

A REVISION OF THE *BRÜELIA* (MALLOPHAGA)
SPECIES INFESTING THE CORVIDAE
PART II

BY
M. ATIQUR RAHMAN ANSARI

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A REVISION OF THE *BRÜELIA* (MALLOPHAGA) SPECIES INFESTING THE CORVIDAE

PART II*

By M. ATIQR RAHMAN ANSARI, M.Sc., Ph.D., D.Sc.

THE various species of *Brüelia* Kéler, 1936 from the crows, belonging to the genus *Corvus*, closely resemble each other in their external morphology and have usually been wrongly identified. Among these species there are three distinct groups separated by the characters of the male genitalia ; a combination of characters including the shape of the head and abdominal chaetotaxy enables these groups to be further subdivided into convenient subgroups.

In the female, the shape of the head, tergal and genital plates are also found useful in separating species.

Three species viz., *Brüelia bipunctata* (Rudow), *B. latifasciata* (Piaget) and *B. rotundata* (Osborn) are included in the present communication as valid names not because we believe them to be so, but because in the absence of the sex, other than from which these are described, we are uncertain of their true status. During these studies we have generally observed that the allied forms are commonly indistinguishable from each other in the females though easily separated in the males. We hesitate therefore to establish a name based on females alone. In order to elucidate this problem, as to whether these names refer to any other known species or not, we think that it is necessary to have collections from the type host and type locality. Before this purpose is achieved, these names are better considered as tentative.

Brüelia argula (Burmeister), 1838 (Text-figs. 1-8, 60-64)

Nirmus argula Burmeister, 1838, *Handb. Ent.* 2 : 430.

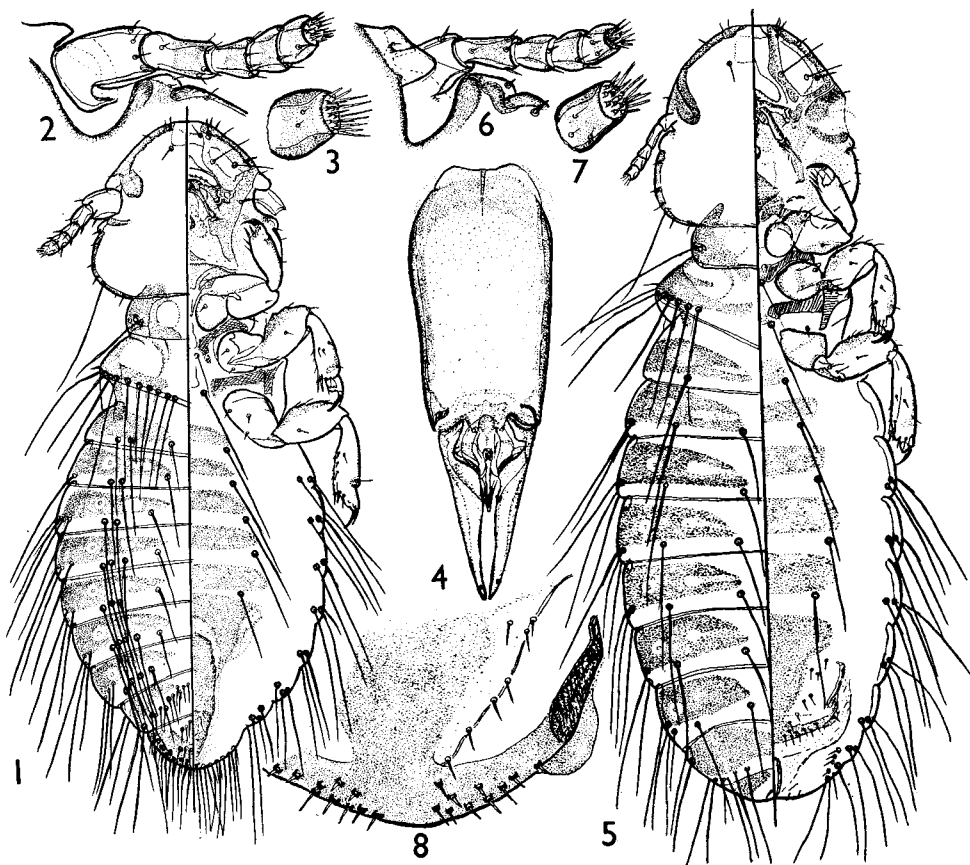
Type host : *Corvus c. corax* Linn.

MALE. Head broader than long and roughly hexagonal in shape. Pre-antennal region triangular, parabolic with slightly flattened anterior margin. Marginal carina entire dorsally and feebly sclerotized medianly. Ventral carina uniformly sclerotized throughout and continuous with the marginal carina. Preocular nodus well developed, continuous with the pre-antennal nodus. Postocular nodus well pigmented. The number and arrangement of setae of head as described by Clay

* Part I appeared in *Bull. Brit. Mus. (Nat. Hist.) Ent.* 4 (8) : 371-406, 1956.

(1951). Antennae exhibiting sexual dimorphism, basal segment robust, about 1.5 times as long as in the female.

Prothorax transverse, with a long dorsal hair in the posterior angle. Pterothorax trapezoidal, laterally divergent. Angulate posteriorly, with 8-9 elongate hairs on the dorsal posterior margin on each side.



FIGS. 1-8.—*Brüelia argula* (Burmeister). (1) Dorsal and ventral aspects of adult male; (2) antenna of male; (3) tip of the same; (4) male genital armature; (5) dorsal and ventral aspects of adult female; (6) antenna of female; (7) tip of the same; (8) vulvar chaetotaxy.

Abdomen elliptical with broadly rounded terminal segment. Tergal plates well developed, II-VI roughly rectangular, narrow; VII-VIII tending to be triangular; IX triangular. Sternal plates II-VI well formed, rectangular, narrowed in the middle. Genital plate triangular. Chaetotaxy as shown in the table below, fairly regular in all specimens save some of the small hairs which vary slightly in some specimens.

GENITALIA. Basal plate is about 1.3-1.4 times as long as the parameres. Mesosomal plate wide anteriorly, concave laterally in the middle and elongated posteriorly.

The details of the proximal head of parameres, shape of endomeres and telomeres and details of mesosome are of specific value and are shown in the figure.

FEMALE. Similar to male but larger and with scarce tergal chaetotaxy. Tergal plates II-VIII approximate, roughly rectangular; IX entire. Genital blotch triangular with posterior angle prolonged backwards to meet a narrow cross-piece forming an anchor-shaped plate. Vulva with 9-10 spines.

Abdominal Chaetotaxy

	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax .	8-9+8-9	1+1	—	7-8+7-8	1+1	—
Abdomen II .	2+1+1+2	1+1	0-0	1+1+1+1	1+1	0+0
III .	2+1+1+2	1+1	1-2+1-2	1+1+1+1	1+1	1+2
IV .	2+1+1+2	1+1	3+3	1+1+1+1	1+1	3+3
V .	2-3+1+1+3	1+1	3+3	1+1+1+1	1+1	3+3
VI .	2-3+1+1+3	1-2+1-2	3+3	1+1+1+1	1+1	4+4
VII .	3+1+1+3	0+0	3+3	1+1+1+1	0+0	3+3
VIII .	3+1+1+3	0+0	4+4	2+1+1+2	0+0	4+4
IX .	1+9+9+1	0+0	5+5	4+4	0+0	4+4
X-XI .	{ 3+3 3+3	—	23+18	—	Vulva : 9+10	—

Measurements (mm.) (Length × Breadth)

	Male (neotype)	Female (neallotype)
Head : pre-antennal .	0.164 × 0.397	0.205 × 0.452
hind head .	0.267 × 0.479	0.288 × 0.527
Prothorax . . .	0.103 × 0.315	0.103 × 0.328
Pterothorax . . .	0.157 × 0.465	0.205 × 0.521
Abdomen . . .	0.924 × 0.698	1.212 × 0.716
L : B of pre-antennal .	1 : 2.42	1 : 2.21
L : B of hind head .	1 : 1.79	1 : 1.83
Cephalic index . . .	1 : 1.11	1 : 1.07

MATERIAL EXAMINED. Six males and 7 females from *Corvus corax corax* Linn. from Uist and Russia in British Museum (Nat. Hist.) Collection.

Neotype (male) of *Brüelia argula* (Burmeister) and *neallotype* (female) on slide no. 14562 in Meinertzhagen collection (British Museum) (Nat. Hist.) from *Corvus corax corax* Linn. *Neoparatypes* : 5 males and 6 females from the same host (data above).

Fifty-four males and 74 females from *Corvus corax laurencei* Hume from Chorband and Kabul (Afghanistan), Palestine and Lyallpur (Pakistan), 20 males and 6 females from *Corvus corax ruficollis* and 5 males and 74 females from *Corvus corax tingitanus* from Egypt, Morocco, North Africa and Teneriffe in Meinertzhagen collection were found to be indistinguishable from *Brüelia argula*.

Brüelia leucocephalus (Nitzsch), 1866

(Text-figs. 9, 26-27, 65-68)

Nirmus leucocephalus, Nitzsch, 1866, *Z. ges. Natwiss.* 28 : 365.Type host : *Corvus albicollis* Latham.

Brüelia leucocephalus is closely allied to *B. argula* from which it differs in the abdominal chaetotaxy. From the other allied forms viz., *B. quadrangularis* and *B. theresae* it differs in the shape of the head.

MALE. Head broader than long ; pre-antennal region less than half the region behind. Marginal carina entire. Dorsal suture well marked. Antennae well built, basal segment robust. Tergal plates II-IX narrow, approximate, well sclerotized ; III-VI ensiform with two clear, or faintly pigmented circular areas. Sternal plates II-VI well formed. Genital plate triangular. Genitalia of the type found in *Brüelia argula*. Basal plate broader anteriorly and narrow posteriorly. Parameres slightly longer and broader than in *B. quadrangularis*. The characters of the proximal head of parameres, endomeres and mesosome are also different.

FEMALE. Similar to male but the measurements are greater. The abdominal chaetotaxy also differs considerably.

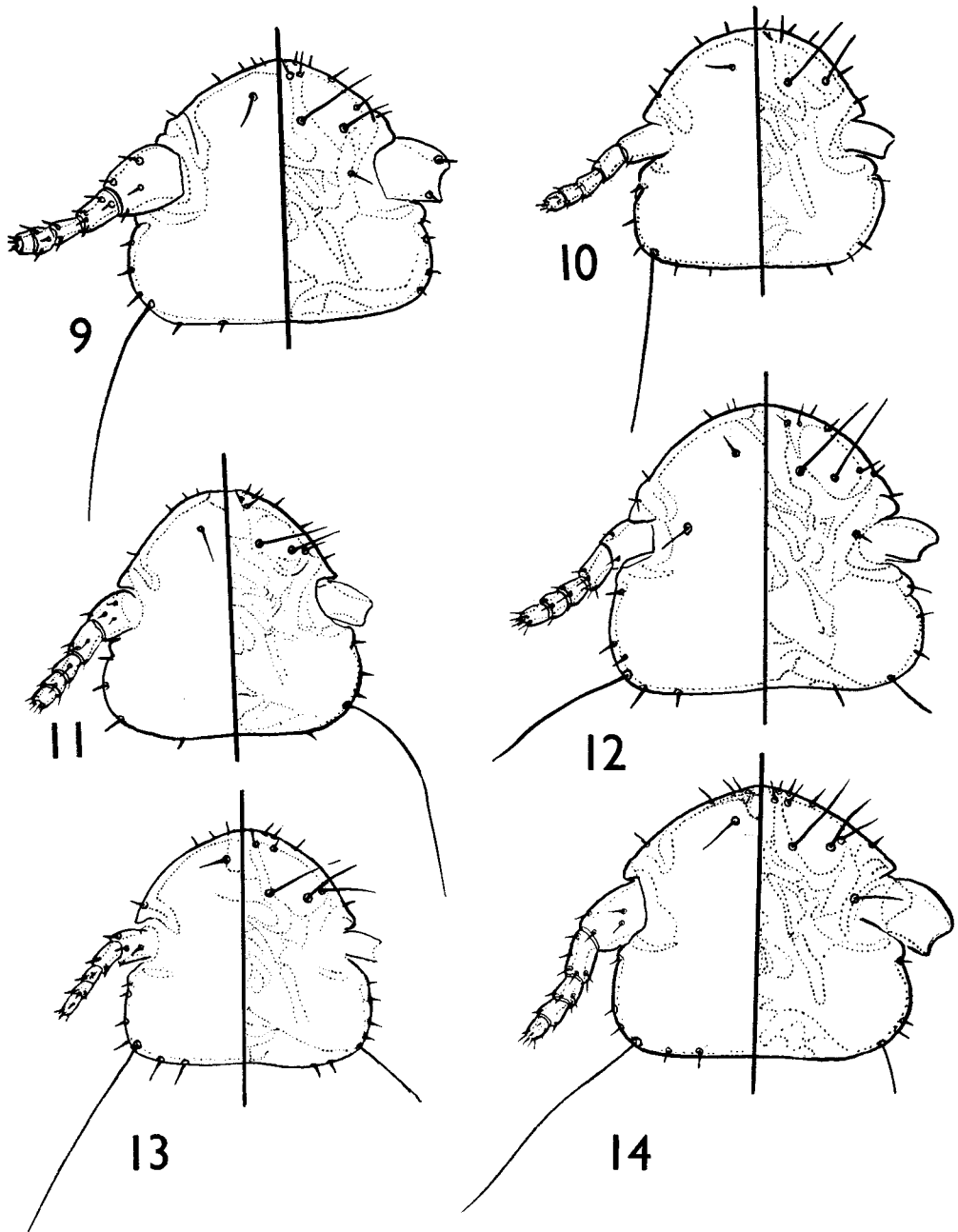
Abdominal Chaetotaxy

	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Ptero-thorax .	11+10-11	1+1	—	9+9	1+1	—
Abdomen :						
II .	2+3+3+2	1+1	0+0	1+2+2-3+1	1+1	0+0
III .	2+4+3-4+2	1+1+1+1	1+2	2+3+3+2	3+4	2+2
IV .	2+3-4+4+2	1+1+1+1	2+3	2+3+3+2	3+3	2+3
V .	2+4+4+2	1+1+1+1	3+3	2+2-3+3+1-2	3+3-4	3+3
VI .	2+3+3+2	1+1+1+1	4+4	1-2+3+3+1-2	3+4	4+4
VII .	2+3-4+3-4+2	0+0	3+3	2+2+2+1-2	1+1	3-4+3
VIII .	4+2+2+4	0+0	5+5	2+3+3+1-2	0+0	4-5+4-5
IX .	1+16+17+1	0+0	4+4	4+4	0+0	5+5
X-XI .	{ 3+3 4+3	7+7	31-33+31-35	—	Vulva : 12+12-16	—

See Text-fig.

Measurements (mm.)

	Male (neotype)	Female (neallotype)
Head : pre-antennal .	0.137 × 0.349	0.184 × 0.424
hind head .	0.308 × 0.514	0.294 × 0.521
Prothorax . . .	0.144 × 0.356	0.131 × 0.342
Pterothorax . . .	0.177 × 0.554	0.171 × 0.500
Abdomen . . .	1.014 × 0.684	1.233 × 0.718
L : B of pre-antennal .	1 : 2.54	1 : 2.31
L : B of hind head .	1 : 1.67	1 : 1.77
Cephalic index . . .	1 : 1.13	1 : 1.09



FIGS. 9-14. Heads of adult males : (9) *Brüelia lecocephalus* (Nitzsch) ; (10) *Brüelia theresae*, sp. nov. ; (11) *Brüelia quadrangularis* (Rudow) ; (12) *Brüelia tasniemae* sp. nov. ; (13) *Brüelia variegata* sp. nov. ; (14) *Brüelia afzali* sp. nov.

MATERIAL EXAMINED. Twelve males and 20 females from *Corvus albicollis* Latham, from Basutoland, Tanganyika, Kenya, South Nigeria and Uganda.

Neotype (male) and *neallotype* (female) from *Corvus albicollis* from Basutoland, Swedish South African Expedition 1950-51. *Neoparatypes*: 11 males and 19 females from the same host species (data above).

***Brüelia theresae* sp. nov.**

(Text-figs. 10, 28-29, 69-73)

This species resembles *Brüelia argula* (Burmeister) in all general details, but there is considerable difference in the abdominal chaetotaxy of both sexes. The male genitalia also differ in the details of the proximal head of the parameres. The shape of the endomeres and telomeres and details of mesosome are similar to that found in *Brüelia argula*.

Abdominal Chaetotaxy

	Male (holotype)			Female (allotype)		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax	9+9	1+1	—	8+7	1+1	0+0
Abdomen:						
II .	2+3+3+2	1+1	0+0	1+3+3+1	1+1	1+2
III .	2+3+3+2	1+1	1+1	1+2+3+1	1+1+1+1	2+2
IV .	2+3+3+2	1+1	2+2	1+2+2+1	1+1+1+1	2+2
V .	2+2+3+2	1+1	2+2	1+2+2+1	1+1+1+1	2+3
VI .	2+2+2+2	1+1	3+3	1+1+1+1	1+1+1+1	2+3
VII .	2+2+3+2	0+0	2+3	1+1+1+1	0+0	2+3
VIII .	6+5	0+0	3+3	1+1	0+0	4+4
IX .	1+8+8+1	0+0	3+3	2+2	0+0	—
X-XI .	3+3	3+3	23+22	—	Vulva:	—
					9+10	

Measurements (mm.)

	Male (holotype)	Female (allotype)
Head: pre-antennal . . .	0.157 × 0.349	0.184 × 0.383
hind head . . .	0.253 × 0.417	0.253 × 0.452
Prothorax . . .	0.103 × 0.281	0.103 × 0.288
Pterothorax . . .	0.151 × 0.431	0.151 × 0.452
Abdomen . . .	0.897 × 0.547	1.027 × 0.582
L : B of pre-antennal . . .	1 : 2.22	1 : 2.08
L : B of hind head . . .	1 : 1.64	1 : 1.78
Cephalic index . . .	1 : 1.02	1 : 1.03

MATERIAL EXAMINED. Eighteen males and 29 females from *Corvus rhipidurus* from Aden. *Holotype* (male) and *allotype* (female), slide no. 17849 in Meinertzhagen collection (British Museum (Nat. Hist.)) from *Corvus rhipidurus* Hartest from Aden. *Paratypes*: 17 males and 28 females from the type host (data above).

***Brüelia quadrangularis* (Rudow), 1869**

(Text-figs. 11, 30-31)

Nirmus quadrangularis Rudow, 1869, *Beitr. Kenntn. Malloph.* : 18.

Type host : *Corvus albus* Müller.

Brüelia quadrangularis is allied to *B. argula*, from which it differs in chaetotaxy. It differs from *B. theresae* and *B. leucocephalus* in the shape of the head.

Rudow described two species of *Nirmus* from *Corvus scapularis* (= *Corvus albus* Müller). Hopkins & Clay (unpublished records) have pointed out that the earlier description (1869, p. 18, *B. quadrangularis*) fits the broad-headed form while the other (1870, p. 467, *bipunctata*) fits the narrow-headed form. In the British Museum collection both of these forms from the type host are represented, but the broad-headed forms were found to predominate.

MALE. Head broad, pre-antennal region almost as long as the postantennal region. Marginal carina entire, medianly less sclerotized and concave. Dorsal suture present. Ventral carina fused with the ventrally interrupted marginal carina. Temporal carinae well formed.

Abdomen with narrow tergal plates on segments II-IX. Sternal plates I-VI well formed, rectangular. Genital plate triangular, occupying segments VI-IX.

Genitalia as in *B. argula*.

FEMALE. Similar to the male in general body markings. Tergal plate IX entire. There is, however, considerable difference in abdominal chaetotaxy.

Abdominal Chaetotaxy

	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Ptero-thorax .	9-10+9	1+1	—	7+8	1+1	—
Abdomen:						
II .	2+3+3+2	1+1	0+0	1+3+2-3+1	1-2+1-2	0+0
III .	2+3+2-3+2	1+1+1+1	2+2	1+1+2+1-2	1-2+1-2	2+2
IV .	2+3+3+2	1+1+1+1	2+2	1+2-3+2-3+1	2-3+2-3	2+2
V .	2+3+2-3+2	1+1+1+1	3+3	1+2-3+2-3+1	2+2	2-3+3
VI .	2+4+3+3	1+2+2+1	3+3	1+1-2+1-2+1	2+2	3+3
VII .	2+2-3+3+2	0+0	3+3	1+1+1+1	0+0	3+3
VIII .	3+3+3+2	0+0	3+3	1+1	0+0	3+4
IX .	1+14+16+1	0+0	4+4	3+4	0+0	4+3
X-XI .	3+3	5+5-6	18-20+22	—	Vulva :	—
					10-11+12-14	

Measurements (mm.)

	Male (neotype)	Female (neallotype)
Head : pre-antennal .	0.164 × 0.335	0.205 × 0.383
hind head .	0.261 × 0.438	0.253 × 0.459
Prothorax . . .	0.116 × 0.308	0.109 × 0.308
Pterothorax . . .	0.137 × 0.459	0.157 × 0.459
Abdomen . . .	0.807 × 0.616	0.938 × 0.586
L : B of pre-antennal .	1 : 2.04	1 : 1.87
L : B of hind head .	1 : 1.68	1 : 1.81
Cephalic index . . .	1 : 1.03	1 : 1.00

MATERIAL EXAMINED. Ten males and 22 females from the type host, *Corvus albus* Müller from Kenya, Tanganyika, Sudan, South West Africa.

Neotype (male) and *neallotype* (female) from *Corvus albus* Müller from South West Africa, on slide no. 19180-91 in Meinertzhagen collection (British Museum (Nat. Hist.)). *Neoparatypes*: 9 males and 21 females from the type host (data above.)

Fourteen males and 17 females from *Corvus corax edithae* from Somaliland (two localities) are indistinguishable from the above specimens.

***Brüelia tasniemae* sp. nov.**

(Text-figs. 12, 32-33, 74-78)

This species resembles *Brüelia uncinosa* (Burmeister) in the shape of the head, from which it can be easily distinguished by the tergal plates. From the other allied forms it differs in the shape of the head, in the development of the marginal carina and ventral carina.

MALE. Fore head rounded. Marginal carina narrow, entire, although less heavily sclerotized in front and indented so as to leave a hyaline margin at this point. Preocular nodus well pigmented. Postocular nodus well developed but not well pigmented. Ventral carina well formed, pigmented in the anterior portion alone. Tergal plates triangular, III-VII with medianly depressed anterior and posterior margins and two circular clear spaces. Genitalia as shown in the figure, similar to that found in *B. argula*, but differ in the shape of the mesosomal plate. The genitalia are also like those found in *B. uncinosa*. The latter species can be easily separated by the pattern of the tergal plates.

FEMALE. Similar to the male, but differs in size of the body, tergal plates and abdominal chaetotaxy. Tergal plates rectangular, with anterior ends opening like a beak.

Abdominal Chaetotaxy

	Male (holotype)			Female (allotype)		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax .	9+7	1+1	—	9+7	1+1	—
Abdomen II .	1+1	1+1	0+0	1+1	1+1	0+0
III .	1+1+1+1	1+1	1+1	1+1+1+1	1+1	1+1
IV .	2+1+1+2	2+3	3+2	1+1+1+1	1+1	2+2
V .	2+2+2+2	2+2	2+2	1+1+1+1	2+2	2+2
VI .	2+3+3+2	2+2	2+3	1+1+1+1	2+2	3+3
VII .	2+3+3+2	0+0	2+2	1+1+1+1	0+0	3+3
VIII .	3+2+2+3	0+0	4+4	1+1+1+1	0+0	4+4
IX .	1+8+9+1	0+0	4+4	3+3	0+0	4+4
X-XI .	3+3	—	15+15	—	Vulvae :	—
						13+12

Measurements (mm.)

	Male (holotype)	Female (allotype)
Head : pre-antennal	0.184 × 0.424	0.219 × 0.486
hind head	0.281 × 0.521	0.294 × 0.561
Prothorax	0.096 × 0.328	0.109 × 0.349
Pterothorax	0.226 × 0.534	0.226 × 0.534
Abdomen	1.000 × 0.712	1.356 × 0.800
L : B of pre-antennal	1 : 2.31	1 : 2.21
L : B of hind head	1 : 1.85	1 : 1.91
Cephalic index	1 : 1.12	1 : 1.09

MATERIAL EXAMINED. Four males and 10 females from *Corvus frugilegus frugilegus* Linn. from Kabul. *Holotype* (male), *allotype* (female) from *Corvus frugilegus frugilegus* Linn. from Kabul on slide no. 9686 in Meinertzhagen collection. *Paratypes* : 3 males and 9 females from the same host (data above).

Brüelia variegata sp. nov.

(Text-figs. 13, 34-35, 79-82)

This species is similar to the above species from which it can be distinguished by the genitalia, and the size and shape of the head, which is rounded in front.

MALE. Marginal carina very narrow, entire, feebly sclerotized and slightly depressed in the middle. Ventral carina not well developed, approximate. Basal antennal segment not so robust as in the allied species. Tertal plates II-VI almost rectangular, with interrupted colourless areas in the middle, VII-IX triangular. Male genitalia as shown in the figures. Parameres comparatively short and robust, with well developed proximal heads.

FEMALE. Similar to the male, but the measurements and chaetotaxy differ and cannot be easily separated from the females of allied forms. Genital plate with almost straight sides so as to form a very obtuse terminal angle.

Abdominal Chaetotaxy

	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax	7-9+7-9	1+1	—	6-7+6-7	1+1	—
Abdomen :						
II	2+1+1+2	1+1	0+0	1+1	1+1	0+0
III	2+1+1+2	1+1	1+1	1+1+1+1	1+1	1+1
IV	2+1+1+2	1+1	2+2	1+1+1+1	1+1	2-3+2-3
V	2+1-2+1-2+2	1+1	2+3	1+2+1+1	1+1	2-3+2-3
VI	2+1-2+3+2	1+1	3+3	1+2+1+1	1-2+1-2	3+3
VII	2+2+2+2	0+0	3+3	1+1+1+1	0+0	3+3
VIII	1+4+2-5+1	0+0	4+3	1+1+1+1	0+0	3+3
IX	1+6-7+6-7+1	0+0	3+3	3+3	0+0	2+2
X-XI	3+3	0+0	14+15	—	Vulva :	—
					8-10+8	

Measurements (mm.)

	Male (holotype)	Female (allotype)
Head : pre-antennal . . .	0.157 × 0.369 . . .	0.177 × 0.377 . . .
hind head . . .	0.239 × 0.424 . . .	0.234 × 0.452 . . .
Prothorax . . .	0.103 × 0.246 . . .	0.109 × 0.253 . . .
Pterothorax . . .	0.137 × 0.397 . . .	0.137 × 0.391 . . .
Abdomen . . .	0.876 × 0.547 . . .	1.131 × 0.568 . . .
L : B of pre-antennal . . .	1 : 2.35 . . .	1 : 2.13 . . .
L : B of hind head . . .	1 : 1.77 . . .	1 : 1.93 . . .
Cephalic index . . .	1 : 1.10 . . .	1 : 1.10 . . .

MATERIAL EXAMINED. Four males and 15 females from *Corvus capensis* from Somaliland, Transvaal, and Damaraland. *Holotype* (male) and *allotype* (female) on slide no. 18329 from *Corvus capensis* Licht. from Somaliland, in the Meinertzhagen collection (British Museum (Nat. Hist.)). *Paratypes*: 3 males and 14 females from the same host (data above).

Brüelia afzali sp. nov.

(Text-figs. 14, 36-37, 83-87)

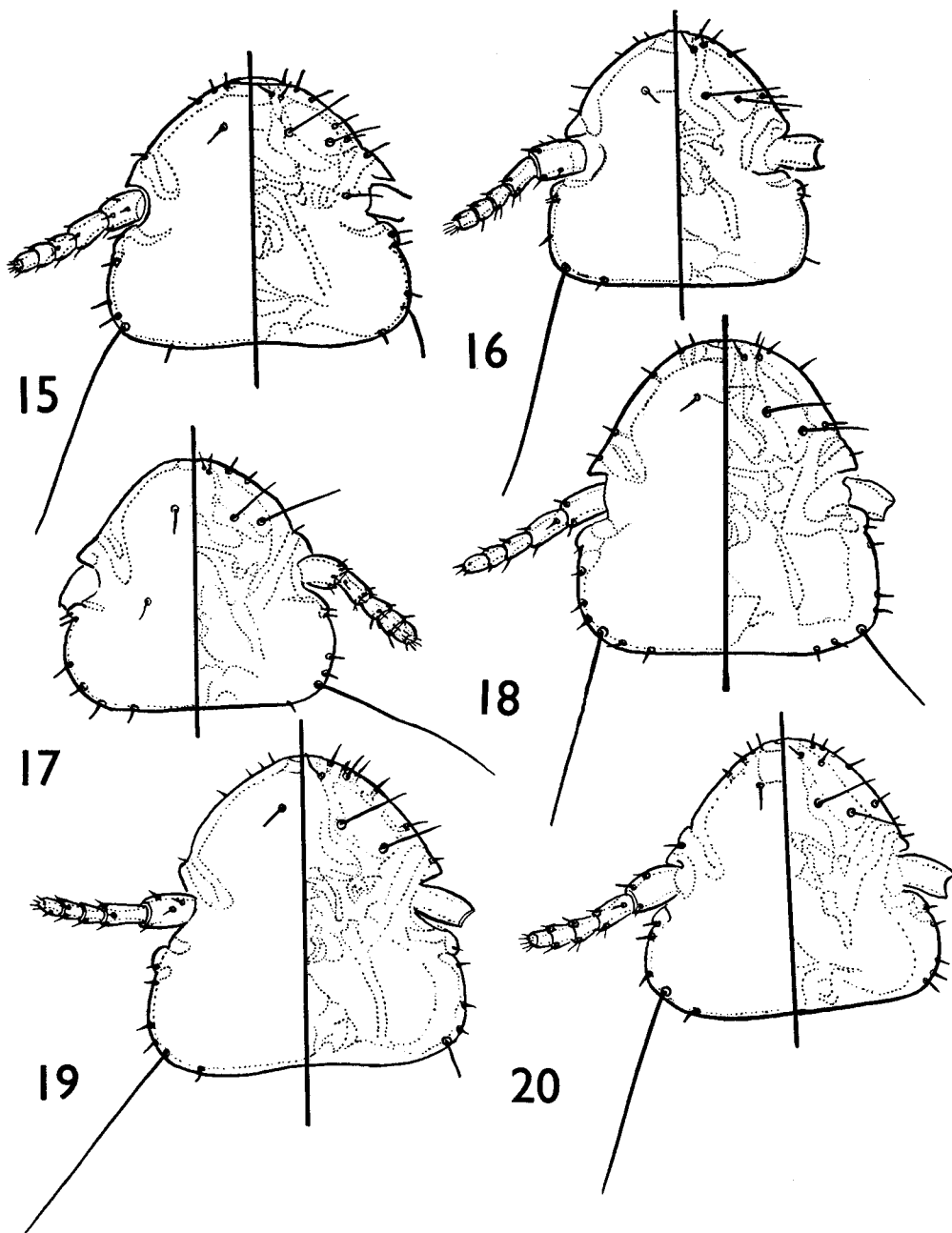
This species resembles *Brüelia leucocephalus* in the shape of the head, and *B. uncinosa* in the form of the male genitalia. From the latter it differs in the shape of tergal plates. It also resembles *B. tasniemae* sp. nov. and *B. variegata* sp. nov. from both of which it is distinguished by the squat and broad fore head and well developed first antennal segment in the male.

MALE. Fore head very squat and broader than long. Marginal carina narrow. Ventral carina well developed. Preocular nodus well pigmented and fused with pre-antennal nodus. Postocular nodus not well pigmented. Antennae well developed, antennal segment I very robust. Tergal plates well developed, II-VI wedge-shaped, VII-IX triangular. Male genitalia of the pattern seen in the species referred to above.

FEMALE. Similar to male. Ventral setae of pleural plate IX elongate.

Abdominal Chaetotaxy

	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax . . .	7-9+6-9	1+1	—	9-10+8-10	1+1	—
Abdomen :						
II . . .	3-4+3-4	2+2	0+0	1+3+2+2	2+2	0+0
III . . .	1+4+4-5+1	3-4+3-4	1+1	2+2-3+2-3+1-2	2+3+2+2	0+0
IV . . .	1+3-4+3-4+1	2-3+3-4	2+2	1+2+1-2+1	4+1+1+4	4+3
V . . .	1+4+5+1	3+3	2+2	1+2+2+1	3+4+1+1+3+5	3+3
VI . . .	1+4+4+1	2-3+2-3	3+3	1+2-3+2-3+1	3+1+1+3	4+4
VII . . .	1+4+4+1	0+0	3+3	1+2+1-2+1	2+1	3+4
VIII . . .	1+4+5+1	0+0	4+4	1+1-2+1-2+1	0+0	4+5
IX . . .	6+3+3+7	0+0	4+3	5+9+5+7	0+0	4+5
X-XI . . .	—	—	14+14	—	Vulva :	—
					18-22+16-19	



FIGS. 15-20. Heads of adult males: (15) *Brüelia uncinosa* (Burmeister); (16) *Brüelia saliemii* sp. nov.; (17) *Brüelia saliemii mollii* ssp. nov.; (18) *Brüelia atherae* sp. nov.; (19) *Brüelia cryptoleucus* sp. nov.; (20) *Brüelia varia* (Burmeister).

Measurements (mm.)

	Male (holotype)	Female (allotype)
Head : pre-antennal . . .	0.171 × 0.445 . . .	0.219 × 0.507 . . .
hind head . . .	0.308 × 0.521 . . .	0.308 × 0.554 . . .
Prothorax	0.109 × 0.335 . . .	0.116 × 0.335 . . .
Pterothorax	0.219 × 0.527 . . .	0.239 × 0.486 . . .
Abdomen	0.979 × 0.726 . . .	1.281 × 0.774 . . .
L : B of pre-antennal . . .	1 : 2.30 . . .	1 : 2.31 . . .
L : B of hind head . . .	1 : 1.69 . . .	1 : 1.79 . . .
Cephalic index	1 : 1.09 . . .	1 : 1.05 . . .

MATERIAL EXAMINED. Four males and 6 females from *Corvus cryptoleucus* from Texas and Illinois. *Holotype* (male) and *allotype* (female) from *Corvus cryptoleucus* Couch from Illinois on slide no. 12668 in Meinertzhagen collection. *Paratypes* : 3 males and 5 females from the same host (data above).

Brüelia uncinosa (Burmeister), 1838

(Text-figs. 15, 38-39, 88-91)

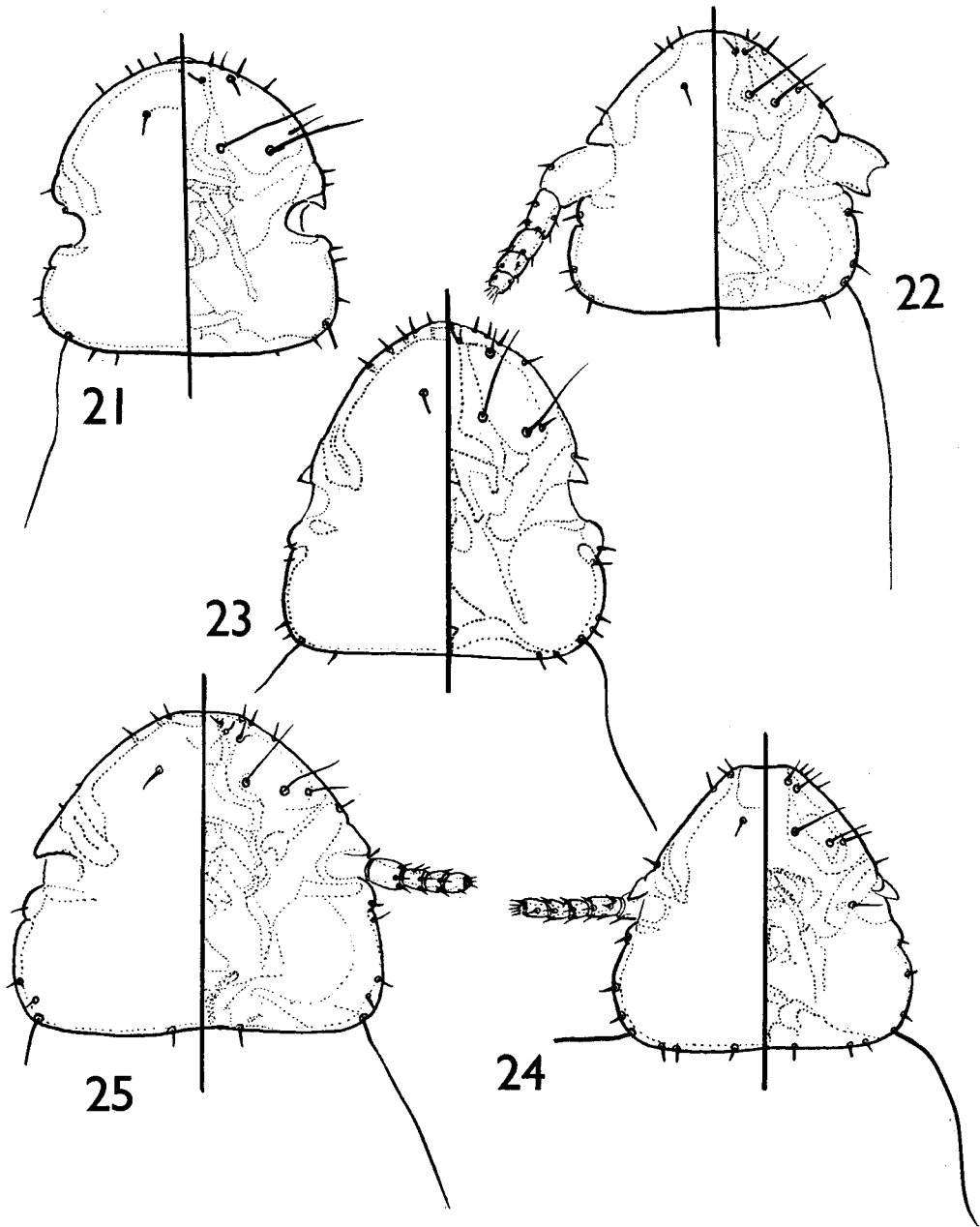
Nirmus uncinosa Burmeister, 1838, *Handb. Ent.* 2 : 430.Type host : *Corvus corone cornix* Linn.

MALE. Head broader than long. Marginal carina entire, but faintly sclerotized in the middle. Ventral carina very feebly sclerotized and not well pigmented. Tergal plates II-III lateral, well pigmented near the stigmata, IV-VIII with a posterior pigmented arm so as to form a horizontally-laid sign of interrogation. Sternal plates II-VI transverse. Genital plate well developed. Genitalia as shown in the figure. Proximal head of parameres narrow. Mesosomal plate polygonal, shape of endomeres and telomeres characteristic.

FEMALE. Similar to the male, but differs in measurements and abdominal chaetotaxy.

Abdominal Chaetotaxy

	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Ptero-thorax	9-10+9-10	1+1	—	6-9+6-9	2+2	—
Abdomen :						
II	1+1+1+1	2+2	0+0	1+1	1+1	0+0
III	1+1+1+1	2+2	1+1	1+1	1+1	1+1
IV	2+1-2+1-2+2	2+2	2+2	1+1+1+1	2+2	2-3+2
V	3+1-2+1-2+2-3	2-3+2	2-3+2	1+1+1+1	2+2	2-3+2
VI	2-3+2-3+3+2-3	2-3+3	2-3+3	1+1+1+1	1+1	3-4+3
VII	2-3+2-3+2-3+2-3	0+0	3+3	1+1+1+1	0+0	3+3
VIII	2-3+2+2+3	0+0	3-4+4	1+1+1+1	0+0	3-4+3
IX	1+9-12+10-13+1	0+0	4-5+4-5	1+3+3+2	0+0	4-5+4
X-XI	{ 3+3 3+3	0+0	12-16+15-17	—	Vulva : 13-15+15-17	—



FIGS. 21-25. Heads of adult males: (21) *Brüelia nawabi* sp. nov.; (22) *Brüelia perwienae* sp. nov. (23-25) Heads of adult females: (23) *Brüelia bipunctata* (Rudow); (24) *Brüelia latifasciata* (Piaget); (25) *Brüelia rotundata* (Osborn).

Measurements (mm.)

	Male (neotype)	Female (neallotype)
Head : pre-antennal	0.199 × 0.472	0.199 × 0.509
hind head	0.318 × 0.582	0.318 × 0.609
Prothorax	0.127 × 0.345	0.127 × 0.345
Pterothorax	0.318 × 0.545	0.336 × 0.545
Abdomen	0.882 × 0.718	1.027 × 0.782
L : B of pre-antennal	1 : 2.37	1 : 2.55
L : B of hind head	1 : 1.83	1 : 1.91
Cephalic index	1 : 1.12	1 : 1.18

MATERIAL EXAMINED. Forty males and 60 females from *Corvus corone cornix* Linn. from South and North Uist, Norfolk, Mull, Dublin, Estonia and Sweden. *Neotype* (male), *neallotype* (female) from *Corvus corone cornix* Linn. from South Uist, Scotland in Meinertzhagen collection (British Museum (Nat. Hist.)), on slide no. 35. *Neoparatypes* : 39 males and 59 females from the same host (data above).

Eight males and 9 females from *Corvus corone sardonius* Klein. from Egypt, Sardonis, and Palestine are not separable from the above specimens.

Brüelia uncinosa plena subsp. n.

Fifteen males and 44 females from *Corvus corone corone* Linn. from Devon, England were found to differ from typical *uncinosa* in the pattern of the abdominal tergal plates. In those specimens instead of the tergal plates resembling a horizontally-laid sign of interrogation, the hook of the sign in the majority of plates is closed leaving a circular unpigmented area. Apart from this one constant difference no other reliable character could be found to differentiate the two forms, these specimens are, therefore, treated as a subspecies of *uncinosa*.

MATERIAL EXAMINED. Fifteen males and 44 females from *Corvus corone corone* from Devon. *Holotype* (male), *allotype* (female) from *Corvus corone corone* Linn. from Devon on slide no. 15262 in Meinertzhagen collection (British Museum (Nat. Hist.)). *Paratypes* : 14 males and 43 females from the same host (data above).

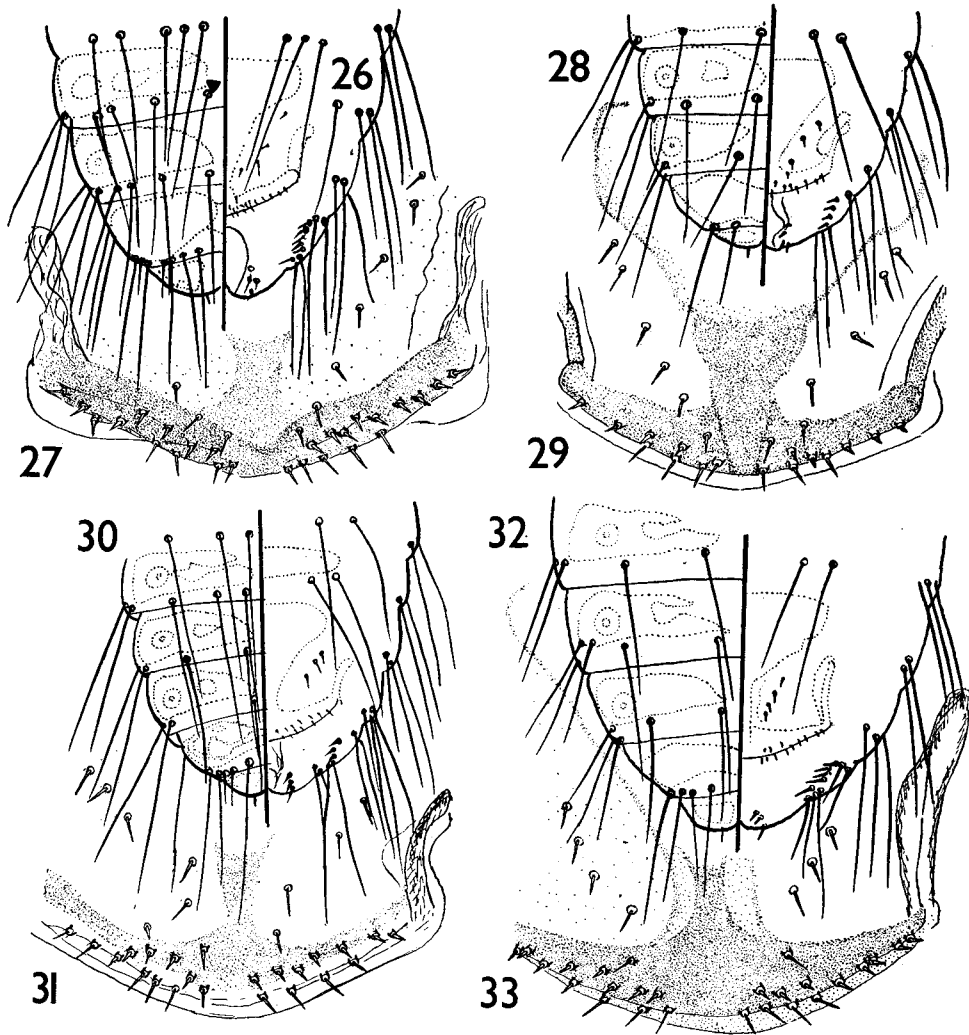
Brüelia saliemii sp. nov.

(Text-figs. 16, 40-41, 92-96)

This species is similar to *Brüelia uncinosa* (Burmeister) from which it can be easily distinguished by the shape of the head, abdominal chaetotaxy and shape of the tergal plates. This species is also allied to *B. saliemii mollii* subsp. nov. from which it can be separated by the tergal plates of the female.

MALE. Head as long as broad. Marginal carina entire dorsally but feebly sclerotized and depressed in the middle. Dorsal suture present, not continued across the head. Ventral carina comparatively less sclerotized and fused to the ends of marginal

carina. Tergal plates triangular, approximate, with scooped out areas in the anterior region, while continuously sclerotized posteriorly. Genitalia of the pattern seen in *B. uncinosa* and distinguished by the characters of parameres, endomeres and mesosome. Parameres are short with broader head.



FIGS. 26-33. Last abdominal segments and vulvar chaetotaxy of adult females : (26-27) *Brüelia leucocephalus* (Nitzsch); (28-29) *Brüelia theresae* sp. nov.; (30-31) *Brüelia quadrangularis* (Rudow); (32-33) *Brüelia tasniemae* sp. nov.

FEMALE. Similar to the male but tends to be larger. The tergal, sternal and genital plates are different from the allied forms. The abdominal chaetotaxy tends to be scarce in this species.

Abdominal Chaetotaxy

	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax .	8-10+8-9	1+1	—	8+9	1+1	0+0
Abdomen II .	1+1+1+1	1+1	0+0	1+1	1+1	0+0
III .	1+1+1+1	1+1	0+0	1+1	1+1	2+1
IV .	2+1+1+2	1+1	2+2	1+1+1+1	1+1	3-4+3
V .	2+1+1+2	1+1	2+2	1+1+1+1	2+1	3-4+3
VI .	2+1+1+2	1+1	3+3	1+1+1+1	1+1	4+4
VII .	2+1+1+2	0+0	3+2	1+1+1+1	0+0	3+3
VIII .	2+2+2+2	0+0	4+4	1+1+1+1	0+0	3-4+3-4
IX .	1+7-8+8+1	0+0	3+3	2+3+2+3	0+0	4-5+4
X-XI .	3+3	0+0	19-21+18-21	—	Vulva :	—
						11-13+12-14

Measurements (mm.)

	Male (holotype)	Femal (allotype)
Head : pre-antennal .	0.177 × 0.356	0.233 × 0.383
hind head .	0.253 × 0.445	0.259 × 0.479
Prothorax .	0.137 × 0.315	0.116 × 0.301
Pterothorax .	0.226 × 0.527	0.246 × 0.501
Abdomen .	0.891 × 0.616	1.164 × 0.630
L : B of pre-antennal .	1 : 2.01	1 : 1.64
L : B of hind head .	1 : 1.75	1 : 1.85
Cephalic index .	1 : 1.03	1 : 0.97

MATERIAL EXAMINED. Ten males and 28 females from *Corvus splendens* Vieill. from Bihar, Deccan, Lyallpur and Nepal. *Holotype* (male) and *allotype* (female) on slide no. 9313 from *Corvus splendens* in Meinertzhagen collection (British Museum (Nat. Hist.)). *Paratypes* : 9 males and 27 females from the same host (data above).

One male and 3 females from *Corvus splendens zugmeyeri*, from Sind in the British Museum (Nat. Hist.) collection, were found to be indistinguishable from the specimens referred to above.

Brüelia saliemii mollii subsp. nov.

(Text-figs. 17, 42-43, 97-100)

This species is similar to the above species, but is easily distinguished by the tergal plates. Plates II-VIII have circular, colourless stigmatal spots, while in the allied form these plates are open like a beak in the anterior region. In female the tergal plates are triangular and entire.

MALE. Marginal carina well developed, indented in the middle, pigmentation light. Ventral carina well developed; devoid of pigment. Tergal plates II-VI more or less rectangular with two clear circular areas, VII-VIII triangular, IX very narrow and acutely triangular. Genital armature as shown in figures, it is distinguished from allied species by the mesosomal plate.

FEMALE. Similar to the allied species in general characters. Tergal plates rectangular. Genital plate triangular, terminal angle not very acute.

Abdominal Chaetotaxy

	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax .	8-10+8-9	1+1	—	7-9+8-9	1+1	—
Abdomen II .	1+1+1+1	1+1	0+0	1+1	1+1	0+0
III .	1+1+1+1	1+1	1+1	1+1	1+1	1+1
IV .	2+1+1+2	1+1	2-3+1-3	1+1+1+1	1+1	2+2-3
V .	2+1+1+2	1+1	2+2-3	1+1+1+1	1+1	2-3+2-3
VI .	2+1+1+2	1+1	2-3+2-3	1+1+1+1	1+1	2-3+3-4
VII .	2+1+1+2	0+0	3+2-3	1+1+1+1	0+0	2-3+3
VIII .	2+1+1+2	0+0	2-3+2-3	1+1	0+0	3-4+3-4
IX .	1+5-7+5-10+1	0+0	3+3	3+3	0+0	4+3-4
X-XI .	3+3	0+0	15-16+14-18	—	Vulva : 11-15+11-17	

Measurements (mm.)

	Male (holotype)	Female (allotype)
Head : pre-antennal .	0.177 × 0.369	0.219 × 0.431
hind head .	0.253 × 0.465	0.274 × 0.514
Prothorax .	0.103 × 0.288	0.103 × 0.321
Pterothorax .	0.171 × 0.479	0.198 × 0.514
Abdomen .	0.821 × 0.616	0.061 × 0.596
L : B of pre-antennal .	1 : 2.08	1 : 1.96
L : B of hind head .	1 : 1.83	1 : 1.87
Cephalic index .	1 : 1.08	1 : 1.04

MATERIAL EXAMINED. Five males and 4 females from *Corvus coronoides macrorhynchus* Wagler from Malay Peninsula, 4 males and 11 females from *Corvus c. intermedius* Adams from Bihar (India), 1 male and 5 females from *Corvus c. colonorum* Swinhoe from China, 1 male from *Corvus c. insularis* Heinroth and 2 males from *Corvus c. bennetti* North. *Holotype* (male) and *allotype* (female) from *Corvus coronoides macrorhynchus* Wagler from Malay Peninsula, in Meinertzhagen collection (British Museum (Nat. Hist.)), on slide no. 4022. *Paratypes* : 4 males and 3 females from the same host (data above).

Brüelia atherae sp. nov.

(Text-figs. 18, 44-45, 101-104)

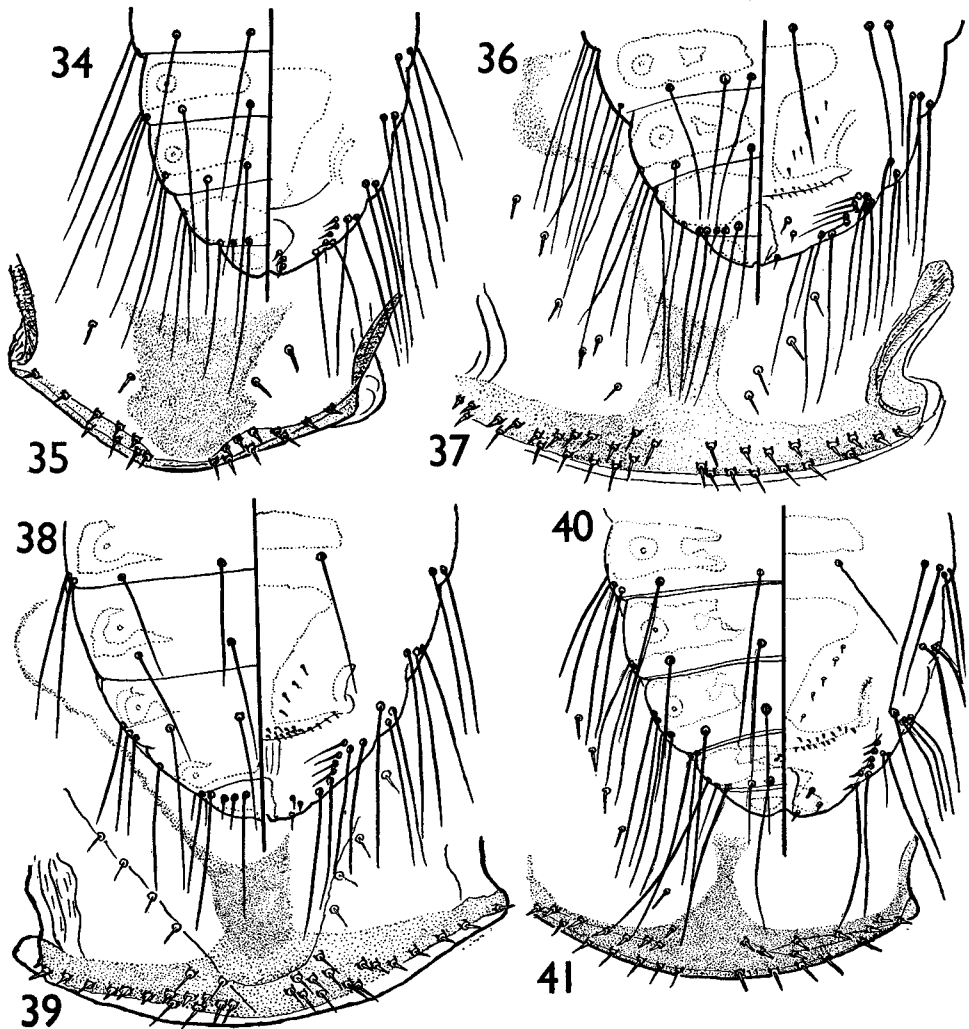
This species is closely allied to *Brüelia varia* from which it can be distinguished by the shape of the head and tergal plates. The male genitalia exhibit characteristic mesosomal characters.

MALE. Marginal carina entire, backwardly hanging to form a concave hyaline margin in the middle. Preocular and postocular nodus well developed. Ventral carina sclerotized only proximally. Tergal plates II-IX approximate, III-IX triangular with one circular and irregular clear area. Sternal plates III-VI well formed. Genital armature of the type found in *B. varia*, but differs in details of proximal heads of the parameres. Mesosomal plates as shown in the figure.

FEMALE. Similar to the male except for abdominal chaetotaxy.

Measurements (mm.)

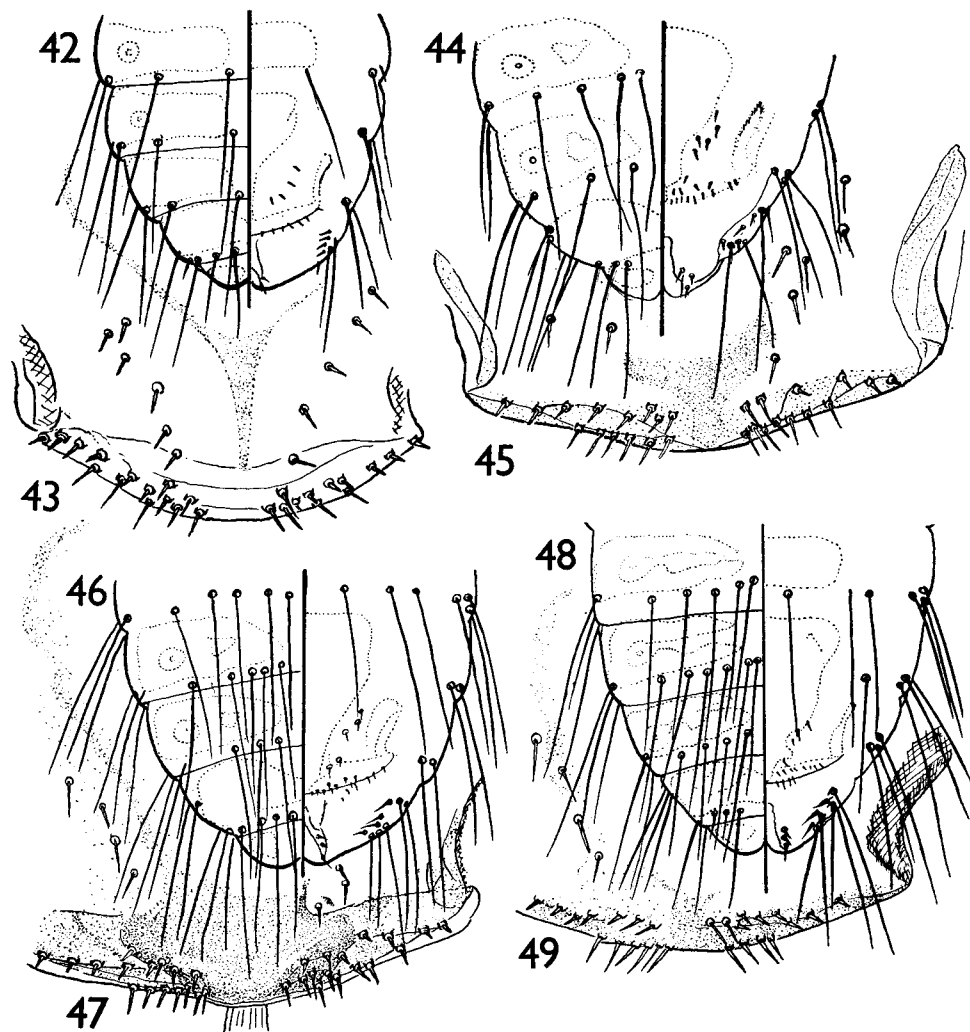
	Male (holotype)	Female (allotype)
Head : pre-antennal	0.239 × 0.424	0.253 × 0.486
hind head	0.281 × 0.521	0.308 × 0.568
Prothorax	0.123 × 0.328	0.103 × 0.342
Pterothorax	0.184 × 0.452	0.212 × 0.547
Abdomen	1.184 × 0.685	1.541 × 0.788
L : B of pre-antennal	1 : 1.77	1 : 1.92
L : B of hind head	1 : 1.85	1 : 1.84
Cephalic index	1 : 1.00	1 : 1.04



FIGS. 34-41. Last abdominal segments and vulvar chaetotaxy of adult females (34-35) *Brüelia variegata* sp. nov.; (36-37) *Brüelia afzali* sp. nov.; (38-39) *Brüelia uncinosa* (Burmeister); (40-41) *Brüelia saliemi* sp. nov.

MATERIAL EXAMINED. Thirty-four males and 30 females from *Corvus corax laurencei* Hume from Shibar Pass, Afghanistan. *Holotype* (male), *allotype* (female) from *Corvus corax laurencei* Hume on slide no. 9765 in Meinertzhagen collection (British Museum (Nat. Hist.)). *Paratypes*: 33 males and 29 females from the same host (data above).

Twenty males and 6 females from *Corvus corax ruficollis* Lesson from Port Sudan, Ahaggar, Ashaira, Palestine and Egypt, were found to be indistinguishable from the above specimens.



FIGS. 42-49. Last abdominal segments and vulvar chaetotaxy of adult females; (42-43) *Brüella saliemii mollii* ssp. nov.; (44-45) *Brüella atherae* sp. nov.; (46-47) *Brüella cryptoleucus* sp. nov.; (48-49) *Brüella varia* (Burmeister).

Brüelia cryptoleucus sp. nov.

(Text-figs. 19, 46-47, 105-108)

This species resembles *Brüelia varia*, *B. atherae* and *B. nawabi* sp. nov. From all the three, it can be distinguished by (1) the shape of the head, (2) marginal carina, (3) tergal plates in male, (4) shape of the female genital plate. The male genital armature is similar to *B. atherae* from which it can be distinguished by the size of the parameres, which are short and narrow with a simple proximal head. The basal plate is also very narrow.

The abdominal chaetotaxy in this species is also a characteristic feature. The female genital plate differs from all the other species in its shape and marginal chaetotaxy. The ventral hairs on abdominal segment IX are almost double the size found in other species.

Marginal carina, ventral carina, preocular nodus and pre-antennal nodus are well developed.

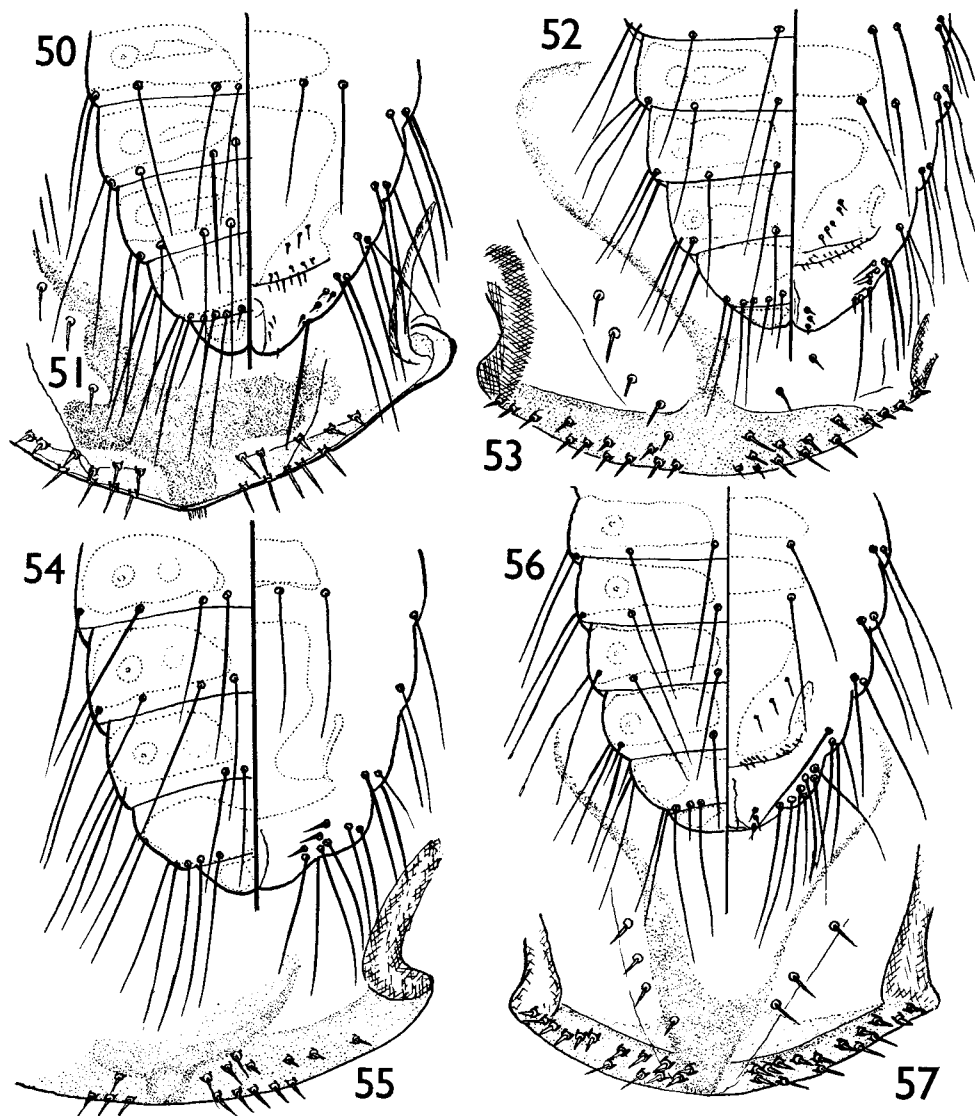
Abdominal Chaetotaxy

	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax	8-9+8-9	1+1	—	9+10	1+1	—
Abdomen :						
II .	1+3+3+1	1-2+1-2	0+0	1+3+2+1	4+4	0+0
III .	1+4+4+1	1-2+1-2	1-2+1-2	1+4+4+1	5+4	2+1
IV .	1+4+4+1	1-2+1-2	2+2	1+4+5+1	4+4	3+3
V .	1+4+4+1	1-2+1-2	2+1	1+4-5+5+1	4+4	3+4
VI .	1+4+4+1	1-2+1-3	3+3	1+4+4+1	3+3	3+4
VII .	1+5+5+1	0+0	3+3	1+4+4+1	0+0	3+3
VIII .	1+4+4-5+1	0+0	3-4+2-4	1+3+3-4+1	0+0	3+3
IX .	5+3+3+6	0+0	2-3+3-4	4+4	0+0	4+4
X-XI .	3+3	0+0	13-14+12-14	—	Vulva :	—
					12+12-13	

Measurements (mm.)

	Male (holotype)	Female (allotype)
Head : pre-antennal	0.226 × 0.424	0.238 × 0.493
hind head	0.301 × 0.534	0.315 × 0.589
Prothorax	0.131 × 0.315	0.123 × 0.356
Pterothorax	0.184 × 0.466	0.212 × 0.561
Abdomen	1.062 × 0.753	1.205 × 0.794
L : B of pre-antennal	1 : 1.87	1 : 2.06
L : B of hind head	1 : 1.77	1 : 1.87
Cephalic index	1 : 1.01	1 : 1.06

MATERIAL EXAMINED. Six males and 12 females from *Corvus cryptoleucus* from Texas and Illinois. *Holotype* (male) and *allotype* (female) from *Corvus cryptoleucus* Couch from Texas on slide no. 46 in Meinertzhagen collection (British Museum (Nat. Hist.)). *Paratypes* : 5 males and 11 females from the same host (data above).



FIGS. 50-57. Last abdominal segments and vulvar chaetotaxy of adult females; (50-51) *Brüelia nawabi* sp. nov.; (52-53) *Brüelia perwienae* sp. nov.; (54-55) *Brüelia bipunctata* (Rudow); (56-57) *Brüelia latifasciata* (Piaget).

Brüelia varia (Burmeister), 1838

(Text-figs. 20, 48-49, 109-113)

Nirmus varia Burmeister, 1838, *Handb. Ent.* 2 : 430.Type host : *Corvus monedula spermologus* Vieillot.

Burmeister (1838) described *Brüelia varia* from material collected from *Corvus corone* and *Corvus monedula*. Giebel (1861 and 1874) referred to this species all the material obtained from *Corvus corone*, *Corvus frugilegus* and *Corvus monedula*. Hopkins & Clay (1952) have designated *Corvus monedula spermologus* Vieillot as type host of the species under consideration. It is a narrow headed species with the following characters :

MALE. Pre-antennal region long and narrow. Marginal carina entire dorsally and interrupted ventrally and feebly sclerotized medially. Preocular nodus well pigmented, fused with the pre-antennal nodus. Postocular nodus running into preocular nodus. Ventral carina well developed and continuous with the marginal carina. Tergal plates II-IX well formed, narrow, triangular, sloping obliquely downwards in the middle to resemble the tegmina of a katydid : II-VI opening like the beak of a bird ; VII-VIII triangular, each with two uncoloured circular areas ; IX entire ; Sternal plates II-VI transverse. Genitalia as shown in the figures. Basal plate twice as long as the parameres and its distal breadth. Parameres narrow, with characteristic head.

FEMALE. Similar to male but the measurements are greater. Antennae, abdominal plates and chaetotaxy exhibit sexual dimorphism.

MATERIAL EXAMINED. Five males and 7 females from *Corvus m. monedula* from Sweden, Estonia, Salonika and Croatia ; 5 males and 13 females from *Corvus monedula soemoeringii* from Afghanistan. Twenty-six males and 32 females from *Corvus frugilegus frugilegus* from Norfolk, Cornwall, Wilts., Hants and South Uist, Ireland, Orkney, Cumberland ; 2 males and 2 females from *Corvus frugilegus pastinator* Gould from China ; 9 males and 4 females from *Corvus frugilegus tschusii* Hartert from Lyallpur (Pakistan), and 15 males and 44 females from *Corvus corone corone* Linn. and 8 males from *Corvus corone orientalis* Eversmann from Afghanistan were found to be indistinguishable from this species.

Brüelia nawabi sp. nov.

(Text-figs. 21, 50-51, 114-117)

This species closely resembles *Brüelia atherae* sp. nov. from which it can be distinguished by the shape of the head and the development of the marginal and ventral carina.

MALE. Head as long as broad. Fore head twice as broad as long. Marginal carina very narrow, entire dorsally, with a slight median depression, and interrupted ventrally. Preocular nodus well developed but not reaching as far as the pre-antennal nodus. Postocular nodus and marginal temporal carina well formed. Tergal plates well formed, approximate, II-VI interrupted in the middle, VII-XI triangular,

Abdominal Chaetotaxy

	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax	8-9+9-10	1+1	—	8-9+8-10	1+1	0+0
Abdomen	1-2+3+2-3+1	1+1+1+1+1+1	0+0	1+3+3+1	2+1+1+2	1+1
II	1+4-5+4-5+1	1+2+2+2+1+1-2	1+1	1+4+5+1	3+2+2+1	3+3-4
III	1+4-5+4+1	2+2+1+2	2+3	1+4+4+1	3+1+1+4	2+2
IV	1+4-5+4-5+1	2+1+1+2	2+2	1+4+4-5+1	3+1+1+3	2-3+4
V	1+4-5+4-5+1	1+1+1+1	3+3	1+4+4+1	1+1+1+1	3+3
VI	1+4-5+5-6+1	0+0	3+3	1+4-5+4-5+1	0+0	4+4
VII	1+4-5+4-5+1	0+0	3+3-4	1+3+3+1	0+0	4-6+5
VIII	4-6+5-7+5-6+4-6	—	3+3-4	2+1+1+2	0+0	—
IX	—	—	14-17+14-20	—	Vulva:	—
X-XI	—	—	—	—	13-15+12-18	—

Measurements (mm.)

	Male	Female
Head: pre-antennal	0.205 × 0.404	0.219 × 0.411
hind head	0.267 × 0.501	0.261 × 0.501
Prothorax	0.130 × 0.301	0.116 × 0.294
Pterothorax	0.233 × 0.501	0.219 × 0.501
Abdomen	1.055 × 0.684	1.369 × 0.684
L: B of pre-antennal	1:1.97	1:1.87
L: B of hind head	1:1.87	1:1.92
Cephalic index	1:1.06	1:1.04

entire. Male genital armature as shown in the figure. Basal plate comparatively shorter than in other species of the same group.

FEMALE. Similar to the male, but differs considerably in abdominal chaetotaxy and tergal plates.

<i>Abdominal Chaetotaxy</i>						
	Male			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax .	6-7+6-7	1+1	—	7-8+7-8	1+1	—
Abdomen :						
II .	2-3+2-3	1+1-2	0+0	3+3	3+3	0+0
III .	1+3+3+1	1+1+1+1	—	1+2-3+3-4+1	3+3	1+1
IV .	1+4+3+1	1+1+1+1	2+1-2	1+3+3+1	1-3+2-1	1+1
V .	1+4+4+1	1+1+1+1	2+1-2	1+3+2-3+1	1-2+1-2	2+2
VI .	1+4+3+1	1+1+1+1	2+2	1+2+2+1	1-1+1-1	3+3
VII .	1+3+3+1	0+0	2+2	1+1-2+1-2+1	0+0	2+3
VIII .	1+3+3+1	0+0	2+2	1+1-2+1-2+1	0+0	3+3
IX .	1+5+4-6+1	0+0	4+4	1+2+2+1	0+0	4+3-4
X-XI .	—	—	9+9	—	Vulva :	—
					11+10	

Measurements (mm.)

	Male (holotype)	Female (allotype)
Head : pre-antennal	0.219 × 0.438	0.260 × 0.493
hind head	0.260 × 0.479	0.281 × 0.547
Prothorax	0.109 × 0.253	0.137 × 0.294
Pterothorax	0.164 × 0.397	0.171 × 0.452
Abdomen	1.164 × 0.637	1.377 × 0.788
L : B of pre-antennal	1 : 2.0	1 : 1.89
L : B of hind head	1 : 1.84	1 : 1.94
Cephalic index	1 : 1.0	1 : 1.0

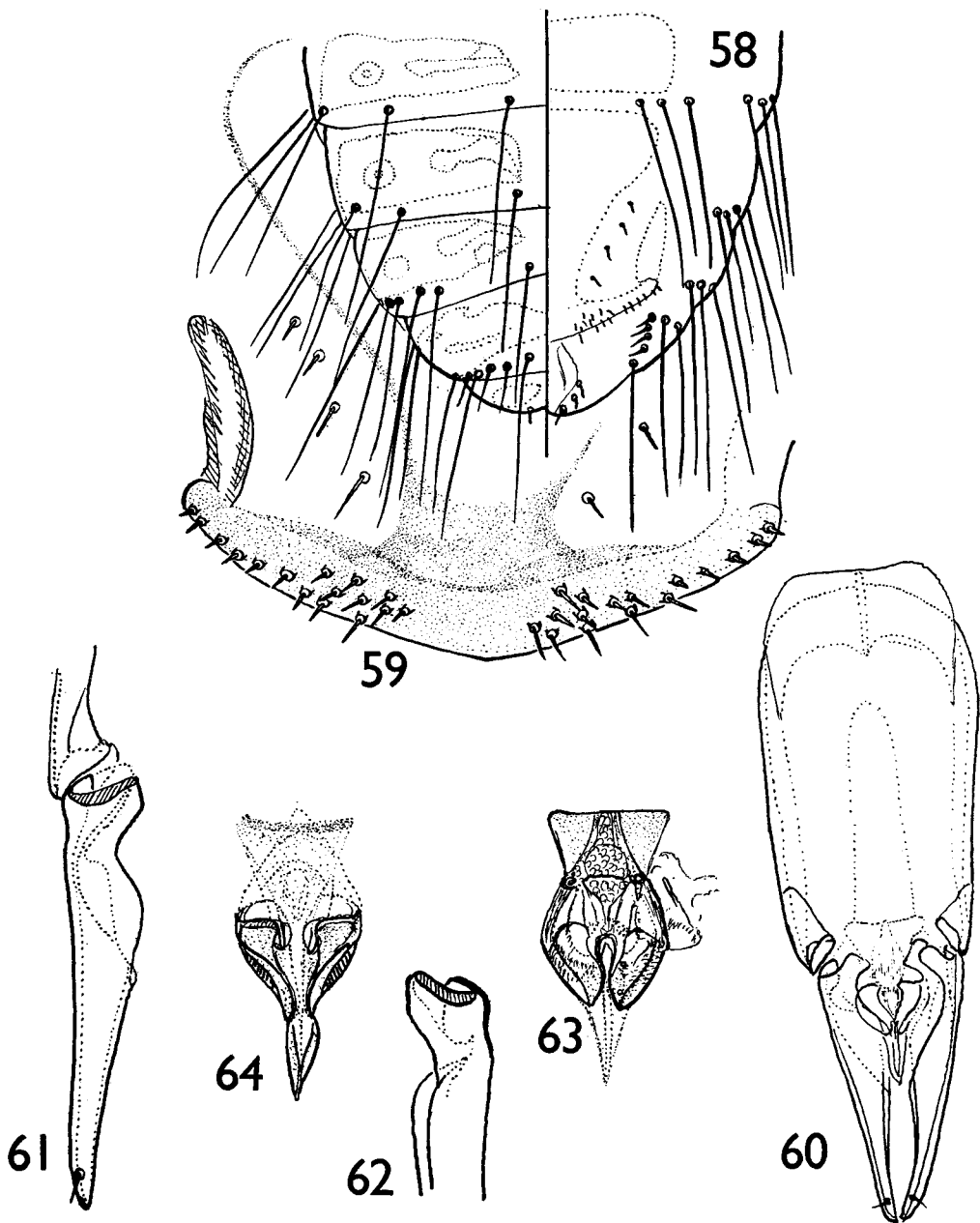
MATERIAL EXAMINED. One male and 4 females from *Corvus capensis* from South West Africa, Damaraland. *Holotype* (male), *allotype* (female) from *Corvus capensis* Licht. from South West Africa, slide no. 13469 in Meinertzhagen collection (British Museum (Nat. Hist.)). *Paratypes* : 3 females from the same host (data above).

Brüelia perwienae sp. nov.

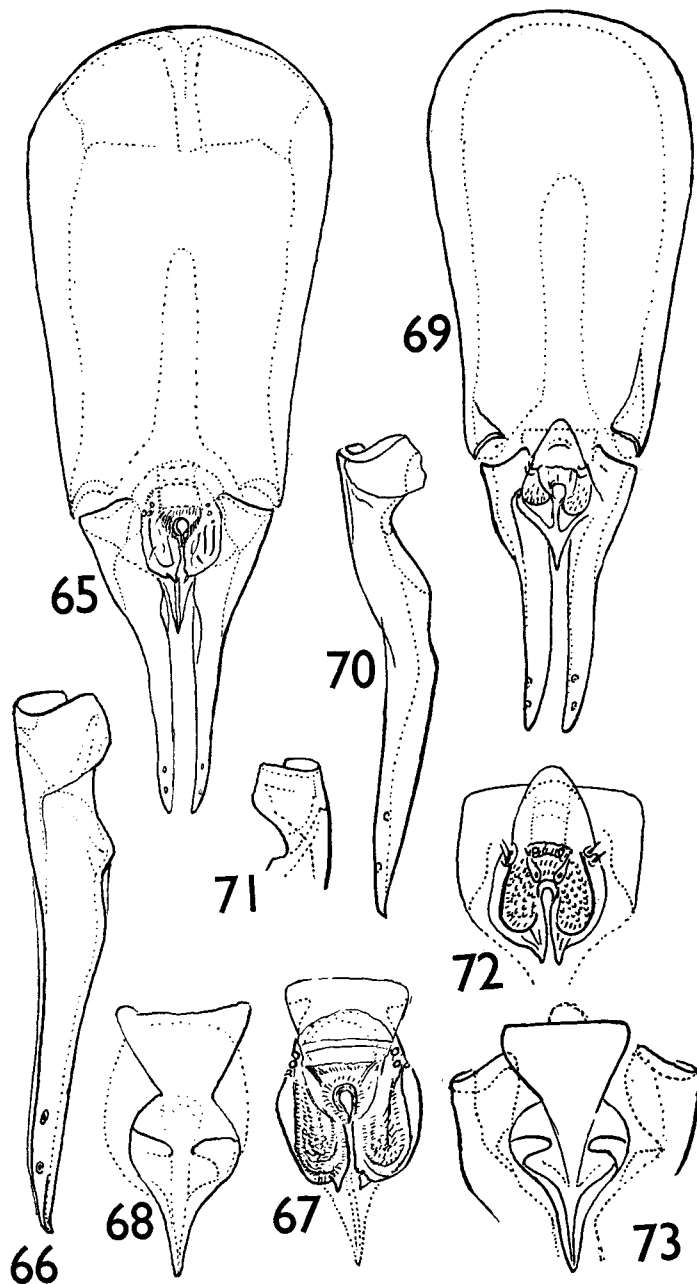
(Text-figs. 22, 52-53, 118-122)

The specimens referred to this name resemble *Brüelia argula* (Burmeister) in all superficial details, but differ in the male genitalia and in the abdominal chaetotaxy of the female. It may also be confused with *Brüelia varia* (Burmeister), but can be separated by the proportions of the parameres and abdominal chaetotaxy.

MALE. Pre-antennal region triangular, fore head truncate. Marginal carina well developed, slightly depressed in the middle, entire dorsally and interrupted ventrally. Preocular nodus well developed. Postocular nodus wanting. Tergal



FIGS. 58-64. (58-59) last abdominal segments of adult female *Brüelia rotundata* (Osborn) and vulvar chaetotaxy of the same; (60-64) male genital armature of *Brüelia argula* (Burmeister): (60) genitalia, (61) parameres, (62) proximal head of parameres, (63-64) two different views of mesosomal plate.



FIGS. 65-73. Male genital armatures: (65-68) *Brüella leucocephalus* (Nitzsch): (65) genitalia, (66) parameres, (67-68) different views of mesosomal plate; (69-73) *Brüella theresae* sp. nov.: (69) genitalia, (70) parameres, (71) proximal head of parameres, (72-73) two different aspects of mesosomal plate.

plates well developed, II-VIII wedge-shaped, IX triangular. Parameres about one-quarter of the total length of the genital armature. The details of the proximal head of the parameres are of specific value and shown in the figure. Female similar to the male, although exhibiting sexual dimorphism of antennae and differences in the abdominal chaetotaxy.

Abdominal Chaetotaxy

	Male (holotype)			Female		
	Tergal	Sternal	Pleural	Tergal	Sternal	Pleural
Pterothorax .	9+8	1+1	—	7+7	1+1	—
Abdomen II .	—	1+1	0+0	1+1	1+1	0+0
III .	1+1+1+1	2+2	1+1	2+2	3+3	1+1
IV .	2+2+2+2	2+2	3+3	1+1+1+1	3+3	3+3
V .	2+4+3+2	2+2	4+3	1+1+1+1	3+3	3+3
VI .	2+3+3+2	2+2	3+3	1+1+1+1	2-3+3	3+3
VII .	2+4+4+2	0+0	3+3	1+1+1+1	0+0	2+2
VIII .	1+5+5+1	0+0	3+2	1+1	0+0	2+3
IX .	1+6+7+1	0+0	3+4	3+3	0+0	4+4
X-XI .	—	—	22+21	—	Vulva :	—
					13-14+12-14	

Measurements (mm.)

	Male (holotype)	Female (allotype)
Head : pre-antennal .	0.184 × 0.390	0.226 × 0.417
hind head .	0.288 × 0.479	0.267 × 0.493
Prothorax .	0.123 × 0.315	0.191 × 0.321
Pterothorax .	0.191 × 0.479	0.219 × 0.514
Abdomen .	0.842 × 0.582	1.109 × 0.631
L : B of pre-antennal .	1 : 2.12	1 : 1.84
L : B of hind head .	1 : 1.66	1 : 1.84
Cephalic index .	1 : 1.01	1 : 1.0

MATERIAL EXAMINED. One male and 5 females from *Corvus nasicus* from Cuba. *Holotype* (male) and *allotype* (female) from *Corvus nasicus* Temminck from Cuba on slide no. 50 and 12669 respectively in Meinertzhagen collection (British Museum (Nat. Hist.)). *Paratypes* : 4 females from the same host (data above).

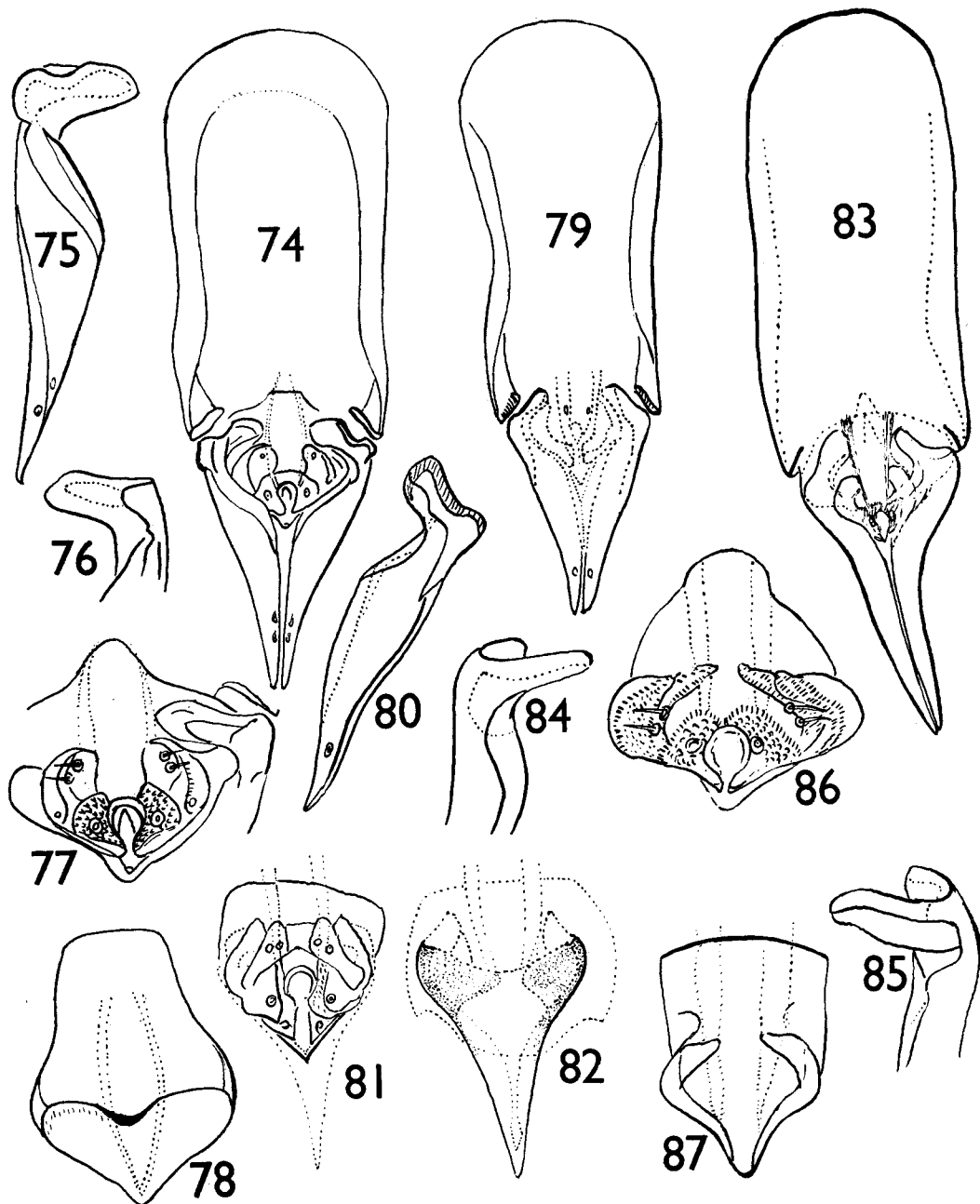
Brüelia bipunctata (Rudow), 1870

(Text-figs. 23, 54-55)

Nirmus bipunctata Rudow, 1870, *Z. ges. Nat. Wiss.* 35 : 467.

Type host : *Corvus albus* Müller.

As stated above, Hopkins & Clay in an unpublished account have shown that this name is not a *nomen novum* for *Brüelia quadrangularis* and that the description



FIGS. 74-87. Male genital armatures: (74-78) *Brüella tasniemae* sp. nov.: (74) genitalia, (75) paramere, (76) proximal head of paramere, (77-78) two views of mesosomal plate; (79-82) *Brüella variegata* sp. nov.: (79) genitalia, (80) paramere, (81-82) two different views of mesosomal plate; (83-87) *Brüella afzali* sp. nov.: (83) genitalia, (84-85) two views of the proximal head of paramere, (86-87) two different views of mesosomal plate.

fits the narrower headed form represented by two female specimens in the British Museum Collection. The general characters of these are as found in the females belonging to *Brüelia tasniemae* sp. nov. and *Brüelia tasniemae variegatus* ssp. nov. and no reliable characters can be found on which to separate them. The characters of the tergal plates, genital plate, and abdominal chaetotaxy although somewhat different in these specimens, cannot be considered reliable as long as a significant number of males and females are not available for examination. This species is provisionally mentioned here for reference by future workers.

Abdominal Chaetotaxy

		Female		
		Tergal	Sternal	Pleural
Pterothorax . . .		7+7	1+1	—
Abdomen	II . . .	3+3	2+2	0+0
	III . . .	1+3+3+1	1+3+2+1	1+1
	IV . . .	1+3+3+1	1+2+2+1	1+1
	V . . .	1+4+4+1	1+2+2+1	1+1
	VI . . .	1+2+2+1	1+2+2+1	1+1
	VII . . .	1+2+2+1	0+0	3+2
	VIII . . .	1-2+2	0+0	3+3
	IX . . .	3+3	0+0	4+4
			Vulva :	—
			12+13	

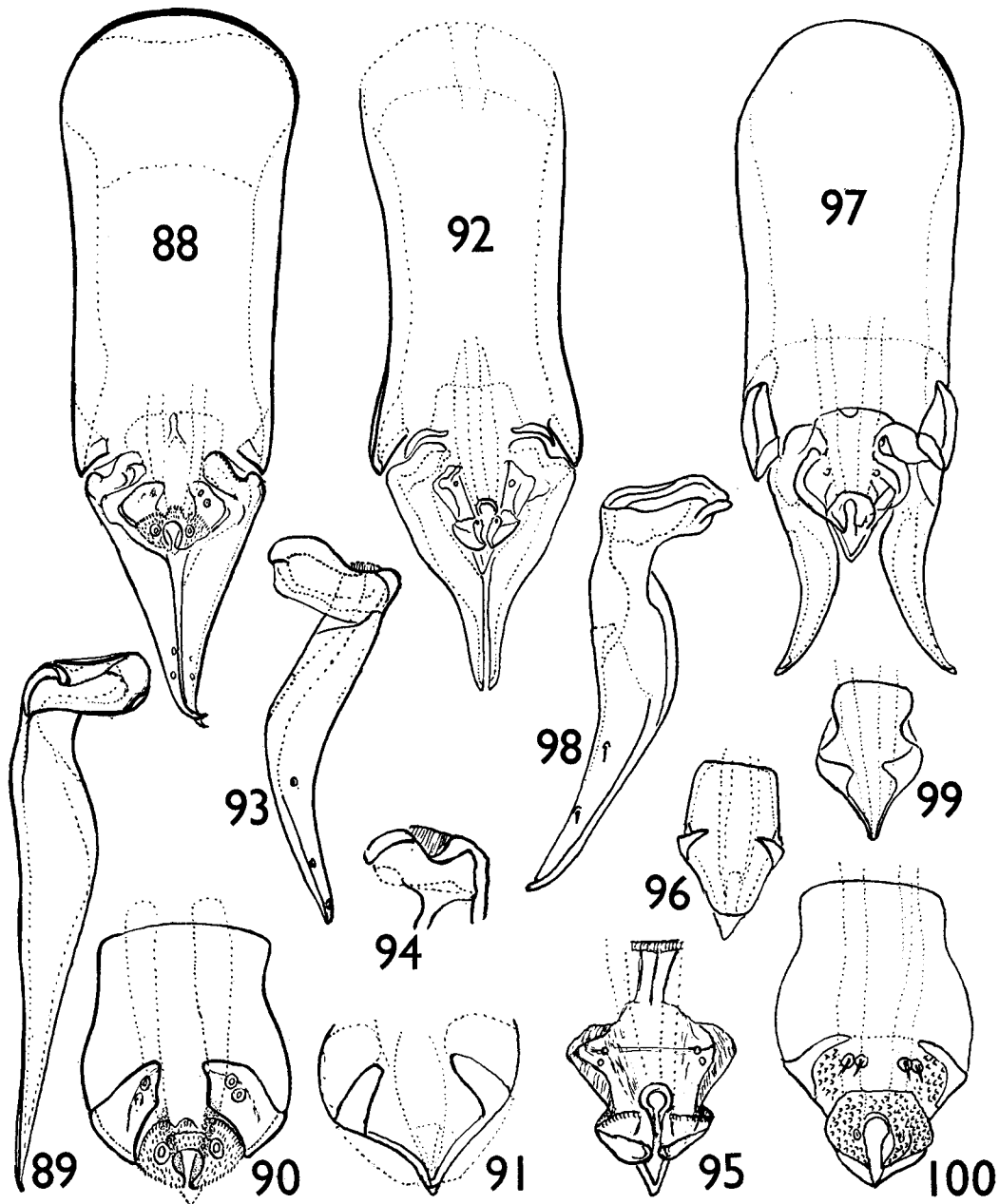
Measurements (mm.)

		Female
Head :	pre-antennal . . .	0.285 × 0.486
	hind head . . .	0.309 × 0.566
Prothorax . . .		0.097 × 0.327
Pterothorax . . .		0.232 × 0.522
Abdomen . . .		1.548 × 0.761
L : B of pre-antennal . . .		1 : 1.705
L : B of hind head . . .		1 : 1.83
Cephalic index . . .		1 : 0.95

FEMALE. Head almost as long as broad. Marginal carina complete above and interrupted ventrally, with a slight concavity and feeble sclerotization in the middle. Ventral carina well formed and fused anteriorly to the ventral component of the marginal carina.

Tergal plates well developed, approximate on segment II–VIII and entire on IX. Tergal plates III–VIII with two colourless spherical areas, tips of each broken.

MATERIAL EXAMINED. Two females from *Corvus albus* Müller from Sudan, slide no. 7942 in Meinertzhagen collection (British Museum (Nat. Hist.)).



FIGS. 88-100. Male genital armatures: (88-91) *Brüella uncinosa* (Burmeister): (88) genitalia, (89) paramere, (90-91) two different views of mesosomal plate (92-96) *Brüella saliemi* sp. nov.: (92) genitalia, (93) paramere, (94) proximal head of paramere, (95-96) two different views of mesosomal plate; (97-100) *Brüella saliemi mollis* ssp. nov.: (97) genitalia, (98) paramere, (99-100) two views of mesosomal plate.

***Brüelia latifasciata* (Piaget), 1880**

(Text-figs. 24, 56-57)

Nirmus latifasciata Piaget, 1880, *Pédiculines*, 143, pl. 11, fig. 11.Type host : ? *Corvus enca enca* (Horsfield).

Clay (1940) has shown that *Brüelia latifasciata* was described from specimens probably obtained from *Corvus e. enca* (Horsfield) and that "Xulla mangola" as mentioned by Piaget was only the name of a locality. This single type female in the British Museum (Nat. Hist.) has been examined and is mentioned here for reference. We have not been able to examine other material from the type host and resolve the present confusion.

FEMALE. Head triangular, marginal carina interrupted medianly, and anterior margin at this point hyaline. Dorsal pre-antennal suture distinct. Dorsal anterior plate present. Preocular nodus runs across to meet pre-antennal nodus. Ventral carina well formed, but comparatively less sclerotized than marginal carina. The number and arrangement of setae of the head as in other *Brüelia* species.

Tergal plates II-VIII and XI interrupted in the middle, while plate IX-X is entire. Sternal plates II-VI distinct and median. Genital plate triangular. Chaetotaxy as given below.

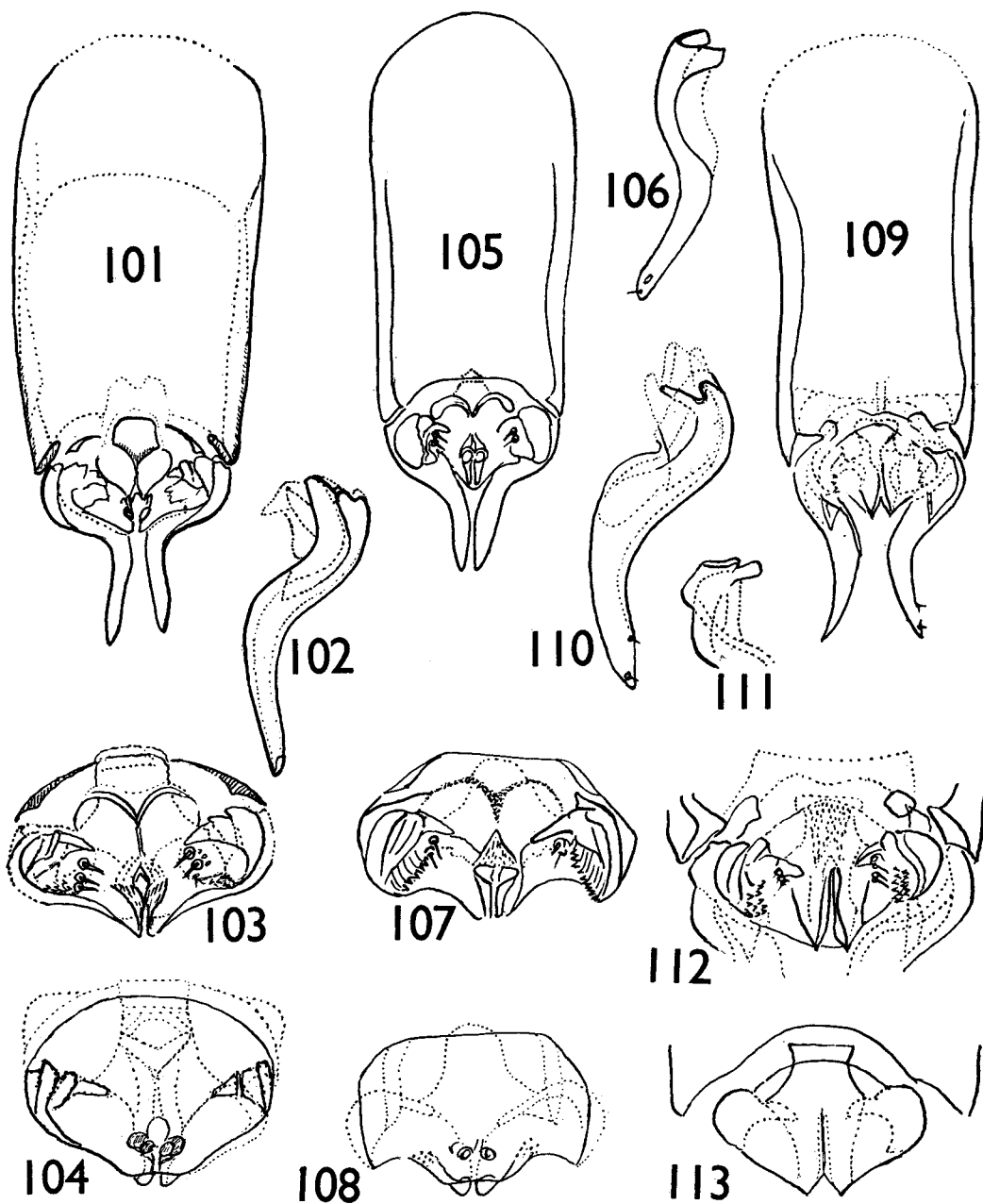
Abdominal Chaetotaxy

		Female (lectotype)		
		Tergal	Sternal	Pleural
Pterothorax . . .		6+6	1+1	—
Abdomen	II . . .	—	—	0-0
	III . . .	1+1	1+1	1+1
	IV . . .	1+1+1+1	1+1	2+2
	V . . .	1+1+1+1	1+1	2+2
	VI . . .	1+1+1+1	1+1	2+2
	VII . . .	1+1+1+1	0+0	2+2
	VIII . . .	0+1+1+0	0+0	4+4
	IX . . .	3+3	0+0	9+9
	X-XI . . .	See Text-fig.	Vulva :	—
			15+17	

Measurements (mm.)

		Female (lectotype)
Head :	pre-antennal . . .	0.212 × 0.411
	hind head . . .	0.261 × 0.493
	Prothorax . . .	0.103 × 0.308
	Pterothorax . . .	0.226 × 0.514
	Abdomen . . .	0.116 × 0.637
	L : B of pre-antennal . . .	1 : 1.94
	L : B of hind head . . .	1 : 1.88
	Cephalic index . . .	1 : 1.04

MATERIAL EXAMINED. One female (Lectotype) in British Museum (Nat. Hist.).



FIGS. 101-113. Male genital armatures: (101-104) *Brüella atherae* sp. nov.: (101) genitalia, (102) parameres, (103-104) two different views of mesosomal plate; (105-108) *Brüella cryptoleucus* sp. nov.: (105) genitalia, (106) paramere, (107-108) two different views of mesosomal plate; (109-113) *Brüella varia* (Burmeister): (109) genitalia, (110) paramere, (111) proximal head of parameres, (112-113) two different views of mesosomal plate.

***Brüelia rotundata* (Osborn), 1896**

(Text-figs. 25, 58-59)

Nirmus rotundata Osborn, 1896, *Bull. U.S. Bur. Ent. (n.s.)*, 5 : 226.

Type host : *Corvus corone brachyrhynchos* Brehm.

This is a broad-headed form distinguished from allied forms by the greater breadth of the temples, tergal plates and chaetotaxy. There are no males of this species in the British Museum (Nat. Hist.) collection and therefore comparison with allied species is difficult ; the following description is provisionally provided to distinguish the females.

FEMALE. Head broader than long. Marginal carina entire, modified medially, with hyaline anterior margin. Dorsal suture present. Ventral carina well formed, fused to the anterior marginal carina. Tergal plates II-VIII approximate, IX entire, X-XI approximate. Sternal plates II-VI well formed. Genital plate conical, with obtuse apical angle.

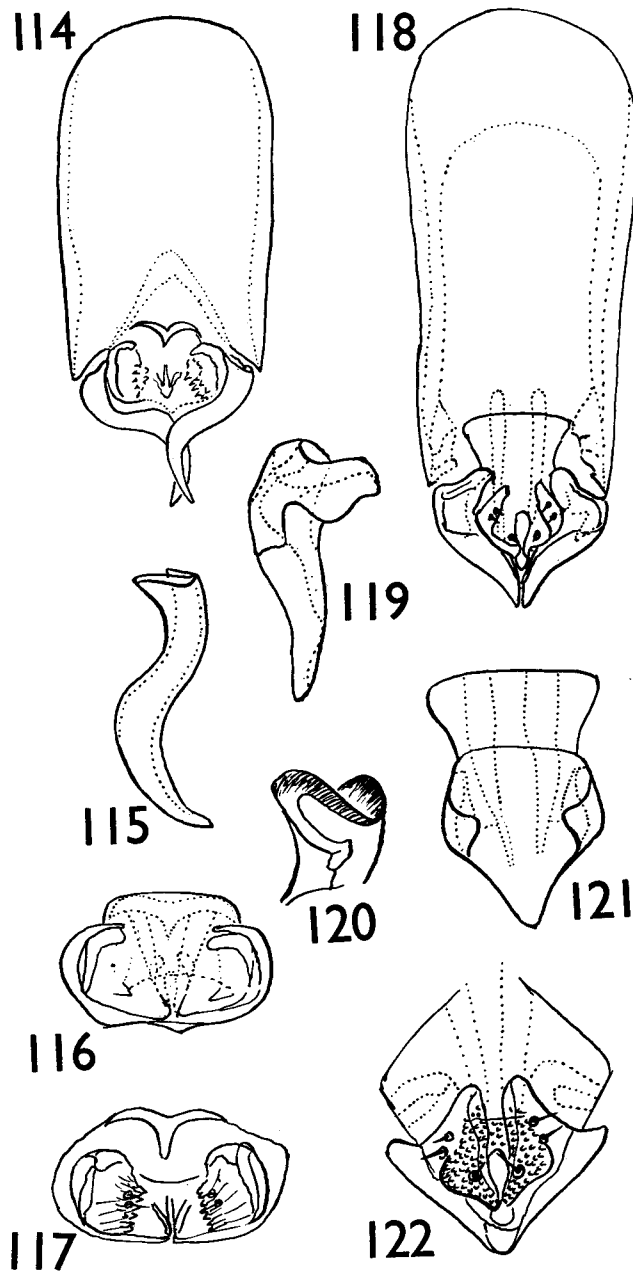
Abdominal Chaetotaxy

		Female		
		Tergal	Sternal	Pleural
Pterothorax	.	8-9+8-9	1+1	0+0
Abdomen	II .	1+1+1+1	1+1	0+0
	III .	1+1+1+1	1+1-2	2+1-2
	IV .	1+1+1+1	2+2-3	3+3
	V .	1+1+1+1	2+2-3	3+3
	VI .	1+1+1+1	2+2-3	3-4+3-5
	VII .	1+1-2+1-2+1	0+0	3-4+4
	VIII .	1-2+1-2+1-2+1-2	0+0	4+4
	IX .	1+5+4-5+1	0+0	4+4-5
	X-XI .	See Text-fig.	Vulva :	—
		15-18+15-20		

Measurements (mm.)

		Female
Head :	pre-antennal . . .	0.219 × 0.507
	hind head . . .	0.315 × 0.616
Prothorax	. . .	0.089 × 0.349
Pterothorax	. . .	0.288 × 0.616
Abdomen	. . .	1.335 × 0.801
L : B of pre-antennal	. . .	1 : 2.15
L : B of hind head	. . .	1 : 1.95
Cephalic index	. . .	1 : 1.15

MATERIAL EXAMINED. Four females from *Corvus corone brachyrhynchos* Brehm. from California and Kansas.



FIGS. 114-122. Male genital armatures: (114-117) *Brüella nawabi* sp. nov.: (114) genitalia, (115) paramere, (116-117) two different views of mesosomal plate; (118-122) *Brüella perwienae* sp. nov.: (118) genitalia, (119) paramere, (120) proximal head of paramere, (121-122) different views of mesosomal plate.

SUMMARY

All the known species of *Brüelia* from *Corvus* species are discussed and eight new species and three new subspecies are described. The species of previous authors are redescribed and figured.

LIST OF SPECIES AND SUBSPECIES DISCUSSED

(Type hosts in bold type)

1. *Brüelia argula* (Burmeister), 1838.
Corvus corax corax.
Corvus c. laurencei.
Corvus c. tingitanus.
Corvus c. ruficollis.
2. *Brüelia afzali* sp. nov.
Corvus cryptoleucus.
3. *Brüelia atherae* sp. nov.
Corvus corax laurencei.
4. *Brüelia bipunctata* (Rudow), 1870.
Corvus albus.
5. *Brüelia cryptoleucus* sp. nov.
Corvus cryptoleucus.
6. *Brüelia latifasciata* (Piaget), 1880.
Corvus enca enca.
7. *Brüelia leucocephalus* (Nitzsch), 1866.
Corvus albicollis.
Corvus affinis.
8. *Brüelia nawabi* sp. nov.
Corvus capensis.
9. *Brüelia perwienae* sp. nov.
Corvus nasicus.
10. *Brüelia quadrangularis* (Rudow), 1869.
Corvus albus.
Corvus corax edithae.
11. *Brüelia rotundata* (Osborn), 1896.
Corvus corone brachyrhynchos.
12. *Brüelia saliemii* sp. nov.
Corvus splendens splendens.
Corvus s. zugmeyerii.
13. *Brüelia saliemii mollii* ssp. nov.
Corvus coronoides macrorhynchus.
Corvus c. intermedius.
Corvus c. colonorum.
14. *Brüelia tasniemae* sp. nov.
Corvus frugilegus frugilegus.

15. *Brüelia variegata* sp. nov.
***Corvus capensis*.**
16. *Brüelia theresae* sp. nov.
***Corvus rhipidurus*.**
17. *Brüelia uncinosa* (Burmeister), 1838.
***Corvus corone cornix*.**
Corvus c. sardonius.
18. *Brüelia uncinosa plena* ssp. nov.
***Corvus c. corone*.**
19. *Brüelia varia* (Burmeister), 1838.
***Corvus monedula spermologus*.**
Corvus m. monedula.
Corvus m. soemoeringii.
Corvus frugilegus frugilegus.
Corvus f. tschusii.
Corvus corone corone.
Corvus corone orientalis.

HOST (CORVIDAE) PARASITE (BRÜELIA) INDEX

CORVIDAE HOST	<i>Brüelia</i> SPECIES
<i>Aphelocoma coerulescens californica</i> (Vigors)	<i>deficiens</i> (Piaget), 1885.
<i>Corvus albus</i> Müller	<i>bipunctata</i> (Rudow), 1870. <i>quadrangularis</i> (Rudow), 1869.
<i>Corvus albicollis</i> Latham	<i>leucocephalus</i> (Nitzsch), 1866.
<i>Corvus capensis</i> Licht.	<i>nawabi</i> sp. nov. <i>variegata</i> sp. nov.
<i>Corvus corax corax</i> Linn.	<i>argula</i> (Burmeister), 1838.
<i>Corvus corax edithae</i> Phillips	<i>quadrangularis</i> (Rudow), 1869.
<i>Corvus corax laurencei</i> Hume	<i>argula</i> (Burmeister), 1838. <i>atherae</i> sp. nov.
<i>Corvus corax tingitanus</i> Irby	<i>argula</i> (Burmeister), 1838.
<i>Corvus corax ruficollis</i> Lesson	<i>argula</i> (Burmeister), 1838. <i>atherae</i> sp. nov.
<i>Corvus corone brachyrhynchus</i> Brehm.	<i>rotundata</i> (Osborn), 1896.
<i>Corvus corone corone</i> Linn.	<i>uncinosa plena</i> ssp. nov. <i>varia</i> (Burmeister), 1838.
<i>Corvus corone cornix</i> Linn.	<i>uncinosa</i> (Burmeister), 1838.
<i>Corvus corone orientalis</i> Eversman	<i>varia</i> (Burmeister), 1838.
<i>Corvus corone sardonius</i> Kleinschmidt	<i>uncinosa</i> (Burmeister), 1838.
<i>Corvus coronoides colonorum</i> Swinhoe	<i>saliemi mollii</i> ssp. nov.
<i>Corvus coronoides intermedius</i> Adams	<i>saliemi mollii</i> ssp. nov.
<i>Corvus coronoides macrorhynchus</i> Warler	<i>saliemi mollii</i> ssp. nov.
<i>Corvus cryptoleucus</i> Couch.	<i>afzali</i> sp. nov. <i>cryptoleucus</i> sp. nov.
<i>Corvus enca enca</i> (Horsfield)	<i>latifasciata</i> (Piaget), 1880.
<i>Corvus frugilegus frugilegus</i> Linn.	<i>tasniemae</i> sp. nov. <i>varia</i> (Burmeister), 1883.
<i>Corvus frugilegus tschusii</i> Hartert	<i>varia</i> (Burmeister), 1838.

CORVIDAE HOST	Brüella SPECIES
<i>Corvus monedula monedula</i> Linn.	<i>varia</i> (Burmeister), 1838.
<i>Corvus monedula soemoeringii</i> Fisher	<i>varia</i> (Burmeister), 1838.
<i>Corvus monedula spermologus</i> Vieillot	<i>varia</i> (Burmeister), 1838.
<i>Corvus nasicus</i> Temminck	<i>perwienae</i> sp. nov.
<i>Corvus rhipidurus</i> Hartert	<i>theresae</i> sp. nov.
<i>Corvus splendens splendens</i> Vieillot	<i>saliemi</i> sp. nov.
<i>Corvus splendens zugmeyerii</i> Laubmann	<i>saliemi</i> sp. nov.
<i>Cyanocitta cristata cristata</i> (Linn.)	<i>clayae</i> Ansari, 1956.
<i>Cyanocitta stellari frontalis</i> (Ridgway)	<i>deficiens</i> (Piaget), 1885.
<i>Cyanocorax cyanomelas</i> (Vieillot)	<i>nitzschi</i> Kéler, 1938.
<i>Cyanopica cyanus cookii</i> Bonaparte	<i>deficiens</i> (Piaget), 1885.
<i>Dendrocitta rufa vagabunda</i> (Latham)	<i>meinertzhageni</i> Ansari, 1956.
<i>Garrulus glandarius glandarius</i> (Linn.)	<i>glandarii</i> (Denny), 1842.
<i>Garrulus glandarius krynicki</i> Kaleniczenko	<i>glandarii</i> (Denny), 1842.
<i>Garrulus glandarius rufitergum</i> Hartert	<i>glandarii</i> (Denny), 1842.
<i>Garrulus glandarius theresae</i> Meinertzhagen	<i>glandarii</i> (Denny), 1842.
<i>Nucifraga caryocatactes caryocatactes</i> (Linn.)	<i>olivacea</i> (Burmeister), 1838.
<i>Nucifraga caryocatactes multipunctata</i> Gould	<i>multipunctata</i> (Clay), 1936.
<i>Perisoreus infaustus infaustus</i> Linn.	<i>perisorius</i> Ansari, 1956.
<i>Ptilostomus afer</i> (Linn.)	<i>zohrae</i> Ansari, 1956.
<i>Pica pica bactriana</i> Bonaparte	<i>biocellata</i> (Piaget), 1880.
<i>Pica pica hudsonia</i> (Sabine)	<i>biocellata</i> (Piaget), 1880.
<i>Pica pica leucoptera</i> Gould	<i>biocellata</i> (Piaget), 1880.
<i>Pica pica nuttalli</i> Audebon	<i>biocellata</i> (Piaget), 1880.
<i>Pica pica sericea</i> Gould	<i>biocellata</i> (Piaget), 1880.
<i>Podoces biddulphi</i> Hume	<i>koslovae</i> (Clay), 1936.
<i>Podoces hendersoni</i> Hume	<i>koslovae</i> (Clay), 1936.
<i>Pyrrhocorax pyrrhocorax docilis</i> (Gmelin)	<i>biguttata docilis</i> Ansari, 1956.
<i>Pyrrhocorax graculus graculus</i> (Linn.)	<i>biguttata</i> (Kellogg & Paine), 1914.
<i>Pyrrhocorax pyrrhocorax himalayanus</i> Gould	<i>biguttata</i> (Kellogg & Paine), 1914.
<i>Pyrrhocorax pyrrhocorax pontifex</i> Stresemann	<i>biguttatus</i> (Kellogg & Paine), 1914.
<i>Pyrrhocorax pyrrhocorax pyrrhocorax</i> (Linn.)	<i>biguttata</i> (Kellogg & Paine), 1914.
<i>Urocissa flaviviridis cuculata</i> Gould	<i>husaini</i> , Ansari, 1956.
<i>Urocissa melanocephala occipitalis</i> (Blyth)	<i>hussaini</i> Ansari, 1956.
<i>Xanthura yncas galeata</i> Ridgway	<i>hopkinsi</i> Ansari, 1956.
<i>Zavattariornis stressemanni</i> Moloni	<i>zavattariornis</i> Ansari, 1956.
Probably a member of the Corvidae	<i>hamatofasciata</i> (Piaget), 1890.

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