

A new species of *Simulium* (*Simulium*) (Diptera: Simuliidae) from Hainan Island, China

Ru CAI¹Ⓐ, Yidi LIU¹, Ji Yao AN²

1. Department of Microbiology and Parasitology, Medicine, Anhui University of Science and Technology, Huainan, Anhui 232001, China

2. State Key Laboratory of Pathogens and Biosecurity, Institute of Microbiology and Epidemiology, Beijing 100071, China

Abstract: A new species in the subgenus *Simulium* Latreille s. str. in the genus *Simulium* is described and illustrated. *Simulium* (*Simulium*) *sanyaense* sp. nov. is from the Sanya District on Hainan Island China. This new species is assigned to the *tuberosum*-group of the subgenus *Simulium* and is closely related to *Simulium* (*S.*) *nitidithorax* Puri (1932), *Simulium* (*S.*) *brevipar* Takaoka and Davies (1995), *Simulium* (*S.*) *tianchi* Chen, Zhang and Yang (2003), and *Simulium* (*S.*) *sigiti* Takaoka and Hadi (1991). However, it is differentiated from them by the genital plate, the enlarged sensory vesicle and the shape of cibarium in the female, and the pupal gill lacking a pit-like cuticular organ.

Key words: *Simulium* (*Simulium*) *sanyaense*; black flies; taxonomy

中国海南蚋科昆虫一新种（双翅目）

蔡茹¹Ⓐ, 刘一荻¹, 安继尧²

1. 安徽理工大学医学院病原生物学教研室, 安徽 淮南 232001; 2. 军事医学科学院微生物和流行病研究所, 病原微生物生物安全国家重点实验室, 北京 100071

摘要: 记述海南岛蚋属 *Simulium* 蚋亚属 *Simulium* 1 新种, 即三亚蚋。该新种与 *Simulium* (*S.*) *nitidithorax* Puri, 1932 (来自印度), *Simulium* (*S.*) *brevipar* Takaoka & Davies, 1995 (来自马来西亚), *Simulium* (*S.*) *tianchi* Chen, Zhang & Yang, 2003 (来自中国海南岛), *Simulium* (*S.*) *sigiti* Takanoka & Hadi, 1991 (来自印度尼西亚) 相似, 但该蚋种雌虫腹部第 8 腹节腹板两侧中部具椭圆形的骨化板, 上面生有 11 根粗刚毛和许多微毛; 生殖板内侧下缘具绳状突起, 与上述 4 种皆然不同。

关键词: 三亚蚋; 黑蝇; 分类

Introduction

The simuliid fauna of Hainan Island has been very poorly studied. Only a total of 2 species of black flies were listed by Long and An (1994). During the last nearly 20 years, 16 new species and 7 newly recorded species totaling 23 species belonging to 3 subgenera have been listed (Adler & Crosskey 2015). In this paper, a new species *Simulium* (*Simulium*) *sanyaense* sp. nov., is reported with a morphological description and a taxonomic discussion.

Received 17 August 2016. Published 25 September 2016. Published online 18 September 2016.

Ⓐ Corresponding author, E-mail: lxhcrh@aliyun.com

Taxonomy

Simulium (*Simulium*) *sanyaense* sp. nov. (Figs. 1–7)

Female. Body length 2.5 mm. Wing length 2.3 mm.

Head. Slightly narrower than the width of the thorax; frons black, shiny, thin, whitish grey pruinose, with several dark stout hairs along lateral margins. Clypeus black, thin, whitish grey pruinose, with scattered dark stout hairs; frontal ratio, 30 : 25 : 32; and frons-head ratio, 35 : 123. Antenna with 2+9 segments, brownish black except scape and pedicel, brownish yellow. Maxillary palp composed of five segments, proportional lengths of 3rd, 4th and 5th segments are in the ratio of 20 : 22 : 45; and 3rd segment is somewhat swollen, with sensory vesicle 0.5–0.6 times as long as 3rd segment (Fig. 3). Maxilla with 19 inner and 17 outer teeth; mandible with 36 inner and 32 outer teeth; and cibarium with numerous well-developed tubercles (Fig. 2).

Thorax. Scutum brownish black, shiny, thinly whitish grey pruinosity, densely covered with black recumbent pubescence. Scutellum brownish black with several erect long brownish black hairs posteriorly. Postscutellum brownish black, whitish grey pruinosity, bare. Pleural membrane and katepisternum bare. Legs: foreleg, coxae and trochanter brownish yellow except trochanter on distal 2/3th brownish black; femur brownish black except its base brownish yellow; tibia brownish black except outer tibia on median portion largely pale white; rest of tarsal segments brownish black. Midleg, coxae and trochanter brownish black except trochanter on base brownish yellow; femur and tibia brownish black except tibia base brownish yellow; tarsal segments brownish black except basitarsus on basal portion and hind median portion brownish yellow. Hind leg, coxae brownish black; trochanter brownish yellow; femur and tibia brownish black except femur and tibia base brownish yellow; tarsal brownish black except on the basal 2/3th of basitarsus and basal 1/5th of 2nd tarsomere brownish yellow. Calcipala developed, about 0.6 times as long as width of basitarsal tip and reaching the pedisulcus; pedisulcus distinct about basal 1/3th of 2nd tarsal segment (Fig. 4). Claws simple (Fig. 5). Wing: costa with spinules as well as hairs; subcosta with 23 root hairs on its basal 3/4th.

Abdomen. Basal scale black with fringe of brownish black hairs. Dorsal surface of abdomen brownish black, tergites 5–7 large, black, shining, with black hairs. Genitalia (Fig. 1): sternite 8 well sclerotized, bare medially, with ellipse sclerotized board on each side, with 11 thick setae and microsetae on each sclerotized board. Anterior gonapophyses thin, membranous, triangular, covered with microsetae and a few short setae; inner border narrowly sclerotized, with rounded cord break on inner posterior border end. Genital fork of inverted-Y form, with well sclerotized stem and arms; arms with stout outer projection of distal section on each arm (Fig. 1). Paraproct in ventral view, horizontal wide, hat shaped, moderately setose and with numerous microsetae (Fig. 1). Cercus circular and cone shaped, with many moderate setae and numerous microsetae (Fig. 1). Spermatheca round, strongly sclerotized, but lacking internal hairs.

Pupa. Body length 2.6 mm. Gill filament length 1.6 mm (Fig. 6).

Head and thorax. Integument yellow, densely covered with tubercles, with 1 facial and 2 frontal pairs of short, slender, simple trichomes, facial trichomes much longer than frontal ones. Thorax: integument yellowish brown, densely covered with tubercles, with 2 dorsal and

2 lateral pairs of rather long simple trichomes on anterior 1/2th plus 1 lateral pair of trichomes on posterior 1/2th, those trichomes are subequal in length to each other, but much longer than facial ones. Gill with 6 thick filaments, arranged in groups of 2, 2, 2; with short stalks.

Abdomen. Tergum 2 with 5 thin, spine like setae on each side. Terga 3 and 4 with 4 hooked spines along posterior margin on each side; tergum 7 with 4 spinous setae along posterior margin on each side. Tergum 8 each with 11 thin hooked spines along posterior margin on each side. Tergum 9 each with a transverse row of spiney-scales on each side. Sternum 5 with 2 hooked spines along posterior margin on each side; sternum 6 and 7 with 2 distinct simple hooks per side.

Cocoon. Simple, wall pocket-shaped, moderately woven, extending ventrolaterally, and with thick anterior margin (Fig. 7).

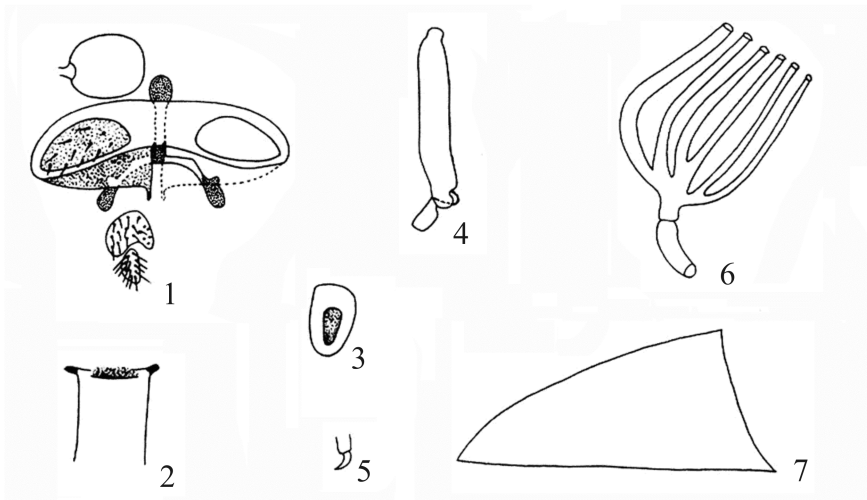
Male and mature larva. Unknown.

Holotype. ♀, **China**, Hainan Island, Sanya District, 18.2°N, 109.5°E, alt. 200 m, 20-IV-1993. Coll. Zhimei LONG. **Paratypes.** 1♀ and 2 pupae with data same as holotype.

Ecological Notes. Pupae of this species were collected on twigs, leaves and stems of grasses trailing in the water of medium shaded streams (2–3 m wide).

Distribution. China (Hainan Island, Sanya District).

Etymology. The specific epithet is named after the type locality, Sanya District, and is used as noun in apposition.



Figures 1–7. *Simulium (Simulium) sanyaense* sp. nov. 1–5. Female; 6, 7. Pupa. 1. Genitalia, ventral view; 2. Cibarium; 3. Third segment of maxillary palp; 4. Hind basitarsus and 2nd tarsal segment; 5. Claw; 6. Pupal gill filaments; 7. Pupal cocoon.

Remarks. The subgenus *Simulium* was well defined by Crosskey (1969) and was recently divided into 24 species-groups (including this new species) based on many criteria established by Rubtsov (1956). Out of all 50 species in the *tuberosum*-group, China has 15 species, among which 2 species, *Simulium (Simulium) tianchi* Chen *et al.* (2003) and *Simulium (Simulium) nitidithorax* Puri (1932) (Adler & Crosskey 2015), have been found on Hainan Island. In this paper, a new species, *Simulium (Simulium) sanyaense* sp. nov. from the Sanya District, Hainan

Island of China has been described.

This new species is assigned to the *tuberosum*-group based on the shape of the genitalia and the 6-filamented pupal gill. This new species most closely resembles *Simulium* (*S.*) *nitidithorax* Puri (1932) from India, *Simulium* (*S.*) *brevipar* Takaoka & Davies (1995) from Malaysia, *Simulium* (*S.*) *tianchi* Chen *et al.* (2003) from China, and *Simulium* (*S.*) *sigiti* Takaoka & Hadi (1991) from Indonesia. However, it is clearly differentiated from them by the sternite 8 well sclerotized, bare medially, with an elliptical sclerotized board on each side, and with 11 thick setae and microsetae on each sclerotized board. Also, the anterior gonapophyses inner border is narrowly sclerotized, with rounded cord break on inner posterior border end (in all 4 species), and lacking a pit-like cuticular organ at the base of the pupal gill (Fig. 7), and the enlarged sensory vesicle and shape of cibarium of the female (from the latter 3 species).

Acknowledgements

This work was supported by the Provincial Natural Science Foundation of Anhui (1408085MH193), and the National Undergraduate Training Programs for Innovation and Entrepreneurship (201510361099).

References

- Adler PH & Crosskey RW. 2015. World Blackflies (Diptera: Simuliidae): A comprehensive revision of the taxonomic and geographical inventory. Available from: <http://www.clemson.edu/cafls/biomia/pdfs/blackflyinventory.pdf>. (Accessed 8 March 2015)
- Chen HB, Zhang CL & Yang M. 2003. Descriptions of two new species in the subgenus *Nevermannia* Enderlein and *Simulium* Latreille from Hainan Island, China (Diptera: Simuliidae). *Acta Zootaxonomica Sinica*, 28(4): 745–750.
- Crosskey RW. 1969. A reclassification of the Simuliidae (Diptera) of Africa and its islands. *Bulletin of the British Museum (Natural History) (Entomology)*, Supplements, 14: 1–195.
- Long ZM, An JY, Hao BS, Yan G & Yuan WH. 1994. Two new Blackflies of *Simulium* (*Gomphostilbia*) from Hainan Island, China (Diptera: Simuliidae). *Chinese Journal of Vector Biology and Control*, 5(6): 405–409.
- Puri IM. 1932. Studies on Indian Simuliidae. Part II. Descriptions of males, females and pupae of *Simulium rufebasis*, Brunetti, its variety *fasciatum* nov. var. and of three new species from the Himalayas. *Indian Journal of Medical Research*, 19(3): 899–916.
- Rubtsov IA. 1956. *Blackflies (Diptera: Simuliidae)* (Second edition). *Fauna of the USSR (New Series No. 64)*. Nauka, Moscow, 859 pp.
- Takaoka H & Davies DM. 1995. *The BlackFlies (Diptera: Simuliidae) of West Malaysia*. Kyushu University Press, Japan, 175 pp.
- Takaoka H & Hadi UK. 1991. Two new blackfly species of *Simulium* (*Simulium*) from Java, Indonesia (Diptera: Simuliidae). *Japanese Journal of Tropical Medicine and Hygiene*, 19(4): 357–370.