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**ON THE VARIABILITY OF *AGAON PARADOXUM* (DALMAN)
GRANDI AND *SERES ARMIPIES* WATERSTON, WITH
REMARKS ON OTHER AFRICAN AGAONIDAE
(HYMENOPTERA, CHALCIDOIDEA).**

by

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with 12 figures

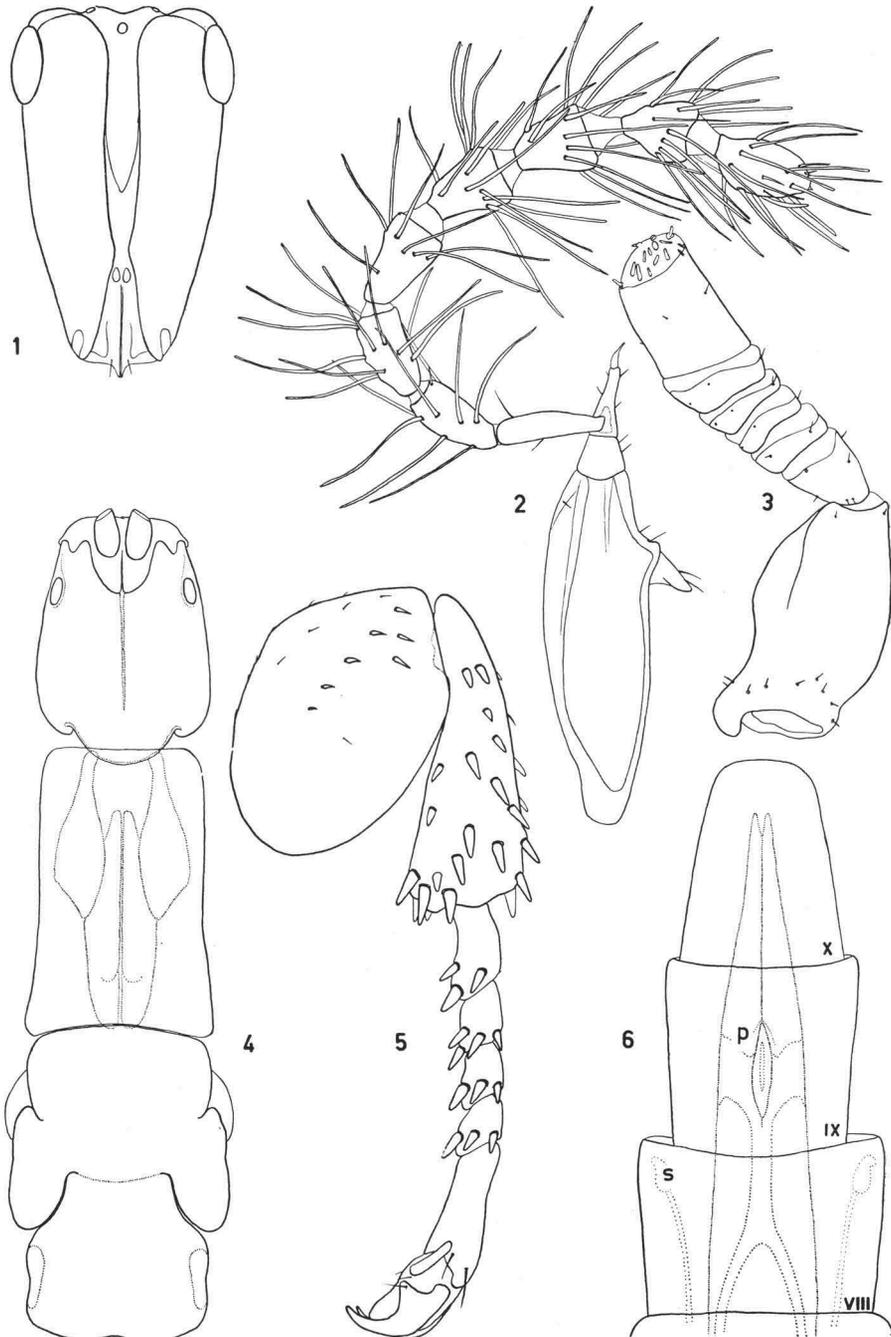
Recently, I received a sample of fig wasps from Uganda (East Africa), collected by Mrs. Ir. W. A. Rijks-Jongbloed in November, 1960. The fig, from which the insects were taken, was recognized by Dr. Gordon P. DeWolf as belonging to *Ficus brachypoda* Hutchinson¹). The sample consisted of two species of Agaonidae, viz., *Agaon paradoxum* (Dalman) Grandi, and *Seres armipes* Waterston; moreover several species of Idarninae were represented. The Agaonid species were known from West Africa only²), where they seem to be rather constant in their characters. It is interesting to establish the fact that the species also occur in East Africa, where, however, they differ significantly from the West African forms. The East African forms are described here as separate subspecies. The material is preserved in the Leiden Museum.

AGAON PARADOXUM MODESTUM nov. subsp.

4 ♀♀, 1 ♂, ex *Ficus brachypoda* Hutch., Kampala (Uganda), XI-1960; coll. no. 481; type, ♂, slide no. 481a; allotype, ♀, slide no. 481b.

1) *F. brachypoda* Hutch. is very close to *F. ovata* Vahl, and perhaps it is only a variety of this species. Information from Dr. E. J. H. Corner (1961, in litt.), who also gave me the other data on *Ficus* mentioned in this paper.

2) *A. paradoxum*: Senegal, French Guinea, Sierra Leone, Ivory Coast, Togo, Nigeria. *S. armipes*: Senegal, Gold Coast.



Figs. 1-6, *Agaon paradoxum modestum* nov. subsp.: 1, head of female, $\times 17$; 2, antenna of female, external aspect, $\times 40$; 3, antenna of male, dorsal aspect, $\times 72$; 4, head, thorax, and propodeum of male, $\times 17$; 5, femur, tibia, and tarsi II of male, external aspect, $\times 53$; 6, abdominal segments and penis of male, dorsal aspect, $\times 53$ (VII, VIII, IX, X, urites, p, penis, s, stigmata).

♀. Head, fig. 1. Mandibular appendage with approximately thirty-five transverse rows of teeth. Maxillae I with four lateral setae, not counting the apicals. Antenna, fig. 2. First segment of tarsus I (fig. 9) with ten subventral, conical spines; second to fourth segments with one apical spine each. Projecting part of the ovipositor nearly as long as the abdomen.

♂. Head, thorax, and propodeum, fig. 4. Head one third longer than its maximum width, and nearly twice as long as broad anteriorly. Antenna, fig. 3. Pronotum more than one and a half times as long as broad. General aspect of meso- and metanotum as in *A. p. paradoxum*, but the segments are more slender. Propodeum only little wider than long. Leg I (fig. 8) with three stout spines on the dorsal edge of the tibia; first tarsal segment with five ventral, conical spines. Leg II, fig. 5. Leg III (fig. 7) with a distinct tibial spur. Seventh to tenth abdominal segments, and penis, fig. 6.

The species of *Agaon* may be distinguished as follows (the males are known from the two subspecies of *A. paradoxum* only, which are easily separated by the characters mentioned in the preceding description):

♀♀ (excluded: *A. nigriventre* Girault, and *A. scobiniferum* Waterston, see p. 237).

1. Mandible with two teeth *A. villiersi* (Risbec)
- Mandible with three teeth, or with three large teeth and a fourth, smaller one 2
2. Mandible with three teeth. First segment of tarsus I shorter than the three following segments combined *A. tridentatum* Joseph
- Mandible with three large teeth, and a fourth, smaller one. First segment of tarsus I longer than the three following segments combined . . . 3
3. Mandibular appendage with approximately fifty transverse rows of teeth
A. fasciatum Waterston
- Mandibular appendage with approximately thirty-five to forty transverse rows of teeth 4
4. First segment of tarsus I with approximately thirty ventral, conical spines
A. p. paradoxum (Dalman) Grandi
- First segment of tarsus I with ten ventral, conical spines
A. paradoxum modestum nov. subsp.

SERES ARMIPES BREVICEPS NOV. subspec.

7 ♀♀, ex *Ficus brachypoda* Hutch., Kampala (Uganda), XI-1960; coll. no. 482; type, ♀, slide no. 482a.

♀. Head (fig. 11) not quite twice as long as broad across the eyes, and little more than twice as long as broad anteriorly. Epistomal margin straight. Trophi, fig. 12. Tibia and tarsi I, fig. 10.

Key to the species of *Seres* (♀♀; the males are not known):

1. Tibia I with a comb of peg-like spines at the external ventral edge, and several rows of smaller spines on the disk 2
- Tibia I without such a comb of spines *S. levis* Waterston
2. Head twice, or more than twice as long as broad across the eyes. Epistomal margin bilobate 3
- Head nearly twice as long as broad across the eyes. Epistomal margin straight *S. armipes breviceps* nov. subsp.
3. Head twice as long as broad across the eyes. Longitudinal diameters of the compound eyes one third the length of the head
- S. a. armipes* Waterston
- Head more than twice as long as broad across the eyes. Longitudinal diameters of the compound eyes one seventh the length of the head
- S. longicephalus* Risbec

GENERAL REMARKS

There is some confusion in the orthography of the family name, and in the use of the generic names. I give some linguistic remarks on the derivations of the names *Agaon* and Agaonidae¹), followed by a survey of the African genera of Agaoninae (including those from Madagascar), and a key for their identification²). I refer to Grandi (1955) for a catalogue of the species.

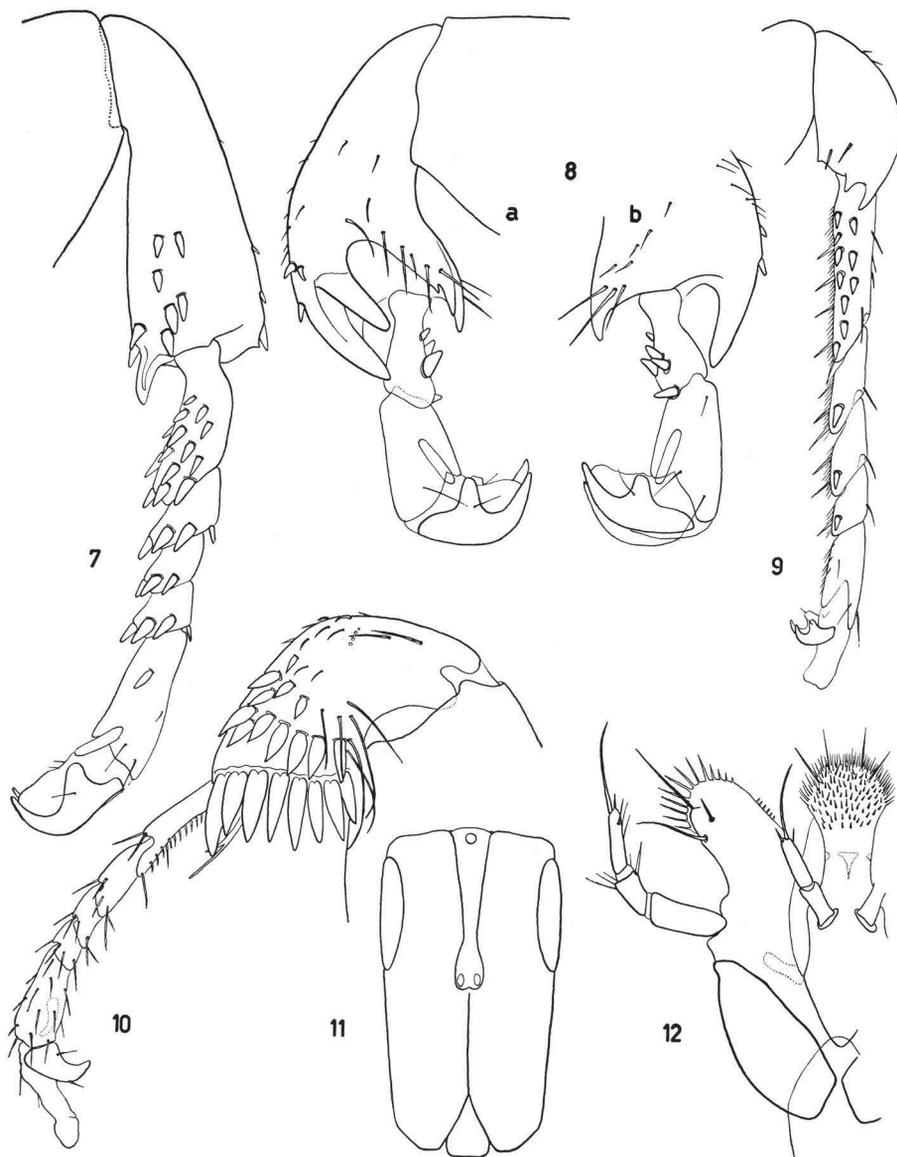
Agaon, Agaonidae.

Tillyard (1926, p. 275) emended the family name Agaonidae to Agaontidae, remarking: "Greek agomai [recte: agamai?], to wonder at, stem agaont-, hence fam. Agaontidae, not Agaonidae".

The stem Agaont-, however, could only arise if *Agaon* (the type genus of the family) stands for ἀγάων (Agaōn), the active participle of ἀγάω (equivalent of ἀγάζομαι), with quite the wrong meaning. Dalman's derivation of the generic name (1818, p. 69) supposes an adjective ἀγαός (Agaōs), and a meaning, admirabilis, which is clearly linked with the verb ἀγαμαί (Agamai), to wonder. As it happens, there is no such adjective as Agaos in classical Greek. Nor has Agamai an active participle Agaon, which

1) I gratefully acknowledge the assistance in these linguistic problems by Miss M. T. Wiebes. Our conclusions were fully confirmed, and our arguments enlarged, by the informations from Professor L. W. Grensted, Consulting Classical Adviser to the International Commission on Zoological Nomenclature.

2) A key to the genera of the Sycophaginae is given by Grandi (1952, p. 40).



Figs. 7-9, *Agaon paradoxum modestum* nov. subsp.: 7, tibia and tarsi III of male, external aspect, $\times 53$; 8, tibia and tarsi I of male, a, external aspect, b, internal aspect, $\times 53$; 9, tibia and tarsi I of female, external aspect, $\times 53$; figs. 10-12, *Seres armipes breviceps* nov. subsp., female: 10, tibia and tarsi I, external aspect, $\times 53$; 11, head, $\times 17$; 12, right half of trophi, ventral aspect, $\times 72$.

Tillyard quite wrongly assumes, so getting a genitive Agaontos and a stem Agaont -.

So *Agaon*, with Dalman's apparently faulty reference to an adjective Agaos, but perfectly clear intention as to meaning, is an un-classical coinage. If ἀγαον (*Agaon*) as a proper name is transliterated into Latin, it would certainly make its genitive Agaonis, giving the stem Agaon- and the family name Agaonidae. The other alternative stem ἀγα- (*Aga-*), possible in Greek, is so unlikely in Latin as to be practically impossible.

I. *Blastophaga* Gravenhorst.

a. subgenus *Blastophaga* Gravenhorst. One introduced species was recorded from Pretoria, Transvaal (Waterston, 1920, p. 128):

Blastophaga psenes (Linnaeus).

b. subgenus *Elisabethiella* Grandi. The following species evidently belong to this subgenus:

Blastophaga articulata Joseph, 1959, p. 32, fig. 2 (1-5),

Blastophaga dakarensis Risbec, 1954, pp. 536-538, fig. 2,

Blastophaga pectinata Joseph, 1959, pp. 32, 34, fig. 2 (6-10).

II. *Alfonsiella* Waterston.

Recently, Joseph described a new species in this genus:

Alfonsiella longiscapa Joseph, 1959, p. 30, fig. 1 (7-12).

III. *Ceratosolen* Mayr.

Sycocrypta Coquerel (1855, pp. 367, 422, Pl. 10 fig. 3; type: *Sycocrypta coeca* Coquerel, monobasic) is congeneric with the species of *Ceratosolen* Mayr (1885). The older name, however, should not replace the well known name *Ceratosolen*. A proposal to suppress the name *Sycocrypta* Coquerel, and to add to the Official List of Generic Names in Zoology the name *Ceratosolen* Mayr, was submitted to the International Commission on Zoological Nomenclature.

Two new African species were recently described:

Ceratosolen longicornis Joseph, 1959, pp. 34, 36, fig. 3 (1-5),

Ceratosolen namorakensis Risbec, 1956, pp. 186-188, fig. 8a, b.

IV. *Allotriozoon* Grandi.

V. *Paragaon* Joseph.

This genus was recently described, with its type:

Paragaon perplexum Joseph, 1959, p. 36, fig. 3 (6-12).

VI. *Agaon* Dalman, sensu Grandi.

One new species was recently described, and another species evidently belongs in the same genus:

Agaon tridentatum Joseph, 1959, pp. 29-30, fig. 1 (1-6),

Blastophaga Villiersi Risbec, 1954, pp. 538-540, figs. 3a-c.

Agaon nigriventre Girault (1915, pp. 44-45), described from Queensland (Australia), certainly does not belong to this genus, as was already suggested by Grandi (1916, pp. 220, 221). It may well be *Pleistodontes* Saunders¹).

Agaon scobiniferum Waterston (1920, pp. 132-134, fig. 2) does not seem to have its third antennal segment with a pointed distal end, and for that reason appears to belong to *Alfonsiella* rather than to *Agaon*. Moreover, the head is much shorter than in the species of *Agaon*. Waterston (l.c., p. 132) himself expressed his doubts as to the generic position of the species, which was described from incomplete specimens. In my opinion, it must remain incertae sedis until new specimens from the same *Ficus* (*F. lukanda* Welw.) become available for study.

The species, described by Risbec (1956, pp. 191-194, figs. 8c-e, 10) as *Pleistodontes bekiliensis*, seems to be very close to the species of *Agaon* in its general aspect, but it is aberrant in some characters, viz., the ♀ head is rather short (length: width = 78: 53), there are five tarsal segments in the ♂ leg I, and the ♂ antenna seems to have only six free segments. The male characters, mentioned above, indeed are the same as in *Pleistodontes* Saunders; the assignment of the species from Madagascar to this Australian genus, however, remains doubtful.

KEY TO THE GENERA.

- | | |
|---|-----------------------------------|
| 1. Females | 2 |
| — Males | 8 |
| 2. Mandibular appendages long, their ventral surfaces provided with transverse rows of teeth | 3 |
| — Mandibular appendages usually shorter, with transverse ridges on the ventral surfaces | 7 |
| 3. Postmarginal veins in fore wings completely developed | 4 |
| — Postmarginal veins in fore wings short and obsolescent | 6 |
| 4. Transverse rows on mandibular appendages with two teeth only | |
| | <i>Paragaon</i> Joseph |
| — Transverse rows on mandibular appendages consisting of many teeth | 5 |
| 5. Head one and a half to two times as long as broad across the eyes. Antennal scape with an angular projection on the ventral margin | |
| | <i>Agaon</i> Dalman, sensu Grandi |

¹) Dr. E. F. Riek (1961, in litt.) informs me that it is the same as *Pleistodontes nigriventris* Girault, 1915, Mem. Queensl. Mus., vol. IV, p. 311.

- Head less than one and a half times as long as broad across the eyes.
Antennal scape without such an angular projection *Elisabethiella* Grandi
- 6. Funicular segments of the antenna with whorls of long, flagellate sensillae *Alfonsiella* Waterston
- Sensillae of the funicular segments of the antenna not particularly long; rod-like *Allotriozoon* Grandi
- 7. Stigmata of the eighth urotergite oblong *Ceratosolen* Mayr
- Stigmata of the eighth urotergite round . . . *Blastophaga* Gravenhorst
- 8. Anterior margin of the head dorsally, between the antennae, with a prominent epistomal process. The antennae are situated in separate grooves 9
- Anterior margin of the head without a prominent process. The antennae are situated together in a common groove 10
- 9. Epistomal process broadly tridentate. Tarsi I consisting of two segments
Ceratosolen Mayr
- Epistomal process sharply pointed. Tarsi I consisting of three segments
Allotriozoon Grandi
- 10. Antennae with seven free segments. Second segment of tarsus I entire
Agaon Dalman, sensu Grandi
- Antennae with five free segments 11
- 11. Second segment of tarsus I with dorsal notches, reflecting the original pentamerous condition. Prosternum not particularly small
Elisabethiella Grandi
- Second segment of tarsus I entire. Prosternum very small, and scarcely visible between the large propleurae . *Blastophaga psenes* (Linnaeus)

HOST RECORDS.

A survey of the host records is given in table 1. Unfortunately, there is no check on the identifications of all *Ficus*-species mentioned as hosts of Agaonidae. Some of the records may be incorrect.

In general, I find in the Indo-Malayan Agaoninae a very close correlation between the taxonomy of the figs and that of the pollinators. Every species of *Ficus* seems to have its own Agaonine wasp, and related species of figs have related pollinators. A tendency to this principle is seen in the list of African host records, as well as an indication of a similar correlation with the taxonomy of the Sycophaginae.

TABLE I.

Host records of African and Madagascan Agaonidae.

| <i>Ficus.</i> | Agaoninae. | Sycophaginae. |
|--|--------------------------------------|-------------------------------|
| subgenus <i>Urostigma</i> Miq. | | |
| <i>Galoglychia</i> (Gasp.) Endl. | <i>Elisabethiella</i> Grandi | <i>Crossogaster</i> Mayr |
| <i>F. salicifolia</i> Vahl | <i>E. socotrensis</i> Mayr | <i>C. triformis</i> Mayr |
| | | <i>Phagoblastus</i> Grandi |
| <i>F. petersii</i> Warb. | <i>E. stuckenbergi</i> Gr. | <i>P. barbarus</i> Gr. |
| | <i>Allotriozoon</i> Grandi | |
| <i>F. vogelii</i> Miq. | <i>A. heterandromorphum</i> Gr. | |
| | <i>Agaon</i> (Dalman) Grandi | <i>Seres</i> Waterston |
| <i>F. ovata</i> Vahl | <i>A. paradoxum</i> (Dalm.) Gr. | <i>S. armipes</i> Wat. |
| <i>F. brachypoda</i> Hutch. | <i>A. p. modestum</i> Ws. | <i>S. a. breviceps</i> Ws. |
| <i>F. lukanda</i> Welw..... | <i>A. scobiniferum</i> Wat. 1)..... | <i>S. levis</i> Wat. |
| | | <i>Sycoecus</i> Waterston |
| (<i>Ficus</i> spec.) | <i>A. fasciatum</i> Wat. | <i>S. thaumastocnema</i> Wat. |
| | | <i>Philocaenus</i> Grandi |
| <i>F. platyphylla</i> Del. | | <i>P. barbatus</i> Gr. |
| | <i>Ceratosolen</i> Mayr | <i>Sycophaga</i> Westwood |
| <i>F. rhodesiaca</i> Warb. | <i>C. myersi</i> Gr. | <i>S. callani</i> Gr. |
| <i>Malvanthera</i> Corner | | |
| <i>F. ferruginea</i> Desf. 2)..... | <i>C. silvestrianus</i> Gr. | <i>S. silvestrii</i> Gr. |
| subgenus <i>Sycomor</i> Miq. | | |
| <i>F. capensis</i> Thunb. | <i>C. capensis</i> Gr. | |
| <i>F. panifica</i> Del. 3) | <i>C. occultiventris</i> (Mayr) | |
| <i>F. sycomorus</i> Linn. | <i>C. arabicus</i> Mayr | <i>S. sycomori</i> (Linn.) |
| <i>F. terrigena</i> Bory 4) | <i>C. coecus</i> (Coq.) 1)..... | <i>S. paradoxa</i> (Coq.) 1) |
| | <i>Elisabethiella</i> Grandi | |
| | | <i>S. silvestrii</i> Gr. 5) |
| <i>F. gnaphalocarpa</i> Steud | <i>E. wanei</i> (Risb.) | <i>Seres</i> Waterston |
| | | <i>S. longicephalus</i> Risb. |
| subgenus <i>Ficus</i> Linn. <i>Blastophaga</i> Gravenhorst | | |
| <i>F. carica</i> Linn. | <i>B. psenes</i> (Linn.) | |

1) incertae sedis.

2) = *F. rubiginosa* Desf. ex Vent. In a sample of fig wasps from this *Ficus*, collected in Adelaide, Australia, however, I find a species of *Pleistodontes* Saunders3) = *F. sur* Forsk.4) probably = *F. mauritiana* Lam. (sec. Grandi, 1916, p. 234).5) probably = *S. valentinae* Gr. (sec. Grandi, 1952, p. 34).

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