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A review of the Genus *Hygrocrates* with a Description of a New Species from Turkey (Araneae: Dysderidae)

***Kadir Boğaç Kunt*[1], *Yuri M. Marusik*[2], *Mikhail M. Omelko*[3,4]**

[1] Poligon Sitesi 71/27-B TR-06810 Dodurga, Çayyolu, Ankara, Turkey; E-mail: chaetopelma@gmail.com
[2] Institute for Biological Problems of the North RAS, Portovaya Str. 18, Magadan, Russia.
[3] Far Eastern Federal University, Sukhanova, 8, Vladivostok 690950 Russia and Gornotaezhnaya Station FEB.
[4] RAS, Gornotaezhnoe Vil., Ussuriyski Dist., Primorski Krai 692533 Russia.

Abstract: A new species, *Hygrocrates kovblyuki* Kunt & Marusik sp. n., is described on the basis of both sexes from the Marmara region of Turkey. Detailed morphological descriptions, diagnosis and figures of the copulatory organs of the new species are provided, in addition to a key to both males and females of all *Hygrocrates* species.

Key Words: Dysderinae, Georgia, *Hygrocrates caucasicus*, Marmara region, spider

Introduction

The genus *Hygrocrates* was erected by Deeleman-Reinhold in 1988 (Deeleman-Reinhold, Deeleman 1988), with the type species as *Harpactocrates lycaoniae* Brignoli, 1978. The genus *Hygrocrates* presently contains four species. Two species are known in Turkey: *H. lycaoniae* (Brignoli, 1978) and *H. deelemanus* Kunt & Yağmur, 2011 (Brignoli 1978, Deeleman-Reinhold, Deeleman 1988, Kunt *et al.* 2011). Recently, Kunt *et al.* (2011) clarified the taxonomic status of the Turkish *Hygrocrates* species and described *H. deelemanus* from Turkey.

During our field trips in 2011, we collected some *Hygrocrates* specimens in the Marmara region of Turkey and these specimens were identified as belonging to a new species. We provide the description of this new species and compare it to other *Hygrocrates* species that occur in Turkey and Georgia.

Material and Methods

All specimens were collected from the Bilecik Province of Turkey (Fig. 1). The specimens were collected by sifting leaf litter and were preserved in 70% ethanol. Digital images of the pedipalp and vulva were taken either with a Leica DFC295 digital camera attached to a Leica S8AP0 stereomicroscope or an Olympus Camedia E-520 camera attached to an Olympus SZX16 stereomicroscope. Five to 30 photographs were taken in different focal planes and combined using "CombineZP" image stacking software. Photographic images were edited using Photoshop CS2 and CorelDraw X3 was used to create the plates. All measurements are in mm. Terminology for the body measurements and copulatory organ structures follows Deeleman-Reinhold, Deeleman (1988), Chatzaki, Arnedo (2006) and Kunt *et al.* (2011).

The material treated herein is deposited in the Anadolu University Zoological Museum (AUZM, Eskişehir, Turkey). Abbreviations: **AL**, abdominal length; **CL**, carapace length; **CWmax**, maximum carapace width; **CWmin**, minimum carapace width; **AME**, anterior median eyes; **PLE**, posterior lateral eyes; **PME**, posterior median eyes; **AMEd**, diameter of anterior median eyes; **PLEd**, diameter of posteri-

or lateral eyes; **PMEd**, diameter of posterior median eyes; **ChF**, length of cheliceral fang; **ChG**, length of cheliceral groove; **ChL**, total length of chelicera (lateral external view); **Ta**, tarsus; **Me**, metatarsus, **Ti**, tibia; **Pa**, patella; **Fe**, femur; **Tr**, trochanter; **C**, coxa; **D**, dorsal; **Pl**, prolateral; **Rl**, retrolateral; **V**, ventral.

Key to the *Hygrocrates* species

1. Male 2
- Female 4
2. Bulbus straight, cylindrical; embolus lobe-shaped; apophysis$_a$ and apophysis$_b$ nearly same size. Tip of apophysis$_b$ is obtuse (Figs 17-21) ....***H. caucasicus***
- Bulbus pyriform; embolus hook-shaped; apophysis$_a$ and apophysis$_b$ smaller than embo.....3
- Bulbus pyriform; embolus beak-shaped; apophysis$_b$ consist of two parts (Figs 2-5, 10, 13) ....***H. kovblyuki* sp. n.**
3. Transition between bulbus and distal continuation is gradual (Fig. 9).....***H. lycaoniae***
- Transition between bulbus and distal continuation is abrupt, clearly curved over 90° (Fig. 8) ....***H. deelemanus***
4. Distalmost part of spermathecae linear..... .....***H. georgicus***
- Distalmost part of spermathecae triangular (Figs 6-7, 16).....***H. kovblyuki* sp. n.**
- Distalmost part of spermathecae oval 5
5. Proxialmost part of spermathecae oval (Fig. 14) .....***H. deelemanus***
Proxialmost part of spermathecae circular (Fig. 15) .....***H. lycaoniae***

Taxonomy

***Hygrocrates* Deeleman-Reinhold, 1988**

H. Deeleman-Reinhold, in Deeleman-Reinhold, Deeleman 1988: 240, type *Harpactocrates lycaoniae* Brignoli, 1978 from the Konya Province of Turkey.

Diagnosis: *Hygrocrates* taxonomically most closely related to *Harpactocrates* Simon, 1914, but it differs in having posterior median eyes closer to each other and anterior cheliceral teeth smaller in the basal region. Moreover, the presence of subapical apophysis in male palp and two parts (distalmost and proximalmost parts) of spermathecae of female vulvae are characteristics of the genus.

Comments: Accounting the new species, the genus comprises five species distributed in the East Mediterranean: three species in Turkey (*H. deelemanus*, *H. kovblyuki* sp. n., *H. lycaoniae*) and two species in the West Caucasus (*H. caucasicus*, *H. georgicus*). It is possible that species described on the basis of opposite sexes from the Caucasus are conspecific.

***Hygrocrates kovblyuki* Kunt & Marusik sp. n. Fig. 2-7**

Material Examined: ***Holotype*** ♂ (AUZM), Turkey, **Bilecik Province**, Bozüyük District, c. 4 km E of Aksutekke Village, Mezit 11 [39°55'13.48"N; 29°46'35.35"E], 731 m, leaf litter in *Fagus* forest, 23.IX.2010, leg. Y.M. Marusik. ***Paratypes*** 2 ♀♀ (AUZM) same data as holotype.

Diagnosis: *Hygrocrates kovblyuki* sp. n. is closely related to *H. deelemanus* and *H. lycaoniae.* The male and female of *H. kovblyuki* sp. n. can be separated from all other *Hygrocrates* species by the following characteristics:

1. The angle between the embolus and apophysis$_a$ is narrower than in *H. deelemanus* and *H. lycaoniae* in the lateral view (see Kunt *et al.* 2011).

2. Apophysis$_b$ consists of two tips that originate from a broad base. One of the tips runs forward to the embolus, while the other is oriented towards the tegulum.

3. The transverse bar in the epigyne is turned towards the spermathecae on both sides and the dorsal arch is much more strongly sclerotized than in *H. deelemanus* and *H. lycaoniae.*

Derivatio nominis: The new species is dedicated to the Ukrainan arachnologist Mykola M. Kovblyuk (Simferopol, Ukraine) who is a respected friend of the authors.

Measurements (Holotype ♂ / Paratypes ♀♀): **AL** 3.30 / 4.40; **CL** 2.90 / 3.20; **CWmax** 2.45 / 3.70; **CWmin** 1.55 / 1.80; **AMEd** 0.12 / 0.16; **PLEd** 0.14 / 0.15; **PMEd** 0.11 / 0.12; **ChF** 0.75 / 0.80; **ChG** 0.50 / 0.62; **ChL** 1.45 / 1.68.

Description: Carapace hexagonal-shaped, reddish brown. Fovea distinct and linear. Cephalic region darker than thoracic region. Labium, gnathocoxae and chelicerae brown. The body color of the male distinctly darker than the female. AME, PLE and PME closely grouped. Distance of AME-PLE shorter than PLE-PME. AME separated. Cheliceral groove with four teeth: retromargin with four teeth, including one small and one large tooth at the base of the groove. Leg length formula: Leg I > Leg IV > Leg II > Leg III. Tarsi with two claws and claw tufts. All tarsi with fine tarsal scopulae. Legs III and IV

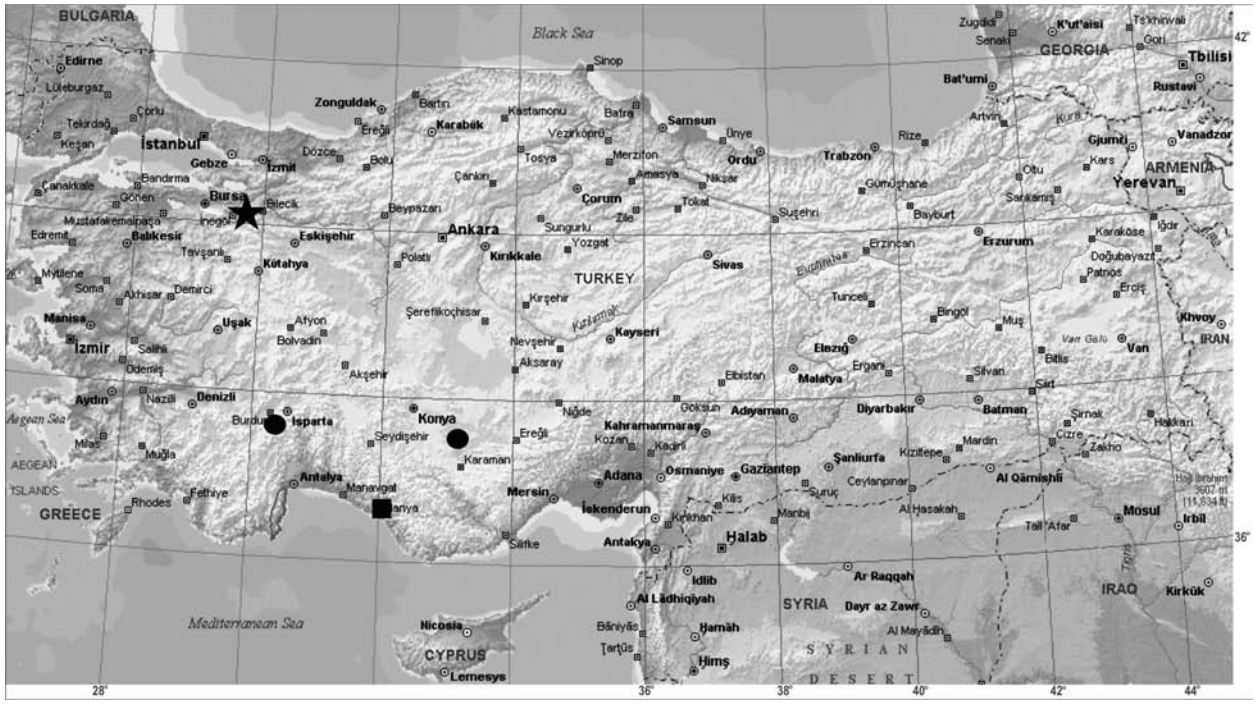


Fig. 1. Distribution of *Hygrocrates* species in Turkey. ■ *H. deelemanus* ● *H. lycaoniae* ★ *H. kovblyuki* sp. n.

with metatarsal scopulae. Coxae without spines. Leg measurements and details of leg spination are given in Table 1 and Table 2, respectively.

Palp with pyriform bulbus. The transition between the bulbus and the distal continuation is distinct. Embolus beak-shaped, wide at the base and tapering towards the tip. The tip of the embolus is slightly sclerotized. Apophysis$_a$ is about as long as the embolus and the angle between them is approximately 45-50^0. The tip of apophysis$_a$ is more strongly sclerotized than the embolus; tips of apophysis$_a$ and embolus point in opposite directions. Apophysis$_b$ originates at the base of the bulbus and is located above the embolus and apophysis$_a$. Apophysis$_b$ has two parts: apophysis$_{b1}$ and apophysis$_{b2}$. Apophysis$_{b1}$ cylindrical, beak-shaped apically and strongly sclerotized. Apophysis$_{b2}$ is triangular and spine-shaped. There are spine-shaped thin and weak structures between the embolus and apophysis$_{b2}$.

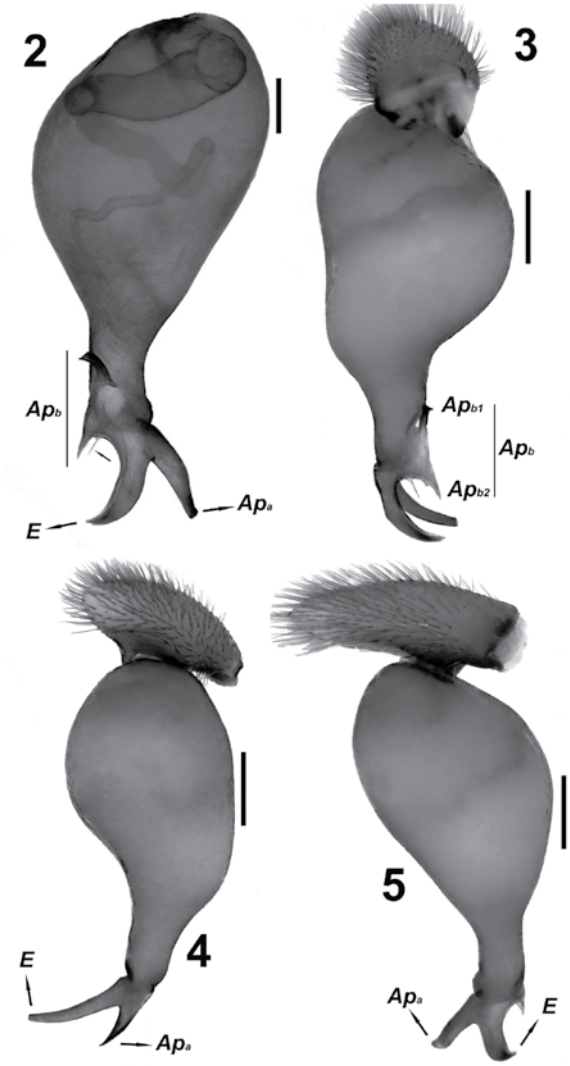
Spermathecae have two parts: referred to here as the distalmost and proximalmost regions. Distalmost region is triangular in shape whereas the proximalmost part is pentagonal in shape. Proximalmost part of the spermathecae, dorsal arch and transverse bar

Table 1. Leg measurements of *Hygrocrates kovblyuki sp. n.*

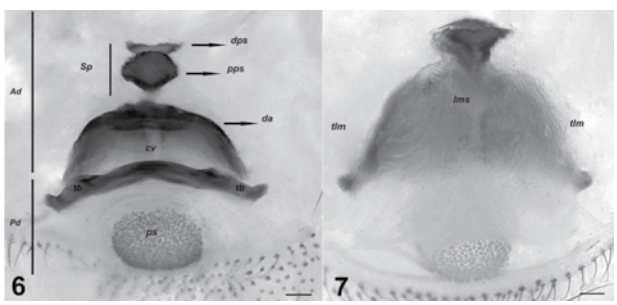
Holotype ♂/ Paratypes ♀♀	**Fe**	**Pa**	**Ti**	**Me**	**Ta**
Leg I	2.35 / 2.50	1.60 / 1.75	1.95 / 1.95	1.50 / 1.86	0.55 / 0.55
Leg II	2.05 / 2.05	1.45 / 1.60	1.55 / 1.71	1.50 / 1.82	0.45 / 0.45
Leg III	1.75 / 1.80	0.95 / 1.05	1.10 / 1.25	1.35 / 1.75	0.45 / 0.45
Leg IV	2.05 / 2.10	1.25 / 1.50	1.65 / 1.93	1.70 / 2.40	0.55 / 0.55

Table 2. Leg spination of *Hygrocrates kovblyuki sp. n.*

♂ (Holotype)	**Leg I**	**Leg II**	**Leg III**	**Leg IV**
Fe	2 pl	1 pl	0	2, 2 D
Ti	0	0	1 pl 1, 2 rl 1, 2 V	1, 2, 2 pl 1, 1 rl 1, 2 V
Me	0	0	1, 1, 1 pl 6 rl 2, 2 V	4 pl 5 rl 2, 2 V
♀ (Paratype)				
Fe	2 pl	1 pl	0	2, 1 D
Ti	0	0	1 pl 1, 2 rl 1, 2 V	2, 2 pl 2, 1 rl, 1, 2 V
Me	0	0	1, 1 pl 1, 1, 1 rl 1 V	4 pl, 5 rl, 2, 2 V



Figs. 2-5. *Hygrocrates kovblyuki* sp. n. **2.** Male palp (right), retrolateral view **3.** ditto, posterior view **4.** ditto, prolateral view **5.** ditto, nearly prolateral view Abbreviations: ***Ap***$_a$ apophysis$_a$ ***Ap***$_b$ apophysis$_b$ ***E*** embolus Scale lines: 0.1 mm



Figs. 6-7. *Hygrocrates kovblyuki* sp. n. **6.** Vulva, dorsal view 7. Ditto, ventral view Abbreviations: ***Ad*** anterior diverticulum ***Pd*** posterior diverticulum ***Sp*** spermatheca ***dps*** distalmost part of spermatheca ***pps*** proximalmost part of spermatheca ***da*** dorsal arch ***cv*** central valve ***tb*** transverse bar ***ps*** membranous sac ***lms*** large membranous sac ***tlm*** twisted lateral membranes. Scale lines: 0.1 mm.

are strongly sclerotized. Dorsal arch is as wide as the transverse bar.

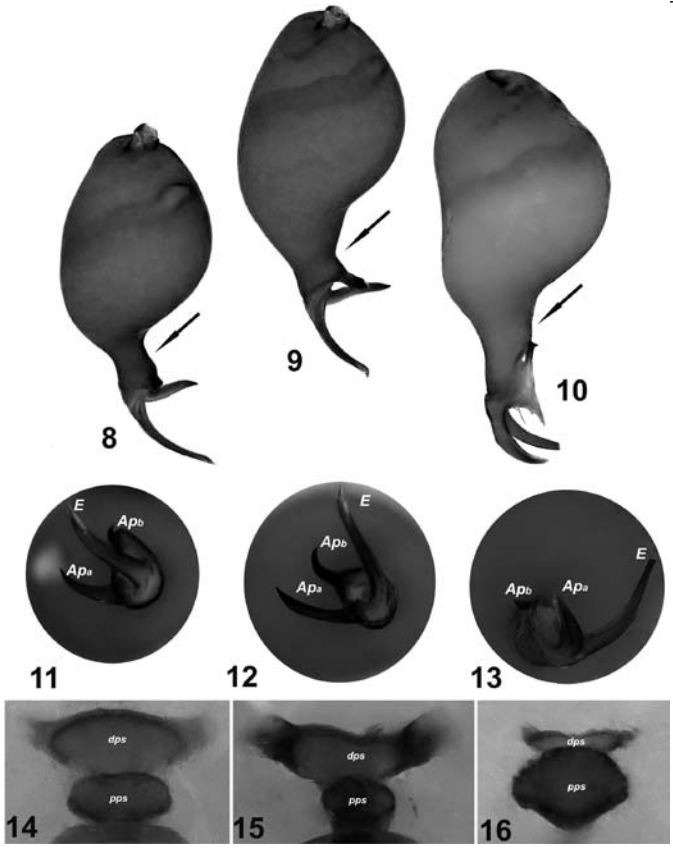
Habitat and distribution: *H. kovblyuki* sp. n. is known from the type locality only. The vegetation at the type locality consists of mixed humid forest composed of *Fagus orientalis*, *Abies nordmanniana* ssp. *bornmuelleriana* and *Pinus sylvestris*.

Remarks

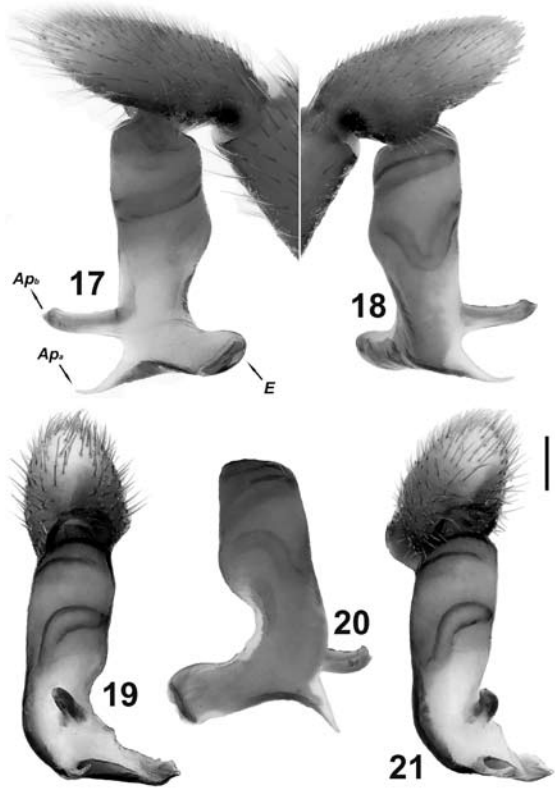
The structure of the copulatory organs of *H. kovblyuki* sp. n. is similar to the other Turkish members of the genus, *H. lycaoniae* and *H. deelemanus*. Males of the new species can be easily distinguished from the others by the shape of apophysis$_b$ which is divided into two parts (Figs 8-13). Also, the spermathecae have two parts (Figs 14-16). The Caucasian species, *H. caucasicus* Dunin, 1992 and *H. georgicus,* were originally described from Georgia. *H. caucasicus* was described based only on the male and *H. georgicus* (Mcheidze, 1972) was described based only on the female. The other sexes are still unknown for both species. The male palp of *H. caucasicus* is characterized by a straight and cylindrical bulbus, a lobe-shaped embolus and a finger-shaped apophysis$_b$ (Figs 17-21). However, because of insufficient information, the taxonomic status of *H. georgicus* remains unclear (see Kunt *et al.* 2011). But, based on current data, *H. georgicus* can be distinguished from the Turkish members of the genus by the linear distalmost part of the spermathecae. Thus, two different groups (Anatolian and Caucasian groups) can be distinguished within the genus *Hygrocrates* based on differences in the structure of their genitalia.

Results

The description of *Hygrocrates kovblyuki* sp. n., raises the total number of *Hygrocrates* species in Turkey to three, with a total number of 49 Turkish Dysderidae. To date, 25 Dysderinae species, including the newly described species, have been recorded in Turkey. *Dysdera* is the most species-rich genus, with 20 species in Turkey (Bayram *et al.* 2012). According to the classification of Deeleman-Reinhold, Deeleman (1988), eight of their nine *Dysdera* species groups occur in Turkey, with the *asiatica* group being most diverse with six species recorded. The other genera of the subfamily, *Dysderocrates* Deeleman-Reinhold & Deeleman, 1988 and *Harpactocrates* Simon, 1914, are represented by only one species



Figs. 8-16. Comparison of the three Turkish species. **8, 11, 14.** *H. deelemanus* **9, 12, 15.** *H. lycaoniae* **10, 13, 16.** *H. kovblyuki* sp. n. Abbreviations: Ap_a apophysis$_a$ Ap_b apophysis$_b$ ***dps*** distalmost part of spermatheca ***pps*** proximalmost part of spermatheca ***E*** embolus



Figs. 17-21. *Hygrocrates caucasicus* Dunin, 1992 (paratype, ZMMU Ta-6533, Abkhazia, Gudauta District, Khuach Village, 6.06./25.07.1987, leg. A.Koval) **17.** Male palp (left), prolateral view **18.** ditto, retrolateral view **19.** ditto, anterior view **20.** ditto, nearly retrolateral view **21.** ditto, nearly anterior view Abbreviations: Ap_a apophysis$_a$ Ap_b apophysis$_b$ ***E*** embolus Scale line: 0.2 mm.

each: *D. regina* Deeleman-Reinhold, 1988 and *H. troglophilus* Brignoli, 1978. Although *Rhodera* Deeleman-Reinhold, 1989 (Crete and Greece) and *Cryptoparachtes* Dunin, 1992 (Azerbaijan and Georgia) occur in neighboring countries, they have not yet been found in Turkey. The genus *Tedia* Simon, 1882 was recently collected from the Eastern Mediterranean region of Turkey, but the specimens probably represent a new species which will be described in a subsequent paper.

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