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A NEW HOST RECORD AND NEW SPECIES OF THE GENUS *BRUEELIA* KÉLER, 1936 (PHTHIRAPTERA: ISCHNOCERA: PHILOPTERIDAE) FROM ZEBRA FINCH (PASSERIFORMES: ESTRILDIDAE) FROM SINDH, PAKISTAN

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ABSTRACT

The Zebra finch, *Taeniopygia guttata* (Passeriformes: Estrildidae) is a captive bird in Sindh. They were observed for their chewing lice in captivity from different regions of Sindh. About 41 specimens of genus *Brueelia* Kéler (Phthiraptera: Ischnocera: Philopteridae) were collected from sixteen birds; mounted permanently in Canada balsam using standard methods. The specimens were compared with the different species of genus *Brueelia,* reported from other estrildid birds of the world. Differences were noticed in head sutures, chaetotaxy, male and female terminalia, subgenital plates and male genitalia, also in their body sclerotization, pigmentation and morphometry. On the basis of these taxonomic characters, the new species *Brueelia spinosum* sp.n.is proposed. This is the first report of a chewing louse from the zebra finch in the world.

Keywords: *Brueelia,* new species, new record, zebra finch, Sindh, Pakistan.

INTRODUCTION

The zebra finch, *Taeniopygia guttata* (Passeriformes: Estrildidae) is an Australian small sized finch, which has been introduced into regions of many temperate countries including Pakistan. It is the most common member of family Estrildidae in the region, kept mainly in captivity. These small, energetic finches are often seen in households as pets, feed on grass seeds, and prefer to live near water in wild. They always live in groups of several pairs (Austin *et al.* 1983; Haddon 1985; Zann 1996; Siddalls *et al.* 2015); this suggests that their ectoparasites can transfer very easily between members of the same group.

15 species of chewing lice are known from estrildid finches across the world. Amongst all chewing lice species, the genus *Brueelia* is represented by nine species on this avian family (Ansari 1955; Lakshminarayana 1969; Tendeiro and Mendez 1994; Price *et al.* 2003; Rékási and Saxena 2005; Sychra *et al.*2009; 2010). On Zebra finches, either in Pakistan or elsewhere (Ansari 1956; Lakshminarayana 1979).

MATERIALS AND METHODS

In different regions of Sindh, the zebra finches were examined for their ectoparasites, where those were kept as pets and in captivity. In total, sixteen birds in five regions including Karachi, Thatta, Hyderabad, Larkana and Jamshoro were examined for their chewing lice. The collected specimens were brought to research lab for sorting and microscopic examination. The specimens were processed through maceration, neutralization, cleaning, dehydration (in ascending grades of ethanol from 20% to absolute), finishing in clove oil and xylol and permanently mounted in Canada balsam in microscopic slides (Palma 1978). For the detailed morphology and chaetotaxt determination, recent literature has been gone through (Tendeiro and Mendez, 1996; Cicchino and Castro, 1996; Gustafsson and Bush, 2015).

For accurate identification, the specimen slides were observed in Olympus light microscope, drawn using micrograticule and measured with the help of ocular micrometer in millimeters. The abbreviations used in measurement are AL for abdominal length, HL for head length, GL for genital length, GW for genitalia width at parameres articulation, PAW for preantennal width, PL for pronotal length, PtL for pteronotal length, PtW for pteronotal width, PW for pronotal width, TL for total length and TW for temporal width. Photographs were taken by Nikon digital camera. Holotype is deposited at Natural History Museum of Department of Zoology, University of Karachi (NHMUK), Sindh, Pakistan.

RESULTS

During the survey of captive birds, *Taeniopygia guttata* the zebra finch (Passeriformes: Estrildidae), sixteen birds were examined for the chewing lice of genus *Brueelia*. This constitutes the first record of the genus on zebra finch throughout the world. Amongst sixteen birds, twelve birds were found infested with one to seven specimens of *Brueelia*, and 41 in total with the

prevalence of 75 and population abundance is 4.87-17.07% from all five areas of Sindh, including Karachi, Thatta, Hyderabad, Larkana and Jamshoro, where the birds were kept as pets in captivity.

***Brueelia* Kéler, 1936 (Ischnocera: Philopteridae):**

Head: Noncircumfasciate; somewhat triangular with anteriorly flat or concave to rounded, truncated posteriorly with smooth temples; hyaline margin engraved medially; ventral carina interrupted at median; antennae monomorphic or sexually dimorphic.

Thorax: Prothorax quadrate, smaller than head; pterothorax trapezal or pentagonal bearing eight to eighteen posterior to lateral setae on pterothorax.

Abdomen: Oblong, rounded at posterior; thick tergal plates, darkly pigmented; chaetotaxy scares specially in female characteristic; male terminalia deeply convex and medially concave in females; well developed subgenital plate having versatile arrangement of setae; genital opening dorsal in position.

***Brueelia spinosum* Naz and Rizvi sp. n.** (Figs. 1-10)

Type Host: *Taeniopygia guttata* Zebra finch (Passeriformes: Estrildidae).

DIMENSIONS

Male (n=3): TL: 1.10–1.18, HL: 0.265–0.290, PAW: 0.190–0.20, TW: 0.230–0.240, PL: 0.06–008, PW: 0.115–0.120, PtL: 0.145–0.15, PtW: 0.26–0.275, AL: 0.58–0.61, GL: 0.70–0.74, GW: (at paramere articulation): 0.230–0.240, PML: 0.14–0.16.

Female (n=3): TL: 1.580–1.595, HL: 0.290–0.342, PAW: 0.205–0.235, TW: 0.275–0.305, PL: 0.108–0.111, PW: 0.176–0.188, PtL: 0.186–0.192, PtW: 0.295–0.305, AL: 1.050–1.060.

Head (Figs 1–6):

Preantennal Region: Head more or less triangular; anterior margin tapered; hyaline margin developed, marginal carina unbroken medially and highly translucent in the mid-anterior part; clypeal suture developed, not touches premarginal carina; ventral preantennal setae (*pas*) conspicuously long and fine in two pairs; preantennal nodus very short; conus sharply pointed, more or less equal to scape in length; ventral anterior plate present; pulvinus divided, not surrounded by pulvinal band; torma absent.

Antennal Region: Antennae monomorphic; scape small, quadrate, in female smaller than in male; pedicel relatively longer than broad, flagellomere I-III short and subequal in length; two sensillae visible on flagellomere II.

Postantennal Region: Gular plate highly sclerotized, unfused with other head plates, pointed anteriorly and flat posteriorly; short temple margins, smoothly becoming flat with posterior head margin smooth and straight; marginal temporal carina thin; marginal temporal setae five, seta 3 dominant; post temporal setae (*pts*) present, very minute microsetae; post temporal sensillae not visible; pre-ocular and ocular setae peg like microsetae, off the lens and on the lens respectively; postocularnodus absent.

Thorax (Figs 1–4, 7):

Prothorax: Twice as broad as long; lateral margins slightly convex; one pair postero-lateral normal fine seta present.

Pterothorax: Trapezoidal, lateral margins slightly divergent, posterior margin convex, forming fine lateral ends; pteronotum not divided; pteronotal postero-lateral marginal setae five to six on each side, arrangement 4,2+2,4 (4 latero-posterior and 2 posterior setae); trichoid setae present, thorn like setae present; mesothoracic spiracles ventral in position; proepimeron expanded posteriorly and separated in median; mesofurcal pit present; meso-metasternal plate elongated and narrow, with one pair of normal fine seta on each.

Male abdomen (Figs 1 and 3): Male abdomen short, oval in shape, sloping and tapering towards posterior.

Pregenital Segments: TergitesI and II fused and showing median slight division, III–VIII partially or completely divided medially; tergopleurites separated by very narrow gap in middle of abdomen; tergopleurites relatively more thick and darkly sclerotized; pleural knots absent; tergal median to submedian setae on abdominal segment II–III: 3 tergal posterior setae (*tps*) on each side, IV: 2 *tps* + 1 mediantergal setae (*mts*) on each side, V: 1 accessory postspiracular seta (*aps*) +3 *tps* + 1*ss*on each side, VI–VII: 1 *aps* + 1 *psps* + 4 *tps* + 1*ss*on each side, VIII: trichoid seta + 2 *tps* on each side; pleurites of segments II to VIII bear one pairs of lateral setae; sternal plates highly sclerotized, rectangular to trapezoidal, with transverse bands; sternal setae one pair on lateral edge of each sternal plate of segment III to VI.

Terminalia (Fig. 8): Tergite IX and X fused, forming large wide plate, with two pairs of long lateral setae and four pairs of thin fine posterior submarginal setae; subgenital plate large, formed by sternites VII to XI, posterior margin with median short process, bearing latero-posterior setae; terminal segment with 01 pair of long lateral seta and 04 posterior submarginal + two marginal setae.

Female abdomen (Figs 2 and 4): Female abdomen elongated, oblong; posterior margin concave in median,

bilobed shape; tergal setae obscure; sternal setae one pair at postero-lateral position on sternites III to VI.

Terminalia (Fig. 9): Tergite IX and X completely fused, short, bearing two pairs long lateral macrosetae, one pair of normal thin fine posterior setae and three very short anal setae (*as*) at posterior margin; anal opening dorsal; subgenital plate long, bud vase shaped, tapering to narrow posteriorly forming a median neck and extending laterally upwards, bearing two pairs mid-posterior short vulval oblique setae (*vos*)and posteriorly 4 vulval marginal setae (*vms*) and 7 vulval submarginal setae (*vss*); vulval margin broad and slightly straight bearing a tuft of 4 to 5 fine and spiniform setae at lateral sides.

Male genitalia (fig. 10a-b): Short and broad; basal apodeme comparatively broader, with thick and darkly pigmented struts, anteriorly less sclerotized; basal plate laterally concave; endome and mesomere structure (fig. 10b) short and roughly triangular in shape with outer corner pointed, surrounding the gonopore, with obscure sensillae at lateral sides of gonopore above paramere, posterior margin slightly serrated and expanded distal margin; parameres very short, laterally concave, anteriorly broad, posteriorly averted with rounded blunt terminal ends, may without terminal microseta.

Comparative Note: The present species of *Brueelia* is closely related to other *Brueelia* species from estrildid birds, mainly *B. cantans* Sychra *et al*, 2010 and *B. fasciata* Sychra *et al*, 2010 in having more or less similar sclerotization and general body shape and colour. *B. cantans* and *B. spinosum* sp.n. share the characters like pleural sclerotization, pigmentation; though all estrildid *Brueelia* are much similar to the *Brueelia* species of ploceid birds specially in the head shape, carina and sclerotization and chaetotaxy (Dhindsaa 1983; Sorensson & Payne 2001; Johnson *et al.* 2002; Sychra *et al.* 2009; 2010); head roughly triangular, anteriorly short and straight to slightly concave hyaline margin; segmentation of antennae; gular plate; pterothorax expanded laterally; all tergal plates are divided medially, with long and spindle shaped abdomen; male shorter, sternites with dark bands in abdomen; male genital struts similar. Though the present new species can be separated from *B. cantans* and *B. fasciata* by the characters like male and female terminalia and male genitalia, other than the female and male subgenital plates are very conspicuous in shape and pigmentation in peculiar pattern (Fig. 8 and 9) which is slightly different from that of *B. cantans* Sychra *et al*. 2010, having a small neck in middle, posterior margin slightly convex with four thorn like subterminal and seven fine terminal microsetae, two pairs of microsetae present at lateral sides to median portion of subgenital plate. Male genitalia (Fig. 10) armature is peculiar of that all species of *Brueelia* of ploceid, estrildid and sturnid birds. In *B. cantans* and *B. senegala* the mesomeral plate circular, endomeral sclerite bear two pairs of micropits, parameres long and tapering to posterior pointed terminated with microsetae, whereas the mesomeral plate is semicircular with medially a slight depression, endomeral sclerite without micropits and parameres are not tapering to posterior and without terminal microsetae in the present specie.

Material Examined: 1♂ holotype, on *Taeniopygia guttata*, in gular region,collected from Karachi, Pakistan during 21-iii-2014 to 10-viii-2014, by Naz, S.
Deposited at NHMUK, Pakistan and author's personal collection at Advanced Parasitology Laboratory, Department of Zoology, University of Sindh, Jamshoro.
PARATYPE: 5 ♂, 5 ♀, on *Taeniopygia guttata*, as above.

Etymology: The new species of genus *Brueelia* is given its name on the large amount of setae present in male as compared to other species of *Brueelia,* making the species conspicuous hence the name is proposed as *B. spinosum* spec. nov. for chaetotaxy in male.

Table 1. Species of genus *Brueelia* Kéler, and their type hosts of family Estrildidae (Passeriformes).

Species of the genus *Brueelia*	Type Host	Locality
Brueelia spp.*	*Lonchura striata* (L.)	Vietnam
B. astrildae Tendeiro and Mendez	*Estrilda astrild* (L.)	Santiago
B. cantans Sychra *et al.*	*Euodice cantans* (Gmelin)	Senegal
B. eichleri Lakshminarayana	*Lonchura maja* (L.)	India
B. fasciata Sychra *et al.*	*Amadina fasciata* (Gmelin)	Senegal
B. lonchurae Tendeiro and Mendez	*Lonchura cucullata* (Swainson)	Mexico
B. munia Ansari	*Lonchura malabarica* (L.)	India
B. senegala Sychra *et al.*	*Lagonosticta senegala* (L.)	Senegal
B. stenozona (Kellogg and Chapman)	*Lonchura punctulatanisoria* (Temminck)	Hawaii

*Sychra *et al.* 2010

Figure: 1- *Brueelia spinosum* sp.n.
Male entire micrograph 100x

Figure: 2- *Brueelia spinosum* sp.n.
Female entire micrograph 100x.

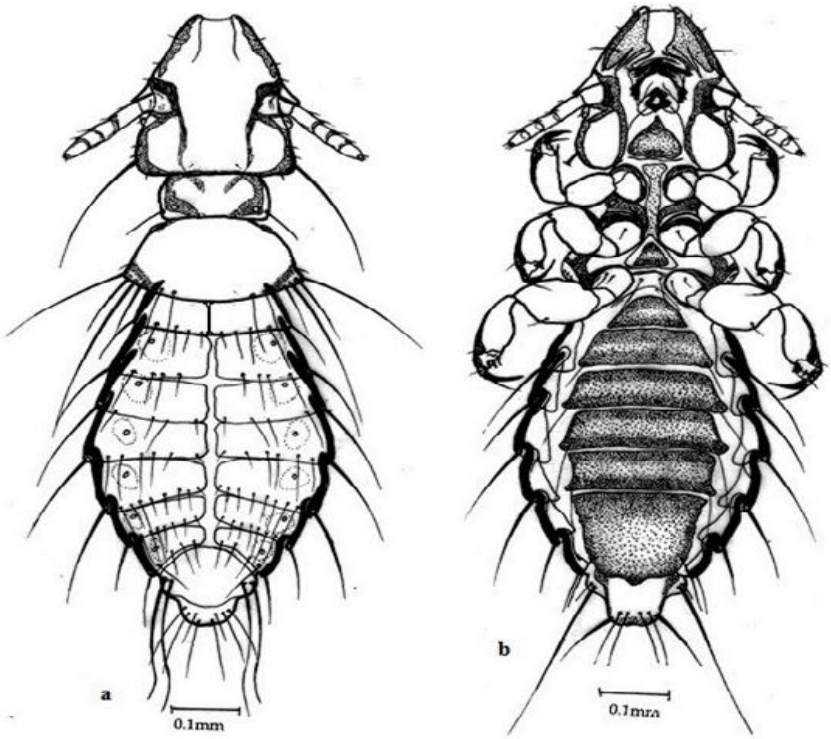

Figure: 3- *Brueelia spinosum* sp.n. a. Male dorsal; b. Male ventral.

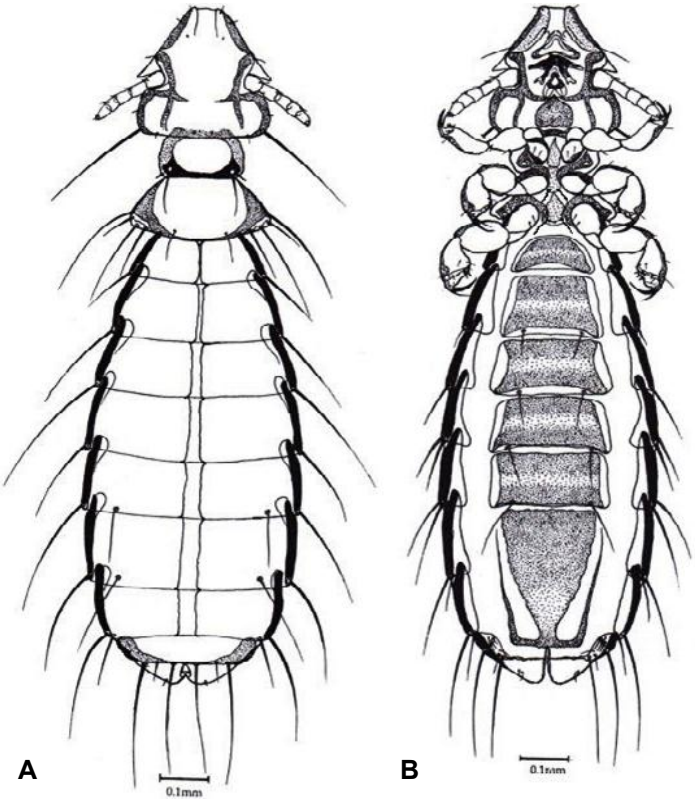

Figure: 4- *Brueelia spinosum* sp.n. a. Female dorsal; b. Female ventral.

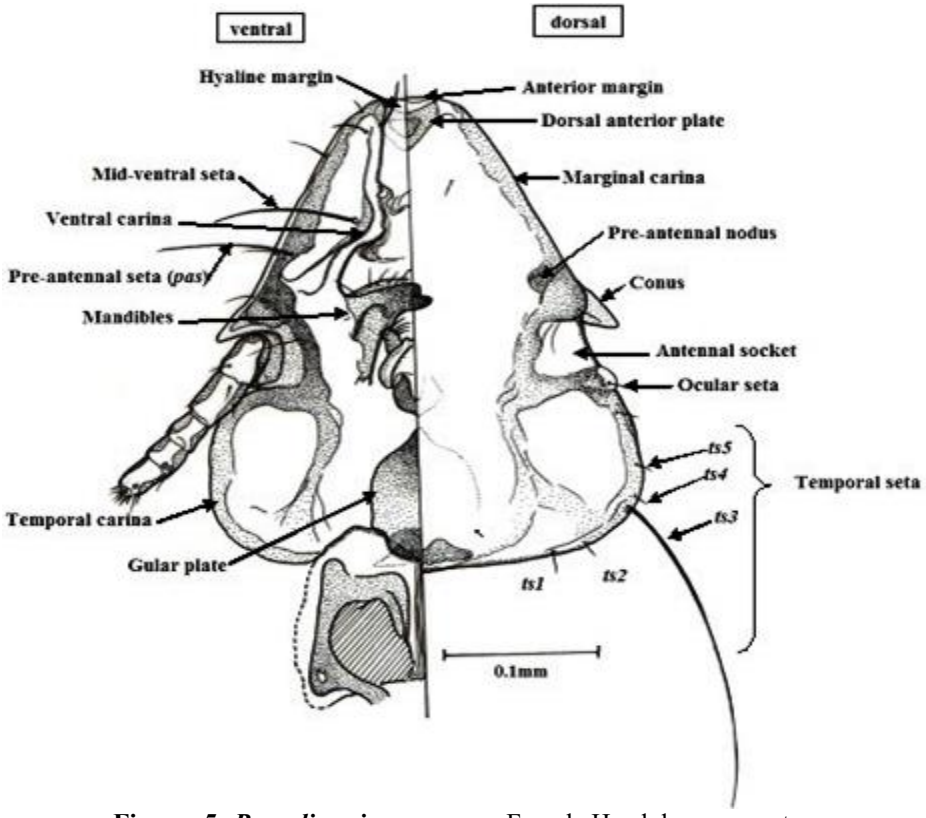

Figure: 5- *Brueelia spinosum* sp.n. Female Head dorsum-ventrum

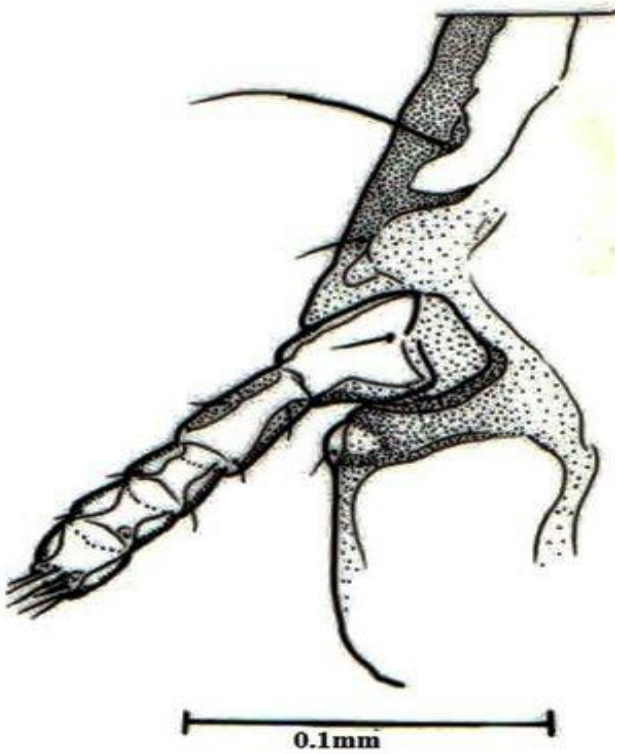

Figure: 6- *Brueelia spinosum* sp.n. Male head (part) showing antenna

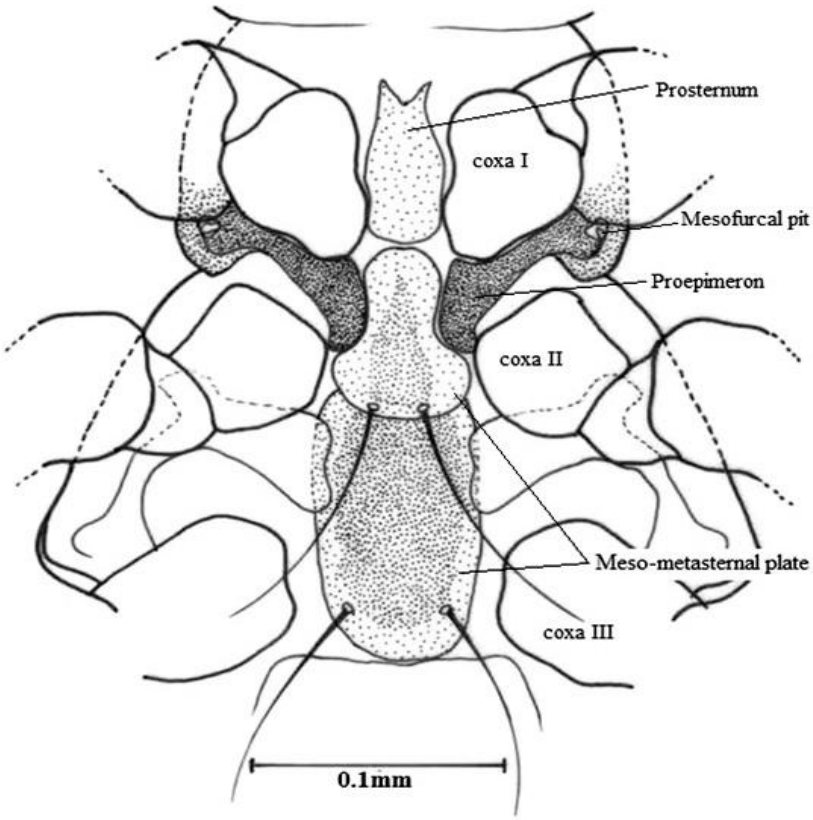

Figure: 7- *Brueelia spinosum* sp.n. Thoracic region showing meso-metasternal plates

Figure: 8a- *Brueelia spinosum* sp.n. Male terminalia micrograph 400x

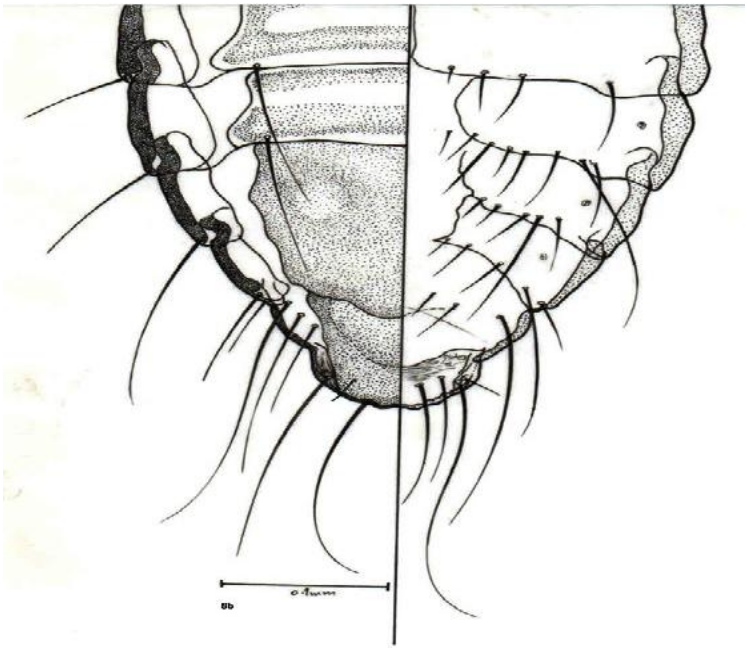

Figure: 8b- *Brueelia spinosum* sp.n. Ddetails in male terminalia dorsum-ventrum

0.1mm

Figure: 9a- ***Brueelia spinosum*** **sp.n.** Female terminalia, microphotograph 400x

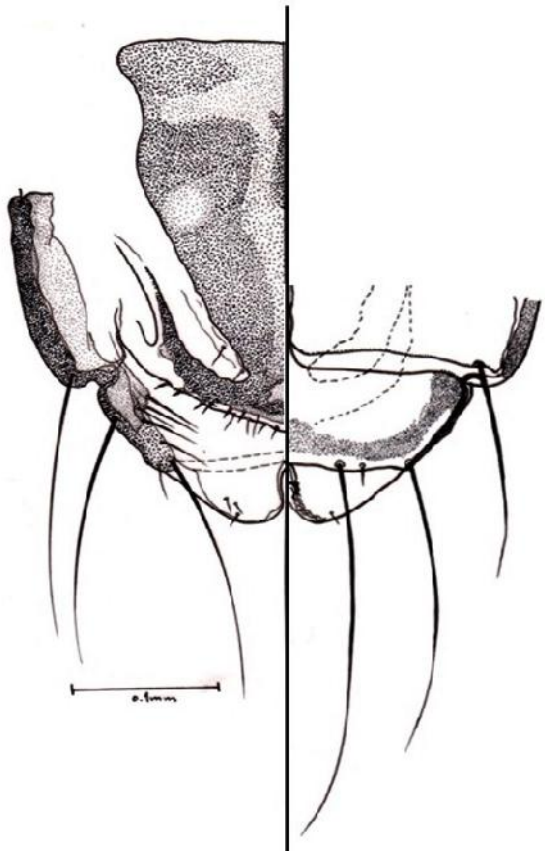

Figure: 9b- ***Brueelia spinosum*** **sp.n**. Female terminalia dorsum-ventrum, showing chaetotaxy and subgenital plate

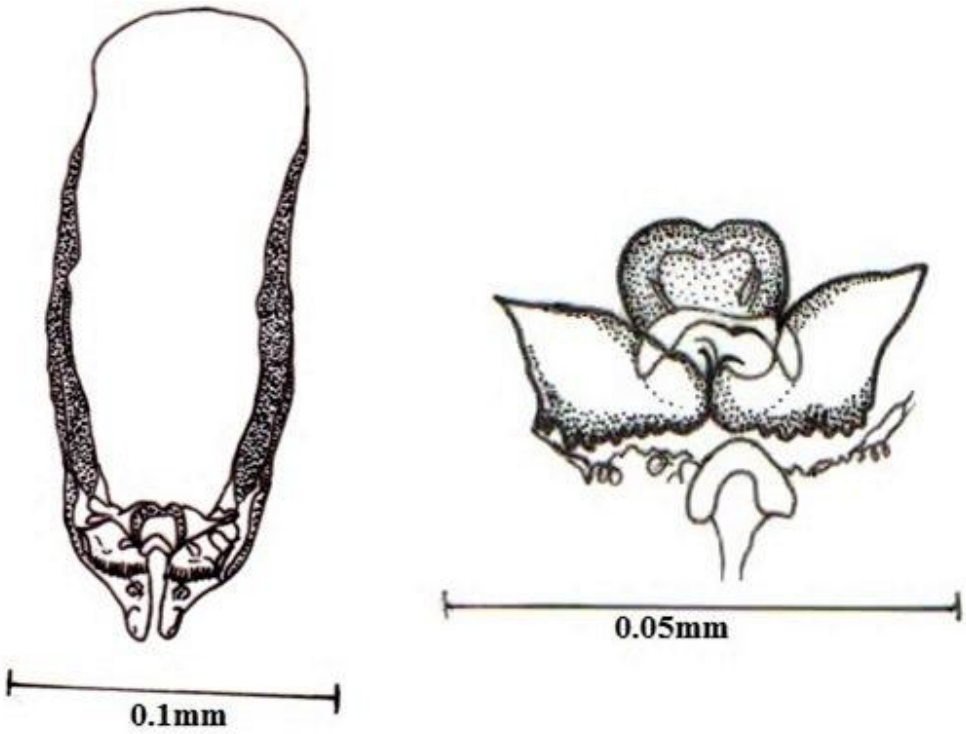

Figure: 10- ***Brueelia spinosum*** **sp.n** Male genitalia (left), Endomere, mesomere and gonopore enlarged (right).

DISCUSSION

The genus *Brueelia* Kéler is peculiar in its morphology, with a vast variety of morphological characters in male species and slight variations in females. It is found on birds of order Coraciiformes, Passeriformes and Piciformes; with maximum number of species on passerine birds (Kellogg and Chapman 1902; Kéler1936; Tendeiro and Mendes 1994; Price *et al.* 2003). Birds of family Estrildidae are infested by nine species of genus *Brueelia* (Table 1) from different regions of world.

Birds of the family Estrildidae have been known to carry four genera of chewing lice including *Myrsidea, Menacanthus, Machaerilaemus* and *Brueelia* in which *Myrsidea* and *Brueelia* are reported as the most common (Eichler 1957; Price *et al.* 2003; Balakrishnan and Sorenson 2007; Sychra *et al.* 2010). Sychra *et al.* (2010) has discussed the systematic position and host parasite relationship of estrildid birds and their *Brueelia* species in detail (Cicchino and Castro, 1996; Gustafsson and Bush, 2015).

The reporting of a *Brueelia* species on zebra finch in the captivity shows the successful breeding and compatibility of the louse with the new record estrildid host. This is the first record of any chewing louse species on this host in the world (Price *et al.* 2003), however phylogeny reveals (Johnson *et al.* 2002) that these birds can carry more lice species.

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