., p. 222, worker. NEW SYNONYMY.
- Strumigenys escherichi* var. *cliens* Forel, 1913, Rev. Zool. Afr., 2: 317, worker. NEW SYNONYMY.
- Strumigenys (Trichoscapa) escherichi* subsp. *cognata* var. *obscuriventris* Santschi, 1914, Boll. Lab. Zool. Portici, 8: 375, worker. Preoccupied name, *nec* Wheeler 1908.
- Strumigenys (Trichoscapa) escherichi* subsp. *cognata* var. *fusciventris* Santschi, 1915, Ann. Soc. Ent. France, 84: 261; *nom. pro obscuriventris*. NEW SYNONYMY.
- Strumigenys (Trichoscapa) alluaudi* subsp. *nigeriensis* Santschi, 1914, Boll. Lab. Zool. Portici, 8: 376, worker. NEW SYNONYMY.
- Strumigenys (Cephaloxys) raymondi* Donisthorpe, part. (see *alluaudi*).

*Worker.* HL 0.52–0.60 mm., CI 75–83, MI 35–42. Mandibular denticulation of Group B, extremely fine and regular, the basal denticles not or virtually imperceptibly enlarged. Dr. Arnold has pointed out (*in litt.*) that the posterolateral mesonotal angles are better developed than in *alluaudi* and that the postpetiole is much less strongly convex and smaller. Otherwise, except for the striking denticitional difference and the completely smooth and shining sides of the alitrunk in *simoni*, the two species are very similar (see *alluaudi*, above). In *simoni*, as in *alluaudi*, the pronotum is more or less shining, with a median carinula and weak, well-spaced oblique costulation on each side of the dorsum. The dorsal surface of the petiole is punctulate, but that of the postpetiole is completely smooth and shining *when clean*.

Spongiform appendages rather well-developed on the petiole, including the midventral strip, and on the postpetiole. The propodeal teeth are the largest in the genus, and like those of the other species, are sharply upturned. The *female* is conspicuously larger and darker than the worker, but otherwise similar. Male not seen.

*S. simoni* is very widely distributed south of the Sahara. It ranges from Makapan in the Transvaal and Angola to Eritrea and French Guinea. Dr. Bequaert, who is quite familiar with African vegetation, has checked the localities for this ant very carefully with me. From the data, it appears that *simoni* avoids the regions of true rain- and gallery-forest quite consistently, although crossing the political boundaries of the Belgian Congo at several places. This form is at home in the more open forest and savannah covering such a large part of the continent. Colonies are found in rotten wood, under stones, and in the soil cover. This is perhaps the most familiar, and certainly the most-named, species of *Serrastruma*.

The extensive synonymy is truly surprising, for this species shows little variation compared to *lujae*, *serrula* or *alluaudi*, even though its range is wider. The confusion began with Emery's original description, which states unequivocally that the basal gastric costulae are lacking. Later authors all utilized this as a difference when describing forms which were obviously close. In reply to my specific request, Dr. Delfa Guiglia has kindly examined the type material in the Emery Collection. She states that the gastric dorsum is basally costulate, and her accompanying sketch shows quite clearly the costulation, which differs in no way from that of the forms next considered. With due allowances for Emery's draughtsmanship, which often erred in small details, the original characterization fits, and fits only the specimens before me.

I have examined type specimens of all the species mentioned in the synonymy except *biconvexa*, *boerorum* and *limbata*. Of the last two species, I have seen specimens, presumably authentic because determined by Dr. Arnold and collected at or near the type localities. The *limbata* specimen may be from the original series. Dr. Arnold states *in litt.* that he has been able to find no differences between *limbata* and *boerorum*, and he has had material from Forel and Santschi.

My material is outstanding in its uniformity, and cannot be distinguished from *simoni* by any satisfactory character. The descriptions of Forel and Santschi frequently differ in important details from the corresponding types, and one cannot but wonder at the thoroughness of observation leading to such publication. In 1910 and 1913 Forel and Santschi crossed in description, but neither attempted an investigation they must have known could scarcely have avoided unearthing synonymy; the result was some minor juggling of subspecific names and further confusion. In each case, both authors apparently compared their specimens against the previous descriptions, and not against authentic specimens. But the descriptions, which they themselves had so largely written, misled them still further. Santschi's description of the homonym-synonym *obscuriventris* on the same page with the synonym *nigeriensis* remains inexplicable, especially since the types of the forms are as alike as two ants can be. These were collected by Silvestri at the same Nigerian locality (types sent by Sig. Consani).

In lieu of a continued detailed statement of the reasons for the new synonymy, I can only point to the lack of reliable differences among the types seen by me, and which have been directly and painstakingly compared in all directions. The species *biconvexa* Santschi, of which I have seen no authentic material, appears to be based on small, dark specimens of *simoni*. If differences other than these questionable ones occur in the types, Santschi has not mentioned them in his publications

or proved them by his figures. In the types of the synonyms and the abundant additional material I have seen, the chief variation, and that slight, is in relative length of the mandibles and in depth of color; no significant geographical apportionment of these characters can be detected. The coloration ranges from medium to deep ferruginous.

*Type locality.* Makapan, Transvaal (Simon).

*Localities for other material examined.* Southern Rhodesia: Victoria Falls. Bulawayo (G. Arnold). Zululand: Sordwana. Richards Bay; specimens from 3 colonies, including females (J. C. Faure). Belgian Congo: Elisabethville (J. C. Bequaert); 4 cotypes of var. *cliens*. Stanleyville (Kohl). Nigeria: Olokomeji (F. Silvestri); specimens from type series of *nigeriensis* and *obscuriventris* ex Consani Collection. Angola: Cucala, Benguela (J. Cruchet); cotype, Musée du Congo Belge, of *cognata*. Eritrea: Ghinda (K. Escherich); cotypes of *escherichi*, Forel Collection and American Museum of Natural History. French Guinea: Kindia (F. Silvestri); det. *cognata* by Santschi. Mauritius: Several series (*raymondi* types in part.), British Museum.

## SPECIES INQUIRENDAE

### SERRASTRUMA LUDOVICI (Forel) new combination

*Strumigenys ludovici* Forel, 1904, Ann. Mus. Acad. Sci. S. Petersbourg, **8**: 369, worker, original description.

This species has been considered by all previous authors to belong to *Strumigenys sensu stricto*. A camera lucida sketch graciously prepared for me by Dr. Ferrière from the type (presently designated *lectotype*) in the Forel Collection shows conclusively that *ludovici* is a member of the *alluaudi* group of *Serrastruma*, for the mandibles are nearly or quite half the length of the head and have the basal five or six denticulae much coarser than the succeeding ones. In fact, *ludovici* can scarcely be differentiated from *alluaudi*, and may well prove to be a senior synonym of the latter when types can be directly compared.

*Type locality.* Southern Madagascar (Sikora).

### SERRASTRUMA CALYPSO (Santschi) new combination

*Strumigenys (Cephaloxys) calypso* Santschi, 1923, Rev. Zool. Afr., **12**: 288-289, fig. 4a, worker, original description.

From Santschi's description and figure, this species seems virtually indistinguishable from Weber's *lotti*. An examination of the mandib-

ular armature is needed to show whether or not the two are synonymous; in the latter case, the name *calypso* would take precedence. The type material of *calypso* is presumably in the Basle Museum. Dr. E. Handschin has written that he cannot lend material from the Santschi Collection because of catalogue difficulties.

*Type locality.* Ouha, British East Africa (Meyer).

*Key to the sufficiently well known species of Serrastruma,  
based on the worker caste*

1. Basal 5 or 6 denticulae of inner mandibular margin distinctly and suddenly larger, coarser, more acute and more irregular than those succeeding distally . . . . . 2  
     Basal 5 or 6 denticulae of inner mandibular margin not or only slightly and gradually enlarged, quite regular and with blunt apices (the first, basal-most denticle may be enlarged) . . . . . 3
2. HL 0.55 mm. or more; body robust; ground pilosity of head variable, but usually more or less broadly spatulate; postpetiole swollen and broadly convex . . . . . *alluaudi* (Santschi)  
     HL less than 0.55 mm., usually less than 0.50 mm.; body slender; ground pilosity of head inconspicuous, narrowly spatulate; postpetiole small and narrowly convex . . . . . *lotti* (Weber)
3. Propodeal teeth reduced to obtuse or rectangular vestiges . . . . .  
     *bequaerti* (Santschi)  
     Propodeal teeth large or small, but always strongly acute . . . . . 4
4. Pronotum with oblique or longitudinal costulate or striate sculpture, its punctulation absent or secondary . . . . . 5  
     Pronotum densely reticulate-punctulate like the mesonotum; costulation or striation absent or feeble and secondary to the punctulation . . . . . 6
5. Costulation of pronotum fine, sharp, and close, longitudinal in direction (appearing like dense striation); ventral petiolar appendage vestigial, scarcely spongiform; cephalic ground pilosity broadly spatulate or spoon-shaped, very conspicuous, but short . . . . . *maynei* (Forel)  
     Costulation of pronotum loose and indefinite, largely oblique, with broad, usually shining interspaces; ventral appendage of petiole developed and spongiform; cephalic ground pilosity narrowly spatulate, not conspicuous . . . . . *simoni* (Emery)
6. Larger form (HL 0.52–0.71 mm.) with narrower head (CI 77–83) and relatively longer mandibles (MI 37–42); funicular segments II and III always longer than broad . . . . . *lujae* (Forel)  
     Smaller form (HL 0.45–0.52 mm.) with broader head (CI 81–89) and relatively shorter mandibles (MI 34–39); segments II and III of funiculus not or just barely longer than broad . . . . . *serrula* (Santschi)

Refer to *species inquirendae* section above for discussion of *ludovici* (Forel) and *calypso* (Santschi).