Studies on *Brueelia* species (Mallophaga) occurring on True Thrushes

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**INTRODUCTION**

Although over one hundred and twenty five species of *Brueelia* are now recognized (Hopkins & Clay, 1952), yet there is no paper containing a comprehensive systematic treatment of the species infesting any one bird-host group. This has probably been due in part to the difficulty in obtaining sufficient material from one host group, and to the brevity of the published descriptions. An attempt has been made in this paper to present a complete revision of almost all the known *Brueelia* species parasitic on True Thrushes (True Thrushes as defined by Ripley, 1952).

The present paper is based on the collection of Col. R. Meinertzhagen in the British Museum (Natural History), except where indicated otherwise in the text. The camera lucida drawings were made from microscopic slides. The male genitalia, when dissected and mounted, naturally did not retain their original appearance because the coverglass flattened them to some extent. This fact should be borne in mind when these drawings are interpreted. All the linear measurements were taken along the midline. The length of the preantennal region represents the distance between the front and the point passing through the posterior margin of the conus and the length beyond is represented by the hind-head. The width represents the maximum transverse measurement of the part concerned. The index (cephalic, preantennal and hind head) is the ratio of the length to the width.

All the specimens including holotype (male), allotype (female) and paratypes (males and females) are in the Collection of the British Museum (Natural History), London. Instances not relating to such cases are indicated in the text.

**TAXONOMIC CHARACTERS**

As to what character or characters may be classed as of specific or subspecific importance, will always remain controversial. The *Brueelia*
species in particular present special problems of their own. There is no constant feature which can be used to separate the various species. Males and females of all the species show more or less difference in abdominal chaetotaxy but exhibit very little sexual dimorphism. Females of several species are identical and it is frequently most difficult to assign a particular female specimen to the proper species unless the evidence is at hand to demonstrate that it was collected from the same host as carried the opposite sex also. Males of most species are easily distinguishable. By employing suitable sets of characters, it is possible to distinguish groups of males corresponding to similar groups of females. The following principal morphological characters of the males were found helpful for splitting the various species and subspecies.

**HEAD:** Thimble-shaped, conical or triangular like fir-cone, with rounded or truncate front. Sides straight or slightly convex, temporal lobes regularly sloping or strongly diverging, proportion of preantennal region and hind-head always constant in allied forms. Characters of the marginal and ventral carinae variable in the different groups. Other modifications of the frontal region of special significance.

**THORAX:** The shape of the prothorax is almost constant, but the variations howsoever small, deserve consideration. The pterothorax is more or less trapezoidal in shape; the degree of its divergence, the point of origin of the abdominal segments, and the posterior chaetotaxy are important.

**ABDOMEN:** The tergal plates are found to be more or less of uniform pattern. The sculpture of the tergal plates, however, varies and provides an additional character for the identification of species. The chaetotaxy is of great importance. Male genital armature is of particular interest: it provides the most stable character, and should invariably be checked in each species. Although it may be very similar throughout a group of species, it differs considerably in its details. In females the subgenital and vulvar plates and the marginal chaetotaxy, though similar in closely allied forms, may sometimes provide additional characters for the differentiation of species and separation of subspecies.

Apart from individual variations, which are of universal occurrence, several species contain subspecies which breed on separate hosts. Many Mallophagologists prefer to give no names to these forms. They probably believe that providing names to these forms complicates the taxonomic system. Others assign a different name to each form. Colless (1954) urges that the term subspecies should not be used as a waste paper basket for controversial forms. In my opinion, this principle, if adopted widely
by workers, will prevent lumping closely allied groups and thus help in the separation of distinctly varient forms in the same species.

According to the general form of the body and head, the Brueelia species from the True Thrushes fall into three distinct groups. These groups with their salient distinguishing characters are given below.

(i) The iliaki group: This category embraces very fragile and feebly sclerotized species. They are similar to Brueelia deficiens (Piaget) described from Cyanopica cyanus cooki Boneparte (Corvidae). The head is longer than broad (cephalic index = 1: 0.79-0.85). Brueelia iliaki, B. iliaki brevicolor, and B. iliaki indiensis fall in this group.

(ii) The marginata group: This class includes small species (males 1.23-1.62 mm. long). The head is almost as long as broad (cephalic index = 1: 0.97-1.08). The forehead is either narrow and elongate or the clypeal region is rounded. The abdominal chaetotaxy is of two patterns. The parameres are of the shape of a knife blade. Brueelia longifrons, B. longifrons antiqua, B. myiophonea, B. marginata, B. visciwori, B. amsel, B. oudhensis, B. turdinulae, B. turdinulae eternitatus and B. ilmasae are included in this group.

(iii) The merulensis group: These are robust species (males 2.11-2.35 mm. long). Head is always longer than broad. Parameres are typical, 'kukri shaped'. B. stresemanni, B. zootherae, B. daumae and B. merulensis belong to this group.

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SYSTEMATIC ACCOUNT

KEY TO THE SPECIES

The following key is based almost entirely on the males of the species discussed in the text. As has already been said elsewhere the females of most species are indistinguishable and cannot be used to separate the species.

1 (8) Marginal carinae entire laterally and indented medially. Anterior margin of head at the interrupted point hyaline. Triangular area of sclerotization in the indented part of the marginal carina present.

2 (7) Delicate species, very feebly sclerotized. Head conical, of the
shape of a fir-cone or a thimble. Ocular carina narrow. Greatest width of the head considerably smaller than the total length. Cephalic index 1 : 0.77-0.87, index of preantennal region 1 : 1.24-1.37. Male genitalia feeble. Parameres rather short and slender, tapering gradually to the tips. (Female genital plate furnished with 7-9 short setae).

3 (6) Mesosome 20-30 percent wider than long. (Subgenital plate in female twice as wide posteriorly as in Bruelia indiensis).

4 (5) VII tergal plate with 2, VIII with 3 setae on each side................... Bruelia iliaci (Denny)

5 (4) VII tergal plate with 2+3, VIII with 1+5 setae on each side .................. Bruelia iliaci brevicolor subsp. nov.

6 (3) Mesosome as long as broad. (Subgenital plate in female narrow posteriorly)........ Bruelia iliaci indiensis subsp. nov.

7 (2) Robust species, moderately sclerotized. Head triangular, of the shape of a squat crucible. Greatest width of the head 25 percent more than the total length. Cephalic index 1 : 1.20-1.22, index of the preantennal region 1 : 1.88-1.95. Male genitalia well-built. Parameres 'kukri-shaped' resembling the wing of 'samara' of common maple. (Female genital plate furnished with 12 thick and 10 long setae) .................. Bruelia stresemanni (Clay)

8 (1) Marginal carina interrupted medially and laterally.

9 (2) Parameres well developed, 'kukri-shaped', resembling the wing of 'samara' of common maple.

10 (13) Head more or less rounded in front, preantennal region with convex sides. Basal plate considerably convex in the middle. Mesosome more or less as wide as long or very slightly wider than long, (1 : 1.05-1.17).

11 (12) Head comparatively squat, narrowly parabolic in front. Basal plate about four times as long as mesosome, (3.96 : 1)........ Bruelia zootherae (Clay)

12 (11) Head narrow in front, broadly parabolic in front. Basal plate about six times as long as mesosome, (5.59 : 1) ................. Bruelia daumae (Clay)

13 (10) Preantennal region with straight sides. Basal plate more or less straight. Mesosome considerably wider than long,
(1 : 1.49). Basal plate 5.05 times as long as mesosome.

Bruelia merulensis (Denny)

14 (9) Parameres well developed, but never 'kukri-shaped'.
15 (20) Head truncate, preantennal region with slightly concave sides.
16 (19) Parameres pointed. Mesosome pointed posteriorly. (Subgenital plate in female moderately acute posteriorly). (Male 1.23-1.26 x 0.41-0.46 mm., female 1.63-1.77 x 0.45-0.55 mm.).
17 (18) Parameres shorter than broad, proximal heads with deep anterior socket. Mesosome with well developed median apophysis. (Subgenital plate in female pointed posteriorly)

Bruelia longifrons sp. nov.

19 (16) Parameres slender, tapering gradually to the blunt tip. Proximal head well developed, extending considerably within mesosome. Mesosome obtuse posteriorly. (Subgenital plate in female blunt posteriorly). Comparatively robust species (male 1.92x0.66 mm. and female 2.27 x 0.76 mm.). Bruelia myophanae (Clay)

20 (15) Head more or less thimble-shaped, preantennal region with slightly convex sides.
21 (26) Basal plate 3.5-4.5 times as long as the mesosome.
22 (25) Basal plate not more than 1.7 times as long as broad. Hind-head twice as wide as long (1 : 2). Mesosome elongate.
23 (24) Basal plate five times as long as the parameres. Parameres 0.0035 mm. long, blunt at the tip. Cross-piece of the anchor (sub-genital plate in female) arched like the segment of a circle (Boomerang). Bruelia turdinulae sp. nov.
24 (23) Basal plate four-times as long as the parameres. Parameres 0.0055 mm. long, pointed at the tip. Cross-piece of the anchor flatly arched. Bruelia turdinulae eternitatus sp. nov.
25 (22) Basal plate 2.38 times as long as broad. Hind-head less than twice as broad as long (1 : 1.34). Mesosome squat.

Bruelia oudhensis sp. nov.
26 (21) Basal plate 2.05-2.91 times as long as the mesosome.
27 (32) Abdominal segments V-VII with 2+1+1+2 setae. Basal plate twice as long as its greatest width.
28 (31) Preantennal region 1.74-1.77 times as wide as long.

29 (30) Mesosome obtuse posteriorly. Postero-lateral slope regular. Vulvar plate in female with 8-10 setae on each side of the posterior margin. Brueilia marginata (Burmeister)

30 (29) Mesosome acute posteriorly. Postero-lateral slope abrupt. Vulvar plate in female with 5-6 setae on each side. Brueilia amsel (Eichler)

31 (28) Preantennal region 1.9 times as wide as long. Brueilia visciuri (Denny)

32 (27) Abdominal segments V-VII with 1+1+1+1 setae. Basal plate 1.75 times as long as its greatest width. Brueilia ilmasae sp. nov.

1. Brueilia iliaca (Denny)

(Text-figs: 1-7)

Nirmus iliaca Denny, 1842, Mon. Anat. Brit., 51, 130, pl. 9, fig. 4.

Type-host: Turdus musicus musicus Linn.

Male: 1.65 x 0.43 mm. Delicate and feebly sclerotized. Head 0.36 x 0.31 mm; cephalic index 1:0.86. Lateral margins of clypeal region moderately convex. Marginal carina narrow, indented medially. Anterior margin of the head at this point hyaline. Dorsal anterior plate V-shaped, with fairly acute posterior angle. Pre-antennal region 0.20 x 0.27 mm. (index 1:1.35). Hind-head 0.16 x 0.31 (index 1:1.94). Antennae showing sexual dimorphism. The number and arrangement of cephalic setae as described by Clay (1951).

Prothorax 0.11 x 0.20 mm., transverse, lateral margins strongly convex, postero-lateral angle with a short seta. Pterothorax 0.15 x 0.33 mm., median posterior angle well marked, obtusely angulate over abdomen. Latero-posterior angle with one small and one long seta followed by four (sometimes five) rather long setae arranged along the latero-posterior margin.

Abdomen 1.03 x 0.43 mm., widest at the 5th-6th segments. Tergal plates rather yellowish brown; tergal plates II-VIII completely divided in the middle line; IX entire; II-V bare; VI-VII with two, VIII with three and IX with four setae on each side. Pleural plates feeble, posterior setae slender and moderately long; II bare; III-VI and IX-X with one, VII with two, VIII with four setae. Sternal plates well formed, confined in the middle; II-VI quadrate, VII-XI fused to form an elongate triangular piece. Stermites II-VI bearing on each side a single seta.
Genitalia 0.0179 mm. long. Basal plate 0.0132 mm. long, anterior width 0.0069 mm., posterior width 0.0058 mm. with slight convexity in the anterior half. Parameres rather short, 0.0051 mm. long, proximal head simple as shown in the figure. Meso some shield-like, 0.0030 x 0.0039 mm. (about 30 percent wider than long).

REMARKS: The male resembles B. deficiens from Cyanopica cyanus cookei Bonepart in general body form and build. The male genital armature is also of the same pattern.

FEMALE: Similar to male, 1.89 x 0.48 mm. Head 0.38 x 0.32 mm.; cephalic index 1: 0.84. Preantennal region 0.19 x 0.28 mm. (index 1: 1.37). Hind-head 0.19 x 0.32 mm. (index 1: 1.68). Prothorax 0.10 x 0.22 mm. Pterothorax 0.18 x 0.39 mm. Abdomen 1.23 x 0.48 mm. Dorsal chaetotaxy showing sexual variation, brief. VI-VIII tergites with one moderately long seta on each side; IX with three such setae on each side; II pleurite bare; III with one, IV-VIII with two, VII with four, IX with 1+4 and X-XI with one very short seta. Ventral surface of the terminal segments with

Text-figs. 1-7. Brueelia iliaci (Denny): (1) Dorsal and ventral aspects of male; (2) dorsal and ventral aspects of the preantennal region showing the carinae; (3) a portion of the abdomen showing tergal plates; (4) male genital armature; (5) various aspects of parameres; (6) various aspects of mesosome; (7) a portion of the subgenital plate of the female showing the marginal chaetotaxy.
a conical sclerotization placed on a meniscus-like cross piece round the edge of the vulva so as to form an anchor-shaped plate. The posterior end of the conical sclerotization considerably obtuse. Vulvar plate with 8-9 marginal setae.

**Material examined:** 3 males and 3 females from *Turdus musicus musicus* Linn. (Meinertzhagen Collection, Cornwall, March 1946).

**Remarks:** Denny (1842, p. 52), in the original description of *Nirmus iliaci*, gave the Redwing (*Turdus iliacus*) as the host. Later, on page 131 of the same publication, Denny stated that he had observed the specimens from the Redwing as well as from the rose-coloured Starling (*Pastor roseus* = *Sturnus roseus*).

In the Denny Collection (in British Museum (Nat. Hist.): Thompson, 1937) there are four specimens (1 male, 2 females, 1 nymph) labelled _Degeeriella iliaci_ Denny (1842) from Redwing (*Turdus iliacus*). Miss T. Clay informs me that when the Denny Collection was mounted on slides, all the specimens were re-labelled and the original labels are now lost. It is, therefore, not known how these specimens were originally labelled; perhaps just with the word "iliaci", but certainly neither as 'types' nor with the wording of the present labels. These specimens belong to the species found on *Sturnus roseus* (Linn.) and not to the one found on *Turdus musicus musicus*. Although Denny's figure, in the shape of the head, is certainly more like the species from *Sturnus* than that from *Turdus*, yet this is probably more by chance than by intention. Denny's figures rarely resemble, with any accuracy, the specimens from which they were drawn. In this case the figures only suggest the species from *Sturnus* since they depict the preantennal region as somewhat long and narrow. If we accept the principle of page priority, then *Turdus iliacus* was the only host mentioned in the original description, and the hosts which Denny mentioned on page 131 are irrelevant. The fact that Denny gave the species the name *iliaci* and that this name has always been used for the Bruelia of the Redwing (Thompson, 1837; Hopkins & Clay, 1952), may justify the restriction of host. In order to settle this confusion, and to ensure against later changes of the name, a neotype will be erected for *Nirmus iliaci* as follows.

**Neotype:** Male in the British Museum (Natural History), slide No. 15643, figures from *Turdus musicus musicus* Linn. **Allotype** (female) in the British Museum (Natural History), slide No. 15643. **Neoparatypes** (3 males and 3 females) in Meinertzhagen Collection (Cornwall, March 1946, slide No. 15643).

Miss Clay sent me some specimens of *Bruelia inornata* Timmermann...
from Redwing, *Turdus migratorius* Linn. These specimens were compared with the type (female in a rather poor condition). I have pointed out elsewhere that the females of the allied forms are usually similar in all details and therefore cannot be used for specific differentiation. In such cases it is only the males which are useful for specific diagnoses. These females were found identical with the females of *Brueelia iliaci* discussed above and therefore I consider *B. inornata* as a synonym of *B. iliaci*.

2. *Brueelia iliaci brevicolor* subsp. nov.

(Text-figs. 8-13)

**Type-host:** *Turdus migratorius propinquis.*

**Male:** 1.72 x 0.39 mm. Head 0.39 x 0.33 mm., cephalic index 1:0.85. Preantennal region 0.21 x 0.26 mm. (index 1:1.24). Hind head 0.18 x 0.33 mm. (index 1:1.83). Prothorax 0.10 x 0.19 mm., Pterothorax 0.16 x 0.30 mm. (a little less than twice as broad as long). Abdomen 1.07 x 0.39 mm. Tergites V and VIII with one, VI-VII with two tergo-lateral setae on each side, V and VI with three and VII-VIII with five tergo-central setae. Tergite IX with 1+2+1 setae on each side. Genital armature of the pattern shown in the figure and resembling *B. iliaci* in important details, 0.0188 mm. long. Basal plate 0.0135 mm. long, anterior width 0.0063 mm., and posterior width 0.0058 mm. Parameres 0.0053 mm. long. Mesoosome 0.0030 x 0.0035 mm. (about 16 percent wider than long).

Text-figs. 8-13. *Brueelia iliaci brevicolor* subsp. nov.: (8) dorsal and ventral aspects of male, (9) dorsal and ventral aspects of the preantennal region showing the carinae, (10) male genital armature, (11) paramere, (12) various aspects of mesosome, (13) a portion of the subgenital plate of female showing the marginal chaetotaxy.
FEMALE: Similar to male; difference, however, exists in abdominal chaetotaxy. 2.04 x 0.47 mm. Head 0.43 x 0.36 mm., cephalic index 1: 0.83. Preantennal region 0.23 x 0.30 mm. (index 1: 1.30). Hind-head 0.20 x 0.36 mm. (index 1: 1.80). Prothorax 0.14 x 0.20 mm. Pterothorax 0.17 x 0.33 mm. Abdomen 1.30 x 0.47 mm. Tergites IV-IX with one seta on each side. Last segment with 2+2+2+2 setae. Vulvar plate as in B. iliaci with 7-8 marginal setae.

MATERIAL EXAMINED: 32 females and 4 males from Turdus migratorius propinquus (Arizona, March 1939: Meinertzhagen Collection No. 13127). HOLOTYPE (male), ALLOTYPE (female) and PARATYPES (3 males and 31 females) from Turdus migratorius propinquus.

REMARKS: Kellogg (1896) recorded Bruelia vulgata from eight birds (Hopkins & Clay, 1952). The type-host of this species has not so far been fixed. One of the hosts in the list given by Hopkins & Clay (1952) is Turdus migratorius migratorius Linnaeus. The author has 4 females and 32 females from Turdus migratorius propinquus before him but is unable to separate these specimens from B. iliaci (Denny). These specimens show differences of subspecific value in the abdominal chaetotaxy and male genitalia.

3. Bruelia iliaci indiensis subsp. nov.

(Text-figs. 14-19)

TYPE-HOST: Turdus ruficollis atrigularis.

MALE: 1.57 x 0.45 mm. Head 0.39 x 0.31 mm., cephalic index 1: 0.79. Preantennal region 0.20 x 0.25 mm. (index 1: 1.25). Hind-head 0.19 x 0.31 mm. (index 1: 1.63). Prothorax 0.09 x 0.20 mm. Pterothorax 0.13 x 0.29 mm. (more or less twice as broad as long). Abdomen 0.96 x 0.45 mm. Tergites V-VII with one tergo-central seta on each side. VI-IX with two tergo-lateral setae; IX with four tergo-central setae. Sternal chaetotaxy as in B. iliaci. Genital armature 0.0169 mm. long. Basal plate 0.0118 mm. long, anterior and posterior widths 0.0060 mm. (more or less twice as long as broad, in B. iliaci brevicolor it is 2.5 times). Parameres 0.0051 mm. long, proximal heads simple but slightly differently modified, sharply pointed posterior portion of the parameres considerably shorter than the anterior portion as against almost equal in the above species. Mesosome 0.0035 x 0.0037 mm. (almost as wide as long), whereas in B. iliaci it is 30 percent wider than long.

FEMALE: 1.86 x 0.46 mm. Head 0.39 x 0.34 mm., cephalic index 1: 0.87. Preantennal region 0.21 x 0.27 mm. (index 1: 1.28). Hind-head
0.18 x 0.34 mm. (index 1 : 1.88). Prothorax 0.10 x 0.21 mm. Pterothorax 0.15 x 0.31 mm. Abdomen 1.21 x 0.46 mm. Chaetotaxy as in the above species. Subgenital plate narrow posteriorly.

**Material Examined**: 3 males and 16 females from *Turdus ruficollis atragularis* Temminck (United Provinces, India, 1939 in Meinertzhagen Collection No. 13358). **Holotype** (male) **Allotype** (female) and **Paratype** (2 males and 15 females) from *Turdus ruficollis atragularis* Temminck in Meinertzhagen Collection No. 13358.

**Remarks**: These specimens closely resemble *B. iliaci* (Denny). The male genitalia and female subgenital plate, however, show differences in the two collections, warranting the present specimens to be given the status of a subspecies.

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4. *Brueelia stresemanni* (Clay)

(Text-figs. 20-24)

_Degeriella stresemanni_ Clay. 1936 _Proc. zool. Soc. Lond._, 1935, p. 910, figs. 6, 7b, pl. 2 fig. 3.

**Type-host**: _Zoothera monticola monticola_ Vigors.

**Male**: Well built, moderately sclerotized body. Head 0.55 x 0.67 mm., cephalic index 1 : 1.22. Preantennal region 0.25 x 0.47 mm. (index 1 : 1.88). Hind-head 0.30 x 0.67 mm. (index 1 : 2.23). Head parabolic in front, marginal carina interrupted anteriorly in the middle. Lateral interruptions incomplete and feeble and often inconspicuous. Dorsal suture
obliterated and leaves the anterior plate continuous with the dorsal...
sides considerably dilating, median posterior angle well marked, obtuse; postero-lateral margin from outer end to the origin of abdominal margin with 6 long setae on each side. Ventrum with ovate plates furnished with two sternal setae.

Abdomen ovate, tergal plates II-VIII completely divided in the middle, each with a tergo-central seta. Pleural plates slender, proximal heads reaching as far as the stigmata of the adjacent segment. Abdominal sternites quadrangular, II-VI with a long and slender seta on each side. Terminal segments with a fused, narrow triangular plate. Genital armature as shown in the figure, of the pattern found in B. zootherae.

**Female**: 2.35 x 0.85 mm., similar to male, slightly less robust than the male. Head 0.54 x 0.65 mm., cephalic index 1 : 1.20. Preantennal region 0.24 x 0.47 mm. (index 1 : 1.95); hind-head 0.30 x 0.65 mm. (index 1 : 2.17). Prothorax 0.14 x 0.34 mm. Pterothorax 0.23 x 0.59 mm. Abdomen 1.44 x 0.85 mm., widest at VI segment. Tergal plates II-VII completely divided in the middle, VIII incised or slightly notched in the middle. Abdominal chaetotaxy showing sexual variation; II-VII tergal plates with one moderately long tergo-central seta on each side; IV-VII with one tergo-lateral seta also, IX with two setae on each side. Sternal plates II-VI with two setae on each side (IV sometimes with one seta on each side). Subgenital plate squat, posterior angulation very blunt. Vulvar plate concave laterally and convex posteriorly, of the shape of Indian 'ladies fan' with 14 very thick and 8-9 moderately short and slender setae.

**Material Examined**: 2 males, 2 females from *Zoothera monticola monticola* Vigors (Sikkim, November 1900, Meinertzhagen Collection No. 3114: Paratypes).

**Remarks**: These specimens resemble *B. zootherae* (Clay), *B. daumae* (Clay) and *B. merulensis* (Denny) in male genital armature. They, however, differ considerably in the shape of the head and details of the genital armature.

5. *Bruelia zootherae* (Clay)

(Text-figs. 25-29)


**Type-Host**: *Zoothera marginata parva* Delacour

**Male**: 2.17 x 0.76 mm., well built and heavily sclerotized. Head 0.51 x 0.58 mm., cephalic index 1 : 1.13, parabolically rounded in front. Marginal carina interrupted anteriorly in the middle and there is also a
well-defined lateral interruption. The dorsal suture does not pass across the head, and leaves anterior plate continuous with the dorsal sclerotization of the head. Dorsal anterior plate shield-shaped, with acute posterior angle. Ventral carina interrupted and fused to the ends of the proximal carina. Marginal temporal carina well formed. Preantennal region 0.24 x


0.43 mm. (index 1 : 1.79). Hind-head 0.27 x 0.58 mm. (index 1 : 2.14).

Prothorax 0.13 x 0.33 mm. Pterothorax 0.23 x 0.53 mm., of the shape shown in \textit{B. stresemanni}. Posterior margin with 8 long setae on each side, confined to the area between postero-lateral angle and point of origin of the abdominal segment.
Abdomen 1.30 x 0.76 mm., widest at the V segment. Tergal plates II-VIII interrupted in the middle, each with a tergo-central seta, IV-VII with a tergo-lateral seta, IX with 6-7 and the last with one seta. Pleural plates slender, of moderate length. Abdominal sternites II-VI quadrangular, each with a long and slender lateral seta.

Genitalia 0.0233 mm. long. Basal plate 0.0202 mm. long, anterior and posterior widths 0.0088 mm. Parameres 0.0072 mm. long, unlike other species of *Brueelia*, of the shape of a 'kukri' with typical hilt, outer margin regularly curved inwards from the extreme tips while the inner side is concave to some distance and then extends downwards to the extreme tip and forms more or less a spatulate blade. Mesosome 0.0051 x 0.0060 mm., ovate, with a fairly well defined central apophysis, reinforced with sclerotized longitudinal lobes.

**FEMALE**: Similar to male, 2.60 x 0.84 mm. Head 0.56 x 0.64 mm., cephalic index 1 : 1.14. Preantennal region 0.27 x 0.47 mm. (index 1 : 1.74). Hind-head 0.29 x 0.64 mm. (index 1 : 2.21). Prothorax 0.14 x 0.37 mm. Pterothorax 0.24 x 0.59 mm. Abdomen 1.66 x 0.84 mm. Abdominal chaetotaxy more or less as in *B. stresemanni*; IX tergite with 3 setae; II sternite with two, and III-VI with one seta on each side; IV-V pleurites with one, VI-VII with two, VIII with four and IX with 6-8 setae. Vulvar plate with 17-23 setae as shown in the figure. Tip of the subgenital plate as shown in the figure.

**MATERIAL EXAMINED**: 2 males (Sikkim, January 1926, paratypes in Meinertzhagen Collection No. 3510), one male and three females (Annam, January 1897, paratypes Meinertzhagen Collection No. 3113, one male and one female (Kangpokpi, Manipur, January 26, 1952, in Meinertzhagen Collection No. 9865). All from *Zoothera marginata parva* Delacour.

**REMARKS**: These specimens resemble *B. stresemanni* (Clay), *B. daumae* (Clay) and *B. merulensis* (Denny). These allied forms can be easily distinguished from each other by the shape of the head in the clypeal region, and some modifications in the male genitalia.

6. **Brueelia daumae** (Clay)

(Text-figs. 30-34)


**TYPE-HOST**: *Turdus dauma dauma* Latham.

**MALE**: 2.11 x 0.68 mm. Head 0.46 x 0.54 mm., cephalic index 1 : 1.18. Preantennal region 0.25 x 0.38 mm. (index 1 : 1.52), parabolic in front, marginal carina always interrupted in front and laterally. The
lateral interruption is typical and oblique. Dorsal suture well-marked. Dorsal anterior plate with slightly concave anterior margin, posterior point not well marked. Ventral carina interrupted as in other allied species, well sclerotized in the proximal region only. Temples as shown in the figures. Marginal temporal carina comparatively well-formed, broad.
Gular plate well-developed, its anterior portion an equilateral triangle and its posterior portion roughly quadrangular, longer than broad. Hind-head 0.21 x 0.54 mm. (index 1 : 2.57).

Prothorax 0.13 x 0.28 mm., latero-posterior angle with a long seta. Pterothorax 0.20 x 0.47 mm., median posterior angle of pterothorax obtuse, latero-posterior angle with one very small and one long seta followed by seven long (sub-equal) setae on each side. Pterothoracic sternites well-formed, with a single small antero-lateral seta and a similar lateral seta.

Abdomen 1.32 x 0.68 mm., widest at the IV-V segments. Abdominal tergites II-VIII separated widely in the middle line, IX with approximate tergites, X-XI entire. First tergite with a single tergo-central seta on each side. A single slender and moderately long tergo-lateral seta on segment IV-VII. The number of setae on the VIII segment varies from 8-10 on each side. Paratergal plates only slightly oblique to the long axis of the abdomen, narrow with elongate re-entrant heads but without inwardly directed processes. Pleural plates slender and of moderate length, II-III bare, IV-V with one, VI-VII with two, VIII with three, IX with two and X-XI with 6-8 setae. Sternite II roughly bell-shaped and bearing on each side a single seta, sternite III-VII quadrangular, each bearing a single seta on each side. Subgenital plate with anterior margin straight, steadily narrowing posteriorly to terminate in a blunt posterior apex. The ventral posterior margin of the abdomen may have a rounded or flattened appearance.

Genital armature 0.0291 mm. long. Basal plate 0.0246 mm. long, anterior width and posterior width 0.0100 mm., slightly concave in the middle. Parameres 0.0069 mm. long, of uniform thickness throughout, with a slightly inward curve, shaped like a ‘kukri’ as in the above species. Proximal heads simple. Mesosome 0.0044 x 0.0046 mm., of the pattern seen in B. zootherae (Clay).

**FEMALE** : 2.43 x 0.73 mm., similar to male. Head 0.54 x 0.58 mm., cephalic index 1 : 1.07. Preantennal region 0.26 x 0.45 mm. (index 1 : 1.73). Hind-head 0.28 x 0.58 mm. (index 1 : 2.08). Prothorax 0.14 x 0.31 mm. Pterothorax 0.25 x 0.50 mm. Abdomen 1.50 x 0.73 mm., tergites II-VIII completely divided in the middle, tergite IX entire. Terminal segment bilobed, with smoothly rounded apex and divided by a shallow sulcus. Tergites II-VIII, with a single moderately long tergo-lateral seta on each side. Tergite IX with four very stout marginal setae. Pleural plates with well developed heads. Subgenital plate more or less trapezoidal in outline. Vulvar plate with slight concavity in the middle, furnished with 11 heavy and 7 short marginal setae.

**MATERIAL EXAMINED** : 2 males (Burma, March 1902 : PARATYPES, in
Meinertzhagen Collection No. 3544) from Turdus dauma aureus and one female (Kohima (Assam), January 28, 1952: in Meinertzhagen Collection, No. 19880) from Turdus d. dauma Latham.

REMARKS: This species resembles B. merulensis (Denny), B. stresemanni (Clay) and B. zootherae (Clay) from which it can be differentiated only by the shape of the head in the preantennal region. The male genitalia also show some modifications.

7. **Brueilia merulensis** (Denny)

(Text-figs. 35-42)


**TYPE-HOST:** Turdus merula merula Linn.

**MALE:** 2.25 x 0.70 mm., well built and fairly sclerotized. Head 0.54 x 0.59 mm., cephalic index 1 : 1.09. Marginal carina interrupted in front and laterally. Dorsal clypeal signature square, shield-like. Ventral carina also interrupted, anterior ridge running as far as the tip, well formed. Temporal carina well built. Preantennal region 0.25 x 0.43 mm. (index 1 : 1.72). Hind-head 0.29 x 0.59 mm. (index 1 : 2.03).

Prothorax wider than long, sides convex with a hair in the latero-posterior angle, arising from near the spiracle. Lateral sclerite heavily pigmented, thickened, well developed, 0.18 x 0.34 mm. Pterothorax 0.25 x 0.51 mm., more or less trapezoidal in shape, moderately angulate posteriorly. Posterior margin, from outer end to the point of origin of the abdominal segment, with 7-8 moderately long setae on each side.

Abdomen 1.28 x 0.70 mm., widest at the V-VI segments, sides very convex, abruptly sloping down, beyond the VIII segment. Tergal plates II-IX interrupted in the middle. Paratergal plates comparatively heavily pigmented. Pleural plates rod-like. Tergal plates II-IX on each side, with a single tergo-central seta. A single slender and moderately long tergo-lateral seta on segments IV-VI; segment IX with 7 unequal setae. Pleural setae moderately long; segment II-III bare, others with 2-3 setae. Sternites I-VII with a single seta on each side. Posterior margin of the abdomen round.

Genitalia 0.0246 mm. long. Basal plate elongate, 0.0197 mm. long, anterior width 0.0069 mm., and posterior width 0.0081 mm., may be flattened or rounded anteriorly, sides subparallel. Parameres 0.0058 mm. long, short and stout, thickness uniform throughout. Proximal heads as shown in the figure. Mesosome 0.0039 x 0.0058 mm., squat, terminating at about two-thirds the length of the parameres, with a highly sclerotized central apophysis.
FEMALE: Similar to the male, 2.50 x 0.78 mm. Head 0.56 x 0.63 mm., cephalic index 1:1.12. Preantennal region 0.27 x 0.46 mm., (index 1:1.70). Hind-head 0.29 x 0.63 mm. (index 1:2.17). Prothorax 0.15 x 0.36 mm. Pterothorax 0.23 x 0.54 mm. Abdomen 1.54 x 0.78 mm. Tergal plates IX-X entire, others interrupted in the middle. Chaetotaxy of the tergites

Text-figs. 35-42. Bruelia menulenis (Denny): (35) dorsal and ventral aspects of male, (36) dorsal and ventral aspects of the head showing carinae, (37) a portion of the abdomen showing tergal plate, (38) male genital armature, (39) paramere, (40) various aspects of mesosome, (41) mesosome, (42) a portion of the subgenital plate of female showing marginal chaetotaxy.
II-VII as in male, VIII-IX with one small seta on each side. Sternites I-VII with two setae on each side. Posterior segment with several setae round the divided shallow sulcus (1+3, 0+1, 1+1, 0+2). Subgenital plate well developed, vulvar plate with 8-9+12 setae on each side.

Material examined: 3 males (Kent, February 1937, Meinertzhagen Collection No. 8353), one male and 2 females (Pembrokeshire, April 20, 1939, B. M. 1939, No. 333), all from Turdus merula merula.

One male and three females from Turdus merula syriacus (Palestine, April 1953, Meinertzhagen 1953 Collection No. 223) were also not distinguishable from Bruelia merulensis (Denny).

Remarks: These specimens resemble B. stresemanni (Clay) and allied species in male genitalia. The shape of the head, and the details of parameres and mesosome will, however, separate all these forms from each other easily.

8. Bruelia longifrons sp. nov.

(Text-figs. 43-47)

Type host: Hylocichla ustulata.

Male: 1.29 x 0.46 mm. Head 0.37 x 0.37 mm., cephalic index 1:1.00, approaching conical form. Preantennal region 0.17 x 0.28 mm. (index 1:1.63), clypeal region more or less flat in front and almost straight laterally. Marginal carina interrupted in front and laterally. Clypeal signature well formed, rectangular. Ventral carina as in other species. Hind-head 0.20 x 0.37 mm. (index 1:1.85). Temples as shown in the figure, moderately dilating. Gular plate well developed.

Prothorax 0.08 x 0.21 mm., with one elongate hair in the latero-
posterior angle. Pterothorax 0.13 x 0.34 mm., median posterior angle well marked, latero-posterior angle with one small and one long seta followed by five long setae on each side. Pterothoracic sternites well formed, with a single, small anterior seta and a small lateral seta.

Abdomen 0.71 x 0.46 mm., tergites II-VIII with one tergo-central seta, tergite IX with 6 small and irregularly beset small setae. Tergites IV-VIII with two subequal tergo-lateral setae, IX with one tergo-lateral seta, X+XI with 3 setae. Paratergal plates comparatively heavily sclerotized. Pleural plates rod-like, pleural setae moderately long, II-III bare, IV-IX with 2-4 setae; segments X+XI fused to form a rounded lobe.

Genitalia 0.0192 mm. long. Basal plate 0.0131 mm. long, anterior width 0.0075 mm. and posterior width 0.0051 mm., sides straight. Parameres 0.0071 mm. long, unlike other species, shorter and broader, widest in the middle, of the shape of 'share of a furrow-turning plough'. Proximal head well developed, flattened, hilt of the shape of the blade of a golf stick. Mesosome 0.0061 mm. long, acutely angulate posteriorly with a central apophysis reinforced with spindle-shaped lateral sclerotization.

FEMALE : 1.72 x 0.55 mm., similar to the male. It resembles the female of b. antiqua (given below). Head 0.39 x 0.42 mm., cephalic index 1 : 1.07. Preantennal region 0.18 x 0.33 mm. (index 1 : 1.83). Hind-head 0.21 x 0.42 mm. (index 1 : 2.00). Prothorax 0.10 x 0.25 mm. Pterothorax 0.16 x 0.37 mm. Abdomen 1.07 x 0.55 mm. It differs from the allied species in the shape of the subgenital plate, the posterior angle is considerably narrow, vulvar plate with 10-12 marginal setae.

MATERIAL EXAMINED : One male (HOLOTYPE), one female (ALLOTYPE) from the Olive-backed Thrush (Hylocichla ustulata). Arena, Wis., May 20, 1953 : W. S. Woodman Collection.

REMARKS : These specimens do not resemble any species so far described from the True Thrushes. The head in this form is narrow in front, of the pattern seen in Brudia myiophoneae (Clay). This species differs from the allied forms in the considerably smaller size of the males and the structure of the male genital armature.

9. Brudia longifrons antiqua subsp. nov.
(Text-figs. 48-52)

TYPE-HOST : The Hermit Thrush (Hylocichla guttata).

MALE : 1.23 x 0.41 mm. Head 0.36 x 0.37 mm., cephalic index 1 : 1.03. Preantennal region 0.17 x 0.29 mm. (index 1 : 1.71). Latero-clypeal region with slight concavity in the anterior half. Hind-head 0.19 x 0.37 mm. (index 1 : 1.95).
Prothorax 0.09 x 0.21 mm., latero-posterior angle with a single moderately long seta. Pterothorax 0.12 x 0.30 mm.

Text-figs. 48-52. *Bruelia longifrons antiqua* subsp. nov. (48) dorsal and ventral aspects of female, (49) male genital armature, (50) various aspects of parameres, (51) various aspects of mesosome, (52) a portion of the subgenital plate of female showing shape and marginal chaetotaxy.

Abdomen 0.66 x 0.41 mm., widest at the IV-V segments. Segment II very narrow, others of almost equal length, II-VIII and X+XI tergites with one tergo-central seta, IX with 6 tergo-central setae. Two subequal, moderately long tergo-lateral setae on IV-VII tergites. Tergal plates VIII and IX, each with one such seta. Pleural setae moderately long; segment II bare; III-IX segments with 2-4 setae. Posterior segment rounded.
Male genitalia not clearly visible. Parmeres 0.0075 mm. long. Mesosome 0.0075 mm. long, with two central spindle-shaped median sclerotizations. Basal plate 0.0061 mm. wide at the apex.

**Female**: Similar to the male, 1.63 x 0.45 mm. Head 0.39 x 0.41 mm., cephalic index 1 : 1.03. Preantennal region 0.18 x 0.30 mm. (index 1 : 1.66). Hind-head 0.21 x 0.41 mm. (index 1 : 1.95). Prothorax 0.10 x 0.23 mm. Pterothorax 0.15 x 0.32 mm. Abdomen 0.99 x 0.45 mm. Chaetotaxy as in *B. myiophoneae* (Clay). Vulvar plate as shown in the figure, posterior angle of the subgenital plate considerably wide, cross-piece of the anchor with 7-8 small setae on each side. This character separates it from *Bruelia longifrons*.

**Material examined**: One male (*holotype*), one female (*allotype*) and one female (*paratype*) from the Hermit Thrush (*Hylocichla guttata*), Vilas, Wis., May 7, 1952 in W. S. Woodman Collection.

**Remarks**: This species resembles *Bruelia longifrons* (described above). The male available to me is teneral and it is difficult to see the character of genital armature clearly. The dorsal chaetotaxy and the subgenital plate in the female exhibit differences of subspecific standard. The form and the posterior angle of the subgenital plate do not seem to be of specific importance and therefore we are not inclined to raise its status beyond subspecific level.

10. *Bruelia myiophoneae* (Clay)  
   (Text-figs. 53-58).

*Dergeriella* *myiophoneae* Clay, 1935, *Proc. zool. Soc. Lond.*, 1933, p. 911, fig. 7g, pl. 2 fig. 4.

**Type-host**: *Myiophoneus coeruleus temminckii* Vigors

**Male**: 1.92 x 0.65 mm. Head 0.53 x 0.52 mm., cephalic index 1 : 0.98, narrow in front. Preantennal region 0.25 x 0.39 mm. (index 1 : 1.56). Marginal carina always interrupted in front and laterally. Dorsal suture well marked, anterior plate distinct, squarish, shield-like. Ventral carina interrupted as in other species, but sclerotized only proximally on each side. Hind-head 0.28 x 0.52 mm. (index 1 : 1.85). Temples slightly convex laterally, posterior angle rounded, marginal temporal carina well developed. Gular plate well formed.

Prothorax 0.12 x 0.23 mm., transverse, posterior angle with one long seta. Pterothorax 0.17 x 0.46 mm., lateral margin divergent, posterior angulation more or less obtuse. Latero-posterior angles with one very small and one long seta followed by a group of rather long setae on each side.
Abdomen 1.10 x 0.66 mm., ovate, widest at the IV-V segments. Segments IX and X are fused to form a pygidium and never separated from XI

Text-figs. 53-58. *Bruelia myiophanae* (Clay): (53) dorsal and ventral aspects of male, (54) dorsal and ventral aspects of preantennal region showing carinae, (55) male genital armature, (56) paramere, (57) mesosome, (58) a portion of the subgenital plate of female showing marginal chaetotaxy.

by a definite suture. Tergal plates II-VI medially interrupted, quadrate. Tergal plates VII and VIII not only separated but also greatly narrowed in the middle. Tergal plate IX runs across the segment and narrows in the middle; II-III tergites with a single tergo-central seta; IV-V with one tergo-central and one tergo-lateral seta; VI-VIII with one tergo-central and 2 tergo-lateral setae, IX with 2+6 setae on each side; X+XI with 3+2 setae on each side. Paratergal plates simple, with shallow re-entrant heads and devoid of any inwardly directed processes; II-III bare; IV-VI
and X+XI with 2, VII with 3, VIII with 4 moderately long setae. The sternal thickenings in the form of median plates, those of the posterior segments VII-XI fused to form an irregular conical plate. Sternites II-VI with one seta on each side, X+XI with one small seta.

Genitalia typical. Basal plate moderately long, about three times as long as parameres and more or less twice its width. Margins markedly sinuate, straight basally, concave in the middle and convex distally. Parameres rather typical, tapering very slightly and gradually, extreme tips blunt. Proximal heads of the parameres rather strongly developed. Mesosome shield-shaped, with postero-lateral portion well sclerotized, of the pattern shown in the figure.

FEMALE: Slightly stouter than the male, 2.27 x 0.76 mm. Head 0.57 x 0.58 mm., cephalic index 1:1.02. Preantennal region 0.27 x 0.44 (index 1:1.62). Hind-head 0.30 x 0.58 mm. (index 1:1.93). Prothorax 0.14 x 0.28 mm. Pterothorax 0.20 x 0.50 mm. Abdomen 1.36 x 0.76 mm., widest at the IV-V segments. Tergal plates II-VII with one tergo-central seta on each side; IV-VIII with one such seta on each side; IX with three setae. Sternal plates II-VI with one seta on each side. Pleurites II-III bare: IV-VI with two setae; VII with three, VIII with four and IX with 8 setae. Subgenital plate well developed, apically broader. Vulvar plate with 14 setae, arranged in two asymmetrical rows.

MATERIAL EXAMINED: One male (PARATYPE) from Baltistan (India), one male (PARATYPE; Kashmir, March 1925 in Meinertzhagen Collection No. 3541), 4 females and one male from Afghanistan (Meinertzhagen, April 1937: 9749), two males and three females (Ansari, June 1940, August 1942, from Kulu). All from the Whistling Thrush (Myiophonus coeruleus temminckii Vigors.)

REMARKS: This species resembles B. longifrons in the shape of the head, but differs in being more robust and in the male genitalia.

11. Brucelia turdinulae sp. nov.
(Text-figs. 59-65)

TYPE-HOST: Turdus philomelos philomelos.

MALE: 1.23 x 0.44 mm. Head 0.37 x 0.38 mm., cephalic index 1:1.03. Preantennal region 0.18 x 0.32 mm. (index 1:1.78). Hind-head 0.19 x 0.38 mm. (index 1:2.00). Marginal carina as in others, lateral interruption incomplete. Anterior plate not well pigmented. Dorsal suture not passing across the head and leaves the posterior part of the anterior plate continuous with the dorsal sclerotization of the head.

Prothorax 0.10 x 0.24 mm., with a long seta in the posterior lateral
angle. Pterothorax 0.15 x 0.34 mm., considerably dilated laterally, posterior margin with 6 long setae on each side, median bare.

Text-figs. 59-65. *Bruelias tundinae* sp. nov. (59) dorsal and ventral aspects of male, (60) dorsal and ventral aspects of a portion of head showing carinae, (61) a portion of the abdomen showing tergal plates, (62) male paramere, (63) various aspects of paramere, (64) various aspects of mesosome, (65) a portion of the subgenital plate of female showing form and marginal setae.

Abdomen 0.61 x 0.44 mm. Tergal plates II-VIII interrupted in the middle, IX entire; II-VII with one tergo-central seta; IV-VI and VIII-IX with one tergo-lateral seta; VII with two tergo-lateral setae on each side;
IX with four tergo-central setae, and a row of 3+3 setae on the posterior segments. Sternites as in others. Pleurites II and III bare, IV-V with one, VI and X with two and VII-VIII with three moderately long setae.

Genitalia 0.0178 mm. long. Basal plate 0.0154 mm. long, anterior width 0.0091 mm. and distal width 0.0067 mm., slightly concave in the middle and rounded anteriorly. Parameres 0.0035 mm., of the shape shown in the figure (like blunt scalpel blade). Proximal head not well developed. Mesosome 0.0035 mm. long.

**FEMALE**: 1.70×0.44 mm. Head 0.40 x 0.41 mm., cephalic index 1: 1.02, Preantennal region 0.21 x 0.34 mm. (index 1: 1.62). Hind-head 0.19 x 0.41 mm. (index 1: 2.15). Prothorax 0.10 x 0.23 mm. Pterothorax 0.16 x 0.32 mm. Abdomen 1.04 x 0.44 mm. Tergal plates II-VIII with one tergo-central seta; IV-XI with one tergo-lateral seta and IX with two tergo-central setae on each side. Ectal plates as in male. Pleural plates II-III bare; IV-V and X with one; VI-VII with two, VIII with four and IX with seven setae. Subgenital plate as shown in the figure. Vulvar plate marginally beset with 9-10 setae.

**MATERIAL EXAMINED**: HOLOTYPE (male), ALLOTYPE (female) and PARATYPES (3 males from Herts, North Mymms (D. Borton and F. F. Shillies, 2nd July 1933, B. M. 1936-624), from the Song Thrush (Turdus philomelos philomelos), 3 males from Cornwall (Meinertzhagen, January 1937, Collection No. 8229) from the Song Thrush (T. p. philomelos).

**REMARKS**: According to Miss T. Clay (Personal communication) there is some confusion about the name of the Song Thrush. The specialists in the British Museum (Natural History) have identified this bird as Turdus philomelos philomelos. She has also very kindly sent me some slides where the Song Thrush is identified as Turdus musicus musicus Linn. In Meinertzhagen’s Collection, Turdus musicus musicus is the Red Wing. I have compared the collection of Brueilia from the two lots and found that the collection from the Song Thrush resembles Brueilia marginata group in the body form and the general shape of the head, while the collection from the Red Wing (Turdus musicus musicus) is referable to Brueilia iliaca. The specimens from Turdus philomelos philomelos resemble Brueilia marginata and others of the group in body and general form of the head. These specimens resemble Brueilia eterinitatus and B. ilmasae in the abdominal chaetotaxy. It differs from all others but Brueilia eterinitatus in the shape of the parameres and mesosome. From Brueilia eterinitatus it differs in the details of the mesosome, proximal heads of the parameres and the subgenital plate of female.
12. *Bruelia turdinalae eternitatus* subsp. nov.

(Text-figs. 66-71)

**Type-host:** *Turdus philomelos clarki*

**Male:** 1.41 x 0.48 mm. Head 0.36 x 0.36 mm., cephalic index 1 : 1.00. Preantennal region 0.18 x 0.29 mm., (index 1 : 1.61). Hind-head 0.18 x 0.36 mm., (index 1 : 2.00). Prothorax 0.09 x 0.21 mm. Pterothorax 0.14 x 0.32 mm. Abdomen 0.82 x 0.43 mm.

**Female:** 1.75 x 0.53 mm. Head 0.40 x 0.39 mm., cephalic index 1 : 0.97. Preantennal region 0.21 x 0.30 mm., (index 1 : 1.43). Hind-head 0.19 x 0.39 mm. (index 1 : 2.05). Prothorax 0.09 x 0.23 mm. Pterothorax

Text-figs. 66-71. *Bruelia turdinalae eternitatus* subsp. nov. (66) dorsal and ventral aspects of male. (67) a portion of head showing carinae. (68) male genital armature. (69) paramere. (70) various aspects of mesosome. (71) a portion of the subgenital plate of female showing shape and marginal chaetotaxy.
0.17 x 0.35 mm. Abdomen 1.09 x 0.53 mm.

**Material Examined:** Holotype (male), Allotype (female) and Paratypes (8 males and 6 females) from Kent (Meinertzhagen, February 1937, No. 8335). All from *Turdus philomelos clarki*.

**Remarks:** The specimens from *T. philomelos clarki* resemble the above species in almost all the salient characters. Male genitalia and subgenital plate in female, however, exhibit some important differences which are presented in the table below. In the light of these differences I am inclined to assign these specimens the status of a subspecies.

<table>
<thead>
<tr>
<th><strong>Bruelia turdinulae from Turdus philomelos philomelos.</strong></th>
<th><strong>Bruelia turdinulae eterinitatus from Turdus philomelos clarki.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Head:</strong> Dorsal anterior plate strongly concave anteriorly.</td>
<td>Dorsal anterior plate moderately concave in front.</td>
</tr>
<tr>
<td><strong>Abdominal tergites:</strong> IX with 4 tergo-central setae, 3 small additional setae in the posterior row.</td>
<td>IX with 3 tergo-central setae on each side. Additional row of setae wanting.</td>
</tr>
<tr>
<td><strong>Male genitalia:</strong> 0.0173 mm. long, comparatively squat (100 : 117).</td>
<td>0.0204 mm. long, comparatively long and narrow. (100 : 83.3)</td>
</tr>
<tr>
<td><strong>Basal plate:</strong> 0.0154 mm. long, posterior width 0.0091 mm., distal width 0.007 mm.</td>
<td>0.0157 mm. long, posterior width 0.0092 mm., distal width 0.0064 mm.</td>
</tr>
<tr>
<td><strong>Parameres:</strong> 0.0035 mm. long, blunt, proximal heads not well developed (100 : 157).</td>
<td>0.0055 mm. long, narrow with very well developed proximal heads (100 : 77.7).</td>
</tr>
<tr>
<td><strong>Mesosome:</strong> 0.035 mm. long, “V-shaped” sclerotization wanting. (100 : 128.5).</td>
<td>0.0045 mm. long, “V-shaped” sclerotization present in one view. (100 : 77.7).</td>
</tr>
<tr>
<td><strong>Female subgenital plate:</strong> Squat and comparatively broad distally. Vulvar plate a round arch. With 9-10 marginal setae.</td>
<td>Subgenital plate narrow distally, vulvar plate like a flattened arch. With 9-9 marginal setae.</td>
</tr>
</tbody>
</table>

13. **Bruelia oudhensis** sp. nov.

(Text-figs. 72-78)

**Type-host:** *Turdus merula nigropelios* Lafrenay.

**Male:** 1.62 x 0.47 mm. Head 0.36 x 0.35 mm., cephalic index 1 : 0.97. Preantennal region 0.17 x 0.26 mm. (index 1 : 1.53). Marginal carina as
in other species, dorsal suture well marked but not passing across the head. Hind-head 0.19 x 0.35 mm. (index 1 : 1.84).

Prothorax 0.08 x 0.21, with a small seta in the postero-lateral angle.

Text-figs. 72-78. *Brueilia oudhensis* sp. nov. (72) dorsal and ventral aspects of male, (73) dorsal aspect of head showing carinae, (74) a portion of the abdomen showing tergal plate, (75) male genital armature, (76) parameres, (77) various aspects of mesosome, (78) a portion of the subgenital plate of the female showing marginal setae.

Pterothorax 0.14 x 0.31 mm. Posterior angulation very obtuse, latero-posterior angle with one small and one moderately long seta followed by 4-5 setae on each side.
Abdomen 1.04 x 0.47 mm. Tergal plates II-VIII with a single tergo-central seta, IV and VIII with one and V-VII with two tergo-lateral setae on each side, IX with 2 long and 3-4 small setae on each side. Last tergite with only one long seta on each side. Sternites as in other species. Pleurites II and III bare, IV-VI and IX+X with 2, VII with 3, and VIII with 3-4 setae.

Genitalia 0.0189 mm. long. Basal plate 0.0138 mm. long, anterior width 0.0058 mm., distal width 0.0061 mm., slightly concave in the anterior one third. Parameres 0.0043 mm. long, slender, of the shape of a knife blade. Mesosome 0.0035 mm. long, of the shape shown in the figure.

**FEMALE :** 1.46 x 0.52 mm. Head 0.39 x 0.38 mm., cephalic index 1 : 0.97. Preantennal region 0.20 x 0.30 mm. (index 1 : 1.50). Hind-head 0.19 x 0.38 mm. (index 1 : 2.00). Prothorax 0.09 x 0.23 mm. Pterothorax 0.16 x 0.35 mm. Abdomen 0.82 x 0.52 mm. Tergal chaetotaxy reduced, II-VII with one tergo-central seta, IV-IX with two tergo-lateral, IX with 2 tergo-lateral setae on each side. Vulvar plate of the shape shown in the figure. Vulvar plate with 8-9 setae disposed of as shown in the figure. Pleural plates II-III bare, IV with one, V-VII with two, VIII with three and IX with 7 setae.

**MATERIAL EXAMINED :** HOLOTYPE (male), ALLOTYPE (female) and PARATYPES (5 males and 7 females) from Bombay (Meinertzhagen; February 1927, slide No. 8472). All from Turdus merula nigropelios Lafresnay.

**REMARKS :** The specimens from Turdus merula nigropelios before me resemble B. viscivori and other allied forms in the general shape of the body and the abdominal chaetotaxy, but differ from all of these in the male genitalia. The parameres and mesosome in this species exhibit a different shape and modifications.

14. Brueelia marginata (Burmeister)

*(Text-figs. 79-85)*


**TYPE-HOST :** *Turdus pilaris* Liin.

**MALE :** 1.33 x 0.52 mm. Head 0.35 x 0.36 mm., cephalic index 1 : 1.03. Marginal carina is interrupted medially and there is also an incomplete lateral interruption. The dorsal suture does not pass across the head and leaves the posterior part of the anterior plate continuous with the dorsal chitinization of the head. Gular plate well developed. Preantennal region 0.18 x 0.32 mm. (index 1 : 1.77). Hind-head 0.17 x 0.36 mm. (index 1 : 2.12).

Prothorax 0.09 x 0.21 mm., latero-posterior angle with one seta.
Pterothorax 0.14 x 0.33 mm., median posterior angle obtuse, latero-posterior angle with 2 long and a small seta on each side followed by 4 subequal...

Text-figs. 79-85. *Bruelia marginata* (Burmeister): (79) dorsal and ventral aspects of male; (80) a portion of head (dorsal and ventral) showing carinæ, (81) a portion of the abdomen showing tergal plates, (82) male genital armature, (83) paramere, (84) various aspects of mesosome, (85) a portion of the subgenital plate of the female showing marginal chaetotaxy.

...hairs confined to the lateral half of the posterior margin. Thoracic sterites well developed, with a single lateral seta.
Abdomen 0.75 x 0.52 mm., widest at the IV segment. Tergites I and III with a single tergo-central seta on each side; IV with one tergo-central and one tergo-lateral seta; V-VIII with one tergo-central and two tergo-lateral setae; IX with two tergo-lateral and 5 tergal setae on each side. Paratergites as shown in the figure. Pleural plates slender, moderately long; II-III bare, IV with one, V, VII, IX and X with two, and VI, VII with three subequal setae. Stermites II-VI with one long seta on each side.

Genitalia 0.0242 mm. long. Basal plate 0.0175 mm. long, wid (0.0087 mm.) and rounded anteriorly and narrow (0.0069 mm.) an concave distally. Parameres 0.0069 mm. long, of uniform thickness throughout, proximal heads as shown in the figure. Mesosome 0.0066 mm long, well developed, with a fairly well developed central apophysis reinforced on both sides (visible in one aspect), resembling a scoop with a small handle.

**FEMALE**: 1.69 x 0.56 mm., similar to male. Head 0.39 x 0.41 mm. cephalic index 1 : 1.05. Preantennal region 0.20 x 0.34 mm. (index 1 1.70). Hind-head 0.19 x 0.41 mm. (index 1 : 2.15). Prothorax 0.09 x 0.2 mm. Pterothorax 0.16 x 0.36 mm. and abdomen 1.05 x 0.56 mm. Terga plates approximate or widely separated. Tergites II-IX with one tergo-central seta on each side; IV-IX with one tergo-lateral seta; X with two small setae on each side. Sternal plates as in male. Subgenital plate well formed, posterior tip blunt as in the figure. Vulvar plate with 5-6 thick and 3-4 feeble setae on each side; II and III pleurites bare, IV and V with one, VI with two, VII and VIII with three, IX with 3-6 setae.

**MATERIAL EXAMINED**: 6 males, 12 females from Heacham, Norfolk (Meinertzhagen, January 1941, Collection No. 14084), 4 males and 4 females from Uppsala, Sweden (Meinertzhagen, October 1946, Collection No.16097) and one male from Estonia (Meinertzhagen, October 1934, Collection No. 1932). All from the type-host (*Turdus pilaris pilaris* Linn.). I designate neotype (male from Uppsala, Sweden, October 1946), allotype (female on the same slide 16097) and all others as neoparatypes (10 males and 15 females).

**REMARKS**: These specimens resemble *B. visciory* (Denny), *B. amsel* (Eichler), *B. oudhensis* sp. nov., *B. ilmasae* sp. nov., *B. turdinae* sp. nov. and *B. turdinae* *eteripatatus* subsp. nov. in the shape of the head. The male genitalia are of the pattern found in *B. visciory*, *B. amsel*, and *B. ilmasae*. The shape of the mesosome and the proximal head of the parameres will however separate these forms from each other easily.
Hopkins & Clay (1952) have recognized *Nirmus marginalis* (Burmeister) as a synonym and I agree with them in this finding.

15. **Bruelia amsel** (Eichler)

(Text-figs. 86-92)


**Type-host**: *Turdus merula merula* Linn.

Text-figs. 86-92. *Bruelia amsel* (Eichler): (86) dorsal and ventral aspects of male, (87) dorsal and ventral aspects of head showing carinae, (88) a portion of the abdomen showing tergal plate, (89) male genital armature, (90) parameres, (91) mesosome, (92) a portion of the subgenital plate of female showing the marginal setae.
MALE: 1.51 x 0.59 mm. Head 0.38 x 0.40 mm., cephalic index 1 : 1.05. Preantennal region 0.19 x 0.33 mm. (index 1 : 1.74). Hind-head 0.19 x 0.40 mm. (index 1 : 2.11). Marginal carina is interrupted medially and there is a well-marked dorsal suture. Anterior plate well demarcated. Prothorax 0.09 x 0.25 mm. Pterothorax 0.19 x 0.36 mm. Abdomen 0.85 x 0.59 mm. Tergal plates II and III with a single tergo-central seta; IV with one tergo-central and one tergo-lateral seta; V with one tergo-central and 2 tergo-lateral setae; VI with 2-3 tergo-lateral and one tergo-central seta; VII with 2-3 tergo-lateral setae; VIII with three setae on each side; IX with 2 long tergo-lateral and 5 small tergo-central setae and X+XI with three anterior and two posterior setae on each side.

Genital armature 0.0252 mm. long. Basal plate 0.0184 mm. long, anterior width 0.0098 mm. and posterior width 0.0069 mm., strongly convex in the anterior region and runs almost parallel from the middle to the apical margin. Parameres sabre-shaped with nearly straight inner margin, proximal heads of the shape shown in the figure, comparatively well developed in one facies than the other, 0.0069 mm. long. Mesosomal plate showing distinct central apophysis with reinforced sides, 0.0063 mm. long.

FEMALE: 1.82 x 0.64 mm. Head 0.42 x 0.47 mm., cephalic index 1 : 1.12. Preantennal region 0.19 x 0.39 mm. (index 1 : 2.05). Hind-head 0.23 x 0.47 mm. (index 1 : 2.04). Prothorax 0.10 x 0.27 mm. Pterothorax 0.19 x 0.41 mm. Abdomen 1.11 x 0.64 mm. Tergal plates II-IX with one tergo-central seta; IV-VII with one tergo-lateral seta, VIII+IX with two tergo-lateral setae on each side. Sternal plates as in other species. Subgenital plate blunt posteriorly. Vulvar plate with 5-6 marginal setae on each side, beset as shown in the figure.

MATERIAL EXAMINED: One female from Iman (Wd. Eichler, Collection No. 36886), one male and one female from Whetestow, England (B. M., April 1953, 356). All from the Blackbird (Turdus m. merula Linn.). Three males and one female from Palestine (Meinertzagen, April 1953, slide No. 20143), taken of Turdus merula syriacus, also resemble the above specimens in all details.

REMARKS: As far as the general body and shape of the head are considered, this species falls in Bruelia marginata group. The abdominal chaetotaxy of Bruelia longifrons, B. longifrons antiqua, B. myiophoneae, B. marginata, B. visciroli, B. turdivinulae and B. oudhensis is more or less similar. The head in B. longifrons, B. l. antiqua, and B. myiophoneae is truncate while in others it is thimble-shaped. Basal plate in B. turdivinulae and B. oudhensis is 3.5-4.5 times as long as mesosome and in B. marginata, B.
viscivori B. amsel, and B. ilmasae the ratio between the mesosome and basal plate is 1 : 2.05-2.41 only. In B. marginata and B. amsel V-VII abdominal segments are with 2+1+1+2 dorsal setae, while in B. ilmasae there are 1+1+1+1 dorsal setae.

16. *Bruelia* viscivori (Denny)

(Text-figs. 93-99)


TYPE-Host: *Turdus viscivorus* viscivorus Linn.

MALE: 1.39 x 0.51 mm. Head 0.37 x 0.40 mm., cephalic index 1:

Text-figs. 93-99. *Bruelia* viscivori (Denny): (93) dorsal and ventral aspects of male, (94) a portion of the head showing marginal carinae, (95) a portion of the abdomen showing tergal plate, (96) male genital armature, (97) paramere, (98) mesosome, (99) a portion of subgenital plate of female showing marginal chaetotaxy.
1.08. Preantennal region 0.17 x 0.32 mm. (index 1 : 1.90). Marginal carina as in B. ansel. Anterior plate well pigmented, concave anteriorly and convex posteriorly. Ventral carina is distinctly divisible in anterior and posterior components, posterior portion is heavily pigmented and thicker than the anterior component. Temples convex. Gular plate well developed, anterior portion squat, equilateral triangle with acutely angulate apex, posterior portion trapezoidal in shape. Hind-head 0.20 x 0.40 mm. (index 1 : 2.00).

Prothorax 0.08 x 0.23 mm., sides straight and slightly divergent, latero-posterior angle with a long seta. Pterothorax 0.15 x 0.36 mm. strongly diverging, median posterior angle obtuse, latero-posterior angle with one very small and one long seta followed by 5-6 long and subequal setae on each side. Thoracic sternites well formed, spherical with a single small antero-lateral seta on each side.

Abdomen 0.79 x 0.51 mm., ovate, narrow anteriorly and broader posteriorly, widest at V-VI segments. Tergal plates II-VIII separated widely in the middle line; IX approximate. Tergites II-VIII with one tergo-central seta; IV and VIII with one tergo-lateral seta also; V-VII and IX with two subequal tergo-lateral setae; IX with 7 short setae on each side. Terminal segment rounded, with two rows of three setae on each side. Pleural plates with elongate re-entrant heads, inwardly directed to the segment in front. Abdominal sternites II-VI with a single seta on each side.

Genitalia 0.0253 mm. long. Basal plate 0.0183 mm. long, more or less three times as long as parameres, wider anteriorly (0.0089 mm.) and narrow distally (0.0077 mm.), concave in the middle. Parameres moderately long, 0.0072 mm., regularly tapering. Proximal heads considerably projecting inwards. Mesosome 0.0071 mm. long, of the pattern shown in the figure, with distinct central apophysis reinforced by spindle-shaped lateral sclerotizations.

**FEMALE**: Similar to male, 1.76 x 0.57 mm. Head 0.42 x 0.44 mm., cephalic index 1 : 1.05. Preantennal region 0.21 x 0.37 mm. (index 1 : 1.76). Hind-head 0.21 x 0.44 mm. (index 1 : 2.09). Prothorax 0.09 x 0.27 mm. Pterothorax 0.17 x 0.39 mm. Abdomen 1.08 x 0.57 mm. Tergites II-VIII with one moderately long tergo-central seta on each side; IV-VIII with such tergo-lateral seta; IX with 3 very short setae. Sternal plates as in male. Subgenital plate well developed, anterior portion ‘top-shaped’ with blunt distal end placed on the arched cross bar. Vulvar plate with 9-10 setae on each side disposed of as shown in the figure. Pleural plates II and
III bare; IV with three, V and VI with three, VII with four and VIII with seven setae.

**Material Examined:** One male from Arren Stiddery, Scotland (Waterston, August 18, 1927, B.M. 1930-432), 2 males, 7 females from Tring (April 19, 1936-250), one male and 16 females from Suffolk (Meinertzhagen, June 1937, 8359), one male from Co Cork, Ireland (Meinertzhagen, January 1953, 20128). All from *Turdus v. viscivorus* Linn.

17. **Bruelia ilmasae** sp. nov.

(Text-figs. 100-104)

**Type-host:** *Turdus olivaceus olivaceus.*

**Male:** 1.54 x 0.47 mm. Head 0.38 x 0.38 mm., cephalic index 1: 1.00.

Text-figs. 100-104. *Bruelia ilmasae* sp. nov. (100) dorsal and ventral aspects of male, (101) male genital armature, (102) paramere, (103) mesosome, (104) a portion of the subgenital plate of female showing marginal chaetotaxy.
Preantennal region 0.81 x 0.31 mm. (index 1:1.72). Marginal carina interrupted anteriorly in the middle and incompletely interrupted laterally. Dorsal suture well marked laterally, anterior plate well marked. Hind-head 0.20 x 0.38 mm. (index 1:1.90).

Prothorax 0.09 x 0.25 mm. with a single lateral seta. Pterothorax 0.15 x 0.37 mm., with six moderately long setae as shown in the figure.

Abdomen 0.92 x 0.47 mm. Tergal plates II-VIII completely divided in the middle; IX approximately; II-VIII and X with one tergo-central seta; IV-VII with one tergo-lateral seta; VIII with three tergo-lateral setae and IX with 3 long and three short setae. Last segment with one dorsal, one ventral and one marginal seta on each side. Sternal plates as in other species; II-VI with one long seta on each side.

Genitalia 0.0212 mm. long. Basal plate 0.0141 mm. long, anterior and distal width almost equal (0.0080 and 0.0075 mm. respectively), fairly concave in the middle. Parameres 0.0363 mm. long, narrow and pointed, outwardly bent from about the middle, proximal head well built as shown in the figure. Mesosome shield-shaped, anterior angulation pulled backwards as in B. marginata. Central apophysis well developed and reinforced laterally; 0.0069 mm. long.

**Female**: Similar to male, 1.80 x 0.53 mm. Head 0.41 x 0.44 mm., cephalic index 1:1.07. Preantennal region 0.21 x 0.36 mm. (index 1:1.71). Hind-head 0.20 x 0.44 mm. (index 1:2.23). Prothorax 0.10 x 0.26 mm. Pterothorax 0.18 x 0.39 mm. Abdomen 1.11 x 0.53 mm.; II-VIII tergites with one tergo-central and one tergo-lateral seta on each side. Last segment with three short setae on each side. Sternal plates as in other species. Subgenital plate blunt posteriorly. Vulvar plate squat, with feeble posterior arch, marginally beset with 9-10 small setae.

**Material Examined**: **Holotype** (male), **Allotype** (female) and **Paratypes** (one male and two females) from Potchefstroom, W. Transvaal. All collected from *Turdus olivaceus olivaceus* on 1.X.1933. **Holotype** (male) in South African Institute for Medical Research, Johannesburg.

**Remarks**: This species belongs to the group of B. marginata. It closely resembles *Bruelia inornata* Timmermann from which it can be differentiated by the fore-head, male genital armature and subgenital plate of female.

**Remarks on Some Unidentifiable Species**

18. *Bruelia antimarginalis* Eichler


This species was erected by Eichler (1951) to accommodate a single
female specimen he collected from *Turdus pilaris*. As the figure of the head and its measurements (0.40 x 0.31 mm.) show, it was a narrow-headed form. However, the specimens from *Turdus pilaris* now before me are broad-headed forms (female 0.39 x 0.41 mm.; male 0.35 x 0.36 mm.). Since the females of several species of *Bruelia* are identical, it is not justifiable to create a new species merely on the basis of a female. The validity of Eichler's *B. antimarginalis* is therefore doubtful, particularly because a narrow-headed male, corresponding to the female described by him has not been found on *Turdus pilaris*. Miss Clay (personal communication) has suggested that the narrow-headed female, to which Eichler gave the specific name *Bruelia antimarginalis*, could be a straggler and not a regular parasite of that bird. It is unidentifiable at present.

19. **Bruelia jacobi** Eichler


This species was described from males and females obtained from *Turdus merula merula* Linn. It is a narrow-headed species (0.38 x 0.23 mm.). I have two species from this host in the Collection under discussion. In one species (*B. merulensis*) the head measures 0.55 x 0.59 mm. in the male and 0.56 x 0.63 mm. in the female, while in the other (*B. amsel*) it measures 0.38 x 0.40 mm. in the male and 0.42 x 0.47 mm. in the female. Whether Eichler's specimens belong to a different species cannot be said with certainty, particularly because he has neither given a good description nor a figure of the male genitalia. Moreover, despite all efforts, the type material could not be secured for these studies.

20. **Bruelia intermedia** (Nitzsch)


This species was recorded from *Turdus pilaris* Linn. and *Turdus torquatus alpestris* Brehm. I have examined specimens from *T. pilaris* and have found that they could be assigned to the species *Bruelia marginata* (Burmeister). I did not have the opportunity of studying any specimen from the second host, but if the parasites from the two hosts belonged to the same species, *Bruelia intermedia* should be regarded as a synonym of *B. marginata*. This is what Miss Clay has suggested to me. However, I have observed that quite commonly a host harbours two distinct species of *Bruelia*. It is therefore possible that *Turdus pilaris* bears another species in addition to *B. marginata* whose occurrence I have verified. The possibility of a distinct species from the other host is also to be kept in view. Efforts should therefore be made to obtain some collection from the other
host. Till further studies of this type have been made, the identity of the species *B. intermedia* will remain doubtful.

21. *Bruelia vulgaris* (Kellogg)


Kellogg (1896) recorded this species from a variety of dissimilar birds including True Thrushes *Turdus migratorius migratorius* Linnaeus. Unfortunately the type host has not so far been fixed. Miss Clay (Personal communication) presumes one of the Finches mentioned near the beginning of the host list given by Hopkins & Clay (1952, p. 63) to be the true host of this species. It is therefore difficult to do much with this species until a type-host has been finally decided.

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