An overview of the genus *Alaptus* Westwood in India (Hymenoptera: Mymaridae)

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Abstract

The genus *Alaptus* Westwood (Hymenoptera: Mymaridae) is characterised by its minute-sized body with no visible petiole and deeply excised posterior margin of fore wing. Three new species are described from different Indian states or Union Territories: *A. deodus* Anwar & Zeya sp. nov. (Karnataka), *A. specatus* Anwar & Zeya sp. nov. (Karnataka), and *A. wandoorenensis* Anwar & Zeya sp. nov. (Andaman and Nicobar Islands). Two species, *A. iceryae* Riley (Karnataka) and *A. terebrans* Kryger (Karnataka), are recorded for the first time from India, albeit the identification of *A. terebrans* is tentative. Two Indian species are put under synonymy: *A. jowainus* Rehmat & Anis syn nov., and *A. pyronus* Anwar & Zeya syn nov. under *A. immaturus* Perkins. As *A. decamanis* Anwar & Zeya share most of its characters with *A. fusculus* Walker except its body and antennal sizes, so a comparative analysis of both the species is provided, but its synonymy with *A. fusculus* has not been proposed at present and it needs to be confirmed on the basis of molecular studies. A revised key to males and females of the Indian species is also provided.

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Keywords: Chalcidoidea, fairy fly, egg parasitoids, taxonomy, Oriental region

Introduction

The genus *Alaptus* Westwood is cosmopolitan in distribution, mainly found in forested habitat but are often overlooked because of their minute size (Triapitsyn 2017). Even if found, they require an expert hand to handle and prepare for their species level identification. Annandale (1909) described the first species (*A. magnanimus*) from India, followed by the description of two species (*A. delhiensis* and *A. ramakrishna*) from India by Mani (1942). After more than seven decades, Anwar and Zeya (2014), Rehmat and Anis (2014) and Anwar et al. (2015) studied the genus in India and described several species. Later, Triapitsyn (2017) revised the genus far the Holarctic region and provided notes on some extralimital species. He, also remarked that some of the Indian species described by Anwar and Zeya (2014) could prove to be synonymous with the Holarctic species. The genus *Alaptus* presently contains 43 world species, and 10 species from India, including the 3 new species described here, and two species newly recorded from India. The main aim of this study is to consider the remarks of Triapitsyn (2017), to record...
and describe some species of *Alaptus* from India and to provide an updated key to the Indian species of *Alaptus* Westwood.

**Material and methods**

The study is based on the material collected by using various traps from several Indian states. The collected specimens were initially stored in 80% ethanol and were later mounted on rectangular cards. Body colour and lengths were noted from card mounted specimens. Further identification slides were prepared following the method described in Noyes (1982), with modifications as mentioned in Anwar et al. (2020). The terminology used in the text follows Zeya and Hayat (1995) and Gibson (1997). The measurements, other than body lengths, are relative and taken from slide mounts. All the measurements are in micrometers (µm). The photographs of slide-mounted parts except Figures 4(b) and 6 were taken with a Leica® DFC295 digital camera attached to a Leica® DM 2500 compound microscope. The photographs of Figures 4(b) and 6 were taken with a digital camera attached to a compound microscope “Nikon eclipse DM 2500”. Photographic plates were prepared using Adobe Photoshop® 7.0. All the determined and type materials were deposited at the Insect Collections Department of Zoology, Aligarh Muslim University, Aligarh, Uttar Pradesh, India.

The following abbreviations are used:

- F1, F2, etc. = Funicular segments 1, 2, etc. of antenna
- mps = Multiporous plate sensillum on flagellomeres
- MT = Malaise trap
- SN = Sweep net
- YPT = Yellow pan trap

The following acronyms are used for the depositories of specimens:

- BMNH = Natural History Museum [formerly British Museum (Natural History)], Department of Entomology, London, UK.
- MMUE = Manchester Museum, University of Manchester, Manchester, UK.
- NMID = National Museum of Ireland, Dublin, Ireland.
- NHMW = Naturhistorisches Museum Wien, Vienna, Austria
- QMB = Queensland Museum, South Brisbane, Queensland, Australia.
- USNM = National Museum of Natural History, Smithsonian Institution, Washington, DC, USA.
- ZDAMU = Insect Collections, Department of Zoology, Aligarh Muslim University, Aligarh, Uttar Pradesh, India.

**Taxonomy**

**Genus *Alaptus* Westwood**

*Alaptus* Westwood, 1839: 79. Type species *Alaptus minimus* Westwood, by monotypy.

*Parulinus* Mercet, 1912: 332. Type species *Parulinus auranti* Mercet, by monotypy.

*Metalaptus* Malenotti, 1917: 339. Type species *Metalaptus torquatus* Malenotti, by monotypy.

**Key to Indian species of *Alaptus* Westwood, males, females**

1 Flagellum 8-segmented (Figure 5(b)) (Males) .......................................................... 2

- Flagellum 6- or 7-segmented (Figures 1(b), 2(b), 3(b), 4(b) and 6(b)), if 7-segmented, F2 broader than long (Females) .................................. 4

2 (1) F4 longer than broad .......................................................... *A. immaturus* Perkins

- Either F2 or F4 quadrate .................................................. 3

3 (2) F2 quadrate (Figure 5(b)) .......................................................... *A. iceriae* Riley

- F4 quadrate .... *A. magnanimus* Annandale

4 (1) Funicle 6-segmented; F2 small, broader than long; ovipositor longer than body length, 1.5× as long as body length, 3.4× as long as metatibia ... .............................................. *A. indicus* Anwar & Zeya

- Funicle 5-segmented; F2 longer than broad; ovipositor shorter than body length, at most 2.3× as long as metatibia ........................................ 5

5 Ovipositor strongly exserted beyond the gasteral apex, exserted part greater than 0.1× of its own length .................................................... 6

- Ovipositor slightly exserted beyond the gasteral apex, exserted part less than 0.1× of its own length .................................................................. 9

6 Clava massive, slightly shorter than the funicle (Figure 3(b)) ........................................ 7

- Clava relatively small, at most or slightly longer than F3–F5 combined (Figure 6(b)) .......... 8

7 Ventral margin of F4 and F5 excised (Figure 3(b)); mesoscutum and scutellum with rugose sculpture (Figure 3(c)) ..............................................

..... *A. wandoorensis* Anwar & Zeya, sp. nov.

- Ventral margin of F4 and F5 not excised; mesoscutum with polygonal reticulate sculpture, and scutellum with longitudinal reticulations ........................................... *A. ramamoorthyi* Anwar & Zeya

8 Ovipositor at least 2.1× as long as metatibia, exserted part 0.2–0.3× its own length (Figure 6(d)) ..............
A.?terebrans Kryger
- Ovipositor at most 1.8× as long as metatibia, exserted part 0.17× of its own length ……………
……………… A. deccanensis Anwar & Zeya
9. Vertex, mesoscutum with a pair of long and thick spine-like setae (Figure 2(a,c)); fore wing with proximal and distal macrochaetae relatively thick, stout and spine-like (Figure 2(c)); axillary seta invariably long, stout and spine-like (Figure 2(e)) …….. ….. A. spicatus Anwar & Zeya, sp. nov.
- Vertex, mesoscutum with a pair of small and thin setae (Figures 4(a) and 1(e)); fore wing with proximal and distal macrochaetae relatively thin (Figure 1(c)); axillary seta invariably short (Figure 1(e)) ……………………………………… 10
10 Antenna with funicular segments subquadrate; clava slightly longer than F1–F5 combined ………
……………… A. delhiensis Mani
- Antenna with funicular segments not subquadrate; clava subequal to F1–F5 combined …… 11
11 F1 and F2 subquadrate, each shorter than F3 ………………… A. ramakrishnai Mani
- F1 and F2 distinctly longer than broad, F2 longer than F3 ………………………………….. 12
12 Fore wing disc with 2–6 setae in the middle; ovipositor 1.1–1.4× as long as metatibia ………
……………… A. immaturus Perkins
- Fore wing disc with a row of 13–16 setae in middle, more close to anterior margin (Figure 1(c)); ovipositor 1.5–1.6× as long as metatibia (Figure 1(d)) ………………………………………
…….. A. deodus Anwar & Zeya, sp. nov.

New species (in alphabetical order)

Alaptus deodus Anwar & Zeya, sp. nov.
(Figure 1)

Type material examined. Holotype, female (on slide under 4 coverslips, slide No. MYM.649), INDIA: KARNATAKA: Hesaraghatta, 22. viii.2013, Coll. K. Veenakumari. (ZDAMU). Paratypes 2 females. INDIA: KARANATAKA: Bengaluru, Kengeri, 1 female (on slide under 4 coverslips, slide no. MYM.126), 11.ix.2012 (YPT), Coll. K Veenakumari. KERALA: Kannur, Mankuzhy, 1 female (on slide under 4 coverslips, slide no. MYM.132), 16.i.2012 (SN), Coll. F.R. Khan. (ZDAMU).

Diagnosis. Alaptus deodus appears similar to Alaptus immaturus in having slightly exserted ovipositor, sculpture on frontovertex, frenum, and more or less similar antennal configuration. However, it differs from the latter mainly by the following characters (A. immaturus characters given in parentheses after Triapitsyn 2017): mesoscum with rugose sculpture (mesoscum with polygonal reticulations); fore wing with a complete row of setae (fore wing disc almost bare except 2–6 setae in the middle).

Based on the fore wing setation and antennal configuration A. deodus also comes close to another Holarctic species A. minimus Westwood from which it differs as follows (A. minimus characters given in parentheses after Triapitsyn 2017): scape 2.2–2.3× as long as broad (scape 2.7–3.4× as long as broad); clava distinctly long, subequal to F2–F5 combined (clava a little shorter than combined length of F3–F5); ovipositor 1.1–1.3× as long as metosibia and, 1.5–1.6× as long as metatibia (ovipositor almost 1.6× as long as metosibia and, 1.2–1.5× length of metatibia).

Description

Female. Holotype. Length, 390 μm (paratypes, 225–300 μm). Body dark brown. Antenna with radi- cule, scape and pedicel brown, funicle pale yellow, clava brown. Wings subhyaline. Legs, including coxae, pale yellow.

Head (Figure 1(a)). Head, in frontal view, 1.2× (paratypes, 1.3–1.4×) as broad as high; frontovertex with rugose sculpture; torulus touching inner eye margin. Antenna with scape 2.3× (paratypes, 2.2–2.3×) as long as broad; pedicel 1.5× (paratypes, 1.2–1.3×) as long as broad, longer than all funicular segments individually; funicular segments all longer than broad; F1 and F4 subequal; F2 the longest; F5 widening apically; clava 3.4× (paratypes, 3.6–3.7×) as long as broad, subequal to F2–F5 combined, with 4 mps (Figure 1(b)).

Mesosoma (Figure 1(d,e)). Mesoscum with rugose sculpture (Figure 1(e)); scutellum smooth, 1.3× (paratypes, 1.2–1.4×) as long as frenum; frenum medially with faint longitudinal reticulations, sides with distinct longitudinal reticulations (Figure 1(e)). Fore wing 9× (paratypes, 8–9×) as long as broad, disc with a row of setae running close to anterior margin (Figure 1(c)); longest marginal seta 4× (paratypes, 3–4×) as long as maximum wing width. Hind wing 16× (paratypes, 13–14×) as long as broad (Figure 1(c)); longest marginal seta 6× (paratypes, 6×) as long as maximum wing width.

Metasoma (Figure 1(d)). Ovipositor slightly exserted beyond the gastric apex, 1.6× (paratypes, 1.5–1.6×) as long as metatibia; exserted part of ovipo- sitor 0.16× (paratypes, 0.11–0.13×) its own length.

Measurements (Holotype slide, μm). Head width: height, 125:155; antennal segments length:width
— radicle, 10:10; scape, 53:23; pedicel, 35:25; F1, 25:10; F2, 35:13; F3, 28:15; F4, 25:15; F5, 23:18; clava, 118:35; mesosoma length, 145; mesoscutum, 63; scutellum, 28: frenum, 23; metanotum, 5; propodeum, 23; fore wing length: width, 448:53; longest marginal seta, 190; hind wing length: width, 448:28; longest marginal seta, 150; protibia, 85; mesotibia, 148; mesobasitarsus,
Figure 2. *Alaptus spicatus* Anwar & Zeya *sp. nov.* holotype female. (a) head frontal view; (b) antenna; (c) wings; (d) base of fore wing enlarged; (e) mesosoma and metasoma; (f) gaster.
Figure 3. *Alaptus wandoensis* Anwar & Zeya sp. nov. holotype female. (a) head frontal view; (b) antenna; (c) wings; (d) mesosoma and metasoma; (e) mesosoma enlarged.
30; metatibia, 130; metasoma, 203; ovipositor, 193; length of exserted part of ovipositor, 33.

**Male.** Unknown.

**Hosts.** Unknown.

**Distribution.** India: Karnataka, Kerala.

**Etymology.** The species name is an arbitrary combination of letters, and may be taken as a noun in apposition.

*Alaptus spicatus* Anwar & Zeya, sp. nov.

(Figure 2)

**Type material examined.** Holotype, female (on slide under 4 coverslips, slide No. MYM.129), INdia: KARANATAKA: Bengaluru, Kengeri, 11. ix.2012 (YPT), Coll. K Veenakumari. (ZDAMU). Paratypes, 2 females. 1 female (on slide under 4 coverslips, slide No. MYM.114) data same as holotype; 1 female (on slide under 4 coverslips, MYM.115): INDIA: KARANATAKA: Bengaluru, Kengeri, 4 ix.2012 (YPT), Coll. K Veenakumari. (ZDAMU).

**Diagnosis.** *Alaptus spicatus* is one of the most distinctive species that can be easily separated from all the other species in the genus by the following characters: head with vertex and mesoscutum with a pair of spine-like thick setae; each axilla with one long spine-like seta; axillary seta more than 2× as long as seta present on vertex and mesoscutum; fore wing with a pair of long and thick dorsal macrochaetae; posterior margin with a translucent membrane-like covering, hence not deeply curved. In other *Alaptus* species: head with vertex and mesoscutum with a pair of relatively thin setae and not spine-like; each axilla with relatively thin seta; fore wing with a pair of dorsal macrochaetae, relatively not thick, and posterior margin without membrane-like covering, hence deeply excised. While none of the *Alaptus* species have such long, spine-like setae on their head, body and fore wings.

**Description**

**Female.** Holotype. Length, 260 μm (paratypes, 270 μm). Body dark brown. Antenna yellow with margins brown. Wings subhyaline. Legs pale yellow.

**Head** (Figure 2(a)). Head, in frontal view, 1.4× (paratypes, 1.3–1.5×) as broad as high; a pair of well-developed setae with sharp edges on vertex; torulus almost touching preorbital trabecula and inner eye margin. Antenna setose (Figure 2(b)); scape 3× (paratypes, 3–3.4×) as long as broad; pedicel 1.6× (paratypes, 1.8–2×) as long as broad, 0.5× scape length; F1–F4 longer than broad, F5 subquadrate; F2 the longest, 2.7× (paratypes, 3×) as long as broad; F3–F5 widening apically; clava 2.9× (paratypes, 2.7–3×) as long as broad, longer than F4 and F5 combined, with 4 (paratypes, 4) mps (Figure 2(b)).

Mesosoma (Figure 2(e)). Mesosoma shorter than metasoma length; mesoscutum subequal to scutellum, with transversely curved striations; mesoscutum with a pair of thick setae touching posterior margin of mesoscutum (Figure 2(e)); each axilla with a long spine-like seta reaching to the basal fourth or so of gaster (Figure 2(e)); scutellum smooth, frenum with faint longitudinal striations; propodeum smooth. Fore wing 11× (paratypes, 11–12×) as long as broad (Figure 2(c)); marginal vein with a pair of long and thick macrochaetae, distal macrochaetae more than 2× as long as proximal macrochaeta (Figure 2(d)); disc with a line of eight setae running almost medially in distal half or so; longest marginal seta 3× (paratypes, 3–4×) maximum wing width; posterior margin just behind venation with a translucent membrane-like covering, hence not deeply curved. Hind wing 20× (paratypes, 17–18×) as long as broad (Figure 2(c)); longest marginal seta 7× (paratypes, 5–6×) as long as maximum wing width.

**Metasoma** (Figure 2(f)). Ovipositor not exserted beyond apex of gaster, 0.7× (paratypes, 0.6×) metasoma length and 0.9× (paratypes, 0.8–0.9×) length of metatibia.

**Measurements** (Holotype slide, μm). head width: height, 118:83; antennal segments length:width—radicle, 8:10; scape, 63:20; pedicel, 31:20; F1, 15:10; F2, 28:10; F3, 28:15; F4, 18:13; F5, 18:15; clava, 65:23; mesosoma, 125; mesoscutum, 45; scutellum, 20: frenum, 26; metanotum, 3; propodeum, 10; fore wing length:width, 375:33; longest marginal seta, 138; hind wing length:width, 355:18; longest marginal seta, 125; protibia, 88; mesotibia, 100; mesobasitarsus, 23; metatibia, 125; metasoma, 165; ovipositor, 115.

**Male.** Unknown.

**Host.** Unknown.

**Distribution.** India: Karnataka.

**Etymology.** The species name is derived from a well-developed spine-like setae present on its head and mesosoma.
**Alaptus wandoorensis** Anwar & Zeya, sp. nov. (Figure 3)

**Type material examined.** Holotype, female (on slide under 4 coverslips, slide No. MYM.103), INDIA: Andaman and Nicobar Islands: South Andaman, Wandoor, 30.1.2013 (SN), Coll. K. Veenakumari. (ZDAMU).

**Diagnosis.** *Alaptus wandoorensis* is a distinct species with a very long and massive clava, rugosely sculptured vertex of head and mesosoma, with a long, curved and exserted ovipositor. It apparently comes close to the *A. ramamurthyi* Anwar and Zeya (2014) by having F2 the longest funicular segment; clava a little shorter than funicle; ovipositor strongly exserted beyond apex of gaster and, occupying the entire length of the gaster. However, it differs from the latter in the following characters (*A. ramamurthyi* characters given in parenthesis): frontovertex with rugose sculpture (frontovertex with transverse striations); antenna with scape 3× as long as broad; pedicel longer than all funicular segments individually except F2; clava 3.4× as long as broad (antenna with scape about 2× as long as broad; pedicel distinctly longer than all funicular segments individually; clava 4.5× as long as broad); mesosoma with rugose reticulate sculpture (mesosoma with polygonal reticulation).

**Description**

**Female.** Holotype. Length, 320 μm. Body dark brown. Antenna pale yellow except clava brown. Wings subhyaline. Legs, including coxae, pale yellow.

Head (Figure 3(a)). Head, in frontal view, 1.3× as broad as high; frontovertex with rugose sculpture. Antenna with scape 3× as long as broad; pedicel 1.5× as long as broad; F1–F4 longer than broad, F1 and F2 slender, F2 the longest; F3–F5 widening apically; F5 subquadrate; clava 3.4× as long as broad, slightly shorter than all funicular segments taken together, with 4 mps (Figure 3(b)).

Mesosoma (Figure 3(d,e)). Mesosoma 0.7× metasoma length, with rugose sculpture (Figure 3(e)); mesoscutum almost subequal to scutellum; scutellum longer than frenum; propodeum 1.6× as long as frenum; mesophragma extending up to 0.15× length of metasoma. Fore wing 13× as long as broad (Figure 3(c)); disc almost bare, except four setae in the middle, and one seta proximal to venation; longest marginal seta 5× as long as maximum wing width. Hind wing 18× as long as broad (Figure 3(c)); longest marginal seta 6× as long as maximum wing width.

Metasoma (Figure 3(d)). Ovipositor arises from base of gaster, strongly exserted beyond apex of gaster, 2× as long as mesotibia, 1.2× as long as metasoma.

**Measurements** (Holotype slide, μm). Head width: height, 145:108; antennal segments length:width—radicle, 10:10; scape, 75:25; pedicel, 30:20; F1, 30:8; F2, 39:8; F3, 28:18; F4, 23:18; F5, 19:20; clava, 128:38; mesosoma, 145; mesoscutum, 50; scutellum, 25: frenum, 23; metanotum, 8; propodeum, 38; fore wing length:width, 382:30; longest marginal seta, 140; hind wing length:width, 363:20; longest marginal seta, 113; protibia, 100; mesotibia, 120; mesosbasitarsus, 35; metatibia, 130; metasoma, 200; ovipositor, 245; exserted part of ovipositor, 45.

**Male.** Unknown.

**Hosts.** Unknown.

**Distribution.** India: Andaman & Nicobar Islands.

**Etymology.** India: Andaman & Nicobar Islands.

**New records**

**Alaptus iceryae** Riley, 1889

(Figures 4, 5)

*Alaptus iceryae* Riley, 1889: 86. Lectotype female, paralectotype male (USNM), California, USA. Designated by Triapitsyn (2017).

*Alaptus priesnerti* Soyka, 1950: 122–123. Holotype female (NHMW), Beni Suef, Beni Suef Governorate, Egypt. Synonymy by Triapitsyn, 2017: 27.

**Material examined.** 3 females, 1 male. INDIA: KARNATAKA: Bengaluru, Kengeri, 1 female (on slide under 4 coverslips, slide no. MYM.119), 21. ii.2012 (YPT); Bengaluru, Attur, 1 female (on slide under 4 coverslips, slide no. MYM.131) 14.ii.2013 (YPT); Bengaluru, Hessaraghatta, Fisheries Division, 1 female (on slide under 4 coverslips, slide no. MYM.149), 26.iii.2014 (YPT); Bengaluru, SEEBI, 1 male (on slide under 4 coverslips, slide no. MYM.650), 3.viii.2013 (SN), coll. K. Veenakumari.

**Diagnosis and comments.** *Alaptus iceryae* has antenna with funicular segments relatively shorter; antenna with F1 almost subquadrate and, clava subequal to or a little shorter or longer than F2–F5.
combined; fore wing disc with one or two setae only (Triapitsyn 2017). The diagnostic characters based on Indian specimens: 

**female**: antenna with scape 3.3–3.8× as long as broad; pedicel longer than all the funicular segments individually; F1 almost subquadrate or a little longer, 1.2–1.4× as long as broad; clava 3.2–3.6× as long as broad, subequal to or a little longer than F2–F5 combined (Figure 4(b)). Fore wing 10–11× as long as broad, disc with one or two setae (Figure 4(c)); hind wing 17–21× as long as broad (Figure 4(c)). Ovipositor barely exserted beyond apex of gaster, shorter than metasoma length, 0.9–1.0× as long as metatibia (Figure 4(d)). 

**Male**: antenna with scape 3× as long as broad; F1 shorter than pedicel; F2 quadrate, shorter than all the flagellar segments individually (Figure 5(b)); fore wing 11× as long as broad (Figure 5(c)); genitalia 63 μm in length (Figure 5(d)).

Based on these taxonomic characters, we consider it to be conspecific with *A. iceryae* and, have taken these minor antennal differences to be intraspecific variation for the species.

**Hosts.** Psocoptera (Viggiani & Jesu, 1988); Liposcelididae viz. Liposcelis divinatoria (Müller) (Triapitsyn 2017).

**Distribution.** India (new record): Karnataka. (Antilles, Bermuda, Egypt, Hawaii, Israel, Italy, Peru, Mexico, USA).

*Alaptus terebrans* Kryger, 1950

(Figure 6)

*Alaptus terebrans* Kryger, 1950: 36, female. Lectotype, female, Cambridgeshire Co., England, UK (MMUE). Designated by Triapitsyn, 2017: 77. Status revised by Triapitsyn 2017: 77.

**Material examined.** INDIA: KARNATAKA: Bengaluru, Hebbal, IVRI, 1 female (on slide under 4 coverslips, slide no. MYM.970), 26.i.2015 (YPT); Bengaluru, Kengeri, 3 females (on slide under 4 coverslips, slide nos. MYM.971, MYM.968, MYM.969), 27.i.2015 (YPT), Coll. K. Veenakumari.

**Diagnosis and comments.** *Alaptus terebrans* has ovipositor longer than entire length of metasoma and, strongly exserted beyond the apex of gaster, 1.3–1.6× as long as metasoma and, 2.1–2.3× as long as metatibia. The specimens identified here as *A. ?terebrans* agree fairly well with the redescription of the species provided by Triapitsyn (2017). However, there are slight differences in following features: antenna with scape 2.2–2.8× as long as broad (Figure 6(b)), pedicel subequal to F2, F2 the longest, 2.6–3× as long as broad, clava 3–3.6× as long as broad, longer than F3–F5 combined (antenna with scape 2.8–3.2× as long as broad, pedicel shorter than F2, F2 the longest, 4.0–5× as long as broad, clava 3.6–4.0× as long as broad, slightly longer than F3–F5 combined); fore wing 8–9× as long as broad, disc with a complete row of 13–15 setae (Figure 6(c)); hind wing 16–17× as long as broad (Figure 6(c)) (fore wing 7.8–8.7× as long as broad, disc with 15–17 setae in a complete row and 0 or 1 additional setae in the widest part just behind it, longest marginal seta 3.0–3.3× as long as maximum wing width; hind wing 15–17× as long as broad); ovipositor occupying the entire length of metasoma and strongly exserted beyond apex of gaster, exserted part 0.2–0.3× its own length (Figure 6(d)) (ovipositor occupying the entire length of metasoma and strongly exserted beyond apex of gaster, exserted part 0.32–0.35× its own length).

Though, *A. terebrans* is exclusively a Palaearctic species mostly confined to northern European region and biogeographically, it would be very unlikely for the species to occur in India. So, without having any supporting genetic evidence, we would not make a positive identification. Because, it shares most of its morphometrics and morphological characters with *A. terebrans* so, at most tentatively we call it *A. ?terebrans*. A better analysis of their differences needs to be presented, even if these are minor. All *A. terebrans* from Europe have at least 2 (up to 7) setae on the disc in addition of the complete row of setae next to anterior margin, and that is an important diagnostic feature which is lacking in our specimens from India.

**Hosts.** Unknown.

**Distribution.** India (new record): Karnataka. (Denmark, Finland, Georgia, Russia, UK (England), USA).

**Synonymy and taxonomic notes.**

*Alaptus immaturus* Perkins, 1905

*Alaptus immaturus* Perkins, 1905: 197. Female. Male. Syntype, female, Queensland, Australia (QMB). Neotype designated by Triapitsyn, 2017: 32.

*Alaptus antillanus* Cheke and Turner, 1974: 281–282, female, male. Holotype, female, Kingston, Jamaica. Synonymy by Triapitsyn, 2017: 32.
Alaptus caecilii Girault, 1908: 189. Lectotype, female, Florida, USA (USNM). Synonymy by Triapitsyn, 2017: 32.

Alaptus pyronus Anwar & Zeya, 2014: 34, female. Holotype, female, Uttarakhand, India (ZDAMU). Tentative synonymy by Triapitsyn, 2017: 32. Syn. Nov.

Figure 4. Alaptus iceryae Riley, female. (a) head frontal view; (b) antenna; (c) wings; (d) mesosoma with metasoma and legs; (e) mesosoma enlarged.
*Alaptus jowainus* Rehmat & Anis, 2014: 53, female, male. Holotype, female, Meghalaya, India (ZDAMU). Syn. Nov.

**Type material examined.** *Alaptus pyronus* Anwar & Zeya: holotype, female (on slide under 4 coverslips, slide No. MYM. 29), INDIA:

Figure 5. *Alaptus iceryae* Riley, male. (a) head frontal view; (b) antenna; (c) wings; (d) mesosoma with metasoma and legs; (e) mesosoma enlarged.
UTTARAKHAND: Dehra Dun, Sahaspur, 11. xi.2011, Coll. P.T. Anwar (ZDAMU, Registration No. HYM.CH.670). *Alaptus jowainus* Rehmat & Anis: holotype, female (on slide under 3 coverslips), INDIA: MEGHALAYA: Jowai, Thaldskin, 22. x.2008, Coll. F.R. Khan. (ZDAMU, registration No. HYM.CH.676). *Alaptus jowainus* Rehmat & Anis: paratypes, 5 females, 1 male: 4 females, 1 male, (on slide under 2,3,3,4,3 coverslips each), INDIA: UTTARAKHAND: Ranikhet, Chaubatia,
27.x.2009, Coll. F.R. Khan; 1 female (on slide under 3 coverslips), Dehradun, Udaibagh, 03. xi.2009, Coll. F.R. Khan. (ZDAMU, registration No. HYM.CH.676).

**Diagnosis and comments.** Two of the Indian species viz., *Alaptus pyronus* Anwar & Zeya and *A. jowainus* Rehmat & Anis, published in the same volume of the same journal share almost the same taxonomic features. The latter being the synonymy of the former, but Triapitsyn (2017) remarked that *A. pyronus* is more similar to *A. immaturus* and placed it under tentative synonymy. However, the taxonomic features shared by all the three species are analyzed here as under: (features of *Alaptus pyronus* and *A. jowainus* are noted under parentheses): body length, 321 µm (in *pyronus*, body length, 270 µm) (in *jowainus*, body length, 308–420 µm); antenna with scape 2.1–3.1× as long as broad; pedicel 2× as long as broad, longer than all funicular segments individually; all funicular segments longer than broad; clava 3.4–4.4× as long as broad, subequal to F2–F5 combined (in *pyronus*, antenna with scape 2.8× as long as broad; pedicel 1.9× as long as broad, longer than all funicular segments individually; all funicular segments longer than broad; clava 3.8× as long as broad, subequal to F2–F5 combined) (in *jowainus*, antenna with scape 2.2–3.8× as long as broad; pedicel 1.9–2.2× as long as broad, longer than all funicular segments individually; F1–F5 distinctly longer than broad; clava 3.9–5× as long as broad, slightly longer than F2–F5 combined); fore wing 8.5–11× as long as broad; disc almost bare except 3–4 setae in the middle (in *pyronus*, fore wing 11× as long as broad; disc almost bare except 2 setae in the middle) (in *jowainus*, fore wing 10–14× as long as broad, disc with 4–6 setae in the middle); ovipositor 1.1–1.4× as long as metatibia, slightly exserted beyond apex of gaster, exserted part of ovipositor 0.2× its own length (in *pyronus*, ovipositor 1.3× as long as metatibia, slightly exserted beyond apex of gaster, exserted part of ovipositor 0.1× its own length) (in *jowainus*, ovipositor 0.9–1.1× as long as metatibia, slightly exserted beyond apex of gaster, exserted part of ovipositor 0.1–0.2× its own length).

Based on the above analyses and comparison of both the Indian species from the illustrations of Neotype of *A. immaturus* Perkins and other images of the species (i.e., lectotype of *A. caecilii* Girault and other determined materials of *A. immaturus*), we conclude that both these species share the characters of *A. immaturus* and hence, both are placed under its synonymy.

**Hosts.** Psocoptera. (for complete list of hosts see Triapitsyn 2017).

**Distribution.** India: Karnataka, Meghalaya, Uttarakhand (Argentina, Australia, Bermuda, Canada, China, Guam, Jamaica, Kenya, Mozambique, South Africa, Taiwan, Thailand, USA).

*Alaptus fusculus* Walker, 1846

*Alaptus fusculus* Walker 1846: 51. Lectotype male. London, England, UK (NMID). Designated by Graham, 1982: 194.

*Alaptus extremus* Soyka, 1939: 19, female. Holotype, female, Limberg, Netherland (NHMW). Synonymy by Triapitsyn, 2017: 16.

*Alaptus foersteri* Soyka, 1939: 18. Lectotype, female, Lower Silesian Voivodeship, Poland (NHMW). Synonymy by Hincks, 1959: 144.

*Alaptus magnus* Cheke & Turner, 1974: 279–281, female. Holotype, female, North Yorkshire Co., England, UK (BMNH). Synonymy by Triapitsyn 2017: 16.

*Alaptus novickyi* Soyka, 1948: 72, female. Holotype, female, Mecklenburg-Western Pomerania, Germany (NHMW). Synonymy by Triapitsyn, 2017: 16.

**Diagnosis and comments.** Triapitsyn (2017) remarked that *Alaptus deccanensis* could likely be either *A. fusculus* or *A. minimus*, however, ovipositor and mesotibia ratio is more similar to *A. fusculus*. Here, we provide a detailed comparison of *A. deccanensis* with *A. fusculus* which are as follows (the features of *A. fusculus* are taken from the redescription provided by Triapitsyn (2017) and are in parentheses): body length 320 µm (body length 400–500 µm); scape 3× as long as broad; pedicel subequal in length to F1, F3 and F4 individually; funicle segments all longer than broad, but F2 the longest and F5 the shortest; clava 3× as long as broad, shorter than F3–F5 combined (scape 2.5–2.9× as long as broad; pedicel subequal in length to F1, F3 and F4 individually; funicle segments all longer than broad, F2 the longest and F5 the shortest; clava 2.8–3.7× as long as broad, shorter than F3–F5 combined); fore wing 12× as long as broad, with a row of 14 setae; hind wing 20× as long as broad (fore wing 8.1–9.2× as long as broad, with a row of 11–19 setae; hind wing 16–18× as long as broad); ovipositor 1.9× as long as metatibia,
distinctly exerted beyond apex of gaster (ovipositor 1.7–1.8× as long as metatibia, distinctly exerted from apex of gaster).

Apart from these differences, the other character that separates *A. deccanensis* from *A. fusculus* is the body size and length of funicle segments. The former being smaller 320 µm and its funicular segments relatively thick and stout, while the latter being a bit larger 400–500 µm with its funicular segments thin and long, otherwise both share the same relative measurements. However, the conspecificity of both the species cannot be determined without a handful support of molecular evidence.

**Hosts.** Psocoptera. (for complete list of hosts see Triapitsyn 2017).

**Distribution.** Argentina, Belgium, Bulgaria, Canada, China, Denmark, England, Finland, France, Germany, Greece, Ireland, Italy, Kyrgyzstan, Macedonia, Netherlands, Poland, Portugal, Romania, Russia, Scotland, Spain, USA.

**Discussion**

Among the three species described in this paper, *Alapetus spicatus* and *A. wandoorensis* are remarkable in the genus, the former has modified spine-like setae on its head, mesosoma and fore wings, while the latter has unique sculpture on its mesosoma. The other described species *A. deodus* though shares some features with *A. immaturus* and *A. minimus* but, can be separated on the basis of the characters mentioned in the key.

While *A. immaturus*, *A. fusculus*, *A. minimus*, and *A. iceryae* are relatively widespread in the world, although perhaps not in all the continents, but occurrence of *A. terebrans* is unlikely as it is exclusively found in Palaearctic region. The newly recorded species from India *A. iceryae* agrees fairly well with the redescription of the species provided by Triapitsyn (2017) and hence is conspecific to *A. iceryae* from Nearctic, Palaearctic and Neotropical regions. The other recorded species *A. ?terebans* has smaller body size, somewhat less setose fore wings, and relatively short antennal configuration as compared to the Palaearctic species; hence, its identification is tentative, similar is the case with *A. deccanensis* that has been compared here with *A. fusculus* but could not be placed under synonymy because of lack of molecular evidence. Occurrence of smaller or larger specimens is possible in Mymaridae (Triapitsyn & Berezovskiy 2003). Consequently, there are several cases where the body size of a species varies viz., *Arescon dimidiatius* (Curtis) (600–700 µm); *Camptoptera jhuberi* Triapitsyn (445–595 µm). The other possible reason for variation in the body size is the climatic conditions. The colder regions (i.e., Holarctic, Nearctic, Neotropical and Palaearctic, etc.) tend to have larger individuals as compared to warmer regions (i.e., Oriental). The other Indian species *A. jowainus* Rehmat & Anis shares most of its features with *A. immaturus* Perkins is hereby put under synonymy with *A. immaturus* and, the tentative synonymy for *A. pyronus* Anwar & Zeya as remarked by Triapitsyn (2017) under *A. immaturus* is confirmed and is formally synonymised.

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No potential conflict of interest was reported by the author(s).

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