A new Palearctic species of the genus *Sitticus*

Simón, with notes on related species in the *floricola* group (Araneae, Salticidae)

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Summary

*Sitticus inexpectus* sp. n. (from Britain, C. and N. Europe, Russia, Kazakhstan and Kirghizstan) is described and distribution maps provided. It is closely related to *S. caricis* (Westring) and *S. rupicola* (C. L. Koch) and has previously been misidentified as either of these. New faunistic data for *S. monstabilis* Logunov are given. Illustrations are provided for the four species mentioned.

Introduction

The genus *Sitticus* has been the subject of considerable interest in recent years, several of its species being allocated to separate informal groups by shared characteristics in the copulatory organs (Prószyński, 1968, 1971, 1973, 1980, 1983; Harm, 1973). Even a provisional phyletic tree has been proposed (Prószyński, 1968, 1993) or *S. caricis* (Prószyński, 1968a, 1985: in part).

Finally, we provide new faunistic data for *S. monstabilis*, hitherto known only from E. Kazakhstan (Logunov, 1992). Thus, a revised list of the *floricola* species group now includes the following twelve species:

*Sitticus caricis* (Westring, 1861)—Europe, Far East

*S. cutleri* Prószyński, 1980—C. and E. Siberia, N. America

*S. florica* (C. L. Koch, 1837)—Palaearctic

*S. inexpectus* sp. n.—W., C. and N. Europe, Russia, SE Kazakhstan, Kirghizstan

*S. magnus* Chamberlin & Ivie, 1944—N. America

*S. monstabilis* Logunov, 1992—SE Kazakhstan, Kirghizstan

*S. palustris* (Peckham & Peckham, 1883)—N. America

[S. florica* pausing* in Prószyński (1980)]


*S. rupicola* (C. L. Koch, 1837)—C. and S. Europe (Balkans)

*S. striatus* Emerton, 1911—N. America, Europe (? (see Prószyński, 1980)

*S. sylvestris* Emerton, 1891—N. America

*S. zimmermanni* (Simon, 1877)—Europe, W. Siberia

As salticids are especially suitable for studying courtship behaviour, future ethotaxonomical investigations within this complex may provide support for the present

who listed them under the name *rupicola*. He (op. cit., p. 17) found differences in coloration between these and specimens from the Tatra Mts. but thought that the discrepancies were probably due to geographical variation “which deserves separate research, perhaps”. Further study of specimens from Estonia shows that they belong to *S. inexpectus*, as suspected by Kronestedt (1983).

The presence of *S. rupicola* in Britain has for many years not been questioned despite biogeographical reasons for doing so. [In fact, Locket & Millidge (1951: 232) had a reservation regarding the identity of the British specimens.] After comparison with Central European material of *S. rupicola* as well as material of *S. inexpectus* we conclude that it is the latter species which occurs in Britain.

The occurrence of *S. inexpectus* in Poland was discovered when one of us (DVL) re-examined a specimen previously identified as *S. rupicola* (and listed under that name in Prószyński, 1961). The presence of *S. inexpectus* in Germany and Austria was revealed from material kindly placed at our disposal by German and Austrian colleagues, respectively.

*Sitticus inexpectus* has repeatedly been recorded from Western Asiatic areas of the former USSR as either *S. rupicola* (Charitonov, 1969; Danilov & Logunov, 1993) or *S. caricis* (Nenilin, 1984a, 1985: in part).

As salticids are especially suitable for studying courtship behaviour, future ethotaxonomical investigations within this complex may provide support for the present
limitation or for further splitting of species based on morphological characteristics. For biogeographical reasons, it would be interesting to compare courtship in European and certain Asian populations currently assigned to *S. inexpectus*. So far we have not found any morphological characteristics which we regard as decisive for separating European from Asian specimens at the species level. We cannot, however, exclude differences at some infraspecific level.

Material and abbreviations

The specimens examined have been borrowed from/will be housed in the following museums/private collections: BMNH=Natural History Museum, London, England (P. D. Hillyard); CPH=Peter Harvey, Grays, England; CPM=Peter Merrett, Swanage, England; CTB=Theo Blick, Hummeltal, Germany; CVR=Vygandas Relys, Vilnius, Lithuania; ISE=Zoological Museum, Institute for Systematics and Ecology of Animals, Novosibirsk, Russia (D. V. Logunov); IZBE=Institute of Systematics and Ecology of Animals, Novosibirsk, Russia (D. V. Logunov); IZW=Museum and Institute of Zoology, Warszawa, Poland (W. Jędrzczkowski); NMB=Naturhistorisches Museum, Basel, Switzerland (A. Hänggi); NMM=Zoological Museum, Institute for Systematics and Ecology of Animals, Novosibirsk, Russia (D. V. Logunov); NRS=Swedish Museum of Natural History, Stockholm, Sweden (T. Kronestedt); PSU=Zoological Museum, Institute for Systematics and Ecology of Animals, Novosibirsk, Russia (D. V. Logunov); ZIP=Zoological Institute of Russian Academy of Sciences, St. Petersburg, Russia (V. I. Ovtsharenko); ZMB=Naturhistorisches Museum, Berlin, Germany (M. Moritz); ZMMU=Zoological Museum of Moscow State University, Moscow, Russia (K. G. Mikhailov); ZMUU=Zoological Museum of Uppsala University, Uppsala, Sweden (T. Jaenson).

Abbreviations used: AME=anterior median eyes, ALE=anterior lateral eyes, PME=posterior median eyes, PLE=posterior lateral eyes, d=dorsal, v=ventral, pr=prolateral, rt=retrolateral, ap=apical, Fe=femur, Pt=patella, Ti=tibia, Mt=metatarsus, Ta=tarsus. For leg spination, the system adopted by Ono (1988) is used. Measurements are given in millimetres.

*Sitticus inexpectus*, sp.n. (Figs. 1–6, 10, 13–17, 21–26, 30, 31, 36–40, 42–44)

*Sitticus inexpectus* (misidentification): Tullgren, 1944: 28–29 (in part: at least illustrations of male palp and vulva were apparently made from foreign material of *S. rupicola*); Locket & Millidge, 1951: 232, figs. (12C, 13D (♀)); Vilhaste, 1969: 183–185, fig. 152, 153 (♂); Jones, 1983: 152, fig. on p. 153 (♀: habitus); Roberts, 1985: 126, fig. 52D, g (♀).

*Sitticus inexpectus* sp.: Kronestedt, 1983: 196–198, fig. 9 (♀: habitus).

*Sitticus inexpectus* sp.: Kronestedt, 1983: 196–198, fig. 9 (♀: habitus).


Etymology: The species name is derived from a Latin word meaning unexpected.

Diagnosis (cf. also Table 1). *Sitticus inexpectus* is closely related to *S. caricis* and *S. rupicola*. From *S. caricis* it can be distinguished by body coloration (*S. caricis* usually has no specific colour markings, cf. Fig. 47), male palp with more conspicuous white pilosity, and size of epigynal pocket (cf. Figs. 21–26 with 28). For habitus, see also Jones [1983: p. 153, *S. inexpectus* (sub *S. rupicola*, specimen from Britain, D. Jones pers. comm.) and *S. caricis*]. From *S. rupicola* the new species differs by the pattern of white hairs on male carapace (cf. Fig. 40 with 41), proportions of the male palp (cf. Fig. 10 with 12), and configuration of the internal female genitalia (cf. Figs. 21–26, 30 with 27, 29).

**Description:** Male holotype. Measurements: Carapace 1.85 long, 1.38 wide, 0.83 high at PLE. Ocular area 0.83 long, 1.10 wide anteriorly and 1.13 wide posteriorly. Diameter of AME 0.33. Abdomen 1.75 long, 1.48 wide. Cheliceral length 0.63. Clypeal height 0.14. Length of leg segments:

<table>
<thead>
<tr>
<th>Leg</th>
<th>Fe</th>
<th>Pt</th>
<th>Ti</th>
<th>Mt</th>
<th>Ta</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1.08</td>
<td>0.55</td>
<td>0.75</td>
<td>0.65</td>
<td>0.40</td>
<td>3.43</td>
</tr>
<tr>
<td>II</td>
<td>0.85</td>
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<td>0.55</td>
<td>0.45</td>
<td>0.38</td>
<td>2.73</td>
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<tr>
<td>III</td>
<td>0.83</td>
<td>0.45</td>
<td>0.48</td>
<td>0.53</td>
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<td>2.64</td>
</tr>
<tr>
<td>IV</td>
<td>1.33</td>
<td>0.60</td>
<td>0.83</td>
<td>0.70</td>
<td>0.48</td>
<td>3.94</td>
</tr>
</tbody>
</table>

Figs. 1–9: Left male palp (2, 5, 8 in retrolateral view, others in ventral view). 1–6 *Sitticus inexpectus* sp.n. (1, 2 holotype from Sweden, 3 from England, 4–6 from Kirghizstan); 7, 8 *S. caricis* (Sweden); 9 *S. rupicola* (Austria). Scale lines=0.1 mm.
Leg spination: Leg I: Fe d 0-1-1-2; Pt pr 0-1-0; Ti pr and v 1-1; Mt v 2-2ap. Leg II: Fe d 0-1-1-3; Ti pr and v 1-1; Mt v 2-2ap. Leg III: Fe d 0-1-1-3; Pt pr and rt 0-1-0; Ti pr and rt 1-1-1, v 1-2ap; Mt pr and rt 1-1-2ap, v 2ap. Leg IV: Fe d 0-1-1-3; Pt pr and rt 0-1-0; Ti d 1-0, pr and rt 1-1-1, v 1-2ap; Mt pr and rt 1-1-2ap, v 2ap.

Coloration: Carapace brown to dark brown, bordered by a line of white hairs which on each side widens at level of coxae III and from there gives off a stripe of white hairs projecting upwards on lateral slope (Fig. 40, arrow). Eye field black; a transverse stripe of white hairs between and above ALs (passing above AMEs). Carapace with three longitudinal stripes composed of white hairs: one along midline of carapace (often distinct as a median spot between PLEs and as a median longitudinal stripe just before and at beginning of posterior carapaceal slope), one at each side, starting above PME, continuing below PLE and becoming more diffuse with rather scattered hairs behind PLE. Sternum, maxillae, labium and chelicerae brownish. Abdomen: dorsum as in Fig. 37 or 39, venter yellowish to brownish grey. Book-ligament covers and spinnerets yellowish to brownish grey. Legs mottled (yellowish and brownish), Fe distally darker (most of Fe I may be dark, Fe IV usually dark only distally), Ti and Mt with traces of annulation. Palp: Fe dark brownish (dorsoapically lighter), Pt dorsally yellowish to light brown, Ti and cymbium brownish, dorsodistal part of Fe and dorsal part of Pt densely covered with white hairs; Ti with long white hairs pro- and retrolaterally; cymbium with some scattered white hairs dorsally.

Palp: Structure as in Figs. 1–6, 10.

Female (England): Measurements: Carapace 2.33 long, 1.88 wide, 1.15 high at PLE. Ocular area 0.98 long, 1.38 wide anteriorly and 1.48 wide posteriorly. Diameter of AME 0.40. Abdomen 2.83 long, 2.15 wide. Cheliceral length 0.68. Clypeal height 0.15. Length of leg segments:

<table>
<thead>
<tr>
<th></th>
<th>Fe</th>
<th>Pt</th>
<th>Ti</th>
<th>Mt</th>
<th>Ta</th>
<th>Total</th>
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<tr>
<td>II</td>
<td>1.08</td>
<td>0.70</td>
<td>0.63</td>
<td>0.58</td>
<td>0.40</td>
<td>3.39</td>
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<tr>
<td>III</td>
<td>1.05</td>
<td>0.55</td>
<td>0.60</td>
<td>0.68</td>
<td>0.40</td>
<td>3.28</td>
</tr>
<tr>
<td>IV</td>
<td>1.83</td>
<td>0.83</td>
<td>1.20</td>
<td>1.05</td>
<td>0.53</td>
<td>5.44</td>
</tr>
</tbody>
</table>

Leg spination: Leg I: Fe d 0-1-1-2; Ti v 2-2-2ap; Mt v 2-2ap. Leg II: Fe d 0-1-1-2; Ti v 1-1-2ap; Mt v 2-2ap. Leg III: Fe d 0-0-1-3; Pt pr and rt 0-1-0; Ti pr and rt 1-1-1, v 1-2ap; Mt pr 2-1-2ap, rt 1-1-2ap, v 2ap. Leg IV: Fe d 0-1-1-2; Pt pr and rt 0-1-0; Ti pr and rt 1-1-1, v 1-2ap; Mt pr 2-1-2ap, rt 1-1-2ap, v 2ap.

Coloration: Lighter than male. Carapace with white hairs in thoracic part forming a very indistinct pattern of oblique, curved streaks from midline towards sides (cf. Figs. 43, 44). Clypeus densely covered with white hairs. Abdomen: dorsum as in Figs. 36, 38. Legs yellowish brown with more contrasting dark annulation/pseudoannulation. Fe may be yellowish brown except...
for dark distal part, and sometimes have an indistinct, somewhat darker, more or less complete ring in proximal half.

Epigyne: As in Figs. 13–17, internal parts as in Figs. 21–26, 30, 31 (see Table 1).

Variation: We are aware of variability in characters such as the small loop of the sperm duct in the bulbus (cf. Figs. 1–6, 10) and the loop of the copulatory ducts in the female (cf. Figs. 21–26). We regard these as intraspecific variations. Most males that we have seen from Britain have a sperm duct loop in the bulbus like Fig. 3, but in one (from Bridgewater Bay), the loop is similar to that illustrated in Fig. 4.


Figs. 21–28. Internal female genitalia (dorsal view). 21–26 Sitticus inexpectus sp.n. (21, 22 from Sweden, 23 from England, 24 from Novosibirsk area, 25, 26 from Kirghizstan); 27 S. topica (Austria); 28 S. caricis (Sweden); arrow points at epigynal pocket. Scale lines=0.1 mm.

Figs. 29–33. Internal female genitalia (dorsal view). 29 Sitticus rupicola (France); 30, 31 S. inexpectus sp.n. (Austria); 32, 33 S. caricis (Sweden); epigynal pocket broken medially as a result of drying. Arrows point at site of copulatory duct joining spermatheca. cd=copulatory duct; s=spermatheca. Scale lines=0.1 mm (29, 30, 32 same magnification, 31, 33 same magnification).
KAZAKHSTAN: 2 \( \frac{2}{55} \) \( \frac{2}{p56} \) (NRS), Almaty Area, Balkhanskiy Distr., Bakanas, bank of Ili River, 11–13 May 1986 (A. A. Zyuzin); 1 \( \frac{1}{p55} \) \( \frac{1}{p56} \) (ZMMU), Temirlik River valley, 25 June 1993 (D. A. Milko).

KIRGHIZSTAN: 2 \( \frac{2}{p55} \) \( \frac{4}{p56} \) (ISE), Baubashata Mt. Range, Yarodar natural limits, 8 June 1981 (S. L. Zonshtein); 1 \( \frac{1}{p55} \) \( \frac{1}{p56} \) (ZIP), Osh Area, Arawnabob, 20 Sept. 1982 (S. L. Zonshtein); 1 \( \frac{1}{p56} \) (ZIP), Isyr-Kul Lake, Kuttarga, 2 July 1977 (S. L. Zonshtein); 1 \( \frac{1}{p56} \) (ZIP), Ferganskiy Mt. Range, Kirova Sovkhoz, 2 June 1981 (S. L. Zonshtein); 1 \( \frac{1}{p55} \) \( \frac{1}{p56} \) (ZMMU), Kingizkiy Mt. Range, 20 km S of Bishkek (=Frante), Malkinovo Canyon, 28 July 1984 (S. V. Ovtchinnikov); 1 \( \frac{1}{p55} \) \( \frac{1}{p56} \) (ZMMU), same locality, Dolinka, 26 June 1980 (S. L. Zonshtein); 1 \( \frac{1}{p56} \) (ZMUU), same range, Tchoon-Kyr, 1200 m asl, 29 May 1983 (S. V. Ovtchinnikov). POLAND: 1 \( \frac{1}{p56} \) (IZW), Puszcza Kampinoska, Narutowa Mts., 28 Apr. 1956 (J. Prószynski; sub rupicola in Prószynski, 1961). RUSSIA: 6 \( \frac{1}{p55} \) \( \frac{6}{p56} \) (PSU), Chelyabinsk Area, Troitskiy District, Troitskiy Reserve, Kukai Lake, on shore, 28 June 1989 (S. L. Eysynt); 1 \( \frac{1}{p55} \) (ISE), Novosibirsk Area, Lake Tchany, Krasnoyarskiy peninsula, 15 Aug. 1992 (V. V. Dubatolov); 1 \( \frac{1}{p55} \) (ISE), Novosibirsk Area, environs of Novosibirsk, Vaskhal, June 1991 (D. Stundnik; sub rupicola in Danilov & Logunov, 1993). SWEDEN: 1 \( \frac{1}{p56} \) (NRS), same locality as holotype, 17 June 1977 (T. Kronestedt); 3 \( \frac{1}{p56} \) \( \frac{3}{p55} \) \( \frac{3}{p56} \) (NRS), same locality, 15 June 1983 (T. Kronestedt); 1 \( \frac{1}{p55} \) \( \frac{1}{p56} \) (ZMUU), Gotland, Lau; 6 Aug. 1942 (G. Wängsjo).

Comparative material: Sitticus rupicola: AUSTRIA: 1 \( \frac{1}{p55} \) \( \frac{1}{p56} \) (CVR), Salzburg, Badgastein, Weisenbachtal canyon, 1770 m asl, stony xeric

Figs. 34–39: Dorsal abdominal pattern. 34, 35 Sitticus rupicola (Austria) (34 \( \frac{3}{p56} \), 35 \( \frac{3}{p55} \)); 36–39 S. inexpectus sp.n. (36, 38 \( \frac{3}{p56} \); 37, 39 \( \frac{3}{p56} \); 36, 37 from England; 38, 39 from Kirghizistan). Scale lines=0.5 mm.

Figs. 40, 41: Male prosoma, lateral view. 40 Sitticus inexpectus sp.n. (Germany, Sachsen-Anhalt), note short white stripe (arrow) on posterior part of carapace slope; 41 S. rupicola (Austria, topotypic specimen). Scale line=1 mm.

**Distribution**: England, Germany, Austria, Poland, Sweden, Estonia (Fig. 48), Russia, Kazakhstan, Kirghizstan (Fig. 49).

**Remarks**: It is very likely that a female identified as *S. rupicola* from Transbaikalia (Izmailova, 1989) belongs either to *S. inexpectus* or to *S. caricis*. An early record of *S. rupicola* from Norway (Collett, 1876) was based on a female of *S. floricola*, preserved in Zoological Museum, Oslo (det. A. Tullgren). Certain lowland finds attributed to *S. rupicola* from Germany (Harm, 1973; Fründ et al., 1994) should be re-evaluated concerning their species assignment as they may turn out to be *S. inexpectus*.

**Figs. 42–47**: 42–44 *Sitticus inexpectus* sp. n. (42  from Austria, Burgenland; 43  from England, Essex; 44  from Sweden, Öland); 45, 46 *S. rupicola* (45  from France, Haute Savoie); 47 *S. caricis* ( from Sweden, Uppland). Scale lines=2 mm (42–46 same magnification).
Habitat: In Sweden *S. inexpectus* was found under flat stones in an exposed area on limestone bedrock, close to a shallow lake (island of Öland locality), and by sifting wrack bed material (island of Gotland locality); in Estonia among shingle and wrack beds as well as among plants on shore meadow in various western localities on the Baltic coast (on islands and the mainland); in Germany in a sandy spot by a river (Oder) and in grassy vegetation at some distance from the same river, as well as at two rather close pools in Sachsen-Anhalt (one of them in a salty area) influenced by human activities; in Poland among grass by a canal (Prószynski, 1961, sub *rupicola*); in Austria in a meadow close to a salty lake; in England in various sea shore localities (shingle, sand).

At least some of the W. Siberian, Kazakhstan and Kirghizstan localities are also close to lakes or rivers. *Sitticus inexpectus* is a lowland species (compared with *S. rupicola* which occurs at higher altitudes), mostly found in the proximity of water (sea, rivers, lakes). Its presence in salty inland habitats in Germany and Austria is noteworthy. One may speculate that the scattered localities of *S. inexpectus* in Europe represent a relict distribution of a currently regressive species that managed to disperse during some earlier period with more suitable conditions. Maybe the species has previously been overlooked, or it should be questioned whether it is endangered at least in Central Europe.

<table>
<thead>
<tr>
<th>S. rupicola</th>
<th>S. inexpectus</th>
<th>S. caricis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td><strong>S. inexpectus</strong></td>
<td><strong>S. caricis</strong></td>
</tr>
<tr>
<td>Carapace and abdomen distinctly patterned.</td>
<td>Carapace and abdomen distinctly patterned.</td>
<td>Carapace and abdomen without, or abdomen with faint pattern. Ground colour brownish.</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td><strong>S. inexpectus</strong></td>
<td><strong>S. caricis</strong></td>
</tr>
<tr>
<td>Epigyne (Fig. 18) and internal genitalia (Fig. 27) comparatively large (note scale lines). Copulatory ducts with comparatively wide drooping loop before opening into anterior part of spermathecae (Fig. 29). Epigynal pocket relatively large.</td>
<td>Epigyne (Figs. 13–17) and internal genitalia (Figs. 21–26) comparatively small (note scale lines). Copulatory ducts with comparatively small loop before opening into medium part of spermathecae on dorsal side (Fig. 31, arrow). Epigynal pocket relatively large.</td>
<td>Epigyne (Figs. 19, 20) and internal genitalia (Fig. 28) comparatively small (note scale lines). Copulatory ducts with comparatively small loop before opening into medium part of spermathecae on outer side (Fig. 33, arrow). Epigynal pocket relatively small (Fig. 28, arrow).</td>
</tr>
</tbody>
</table>

Table 1: Differences between *Sitticus rupicola*, *S. inexpectus* and *S. caricis*. 

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Fig. 48: Collection localities of *Sitticus inexpectus* sp. n. in Europe. Occurrence in Britain taken from Locket et al. (1974: map 165), in Estonia from Vilbaste (1987: map 146). One dot may represent more than one close locality.

Fig. 49: Collection localities of *Sitticus inexpectus* sp. n. in Russia, Kazakhstan and Kirghizstan.
Sitticus monstrabilis Loganov, 1992 (Figs. 50, 51)


Note: The species has previously been described (57) from SE Kazakhstan (Loganov, 1992), thus Issyk-Kul Area in Kirghizstan represents its southernmost known occurrence. Improved illustrations of the female copulatory organ (Figs. 50, 51) are given here. The arrangement of the copulatory ducts and the spermathecae is essentially as in the S. rubicola complex. The palpal organ (Loganov, 1992: fig. 9a), however, indicates affinity to S. pulchellus.

Acknowledgements

We wish to express our thanks to the following persons who contributed specimens for this study: Mr W. Beyer (Institut für Bodenzoologie und Ökologie, Freie Universität, Berlin, Germany), Mr T. Blick (Humboldt-Universität, Berlin, Germany), Dr V. V. Dubatolov (ISE), Dr S. L. Eysunin (PSU), Dr A. Hänggi (NMB), Mr P. R. Harvey (Grays, England), Mr P. D. Hillyard (BMNH), Dr T. Jaenson (ZMUU), Dr P. Merrett (Swanage, England), Mr D. A. Milko, Mr S. V. Ovtchinnikov and Mr S. L. Zonshtein (all from Bishkek, Kirghizistan), Dr V. Relys (Department of Zoology, Vilnius University, Vilnius, Lithuania), Dr J. Viadallep (IZBE), Dr H. W. Walden (Museum of Natural History, Gothenburg, Sweden), Dr K. P. Zulka and Dr N. Milasowsky (Institut für Zoologie, Universität Wien, Wien, Austria), and Dr A. A. Zyuzin (Institute of Zoology, National Academy of Sciences, Almaty, Kazakhstan). We are grateful to Dr R. Platen (Institut für Bodenzoologie und Ökologie, Freie Universität, Berlin, Germany) and Mr J. Wunderlach (Straubenhart, Germany) for transferring material, and to Mr Beyer, Mr Blick, Dr B. Cutler (University of Kansas, Lawrence, Kansas, USA), Mr K. Sund (Zoological Museum, Oslo, Norway), and Dr K. P. Zulka for information. Thanks are due to Dr M. Žabka (Department of Zoology, Agricultural and Teachers University, Siedlce, Poland), who kindly discussed the taxonomic problems being treated in this paper, and to Dr Merrett for comments on the manuscript.

References


A new species of Sitticus

Figs. 50, 51. Sitticus monstrabilis (from Kirghizstan). 50 Epigyne; 51 Internal female genitalic (dorsal view). Scale lines=0.1 mm.
Niche partitioning in three sympatric web-building spiders (Araneae: Linyphiidae)

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Summary

Three sympatric species of linyphiid spiders, *Frontinellina frutetorum*, *Neriene radiata* and *Linyphia triangularis* were observed in eastern Austria. Their phenology, web height, prey capture and web structure were measured and compared. The adults of *F. frutetorum* and *N. radiata* were active in early summer, while adults of *L. triangularis* were seasonally isolated, being active in autumn. The spiders were also observed to utilise different web heights and to capture different types of prey. In contrast, aspects of web size, prey size and prey capture rates were similar. It is postulated that differences in the spiders’ spatial and temporal distribution resulted in further prey capture differences.

Introduction

The utilisation of distinct niches in terms of temporal segregation, web structure, web placement and prey capture has been reported for many different web-building spiders (Brown, 1981; Enders, 1974; Herberstein & Elgar, 1994; Malt et al., 1990; Olive, 1980; Pasquet, 1984; Uetz et al., 1978; Ward & Lubin, 1992; Wise & Barata, 1983). The suggested mechanism responsible for the observed patterns is the competitive exclusion principle, stating that no two species can occupy the same niche as a result of competition, leading to some form of displacement (Begon et al., 1990).

Niche theory has, however, recently come under attack. Studies have found extensive prey and niche overlap (Kajak, 1965; Nyffeler & Benz, 1979, 1989), providing strong arguments against competition theory and questioning the importance of niche partitioning (Wise, 1993).

Investigating niche parameters brings with it some practical difficulties, as the niche occupied by any organism has an infinite number of dimensions which cannot be completely assessed (Krebs, 1970). Measuring a vast array of niche parameters for the purpose of comparing two or more organisms will, however, probably find a number of differences, though some of these may not be of great importance to the ecology of the animals studied (Toft, 1987).

Nevertheless, while these arguments may deter further investigations into niche partitioning, a careful selection of niche parameters can provide important and conclusive results, which in turn are necessary for the design of further studies into the forces driving the observed patterns.

Herein, I report on a number of niche parameters, such as prey capture, web structure, web placement and seasonality, utilised by three linyphiid spiders, *Frontinellina frutetorum* (C. L. Koch), *Neriene radiata* (Walckenaer) and *Linyphia triangularis* (Clerck). The spiders construct typical linyphiid webs with a centrally located sheet beneath which the spider hangs. Entangling threads are spun above the sheet to intercept prey which tumbles down on to the sheet, where it is attacked by the spider.

Material and methods

The spiders were studied from March to October (1993 and 1994) in a mixed deciduous forest in eastern Austria near the town of Hartberg (Herberstein, 1995). The study site consisted of an area of forest regrowth planted with fir trees (mostly Douglas fir, *Pseudotsuga menziesii*). The trees were surrounded by a dense understorey, composed of grasses, ferns, raspberry and blackberry bushes.

Phenology

The species-specific phenologies were estimated using density measures (individuals per square metre). Ten transects (10 × 1 m) were randomly chosen each month and the number of spiders found along the transects counted. The average monthly densities sampled from March to October 1994 were plotted to show the emergence and disappearance of the spiders. A more precise measure of the phenologies of the spiders could have been achieved by regular samples of their size. However, this would have been a very disruptive method, causing the destruction of webs and probably an exodus of spiders and was therefore not used.

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