Two new species of the subgenus *Polypedilum* (s. str.) Kieffer, 1912 (Diptera: Chironomidae: *Polypedilum*) from China

Author(s): Ruilei Zhang, Liming Zhu, Wenbin Liu, Xin Qi and Xinhua Wang
Source: Pan-Pacific Entomologist, 93(1):7-13.
Published By: Pacific Coast Entomological Society
DOI: http://dx.doi.org/10.3956/2017-93.1.7
URL: http://www.bioone.org/doi/full/10.3956/2017-93.1.7

THE PAN-PACIFIC ENTOMOLOGIST
93(1):7–13, (2017)

Two new species of the subgenus *Polypedilum* (s. str.) Kieffer, 1912 (Diptera: Chironomidae: *Polypedilum*) from China

Ruilei Zhang[1], Liming Zhu[1], Wenbin Liu[2], Xin Qi[3] and Xinhua Wang[2,*]

[1]College of Fisheries and Life Science, Shanghai Ocean University, Shanghai 201306, China, e-mail: rlzhang@shou.edu.cn

[2]College of Life Sciences, Nankai University, Tianjin 300071, China

[3]College of Life Sciences, Taizhou University, Zhejiang 318000, China

*Corresponding author. E-mail: xhwang@nankai.edu.cn

Abstract. Two new species of *Polypedilum* (s. str.) Kieffer, 1912, from China with the anal point constricted apically, *P*. (s. str.) *adustalum* Zhang & Wang, **sp. n.**, and *P*. (s. str.) *constrictum* Zhang & Wang, **sp. n.**, are described and illustrated as male imagines. A checklist of *Polypedilum* subgenera and species from China is also presented.

Key Words. Chironomidae, *Polypedilum*, new species, China.

Introduction

Polypedilum Kieffer, 1912, has a cosmopolitan distribution and includes about 500 species (Cranston et al. 2016). It is a heterogeneous group, and the larvae occur in almost all lentic and lotic waters, except at high altitude and latitude. The male imagines of the genus can be recognized by the combination of deeply bifid pulvilli and abdominal segment VIII constricted basally giving it a triangular appearance. The delimitation of subordinate groups within *Polypedilum* is difficult and problematic since the diagnoses of different stages are not always consistent. Sæther et al. (2010) divided *Polypedilum* into eight subgenera: *Polypedilum* (s. str.); *P.* (*Pentapedilum*) Kieffer, 1913; *P.* (*Tripedilum*) Kieffer, 1921; *P.* (*Kribionympha*) Kieffer, 1921; *P.* (*Tripodura*) Townes, 1945; *P.* (*Uresipedilum*) Oyewo & Sæther, 1998; *P.* (*Cerobregma*) Sæther & Sundal, 1999; and *P.* (*Probolum*) Andersen & Sæther, 2010. Cranston et al. (2016) treated *Tripedilum* to as a junior synonym of *Polypedilum* (s. str.).

In the last decade, 40 new species of the genus *Polypedilum* have been described in China. To date, 82 species of *Polypedilum* assigned to six subgenera have been recorded in China, including six in *P.* (*Cerobregma*), eight in *P.* (*Pentapedilum*), 24 in *Polypedilum* (s. str.), one in *P.* (*Probolum*), 27 in *P.* (*Tripodura*), and 16 in *P.* (*Uresipedilum*) (Wang 2000; Wang et al. 2005; Lin et al. 2013; Qi et al. 2014; Zhang & Wang 2004, 2005a, 2005b, 2006, 2007a, 2007b, 2008; Zhang et al. 2015; Qi et al. 2016). In this contribution, two new species of *Polypedilum* (s. str.) with the anal point characteristically constricted distally are described based on male imagines.

Methods

The morphological nomenclature follows Sæther (1980). The material examined was mounted on slides following the procedure outlined by Sæther (1969). Measurements are given as ranges followed by a mean when there are three measurements, followed by the number measured (n) in parentheses. Specimens are deposited in the Department of Biology, Nankai University, China (BDN).

Checklist of *Polypedilum* subgenera and species from China

Polypedilum (*Cerobregma*) Sæther & Sundal, 1998

cyclus Zhang & Wang, 2005; *exilicaudatum* Sæther & Sundal, 1998; *jii* Zhang & Wang, 2005; *kamotertium* Sasa, 1989; *okigrandis* Sasa, 1993; *paucisetum* Zhang, Wang & Sæther, 2006.

Polypedilum (*Pentapedilum*) Kieffer, 1913

convexum (Johannsen, 1932); *fanjingensis* Zhang & Wang, 2005; *kamosecundum* (Sasa, 1989); *nodosum* (Johannsen, 1932); *paraconvexum* Zhang & Wang, 2005; *pseudosordens* Zhang & Wang, 2005; *sordens* (van der Wulp, 1874); *tenuis* Zhang & Wang, 2005.

Polypedilum (s. str.) Kieffer, 1912

acutum Kieffer, 1915; *aequabe* Zhang & Wang, 2007; *albicorne* (Meigen, 1838); *asakawaense* Sasa, 1980; *bisetosum* Wang, 1995; *benokiense* Sasa & Hasegawa, 1988; *coalitum* Zhang & Wang, 2008; *depile* Zhang & Wang, 2008; *edensis* Ree & Kim, 1981; *medivittatum* (Tokunaga, 1964); *nubifer* (Skuse, 1889); *genpeiense* Niitsuma, 1996; *hainanense* Zhang & Wang, 2008; *henicurum* Wang, 1995; *laetum* (Meigen, 1818); *lichuanensis* Wang, 1994; *nubeculosum* (Meigen, 1804); *pedestre* (Meigen, 1830); *shanguiensis* Wang, *tamanigrum* Sasa, 1983; *tsukubaense* (Sasa, 1979); *xianjuensis* Qing, Zhang, Zhu & Wang, 2016.

Polypedilum (*Probolum*) Andersen & Sæther, 2010

bullum Zhang & Wang, 2004

Polypedilum (*Tripodura*) Townes, 1945

absensilobum Zhang & Wang, 2016; *apiclusetosum* Zhang & Wang, 2016; *arcuatum* Zhang & Wang, 2106; *bilamella* Zhang & Wang, 2016; *bicrenatum* (Kieffer, 1921); *bispinum* Zhang & Wang, 2007; *cochlearum* Zhang & Wang, 2005; *conghuaense* Zhang & Wang, 2016; *cypellum* Qi, Shi, Zhang & Wang, 2014; *decematoguttatum* (Tokunaga, 1938); *dengae* Zhang & Wang, 2016; *falcutum* Zhang, Song, Wang & Wang, 2015; *harteni* Andersen & Mendes, 2010; *japonicum* (Tokunaga, 1938); *masudai* (Tokunaga, 1938); *mengmanense* Zhang & Wang, 2016; *napahaiense* Zhang & Wang, 2016; *nudiprostatum* Zhang, Wang & Sæther, 2006; *parallelum* Zhang & Wang, 2016; *pollicium* Zhang & Wang, 2016; *procerum* Zhang, Song, Wang & Wang, 2015; *quadriguttatum* Kieffer, 1921; *scalaneum* (Schrank, 1803); *spathum* Zhang & Wang, 2007; *trapezium* Zhang & Wang, 2016; *udominutum* Niitsuma, 1992; *unifascia* (Tokunaga, 1938).

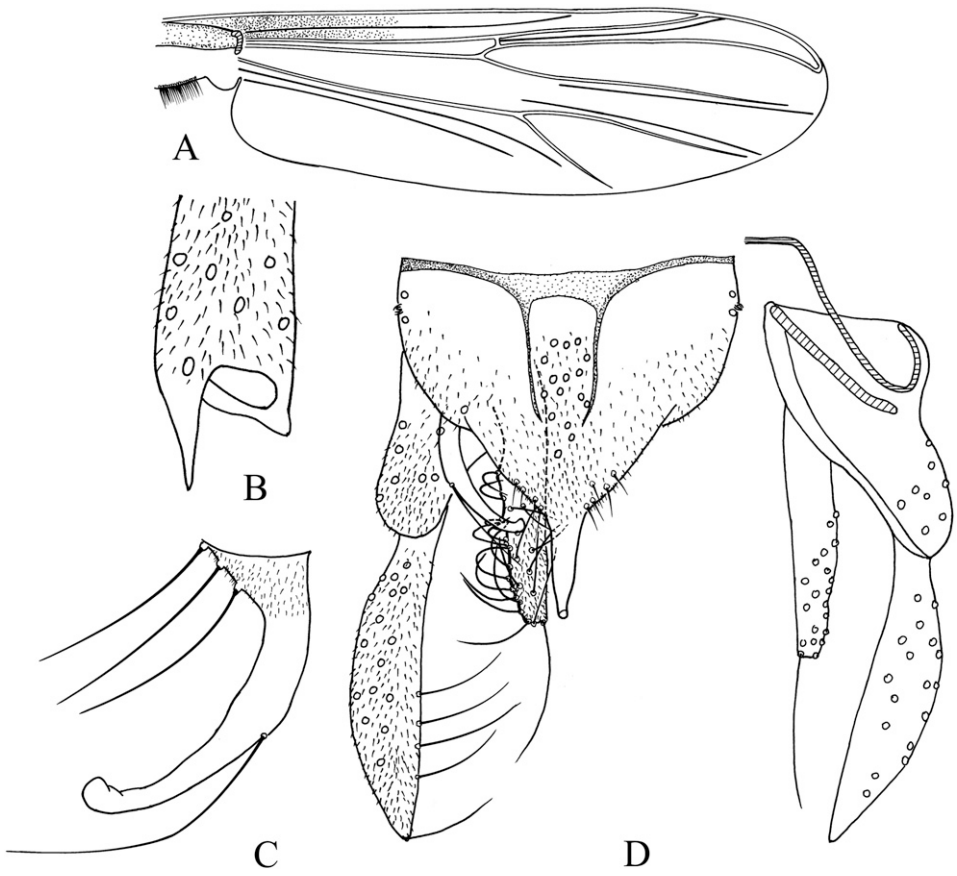
Polypedilum (*Uresipedilum*) Oyewo & Sæther, 1998

basilarum Zhang & Wang, 2004; *bingopardoxum* Kawai, Inoue & Imabayashi, 1998; *breviplumosum* Zhang & Wang, 2004; *convictum* (Walker, 1856); *crassiglobum* Zhang & Wang, 2004; *cultellatum* (Goetghebuer, 1931); *dilatum* Zhang & Wang, 2004; *infundibulum* Zhang & Wang, 2004; *lateralum* Zhang & Wang, 2004; *medium* Zhang & Wang, 2004; *minimum* Lin, Qi, Zhang & Wang; 2005; *paraviceps* Niitsuma, 1992; *prominens* Zhang & Wang, 2004; *surugense* Niitsuma, 1992; *xuei* Zhang & Wang, 2004.

Descriptions

Polypedilum (*Polypedilum*) *adustalum* Zhang & Wang, **sp. n.**
(Figure 1)

Type Specimens. Holotype: male (BDN. 1581), CHINA, Guangxi Zhuang Autonomous Region, Longsheng County, 23.V.1990, light trap, X. Wang.



Figures. 1. *Polypedilum* (s. str.) *adustalum* Zhang & Wang, sp. n. A. Wing. B. Fore tibial scale. C. Superior volsella. D. Hypopygium, dorsal and ventral view.

Diagnostic Characters: The species can be separated from other members of the subgenus by the wing having brown coloration in the proximal 2/5 of the area between vein C and R to R_{4+5} and having the anal point constricted from distal 1/4 to apex.

Etymology: From the Latin, *adustus*, brown, and *ala*, wing, referring to the brown coloration in the proximal 2/5 of the area between vein C and R to R_{4+5}.

Male imago (n =1)

Total length 5.15 mm. Wing length 2.55 mm. Total length/wing length 2.01. Wing length/length of profemur 1.82.

Table 1. Lengths (in μm) and proportions of legs of *Polypedilum* (s. str.) *adustalum* Zhang & Wang, sp. n.

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR
p_1	1400	960	1375	-	310	270	110	1.74
p_2	1525	1225	640	420	320	220	130	0.52
p_3	1650	1400	950	570	470	400	140	0.68

Coloration. Head dark brown. Thorax dark brown. Fore leg dark brown except for femur proximal 1/4 yellowish brown; mid and hind legs with femur distal 3/4 and tibia dark brown, femur with proximal 1/4 yellowish brown, tarsi stramineous. Abdominal segments I-V yellow, VI to hypopygium brown. Wing brown in the proximal 2/5 of the area between vein C and R to R_{4+5}.

Head. Frontal tubercles absent. AR 0.96. Ultimate flagellomere 670 µm long. Temporal setae 16. Clypeus with 25 setae. Tentorium 188 µm long, 48 µm wide. Palpomere lengths (in µm): 60, 88, 208, 170, 285.

Wing (Figure 1A). VR 1.20. R with 38 setae; R_1 with 32; R_{4+5} with 44. Squama with 38 setae. Anal lobe well developed.

Thorax. Dorsocentrals 21 including 4 humerals, acrostichals 17, prealars 6. Scutellum with 32 setae.

Legs. Terminal scale (Figure 1B) of front tibia 68 µm long, triangular and apically pointed. Spur on median tibia 70 um long including 45 µm long comb, un-spurred comb 43 µm long, spur on hind tibia 80 µm long including 50 µm long comb, un-spurred comb 40 µm long. Width at apex of front tibia 80 µm, of median tibia 78 µm, of hind tibia 88 µm. Lengths (in µm) and proportions of legs as in Table 1.

Hypopygium (Figures 1C, D). Anal tergite band developed and fused basally. Tergite IX with 16 median setae, laterosternite with 3 setae. Anal point 88 µm long, tapered basally and constricted from distal 1/4 to apex. Phallapodeme 150 µm long, transverse sternapodeme 75 µm long. Gonocoxite 255 µm long. Superior volsella (Figure 1C) 158 µm long, base covered with microtrichia and with 3 inner setae; distal extension gradually curved and expanded apically, 1 lateral seta placed in the middle. Inferior volsella 195 µm long with 22 orally directed setae (some of them split) and an apical seta. Gonostylus 255 µm long, with 4 long setae along inner margin and an apical seta. HR 1.00, HV 2.02.

Distribution: The species has only been collected at the type locality (Oriental China).

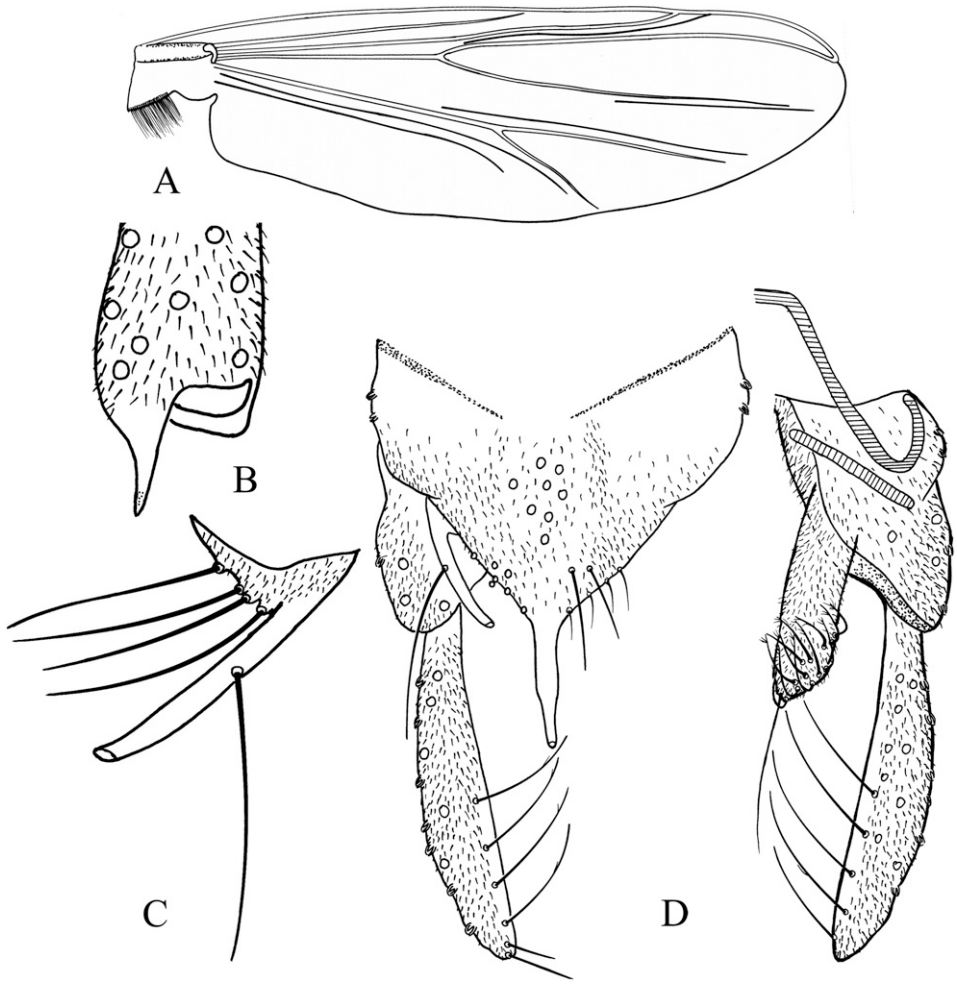
Remarks: The species is close to *P. pedestre* and *P. constrictum* Zhang & Wang, sp. n.; the differences between them are shown in Table 2.

Polypedilum (s. str.) *constrictum* Zhang & Wang, **sp. n.**
(Figure 2)

Type Specimens. Holotype: male (BDN. 02195), CHINA, Fujian Province, Wuyishan City, Mountain Wuyi, Sangang Town, 25.IV.1993, light trap, X. Wang.

Table 2. The differences between *Polypedilum* (s. str.) *pedestre*, *P.* (s. str.) *constrictum* Zhang & Wang, sp. n. and *P.* (s. str.) *constrictum* Zhang & Wang,, sp. n.

	P. pedestre	*P. adustalum*	*P. constrictum*
AR	0.74–0.97, 0.88	0.96	0.83–0.94, 0.88
Fore leg ratio	1.49–1.56, 1.51	1.74	1.89–1.97, 1.92
Brown area on wing	absent	present	Absent
Anal point	not constricted distally	constricted distally	constricted distally
Anal tergite band	fused basally	fused basally	not fused basally
Distal extension of superior volsella	curved gradually	curved gradually	nearly straight
Coloration of abdominal segments	I–V yellow, VI–XI brown	as in *P. pedestre*	uniformly brown



Figures. 2. *Polypedilum* (s. str.) *constrictum* Zhang & Wang, sp. n. A. Wing. B. Fore tibial scale. C. Superior volsella. D. Hypopygium, dorsal and ventral view.

Paratypes: 2 males: Fujian Province, Shanghang County, Buyun Town, Shiyankeng, 7.V.1993, light trap, X. Wang.

Diagnostic Characters: The species differs from other members of the subgenus by the anal point being constricted from distal 1/3 to apex, and having the distal extension of the superior volsella nearly straight.

Etymology: From the Latin, *constrictus*, contracted, referring to the anal point constricted from distal 1/3 to apex.

Male imago (n =3)

Total length 2.83–3.65, 3.26 mm. Wing length 1.70–2.27, 1.95 mm. Total length/wing length 1.61–1.76, 1.68. Wing length/length of profemur 2.43–2.54, 2.48.

Coloration. Head brown. Thorax brown with darker vittae, postnotum and preepisternum; halteres brown. Legs entirely stramineous. Abdominal segments brown.

Head. Frontal tubercles absent. AR 0.83–0.94, 0.88. Ultimate flagellomere 450–580, 510 μm long. Temporal setae 10–13, 12; including 3–4, 3 inner verticals, 4–6, 5 outer

verticals and 3–3, 3 postorbitals. Clypeus with 20–23, 22 setae. Tentorium 116–135, 124 µm long; 20–30, 25 µm wide. Palpomere lengths (in µm): 33–38, 35; 40–47, 44; 88–112, 98; 93–125, 108; 195–218, 210.

Wing (Figure 2A). VR 1.28–1.32, 1.30. R with 20–21, 20 setae, R_1 with 20–23, 22, R_{4+5} with 38–42, 40. Squama with 27–32, 30 setae. Anal lobe developed.

Thorax. Dorsocentrals 18–28, 23, including 4–6, 5 humerals, acrostichals 15–18, 16; prealars 5–6, 6. Scutellum with 13–23, 17 setae.

Legs. Terminal scale (Figure 2B) of front tibia 43–52, 47 µm long, triangular and apically pointed. Spur on median tibia 50–60, 55 µm long including 25–31, 29 µm long comb, un-spurred comb 25–29, 26 µm long, spur on hind tibia 58–70, 65 µm long including 28–35, 31 µm long comb, un-spurred comb 28–30, 29 µm long. Width at apex of front tibia 48–55, 51 µm, of median tibia 50–62, 57 µm., of hind tibia 55–73, 63. Lengths (in µm) and proportions of legs as in Table 3.

Hypopygium (Figures 2C, D). Anal tergite band not fused basally. Tergite IX with 7–11, 9 median setae. Laterosternite with 2–3, 3 setae. Anal point 80–83, 81 µm long, slender, tapered basally and constricted from distal 1/3 to apex. Phallapodeme 78–88, 83 µm long, transverse sternapodeme 28–47, 37 µm long. Gonocoxite 178–212, 193 µm long. Superior volsella (Figure 2C) 78–95, 87 µm long, base wide with 3–4 inner setae and coved with microtrichia; distal extension nearly straight, and 1 lateral seta placed in the middle. Inferior volsella 110–115, 112 µm long, with 13–17 split oral setae and an apical seta. Gonostylus 178–212, 193 µm long, with 4–5 long setae branched along inner margin and an apical seta. HR 0.79–0.83, 0.82. HV 1.59–1.74, 1.68.

Distribution: The species is known from Oriental China.

Remarks: It is characteristic of the species that the anal point is constricted from distal 1/3 to apex. This species resembles the Holarctic species *P. albicorne* but differs by the combination of following characters: anal point constricted from the distal 1/3 to apex (tapered from base to apex in *P. albicorne*) (Figure 43 in Maschwitz & Cook 2000); fore leg ratio (1.89–1.97) higher (1.47–1.58 in *P. albicorne*) (Maschwitz & Cook, 2000); anal tergite band not fused (fused in *P. albicorne*).

Acknowledgments

Financial support from the National Natural Science Foundation of China (NSFC, grant Nos. 31201739, 31272284, 31301908; J1210005), Fauna of China (FY120100)) are acknowledged with thanks.

Table 3. Lengths in µm (means and ranges) and proportions of legs of *Polypedilum* (s. str.) *constrictum* Zhang & Wang, sp. n.

	fe	ti	ta_1	ta_2
p_1	784 (700–8930)	570 (510–630)	1096 (970–1242)	722 (640–837)
p_2	1034 (920–1161)	890 (800–999)	451 (400–504)	282 (250–315)
p_3	1053 (920–1215)	940 (830–108)	645 (590–746)	370 (330–420)
	ta_3	ta_4	ta_5	LR
p_1	417 (380–462)	397 (350–431)	166 (150–189)	1.92 (1.89–1.97)
p_2	224 (192–252)	141 (130–158)	87 (80–95)	0.5 (0.50–0.52)
p_3	327 (275–360)	192 (175–210)	92 (85–105)	0.69 (0.66–0.71)

Literature Cited

Cranston, P., J. Martin & P. Spies. 2016. Cryptic species in the nuisance midge *Polypedilum nubifer* (Skuse) (Diptera: Chironomidae) and the status of *Tripedilum* Kieffer. *Zootaxa* 4079(4): 429–447.

Kieffer, J. J. 1912. Tendipedidae. In: H. Sauter's Formosa-Ausbeute, Tendipedidae (Chironomidae) (Dipt.). *Supplementa Entomologica* 1:27–43.

Maschwitz, D. E. & E. F. Cook. 2000. Revision of the Nearctic species of the genus *Polypedilum* Kieffer (Diptera: Chironomidae) in the subgenera *P*. (*Polypedilum*) and *P*. (*Uresipedilum*) Oyewo and Sæther. *Bulletin of the Ohio Biological Survey*, *New Series* 12:1–135.

Lin, X. L., X. Qi, R. L. Zhang & X. H. Wang. 2013. A new species of *Polypedilum* (*Uresipedilum*) Oyewo & Saether, 1998 from Zhejiang Province of Oriental China (Diptera, Chironomidae). *Zookeys* (320):43–49.

Qi, X., S. D. Shi, R. L. Zhang & X. H. Wang. 2014. *Polypedilum* (*Tripodura*) *cypellum* sp. nov. (Diptera: Chironomidae) from Xishan Island, Zhejiang Province. *Entomotaxonomia* 36(2):119–122.

Qi, X., R. L. Zhang, L. F. Zhu & X. H. Wang. 2016. A new species in the genus *Polypedilum* (Diptera: Chironomide) from the Xianju National Park, Zhejiang. *Entomotaxonomia* 38(2):131–134.

Sæther, O. A. 1969. Some Nearctic Podonominae, Diamesinae and Orthocladiinae (Diptera: Chironomidae). *Bulletin of the Fisheries Research Board of Canada* 170:1–154.

Sæther, O. A. 1980. Glossary of chironomid morphology terminology (Diptera: Chironomidae). *Entomologica Scandinavica Supplement* 14, 51 pp.

Sæther, O. A., T. Andersen, L. C. Pinho & H. F. Mendes. 2010. The problems with *Polypedilum* Kieffer (Diptera: Chironomidae), with the description of *Probolum* subgen. n. *Zootaxa* 2497:1–36.

Wang, X. H. 2000. A revised checklist of Chironomidae from China (Diptera), pp. 629–652. *In*: O. Hoffrichter (Ed.), *Late 20th Century Research on Chironomidae: An Anthology from the 13th International Symposium on Chironomidae*. Shaker Verlag, Aachen, 678 pp.

Wang, X. H., H. Q. Tang, R. L. Zhang, Y. H. Guo, C. C. Yan, Y.D. Liu, M. Cheng & X. Qi. 2005. Family Chironomidae, pp 384–393. *In*: M. F. Yang & D. C. Jin (Eds.), *Insect of Dasha River, Guizhou Pronvice, Guizhou People's Publishing House*, Guizhou, 607 pp.

Zhang, R. L. & X. H. Wang. 2004. *Polypedilum* (*Uresipedilum*) Oyewo and Sæther from China (Diptera: Chironomidae). *Zootaxa* 565:1–38.

Zhang, R. L. & X. H. Wang. 2005a. *Polypedilum* (*Cerobregma*) *S*æther & Sundal from China (Insecta: Diptera: Chironomidae). *Aquatic Insects* 27(1):47–55.

Zhang, R. L. & X. H. Wang. 2005b. Description of new species of *Polypedilum* (*Pentapedilum*) Kieffer from China (Diptera: Chironomidae: Chironomini). *Studia Dipterologica* 12:63–77.

Zhang, R. L., X. H. Wang & O. A. Sæther. 2006. Two unusual species of *Polypedilum* Kieffer (Diptera: Chironomidae) from Oriental China. *Zootaxa* 1282:39–48.

Zhang, R. L. & X. H. Wang. 2007a. A new species of subgenus *Polypedilum* (s. str.) Kieffer (Diptera: Chironomidae) from China. *Entomotaxonomia* 29(4):293–296.

Zhang, R. L. & X. H. Wang. 2007b.Two new species of *Polypedilum* (*Tripodura*) Townes from Oriental China (Diptera, Chironomidae). *Acta Zootaxonomica Sinica* 32(4):787–791.

Zhang, R. L. & X. H. Wang. 2008. Three new species of *Polypedilum* s. str. Kieffer from China, with L-shaped superior volsella (Diptera: Chironomidae). *Zootaxa* 1702:61–68.

Zhang, R. L., C. Song, L. Q. Wang & X. H. Wang. 2015. Two new species of the *acifer* species group of *Polypedilum* subgenus *Tripodura* Townes from China (Diptera: Chironomidae). *Zootaxa* 3918(4):571–578.

Zhang, R. L., C. Song, X. Qi & X. H. Wang. 2016. Taxonomic review on the subgenus *Tripodura* Townes (Diptera: Chironomidae: *Polypedilum*) from China with eleven new species and a supplementary world checklist. *Zootaxa* 4136(1):001–053.

Received 16 May 2016; Accepted 14 Dec 2016 by C. J. Borkent; Publication date 24 March 2017