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The first case of an abnormally developed bulb in Dictynidae, and the first case of a malformed conductor in spiders (Arachnida: Aranei)

Первый случай аномального развития бульбуса в семействе Dictynidae и первый случай уродливого развития кондуктора у пауков (Arachnida: Aranei)

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KEY WORDS: Araneae, *Dictyna*, male palp, teratology, Siberia.
КЛЮЧЕВЫЕ СЛОВА: Araneae, *Dictyna*, пальпа самца, тератология, Сибирь.

ABSTRACT: The first case of an abnormality in the development of the male palp in Dictynidae is reported, based on a specimen collected in Northeastern Siberia. Both palps of this specimen exhibit an abnormality in the conductor, with the shape differing between each palp. This marks the first occurrence of a malformed conductor in spiders.

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РЕЗЮМЕ: Описан первый случай аномального развития пальпы самца в семействе Dictynidae. Самец, собранный на Северо-Востоке Сибири в Магаданской области, имеет видоизменённый кондуктор, при чём форма кондуктора различается на левой и правой пальпах. Это первый задокументированный случай аномального развития кондуктора у пауков.

Introduction

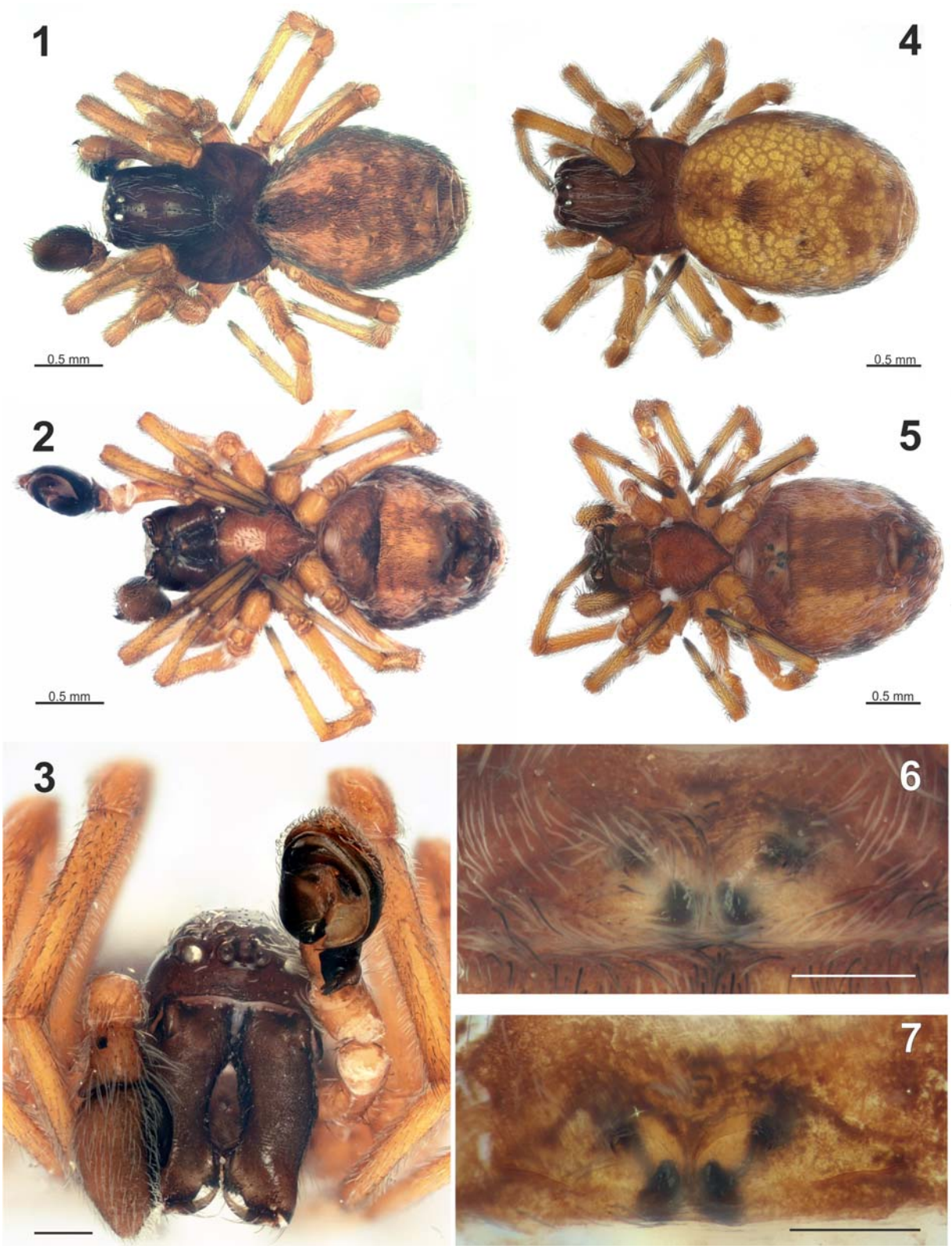
Teratological or malformed copulatory organs have been reported in many families of entelegyne spiders [Nadolny *et al*., 2022]. In the majority of reported cases, abnormal development has been documented in the epigynes and is associated with the appearance of additional parts. Abnormally developed palps have been recorded either in gynandromorph or intersex specimens. We are only aware of one case reported by Woźny [1979] in which one palp is properly developed in *Ozyptila trux* (Blackwall, 1846), while the other palp has not properly developed the tibia and bulb. To the best of our knowledge, there are no reports of abnormalities solely in the development of one of the palpal sclerites in both palps.

During spider collection in the Magadan area, the first author collected a male and female pair belonging to *Dictyna* Sundevall, 1833. Examination of the left male palp led to the conclusion that it belongs to an undescribed species with a highly unusual structure of the conductor. Subsequent examination of the female and its endogyne, however, revealed that it belongs to *D. arundinacea* (Linnaeus, 1758), the type species of the genus. This prompted further examination of the right palp of the male, revealing a different shape of the conductor than that of the left palp, and leading to the conclusion that the observed differences represent teratological deformities.

The goal of this paper is to document an abnormality in the development of a single sclerite, the conductor, in the male palp of a spider.

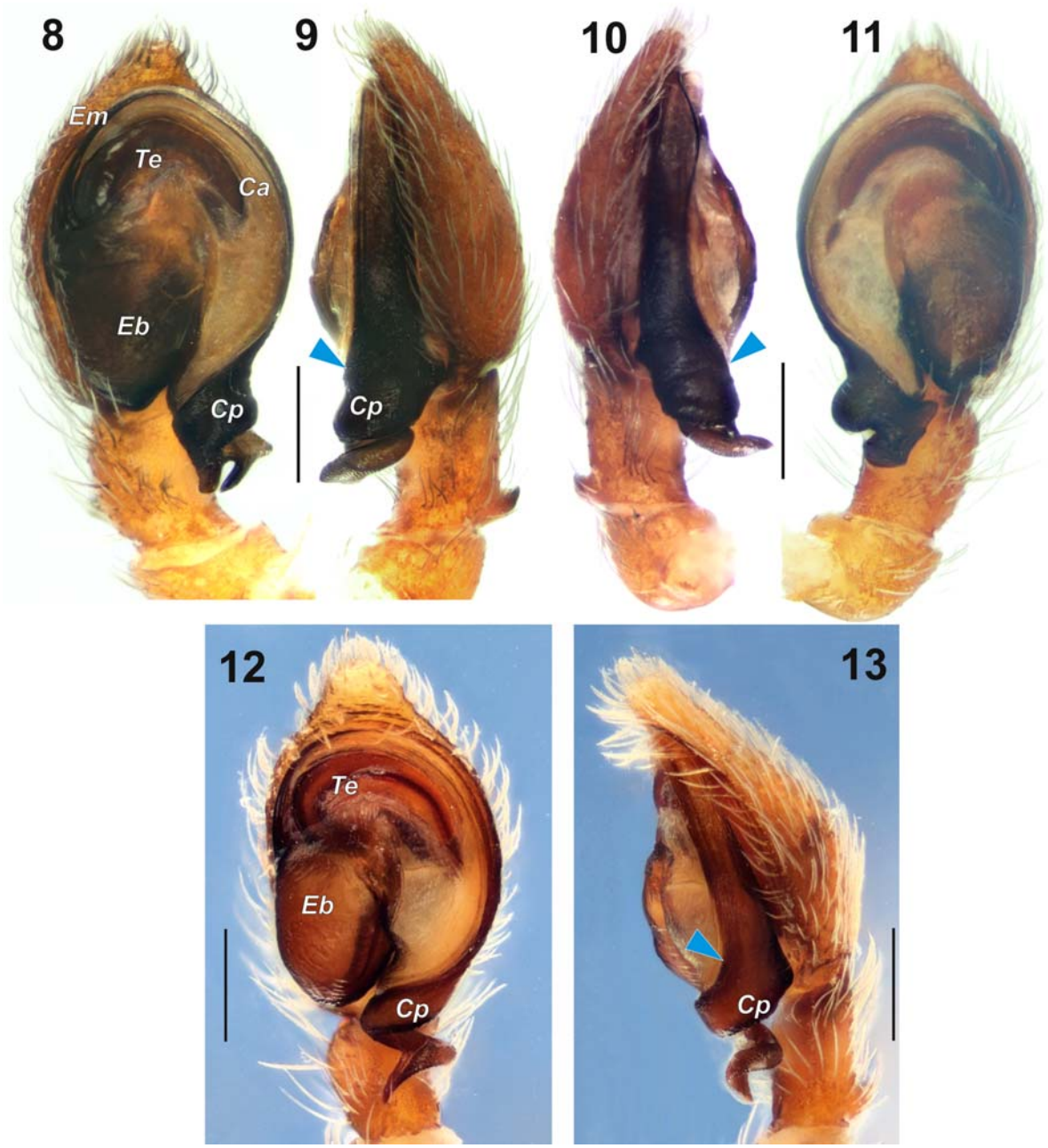
Material and methods

Photographs of specimens and their copulatory organs were obtained using an Olympus Camedia E-520 camera attached to an Olympus SZX16 stereomicroscope in the



Figs 1–7. *Dictyna arundinacea* from environs of Madaun: general appearance of male (1–3), general appearance of female (4, 5), and intact and dissected epigyne with shaved setae (6, 7). Scale = 0.2 mm, if not otherwise indicated. 1, 4 — dorsal; 2, 5–7 — ventral; 3 — anterior.

Рис. 1–7. *Dictyna arundinacea* из окрестностей Мадауна: общий вид самца (1–3), общий вид самки (4, 5), интактная отпрепарированная эпигина с удалёнными волосками (6, 7). 1, 4 — сверху; 2, 5–7 — снизу; 3 — спереди. Масштаб 0,2 мм, если не указано иначе.



Figs 8–13. Male palps of *Dictyna arundinacea*: specimen from environs of Madaun with malformed conductor (8–11), and specimen from Yakitia with properly developed palp (12, 13). Scale = 0.2 mm. 8, 9, 12, 13 — left, ventral and retrolateral; 10–11 — right, retrolateral and ventral. Abbreviations: *Ca* — anterior arm of conductor, *Cp* — posterior arm of conductor, *Eb* — embolic base, *Em* — embolus, *Te* — tegulum. Arrows mark the differences: straight part in the malformed conductor and bent part in the normal one.

Рис. 8–13. Пальпы самцов *Dictyna arundinacea*: экземпляр из окрестностей Мадауна с аномально развитым кондуктором (8–11), и самец из Якутии с нормально развитой пальпой (12, 13). 8, 9, 12, 13 — левая, вентрально и ретролатерально; 10–11 — правая, ретролатерально и вентрально. Масштаб 0,2 мм. Сокращения: *Ca* — передняя ветвь кондуктора, *Cp* — задняя часть кондуктора, *Eb* — основание эмболюса, *Em* — эмболюс, *Te* — тегулюм. Стрелки указывают на различия кондуктора: прямой у аномально развитого, и искривлённый у нормального.

Zoological Museum of the University of Turku. Digital images of different focal planes were stacked with Helicon Focus™ 8.1.1. All measurements are given in millimeters. The specimens will be deposited in the Zoological Museum of the Moscow State University (ZMMU).

Taxonomy

Family Dictynidae O. Pickard-Cambridge, 1871
Genus *Dictyna* Sundevall, 1833

NOTE. *Dictyna* is the most speciose genus of the family with 125 nominal species. Some of the species occurring outside of the Holarctic are very likely to be misplaced in the genus.

Dictyna arundinacea (Linnaeus, 1758)
Figs 1–13.

Dictyna arundinacea: Marusik *et al*., 2015: 135, figs 26–30, 37–39 (♂).

Dictyna arundinacea: Crews *et al*., 2020: 912, figs 20E, I, K–L, S11A–H, S12D–E (♂♀).

Dictyna arundinacea: Marusik, 2022: 416, figs 1a–e, h, 2a–h (♂♀).

For the complete list of 87 taxonomic references see WSC [2023].

MATERIAL EXAMINED: 1♂ 1♀ (ZMMU), RUSSIA, ***Magadan Area***, environs of Madaun Vil., 60.602852ºN, 150.668253ºE, sweeping yernik (*Ledum* and *Betula* shrubs) in thin-leaved larch forest, 1.07.2022 (Yu.M. Marusik). Both specimens have been caught during the same set of sweeping.

DIAGNOSIS. *Dictyna arundinacea* differs from all congeners, with the exception of *D. pusilla* Thorell, 1856, in the shape of the posterior arm of the conductor (Z-shaped) and the endogyne. The male of *D. arundinacea* can be distinguished from that of *D. pusilla* by the relatively shorter dorsal tibial apophysis with ctenidia, measuring less than half the tibia diameter *vs.* about the tibia radius. Females differ by their endogynes: in *D. arundinacea* the receptacles are wider than the copulatory duct, *vs*. approximately the same width in *D. pusilla*.

DESCRIPTION. This species has been described in numerous publications; therefore, we here provide only measurements.

Male. Habitus as in Figs 1–3. Total length 2.75; carapace 1.3 long, 1.0 wide; chelicera 0.73 long. Lengths of leg segments as shown in the Table 1.

Table 1. Lengths of leg segments of the male with malformed conductors.
Таблица 1. Промеры члеников ног самца с деформированным кондуктором.

	Fe	Pa	Ti	Mt	Ta	Total
I	1.14	0.37	0.97	0.86	0.57	3.91
II	1.0	0.36	0.81	0.73	0.5	3.4
III	0.74	0.36	0.5	0.6	0.36	2.56
IV	0.81	0.36	0.74	0.71	0.39	3.01

Palp as in Figs 8–13. Tibia, cymbium, tegulum (*Te*), embolic base (*Eb*), embolus (*Em*) and anterior arm of conductor (*Ca*) normally developed; anterior arm of conductor originates and terminates at the same position as in normal palp (Figs 12–13); posterior arm of conductor (*Cp*) deformed in different ways in left (Figs 8–9) and right (Figs 10–11) palps; both conductors are straight in lateral view *vs*. bent in normal palp (differences arrowed); terminal parts of the posterior arm of conductor have different shape (Figs 8, 11).

Female. Habitus as in Figs 4, 5. Total length 3.3; carapace 1.45 long, 1.08 wide. Lengths of leg segments as shown in the Table 2.

Table 2. Lengths of leg segments of the female.
Таблица 2. Промеры члеников ног самки.

	Fe	Pa	Ti	Mt	Ta	Total
I	1.14	0.47	0.87	0.81	0.53	3.82
II	1.06	0.43	0.74	0.73	0.5	3.46
III	0.79	0.37	0.51	0.57	0.4	2.64
IV	1.0	0.43	0.7	0.71	0.4	3.24

Epigyne as in Figs 6, 7.

DISTRIBUTION. Circum-Holarctic.

Compliance with ethical standards

CONFLICT OF INTEREST: The authors declare that they have no conflict of interest.

Ethical approval: No ethical issues were raised during our research.

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