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SPIDERS OF THE GENUS *HEPTATHELA* (ARANEAE, LIPHISTIIDAE) FROM VIETNAM, WITH NOTES ON THEIR NATURAL HISTORY

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ABSTRACT. Spiders of the family Liphistiidae collected from northern Vietnam are taxonomically studied. Two new species of the genus *Heptathela* are described under the names, *H. abca* (from Yen Bai) and *H. cucphuongensis* (from Cuc Phuong National Park). Some natural history and zoogeographic notes of the new species are given.

About 90 years ago, a liphistiid spider was recorded from Kha-lé in the area of the river Song Luc Nam northeast of Hanoi (Simon 1908). This spider was erroneously identified as *Liphistius birmanicus* Thorell 1897, originally described from Burma. Because this record was based on a misidentification, Bristowe (1933) gave a new name *Liphistius tonkinensis* for the same spider. Although the genus *Heptathela* was already known at that time (Kishida 1923), the Vietnamese species was misplaced in *Liphistius* for a long time. Haupt (1983) finally redescribed the species and transferred it to *Heptathela. Heptathela tonkinensis* was the first heptatheline recorded.

In 1995 and 1997, I had opportunities to participate in entomological expeditions to northern Vietnam, made by the National Science Museum, Tokyo. Although it was hard to find preserved forests in the country, researchers on our expeditions collected many spider specimens, including those of *Heptathela. Heptathela tomokunii,* the second species of the genus from Vietnam, was described from Mt. Tam Dao, about 60 km northwest of Hanoi, based on this material (Ono 1997a).

The present paper deals with the results of a taxonomic study of liphistiids obtained during the second Vietnam expedition in 1997. Two further new species of the genus *Heptathela* are described from Yen Bai and Cuc Phuong National Park. Some biological data of these spiders are noted.

METHODS

Between 26 September–25 October 1997, liphistiid spiders were collected at Yen Bai (elevation 120 m), and in the National Park of Cuc Phuong (350 m) in northern Vietnam (Fig. 1). Some biological observations (for example, the shape of egg sac and the diameter of trapdoor) were made in the field. The spiders were kept in 75% alcohol and taxonomically studied in laboratory of the museum at Tokyo. After morphological observations, two new species were recognized.

The type specimens of the new species are deposited in the collection of the Department of Zoology, National Science Museum, Tokyo (NSMT). The abbreviations herein used are as follows: ALE, anterior lateral eye; AME, anterior median eye; PLE, posterior lateral eye; PME, posterior median eye. Morphology of genital organs chiefly follows Haupt (1979).

DESCRIPTIONS OF NEW SPECIES

Heptathela abca new species
(Figs. 2–4, 14)

Diagnosis.—This new species seems to be related to *Heptathela tomokunii* Ono 1997, described from Mt. Tam Dao, Vinh Phu Province, Vietnam, having the same construction of female genitalia. However, the new species can be distinguished from the latter by the shape of spermathecae (receptacalula seminis): main, lateral bursae of *Heptathela abca* are reniform and are set on their bases, while those of *H. tomokunii* are oval and close to the lamellar interior part of the genitalia; the tubular stems of median bursae of *H. abca* are much longer than those of *H. tomokunii* (*cf.* Fig. 3 of this paper and fig. 6 in Ono 1997a).

Etymology.—The specific epithet is an arbitrary combination of letters.

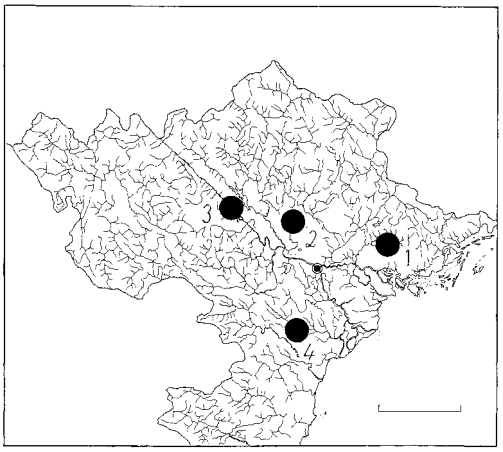


Figure 1.—Records of the spiders of the genus *Heptathela* in Vietnam. 1. Song Luc Nam, Ha Bac Province, *Heptathela tonkinensis* (Bristowe 1933); 2. Tam Dao, Vinh Phu Province, *Heptathela tomokunii* Ono 1997; 3. Yen Bai, Yen Bai Province, *Heptathela abca* new species; 4. Cuc Phuong, Ninh Binh Province, *Heptathela cucphuongensis* new species. [Small circle = Hanoi; upper line of the frame, 24°N, bottom, 19°N, left, 102°E, right, 108°E; scale = 100 km]

Type series.—Female holotype, VIETNAM, Yen Bai Province, Yen Bai (elevation 120 m), 13 October 1997, H. Ono leg. (NSMT-Ar 3830); paratypes: 2♀, same data as for holotype (NSMT-Ar 3831-3832), 3♀ and 2 juveniles, same locality and collector as for holotype, 14 October 1997 (NSMT-Ar 3833-3837).

Description.—Female (male specimen not available). Measurements based on holotype: body length 17.5 mm; prosoma length 8.4 mm, width 7.1 mm; opisthosoma length 9.1 mm, width 6.8 mm; lengths of palp and legs [total length (femur + patella + tibia + metatarsus + tarsus)]: palp 15.3 mm (5.3 + 2.7 + 3.4 + – + 3.9); leg I 17.8 mm (5.8 + 3.0 + 3.5 + 3.5 + 2.0); II 18.2 mm (5.8 + 2.9 + 3.4 + 3.9 + 2.2); III 19.9 mm (5.7 + 3.3 + 3.4 + 4.7 + 2.8); IV 29.0 mm (8.0 + 3.7 + 5.1 + 8.2 + 4.0). Variation of body length: 12.1–20.2 mm. Head high; ocular tubercle wider than long, ALE > PLE > PME > AME (9.6:8.3:4.6:1 in ratio), AME small, clypeus wider than ALE-ALE, median ocular area trapezoidal, wider than long. Chelicera with 11 teeth (3 large and 8 small) on promargin of fang furrow. Leg formula IV, III, II, I; superior claws of tarsi each with 2 teeth; claw of palp without tooth. Opisthosoma ovate, longer than wide; posterior median spinnerets reduced, completely fused, with setae (Fig. 4). Two pairs of spermathecae present (Fig. 2–3); main, lateral bursae set on thick bases, reniform, with many middle-sized, granulate tubercles; median ones small, on long tubular stems.

Coloration: Prosoma brown, cephalic part not darker, ocular tubercle black; chelicerae brown, basally lighter, fang and fang furrow reddish-brown, sternum and coxae of legs and palps light reddish-brown, other segments of legs and palps brown. Opisthosoma grayish-brown, dorsal sclerites blackish-brown, ventral sclerites and spinnerets yellowish-brown.

Remarks.—A female specimen (NSMT-Ar 3839) collected at a village about 15 km northwest of Yen Bai on 6 October 1997 by myself tentatively identified as *Heptathela abca*. However, the shape of female genitalia of the spider (Figs. 5–6) is slightly different from that of holotype.

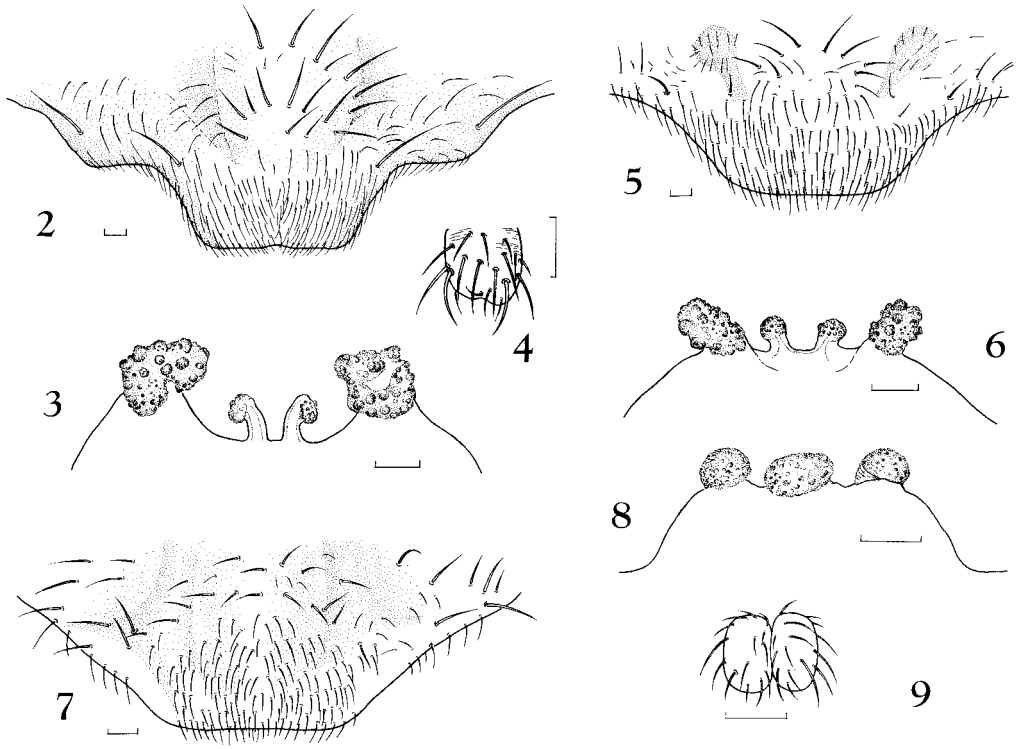
Heptathela cucphuongensis new species
(Figs. 7–9, 17)

Diagnosis.—This new species is close to *Heptathela hunanensis* Song & Haupt 1984, described from Qianyang County, Hunan Province of China. In both the species, median spermathecae are fused and form a large bursa. However, the new species is distinguishable from the Chinese spider by the shape of lateral bursae without bases (*cf.* Fig. 8 of this paper and fig. 3e in Song & Haupt 1984).

Etymology.—The specific epithet is derived from the type locality.

Type series.—Female holotype, VIETNAM, Ninh Binh Province, Gia Vien, Cuc Phuong (elevation 350 m), 30 September 1997, H. Ono leg. (NSMT-Ar 3822); paratypes: 2♀ and 7 juveniles, same data as for holotype (NSMT-Ar 3823-3827).

Description.—Female (male specimen not available). Measurements based on holotype: body length 17.5 mm; prosoma length 7.8 mm, width 6.1 mm; opisthosoma length 8.1 mm, width 5.4 mm; lengths of palp and legs [total length (femur + patella + tibia + metatarsus + tarsus)]: palp 12.2 mm (4.4 + 2.3 + 2.5 + – + 3.0); leg I 15.5 mm (5.3 + 2.5 + 3.1 + 2.9 + 1.7); II 15.7 mm (5.2 + 2.7 + 2.8 + 3.3 + 1.7); III 16.6 mm (5.1 + 2.7 +



Figures 2–9.—2–4, *Heptathela abca* new species, female holotype, NSMT-Ar 3830; 5–6. *Heptathela* sp. (?*H. abca*) from 15 km NW of Yen Bai; 7–9. *Heptathela cucphuongensis* new species, female holotype, NSMT-Ar 3822. 2, 5, 7. Genital area, ventral view; 3, 6, 8. Spermathecae, dorsal view; 4, 9. Posterior median spinnerets, ventral view. [Scales = 0.25 mm]

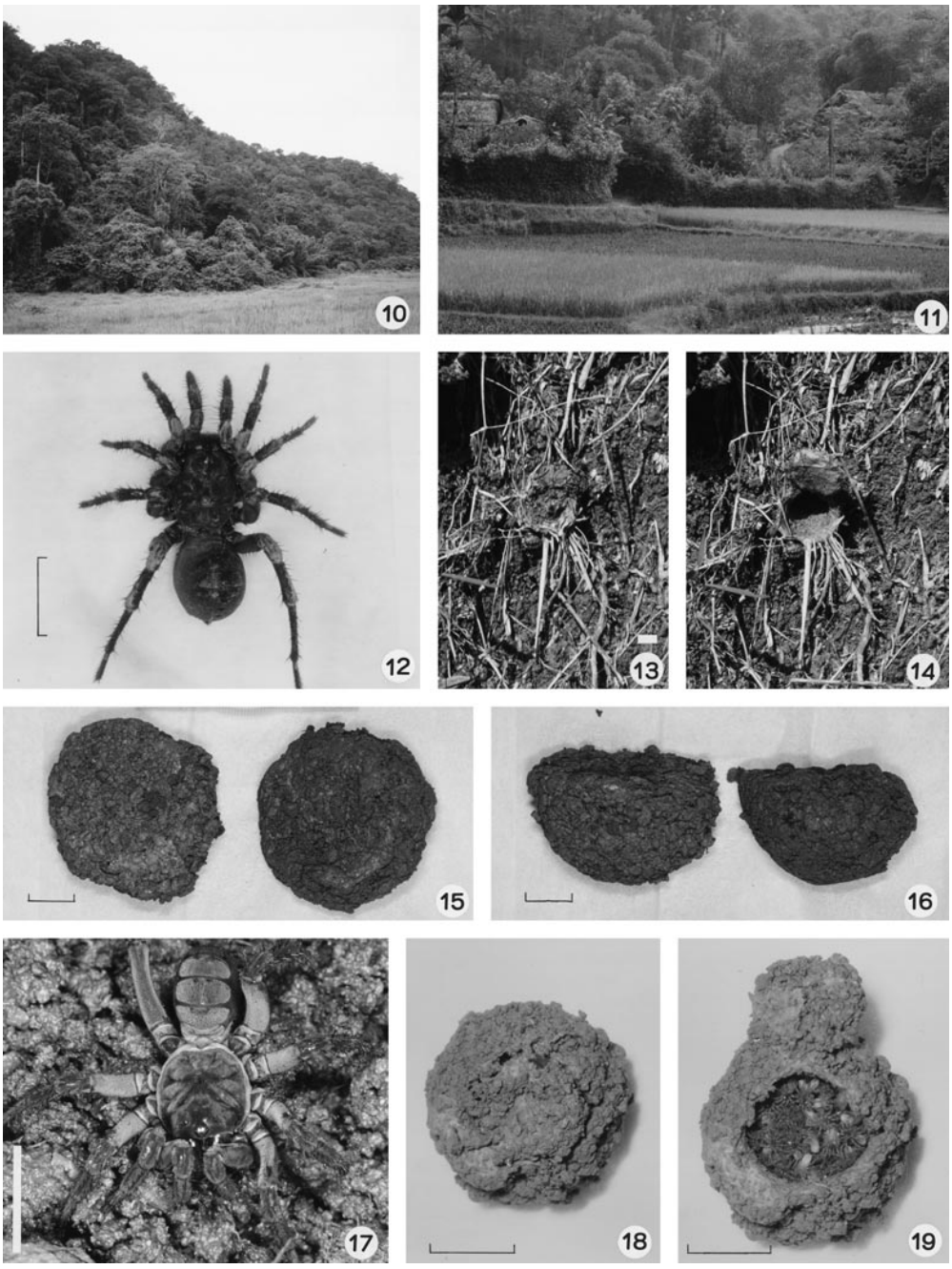
2.9 + 3.8 + 2.1); IV 23.4 mm (6.8 + 3.2 + 4.2 + 6.4 + 2.8). Variation of body length: females 15.1–17.5 mm. Head high; ocular tubercle slightly longer than wide, ALE > PLE > PME > AME (8 : 7.6 : 4.3 : 1 in ratio), clypeus wider than ALE-ALE, median ocular area trapezoidal, slightly wider than long. Chelicera with 12 (right) or 13 (left) teeth (3 large and 9 or 10 small) on promargin of fang furrow. Leg formula IV, III, II, I; superior claws of tarsi I with 3 teeth, II–IV each with 2 teeth; claw of palp without tooth. Opisthosoma ovate, longer than wide; posterior median spinnerets not fused (Fig. 9). Three spermathecae present (Figs.7–8); lateral bursae without bases, globular, with many small granulate tubercles; median one unpaired, oval, granulate, without stem.

Coloration: Prosoma blackish-brown, cephalic part darker, ocular tubercle black; chelicerae blackish-brown, basally light yellowish-brown, fang and fang furrow reddish-brown, sternum and coxae of legs and palps grayish-brown, other segments of legs and palps dark gray, femora much darker. Opisthosoma dark gray, dorsal sclerites blackish-brown, ventral sclerites and spinnerets yellowish-brown. Color in life bluish-black.

NATURAL HISTORY NOTES

As an agricultural country in Asia, Vietnam has developed at the expense of deforestation for centuries. Sub-tropical and tropical lowlands are totally cultivated mainly for rice production. On the other hand, the people of various tribes farm with primitive methods on temperate highlands, and cut trees for firewood. Thus, primary forests, the habitat of liphistiid spiders, are only found scattered on the mountainous hinterland. Tam Dao (1230 m elevation at peak) is one of the typical areas preserved by the country. Spiders of *Heptathela tomokunii* live there (Ono 1997a).

In Cuc Phuong National Park, evergreen broad-leaved forests and occasional damp bushes are preserved in nature (Fig. 10). Spi-



Figures 10–19.—10. Habitat of *Heptathela cucphuongensis* new species at Cuc Phuong; 11. Habitat of *Heptathela abca* new species at Yen Bai; 12. Holotype female of *Heptathela abca* new species; 13–14. A retreat with grass-blades of *Heptathela abca* new species; 15–16. Egg sacs of *Heptathela abca* new species; 17. Holotype female of *Heptathela cucphuongensis*; 18–19. Egg sac of *Heptathela cucphuongensis* new species. [Scales = 10 mm]

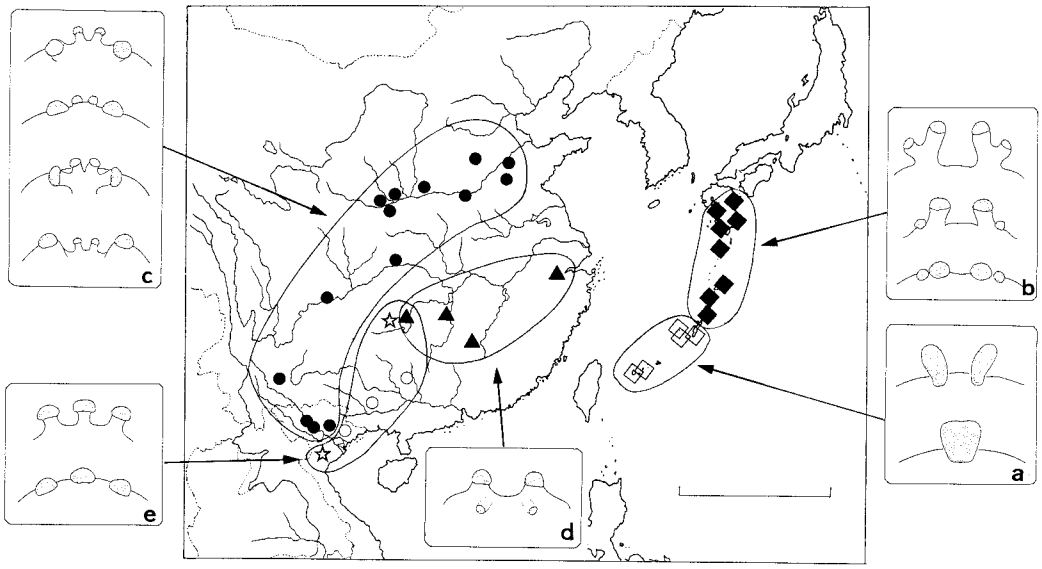


Figure 20.—Distribution of the species of the subfamily Heptathelinae in East Asia: The symbols correspond to the groups A-E in the text: □ = Group A, ■ = Group B, ● = Group C, ▲ = Group D, and ☆ = Group E. The open circles (○) indicate species whose female is unknown. a–e are diagrams of female genitalia. [Scale = 1000 km]

ders of *Heptathela cucphuongensis* were found along roadsides at the forest edge. They built retreats in the soil about 15–25 cm deep, as is typical of the genus *Heptathela.* The trapdoor of the holotype female was the largest at 35 mm wide and 27 mm long. Globular egg sacs made with soil and 24–27 mm in diameter (Fig. 18) were found at the bottom of the tubular retreats, with 120 spiderlings closely packed in the sac (Fig. 19).

As an unusual case, *Heptathela abca* was found in a village near the city of Yen Bai. The environmental difference between that village and other cultivated areas on lowlands, in which no liphistiids were found, is the existence of trees left around the houses and rice fields (Fig. 11). The earth was kept moist. The openings of some retreats were decorated with fragments of grass (Figs. 13–14). The trapdoors of the spiders were measured: 43 × 33, 33 × 29, 30 × 26, 28 × 25, 24 × 21 and 17 × 15 mm. Egg sacs were semiglobular and about 35 mm in diameter (Figs. 15–16). Respectively, 201 and 221 spiderlings emerged from the sacs in November.

ZOOGEOGRAPHIC NOTES

Trapdoor spiders of the family Liphistiidae (Araneae, Mesothelae) are composed of two recent subfamilies, Liphistiinae and Heptathelinae, both distributed in East Asia. More than 40 species of the single genus *Liphistius* Schiödte 1849 were described under the former subfamily from Myanmar (Burma), Thailand, the Malay Peninsula and Sumatra (newest informations: Schwendinger 1996; Platnick, Schwendinger & Steiner 1997), while 29 species of two genera, *Heptathela* Kishida 1923 and *Ryuthela* Haupt 1983 were known in the latter subfamily in Japan, China and Vietnam (Haupt 1983; Song & Haupt 1984; Ono 1996, 1997a & b, 1998 and this paper).

Based on characteristics of the female genitalia (males are unknown in many species), the heptatheline species are classified into five groups as follows, which are grouped in an allopatric arrangement (Fig. 20). Their phylogenetic relationships are not considered in this paper. Vietnamese species belong to two different groups.

Group A.—*Ryuthela nishihirai* Haupt 1979, *R. ishigakiensis* Haupt 1983, *R. owadai* Ono 1997, *R. sasakii* Ono 1997, *R. secundaria* Ono 1997, and *R. tanikawai* Ono 1997. A pair of monolobal spermathecae present, both the spermathecae close to each other, or fused

with one large opening (Fig. 20a). Distribution: Japan (southern part of the Ryukyu Islands). [Although the genus *Ryuthela* was synonymized with *Heptathela* by Raven (1985), I follow the contrary treatment by Haupt (1990).]

Group B.—*Heptathela kimurai* (Kishida 1920), *H. amamiensis* Haupt 1983, *H. higoensis* Haupt 1983, *H. kanenoi* Ono 1996, *H. kikuyai* Ono 1998, *H. nishikawai* Ono 1998, *H. yaginumai* Ono 1998, *H. yakushimaensis* Ono 1998, *H. yanbaruensis* Haupt 1983. A pair of spermathecae present, spermathecae bilobal with secondary process laterally (Fig. 20b). Distribution: Japan (Kyushu and the northern part of the Ryukyu Islands).

Group C.—*Heptathela sinensis* Bishop & Crosby 1932, *H. bristowei* Gertsch 1967, *H. jianganensis* Chen *et al.* 1988, *H. schensiensis* (Schenkel 1953), *H. heyangensis* (Zhu & Wang 1984), *H. yunnanensis* Song & Haupt 1984, *H. tomokunii* Ono 1997 and *H. abca* new species. Two pair of spermathecae present, the lateral bursae larger and usually on thick bases, the median ones small and on tubular stems (Fig. 20c). Distribution: China (from Hebei to Yunnan) and Vietnam.

Group D.—*Heptathela hangzhouensis* Chen, Zhang & Zhu 1981 and *H. cipingensis* (Wang 1989). Two pair of spermathecae present, the main bursae situated in more median position, the median ones moved posteriorly and situated at the base of main bursae (Fig. 20d). Distribution: China (from Zhejiang to Hunan).

Group E.—*Heptathela hunanensis* Song & Haupt 1984 and *H. cucphuongensis* Ono new species. Three spermathecae present, two lateral bursae and one median one in same size (Fig. 20e). Distribution: China (Hunan) and Vietnam.

Female unknown.— *Heptathela tonkinensis* (Bristowe 1933) and *H. hongkong* Song & Wu 1997.

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