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Authors: Nassirkhani, Mahrad, and Doustaresharaf, Mojtaba Mohammad

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First record of the genus *Beierochelifer* (Pseudoscorpiones: Cheliferidae) from north-western Iran

Mahrad Nassirkhani & Mojtaba Mohammad Doustaresharaf

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Abstract. *Beierochelifer peloponnesiacus* (Beier, 1929) is recorded from Iran for the first time. The species is briefly described and its diagnostic characters are illustrated. Furthermore, a key for recognizing males of the genera of the family Cheliferidae Risso, 1827 reported from Iran is provided.

Keywords: Arachnida, distribution, identification key, Middle East, taxonomy

Zusammenfassung. Erster Nachweis der Gattung *Beierochelifer* (Pseudoscorpiones: Cheliferidae) aus den Nordwesten Irans. *Beierochelifer peloponnesiacus* (Beier, 1929) wird erstmals für den Iran nachgewiesen. Die Art wird kurz beschrieben und ihre diagnostischen Merkmale werden abgebildet. Zusätzlich wird ein Schlüssel für die Gattungen der Familie Cheliferidae Risso, 1827 im Iran erstellt.

The pseudoscorpion genus *Beierochelifer* Mahnert, 1977 is distributed mostly in the Mediterranean region, but – less frequently – was also recorded in the Middle East and its adjacent areas. *Beierochelifer peloponnesiacus* (Beier, 1929) currently contains two subspecies: *B. p. peloponnesiacus* (Beier, 1929), which was originally described from Greece and subsequently reported from Azerbaijan, Bulgaria, Italy and Slovakia, and *B. p. jonicus* (Beier, 1932), known from Greece, Spain and Turkey (Harvey 2013, Krajčovičová & Christophoryová 2017, Hernández-Corral et al. 2018).

Brief descriptions and drawings of the pedipalp and tarsus I of this species were presented by Beier (1929, 1932, 1963), Dashdamirov & Schawaller (1992) and Petrov (2004) for the specimens collected from Greece, Azerbaijan and Bulgaria. In addition, the only known figure of the statumen convolutum of *B. p. jonicus* was drawn by Mahnert (1977) based on males from Greece. Recently, Krajčovičová & Christophoryová (2017) provided a short description of *B. p. peloponnesiacus* based on two males from Slovakia. The authors figured the pedipalpal segments, details of the pleural membrane, and tarsus I and IV. Moreover, Hernández-Corral et al. (2018) prepared a description of *B. p. jonicus* based on the adults from Spain, but did not provide any illustrations.

According to Beier (1963), the subspecies of *B. peloponnesiacus* can only be separated by small morphometric differences between the pedipalpal segments. Therefore the determination of the subspecies is rather difficult and unreliable. In this contribution, the specimens from Iran are considered at the specific level. The illustrations presented here depict males recently found in Iran. The presented locality is thus the easternmost record of the known species range.

A total of seven genera of the family Cheliferidae Risso, 1827 have been reported from Iran including the present study (Beier 1951, 1971, Mahnert 1974, Schawaller 1983, Judson 1990, Nassirkhani & Takalloo zade 2012, 2013a, 2013b, Nassirkhani & Shoushtari 2014, 2015, Nassirkhani et al. 2016). An identification key to these genera for recognizing the males is provided, together with the provincial distribution of the cheliferid species in Iran (Fig. 1).

Mahrad NASSIRKHANI, Entomology Department, Faculty of Agriculture and Natural Resources, Islamic Azad University, Arak branch, Arak, Iran;
E-mail: greenartificialturfgrass@gmail.com
Mojtaba Mohammad DOUSTARESHARAF, Department of Plant Protections, Faculty of Agriculture, University of Maragheh, Maragheh, Iran;
E-mail: mojtaba.doostar@gmail.com

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Material and methods

The specimens were found in soil and litter at a depth of 6–10 cm. They were collected by sieving samples, and removed by hand with the thin needle of a hypodermic syringe. They were permanently mounted in Swann's fluid, examined with an Olympus CH-2 compound microscope, illustrated with a drawing tube attached to the microscope, and measured by an ocular graticule. Photographs were made using a digital camera (Canon PC1468). All measurements are expressed in millimetres; the given ratios are length/width for individual articles and the length/width for legs; when two articles are compared, the ratio is the length/length index. Morphological terminology and measurements follow Chamberlin (1931), Harvey (1992), Harvey et al. (2012) and Judson (2007). Terminology for chelal lyrifissures follows Zaragoza (2017). Coordinates are given in the Geodetic System WGS 84. The specimens are deposited in Collection of Acarology Laboratory, Islamic Azad University of Arak, Iran (IAUA).

Abbreviations

dat = dorsal accessory tooth
ddp = dorso-distal projection
ds = discal seta
fa = retrolateral lyrifissure of fixed chelal finger,
fb = dorso-retrolateral lyrifissure of fixed chelal finger,
fd = dorso-distal lyrifissure of fixed chelal finger
L = length
ls = lateral seta
ma_1 = retrolateral lyrifissures
ma_2 of movable
ma_3 chelal finger
ms = median seta
sdt = serrate dorsal teeth
sc = statumen convolutum
se = sensillum
T = tactile seta
W = width

Trichobothriotaxy as in Chamberlin (1931):

eb = external basal
esb = external sub-basal
est = external sub-terminal
et = external terminal
ib = internal basal
isb = internal sub-basal
ist = internal sub-terminal
it = internal terminal
t = terminal
st = sub-terminal
sb = sub-basal
b = basal

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Fig. 1: Distribution of the Cheliferidae Risso, 1827 species reported from Iran (according to Iranian provinces): **(1)** *Beierochelifer peloponnesiacus* (Beier, 1929); **(2)** *Dactylochelifer brachialis* Beier, 1952; **(3)** *Dactylochelifer gracilis* Beier, 1951; **(4)** *Dactylochelifer intermedius* Redikorzev, 1949; **(5)** *Dactylochelifer kussariensis* (Daday, 1889); **(6)** *Dactylochelifer latreillii* (Leach, 1817); **(7)** *Dactylochelifer mrciaki* Krumpál, 1984; **(8)** *Dactylochelifer spasskyi* Redikorzev, 1949; **(9)** *Ellingsenius fulleri* (Hewitt & Godfrey, 1929); **(10)** *Gobichelifer chelanops* (Redikorzev, 1922); **(11)** *Hysterochelifer afghanicus* Beier, 1966; **(12)** *Rhacochelifer melanopygus* (Redikorzev, 1949); **(13)** *Strobilochelifer spinipalpis* (Redikorzev, 1918) (Beier 1951, 1971, Mahnert 1974, Schawaller 1983, Judson 1990, Nassirkhani & Takalloo zade 2012, 2013a, 2013b, Nassirkhani & Shoushtari 2014, 2015, Nassirkhani et al. 2016, present study)

Systematics

Family Cheliferidae Risso, 1827

Genus *Beierochelifer* Mahnert, 1977

***Beierochelifer peloponnesiacus* (Beier, 1929)** (Figs 2-16)

Material examined. IRAN: East Azerbaijan, Asheghlou, Arasbaran Jungles, soil and litter, 39.05278°N, 46.77611°E, 308 m a.s.l., 27. Jun. 2017, 4 ♂♂; leg. M. M. Doustaresharaf.

Description (males). Differences between the specimens (if present) in square brackets.

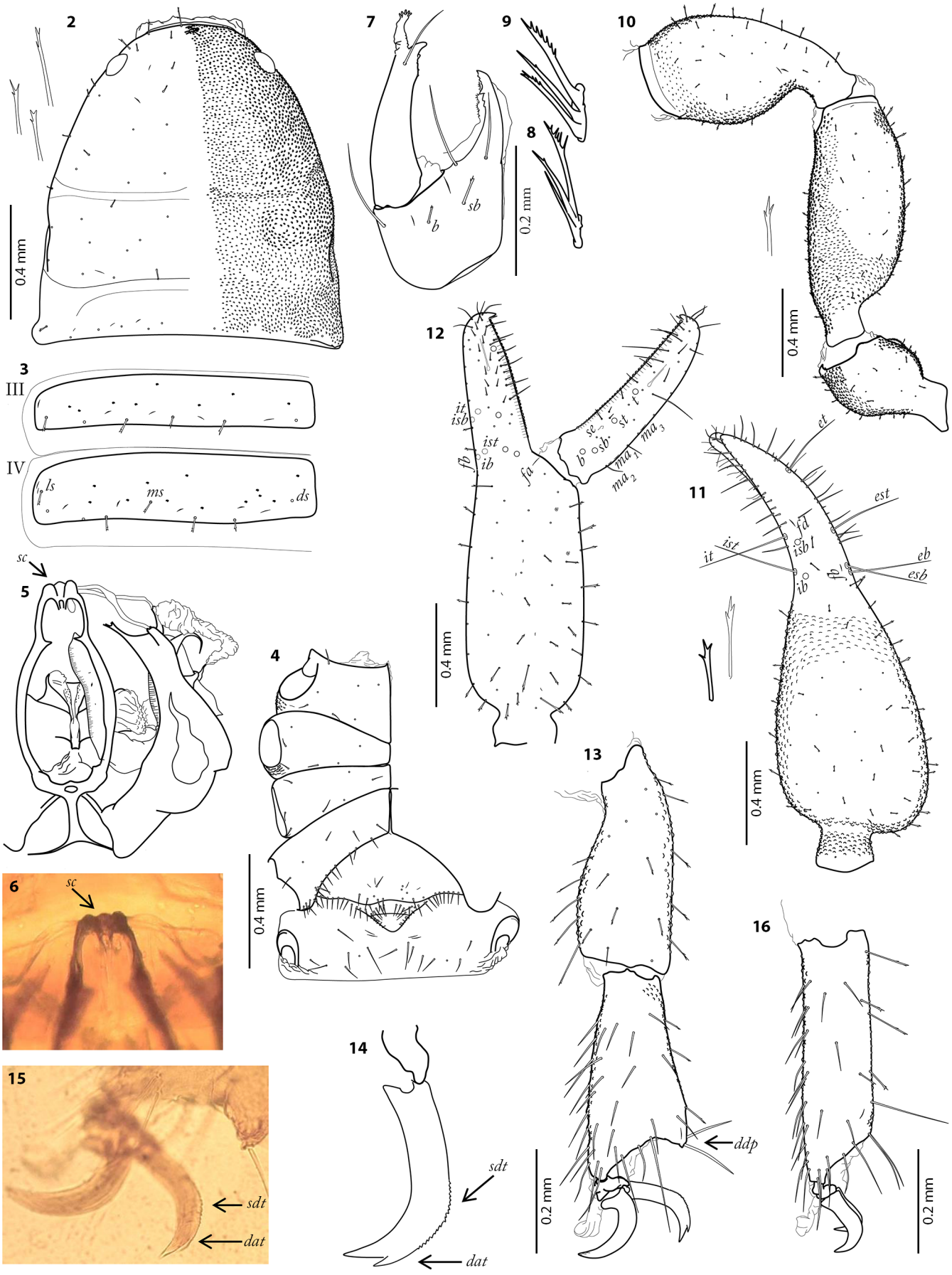
Carapace (Fig. 2): 1.05–1.12× longer than broad.

Tergites: I–II and IX–XI partially divided, III–VIII divided [in one specimen: I and XI not completely divided, II–X divided; in one specimen: I–X divided, XI partially divided]; in addition to marginal setae, discal setae present on some of hemitergites (Fig. 3), hemitergites I–III with setae arranged in one row, and hemitergites IV–X with one lateral, one median, and one discal setae [in one specimen: hemitergites I–II with setae arranged in one row, III–V with one lateral seta, VI–VII with one lateral and one discal setae, and VIII–X with one lateral, one medial and one discal setae; in one specimen: hemitergites I–III with uniserrate setae, IV–VII with one lateral and one discal setae, and VIII–X with one lateral, one median, and one discal setae]; X without tactile setae [in one specimen: hemitergite X with two slightly long and finely dentate setae]; XI with 2 long tactile setae [in one specimen: tergite XI with 4 long tactile setae]; chaetotaxy: 11–13: 10–14: 12: 12–15: 12–16: 13–16: 13–15: 13–16: 12–15: 13–16: 1T8T1–2T1T3T2T2: 2.

Sternites: internal genitalia and chaetotaxy of opercula as in Figs 4–6; chaetotaxy: 36–44: (0)21–29(0): (1)8–9(1): 12–13: 13–14: 12–14: 12–14: 15–16: 13–14: 2T4T2–2T7T2: 2.

Chelicera: hand with 5 setae, *b* and *sb* denticulate, the other setae smooth (Fig. 7); rallum with 3 blades, distalmost blade laterally denticulate, median blade with a few (1–2) lateral denticulations and proximalmost blade smooth (Fig. 8) [in one specimen, proximalmost blade with some lateral denticulations (Fig. 9)].

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Figs 2–16: *Beierochelifer peloponnesiacus* (Beier, 1929), ♂: **2.** carapace, dorsal view (some setae magnified, right half showing granulation pattern, left half showing chaetotaxy, position of furrows and lyrifissure); **3.** left hemitergites III–IV, dorsal view; **4.** right coxae and sternites II–III, ventral view; **5.** internal genitalia, in part; **6.** statumen convolutum, magnified (microscopic picture); **7.** left chelicera, dorsal view; **8.** rallum, magnified (showing proximalmost blade smooth); **9.** rallum, magnified (showing proximalmost blade denticulate); **10.** right pedipalp (chela omitted), dorsal view (one seta magnified); **11.** right chela, dorsal view (some setae magnified); **12.** right chela, retrolateral view; **13.** tibia and tarsus I, retrolateral view; **14.** posterior claw of tarsus I, magnified; **15.** distal part of tarsus I, retrolateral view (microscopic picture); **16.** tarsus IV, retrolateral view. See Material and methods for abbreviations

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Pedipalps: granulation pattern as in Figs 10–11; trochanter 1.50–1.73×; femur 2.32–2.61×; patella with short and stout pedicel (L = 0.25–0.27 mm), 2.16–2.21×; Chela with pedicel 3.60–3.86×, without pedicel 3.32–3.57×; hand with pedicel 2.22–2.28×, without pedicel 1.95–2.04×; hand (with pedicel) 1.32–1.39× longer than movable finger; hand (without pedicel) 1.14–1.23× longer than movable finger; trichobothriotaxy as in Figs 11-12.

Legs: coxal chaetotaxy: 8:7–8:7–8:18–19; sub-terminal setae simple; aroliae shorter than claws. Leg I: femur 1.61–1.69×; patella 2.26–2.35×; patella 1.35–1.38× longer than femur; tibia 2.44–2.55×; tarsus 2.10–2.27× [in one specimen 2.40×]; claws asymmetric, posterior claw with a dorsal accessory tooth, which bears some serrate dorsal teeth with different sizes (Figs 13-15). Leg IV: femur 1.60–1.75×; patella 2.62–2.84×; femur + patella 3.06–3.39×; tibia 3.70–3.89×; tarsus with a tactile seta situated distinctly distal to middle of the segment (T = 0.64–0.67), 3.69–3.85×; claws symmetric and smooth (Fig. 16).

Measurements (mm): Body length: 3.75–4.07. Carapace: 1.10–1.15/0.97–1.05. Pedipalp: trochanter 0.58–0.60/0.34–0.40; femur 1.00–1.10/0.39–0.44; patella 0.93–0.98/0.43–0.46; chela (with pedicel) 1.62–1.72/0.42–0.46; chela (without pedicel) 1.50–1.57; hand (with pedicel) L. 0.96–1.02; hand (without pedicel) L. 0.86–0.89; movable finger L. 0.71–0.77. Leg I: femur 0.37–0.39/0.23; patella 0.50–0.54/0.22–0.23; tibia 0.44–0.46/0.18; tarsus 0.40–0.41/0.17–0.19. Leg IV: femur 0.32–0.35/0.20–0.21; patella 0.84–0.88/0.31–0.32; femur + patella 0.98–1.05; tibia 0.74–0.75/0.19–0.20; tarsus 0.48–0.50/0.13.

Discussion

Beierochelifer peloponnesiacus (Beier, 1929) can be easily separated from *B. anatolicus* (Beier, 1949) from Turkey and Greece, and from *B. geoffroyi* Heurtault, 1981 from France on the basis of the shape of the male tarsus I and the morphometric characteristics. In *B. anatolicus*, the male tarsus I has no dorso-distal projection (see Beier 1965: fig. 11). In *B. geoffroyi*, the dorso-distal projection of the male tarsus I is not conspicuous and not clearly protruded (see Heurtault 1981: fig. 5). Comparatively, the male tarsus I of *B. peloponnesiacus* bears a very robust and prominent dorso-distal projection (see Beier 1929: fig. 11B, 1932: figs 287, 289, 1963: figs 299-300, Krajčovičová & Christophoryová 2017: fig. 5, present study: Fig. 13).

Moreover, *B. peloponnesiacus* is clearly larger than the other *Beierochelifer* species, e.g. the pedipalpal femur length is 0.77–1.00 mm, the patellal length is 0.71–0.95 mm, and length of the movable chelal finger is 0.54–0.69 mm for *B. peloponnesiacus* (Petrov 2004, Krajčovičová & Christophoryová 2017, Hernández-Corral et al. 2018), while these are 0.59–0.69 mm, 0.54–0.65 mm, and 0.38–0.44 mm for *B. anatolicus* and *B. geoffroyi* respectively (Beier 1949, Heurtault 1981, Petrov 2004). The newly collected specimens from Iran are slightly larger than the specimens of *B. peloponnesiacus* previously recorded from different localities, e.g. the pedipalpal femur length is 1.00–1.10 mm, and the length of the movable chelal finger is 0.71–0.77 mm.

Noticeably, the granulation pattern of the pediplap is different between the specimens studied before under *B. peloponnesiacus*. The pedipalpal trochanter and femur are entirely, and the patella is partly, granulated and the chela is completely smooth in the specimens from Bulgaria (judging from Petrov 2004: fig. 9). The pedipalpal segments, even the chelal fingers, are entirely granulated in *B.* aff. *peloponnesiacus* from Azerbaijan (judging from Dashdamirov & Schawaller 1992: fig. 13D). Moreover, both surfaces of the pedipalpal femur and the prolateral surface of the patella and the chelal hand are granulated in the specimens from Spain (Petrov 2004, Hernández-Corral et al. 2018). In the newly collected specimens from Iran, only the retrolateral surface of each pedipalpal segment is partially, and the chelal fingers are entirely smooth. The other parts of the pedipalp are distinctly granulated (Figs 11–12).

The other important regional difference between the specimens is the shape of the statumen convolutum of the male internal genitalia, e.g. it has apically a shallow incision in the specimens from Greece (see Mahnert 1977: fig. 12a), whereas it is apically rounded and without any notch in the newly found specimens from Iran (Figs 5–6).

The position of the trichobothrium *isb* varies within the species, e.g. *isb* is located at the same level as *it* in the adults from southern and the male from western Greece (see Beier 1932: figs 286, 288), while it is located proximal to *it* in the female from western Greece (see Beier 1932: fig. 288), the female from Azerbaijan (see Dashdamirov & Schawaller 1992: fig. 13D), and the newly collected males from Iran (Figs 11–12).

Beierochelifer peloponnesiacus can be mostly found under bark of *Quercus* spp. and *Platanus* sp. (Petrov 2004, Krajčovičová & Christophoryová 2017), and it was rarely collected from litter or tree hollows of *Quercus* spp., *Q. cerris* L. and *Q. pyrenaica* Willd (Petrov 2004, Krajčovičová & Christophoryová 2017, Hernández-Corral et al. 2018). Herein, the males were collected from soil and litter consisting of leaf and wood pieces of *Quercus macranthera* Fisch. & Mey. ex Hohen. and *Quercus petraea* (Matt.) Liebl.

Key to the genera of the family Cheliferidae Risso, 1827 recorded from Iran (males)

Many cheliferids can only be identified with certainty at the generic or specific level according to the male characters. Therefore, the present key is provided for recognizing males of the cheliferid genera from Iran.

1. Statumen convolutum with a deep apical recess and a sclerotized rod in the middle of this indentation [tribe Cheliferini Risso, 1827] 2
– Statumen convolutum apically rounded, not deeply indented, and without sclerotized rod [tribe Dactylocheliferini Beier, 1932] 3
2. Pedipalpal femur and patella with large and conspicuous conical keels . . . . . *Strobilochelifer* Beier, 1932
– Pedipalpal femur and patella without large conical keels . . . . . *Hysterochelifer* Chamberlin, 1932
3. Movable chelal finger with 3 trichobothria . . . . . *Ellingsenius* Chamberlin, 1932
– Movable chelal finger with 4 trichobothria 4
4. Sub-terminal setae of pedal tarsus I–IV simple 5
– Sub-terminal setae of pedal tarsus I–IV denticulate . . . . . *Rhacochelifer* Beier, 1932
5. Coxal sac present in coxae IV; tarsus IV without a tactile seta . . . . . *Dactylochelifer* Beier, 1932

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– Coxal sac absent in coxae IV; tarsus IV with a long/slightly long tactile seta 6
6. Claws of tarsus I asymmetric, one claw with a large smooth ventral accessory tooth; all setae on cheliceral hand simple . . . . . *Gobichelifer* Krumpál, 1979
– Claws of tarsus I asymmetric, one claw with a large dorsal accessory tooth plus some small teeth on its outer edge; *b* and *sb* on cheliceral hand denticulate . . . . . *Beierochelifer* Mahnert, 1977

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