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Review of the *Hydrotaea meteorica* group (Diptera, Muscidae)

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Abstract. A review of the world fauna of the *H. meteorica* group, which, according to the present publication, consists of six valid species, is offered. It is proposed that the group originated from SE Asia and recently several of its species have been widely spread along with cattle breeding. Four new synonymies are offered: *Hydrotaea affinis* Karl, 1935 = *H. zao* Shinonaga & Kano, 1971, **syn.nov**. = *H. affinoides* Feng & Feng, 1997, **syn.nov**. and *Hydrotaea nigribasis* Stein, 1913 = *H. australis* Malloch, 1923, **syn. nov**. = *H. dukouensis* Ni, 1982, **syn. nov**. Considering these cases, the author has formulated his approaches to the synonymy in general. Keys to males and females of the *H. meteorica* group are given.

Keywords: Diptera, Muscidae, *Hydrotaea meteorica* group, identification keys, synonymy

Обзор группы видов *Hydrotaea meteorica* (Diptera, Muscidae)

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Аннотация. Предложен обзор мировой фауны группы видов *H. meteorica*, которая согласно этой публикации, включает шесть валидных видов. Предположено, что рассматриваемая группа видов происходит из Юго-Восточной Азии, а в недавние времена некоторые виды широко распространились благодаря скотоводству. Предложены четыре новых синонима: *Hydrotaea affinis* Karl, 1935 = *H. zao* Shinonaga & Kano, 1971, **syn.nov**. = *H. affinoides* Feng & Feng, 1997, **syn.nov**. и *Hydrotaea nigribasis* Stein, 1913 = *H. australis* Malloch, 1923, **syn. nov**. = *H. dukouensis* Ni, 1982, **syn. nov**. На примере рассмотренных видов автором сформулированы общие подходы к синонимии. Даны определительные ключи по самцам и самкам для группы видов *H. meteorica*.

Ключевые слова: Diptera, Muscidae, группа видов *Hydrotaea meteorica*, определительные ключи, синонимия

Introduction

Males of the species included in the *Hydrotaea meteorica* group have on the apex of *f1* a pair of swollen spines dilated basally and sharpened apically (Fig. 4), instead of a pair of rigid teeth typical for *Hydrotaea*. They have a compact habitus, even somewhat roundish, with a large head and short body (Fig. 1). Their c haetotaxy i s a s follows: *f2* with a regular row of spinulose ventral setae in basal half; *t2* with 2 *p*, without *ad*; *t3* with *pd* seta weak (not longer than tibia width) or absent. Outer rows of *ac* are represented by rather strong setae, distinctly longer than scutal ground setulae.

The adults are cattle secretophages and are often attracted to the human body. They also visit cattle dung, where larvae breed (Pont 1973). According to the present publication, the world fauna consists of six valid species. Three species (*Hydrotaea affinis* Karl, 1935; *Hydrotaea cilifemorata* Emden, 1965 and *Hydrotaea spinigena* Xue & Li, 1995) are dustributed in SE Asia, and I suppose that the *H. meteorica* group originated from this region. Other three species (*Hydrotaea cinerea* Robineau-Desvoidy, 1830; *Hydrotaea meteorica* Linnaeus, 1758 and *Hydrotaea nigribasis* Stein, 1913) are widely distributed, which is quite expected for species associated with cattle.

Material and Methods

The specimens examined are deposited in the following museums:

ANIC — Australian National Insect Collection, Canberra, Australia;

MNHN — Muséum national d'Histoire naturelle, Paris, France;

ZIN — Zoological Institute, Saint Petersburg, Russia;

ZMHU — Museum für Naturkunde, Humboldt–Universität zu Berlin, Germany;

ZMUM — Zoological Museum of Moscow University, Russia (not indicated in the text).

Geographical coordinates are given in the decimal degrees format. 'River' is abbreviated to 'R.'

The following generally accepted abbreviations for morphological structures are used: *f1*, *t1*, *f2*, *t2*, *f3*, *t3* = fore-, mid-, hind- femur or tibia respectively; *ac* — acrostichal setae; *dc* — dorsocentral setae; *prst* — presutural; *post* — postsutural; *a*, *p*, *d*, *v* = anterior, posterior, dorsal, ventral seta(e).

The abbreviation for the tarsi as *tar* followed by a pair of digits separated by a hyphen was proposed by Vikhrev (2011): the first digit (1 to 3) gives the leg number and the second digit (1 to 5) the number of the tarsal segment. For example, *tar1-4* = 4th segment of fore tarsus; *tar3-1* = hind basitarsus.

When referring to figures, to avoid confusion I capitalise the first letter (Fig. or Figs.) for those appearing in this paper and use lowercase (fig. or figs.) for those published elsewhere.

List of species of the *Hydrotaea meteorica* group with extensive taxonomic comments

Hydrotaea affinis Karl, 1935
Fig. 5

Hydrotaea affinis Karl, 1935: 38. Type locality: Tainan, Formosa (= Taiwan).

Hydrotaea zao Shinonaga & Kano, 1971. Type locality: Japan, Honshu, **syn.nov**.

Hydrotaea affinoides Feng & Feng, 1997. Type locality: China, Sichuan prov., Yaan env., Mt. Zhougong (29.946°N, 103.040°E), 1700 m, **syn.nov**.

Hydrotaea affinis Karl, 1935: Emden (1965, redescription).

Hydrotaea zao Shinonaga & Kano, 1971: Shinonaga & Kano (1971); Shinonaga (2003, redescription).

Hydrotaea affinoides Feng & Feng, 1997: Fan (2008: 484, redescription in Chinese; 1017–1023, identification key, in English.

Material examined: INDIA, *West Bengal* state, Kalimpong, 27.06°N, 88.43°E, 16–30.11.2013, K. Tomkovich, 1♂; RUSSIA, *Primorsky* Reg.: Andreevka env, 42.7°N, 131.1°E, 26–31.07.2018, N. Vikhrev, 3♂, 21♀, first record for Russia. THAILAND: *Chanthaburi* province, Khao Khitchakut National Park, 12.82°N, 102.13°E; 1–4.11.2009, N. Vikhrev, 1♂; 3–6.12.2011, D. Gavryushin, 1♂; N. Vikhrev, 1♂; *Nakhon Ratchasima* province, Khao Yai National Park, 11.02.2009, N. Vikhrev, 1♂.

Distribution. SE Asia. China: Taiwan and Sichuan provinces; India: Madras and West Bengal states; Japan, Honshu; Russia, Primorsky region; Central Thailand.

Discussion on synonymy. Males of *H. affinis* are unmistakable due to a row of 4–6 long apically downcurved *pv* setae in the apical quarter of *t3* (Fig. 5). More precisely, they were easily distinguishable before two more species with the same modification of hind tibia were described from Japan and China. Shinonaga & Kano (1971) and Shinonaga (2003) compared *H. zao* with *H. meteorica* but did not compare it with *H. affinis*. *H. affinoides* was described as a species with calypters 'dirty white' while *H. affinis* has calypters 'pale brown' (Fan 2008).

1. Let us compare the diagnostic value of the two mentioned characters: the modified *t3* and the colour of calypters. The most appropriate analogy belongs to William Paley and is widely known from Richard Dawkins's book *The blind watchmaker*: a stone has a common natural origin, whereas a watch implies the presence of an intelligent design. The row of curved *pv* setae on *t3* is a 'watch': it is a complex and ordered structure that was created by the directed action of natural selection. It is obvious that such a modification occurred only once; therefore, all its owners are at least closely related organisms. Another 'watch' character is the unusual shape of apical teeth on the male fore femur: swollen spines dilated basally and sharpened apically (Fig. 4). This synapomorphic character is shared by the species of the *H. meteorica* group, and actually this was the reason of recognizing this group. In such terms the characters like dirty white/pale brown colour of the calypters or the number (4 to 6) the apically curved *pv* setae on *t3* are 'stones'. Below, I will use the terms 'strong' or 'weak' characters instead of 'watch' and 'stone'.

The description of new species on the base of weak characters is not convincing unless there are at least two correlating independent weak characters and intraspecific variability has been studied on a large enough series of specimens. Neither *H. zao* nor *H. affinoides* satisfies these conditions.

2. By analogy with 'case law' (in Russian: *прецедентное право*), I'd like to propose on this example the principle of 'case taxonomic approach' (i.e. in Russian: *прецедентный таксономический подход*). *H. affinis* is an uncommon species poorly represented in insect collections. Instead of describing new *H. affinis*-like species from few available specimens on the base of difference of the calypters colour, the authors should have started with studying variability of the same character in related, much more common and much better represented in collections *H. meteorica*. In *H. meteorica* the colour of calypters varies widely from yellow to dark brown, commonly there are yellow and brown-calypter specimens from the same locality. I consider this variability as intraspecific, either inherited or induced by external conditions, such as temperature. Only if someone convincingly justifies the need for splitting *H. meteorica* into several species on the base of variability of the calypters colour, it would be reasonable to discuss the same approach to *H. affinis*.

3. The third principle — 'no difference, no validity' — is a practical application of the main approach to any scientific investigation, namely Occam's presumption 'not to produce unnecessary entities'. If author(s) forgot (or 'forgot') to compare a newly described species with a really similar one(s) but compared it only with an obviously different one(s), then such new species goes to synonymy without long discussions. This principle may well be applied to *H. zao*.

So, *Hydrotaea affinis* Karl, 1935 = *H. zao* Shinonaga & Kano, 1971, **syn.nov**. (using the above suggested principles 1 and 3) = *H. affinoides* Feng & Feng, 1997, **syn. nov**. (using the above suggested principles 1 and 2).

Hydrotaea cinerea Robineau-Desvoidy, 1830

Hydrotaea palpalis Robineau-Desvoidy, 1830

Hydrotaea gracilis Robineau-Desvoidy, 1830

Hydrotaea trimucronata Pandelle, 1889

Material examined: KAZAKHSTAN, *East Kazakhstan* Reg., 49.25°N, 87.00°E Ust'-Chindagatuy env., 1750 m, 3–5.07.2012, O. Kosterin, 2♂. MONGOLIA, *Uvs* aimak, 10 km W of Uureg Nuur Lake, 50.17°N,

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90.73°E, 1700 m, YPT, W. Slaymaker & A. Reshchikov, 11–13.07.2010, 1♂; Sredne-Gobiysky (= *Dundgobi*) aimak, somon Luus (45.5°N, 105.8°E), 23–24.07.1967, V. Zaitsev, 1♂ (both ZIN). RUSSIA: *Buryatia* Reg.: Mondy env, 51.67°N, 100.94°E, Irkut R., 1350 m, 20–26.06.2021, N. Vikhrev, 1♂. TURKEY, (*Antalya* province), Manavgat env., pine forest (36.76°N, 31.44°E), 31.03.2008, N. Vikhrev, 1♂. UKRAINE, *Kharkov* Reg., Kharkov env., 18.05.1881, K. Yaroshevsky, 2♂ (ZIN).

Distribution. Palaearctic.

Hydrotaea cilifemorata Emden, 1965

Type locality: India, Uttarakhand state, Mundali (forest), 9000 ft. (2500 m) (30.83°N, 77.95°E); ♂ holotype and 2♀ paratypes in Zoological survey of India, Calcutta (whether they still exist or not is unknown), 2♀ paratypes in BMNH, London.

Material examined: INDIA, *Uttarakhand* state, 30.407°N, 78.289°E (Surkunda Devi Temple trek starting point), 2500 m, (around horses), 9–10.09.2010, N. Vikhrev, 18♂, 2♀.

Distribution. So far known only from India, Uttarakhand state.

Hydrotaea meteorica Linnaeus, 1758
Fig. 1

Hydrotaea constans Harris, 1780

Material examined: ARMENIA, Arzakan (40.45°N, 44.60°E), 1.08.1969, V. Rikhter, 1♂ (ZIN); BELARUS: *Gomel*, *Minsk* and *Vitebsk* Regions (Makovetskaya, Vikhrev 2020). GEORGIA, Tbilisi, Tskneti (41.7°N, 44.7°E), 4–8.06.1979, G. Veselkin, 1♂. KYRGYZSTAN, *Jalal-Abad* Reg., Lake Sary-Chelek (41.90°N, 71.95°E), 29.05.1952, A. Zhelokhovtsev, 1♂. RUSSIA: *Altai Rep*. Reg., Chulyshman R. (51.35°N, 87.75°E), 19.07.1970, V. Sychevskaya, 1♂; *Amur* Reg.: Zeya env., 53.7°N, 127.3°E, 29.06.1981, A. Shatalkin, 1♂; Yukhta, 51.5°N, 128.2°E, 27.07.1979, G. Veselkin, 1♂; *Bashkortostan* Reg., Muldashevo env., 54.82°N, 59.77°E, 9.07.2021, O. Kosterin, 1♂; *Buryatia* Reg.: Tunka env., 51.7°N, 102.6°E, 750 m asl, 7–11.06.2021, N. Vikhrev, 4♂; E of Tory, 51.8°N, 103.2°E, 660 m, 12.06.2021, N. Vikhrev, 1♂; Arshan env., 51.927°N, 102.435°E, 1200 m, 16.06.2021, E. Makovetskaya, 11♂; Ulan-Ude env., Tataurovo (52.14°N, 107.44°E), 10.06.1977, G. Veselkin, 1♂; *Irkutsk* Reg., Slyudyanka, 51.68°N, 103.69°E, 480 m, 12–14.06.2021, N. Vikhrev, 1♂; 28–29.06.2021, E. Makovetskaya, 10♂; Ust-Kut (56.8°N, 105.8°E), 25.07.1979, G. Veselkin, 1♂; *Khakasia* Reg.: Abakan, park, 53.74°N, 91.41°E, 16.07.2017, N. Vikhrev, 1♂; Shira env., 54.5°N, 90.1°E, 21–27.06.2011, K. Tomkovich, 2♂; *Krasnodar* Reg., Dakhovskaya env., 44.20°N, 40.17°E, 29–30.06.2009, K. Tomkovich, 2♂; *Krasnoyarsk* Reg., Novochernorechenskiy env., 56.27°N, 91.12°E, 16.06.2011, K. Tomkovich, 2♂; *Mordovia* (Vikhrev et al. 2020); *Moscow* Reg., 10 km W of Ruza, 55.66°N, 36.05°E, 1–10.08.2016, E. Erofeeva, 2♂; 1–11.06.2017, 2♂; Kostino env. (56.31°N, 37.75°E), 22–23.05.2010, N. Vikhrev, 1♂, 3♀; *Novosibirsk* Reg., Ob' R. right oxbow, 54.86°N,

Fig. 1. *Hydrotaea meteorica*, male (photo by Frank Koehler, diptera.info)
Рис. 1. *Hydrotaea meteorica*, самец (фото: Frank Koehler, diptera.info)

83.04°E, 16.06.2016, O. Kosterin, 1♂; *Primorsky* Reg., Andreevka env, 42.7°N, 131.1°E, 25–30.06.2014, N. Vikhrev, 1♂; Suputinsky (presently Ussuriysky) Nat. Reserve (≈43.6°N, 132.3°E), 20.07.1968, Kandybina, 1♂ (ZIN); *Stavropol* Reg., Essentuki env. (44.0°N, 42.8°E), 10.05.1979, G. Veselkin, 4♂; *Tomsk* Reg., Bachkar (57.02°N, 82.1°E), 9.07.1972, P. Polyakova, 4♂; *Tuva* Reg., Uyuk R., 800 m, 52.07°N, 94.04°E, 27.05.2018, N. Vikhrev, 1♂; *Saint Petersburg* Reg., Yukki (60.11°N, 30.28°E), 18.07–16.08.1933, A. Stackelberg, 3♂ (ZIN). TAJIKISTAN, *Dushanbe* Reg., Gissar Range, Varzob gorge, Takob biostation, 38.835°N, 68.964°E, 2000 m, 2–4.06.2010, K. Tomkovich, 1♂. TURKEY, *Nevshehir* Reg., 38.594°N, 35.024°E, 1250 m, 18.04.2010, N. Vikhrev, 3♂, 2♀.

Distribution. Widespread in Holarctic and north of the Oriental regions. I suppose that the species was introduced to North America only 200–300 years ago. When entomologists began to study regional faunas in the 19th and 20th centuries, many species associated with cattle had already been introduced to many remote localities.

Discussion. In most species of *Hydrotaea*, the male genitalia are uniform and useless for identification. Instead, almost all males of *Hydrotaea* have modified setae or setulae on the mid- and hind legs. There are only few examples of absence of such modifications. A lot of species of *Hydrotaea* which have the same modifications (a strong character) and differ by weak characters only were found belonging to the same species and synonymysed, but *H. meteorica*, *H. cinerea* and *H. cilifemorata* are still considered as valid species. The best recommendations how to divide *H. meteorica* and *H. cinerea* were given by D'Assis-Fonseca (1968: 30–31); Emden (1965: 315–317) gave detailed diagnosis for *H. cilifemorata*. The diagnostic characters are summarised in Table 1.

On the one hand, the considered species fit the criterion I proposed above: there are several independent diagnostic characters, though weak ones. On the other hand, these characters vary widely and gradually. They usually allow the identification of Eastern European specimens, but it is often difficult to apply them to specimens from East Asia. Two examples are given below.

THAILAND, *Chantaburi* province, Khao Khitchakut National Park, 12.82°N, 102.13°E, 3–6.12. 2011, N. Vikhrev, 1♂. This specimen has the ventral setulae on *f3* medium long and notopleuron without hairs near posterior seta as in *H. cinerea*, but the ventral spines on *f2* weak; the scutum and abdomen undusted; the knob of halter and calypters brown as in *H. cilifemorata*.

RUSSIA, *Primorsky* Reg., Anisimovka env., 43.13°N, 132.80°E, 450 m, 21–24.07.2018, N. Vikhrev, 2♂. These specimens have the ventral setulae on *f3* medium long and the notopleuron without hairs near posterior

Table 1

Diagnostic characters to divide *H. meteorica, H. cinerea* and *H. cilifemorata*

Таблица 1

Диагностические признаки для разделения *H. meteorica, H. cinerea* and *H. cilifemorata*

Character species	fine *av* on *f3*	dusting on scutum	dusting on abdomen	colour of calypters	colour of halters knob	*v* spines on *f2*	hair(s) near *post ntp* seta
H. meteorica ♂	0.5x as long as *f3* width	absent or fine	fine, dark grey, median vitta not distinct	brown or yellow	dark	long and strong	present
H. cinerea ♂	about as long as *f3* width	more or less strong	densely dusted with distinct narrow vitta	yellow	yellow or dark	long and strong	absent
H. cilifemorata ♂	2x as long as *f3* width	absent	undusted, median vitta indistinct	brown	dark	short and fine	present

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seta as in *H. cinerea*, but the scutum and abdomen undusted; the knob of halter and calypters brown as in *H. meteorica*.

H. cilifemorata might be considered as a North Indian subspecies of *H. meteorica*, but *H. cinerea* can not be a subspecies because it has the same wide trans-Palaearcic distribution as *H. meteorica*.

Personally I believe that these forms represent intraspecific variability of the widespread and common, cattle secretophagous *H. meteorica*. However, in order to avoid possible disagreements between Muscidae experts, I still consider here *H. meteorica*, *H. cinerea* and *H. cilifemorata* as valid species. I hope that molecular data will clarify the situation.

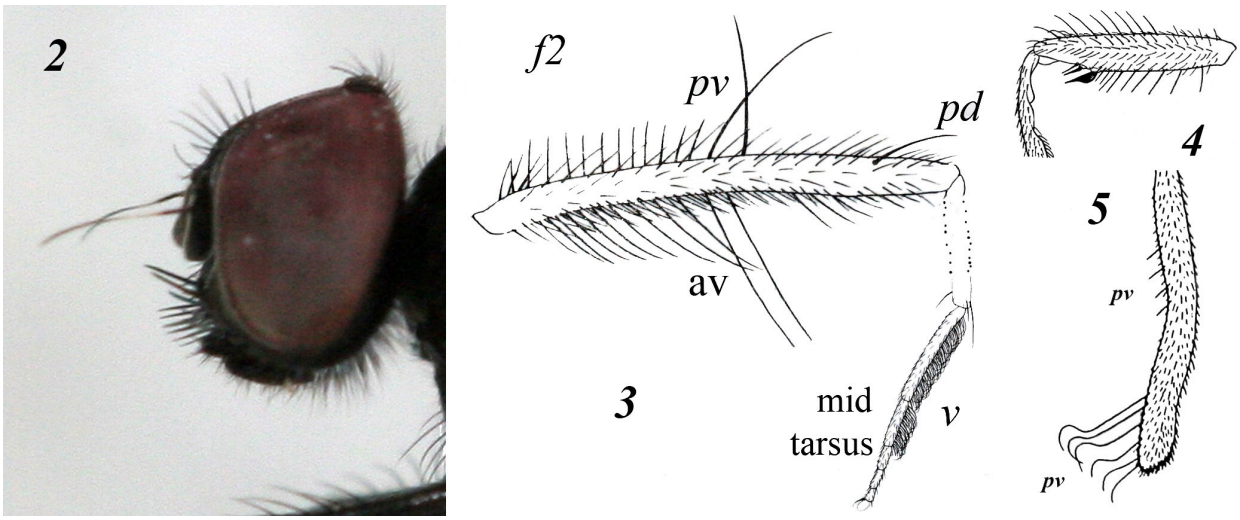
Hydrotaea nigribasis Stein, 1913
Fig. 4.

Hydrotaea nigribasis Stein, 1913. Type locality: South Africa, Durban.
Hydrotaea australis Malloch, 1923: 667. Type locality: Australia, south Queensland, **syn. nov**.
Hydrotaea dukouensis Ni, 1982. Type locality: Sichuan, Dukou (presently Panzhihua 26.57°N, 101.71°E), **syn. nov**.
Hydrotaea australis Malloch, 1923. Emden (1965: 314, redescription); Pont (1973: 232, redescription).
Hydrotaea dukouensis Ni, 1982: Fan (2008: 482, redescription in Chinese; 1017–1023, identification key, in English).

Type material examined: Holotype, *H. nigribasis*, ♂: Pinetown, Durban, (= S Africa, 29.84°S, 30.84°E), 20.04.(19)02, F. Muir (ZMHU).

Other material examined: AUSTRALIA, *Queensland*, Eidsvold (≈25.4°S, 151.1°E), 6.10.1929 and no data, 3♂, 5♀ (ANIC). ETHIOPIA, *Oromia* Reg., Ambo env., (8.98°N, 37.85°E), 2100 m, 01.11.2009, L. Rybalov, 1♂, 1♀. INDONESIA, *Papua* province, Jayapura (2.55°S, 140.70°E) env., 18–25.04.2009, A. Sokolov, 3♂, 5♀. NEW CALEDONIA, Noumea (22.2°S, 166.5°E), 07.1958, J. Rageau, 1♂ (MNHN).

Distribution. A Paleotropical species associated with cattle. Australia: WA, NT, QLD, NSW (Pont 1973); China, Sichuan (Fan 2008), Ethiopia, Oromia; Indonesia, Papua; New Caledonia; Malaysia (Emden 1965); Nepal (Shinonaga, Singh 1994); S Africa (type locality); Sri Lanka (Emden 1965).



Figs. 2–5. *2 — H. spinigena*, male head, lateral; *3 — H. spinigena*, male mid leg (modified from Xue & Chao 1998: 905, figs 2097Fe and 2097Fp); *4 — H. nigribasis*, male fore leg (as *H. australis*, from Emden 1965: 313, fig. 83b); *5 — H. affinis*, male hind tibia (as *H. affinoides*, from Fan 2008: 484, fig. 153c)

Рис. 2–5. *2 — H. spinigena*, голова самца сбоку; *3 — H. spinigena*, средняя нога самца (с изменениями по Xue & Chao 1998: 905, figs 2097Fe и 2097Fp); *4 — H. nigribasis*, передняя нога самца (как *H. australis*, по Emden 1965: 313, fig. 83b); *5 — H. affinis*, задняя голень самца (как *H. affinoides*, по Fan 2008: 484, fig. 153c)

Synonymy. I have no doubts that specimens from Africa as well as from Australia and New Guinea (known as *H. australis*) belong to the same species. They fit the redescription by Pont (1973) and share all diagnostic characters: body length 3 mm; no minute setulae between outer rows of rather strong *ac* setae; notopleuron bare; head dusted, without any glossy areas; ♂ with fore leg as in the *H. meteorica* group; *t3* in medial third with a row of 3–5 straight *pv* setulae (same as on *t3* of *H. affinis* as shown in Fig. 5). The description of *H. dukouensis* is less comprehensive. Fan (2008: 458, fig. F) showed typical fore femur of the *H. meteorica* group. In both keys by Xue et al. (2007a; 2007b) *H. dukouensis* does not run to the *H. meteorica* group although the modification of *f1* was clearly described as that of the *H. meteorica* group: 'fore femur with 2 specialised setae on ventral surface of distal part, one spine-like, the other resembling a bird's head'. In the better key by Fan (2008: 1022) *H. dukouensis* runs to the *H. meteorica* group. *H. dukouensis* also shares a small size (3 mm) and a row of 3–5 short *pv* setulae at middle of *t3*. The principle 'no difference, no validity' should be applied here. So, *Hydrotaea nigribasis* Stein, 1913 = *H. australis* Malloch, 1923, **syn. nov**. = *H. dukouensis* Ni, 1982, **syn. nov**.

If my supposition that the origin of the *H. meteorica* group is SE Asia is correct, then the spread of *H. nigribasis* to Australia and Africa most likely happened along with cattle breeding. At least I am sure that *H. nigribasis* appeared in New Caledonia together with human settlement.

Hydrotaea spinigena Xue & Li, 1995
Figs. 2, 3

Material examined: INDIA, *West Bengal* state, Kalimpong, 27.06°N, 88.44°E, 650 m, 1–11.12.2013, K. Tomkovich, 1♀. NEPAL, Rasuwa distr., Dhunche env., 28.098°N, 85.318°E, 2000 m, 7–9.06.2017, A. Ozerov, 1♀. THAILAND**,** *Chiang Mai* province, 19.28°N, 98.61°E. 1350 m, attracted on human body, 15–18.11.2010, N. Vikhrev, 3♂. VIETNAM, *Lao Cai* province, Sa Pa env., 22.321°N, 103.856°E, 1400 m, on buffalo dung, 19–29.03.2019, N. Vikhrev, 1♂, 5♀.

Distribution. Continental mountain part of the Oriental Region. Known from: China: Guizhou province, Changshun County (26.0°N, 106.4°E) and Yunnan province, Qujing (25.5°N, 103.8°E) (Fan 2008); India: W Bengal state; Nepal: Rasuwa district, Thailand: Chiang Mai province; Vietnam: Lao Cai province.

Descriptive notes. A distinctive species. *Head* large. Arista slightly thickened; the second quarter of arista whitish; aristal setulae very short. Vibrissae short, straight and thickened; under vibrissae there is a vertical row of four short, straight and thickened setae (Fig. 2). Gena narrow, at the anterior end with a pair of strong, upward directed spinulose setae. *Thorax* black, almost without dusting. Katepisternals 1+1; *dc* 2+4, *ac* 0+1, katepimeron bare. Notopleuron without hair(s) near posterior seta. Wing slightly darkened, calypters brown.

Legs black. Fore leg typical for *H. meteorica* group: *f1* with swollen apical spines, *t1* emarginated in basal half and thickened in apical half. Mid femur modified: basal 3/5 of *av* surface with a row of fine setae ending by two long and strong *av* setae; basal 3/5 of *pv* surface with a row of straight, spinulose setae ending by two long and strong *pv* setae (Fig. 3). *t2* with 2 *p*; *tar2-1* and *tar2-2* with a dense row of fine waved *v* setulae (Fig. 3). *f3* with a complete row of fine *v* setulae in basal 3/4; in apical 1/4 with 3 strong *av* setae. *t3* with 4 fine *av* in middle third. *Abdomen* in posterior view with thin grey dusting and black median vitta.

Female is easily recognizable by the arista whitish in the second quarter. Aristal hairs very short. Upper parafacials and most of fronto-orbital plates glossy. *t3* with 2–3 *av* and 1 *ad*.

Key to the males of *Hydrotaea meteorica* group

1. Arista slightly thickened; the second quarter of arista whitish; aristal setulae very short. Vibrissae short, straight and thickened;

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under vibrissae there is a vertical row of 4 short, straight and thickened setae (Fig. 2). *f2* beyond middle with 2 long *av* and 2 long strong *pv*; *tar2-1* and *tar2-2* with dense ventral hairs (Fig. 3) . . ***spinigena*** Xue & Li

— Without modifications described above **2**

2. *t3* at apical quarter with a row of 4–6 long apically down-curved *pv* setae (Fig. 5). Upper parafacial glossy black. (*f2* with a row of 7–9 ventral spines, these are weak and almost twice shorter than femur width. *f3* ventrally bare except for 3–4 strong *av* at apical quarter. *t3* in middle with a row of 3–4 stright *pv* setulae, with or without *av*, without *ad* and *pd*. Notopleuron bare. Body length 4.5–5 mm) . . . . . ***affinis*** Karl

— *t3* without long *pv* setae at apical quarter. Parafacial entirely dusted **3**

3. Small, body length about 3 mm. *t3* in middle with a row of 3–5 stright *pv* setulae, without *pd* and *ad*, with 2(1–3) strong *av*. No minute setulae between outer *ac* setae. (Notopleuron bare. *f2* with a row of 3–4 ventral spines, these are strong, as long as or longer than femur width. Abdomen densely dusted with black median vitta.) . . . . . ***nigribasis*** Stein

— Body length about 4–5 mm. *t3* without row of minute *pv* setulae, with medium strong 1 *pd*, 1 *ad* and 1 *av*. Surface between outer *ac* setae covered with minute setulae **4**

4. *f3* all along covered with dense, long (2–2.5x longer than femur width) and fine *av* and *pv* setae, in apical quarter with 3–4 strong *av* setae. *f2* without spinulose ventral setae, a row of straight *v* setae present but they are not stronger than other setae on *f2*. (Scutum not dusted) . . . . . ***cilifemorata*** Emden

— *f3* covered with more sparse and shorter (at most as slightly longer than femur width) ventral setae (except for 3–4 strong *av* setae in apical quarter). *f2* with a row of 10–12 spinulose ventral setae, they are much stronger than other setae on *f2* **5**

5. *f3* with with fine *av* setae half as long as femur width. Scutum seen from behind not dusted (Fig. 1); abdomen thinly dusted. Knob of halters always brown. Notopleuron usually with hair(s) near posterior seta . . . . . ***meteorica*** Linnaeus

— *f3* with fine *av* setae as long or slightly longer than femur width. Scutum seen from behind dusted grey (on posterior part or humeral calli or both); abdomen densely dusted. Knob of halters yellow or brown. Notopleuron without hair(s) near posterior seta . . . . . ***cinerea*** Robineau-Desvoidy

Notes on females of the *Hydrotaea meteorica* group

The only diagnostic character that allows distinguishing females of *H. cinerea* was provided in the key by D'Assis-Fonseca (1968). For all other species considered here I examined series of females collected together with males and on this base worked out the recommendations given below. However, there is a difficulty: the males of the *H. meteorica* group are easily identifiable by characteristic shape of swollen spines at the apex of *f1*, but how to understand that a female belongs to this group? Recommendations for the Palaearctic fauna are mostly useless for tropical species of the *H. meteorica* group, tropical *Hydrotaea* are poorly known, especially their females. I can offer the following set of characters for females of the *H. meteorica* group:

a. *t2* never with *ad*;

b. *pd* seta on *t3* either absent or short if present (not longer than tibia width);

c. outer rows of *ac* are represented by rather strong setae, distinctly longer than inner setulae or scutal ground setulae;

d. species of the group are secretophaguos and are often attracted by human body or to cattle.

Key to the females of the *Hydrotaea meteorica* group

1. Paleotropical. Small, body length about 3 mm. No minute setulae between outer *ac* setae. Frons distinctly narrower than 1/3 head width. (Notopleuron bare. Parafacials and fronto-orbital plates entirely dusted. *t3* without or with very short *pd*.) . . . . . ***nigribasis*** Stein

— Body length about 4–5 mm. Surface between outer *ac* setae covered with minute setulae **2**

2. Oriental. Upper parafacial glossy black **3**

— Palaearctic. Parafacial and fronto-orbital plates entirely dusted. (Notopleuron with hairs. *t3* with 1 *pd* and 1 *ad*.) **5**

3. Notopleuron bare. *t3* without *pd*. Frons narrower than 1/3 head width. Fronto-orbital plates mostly glossy black **4**

— Notopleuron with hairs. *t3* with *ad* and *pd*. Frons wider than 1/3 head width. Fronto-orbital plates dusted ..... ***cilifemorata*** Emden

4. Arista whitish in second quartre. Aristal hairs shorter than base of arista. *t3* with *ad*. ..... ***spinigena*** Xue & Li

—Arista entirely dark. Aristal hairs as long as base of arista. *t3* without *ad*. (Apart from Oriental realm, this species is known from SE Palaearctic.) ..... ***affinis*** Karl

5. Knob of halters always brown. Notopleuron with hair(s) near posterior seta ..... ***meteorica*** Linnaeus

— Knob of halters yellow. Notopleuron without hair(s) near posterior seta ..... ***cinerea*** Robineau-Desvoidy

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