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Review of the genus *Hasarius* (Araneae: Salticidae) - a taxonomic fiasco^{1*}

JERZY PRÓSZYŃSKI

Professor Emeritus, Museum and Institute of Zoology, Polish Academy of Sciences
ul. Wilcza 63, 00-679 Warsaw, POLAND.
e-mail: jerzy.proszynski@wp.pl

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Abstract

The genus *Hasarius* Simon, 1871, is revised following methodology recommended by "Pragmatic classification" of Prószyński (2017). Structure of the genus is insufficiently known, containing at present single cosmopolite species and a few of uncertain congeners.

The paper introduces the following nomenclatorial corrections:

Hasarius adansoni: Jastrzebski, 2010b: 321, f. 1, 4-5 (female only) = *Hasarius tropicus* Jastrzebski, 2010 - correction of identification.

Species: *kweilinensis* Prószyński, 1992, *orientale* Zabka, 1985, *dactyloides* Xie, Peng & Kim, 1993 listed variably in combinations with generic names *Habrocestum*, *Habrocestoides*, *Hasarius* and *Chinattus* seem to be misplaced in these genera and deserve transfer to own new genus.

Qualification of 6 species of *Hasarius* as "nomina dubia" by the WSC (ver. 18.5) after Roewer's (1954[1955]: 1523-1524) is changed to "pending revision" because of existence of preserved type specimens.

Synonymy of the genera *Gedea* Simon, 1902 and *Meata* Zabka, 1985 proposed recently by Maddison (2015) without published documentation are not recognized here until proof will appear printed.

Key words: pragmatic classification, molecular classification, molecular phylogeny, chain of morphological similarities, *Chinattus*, *Habrocestoides*, *Habrocestum*, *Hasarius*, Salticidae, system, taxonomy.

Introduction

History of research on genus *Hasarius* Simon, 1871 reflects changing approach to taxonomic research. Wanless (1983[1984]: 471) writes that *Hasarius* comprises "about 45 species", Prószyński (1971: 412) lists 38 "species" labeled as *Hasarius* in various collections of spiders, the Salticidae Database of Prószyński (2016b: 16) gives lists of 32 species and of 70 synonyms, which is not much different from joint number of 98 species and synonyms given by the WSC (ver. 18.5, assessed November 2017) but in the last paper Prószyński (2017b: 16) gives number of species as 16.

¹ Paper constitutes partial publication of sections of the Internet "Monograph of Salticidae (Araneae) of the World 1995-2016", parts I & II by Prószyński (2016a, b), available at: <http://www.peckhamia.com/salticidae/Subfamilies/> and <http://www.peckhamia.com/salticidae> respectively.

The present paper purports to revise diagnostic properties of species identified in the literature as belonging to *Hasarius* (Figs 1-2) and that gives surprising results: there are only 3 species belonging possibly to *Hasarius* (*H. adansoni*, *H. insularis* and *H. kulczyński*), and one species photographed but not yet described and named. All remaining nominal species seem to be misplaced or, at least, unrecognizable. The species structure of the genus *Hasarius* is unusual: single cosmopolite species spread over the world, and there are two other poorly known local congeners. From evolutionary point of view the monotypic genera can be old survivors, at the end of their history, but such species could be expected to survive in limited environment on remote geographic spot, which hardly correspond with resilient *Hasarius adansoni*. Opposite situation - newly originated species, not yet proliferating, could be, possibly, also strictly localized geographically. The third possibility, the most probable, is that congeners of *Hasarius* are neither recognized yet nor collected. The example of other genus represented by "sole" cosmopolite species - *Plexippus* C. L. Koch, 1846, has none the less a background of 19 other local congeners, distributed over three continents and multitude of islands.

There is also disagreement about position and relationships of the genus *Hasarius*. Similarities with other genera, selected in agreement with "pragmatic classification" of Prószyński (2017b) are shown of Fig. 5, relations proposed by "molecular phylogeny" of Maddison (2015) are presented on Figs 6-7. Questions of inter generic similarities and relationships may appear academic, but their value for taxonomic research cannot be overestimated. There is always possibility of misinterpretation of identification, so this paper provides survey of diagnostic characters of all "*Hasarius*" species.

Taxonomy

Gen. *Hasarius* Simon, 1871

Type species *Attus adansoni* Audouin, 1826 = *Hasarius adansoni* (Audouin, 1826)

Documentation studied. Summary of world's literature provided in "Monograph of Salticidae (Araneae) of the World 1995-2016", part I & II, by Prószyński (2016a, b) and current literature.

Diagnosis. Medium size jumping spiders of average appearance and dimensions (Fig. 1), males instantly recognizable by mane of white setae stretching dorsally over palps - from distal end of femur to mid-length of tibia, ending distally by characteristic oblique bunch of longer white setae^{2*} (Figs 1B, E, I, L, N1, P), accompanied by lighter broad belt along abdomen and a pair of small, but striking white spots posteriorly. Palpal organ very characteristic (Fig. 1M, 2C, F-G), resembling to certain extent palps of other genera of informal group CHRYSILLINES by short, anterior embolus atop of triangular fleshy basis extending obliquely over the whole bulbus, leaving visible only part of spermophor - anterior bend and a part running on retrolateral side. Whole palps are unusually long, due especially to length of tibia, which is longer than the distal segment - cymbium, but also long patella and femur. Habitus of female resembles males but is devoid of distinct recognition pattern, epigyne nondescript sclerotized plate (Fig. 1K, 2D, G) devoid of noticeable sculpture, internal structure consists of sclerotized chamber, developed towards interior of abdomen, perpendicularly to plate, and shortened optically when looking at, hence its shape is not reproduced reliably, the position shown (Fig. 2C, G) is perhaps the best presentation of its structure, but departing from that seen on average drawings.

Description. General appearance is shown on Figs 1 and 2A-B, the background of diversity of genitalic characters in related genera is presented on Fig. 5. Due to similarity of palps and epigyne in known species, the separating characters could, perhaps, be found in details of color pattern, but this require more studies on inter-population variation, which may lead to delimitation of independent species. It seems that basic components of body coloration in *Hasarius* are semiarch white band of setae around dorsal edge of thorax

² Evaluation of striking white pedipalpal mane is generally accepted by arachnologists, see Maddison (2015, Journal of Arachnology 43: 247 and 278) who wrote "... *Monophyly*: Hasarines are compact-bodied, often with distinctly white-edged palps that are held across the face ...". The same character, however, is discovered on new colour photographs of *Euophrys frontalis* (Walckenaer, 1802), *E. herbigrada* (Simon, 1871) and *E. sulphurea* (L. Koch, 1867) (Prószyński, 2018 – in press) which calls for further research

and stretching anteriorly beneath eyes lateral, its optical frontal extension is white mane on palps, usually held horizontally by a male *Hasarius* (Fig. 1B, E, I, L, N1, P). Abdominal pattern consists of semilunar white line along anterior edge, broad median lighter belt along the whole length of abdomen, accompanied in posterior third of length by a pair of minute, contrasting pair of white dots (Figs 1A, D-F, 2B). That color pattern may appear variable, be either striking or barely discernible, white lines may be thin or broadened along their course, in preserved specimens may partially disappear (Fig. 1G). There seems to be difference in the hue of the background body coloration, which typically may be relatively light (Fig. 1A) or almost black (Fig. 1L) or fawn (Fig. 1D). Color pattern of face in males may be very significant, with presence of red, red and white, or yellow rings of scales around eyes I, red lower lateral bands entering eye field (Fig. 1N1), or a pair of small red dots beneath eyes I lateral and small white triangle above touching point of eyes I median (Fig. 1P). The taxonomic significance of these markings deserves revision, which however cannot be undertaken without photographic documentation. It should be noted that shape of embolus and its basis is somewhat variable and deserves more attention (Figs 1B, J, M, 2C, F-H).

Distribution. *H. adansoni* is commonly accepted as cosmopolite in warmer parts of the world and as an invader of hothouses in cooler countries. It is now clear, that majority of species placed at some times in *Hasarius*, were misplaced, and should be transferred elsewhere (Fig. 3). While placement of *H. tropicus* (Figs 1N1-O) is uncertain (male palp indicates rather *Chinattus*), discovery of unnamed "tadpole eating" *Hasarius* species (Figs 1P-Q) in S India suggest that distributional center (a "home land") of the genus may be located in tropical Asia, different coloration of specimen from Kenya (Figs 1L, but note difference in embolus -1M) may ultimately be recognized as another separate species. So there is a possibility of discovery of other local species in other warm areas of the Old World.

Composition. Type species - *Hasarius adansoni* (Audouin, 1826), other species are *H. kulczyński* Zabka, 1985 and *H. insularis* Wesolowska & van Harten, 2002. Placement of *H. tropicus* Jastrzębski, 2010 is problematic, pending further research.

Species pending placement elsewhere: *H. egaenus* Thorell, 1895, *H. glaucus* Hogg, 1915 (Fig. 3D), *H. insignis* Simon, 1885, *H. mulciber* Keyserling, 1881 (Fig. 3B), *H. obscurus* Keyserling, 1881 (Fig. 3E), *H. pauciaculeis* Caporiacco, 1941 (Fig. 3K), *H. rufociliatus* Simon, 1898 (Fig. 3G), *H. testaceus* (Thorell, 1877), *H. trivialis* (Thorell, 1877), *H. validus* (Thorell, 1877)

Species names "nicht zu deuten"

Platnick's Catalog, predecessor of the present the World Spider Catalog, cultivated unshakable respect to the nomenclatorial decisions's of otherwise distinguished C. F. Roewer, rather not shared by the immediate collaborators of the latter. One of rather harmful manifestations of that was listing of some names as "nicht zu deuten" ("not interpretable"), effectively eliminating such names from attention, and therefore from further research. The WSC (ver. 18.5, accessed November 2017) follows Roewer's (1954[1955]: 1523-1524) mistake listing the following nominal species of "*Hasarius*" as "nomina dubia", in spite of preservation of their type species in several collections, listed in the Prószyński's (1971e) "Catalogue of Salticidae (Aranei) specimens kept in major collections of the world". Species having type specimens are not "nomina dubia" of course, but pending taxonomic revision - or "species inquirenda" (in the wording of Salticidae Database by Prószyński (2016b)).

Hasarius elisabethae Thorell, 1890b: 85 (Sumatra) - Roewer, 1954[1955]: 1523 - Prószyński 1971: 412 - Coll. Goa (=Genova) - *Hasarius elisabethae*

Hasarius inhebes Karsch, 1879a: 359 (West Africa) - Roewer, 1954[1955]: 1523 - Prószyński 1971: 412 - Coll. Ber (= Berlin) - *Hasarius inhebes*

Hasarius kjellerupi Thorell, 1891: 142 (Nicobar Is.) - Roewer, 1954[1955]: 1523 - Prószyński 1971: 412 - Coll. Cop (=Kopenhagen) - *Hasarius kjellerupi*

Hasarius scylax Thorell, 1892c: 413 (Sumatra) - Roewer, 1954[1955] : 1524 - Prószyński 1971: 412 - Coll. Goa (=Genova) - *Hasarius scylax*

Hasarius sulfuratus Thorell, 1891: 145 (Nicobar Is.) - Roewer, 1954[1955]: 1524 - Prószyński 1971: 412 - Coll. Cop (=Kopenhagen) - *Hasarius sulfuratus*.

Hasarius workmanii Thorell, 1892c: 423 (India) - Roewer, 1954[1955]: 1524 - Prószyński 1971: 412 - Coll. Goa (=Genova) - *Hasarius workmanii*.

Color patterns in *Hasarius*

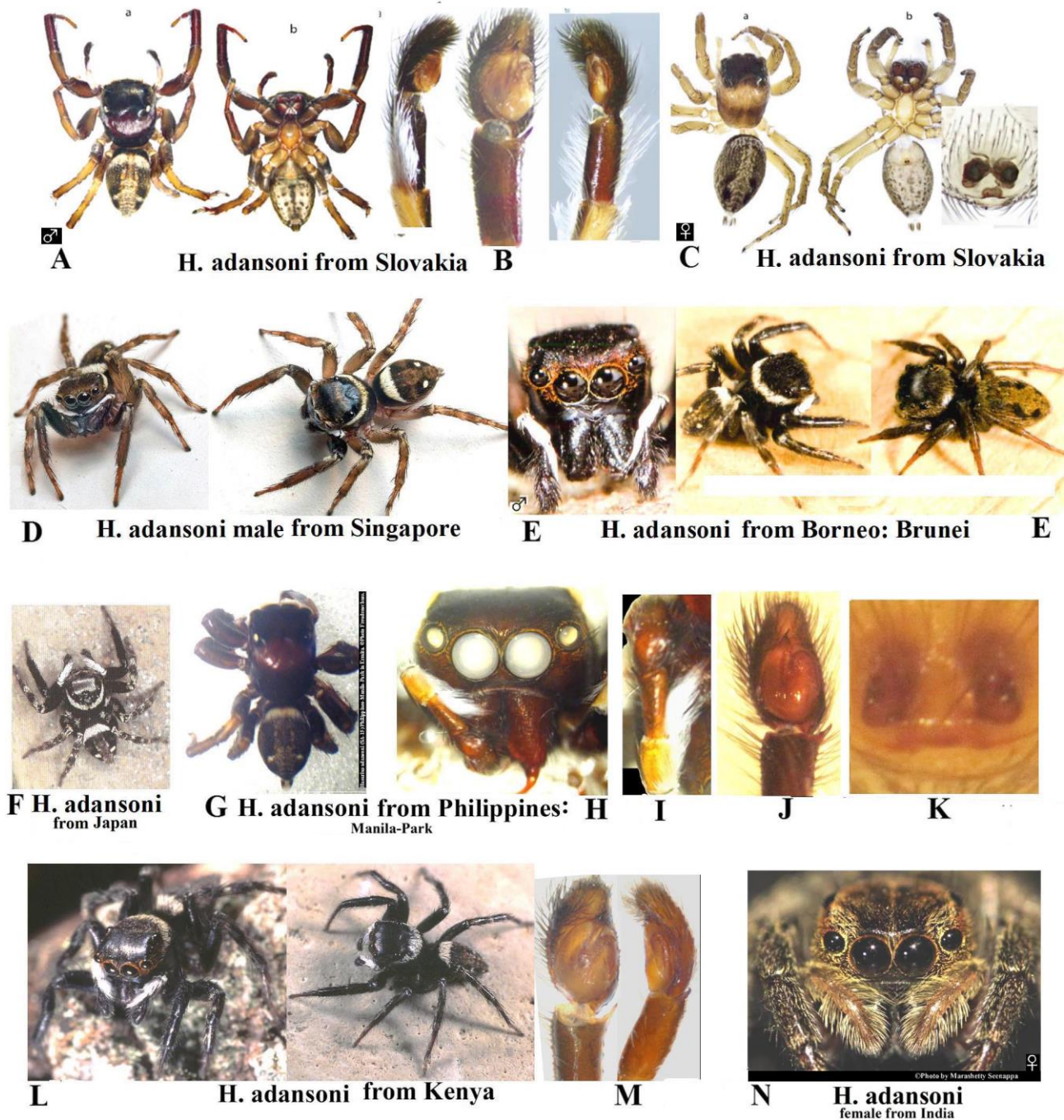
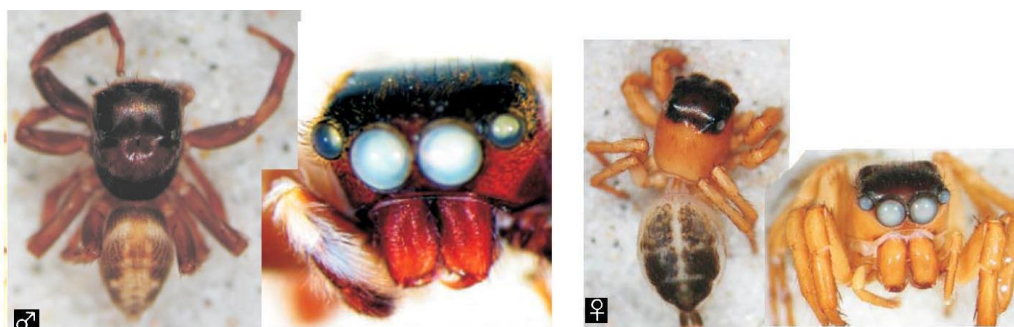


Figure 1A-N. Habitus of *Hasarius adansoni* and related species from various areas of the World. **A-C** - Exemplary documentation of *H. adansoni* from Slovakia (**A-B** - male habitus and palp, **C** - female habitus and cleared epigyne), **D** - *H. adansoni* male from Singapore, **E** - *H. adansoni* from Borneo: Brunei, **F** - *H. adansoni* from Japan, **G-K** - *H. adansoni* from Philippines: Manila-Park, **L-M** - *H. adansoni* from Kenya, **N** - *H. adansoni* female from India.

SOURCES: **A-C** - ©Photo A, Sestakova, **D** - © Photo H.K. Tang, **E** - ©Photo Koh J. 2013, **F** - © Ono, Ikeda, Kono. Salticidae of Japan, **G-K** - ©Photo Freudenschuss, **L-M** - © Phot J. Holstein, **N** - ©Photo by Marashetty Seenappa. All copyrights are retained by the original authors and copyright holders, used here by their courtesy.



N1 *Hasarius tropicus* Bhutan: Phuntsholing, 200-400 m. **O**
described as *H. "adansoni"*



P *Hasarius* sp. n. "tadpole-eater" India: Maharastra **Q**

Figure 1N1-Q. Color pattern in other species of *Hasarius*. **N1-O** - *Hasarius tropicus* Jastrzębski Bhutan: Phuntsholing, 200-400 m. (female described as *H. adansoni*) Genus: 21(2): 321-323, f 6-7, **P-Q** - *Hasarius* sp. n. "tadpole-eater", India: Maharastra: W Ghats, near Satara.

SOURCES: **N-O** - Jastrzębski 2010. Genus: 21(2): 321-323, f 6-7, **P-Q** - Photo by S. Satpute in Ahmed, J. et al. 2017, Peckhamia 159.1: 1-2. All ©copyrights are retained by the original authors and copyright holders, used here by their courtesy.

Comments on some species included into genus *Hasarius*

H. albocircumdatatus (L. Koch, 1880) is certainly a *Hasarius* because of white color and length of segments of palps, as well as incomplete median white mark on abdomen (Fig. 2L). There is a chance that Zabka (1991: 29) was right synonymizing *Jotus albocircumdatatus* L. Koch, 1880: 1250, pl. 107, f. 4 (= *Hasarius albocircumdatatus* Simon, 1903a: 795) from Tahiti with *H. adansoni*, but he did not provide documentation for that, and the original drawings are not precise enough.

H. dishonestus Keyserling, 1881 was examined by Zabka (1992: 29-30) but there is no documentation left and the original drawings by Keyserling (Fig. 3C) are not unequivocal proof of that classification.

Hasarius insularis Wesolowska & van Harten, 2002 - shape of thick walled spermatheca and ducts (Fig. 2M) corresponds with the same structures in *H. adansoni* (Fig. 2D), but no other diagnostic characters are known in females of this genus, confirmation of classification of this species must be delayed until male will be known.

H. kulczyński Zabka, 1985 - the enclosed drawing (Fig. 2K) is not clear - it resembles *Hasarius*, but that requires revision.

H. tropicus Jastrzebski, 2010 from Phuntsholing in Bhutan was described from male specimen, presumably because of typical white mane on palps, in spite of different body color pattern, especially striking red coloration of lower anterior angle of carapace (Fig. 1N1). The original description is illustrated, however, by

very different palps (Fig. 2I), not resembling other species of *Hasarius*. It was discovered recently that palpal white mane occurs also in some species of *Euophrys* C. L. Koch, 1834 (*E. frontalis* (Walckenaer, 1802), *E. herbigrada* (Simon, 1871) and *E. sulphurea* (L. Koch, 1867) – for documentation see Prószyński (2018c – in press). Therefore the white hairs on palps may be less useful character than it was expected. The matter should be checked on other specimens and species, documented by both color photos of habitus and drawings/photos of palps, epigyne and spermathecae. Female collected from the same locality and by the same expedition was misidentified as *H. adansoni* from which differs by color pattern (Fig. 1O) and details of epigyne (Fig. 2J), unfortunately spermathecae were not documented - it is assumed provisionally that it is matching the male *H. tropicus* and tentatively transferred to that species.

Nomenclatorial corrections

Hasarius adansoni: Jastrzebski, 2010b: 321, f. 1, 4-5 (female only) = *Hasarius tropicus* Jastrzebski, 2010 - correction of identification.

Hasarius kweilinensis Logunov, 1999a: 148 = *Habrocestoides kweilinensis* Peng & Xie, 1995a: 58 (Tf from *Habrocestum*) (return to provisional combination, pending placement in a new genus).
Habrocestum kweilinensis Prószyński, 1992a: 96, f. 33-34 (Df) = *Habrocestoides kweilinensis* Peng & Xie, 1995a: 58 (Tf from *Habrocestum*) (return to provisional combination, pending placement in a new genus).

Hasarius adansoni (Audouin, 1826)

Type specimen - collected [presumably by Etienne Geoffrey Saint-Hilaire] from unspecified locality in "Egypt and Syria" (which, at the time of Napoleonic Invasion 1798–1801, extended to the present day Israel) documented on original drawings (Fig. 2A). Present location of type specimen is unknown, presumed lost.

Designation of neotype. Due to diversity shown in existing documentation (Figs 1A-N, 2A-H) of the cosmopolite species assumed to be *Hasarius adansoni* (being simultaneously type species of the genus *Hasarius*), there is particular need to designate neotype, to stabilize understanding of the species and to replace lost original type specimen. Good candidate for that is male specimen from Israel [possible terra typica, or adjacent to it], documented by Prószyński (2003: 68, f. 256-257) (Fig. 2B-C), which agrees with characters shown in the original drawing (Fig. 2A). The proposed neotype specimen is accompanied by matching female (Fig. 2D) from the same area. The proposed neotype specimen is preserved in the Israel National Arachnid Collection at Hebrew University, Givat Ram Campus, Jerusalem, Israel.

Documentation studied. Summary of world's literature provided in "Monograph of Salticidae (Araneae) of the World 1995-2016", part I & II, by Prószyński (2016a, b, and current literature).

Diagnosis and description - see Prószyński (2003 *Annales Zoologici* 53: 68, f. 256-260). Diagnostic drawings see Figs 1A-C, 2B- E.

Remarks. The diagnoses, descriptions and graphic documentation of *Hasarius adansoni*, available in the literature, contain characters pertaining, in fact, to the whole genus, but insufficient to subdivide it into possible partial species. Solution of that hypothesis and writing eventual differentiating diagnoses must be delayed until next revision.

Distribution. *Hasarius adansoni* is accepted as cosmopolite in warmer parts of the world, invader of hothouses in cooler countries. It is now clear, that majority of species placed at some times in *Hasarius*, were misplaced, and should be transferred elsewhere (Fig. 3). Discovery of supposed *Hasarius* (with bunch of white setae on palps - Fig. 1N) - *H. tropicus* in Bhutan suggests, however, possibility of discovery of other local species in other areas of the Old World.

Characters of *Hasarius* species

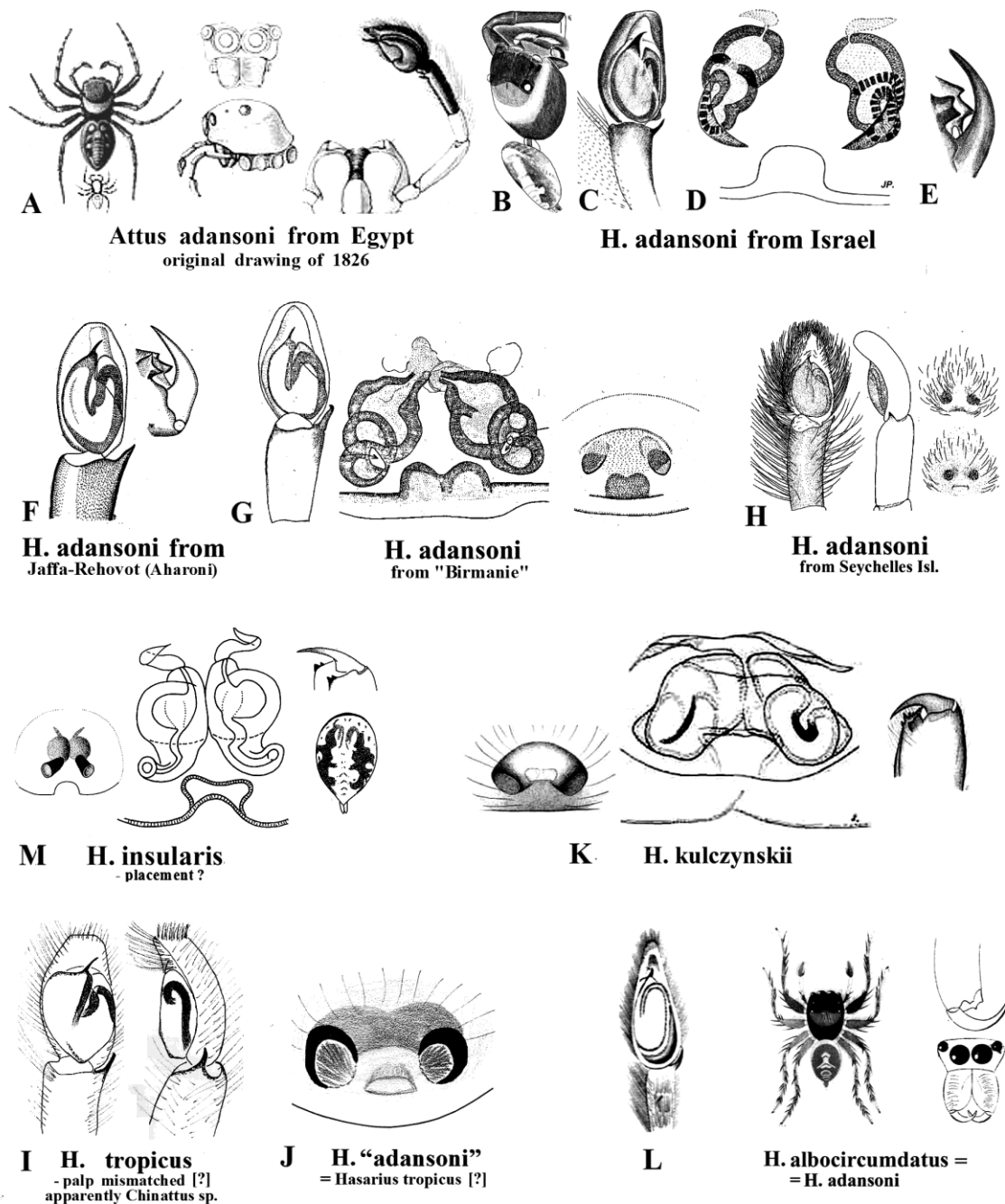
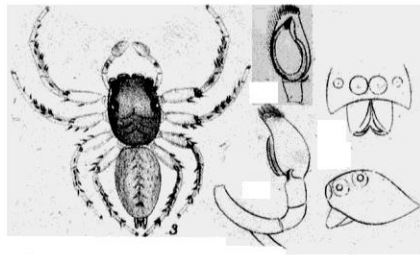


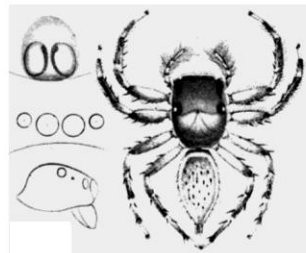
Figure 2. Diagnostic characters of representatives of genus *Hasarius*. **A** - *Attus adansoni* from Egypt, original drawing of 1826, **B-E** - *H. adansoni* from Israel - habitus, palp, internal structure of epigyne (spermatheca developed vertically to surface of epigyne, here lies in horizontal position), cheliceral dentition, **F** - *H. adansoni* from Jaffa-Rehovot, **G** - *H. adansoni* - Thorell's specimen from "Birmanie", **H** - *H. adansoni* from Seychelles Isl., **I** - "*H. tropicus* [?]" - palp mismatched, apparently *Chinattus* sp. (compare Fig. 1N), **J** - *H. adansoni* (mistake!) - possibly *H. tropicus*, **K** - *H. kulczynskii*, **L** - *H. albocircumdatus* (note white palpal tibia and patella), **M** - *H. insularis*.

SOURCES: **A** - Audouin, 1826: 404, pl. 7, f. 8 1826, **B -E** - Prószyński, 2003: Annales Zoologici **53**: 68, f. 256-260, **F-G** - Prószyński, 1984: 58, 107, **H** - Wanless, 1983[1984]: 49, f. 16a-d, **I-J** - Jastrzębski 2010: Genus: 21(2): 321-323, f 6-7, **K** - Zabka 1985. Annales zoologici, 39, 11: 227-228, ff. 208-210, **L** - L. Koch 1881. Die Arachniden Australiens: 1250, T. 107, F. 4, **M** - Wesołowska, van Harten, 2002 Fauna of Arabia 19: 377-378, figs 26-29. All copyrights are retained by the original authors and copyright holders, used here by their courtesy.

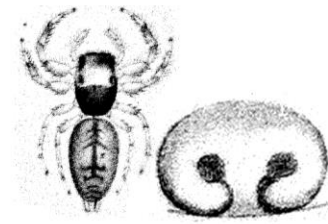
Misidentified "Hasarius" species



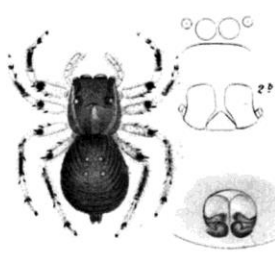
A *H. pumilio*
- misplaced ?



B *H. mulciber*



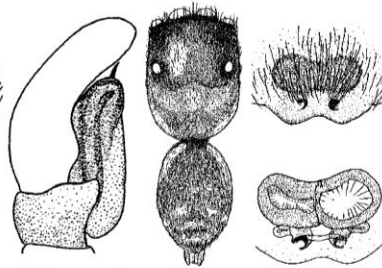
C *H. inhonestus*



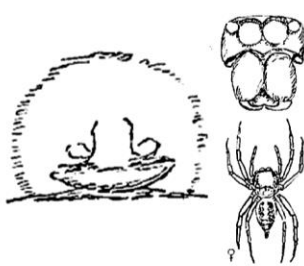
E *H. obscurus*



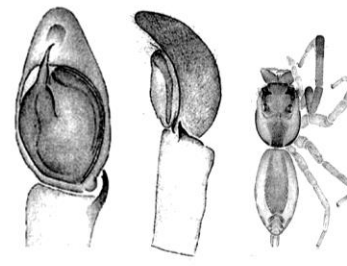
F *H. mahensis*
- misplaced ?



G *H. rufociliatus*
- misplaced!



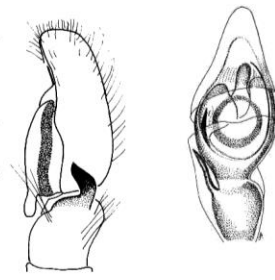
D *H. glaucus*



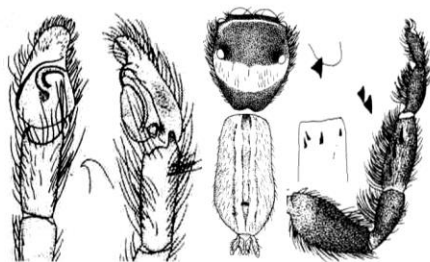
I *H. cheliceroideus*



J *H. firmus*



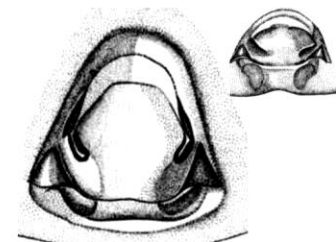
K *H. pauciaculeis*
from Cashei



L *H. "adansoni"* by
Barrion & Litsinger 1995
- misplaced!



M palp of the same,
quick sketch by Prószyński

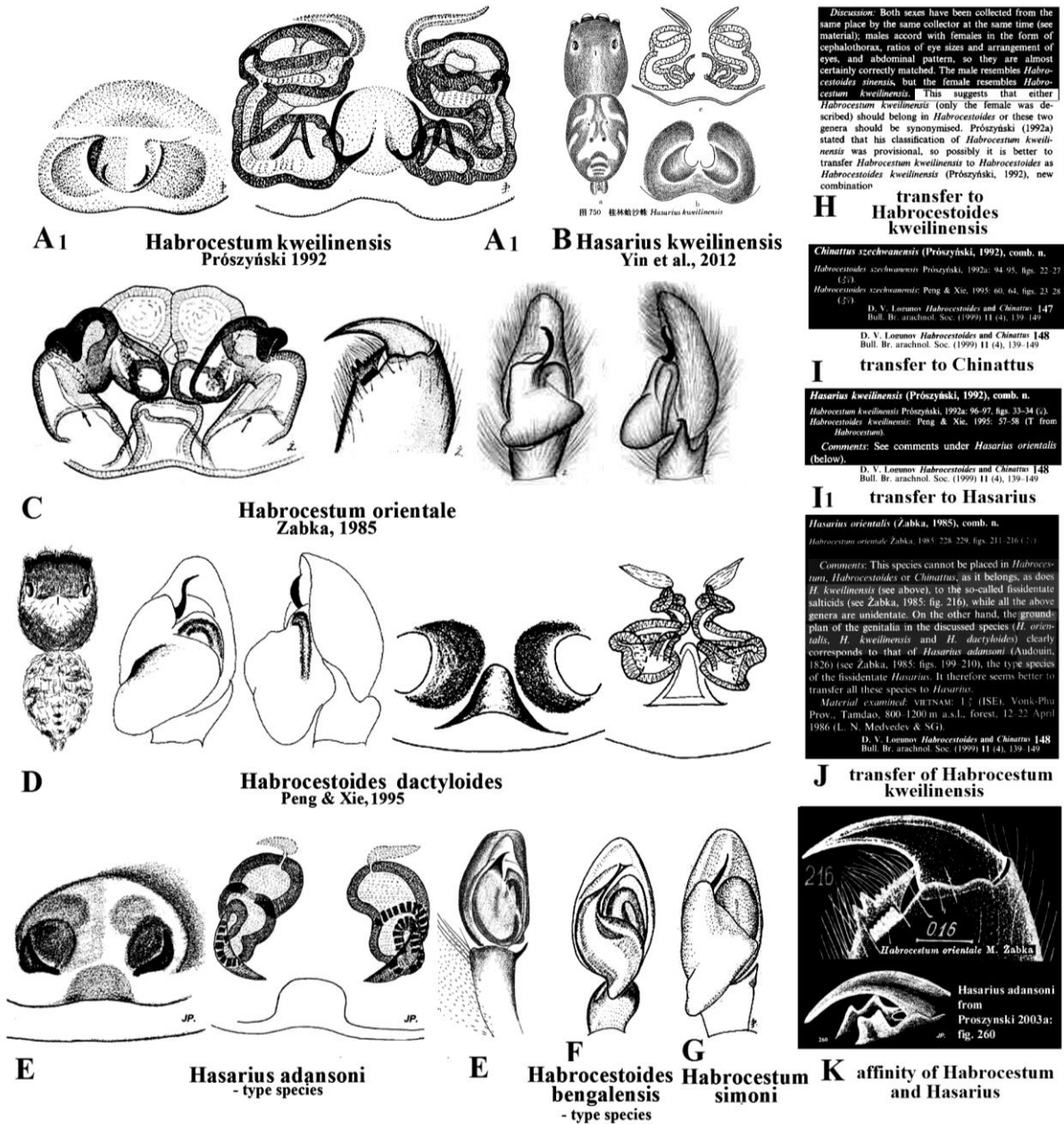


N *H. rusticus* - type

Figure 3. Misidentified and misplaced nominal species of "*Hasarius*" pending revision. **A** - *Hasarius pumilio*, **B** - *H. mulciber*, **C** - *H. inhonestus*, **D** - *H. glaucus*, **E** - *H. obscurus*, **F** - *H. mahensis*, **G** - *H. rufociliatus*, **I** - *H. cheliceroideus*, **J** - *H. firmus*, **K** - *H. pauciaculeis* - maturing palp, still covered by the tegument of previous instar, **L** - *H. "adansoni"* - misplaced [true *H. adansoni* also is documented from Philippines (see Fig. 1G-K)], **M** - palp of the same, quick sketch by Prószyński, **N** - *H. rusticus* - type from "Birmania".

SOURCES: **A-C**, **E** - Keyserling E, 1881: 1310 T. 111 F. 7; 1312, pl 111, f 8; 1315, T. 112, F. 2, 1317, pl. 112, f. 3; **D** - Hogg, 1915b: 523, f. 9, . **F-G** - Wanless, 1983[1984] Annales, Musée Royal de l'Afrique Centrale, Sci. zoologiques 241: 54, f. 18a-f; 51, f. 17a-g, **I** - Borowiec & Wesolowska, 2002 Genus 13: 405, f. 1-7, **J** - Wisniewski & Wesolowska, 2013 Genus 24(3-4): 504, f. 1-5, **K** - Prószyński 1987. Atlas ...: 45, **L** - Barrion & Litsinger, 1995: Riceland Spiders of South and Southeast Asia 92, f. 48a-l, **M** - the same palp, quick sketch by Prószyński (2016a, b - Internet), **N** - Prószyński 1984c: 60. All copyrights are retained by the original authors and copyright holders, used here by their courtesy.

FEMALE. A small spider resembling somewhat ♂ *Habrocestum hongkongiensis* sp. n. described above. The position of the species remains uncertain and the present classification is only provisional.



(ATTENTION: The text above can be easier read if magnification of the page would be increased on screen to 125-150%).

Figure 4A-K. Example of searching for placement into a correct genus. **A** - Disclaimer in original description of *Habrocestum kweilinensis* Prószyński, 1992 - facsimile, **A1** - original drawings of *Habrocestum kweilinensis* by Prószyński 1992, **B** - the same species labeled *Hasarius kweilinensis*: Yin et al., 2012, **C** - comparison with *Habrocestum orientale* Zabka, 1985, **D** - comparison with *Habrocestoides dactyloides* Peng & Xie, 1995, **E** - *Hasarius adansoni* - type species, **F** - *Habrocestoides bengalensis* Prószyński, 1992 - type species, **G** - *Habrocestum simoni* - representative species, **H** - facsimile of transfer from *Habrocestum* to *Habrocestoides kweilinensis*, **I** - transfer of *H. szechwanensis* to *Chinattus*, **II** - transfer to *Hasarius*, **J** - facsimile of argumentation for transfer of *Habrocestum kweilinensis*, **K** - key proof for affinity of *Habrocestum orientale* (by Zabka,1985) and *Hasarius adansoni*.

SOURCES: **A-A1** - Prószyński 1992: 96, f. 33-34, **B** - Yin et al., 2012: 1381, f. 750a-c, **C** - Zabka, 1985: 228, f. 211-216, **D** - Peng & Xie, 1995a: 57, f. 1-7, **E** - Prószyński, 2003: Annales Zoologici **53**: 68, f. 256-260, **F** - Prószyński, 1992b: 174, f. 38-42i, **G** - Prószyński 1987. Atlas ...: 35-36, **H** - Peng & Xie, 1995a: 58, **I** - Logunow, 1999: 147, **II-J** - Logunow, 1999: 148, **K** - upper - Zabka, 1985: 228, f. 211-216, lower - Prószyński, 2003: f. 260.

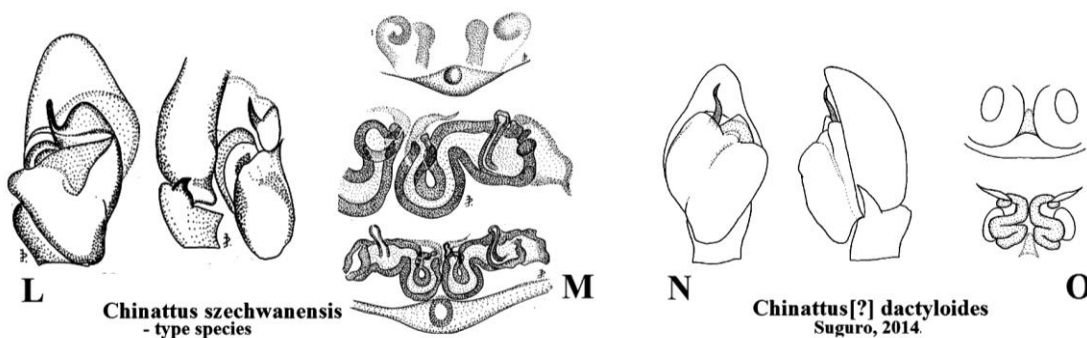


Figure 4L-O. Example of searching for placement into a correct genus. **L** - *Chinattus szechwanensis* - type species, **M** - the same - epigyne, **N** - *Chinattus[?] dactyloides* by Suguro, **O** - the same - epigyne.

SOURCES: **L-M** - Prószyński, 1992: 94, f. 22-27, **N-O** - Suguro, 2014: 10, f. 11-18.

Correct placement of *Hasarius kweilinensis* and related species. Species *kweilinensis* is listed now in the WSC (ver. 18.5, assessed December 2017) in combination with the genus name *Hasarius* - is that correct? Placement of *Habrocestum kweilinensis* Prószyński, 1992 was uncertain right from the first description, which begun from the disclaimer "the present classification is only provisional" (Fig. 4A). That initial placement was influenced by some resemblance of its spermathecae (Fig. 4A1) to *Habrocestum orientale* Zabka, 1985 (Fig. 4C). Peng & Xie (1995a: 58) added observation on similar Chinese species *Habrocestoides dactyloides* Xie, Peng & Kim, 1993 (Fig. 4D), in which male resembles *Habrocestoides sinensis* Prószyński, 1992 but female rather *Habrocestum kweilinensis*, they chosen placement in *Habrocestoides* as appropriate for both species (Fig. 4H). Their move appeared closer to acceptable, although not fully convincing. At the same time D. V. Logunov (1999: 148) (Fig. 4I-J) expressed opinion that the species should be rather moved to the genus *Hasarius*, unsupported by comparison of diagnostic drawings, but based on following reasoning (Fig. 4K):

1) "this species (*Hasarius orientalis*) cannot be placed in *Habrocestum*, *Habrocestoides* or *Chinattus*, as it belongs, as does *H. kweilinensis*, to the so-called fissidentate salticids ... while all the above genera are unidentate";

2) "the groundplan of the genitalia in the discussed species (*H. orientalis*, *H. kweilinensis* and *H. dactyloides*) clearly corresponds to that in *Hasarius adansoni* ..., the type of species of the fissidentate *Hasarius*. It therefore seems better to transfer all these species to *Hasarius*."

These arguments are wrong. 1) Types of cheliceral dentition (pluridentate, unidentate, fissidentate) (Fig. 4K) were popularized by Simon (1901-1903) as a tool for division of the whole family Salticidae (over 4800 species) into three groups of genera, but are largely abandoned in modern arachnology and cannot be used as a proof of affinities of genera. 2) Nobody ever confirmed similarity of the "groundplan" of spermathecae, ducts and palps of *Hasarius adansoni* with genera discussed by Logunov (Figs 4A1 compare with 4E, also D, M). In spite of that, name "*Hasarius*" stuck with the discussed species. Recently similar species *H. dactyloides* was transferred to *Chinattus* by Suguro (2014: 10, f. 11-18) (compare Figs 4N-O with 4L-M), a solution not fully satisfactory. The problem obviously cannot be solved with so incomplete data available and the group of species³* deserves full revision. Species *dactyloides*, *kweilinensis* and *orientalis* deserve transfer to a new genus of their own.

³ More drawings of unpublished species of *Habrocestoides* and *Chinattus*, from Bhutan, Iran and Nepal by Prószyński can be compared at <http://www.peckhamia.com/salticidae/specimen.php?id=3817>.

Similarity of Hasarius to other genera
according to Prószyński (2016a)

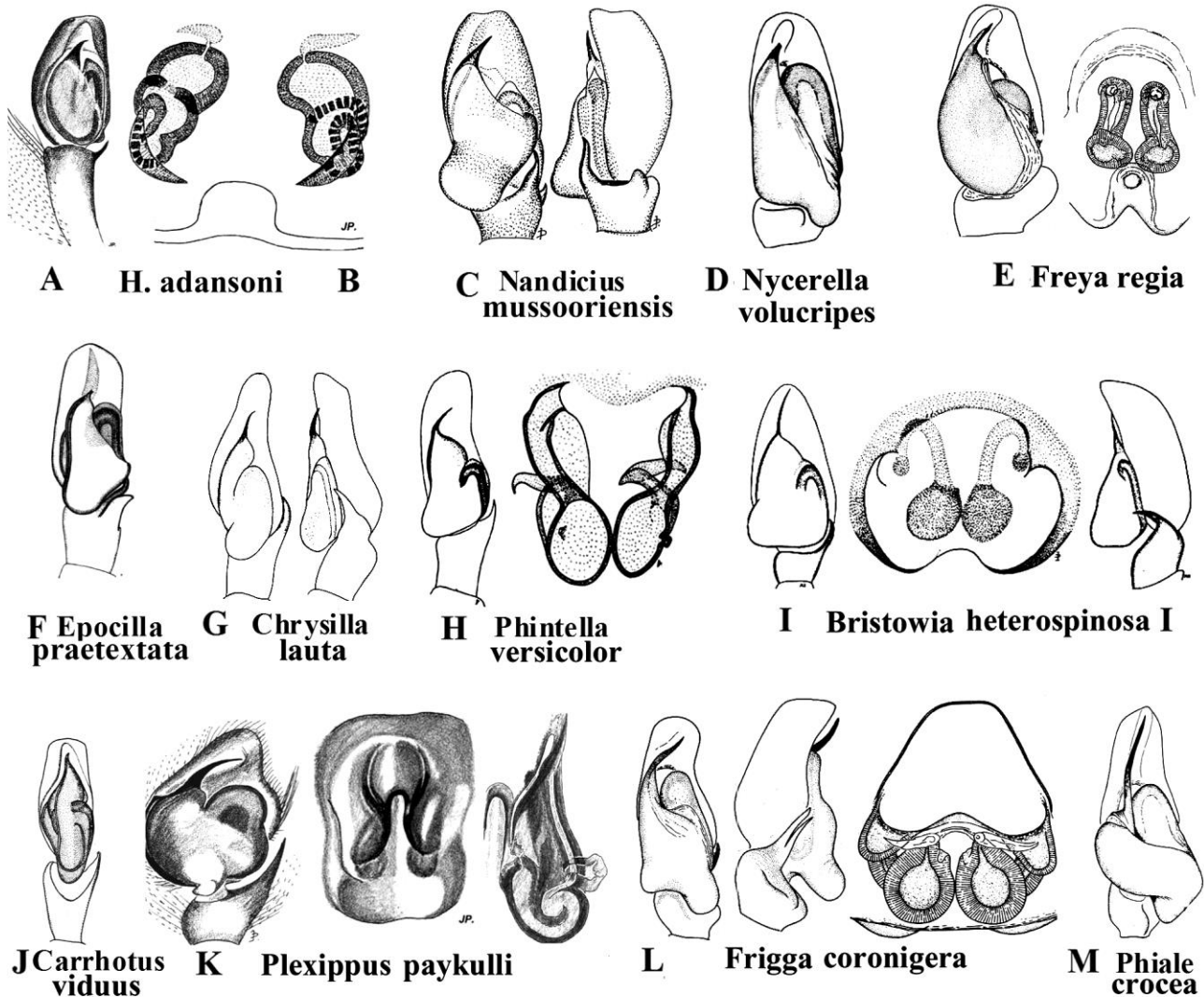


Figure 5. Genera similar to *Hasarius* (therefore possibly related) according to "pragmatic classification" of Prószyński (2016a, 2017b) (genera shown on this plate contain together 222 recognizable species). **A-B** - *H. adansoni* from Israel - palp and internal structure of epigyne, **C** - *Nandicius mussooriensis* Prószyński, 2016 (6 species), **D** - *Nycerella volucripes* Galiano, 1982 (16 species), **E** - *Freya regia* (Peckham & Peckham, 1896) (24 species), **F** - *Epocilla praetextata* Thorell, 1887 (14 species), **G** - *Chrysilla lauta* Thorell, 1887 (15 species), **H** - *Phintella versicolor* (Koch C.L., 1846) (62 species), **I** - *Bristowia heterospinosa* Reimoser, 1934 (3 species), **J** - *Carrhotus viduus* (Koch C.L., 1846) (29 species), **K** - *Plexippus paykulli* (Audouin, 1826) (20 species), **L** - *Frigga coronigera* (Koch C.L., 1846) (9 species), **M** - *Phiale crocea* (21 species). (In brackets - number of species having similar genitalic characters).

SOURCES: **A-B, K** - Prószyński, 2003: *Annales Zoologici* **53**: 68, f. 256-260; 143-145, f. 583, 587-588, **C** - Prószyński 1992a *Annales Zoologici* **44**: 101, f. 54-59, **D** - Galiano 1982b. *Physis* **C**, **41**, 100: 62-63; f. 20-22, **E** - Galiano 2001. *Journal of Arachnology* **29**: 28, f. 17-18, 46, 52, **F, L, J** - Prószyński 1984c. *Atlas ...*: 39; 14; 16, **G** - Prószyński 1983c. *Acta Arachnologica* **31**(2): 44, f. 4-6, **H** - Prószyński 1973b. *Annales Zoologici*, **30**: 107-110, f. 25-32, **L** - Galiano 1981f. *Revista de la Sociedad Entomológica Argentina*: **39** (3-4): 283, f. 1-2, **M** - Galiano M. E. 1981b. *Journal of Arachnology* **9**: 75, 79-82, f. 14. All copyrights are retained by the original authors and copyright holders, used here by their courtesy.

Relation of *Hasarius* to other genera
according to Maddison (2015)

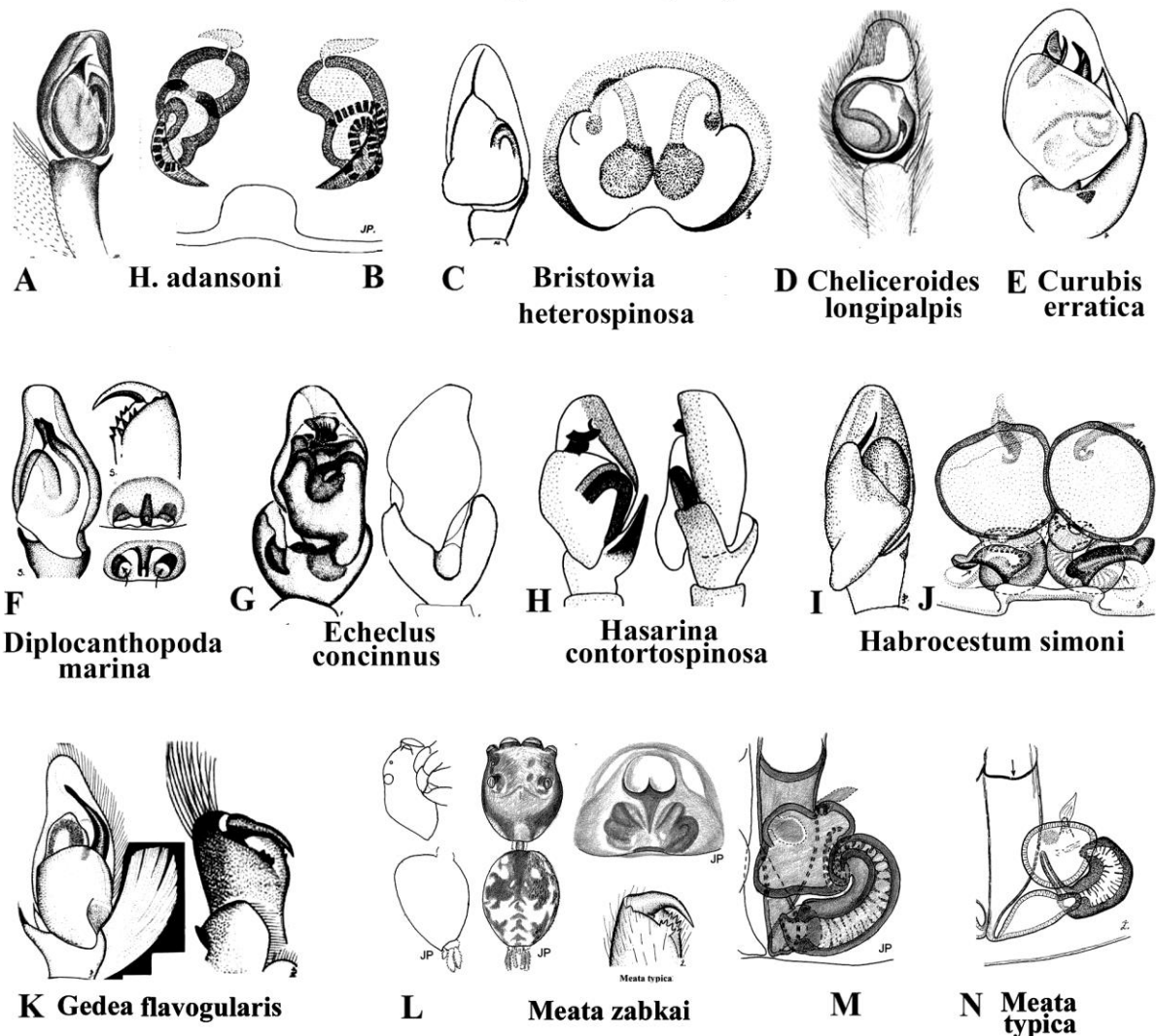


Figure 6A-N. Genera considered by Maddison (2015) as related to *Hasarius* - tribe Hasariini (genera shown on this plate contain together 82 recognizable species). **A-B** - *H. adansoni*, **C** - *Bristowia heterospinosa* Reimoser, 1934 (3 species), **D** - *Cheliceroides longipalpis* Zabka, 1985 (single species), **E** - *Curubis erratica* Simon, 1902 (2 species), **F** - *Diplocanthopoda marina* (Abraham, 1925) (2 species), **G** - *Echeclus concinnus* Thorell, 1890 (2 species), **H** - *Hasarina contortospinosa* Schenkel, 1963 (single species), **I-J** - *Habrocestum simoni* Dalmas, 1920 (44 species), **K** - *Gedea*⁴ *flavogularis* Simon, 1902 (6 species), **L-M** - *Meata*^{*} *zabkai* Prószyński, Deeleman-Reinhold, 2010 (3 species), **N** - *Meata*^{*} *typica* Zabka, 1985, **O-P-Q** - *Habrocestoides bengalensis* Prószyński, 1992 (13 species), **R** - *Madhyattus jabalpurensis* Prószyński, 1992 (single species), **S-T** - *Imperceptus minutus* Prószyński, 1992 (single species), **U** - *Mikrus ugandensis* Wesołowska, 2001 (single species), **V** - *Uxuma impudica* Simon, 1902 (single species). (In brackets - number of species having similar genitalic characters).

SOURCES: **A-B** - Prószyński, 2003: *Annales Zoologici* 53: 68, f. 256-260; 143-145, f 583, 587-588, **C** - Prószyński 1984c. *Atlas ...* 14, **D** - Zabka 1985. *Annales zoologici*, 39, 11: 210, f 79, **E** - Prószyński 1987: *Atlas ...* 18, **F** - Prószyński J. 1984c: *Atlas ...* 35, **G** - Prószyński 1984c. *Atlas ...* 36, **H** - Wesołowska 1981b: *Annales Zoologici* 36: 132-133, f 10-13, **I-J** - Prószyński 1987. *Atlas*: 35-36, **K** - Prószyński 1987: *Atlas ...* 27, **L-M** - Prószyński, Deeleman-Reinhold, 2010. *Arthropoda selecta* 19(3): 174, f 107-110, **N** - Zabka 1985. *Annales Zoologici* 39, 11: 239, ff. 279-282, **O-Q** - Prószyński 1992a. *Annales Zoologici*, 44, 9: 174-176, figs 38-42, **R** - Prószyński J. 1992b. *Annales Zoologici* 44, 9: 184, fig. 76-78, 79, **S-T** - Prószyński J. 1992b. *Annales Zoologici*. 44, 9: 181, f 65-66,

⁴ Synonymy of genera *Gedeia* and *Meata*, proposed recently by Maddison (2015) without published documentation, are not recognized here until proof will appear printed.

U - Wesolowska 2001c. Genus 12(4): 585-588, figs 1-7 , V - Szuts 2005[2007]. Opuscula zoologica 36: 94, f 38-42. All copyrights are retained by the original authors and copyright holders, used here by their courtesy.

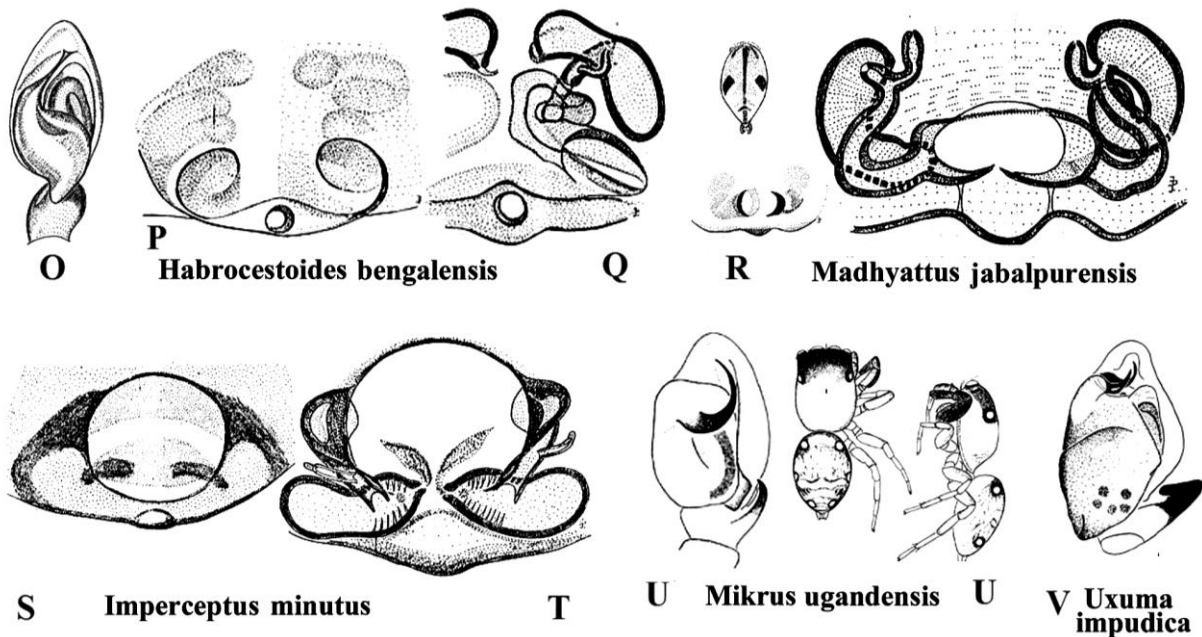


Figure 60-V. Genera considered by Maddison (2015) as related to *Hasarius* - tribe Hasariini (genera shown on this plate contain together 82 recognizable species). **O-P-Q** - *Habrocestoides bengalensis* Prószyński, 1992 (13 species), **R** - *Madhyattus jabalpurensis* Prószyński, 1992 (single species), **S-T** - *Imperceptus minutus* Prószyński, 1992 (single species), **U** - *Mikrus ugandensis* Wesolowska, 2001 (single species), **V** - *Uxuma impudica* Simon, 1902 (single species). (In brackets - number of species having similar genitalic characters).

SOURCES: **O-Q** - Prószyński 1992a. Annales Zoologici, 44, 9: 174-176, figs 38-42, , **R** - Prószyński J. 1992b. Annales Zoologici 44, 9: 184, fig. 76-78, 79 , **S-T** - Prószyński J. 1992b. Annales Zoologici. 44, 9: 181, f 65-66, **U** - Wesolowska 2001c. Genus 12(4): 585-588, figs 1-7 , **V** - Szuts 2005[2007]. Opuscula zoologica 36: 94, f 38-42. All copyrights are retained by the original authors and copyright holders, used here by their courtesy.

Placement and relationship of the genus *Hasarius*

There are two different proposals of placement of the genus *Hasarius* (Figs 5 and 6 below). **Pragmatic classification** proposed by Prószyński (2016a, 2017b) points at similarity of palps, and in a lesser degree of epigynes. That methodology is based on comparison of morphological characters, and is aimed primarily at identification of genera and species of Salticidae, it is not a phylogeny guide but may help in understanding phylogeny of particular taxa as a side effect. It requires:

- 1) usage of existing, or preparation of new, diagnostic graphic documentation, of high quality and in a standardized way;
- 2) charting that documentation into comparative plates containing all relevant recognizable species (or genera, or super generic taxa, whichever are needed for particular case), always checked with type species of relevant genera;
- 3) all findings should be transparent and open to permanent scrutiny at all time.

Molecular phylogeny and classification, as developed in publications on Salticidae by papers of Maddison et al. (since 2003), could be understood as a system permitting quick establishing phylogenetical relationships among large number of taxa, a system based on selected fragments of DNA, processed with appropriate computer programs. Its visible output are phylogeny trees, grouping genera according to highly sophisticated indices. The morphological premises for these relationships of *Hasarius* were quoted but not documented, it may be suspected that the arrangement presented includes component of previous knowledge

of morphology, applied intuitively in part. Valuable comments to tribus Hasariini, pertaining to *Hasarius* and related genera, are give by Maddison (2015, Journal of Arachnology 43: 246-247 and 278), compilation of diagnostic characters of these genera are shown in the present paper on Figs 6-7. Due to different approach, comparison of these characters are not fully compatible with conclusions drawn from morphological studies presented in Fig. 5. Further research may, perhaps, resolve these discrepancies. It is not clear which mutual properties are shared by genera illustrated on these plates.

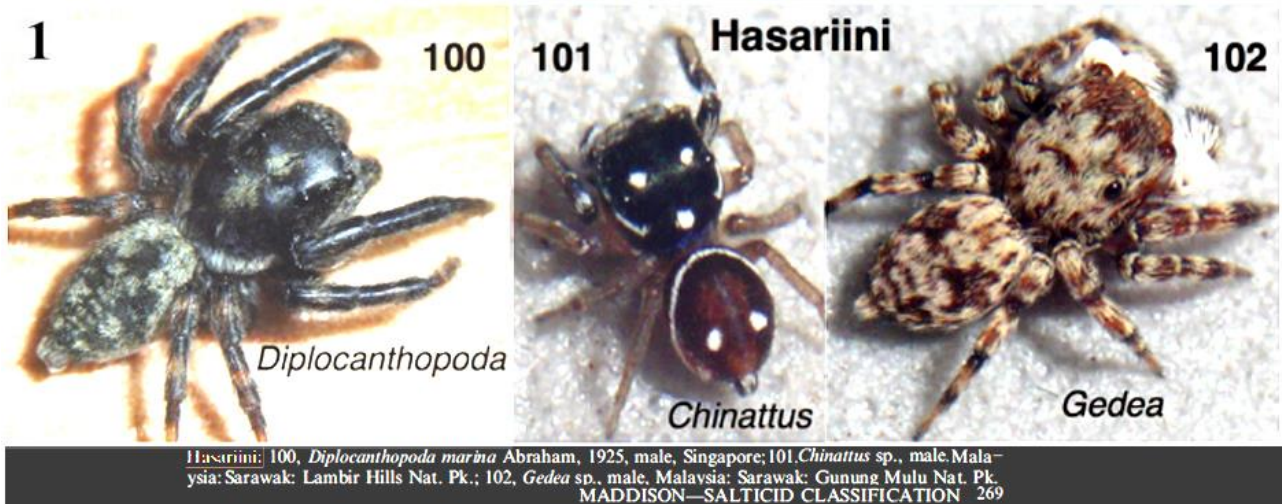


Figure 7-1. Genera considered by Maddison (2015) as related to *Hasarius* - his tribe Hasariini. ATTENTION: genera *Gedea* (males) and *Meata* (females) considered congeneric by Maddison (2015: without published documentation - see facsimile of description Fig. 7-2 – below). A - *Diplocanthopoda* s., B - *Chinattus*, C - *Gedea*.

SOURCES: Maddison 2015: 269, f, 100-102. All copyrights are retained by the original authors and copyright holders, used here by their courtesy.

2

Tribe Hasariini Simon, 1903
(15 genera; Figs. 100-102)

Remarks.—The cosmotropical *Hasarius adansoni* (Audouin, 1826) is the only widely known hasariine. In general they are ground dwellers, except for the trunk- or rock-dwelling *Gedea*.

Monophyly: Hasariines are compact-bodied, often with distinctly white-edged palps that are held across the face. The palp's bulb is generally oval, with a reasonably robust embolus and a cleft across the face of the functional tegulum. A probable synapomorphy for the group is a small circular structure hidden in an overhanging lip at the back of the epigynum (see Logunov 1999a, figs. 17, 45), although a similar structure is

seen in freyines (Edwards in press). Logunov (1999a) correctly surmises that *Chinattus* is related to *Habrocestum*. Although Logunov suggests that *Habrocestoides* is not near *Habrocestum* or *Chinattus*, the similarities to *Chinattus* in body form and genitalia, including the peculiar epigynal lip, suggest that *Habrocestoides* (for which molecular data are lacking) is a hasariine. The molecular data strongly link *Hasarius*, *Habrocestum*, *Chinattus*, and several other genera (Maddison et al. 2014).

Meata Zabka, 1985, known only from the female, is here synonymized with *Gedea* Simon, 1902 (NEW SYNONYMY), based on co-collecting and molecular data matching it with male *Gedea* (Maddison, unpublished data).

Figure 7-2. Facsimile of description of Hasariini by Maddison (2015: 269).

Conclusion

Analysis of literature data on the genus *Hasarius* does not yield a coherent picture of a biological taxon, a constellation of diverse but related species, having own summary areal consisting of ranges of particular species, displaying similar biological and ecological properties, own history of evolution and spreading, different from majority of other biological units of a genus rank. Apart from poor state of knowledge of fauna of Salticidae, this is probably a result of general conviction that *Hasarius adansoni* is a cosmopolite species and assumption that every *Hasarius*-like species is *H. adansoni*. The present paper confirms existence of at least two other distinct species: "*H*".[?] *tropicus* in Bhutan (Fig. 1N1), and undescribed "tadpole-eating" species (Fig. 1P-Q) photographed in the West Ghats Range in India. Enclosed photographs show black bodied specimen photographed in Kenya (Fig. 1D), brownish specimens from Singapore (Fig. 1D), lighter colored immigrant in Slovakia (Fig. 1A, C) - are these really conspecific? Palp of Israel specimen (Fig. 2B) is slightly different from that in Slovakian specimen (Fig. 1B), and manifestly different

from that of Bhutani species (Fig. 2I) (dismissed as mismatched - but is that sure?). These are problems demanding answer from future revision.

NOTICE

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<http://www.peckhamia.com/salticidae/permission.php>.

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Attention: only selected references are listed here, other references can be found in the Internet "Monograph of Salticidae (Araneae) of the World 1995-2016" Prószyński (2016a, b) at <http://www.peckhamia.com/salticidae/>, or in the WSC at <http://www.wsc.nmbe.ch/>

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