



Far Eastern Entomologist

Дальневосточный энтомолог

Journal published by Far East Branch
of the Russian Entomological Society
and Laboratory of Entomology,
Institute of Biology and Soil Science,
Vladivostok

Number 211: 1-10

ISSN 1026-051X

June 2010

A NEW SPECIES OF THE GENUS *CLADOTANYTARSUS* KIEFFER, 1921 (DIPTERA, CHIRONOMIDAE) FROM INDIA WITH SHORT NOTES ON ITS BIOLOGY

U. Majumdar, A. Mazumdar and P.K. Chaudhuri

*Department of Zoology, University of Burdwan, Burdwan 713 104, India.
E-mail: chaudhuri_pk@yahoo.co.in*

The adult, pupa and larva of *Cladotanytarsus dividuus* **sp. n.** are described from India. A short note on the biology of a new species is given.

KEY WORDS: Diptera, Chironomidae, *Cladotanytarsus*, new species, biology, India.

У. Маюмдар, А. Мазумдар, П.К. Чаудхури. Новый вид рода *Cladotanytarsus* Kieffer, 1921 (Diptera, Chironomidae) из Индии с краткими заметками по его биологии // Дальневосточный энтомолог. 2010. N 211. С. 1-10.

Из Индии по имаго, личинке и куколке описан *Cladotanytarsus dividuus* **sp. n.** Приведены сведения по биологии нового вида.

Отдел зоологии, Университет Бурдвана, Бурдван 713 104, Индия.

INTRODUCTION

A well defined more or less wide genus *Cladotanytarsus* Kieffer, 1921 was considered as a subgenus of the genus *Tanytarsus* Wulp for many years. Hirvenoja (1962) reverted and confirmed its generic status in the tribe Tanytarsini and which is now in use. The genus was previously known by 15 species (Chaudhuri *et al.*, 2001); and life cycle of only one species, *Cladotanytarsus gloveri* Chaudhuri et Das, 1988 was known from India.

This paper describes larva, pupa and the adult with short notes account of biology of the new species of *Cladotanytarsus* in India.

MATERIAL AND METHODS

The light trapped gravid female deposits the egg mass on the floating paper strips in the experimental dish (5 cm diameter) containing water and is subjected to rearing in the laboratory following Epler (1995) within a nylon cage and aeration from the air pump. A small amount of algal filaments and leaves of aquatic macrophytes are provided as food twice a week. Observations have been made periodically for the development and for procuring the eggs, larvae, pupal exuvia and the imagines. The life stages are processed and mounted on the micro-slides after Wirth & Marston (1968). Terminologies used in the description of the species follow Saether (1980, 1990).

The average value of measurements are before and the ranges suffixed by “n” the number of specimens examined within parentheses.

Types presently retained with the collections of insects at the Entomology Laboratory, University of Burdwan, Burdwan (India), will be deposited to the National Zoological Collections (NZC), Calcutta in time.

DESCRIPTION OF A NEW SPECIES

Cladotanytarsus dividuus Majumdar, Mazumdar et Chaudhuri, sp. n.

Figs 1–13

MATERIAL. Holotype – ♂ (reared), West Bengal, Arambag, 20.XI 2003 (Coll. U. Majumdar). Paratypes: 5♂, 5 pupa ♂ and 7 larvae, data same as holotype.

MALE. Body length 2.6 (2.5-2.8, n=5) mm, wing length 1.3 (1.2-1.4, n=5) mm. Total length / wing length 2.00.

Head. Frontal tubercle nipple like with microtrichia 102 µm long. Clypeus with 6-10 setae. Antenna brown, 750µm long; AR 0.9 (0.8-0.9, n=5). Maxillary palps 300 µm long; antenna length / palp length 2.5 Head width / palp length 1.12 (1.12-1.13, n=5).

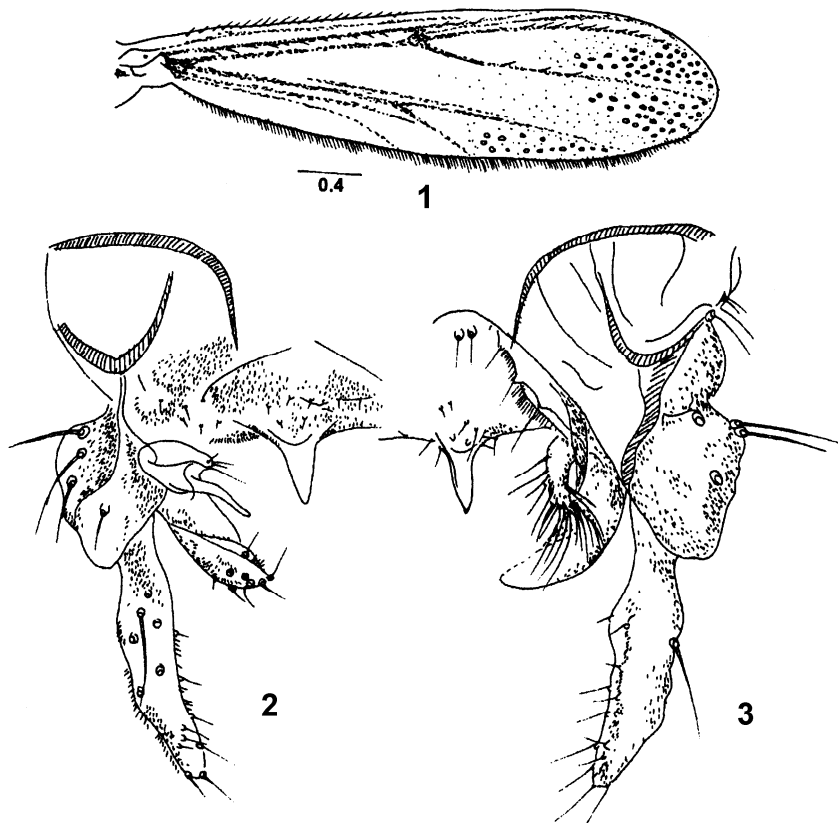
Thorax. Brown in colour. Acristichals 12, dorsocentrals 7 in a linear row, prealars 2, supralars 2 and scutellars 8.

Wing (Fig. 1). Membrane with macrotrichiae towards apex. Brachiolum with 1 seta; C evenly setose throughout its length and little extended beyond R_{4+5} ; R with 5-6, R_1 with 3-4; R_{2+3} with 8-10 and R_{4+5} with 4-5 setae; anal lobe weakly developed; VR 0.77.

Legs. Light brown. Fore tibial comb fused, mid and hind tibiae with two dark spurs 20 µm and 24 µm long. Length and proportions of legs in Table 1.

Abdomen. Light brown to yellow. Hypopygium (Figs. 2, 3): tergite IX broad and roughly rectangular with well separated V shaped bands and 2 strong median setae, 60-72 µm long slightly swollen at the middle and narrowed towards apex with 8-10

dorsal and a few setae at its inner margin, lateral teeth absent.; anal point 25(20-28, n=5) μm long and 7.3 (7.2-7.3, n=5) μm wide, small and attenuated with dorsal 4-6 anal spinules, 4 setae at about base and 2 baso-lateral setae, anal crests present. Gonocoxite 73 (71-75, n=5) μm long with 4 setae on inner margin. Gonostylus 84 (82-86, n=6) μm long slender, slightly swollen at the middle and narrowed towards apex with 8-10 dorsal and a few setae at its inner margin. Superior volsella 30 μm long, stout more or less cap like with 4 setae at its base; digitus 18 μm long slender and slightly curved. Median volsella stout about 68 long stem of median volsella stout slightly curved 48 μm long with characteristics 4 branched lamellae bearing slightly bent long furcated setae not extending beyond inferior volsella. Inferior volsella 66 μm long stout and slightly bent inward extending nearly half of the length of gonostylus bearing 5-6 long dorsal, 2 apical and 5 short setae at its inner margin. HR=1.11-1.66.



Figs. 1-3. *Cladotanytarsus dividuus* sp. n., adult male. 1) wing; 2) hypopygium, ventral view; 3) the same, dorsal view.

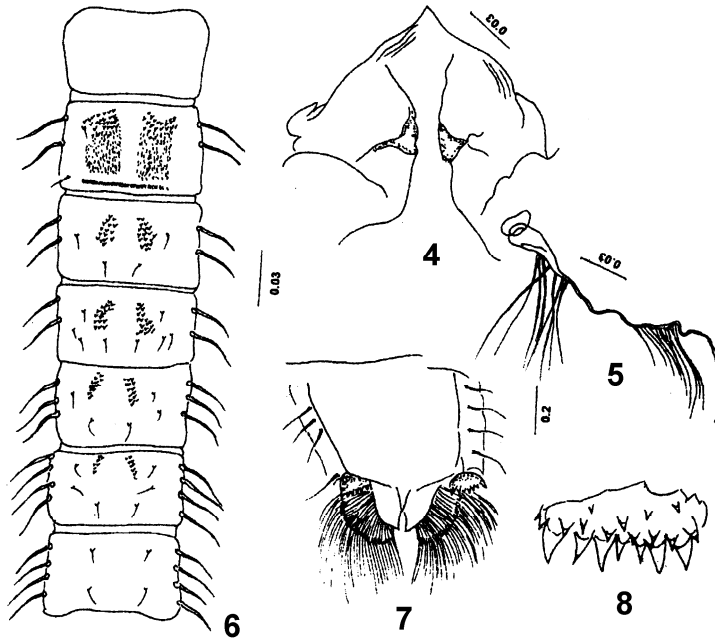
Table 1

Lengths (in μm) and proportions of leg of *Cladotanytarsus dividuus* sp. n.

	Fe	Ti	ta ₁	ta ₂	Ta ₃	ta ₄	Ta ₅	LR	BV	SV	BR
P ₁	280	121	298	153	121	89	48	2.5	1.7	2.6	2.3
P ₂	242	209	113	56	40	32	24	0.5	3.7	8.1	3.1
P ₃	290	258	161	113	97	65	40	0.6	2.2	4.8	4.6

PUPA. Exuviae pale with dark pigmentations. Total length 2.54 (2.48-2.64, n=8) mm.

Cephalothorax. Frontal apotome rugulose; frontal setae 102.7 μm long arising from well developed conical cephalic tubercles 25.7 μm high (Fig. 4). Thoracic horn (Fig. 5) fine, tubular 440-710 μm long, 22-27 μm wide, with wide disc like base with fringe of lateral chaetae 38-66 μm long at the base and before the apex. Anteprenotals 2 short, precorneals 2 linear arising from a tubercle at the base, posterior precorneal shorter, median and lateral ones indistinct; dorsocentrals 2.40 and 44 μm , distance between Dc₁ and Dc₂, 132 μm . Wing sheath with a subapical nose and 1 or 2 pearls.



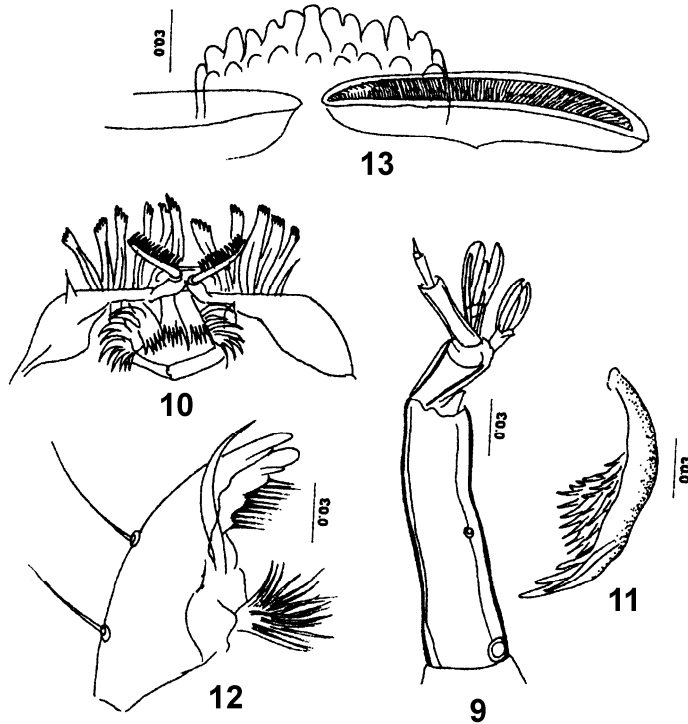
Figs. 4-8. *Cladotanytarsus dividuus* sp. n., pupa. 4) frontal apotome; 5) thoracic horn; 6) abdomen; 7) tergite VIII and anal lobe; 8) anal lobe.

Abdomen (Fig. 6). Tergites I, VII and VIII bare (Fig. 7), II with a dark longitudinal parallel patches of shagreen, III-VI with a paired narrow linear parallel patches; Pedes spurii A and Pedes spurii absent. Segment II-IV with 2 L, V-3 L, VI-VI and VIII with 4 L setae. Anal comb (Figs. 7, 8) well developed with 20 teeth of variable length. Anal lobe 105(102-110, n=6) μm long and 56 (54-68, n=6) μm wide and fringed with 30-33 filamentous setae. ALR 1.84 (1.84-1.88, n=5). Genital sac 97 (96-99, n=6) μm , long, G/F 0.92 (0.91-0.94, n=6).

LARVA. Red in colour. Total length 3.6-3.9 mm (n=8).

Head. Length of the head capsule 245 μm , width 220 μm .

Antenna (Fig. 9) 5-segmented, 139.3 μm long, basal segment 22 μm longer than flagellum, lengths of flagellomeres I-V (in μm): 54, 15, 22, 7, 4 respectively. AR 1.3 (1.1-1.5, n=5); flagellomere I long with seta at the middle; ring organ at the base; flagellomere II shorter than I, blade 24 μm long and accessory blade 18 μm long; 1 lauterborn organ large with three petal like peg sensillae on short pedestal reaching nearer to apex of flagellomere I.



Figs. 9-13. *Cladotanytarsus dividuus* sp. n., larva. 9) antenna; 10) labrum; 11) premandible; 12) mandible; 13) mentum and ventromental plate.

Maxilla with 6 lacinal chaetae, pecten galearis brush like, multilobate sensilla 6 on each side.

Labrum (Fig. 10). SI comb like 25.7µm long (n=5), SII plumose 29.3 µm long, SIII and SIV indistinct, labral lamella brush like; pecten epipharyngis consisting of 3 plates each of these distally with 3 teeth.

Premandible (Fig. 11) 48-56 µm long with slender curved with 3 apical teeth.

Mandible (Fig. 12) 80-86 µm (n=5) with 1 pale dorsal, 1 apical and 3 inner dark brown teeth; seta subdentalis long curved 44 µm long; seta interna plumose like, sensilla minusculum 2, ring organ indistinct.

Mentum (Fig. 13) with 1 median and 5 pairs of closely appressed unequal lateral teeth, first pair of lateral teeth bifurcated; width of mentum 56-60 µm (n=5); ventromental plate narrow with wider margin, width 60-76 µm (n=5), height 11 µm; distance between ventromental plates 11-22 µm, margin serrated ending at a very close proximity.

Body. Anterior and posterior parapods with simple long curved claws, procercus 60 (60-62, n=5), 70 µm long 6-8 anal setae, 3 short and 5 long anal tubules.

EGG. Eggs remain in a gelatinous thread like pale brown mass with a suspensory stalk. Each mass comprises of 180-200 obliquely arranged eggs (4500-4800 µm, n=5) long which fall at the bottom of the experimental dish and swell 2-2.5 times with the absorption of water. The empty shell turns yellow after exit of eggs from the case

ETYMOLOGY. The name refers to the bifurcated lateral tooth of larval mentum.

DIAGNOSIS. The adult resembles *Cladotanytarsus verbosus* Mazumdar et Chaudhuri, 2000 and *Cl. matthei* Gilka, 2001 in the shape of superior volsella and AR value. It also appears closer to *Cl. parvus* and *Cl. digitalis* described by Wang & Zheng (1993) in anal point. The superior volsella of the new species looks closer to that of *Cl. iucundus* Hirvenoja, 1968. Structure of anal comb and rugulose frontal apotome of pupa show affinity with *Cl. aeiparthenus* and *Cl. fusiformis* described by Bilyz & Davis (1989). But the following combinations of characters segregate it from other species of the genus and favour for considering the species as a new member of *Cladotanytarsus* from India.

ADULT MALE. Frontal tubercle nipple like, Wing.m embrane with macrotrichiae towards apex., anal lobe weakly developed; Fore tibial comb fused, mid and hind tibiae with two dark spurs. Hypopygium with tergite IX broad and roughly rectangular with well separated V shaped bands and 2 median setae, lateral teeth absent; anal point small and attenuated with dorsal 4-6 anal spinules, anal crests present. Gonocoxite with 4 setae on inner margin. Gonostylus long slender, slightly swollen at the middle and narrowed towards apex with 8-10 dorsal and a few setae at its inner margin. Superior volsella stout more or less cap like with 4 setae at its base; digitus slender and slightly curved. Median volsella with characteristics 4 branched lamellae bearing slightly bent long furcated setae not extending beyond inferior volsella., Inferior volsella 66 µm long stout and slightly bent inward extending nearly half of the length of gonostylus bearing 5-6 long dorsal, 2 apical and 5 short setae at its inner margin.

PUPA. Exuviae pale with dark pigmentations. Cephalothorax with frontal apotome rugulose; frontal setae long arising from well developed conical cephalic tubercles. Thoracic horn fine, tubular with wide disc like base with fringe of lateral chaetae at the base and before the apex. Anteprenotals 2 short, precorneals 2 arising from a tubercle at the base in a linear row, posterior precorneal shorter, median and lateral ones indistinct; dorsocentrals 2. Wing sheath with a subapical nose and 1 or 2 pearls.

LARVA. Antenna 5-segmented, basal segment longer than flagellum, ring organ at the base; flagellomere II shorter than I; blade 24 μm long and accessory blade 18 μm long; lauterborn organs large with three petal like peg sensillae on short pedestal reaching nearer to apex of flagellomere I. Maxilla with 6 lacinal chaetae, pecten galearis brush like, multilobate sensilla 6 on each side. Labrum with SI comb like SII plumose, SIII and SIV indistinct, labral lamella brush like; pecten epipharyngis consisting of 3 plates each with 3 teeth. Premandible long, slender curved with 3 apical teeth. Mandible with 1 pale dorsal, 1 apical and 3 inner dark brown teeth; seta subdentalis long curved; seta interna plumose, and ring organ indistinct. Mentum with 1 median and 5 pairs of closely appressed unequal lateral teeth, first pair of lateral teeth bifurcated; ventromental plate narrow with wider serrated margin. Body: anterior and posterior parapods with simple long curved claws, procercus with 6-8 anal setae, anal tubules 3 short and 5 long.

BIOLOGY

The life cycle passes as usual and the duration of each stages as observed in both the summer ($32 \pm 2.5^{\circ}\text{C}$ and 51-76% humidity) and the winter ($24.5 \pm 2.5^{\circ}\text{C}$ and 20-48% humidity) months are: eggs: a-30-36, b-48-60(hrs.) larva: a-70-80, b-90-100; (hrs.) pupa: a-18-20, b-20-22; (hrs.) adult: a-30-40, b-70-80 (hrs.) (Fig. 14).

The insect deposits solitary pale brown eggs (200 x 80) under decaying leaves and debris under the water and remained as such for 2 days in the summer ($30-32^{\circ}\text{C}$). Eggs hatch within 3 minutes to minute and sometimes invisible free swimming first instar larvae followed by the later instars (2nd, 3rd, and 4th) which reside in the tubular dwellings at or near the bottom of the water. The larvae make use of soil and particles for construction of the residence at the late first followed by later instars mostly at the fourth instar. The second to fourth instar larvae being photonegative are found to settle down at the centre of the media in order to start building of the residence with the above particles cemented with saliva. The method of construction of residence appears similar to that of other midges taking almost an hour to complete the suitable house suitable for living. The residence of the new species is of two types-horizontal and bow-shaped.

The species adopt filter feeding mechanism in taking food. Examination of gut content of the wild larvae reveals that they are mainly detritus feeders but also consumes algae and vegetable fragments.

The pupae are free-swimming throughout and require 15-16 seconds for eclosion to the imago.

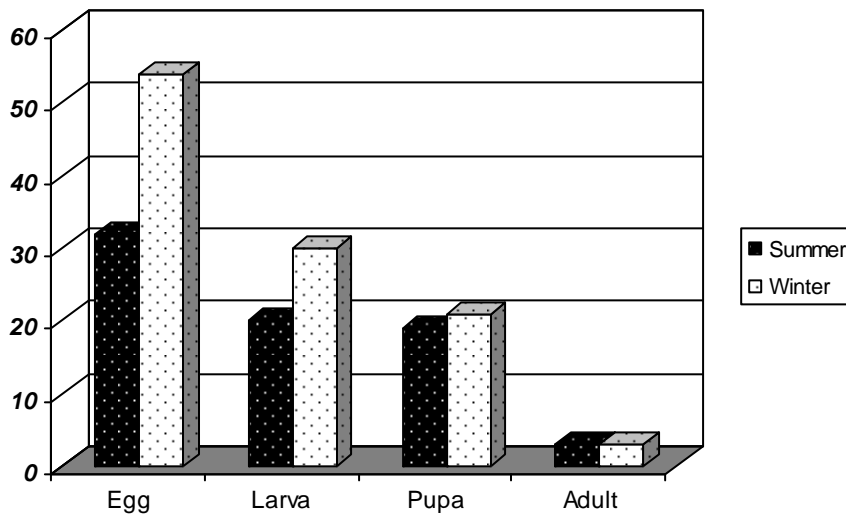


Fig. 14. Duration of life stages of *Cladotanytarsus dividens* in summer ($32 \pm 2.50C$) and winter ($24 \pm 2.50C$). Time: for egg and pupa in hours; for larva and adults in days.

Emergence occurs through a dorsal split of the thorax of the pupa. The phenomenon starts from 1-1.5 hours before dusk to the next 1-4 hours and most of the imagines (70-80%) extrude within 3 hours reaching its peak with in 1-1.5 hours after sunset. The event is restricted in the dusk only displaying biphasic pattern in summer (May and June) at dawn and dusk , 1-2 hours earlier in winter and at times continue for a week with a pause of 1-2 months before the next event. The midges show more or less diel periodicity like others with maximum occurrence between late after noon and the early hours of darkness.

DISCUSSION

The life cycle requires less time with the rise of temperature (summer) and more with the fall (winter) which corroborates Oliver (1971) and Danks (1978). The hatching of eggs is related to rise and fall of temperature and appears similar to that of Chaudhuri & Chattopadhyay (1990). Construction of dwellings initiates at the late first or early second instar with the soil cemented with saliva seems similar to that of Edgar & Meadows (1969). Structure of the residence and the time for its construction are found the same as Scott (1967) and Chaudhuri & Das (1988). According to Oliver (1971), the duration of larval period has been noted as longer with the increase of latitude and climatic equivalent. The study reveals that temperature itself is not a factor controlling larval life, rather it plays the key role in determining the length of larval life. Other factors and food in particular have been found important (Forsyth, 1971). The duration of larval stages confirms Chaudhuri

& Chattopadhyay (1990) indicating gradual increase from the first to the fourth instars where maximum physiological changes take place before pupation. The pupal behavior is almost identical with Danks (1978).

The filter-feeding mechanism is more or less in agreement with Scott (1967). The time taken for filling up the alimentary tract appears a little more than that of Kajak & Warda (1968). The phenomenon of emergence is found to confine in the dusk only which is in conformity with Ali (1980).

ACKNOWLEDGEMENTS

We are indebted to the Ministry of Environment & Forests, Govt. of India for financial assistance for the work and to the University of Burdwan for laboratory facilities. We are thankful to Ms. Mou Nandi, Research Fellow of the project for technical assistance.

REFERENCES

- Ali, A. 1980. Nuisance Chironomids and their control: a review. *Bulletin of the American Entomological Society*, 26(1): 3–16.
- Bilyj, B. & Davies, I.J. 1989. Description and ecological notes on seven new species of *Cladotanytarsus* (Chironomidae: Diptera) collected from an experimentally acidified lake. *Canadian Journal of Zoology*, 67: 948–962.
- Chaudhuri, P.K. & Chattopadhyay, S. 1990. Chironomids of the rice paddy areas of West Bengal, India (Diptera: Chironomidae). *Tijdschrift voor Entomologie*, 133(2):149–195.
- Chaudhuri, P.K. & Das, S.K. 1988. *Cladotanytarsus gloveri* new species (Diptera: Chironomidae) from India. *Proceedings of the Zoological Society, Calcutta*, 38: 15–20
- Chaudhuri, P.K., Hazra, N. & Alfred, J.R.B. 2001. A check-list of Chironomid midges (Diptera : Chironomidae) of the Indian subcontinent. *Oriental Insects*. 35: 335–372.
- Danks, H.V. 1978. Some effects of photoperiod, temperature and food on emergence in three species of Chironomidae (Diptera). *Canadian Entomologist*, 110: 289-300.
- Edgar, W.D. & Meadows, P.S. 1969. Case construction, movement, spatial distribution and substrate selection in the larvae of *Chironomus riparius* Meigen. *Journal of Experimental Biology*, 50: 247-253.
- Epler, J.H. 1995. Identification manual for the larval Chironomidae (Diptera) of Florida. *Final report for DEP Contract No. WM 579, Departemnt of Environment Protection, Florida*. 1.1-9.6.
- Forsyth, D.J. 1971. Some New Zealand Chironomidae (Diptera). *Journal of the Royal Society of New Zealand*, 1(2): 113–144.
- Gilka, W. 2001. A review of Polish *Cladotanytarsus* Kieffer (Diptera: Chironomidae) with description of three new species. *Poliskie Pismo Entomologiczne*, 70: 307–328.
- Hirvenoja, M. 1962. *Cladotanytarsus*-Arten (Dipt.,Chironomidae) aus Finnish-Lapland. *Suomen Hyönteistietee Sllinen Aikakauskirja*. 28: 173–181.
- Hirvenoja, M. 1968. *Cladotanytarsus*-Arten (Diptera, Chironomidae) aus Finnish-Lapland. *Annales Entomologici Fennici*, 28:173–181.
- Kajak, Z. & Warda, J. 1968. Feeding of benthic non-predatory chironomidae in lakes. *Annales Zoologici Fennici*, 5: 57–64.

- Kieffer, J.J. 1921. Description de quelques Chironomides exotiques. *Annales de la Societe Scientifique de Bruxelles*, 40: 269–277.
- Mazumdar, A. & Chaudhuri, P.K. 2000. In: Mazumdar, A., Hazra, N. & Chaudhuri, P.K. New species of *Cladotanytarsus* Kieffer from the Deltaic region of West Bengal, India (Diptera: Chironomidae). *Oriental Insects*, 34: 193–202.
- Oliver, D.R. 1971. Life history of the Chironomidae. *Annual Review of Entomology*, 16: 211–230.
- Saether, O.A. 1980. Glossary of chironomid morphology, terminology (Diptera: Chironomidae). *Entomologica Scandinavica Supplementa*, 14: 1–51.
- Saether, O.A. 1990. A review of the genus *Limnophyes* Eaton from the Holarctic and Afrotropical regions (Diptera; Chironomidae, Orthocladiinae). *Entomologica Scandinavica*, 35: 1–139.
- Scott, K.M.F. 1967. The larval and pupal stages of the midge, *Tanytarsus (Rheotanytarsus) fuscus* Freeman (Diptera: Chironomidae). *Journal of the Entomological Society of South Africa*, 30(2): 175–184.
- Wang, X. & Zheng, L. 1993. A taxonomic study on Chironominae from China V. Genus *Cladotanytarsus* Kieffer. *Entomofauna*, 14: 1–12.
- Wirth, W.W. & Marston, N. 1968. A method for mounting small insects on microscope slides in Canada balsam. *Annals of the entomological Society of America*, 61: 783–784.

SHORT COMMUNICATION

V. M. Loktionov. *ANOPLIUS EOUS* YASUMATSU, 1936 (HYMENOPTERA, POMPILIDAE) IS NEWLY RECORDED FROM RUSSIA. – Far Eastern Entomologist. 2010. N 211: 11-12.

В. М. Локтионов. *Anoplius eous* Yasumatsu, 1936 (Hymenoptera, Pompilidae) – новый вид для фауны России // Дальневосточный энтомолог. 2010. N 211. С. 11-12.

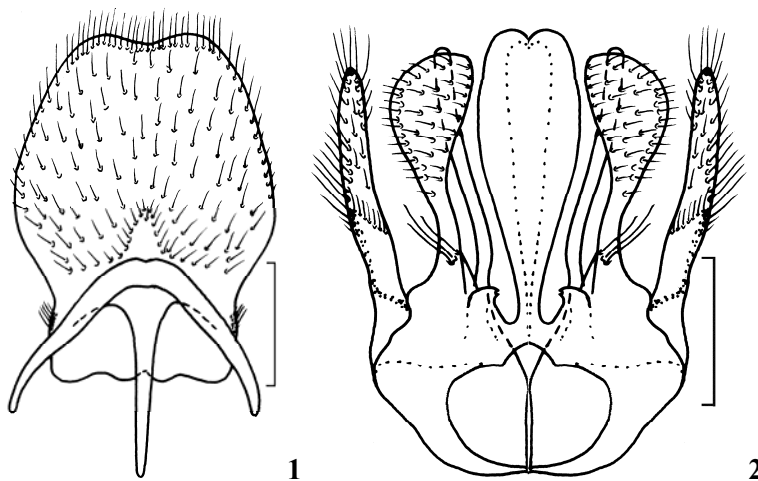
In spite of the review of the Far Eastern [1] and East Asian [2] *Anoplius*-species *A. eous* was unknown from Russia and herein recorded for the first time. Addition to the key of the species is given also. I thank Yu. Sundukov (Lazovskii Natural Reserve, Russia) for collecting of material and A. Shimizu (Tokyo Metropolitan University, Japan) for the sending of comparative material. This work was supported by the grant of Far Eastern Branch (N 09-III-A-06-174).

Anoplius (Anoplius) eous Yasumatsu, 1936

Anoplius eous Yasumatsu, 1936: 25, ♀ ♂ [holotype – ♂, “Ikeda, Settsu, Honshū, 5.VI 1932 (K. Iwata)” (Japan, Honshu), deposited in Kyushu University, Fukuoka, Japan].

MATERIAL. Russia: Primorskii krai, Lazovskii reserve, Prosyolochnyi, 21-25.VII 2008, 1 ♂ (Yu. Sundukov). Japan: Saitama Pref., Higashimatsuyama-shi, Ichinokawa, 20.VII 1989, 1 ♂ (A. Shimizu); the same place, 21.IX 1989, 1 ♀ (A. Shimizu).

DISTRIBUTION. Russia: Primorskii krai (first record). – Japan (Honshu, Kyushu) [2].



Figs 1-2. *Anoplius eous* (Primorskii krai): 1) sterna 7 and 8 (hypopygium), ventral view; 2) genitalia, ventral view. Scale bar 0.5 mm.

**Addition to the key of *Anoplius* species of the Russian Far East [1]
Females**

- 9. Head posterolaterally (dorsal view) strongly rounded. Ratio of genal median length to eye median length (lateral view) 0.3X. Frons, occiput, and propodeum with sparse erect setae. 7.5-11.0 mm ***A. (A.) iwatai* Yasumatsu**
- Head posterolaterally (dorsal view) angulate. Ratio of genal median length to eye median length (lateral view) 0.5X. Frons, occiput, and propodeum with dense erect setae 9a
- 9a. Flagellomere 1 length more than 5.0X its width. Pronotum, mesopleurae, and tergum 1 basally with dense erect setae. 13 mm ***A. (A.) eous* Yasumatsu**
- Flagellomere 1 length less than 4.0X its width. Pronotum, mesopleurae, tergum 1 basally without erect setae. 7.0-10.0 mm ***A. (A.) sachalinensis* Lelej**

Males

- 20. Hypopygium flat, not roof-like. 6.5-7.5 mm ***A. (A.) sachalinensis* Lelej**
- Hypopygium with median carina or roof-like 20a
- 20a. Hypopygium widened mesally, straight or weakly emarginated apically (Fig. 1). – Genitalia as in Fig. 2. 8.9 mm ***A. (A.) eous* Yasumatsu**
- Hypopygium widened basally, strongly narrowed apically 21

- 1. Lelej, A.S. 1995. 64. Fam. Pompilidae – Spider wasps. – In: Lelej A.S., Kupianskaya A.N., Kurzenko N.V. & Nemkov P.G. (Eds). *Key to the Insects of the Russian Far East*. Vol. IV. Pt 1. Sankt-Petersburg: Nauka. P. 211–264. (In Russian).
- 2. Lelej, A.S. & Yamane, Sk. 1994. A review of the East Asian species of *Anoplius* Dufour (Hymenoptera, Pompilidae). *Reports of the Faculty of Science Kagoshima University (Earth Sciences and Biology)*, 27: 229–244.

Author's address:

Institute of Biology and Soil Science,
Far Eastern Branch of Russian Academy of Sciences,
Vladivostok-22, 690022, Russia.
E-mail: pompilidaefer@mail.ru

© **Far Eastern entomologist (Far East. entomol.)** Journal published since October 1994.
Editor-in-Chief: S.Yu. Storozhenko
Editorial Board: A.S. Lelej, V.S. Sidorenko, N.V. Kurzenko, P.G. Nemkov
Address: Institute of Biology and Soil Science, Far East Branch of Russian Academy of Sciences, 690022, Vladivostok-22, Russia.
E-mail: entomol@ibss.dvo.ru web-site: <http://www.biosoil.ru/fee>