Figure 40: *Calchas nordmanni*, dorsal view (specimens dried). **Left.** Adult female (43 mm), Demirkent – Tortum, Turkey. **Right.** Adult female (45 mm), Demirkent – Tortum, Turkey.
Figure 41: Trichobothrial pattern of *Calchas nordmanni* Birula, female, Tortum, Turkey.
this species in Figure 41. The overall telson structure is consistent with Birula's (1917a: fig. 13; 1917b: Pl. II, figs. 6–7) description (Figs. 28–31), and the coloration and patterns seen in two studied females (Fig. 40) is as described by Birula (1917a, 1917b). Finally, the pectinal tooth counts, male and female, are consistent with those reported by Birula (1917a, 1917b) (Fig. 36).

Calchas birulai Fet, Soleglad et Kovařík, sp. nov. (Figs. 4–5, 8–9, 13, 15, 16, 20–23, 25, 27, 32–38, 42–58; Tables 2, 3)

REFERENCES:
Paraiurus nordmanni: Vachon & Kinzelbach, 1987: 99, 102, fig. 6 (in part).

Holotype: ♂ (NMW 0843), TURKEY, Mardin Province: Mardin, 6 May 1966, J. Eiselt et al. leg. Paratypes (11 ♂, 14 ♀, 4 juv.), see list below.

Diagnosis. Small-sized scorpio n with heavy chelae, 25–28 mm in length, pectinal tooth counts, 5–6 (6) male and 5–6 (5) female. Coloration yellow-orange with little pigmented patterns. Telson with short, abruptly curved aculeus; subaculeal setal pair (SSP) located on aculeus; aculeus a dark brown. No variegated patterns present.

CARAPACE (Fig. 44). Anterior edge with a small median indentation, five small irregularly placed setae visible; interocular area somewhat rough with scatter granulation, though smooth around the immediate area of the median eyes; posterior lateral aspects covered with medium to large granules. Anterior and lateral edges next to lateral eyes with small but conspicuous pointed granules. Mediolateral ocular carinae present and granular, extending to the lateral eyes; lateral eyes number two, the posterior eye slightly larger. Median eyes and tubercle somewhat small, positioned considerably anterior of middle with the following length and width formulas: 100/335 (anterior edge to medium tubercle middle |carapace length) and 40/250 (width of median tubercle including eyes|width of carapace at that point).

MESOSOMA (Fig. 46). Tergites I–II granulated on extreme posterior edge, III–VI with heavier granulation, primarily on posterior half; tergite VII covered with coarse granules with two pairs of granulate carinae. Sternites III–VI smooth and lustrous, VII surface rough; on segment VII, one pair of irregularly granulated lateral carinae and one median pair essentially obsolete with some traces present posteriorly. Stigmata (Fig. 46) are short sub-oval in shape, angled 45 degrees in an anterointernal direction.

METASOMA (Figs. 49–50). Segments I–IV: dorsal and dorsolateral carinae crenulate; dorsal (I–IV) and dorsolateral (I–III) carinae terminate with spine; lateral carinae crenulate on I, present on one-half of II, on 30 % of III, and absent on IV; ventrolateral and ventromedian carinae crenulate. Dorso lateral carinae of segment IV terminate at articulation condyle. Segment V: dorso lateral carinae crenulate; lateral carinae crenulate for two-thirds of posterior aspect; ventrolateral and single ventromedian carinae crenulate; ventromedian carina not bifurcated, terminating in straight line (Fig. 50). Intercalary areas of segments I–IV essentially smooth ventrally, with scattered granulation laterally; segment V
<table>
<thead>
<tr>
<th></th>
<th><strong>Calchas birulai</strong></th>
<th></th>
<th><strong>Calchas gruberi</strong></th>
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**Table 3:** Morphometrics (mm) of *Calchas birulai, sp. nov.*, *C. gruberi, sp. nov.*, and *C. nordmanni.*
with heavy granulation on ventral surface. Metasoma essentially void of setation.

**Telson** (Figs. 49–50, 51, paratype female from Mardin). Elongated vesicle with short abruptly curved aculeus. Vesicle ventral surface covered with medium sized granules, heavier basally; scattered setae located on ventral surface of vesicle; subaculear setal pair (SSP) located on base of aculeus, distal of vesicle/aculeus juncture.

**Pectines** (Fig. 47). Well-developed segments exhibiting length/width formula 340|190 (length taken at anterior lamellae/width at widest point including teeth). Sclerite construction complex, three anterior lamellae and 4/4 middle lamellae; fulcra of medium development. Teeth number 6/6. Sensory areas developed along most of tooth inner length on all teeth, including basal tooth. Small white setae found on anterior lamellae and distal pectinal tooth. Basal piece large, with deep indentation along anterior edge, length/width formula 80|115.

**Prepectinal Plate** (Fig. 47). Not present in male (see discussion on female below).

**Genital Operculum** (Fig. 47). Sclerites large, sub-triangular, approximately as wide as long, separated for most of length. Conspicuous genital papillae present between the sclerites, but not extending beyond the posterior edge (see discussion on female below).

**Sternum** (Fig. 47). Type 2, posterior emargination present, well-defined convex lateral lobes, apex visible but not conspicuous; wider than long, length/width formula 85/135; sclerite tapers anteriorly, posterior-width/anterior-width formula 135/108.

**Chelicerae** (Fig. 53, female). Movable finger dorsal edge with one large subdistal (sd) denticle; ventral edge with two small pigmented crenulations (va) on the distal half, and one large pigmented accessory denticle at finger base; ventral edge with heavy setal brush covering well-developed serrula with over 20 contiguous tines, terminating just before distal tip. Ventral distal denticle (vd) considerably longer than dorsal (dd). Fixed finger with four denticles, median (m) and basal (b) denticles conjoined on common trunk; no ventral accessory denticles present.

**Pedipalps** (Figs. 48, 54). Short fingered, strong chelae, heavily carinated, no scalloping on chelal fingers, thus not exhibiting sexual dimorphism in this structure. **Femur**: Dorsointernal and ventrointernal carinae serrate, dorsoexternal carina crenulate, ventroexternal rounded. Dorsal and internal surfaces sparsely granulate, ventral smooth, and external surface with line of serrate granules. **Patella**: Dorsointernal and ventrointernal carinae serrate, dorsoexternal granulate, ventroexternal rough rounded, and exteromedian carina granulate. Dorsal, ventral, and external surfaces smooth; external surface with granulate exteromedian carina; internal surface smooth except for weakly developed doubled

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**Figure 42**: Large-scale range of confirmed localities of *Calchas birulai, sp. nov.* (open circles). See general *Calchas* map in Fig. 38.
DPS and single VPS. **Chelal carinae:** Complies with the “8-carinae configuration”. Digital (D1) carina strong, smooth to granulate; dorsosecondary (D3) present on basal half only, smooth; dorsomarginal (D4) rounded, continuous, with granules; dorsointernal (D5) weak, sparsely granulated; ventroexternal (V1) strong and granulated proximally, terminating at external condyle of movable finger; ventrointernal (V3) strong and smooth, continuous to internal condyle; external (E) strong, continuous, essentially smooth except for proximal one-fifth which is granulate; internal (I) weak, rounded, not continuous, with small granules. **Chelal finger dentition** (Fig. 48): median denticle (MD) row groups oblique and slighting imbricating, numbering 6/6 and 7/7 on fixed and movable fingers; 5/5 and 6/6 internal denticles (ID) and 5/5 and 6/6 outer denticles (OD) on fixed and movable fingers, respectively. No accessory denticles present. Number of MD denticles on movable finger is 55. **Trichobothrial patterns** (Fig. 54): Type C, orthobothriotaxic. See discussion of trichobothria differences between *Calchas* species which highlights the pattern of this male type.

**LEGS** (Fig. 45). Both pedal spurs present on all legs; tibial spurs present on legs III and IV. Tarsus covered heavily with large socketed setae on ventral surface.
Figures 44–53: Calchas birulai, sp. nov. 44–50. Male holotype (NMW), Mardin, Turkey. 44. Carapace showing close-up of lateral eyes. 45. Leg IV (left, ventral view), showing the tibial spur. 46. Stigma IV. 47. Sternum, genital operculum, and pectines. 48. Chelal fixed and movable finger dentition. 49. Telson and metasomal segments IV–V, lateral view. 50. Metasomal segment V and telson, ventral view. 51–52. Female paratype (NMW), Mardin, Turkey. 51. Telson, ventral view. 52. Sternum, genital operculum, prepectinal plate, and pectines. 53. Female paratype (HNHM), Kavurma Köyü, Diyarbakır Province, Turkey. Chelicerae, ventral and dorsal views.
HEMISPERMATOPHORE (FIG. 55). In Figure 55 the right hemispermatophore ventral view is illustrated. It is consistent with the *C. birulai* hemispermatophore described in detail elsewhere. The overall structure is simplistic with a straight, parallel, and somewhat wide lamina terminating in a blunt, slightly tapered distal tip. The distal tip is thickened on the external edge exhibiting a slight sclerotization. The lamina base lacks a basal constriction but a slight angled expansion is visible just proximally of the lamina midpoint. At the

Figure 54: Trichobothrial pattern of *Calchas birulai*, sp. nov., male holotype (NMW), Mardin, Turkey.
Figure 55: Right hemispermatophore of *Calchas birulai*, sp. nov., male holotype (NMW), Mardin, Turkey. Ventral view and close-up of capsular area showing the truncated distal tip of the acuminated process.

lamina base is a nonpigmented, slightly sclerotized thin pointed internal protuberance. Emanating from the internal aspect of the capsular area is a highly pigmented sclerotized acuminated process terminating in a delicately truncated point.

**Female Paratype** (Mardin, Turkey, Figs. 51–53). Adult females are approximately the same size as the male, 24.60–27.00 [2] for males, compared to 25.90–28.00 [2] for females. The genders do not exhibit any significant morphometric differences except for the carapace length, which is relatively larger in the female; the female carapace length dominated in every possible ratio calculation. Pectinal tooth counts in the male exceed the female by one tooth over 80 % of the samples, male 5–6 (5.97) [30], female 5–6 (5.15) [26] (see histograms in Fig. 36). The genital operculum of the male is dramatically different from that in the female (Figs. 47, 52). The sclerites, subtriangular in shape, are as long as or longer than wide in the male, whereas in the female the sclerites are short and wide, more than twice as wide as long. Whereas the sclerites are fused medially in the female, they are separated their entire length in the male, exposing significantly developed genital papillae. The prepectinal plate, so conspicuous in the female, is absent in males (Figs. 47, 52). Figures 56–58 show dorsal and ventral views of both male and female specimens, and a locality area (Birecik, Turkey) for this species.


Note: see Eiselt (1967) for detailed itinerary and map of the NMW expedition to southeastern Turkey in 1966.

**Additional specimens/localities (not examined):** TURKEY, Adiyaman Province: 1 specimen (ZSRO 1181),
Figure 56: *Calchas birulai*, sp. nov., dorsal and ventral views. Adult female paratype (FKCP) (24 mm), Nemrut Dağ, Turkey.
Figure 57: *Calchas birulai*, sp. nov., dorsal and ventral views. Adult male paratype (FKCP) (22 mm), Birecik, Turkey.

**Calchas gruberi** Fet, Soleglad et Kovařík, sp. nov.  
(Figs. 3, 5–7, 9–11, 14, 17–21, 25–26, 32–38, 59–75; Tables 2–3)

**REFERENCES:**

*Calchas nordmanni*: Kinzelbach, 1980: 169–174 (in part), figs. 1–2, 5 (map locality 16); Kinzelbach, 1982: 58 (in part); Kinzelbach, 1985: Map IV (in part); Crucitti, 1999: 87 (in part); Kovařík, 1999: 40, 42 (in part); Fet & Braunwalder, 2000: 18 (in part); Sissom & Fet, 2000: 418–419 (in part); Crucitti & Cicuzza, 2001: fig. 7 (in part); Stathi & Mylonas, 2001: 290, 293; Soleglad & Fet, 2003a: 7 (in part), figs. 19, 23, 52, 96; Fet et al., 2004: 24, figs. 1–4, 41–42 (Megisti listed in error; should be Anamur, NMW 0841); Fet et al., 2006a: 269–271, figs. 6–7; Fet & Soleglad, 2008: 256 (in part); Kaltsas et al., 2008: 227 (in part); Soleglad et al., 2009: 2 (in part), fig. 1.

*Paraiurus nordmanni*: Vachon & Kinzelbach, 1987: 99, 102, fig. 6 (in part); Sissom, 1988: 272.
Holotype: ♀ (NMW 0847), TURKEY, Mersin Province: Mamure Kalesi, Anamur, under stones, 15 May 1969 (F. Ressl). Paratypes (6 ♂, 10 ♀, 4 juv.): see list below.

Note: the type locality, Mamure Kalesi, is a famous waterfront Roman fortress, further strengthened by the Ottomans. It is located on Cape Anamur, the southernmost point of the Anatolian Peninsula.

Diagnosis. Small-sized scorpion with medium chelae, 26–36 mm in length, pectinal tooth counts 8–9 (8) male and 7–8 (7) female. Coloration variable, from yellow-orange with little patterns to dark brown and variegated patterns. Telson with bulbous vesicle, with long, wide curved aculeus; subacicular setal pair (SSP) located at vesicle/aculeus juncture. Seven and six inner denticles (ID) and eight and seven median denticles (MD) groups on the movable and fixed fingers, respectively. Fixed finger of chela longer than palm, trichobothrium it located on distal third of fixed finger. Metasomal segment V two times longer than wide.


Etymology. The species name is a patronym honoring our colleague Dr. Jürgen Gruber, the prominent opilionologist and a veteran curator of Arachnida in Zoológische Abteilung, Naturhistorisches Museum Wien, Austria.

FEMALE. Description based on holotype female from Mamure Kalesi, Anamur, Turkey. Measurements of this holotype plus four paratypes are presented in Table 3. See Figure 60 for a dorsal view of the female holotype.

COLORATION. Basic color of carapace, tergites, metasoma, telson, pedipalps, and legs yellow-orange; carinae of pedipalps and metasoma, and cheliceral dentition a light red; chelal finger dentition and telson aculeus a dark reddish-brown; leg conoides red; sternites and pectines pale yellow. No variegated patterns present.

CARAPACE (Fig. 61). Anterior edge with a small median indentation, equipped with four small irregularly placed setae (others may be broken off); interocular area somewhat rough with scattered granulation, though smooth around the immediate area of the median eyes; posterior lateral aspects covered with medium to large granules. Mediolateral ocular carinae present, extending to the lateral eyes; lateral eyes number two, the posterior eye a little larger. Median eyes and tubercle somewhat small, positioned considerably anterior of middle with the following length and width formulas: 118|420 and 54|338.

MESOSOMA (Fig. 62). Tergites I–III lightly granulated, IV–VI with heavier granulation, primarily on posterior half; tergite VII covered with coarse granules with two pairs of granulate carinae. Sternites III–VI smooth and lustrous, VII covered with small granules; two pair of weak, vestigial carinae present on segment VII. Stigmata (Fig. 62) are short sub-oval in shape, angled 45° in an anterointernal direction.

METASOMA (Figs. 66–67). Segments I–IV: dorsal and dorsolateral carinae crenulate; dorsal (I–IV) and dorsolateral (I–III) carinae terminate with spine, smaller on dorsolateral; lateral carinae crenulate on I and obsolete on II–IV; ventrolateral and ventromedian carinae crenulate. Dorsolateral carinae of segment IV terminate at articulation condyle. Segment V: dorsolateral carinae crenulate; lateral carinae irregularly granulated for two-thirds of posterior aspect; ventrolateral and single ventromedian carinae crenulate; ventromedian carina not bifurcated, terminating in straight line (Fig. 67). Intercarinal areas essentially smooth on I–III, scattered with granulation ventrally on IV–V. Metasoma essentially void of setation.

TELSON (Figs. 66–67, 68, paratype male from Anamur). Bulbous vesicle with long widely curved aculeus. Vesicle surface covered ventrally with medium sized granules, heavier basally; scattered setae located on ventral surface of vesicle; subacicular setal pair (SSP) located at vesicle/aculeus juncture.

PECTINES (Fig. 64). Well-developed segments exhibiting length/width formula 400|160 (length taken at anterior lamellae/width at widest point including teeth). Sclerite construction complex, three anterior lamellae and 3/3 middle lamellae; fulcra of medium development. Teeth number 7/7. Sensory areas developed along most of tooth inner length on all teeth, including basal tooth. Delicate thin, white setae found on anterior lamellae and distal pectinal tooth. Basal piece large, with deep indentation along anterior edge, length/width formula 80|100.

PREPECTINAL PLATE (Fig. 64). Conspicuous lustrous plate, approximately as wide as a gential operculum sclerite; length/width ratio 230/550.

GENITAL OPERCULUM (Fig. 64). Sclerites much wider than long, fused medially. Posterior medial area contracts anteriorly. Genital papillae absent (see discussion on male below).

STERNUM (Fig. 64). Type 2, posterior emargination present, well-defined convex lateral lobes, apex visible but not conspicuous; slightly wider than long, length/width formula 115|135; sclerite tapers anteriorly, posterior-width/anterior-width formula 135/93.
**CHELICERAE (Fig. 69, paratype male from Anamur).**

Movable finger dorsal edge with one large subdistal (sd) denticle; ventral edge with three small crenulations (va), two pigmented, on the distal half, and one large pigmented accessory denticle at finger base; ventral edge with heavy setal brush covering well-developed serrula with over 20 contiguous tines, terminating just before distal tip. Ventral distal denticle (vd) considerably longer than dorsal (dd). Fixed finger with four denticles, median (m) and basal (b) denticles conjoined on common trunk; no ventral accessory denticles present.

**PEDIPALPS (Figs. 65, 71).** Moderately chelate, heavily carinate species, no scalloping on chelal fingers, thus not exhibiting sexual dimorphism in this structure. **Femur:** Dorsointernal carina serrate, dorsoexternal and ventrointerior carinae crenulate, ventroexternal rounded. Dorsal, ventral, and external surfaces rough, internal surface granulated. **Patella:** Dorsointernal, dorsoexternal, and ventrointernal carinae crenulate, ventroexternal carina granulate, exteremedian carina irregularly crenulate. Dorsal and ventral surfaces rough; external surface with exteremedian carina; internal surface smooth except for weakly developed doubled DPS and VPS. **Chelal carinae:** Complies with the “8-carinae configuration”. Digital (D1) carina strong, smooth to granulate; dorsosecondary (D3) present on basal half only, covered with large granules; dorso-marginal (D4) strong, round, continuous, with large granules; dorsointernal (D5) weak, sparsely granulated; ventroexternal (V1) strong and granulated, terminating at external condyle of movable finger; ventrointernal (V3) medium development, continuous to internal condyle, covered with small granules; external (E) strong, continuous, and granulated; internal (I) weak, rounded, not continuous, with small granules. **Chelal finger dentition (Figs. 65):** median denticle (MD) row groups oblique and slightly imbricating, numbering 7 and 8; 6/6 and 7/7 internal denticles (ID) and 6/6 and 7/7 outer denticles (OD) on fixed and movable fingers, respectively. No accessory denticles present. Number of MD denticles on movable finger is 76. **Trichobothrial patterns (Fig. 71):** Type C, orthobothriotaxic. See discussion of trichobothria differences between Calchas species which highlights the pattern of this female type.

**LEGs (Figs. 62).** Both pedal spurs present on all legs; tibial spurs present on legs III and IV. Tarsus covered heavily with large socketed setae on ventral surface.

**HEMISPERMATOPHORE.** Unknown, not found in available males.

**Male Paratype (Figs. 68–70, from Anamur).** Adult males are approximately the same size as the female, 26.60–27.40 [3] for males, compared to 28.75–31.90 [2] for females. The genders do not exhibit any significant morphometric differences: for example, metasomal segments (L/W), where gender differences are commonly found, mean-value differences ranged only
0.8–2.4 %. Only the chelal palm showed mean-value differences exceeding ten percent; chela length / palm width 14.9 % and chela length / palm length 12 % (in both cases, based on the female with the longer chela).

Pectinal tooth counts in the male exceed the female by one tooth, male 8–9 (8.44) [18], female 7–8 (7.29) [24] (see histograms in Fig. 36). Note that one of the males with nine pectinal teeth is from the Greek island of Samos, off the western coast of Turkey, somewhat removed from the primary range of *C. gruberi* (see maps in Figs. 38, 59). The genital operculum of the male is dramatically different from that in the female (Figs. 64, 70). The sclerites, subtriangular in shape, are as long as or longer than wide in the male whereas in the female, the sclerites are short and wide, more than twice as wide as long. Whereas the sclerites are fused medially in the female, they are separated their entire length in the male, exposing significantly developed genital papillae. The prepectinal plate, so conspicuous in the female, is absent in males (Figs. 64, 70). Figures 72–73 show dorsal and ventral views of two dark colored *C. gruberi* female specimens: one from Antalya (dry, Fig. 72) another from Akseki (live specimen, Fig. 73) as well as the locality area where the latter specimen was collected; and Figures 74–75 show dorsal and ventral views of light colored female and male specimens from Kemer, Turkey.

**Type material.** TURKEY. **Holotype:** 1 ♀ (NMW 0847), Mersin Province: Mamure Kalesi, Anamur, 36.078°N, 32.834°E, under stones, 15 May 1969, F. Ressl leg. **Paratypes** (6 ♂, 10 ♀, 4 juv.): Mersin Province: 2 ♀ (NMW 0847), Mamure Kalesi, Anamur, under stones, 15 May 1969, F. Ressl leg.; 1 ♂, 1 ♀ juv. (partially dismembered and used for SEM) (NMW 0841), 15 km by road W of Anamur, 36.078°N, 32.817°E, 18 May
Figures 61–70: *Calchas gruberi*, sp. nov. 61–67. Female holotype (NMW), Mamure Kalesi, Anamur, Turkey. 61. Carapace showing close-up of lateral eyes. 62. Leg IV (left, ventral view), showing the tibial spur. 63. Stigma III. 64. Sternum, genital operculum, prepectinal plate, and pectines. 65. Chelal fixed and movable finger dentition. 66. Telson and metasomal segments IV–V, lateral view. 67. Metasomal segment V and telson, ventral view. 68–70. Male paratype (NMW), Anamur, Turkey. 68. Telson, ventral view. 69. Chelicerae, ventral and dorsal views. 70. Sternum, genital operculum, and pectines (note lack of prepectinal plate conspicuous in female).
Figure 71: Trichobothrial pattern of *Calchas gruberi*, sp. nov., female holotype (NMW), Mamure Kalesi, Anamur, Turkey.

Figure 72: *Calchas gruberi*, sp. nov., dorsal and ventral views. Adult female paratype (FKCP), Antalya, Turkey.
Figure 73: Adult female paratype (FKCP) of Calchas gruberi, sp. nov., (top) and collection locality, 12 km S. Akseki, Turkey (bottom).
Figure 74: *Calchas gruberi*, sp. nov., dorsal and ventral views. Adult paratype female (FKCP) (34 mm), Kemer, Turkey.
**Figure 75:** Calchas gruberi, sp. nov., dorsal and ventral views. Adult paratype male (FKCP) (36 mm), Kemer, Turkey.
Figure 76: Part of scorpion collection in Naturhistorisches Museum Wien (NMW), curated by Dr. Jürgen Gruber (1999).

♀, near Antalya, 1994 (FKCP); 2 ♀, 1 juv. (FKCP), 12 km S of Akseki, 11–12 May 2006, F. Kovařík leg.; 3 ♀, 2 ♀, 1 juv. (FKCP), Kemer, May 2009; 1 ♀ (NMM 0250), 15 km NE of Kumluca, 36.546°N, 30.283°E, 12 August 1972, R. Kinzelbach leg. (Kinzelbach, 1982: 58; the same specimen was reported as “20 km N of Kumluca, 12 August 1972” by Kinzelbach, 1980).

Note: see Pretzmann (1972) for a detailed itinerary and map of the NMW expedition to Turkey in 1969.

Other material examined: GREECE, 1 ♀ juv. (NMHC 81.1.7.9/VF; specimen dismembered and partially used for DNA studies), Megisti (=Kastelorizo) Island, 36.149°N, 29.594°E, I. Stathi leg.; 1 ♂ (FMNH), Samos Island, 37.757°N, 26.977°E, Mt. Spiliani, 2 km N Pithagorion, S slope, 23 April 1979, A. Riedel leg.

Note: we do not include Greek island specimens, identified here as *C. gruberi*, in the type series of *C. gruberi*; a further detailed study of Samos and Megisti populations is warranted.

Other specimens/localities (material not examined): TURKEY, Antalya Province: 1 specimen (NMW 0845), 46 km by road N of Antalya, 865 m, mountain pass, 21 May 1969, G. Pretzmann leg. GREECE, Megisti (=Kastelorizo) Island (Stathi & Mylonas, 2001: “big population”).

Biogeography

Kaltsas et al. (2008: 238) mentioned that “the biogeography of the monotypic genus *Calchas* still remains a mystery to scientists.” We are glad to offer here a window to this mystery.

Figures 38, 39, 42, and 59 present the current ranges of three species described and discussed in the present paper, based on all known records. The observed disjunction follows modern ecological barriers. The ecologically diverse territory of the Anatolian Peninsula (historical Asia Minor) is divided into a number of biogeographic provinces or regions. Three disjunct species of *Calchas* tend to fall under three separate regions as described for the Anatolian scorpion fauna by Crucitti & Cicuzza (2001).

Already the range of *Calchas nordmanni* depicted by Kinzelbach (1985) and Vachon & Kinzelbach (1987: 99, fig. 6) reflected three widely disjunct populations; additional records expanded boundaries of their ranges,
but the disjunction remains. The geographic range of Calchas nordmanni Birula, 1899 (sensu stricto) is limited to Çoruh River valley (Black Sea watershed) in northeastern Turkey, i.e. mainly in the very east of Black Sea Region; it does not cross the mountain ranges stretching between Erzurum and Kars. The geographic range of Calchas birulai sp. nov. covers a large area in southeastern Turkey, across Gaziantep, Adıyaman, Malatya, Sanlurfa, Diyarbakır, Mardin, and Siirt Provinces, and reaches to northern Iraq. This range covers the entire East Anatolian Region as defined by Crucitti & Cicuzza (2001). C. nordmanni and C. birulai are clearly separated by the high mountain ranges of Güneydoğu Toroslar, Hakkari, Munzur, and Bingöl. The geographic range of Calchas gruberi sp. nov. at this moment is limited to a small portion of southern Turkey along the Mediterranean coast, from Kumluca to Anamur, within the Mediterranean Region. On the east, it is well separated by the Taurus Mountains from the range of C. birulai. The populations from Greek islands (Samos and Megisti) are currently also assigned to C. gruberi but should be a subject of a more detailed study, with a possible clarification of Samos locality.

The disjunct distribution of Calchas, therefore, appears to be a textbook illustration of allopatric speciation, with three species that seem to occupy different ecological regions. Although it is hard to speculate about the timing of this disjunction, it does not have to be very recent (i.e. Pleistocene). Modern evolution of scorpion fauna in the Aegean-Anatolian area, at species level and below, was traced in the recent DNA-based studies of Greek researchers (Parmakelis et al., 2006a, 2006b). It is believed to have been influenced by tectonic fragmentation for both a widespread Mesobuthus gibbosus (Buthidae) and a more localized Iurus dufoureius (Iuridae). It is generally accepted that the Aegean-Anatolian area was represented by a single landmass (Agäis) in the Upper to Middle Miocene (23–12 Mya), with the subsequent fragmentation due to tectonic events of 12–5 Mya (Stathi & Mylonas, 2001).

Hrbek et al. (2004) in their detailed DNA-based work on historical biogeography of Central Anatolian fish, conclude that “geologically complex areas of the Near East contain many phylogenetically deeply divergent lineages, some showing reproductive isolation, that are otherwise morphologically difficult to differentiate. We suggest this is most likely due to fragmentation of previously contiguous areas into a parapatric series of ecologically equivalent regions.” The case of Calchas seems to be more straightforward: there are three distinct morphospecies in three ecologically different regions.

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Figure 77: Peter Jäger (left), holding a jar with Ragnar Kinzelbach’s scorpion specimens, and a local volunteer in Naturhistorisches Museum Mainz (NMM) (1999).
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