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Utilization of silk, use of webs, and predatory behaviour of the jumping spider *Pseudicius encarpatus* (Araneida: Salticidae)

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Abstract. *Pseudicius encarpatus* builds two types of nests: the densely woven cocoon-like or tubular nests for molting, oviposition and over-wintering, and less thick woven, dome-shaped or tent-shaped resting nests. Besides of nests the females *P. encarpatus* build sparsely woven three-dimension structure of arrays, the "mesh", which they use for prey-capture. However, both sexes of *P. encarpatus* can catch the prey as cursorial hunters, as well. Predation behaviour away from and in the web is described.

INTRODUCTION

The Salticids are cursorial, diurnal hunting spiders with acute vision, which they use to stalk, chase and leap on active insects. Recently, however, slaticids were found which catch a prey as cursorial hunters but spin prey-catching webs as well (Jackson & Blest 1982, Jackson 1985a, 1985b, 1985c, Jackson 1986a, Jackson & Hallas 1986a, 1986b, Hallas & Jackson 1986, Jackson 1990, Jackson & Pollard 1990, Richman & Jackson 1992). All these unusual, aberrant salticids are mostly tropical and they are generally considered to be primitive (Wanless 1984, Jackson 1986a). *P. encarpatus* is not generally considered to be primitive, although it exhibits, at least in some species, some "primitive" behavioural characters (Jackson 1986b). *P. encarpatus* is the first European salticid in which the building of prey-catching webs was observed.

MATERIAL AND METHODS

30 adult males and 6 adult females of *Pseudicius encarpatus* (Walckenaer, 1802) were observed in the field in Velehrádek (Eastern Bohemia, near Dvůr Králové n.L.) from April 29 to June 2, 1994 on trunks of very old cherry-trees. The observed unequal sex ratio corresponds well with data given by Fuhn & Gherasim (1984). In the studied biotope *P. encarpatus* lives sympatric with less common *Salticus zebraneus* (C. L. Koch, 1837) and *Sitticus pubescens* (Fabricius, 1775). Further 3 adult males and 2 adult females of *P. encarpatus* from the same locality were kept and observed in captivity during 2 months in transparent plastic boxes 140x140x60 mm. Stoppered holes permitted insertion of prey without damaging webs and water was continually available from moist cotton rolls, inserted through the hole from outside glass jar filled with water. A skewer with 3 pieces of thin pine bark (about 20x30x3mm) and some thin twigs were placed in each cage.

If in the text the expressions such as "usually" or "generally", "sometimes" or "occasionally", and "infrequently" or "rarely" were used, they indicate according to the convention frequencies of occurrence of about 80 per cent or more, 20-80 per cent, and less than 20 per cent, respectively.

RESULTS

Nests

Both sexes of *Pseudicius encarpatus* build dense silky cocoon-like or tubular nests (chambers, retreats) for molting. The molting nests are situated in splits or crevices of the bark or under the loose bark, in the boxes in captivity often in edges or corners. The very similar cocoon-like chambers for oviposition are built by females only and are very dense and firm woven. In the nature they are always under loose bark. The female obviously stays with the eggs in the chamber up to the hatching of spiderlings. The nests for over-wintering are very similar to those for oviposition with the silk very dense and firm. Usually are several chambers found close together in an ower-wintering aggregation (Fig. 1*). In spring I found some similar dense woven chambers with rests of dead males of Pseudicius encarpatus. Therefore I suppose that the males build such dense and firm chambers for their hibernation as well.

Sometimes, both sexes of *P. encarpatus* build less thick woven resting nests, roughly dome-shaped or tent-shaped (Fig. 2). These nests are usually used for one night only or for shorter periods of inactivity.

Prey-catching "mesh"

Besides of nests the females of *Pseudicius encarpatus* build occasionally sparsely woven three-dimension silk structures which crudely resemble a web (the "mesh") of about 3x5 cm, which they use for prey-capture. These prey-catching webs are usually build in or over larger crevices in the bark, in captivity they were build in the corner of the cage or between thin twigs, which were a part of equipment of the box (Fig. 3). In contrary to the nests which were build in most instances at the first day after giving the spider into the cage already, the prey-catching webs were build some days later, not until the spider became familiar with its new environment. The silk of prey-catching webs is non-sticky or very poorly sticky only and it detains briefly insects landing on them.

Predatory behaviour

The spider usually stays near the web (in the distance of about 2 cm) facing toward it or facing down. If the prey is detained for some period and does not move too vigorously, the spider approaches up to the distance of about 2 body lengths, fixates the prey and then sometimes leaps to catch it, but usually it walks instead of leaping up to the distance of about half body length and catches the prey by lunging at it (i. e. that the tarsi stay on the substrate as the spider moves forward). The spider holds the prey with its chelicerae and, after a short pause it pulls the insect from the silk and moves with the prey to feed on the wall of the cage, where it sits facing downwards.

The predatory behaviour away from the web is principally the same in both sexes of *Pseudicius encarpatus*. The spider may scan the environment from one place and then stalk the prey that comes near, or rarely it walks slowly straight line and stops periodically to look around and stalk the prey, if it is at close distance. The spiders began predatory sequences by turning to face insects that were active or sitting 20-30 mm away, then walk slowly toward them. If one or two body lengths away, the spider rarely leaps at the insect, however, usually it walks closer and lunges on the insect from about half body length away.

*) Figs 1-3 will be found at the end of this issue, Plate 5.

The observed *Pseudicius encarpatus* usually took no notice to larger and fast moving insects. In captivity, the Housefly *Musca domestica* Linnaeus, 1758 was usually avoided, on the contrary the smaller and not so vigorous Lesser Housefly *Fannia canicularis* (Linnaeus, 1761) or more slowly moving, long-legged representatives of the dipteran families Dolichopodidae (mostly *Dolichopodus plumipes* (Scopoli, 1763)) and Culicidae (genera *Culex* Linnaeus and *Aedes* Meigen) were generally accepted as a prey.

DISCUSSION AND CONCLUSSION

The comparative study of silk and web utilization and predatory behaviour in Salticidae has taken on heightened interest in last years, because it may help us to resolve some problems of salticid evolution. Recent studies concern before all the representatives of the "primitive" subfamilies Lyssomaninae and Spartaeinae and some fissident tropical salticids as *Euryattus* Thorell, 1881 and *Simaetha* Thorell, 1881, which are also considered as "primitive".

The genus *Pseudicius* Simon, 1883, is not generally considered as primitive, although (as mentioned above) it exhibits some "primitive" behavioural characters. The affinities of *Pseudicius* to other salticid genera is not clear enough; it is sometimes ranked into the subfamily Heliophaninae, sometimes in Dendryphantinae.

Following results of our behavioural study of *Pseudicius encarpatus* may support the previous statements (Jackson 1986b) of the interesting behavioural aberrance of the genus *Pseudicius*:

1. *P. encarpatus* builds two types of nests: the densely woven cocoon-like or tubular nests for molting, oviposition and over-wintering, and less thick woven, dome-shaped or tent-shaped resting nests.

[Note: the tent-shaped nests resemble the similar structures build by representatives of Spartaeinae or *Euryattus*, which are considered to be "primitive" (Jackson 1985a, Jackson & Hallas 1986a, 1986b).]

2. Besides of nests females of *P. encarpatus* build sparsely woven three-dimensional structure of arrays, the "mesh", which they use for prey-capture. However, both sexes of *P. encarpatus* can catch motile insects as cursorial hunters, as well.

[Notice: web building is not expected by morphologically advanced salticids (Jackson 1986a) and spinning of webs is considered as plesiomorphic salticid behaviour (Jackson & Blest 1982).]

3. It removes the prey from the web before feeding.

[Notice: removing prey from the net before feeding has been observed in "primitive" salticid subfamily Lyssomaninae, too (Hallas & Jackson 1986).]

4. *P. encarpatus* rarely leaps during predation, it usually lunges at the prey from close distance instead of leaping on it.

[Notice: "Runners" which prefer lunging instead of leaping on its prey are considered to be more "primitive" than "advanced" "hoppers" (Crane 1949).]

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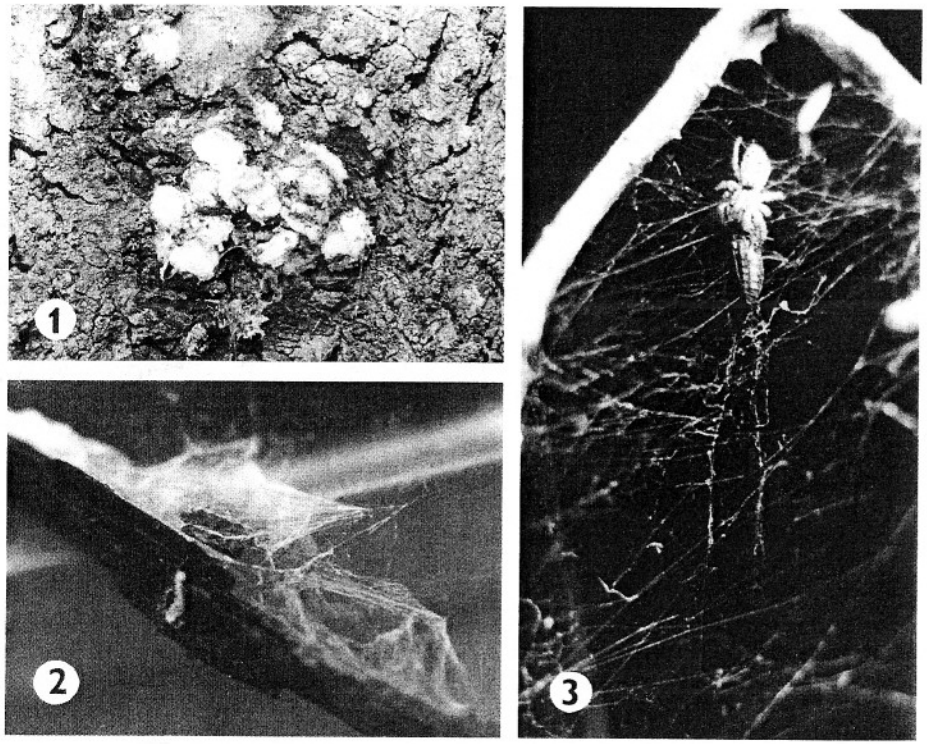

Plate 5. Figs 1-3. 1- aggregation of cocoon-like over-wintering nests of *Pseudicius encarpatus*, 2 - tent-shaped resting nest of *P. encarpatus*, 3 - female *P. encarpatus* with prey in prey-catching widely spaced three-dimensional "mesh".