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K. Sanyal, N. Hazra*. A NEW SPECIES OF THE GENUS *PROCLADIUS* SKUSE, 1889 (DIPTERA: CHIRONOMIDAE) FROM INDIA. – Far Eastern Entomologist. 2016. N 319: 17-24.

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Summary. *Procladius tridentus* **sp. n.** (Chironomidae: Tanypodinae, Procladiini) is described from India based on adult male, pupa and larva. New species belongs to the *paludicola* group of the subgenus *Procladius* s. str. The nominotypical subgenus of *Procladius* is recorded for the first time from India. A key to adult males of *paludicola* species group of subgenus *Procladius* s. str. is also provided.

Key words: Diptera, Chironomidae, Tanypodinae, *Procladius*, new species, India.

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Резюме. Из Индии по самцу, куколке и личинке описан *Procladius tridentus* **sp. n.** (Chironomidae: Tanypodinae, Procladiini). Новый вид относится к группе *paludicola* подрода *Procladius* s. str. Номинативный подрод рода *Procladius* впервые указывается для Индии. Приведена определительная таблица видов по самцам группы *paludicola* подрода *Procladius* s. str.

INTRODUCTION

The genus *Procladius* Skuse, 1889 consists of about 70 species distributed in the world except Antarctica and Oceania. The genus *Procladius* was erected by Skuse (1889) based on *Procladius paludicola* as the type species from New South Wales in Australia. Within this genus, three subgenera are currently recognized (Roback, 1982a). So far, about 8 species under 3 subgenera as well as 5 subgenerically unplaced species have been reported from the Oriental Region (*Holotanypus* Roback: 4 species; *Procladius* Skuse: 1 species; *Psilotanypus* Kieffer: 3 species; subgenerically unplaced species: 5 species) (Ashe & O'Connor, 2009; Hazra *et al*., 2016) including 5 Indian species in 2 subgenera as well as in subgenerically unplaced species (*Holotanypus* Roback: 1; *Psilotanypus* Kieffer: 2; subgenerically unplaced: 2) (Kieffer, 1911, 1923, 1921; Johannsen, 1932; Chaudhuri & Debnath, 1983).

According to Silva & Ekrem (2016), the genus *Procladius* is the sister group of the remaining Procladiini. This genus is related to the *Djalmabatista* Fittkau and *Tanypus* Meigen due to presence of stalk between MCu and FCu (Murray & Fittkau, 1989). But much shorter stalk discriminates *Tanypus* from *Procladius*. The members of *Djalmabatista* can easily be identifiable from *Procladius* because of the adult males with striking pigmented patterns on the thorax, abdomen and legs and the iridescent eyes; pupa with a distinct terminal elongated spine in the anal lobe and larva with antennal blade twice or more as long as flagellum. But both the genera differ from all other genera of Tanypodinae with a dorsomental teeth row in ligula (Roback & Moss, 1977). Taxonomically, *Procladius* is a complex group; it has high

levels of intra-specific variability and lacks clear differences between species at some life stages, which has caused hindrance to taxonomists to distinguish species within the genus (Carew *et al.*, 2011; Murray & Fittkau, 1989). A revision of the world-wide species of this genus, along with its subgenera and species group is urgently needed.

The subgenus *Procladius* s. str. is known from Afrotropical, Australasian, Neotropical and Oriental Regions but till date has not been reported from Holarctic Region. Up till now, only *P.* (*Procladius*) *recurva* Johannsen (Indonesia) is reported from the Oriental Region. Species group of this subgenus made by Roback (1982a) has been followed here. We have found a new species of the subgenus *Procladius* in India. This new species belongs to the *paludicola* group because inner corners of anal lobe of pupa slightly concave and posterior parapods of larva with simple claws.

MATERIALS AND METHODS

The single larva collected from a slow moving stream near Rishop (India: West Bengal) was subjected to rearing in the laboratory following Epler (1995). The larva was reared to the individual glass vial containing water and natural substrates, algal films and dead leaves of local macrophytes. The glass vial was placed obliquely in a wooden rack to increase the surface area at room temperature. After eclosion, adult, larval and pupal exuviae were preserved in 80% ethanol. The materials were processed and mounted on micro–slides in phenol balsam following the procedure outlined by Wirth & Marston (1968) are described following Hazra & Chaudhuri (2010). Morphological terminology and abbreviations mostly follow Sæther (1980) and Langton (1991). Measurements of parts of immature stages and adults are expressed in micrometers (µm) except the total lengths, wing lengths and costal extension which are in millimeters (mm). Type is kept at the Entomological collections of the Department of Zoology, University of Burdwan and will be deposited in the National Zoological Collections (NZC), Kolkata in due course.

The abbreviations in the text are as follows: Ac – acrostichals; ALR – Anal lobe ratio; Ap – Antepronotum; AR – Antenna ratio; BR – "Bristle ratio"; BV – "Beinverhältnisse"; CA – Head–Antennal ratio; CP – Head–Palp ratio; CR – Costal ratio; Cu – Cubitus; Dc – Dorsocentrals; FS – Frontals; fe – Femur; HR – Hypopygium ratio; HV – Hypopygium value; IC – Cephalic index; IV – Inner Verticals; LR – Leg ratio; LS – Lateral seta; M – Media; MCu – Crossvein between Media and Cubitus; OV – Outer Verticals, Pa – Prealars, Po – Post orbitals; PpB – Plastron plate breadth; R – Radius; RaB – Respiratory atrium breadth; RM – Crossvein between Radius and Media, Scts – Scutellers; SV – "Schenkel–Schiene–Ver–hältnis"; ThB – Thoracic horn breadth; Thr – Thoracic horn ratio; ta – tarsomere; ti – tibia; VR – Venarum ratio.

TAXONOMY

***Procladius* (*Procladius*) *tridentus* sp. n.**
Figs 1–21

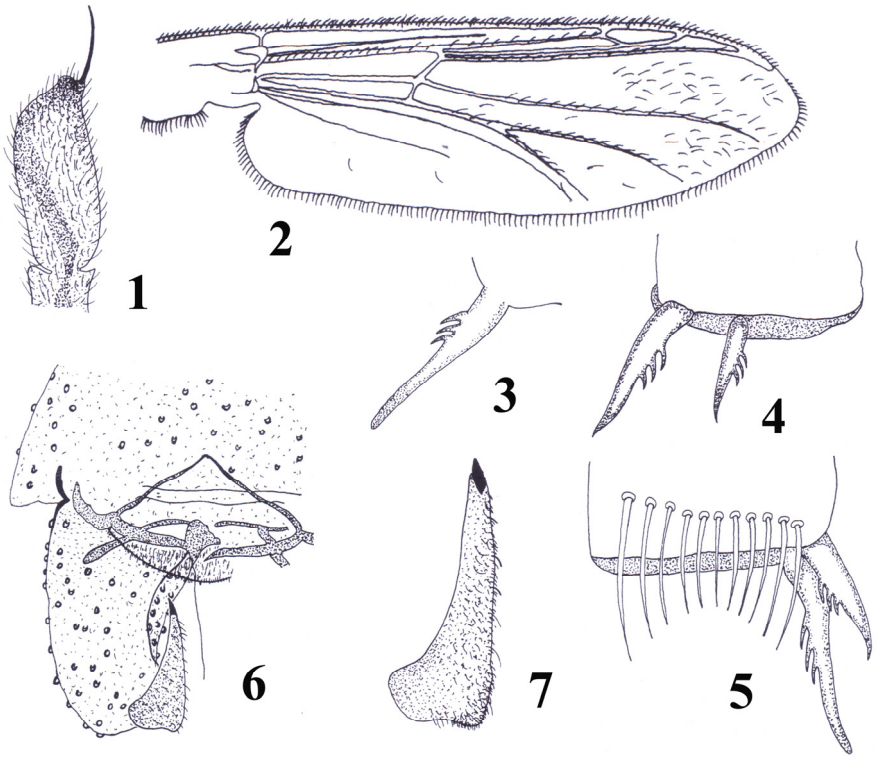
TYPE MATERIAL. Holotype: male with larval and pupal exuviae [reared] (Type no. B.U. Ent. 274), **India**: West Bengal, Rishop, 27°6' N, 88°38' E, elevation 2200 m, 03.VI 2013, coll. K. Ghosh.

DESCRIPTION. MALE (n=1) (Figs 1–7). Total length 2.66 mm; wing length 1.24 mm; wing breadth 0.47 mm; total length / wing length 2.14; wing length / length of profemur 2.24.

Coloration. Head yellow. Thorax light brown. Wing brownish. Abdomen pale yellow. Hypopygium brown. Legs: Coxa, trochanter and tibial ends of all three legs brown; remaining parts yellow.

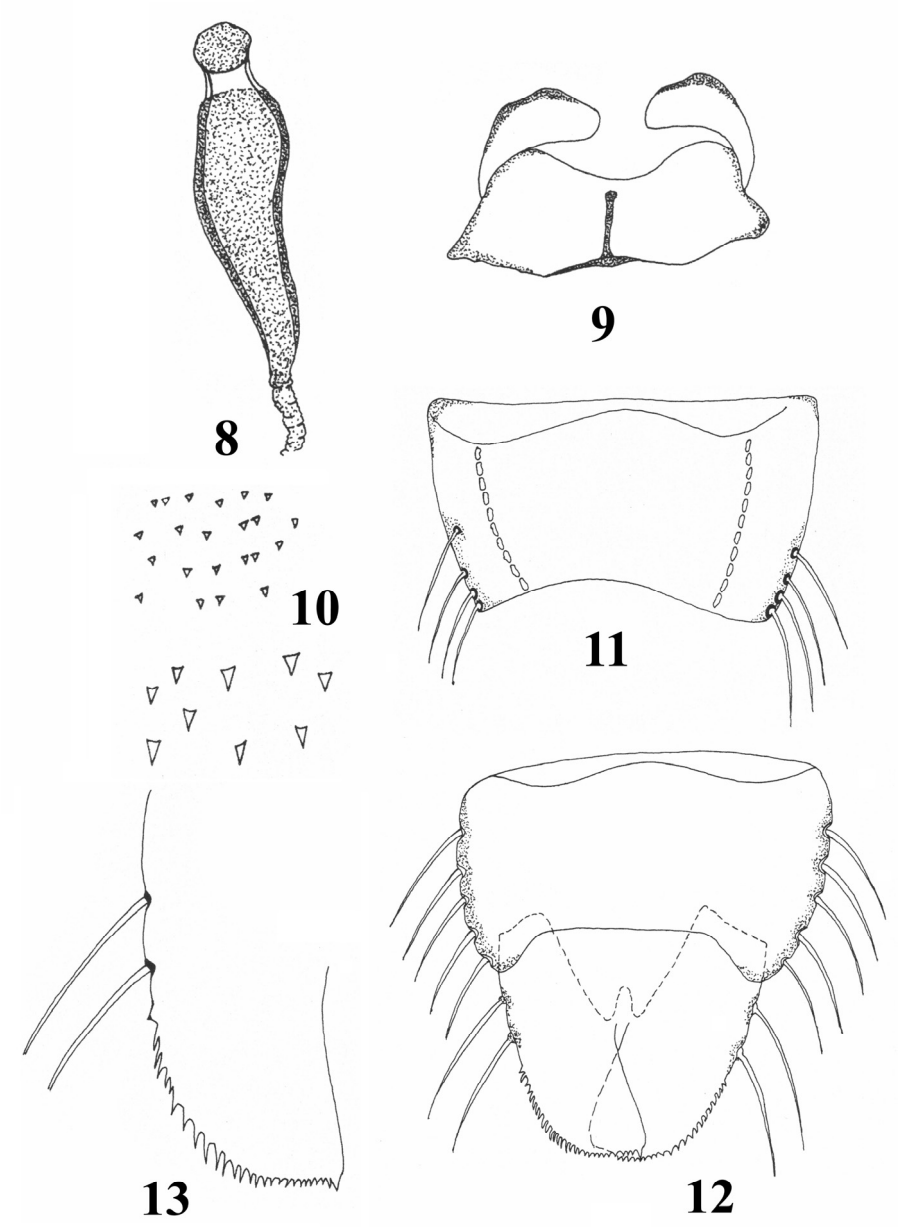
Head. Eyes bare with dorsomedian extension 104 µm. Temporal setae 32 including 4 FS, 6 IV, 18 OV and 4 Po. Antenna with 14 flagellomeres; length of flagellomeres (I–XIV) (in µm) 30, 12, 24, 22, 24, 20, 20, 24, 24, 20, 20, 24, 390, 54. Flagellomere XIII long and cylindrical. Terminal flagellomere (Fig. 1) more or less cylindrical; 2–3 × as long as broad basally and apically tapered with prominent apical nipple. Apical seta about 24 µm long. Clypeus with 16 setae. AR 1.68. Length of palpomeres (I–V) (in µm): 30, 42, 51, 84, 98. Length ratio of palpomeres V/III 1.92. CA 0.63; CP 1.43.

Thorax. Dc 19 uniserial, Ac 20 biserial, Pa 10, Scts with 10 setae.



Figs 1–7. *Procladius* (*Procladius*) *tridentus* sp. n., adult male. 1 – apex of antenna; 2 – wing; 3 – apex of fore tibia; 4 – apex of mid tibia; 5 – apex of hind tibia; 6 – male hypopygium; 7 – gonostylus.

Wing (Fig. 2). Wing membrane with macrotrichia on the apical portion. Wing length 1.24 mm. Wing breadth 0.47 mm. Costal extension 1.18 mm. R_2, R_3, R_{2+3}, M and Cu bare; R with 17 setae; $R_1$10; R_{4+5} 16; M_{1+2} 15; M_{3+4} 14; stalk between MCu and FCu with 3; $Cu_1$7. Distance between MCu and RM 36 µm and MCu before RM. Stalk between MCu and FCu 226 µm long. Cu_1weakly curved. Wing membrane cell r_{4+5} with 33 setae; m_{1+2} with 20; m_{3+4} with 2; cu with 1 and an with 2 macrotrichia. Squama with 18 setae. CR 0.95, VR 1.34.



Figs 8–13. *Procladius* (*Procladius*) *tridentus* sp. n., pupa. 8 – thoracic horn; 9 – tergite I; 10 – shagreen on tergites II–VIII; 11 – tergite IV with chaetotaxy; 12 – segment VIII, anal lobe and male genital sac; 13 – anal lobe (left side).

Legs. Spur of fore, mid and hind tibia with 3 lateral teeth each; spur of fore tibia (Fig. 3) 36 µm; of mid tibia (Fig. 4) 30 and 24 µm long; of hind tibia (Fig. 5) 45 and 30 µm long. Width at apex of fore tibia 33 µm, of mid tibia 36 µm, and of hind tibia 39 µm. Hind tibial comb (Fig. 5) with 11 setae, shortest being 18 µm long and longest one 36 µm long. Pseudospurs on mid tarsomere 1 with 24 µm and mid tarsomere 2 with 21 µm long. Pseudospurs on hind tarsomere 1 with 27 µm and hind tarsomere 2 with 24 µm long. Lengths (in µm) and proportions of legs in table 1.

Hypopygium (Fig. 6). Tergum IX with 26 setae. Anal point small, hyaline. Gonocoxite 135 µm long; broader basally and tapering in the apical ½; inner border slightly concave with 10 setae. Inferior volsella absent. Superior volsella ovoid. Gonostylus (Fig. 7) slender, about 80 µm long, i.e., 0.6 × as long as gonocoxite without posterior heel, megaseta short, 10 µm in length. Transverse sternapodeme 76 µm long and arched anteriorly. Phallapodeme 54 µm long. HR 1.68. HV 1.97.

PUPA (n=1) (Figs 8–13). Total length 3.36–3.48 mm. Exuviae light brown.

Cephalothorax. Thoracic horn (Fig. 8) 218 µm long, 54 µm broad and expanded towards apex and trumpet shaped, 4 × as long as broad; external surface smooth; horn sac tubular. Thr 4.03. Plastron plate oval, 30 µm long and 36 µm wide and connected to the horn sac by a 15 µm long distinct neck. Respiratory atrium breadth 42 µm. RaB : ThB 0.78. PpB : ThB 0.67. Basal lobe poorly developed. Thoracic comb absent.

Abdomen. Scar on tergite I (Fig. 9) 146 long, without shagreen. Tergites II–VIII with dense shagreen mostly solitary and occasionally grouped into two pointed spines (Fig. 10). Arrangement of setae on segment IV as in figure 11. Pedes spurii B present on tergites II and III and pedes spurii A present on tergites IV–VI. Segment VII with 4 LS setae placed 0.65, 0.78, 0.91 and 0.95 of segment length. Segment VIII with 5 LS setae (Fig. 12) placed 0.27, 0.45, 0.63, 0.75 and 0.92 of segment length. Posterolateral corners of segment VIII project backwards. Anal lobe (Fig. 12) 345 µm long and 164 µm wide, with 2 anal macrosetae placed 0.27 and 0.45 of segment length and inner corners produced with margin just before corner slightly concave, outer margin (Fig. 13) bearing row of 28 spines up to 16 µm long. Genital sac 150 µm long. ALR 2.10. G/F 0.43.

LARVA (n=1) (Figs. 14–20). Head capsule 0.46 mm long, 0.49 mm long. IC 0.82 (only head capsule and posterior parapod with anal setae retained).

Coloration. Head capsule yellow in color, post–occipital margin dark brown in color. Reared larvae grey white in color.

Antenna (Fig. 14). AR 4.5. Basal segment about 3 × as long as basal width with ring organ at 0.8. Basal antennal segment 81 µm long, 21 µm wide. Length of antennal segments (II–IV) (in µm) 14, 3, 1. Blade 12 µm long.

Mandible (Fig. 15). 90 µm long, basal width 30 µm, uniformly curved. Apical tooth dark, more than 1/3 length of mandible. Basal tooth 15 µm long and situated on dorsal side of mandible, bluntly rounded apex. Seta subdentalis 12 µm long. Ventrolateral setae 1, 2 and 3 present.

Maxilla (Fig. 16). Basal segment of palp 24 µm long and 9 µm wide, ring organ situated 0.70 µm from base of basal segment.

Mentum. With 7 light brown dorsomental teeth (Fig. 17) and 46 µm in width.

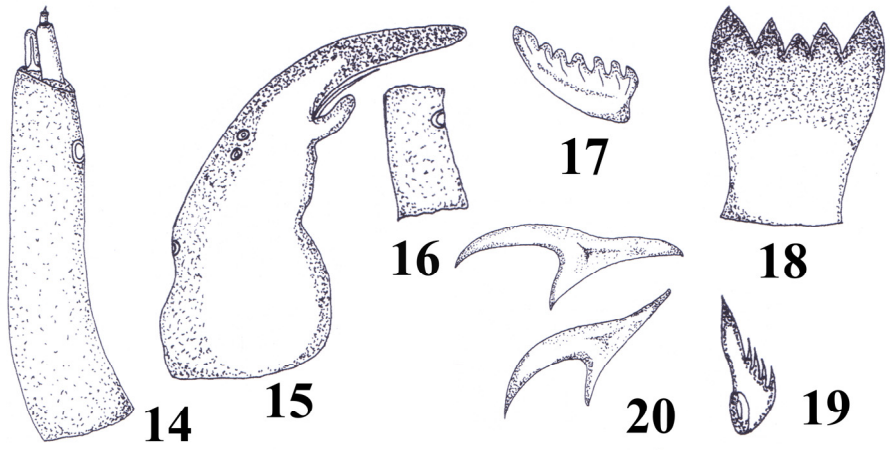
Ligula and Paraligula. Ligula (Fig. 118) 46 µm long, with 5 teeth, distal 1/3 and teeth dark in color. Apex of ligula dark. Teeth in concave row, inner tooth smallest, outer tooth largest and middle tooth ¾ as long as outer tooth. Paraligula (Fig. 19) 22 µm long.

Body. Procercus 126 µm long with 13 long setae. Largest setae 466 µm long. Posterior parapods with 10 claws (Fig. 20) and all claws uniformly curved and simple. Largest claw 60 µm long.

Table 1. Lengths (in μm) and proportions of legs of *Procladius* (*Procladius*) *tridentus* sp. n.

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV
P_1	555	690	525	240	180	135	90	0.76	2.74	2.37
P_2	660	630	435	195	150	120	75	0.69	3.19	2.96
P_3	570	720	495	240	165	120	90	0.68	2.90	2.60

DIAGNOSTIC CHARACTERS. The following combination of characters justifies it as a new member of the genus *Procladius*: Male imago. i) AR 1.68, ii) wing with macrotrichia on the apical portion, iii) squama with 18 setae, iv) long stalk present between MCu and FCu, v) each tibial spur with 3 lateral teeth, vi) hind tibial comb with 11 setae, vii) gonostylus with megaseta but without posterior heel or inner lobe, viii) inferior volsella absent and ix) superior volsella ovoid; Pupa. i) Thoracic horn long, expanded towards apex and trumpet shaped, ii) scar on tergite I present, iii) well–developed pedes spurii A and B present, iv) tergite VII with 4 LS setae and tergite VIII with 5 LS setae and v) outer margin of anal lobe with 24–26 spines and inner corners slightly concave; Larva. i) IC 0.82, ii) AR 4.5, iii) ligula with 5 teeth and apex dark and iv) posterior parapods with simple claws.



Figs 14–20. *Procladius* (*Procladius*) *tridentus* sp. n., larva. 14 – antenna; 15 – mandible; 16 – basal segment of maxillary palp; 17 – dorsomental tooth; 18 – ligula; 19 – paraligula; 20 – claws of posterior parapod.

FEMALE. Unknown.

ETYMOLOGY. From Latin *tridens,* the species name derives "*tridentus*", referring to having three lateral teeth on each tibial spur of legs.

DISTRIBUTION. Known only from India.

REMARKS. Among the previously known species the *Procladius* (*Procladius*) *tridentus* **sp. n.** differs markedly from the *P.* (*P.*) *albitalus* Freeman (1955) in distribution of macrotrichia in wing. It differs from *P.* (*P.*) *goanna* Roback (1982a) and *P.* (*P.*) *paludicola* Skuse (1889) in tibial spur, gonostylus of adult male and thoracic horn of pupa. Tibial spur, wing and maculate abdomen differentiate this species from *P.* (*P.*) *mozambique* Roback (1982b). *P.* (*P.*)

polytomus (Kieffer, 1923) and this new species differ in wing structure. *P.* (*P.*) *recurva* Johannsen (1932) also varies in gonostylus and wing length. Wing length and maculate abdomen also differentiate this species from *P.* (*P.*) *squamifer* Freeman (1961). *P.* (*P.*) *umbrosus* Lehmann (1981) and *Procladius* (*P.*) *tridentus* **sp. n.** differ in tibial spur, tibial comb of hind leg, wing and anal point.

Key to the males of *paludicola* species group of the subgenus *Procladius* s. str. of the world

1. Tibial spurs with constant number of lateral teeth (India) ..... *P.* (*P.*) *tridentus* sp. n.
– Tibial spurs with variable number of lateral teeth 2
2. Thorax shining black, not pruinose; abdominal segments 2, 4 and 8 with milk–white marks (Australia) ..... *P.* (*P.*) *squamifer* Freeman
– Thorax pruinose, not shining; each abdominal segment with a pale band 3

3. Thorax pale; wing length < 1.5 mm (Australia) ..... *P.* (*P.*) *goanna* Roback
– Thorax dark black–brown; wing length > 1.5 mm 4
4. Wing without bands 5
– Wing with bands 6
5. Gonostylus robust (Indonesia) ..... *P.* (*P.*) *recurva* Johannsen
– Gonostylus slender (Colombia) ..... *P.* (*P.*) *mozambique* Roback
6. Antennal ratio < 1.6 7
– Antennal ratio > 1.6 8
7. Leg ratio 0.75 (Australia) ..... *P.* (*P.*) *paludicola* Skuse
– Leg ratio 1.4 (Afrotropical Region) ..... *P.* (*P.*) *albitalus* Freeman
8. Apex of R_1 with dark spot (Cameroon, Chad, Niger, Sudan) .... *P.* (*P.*) *polytomus* (Kieffer)
– Apex of R_1 without any dark spot (Congo) ..... *P.* (*P.*) *umbrosus* Lehmann

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