SHORT NOTE

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Twig-lining in a trapdoor spider *Latouchia swinhoei* (Araneae: Ctenizidae) from Okinawa

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Abstract. A twig-lining population of *Latouchia swinhoei* Pocock, 1901 (Ctenizidae) was found in Okinawa in a habitat also densely populated by other trapdoor spiders (*Ryuthela nishihirai*, Mesothelae). Specimens were tested in the laboratory for their utilization of objects offered to them for attachment to the rim of the burrow. The behavioural capacity of twig-lining is discussed in comparison with other trapdoor spiders.

Introduction

Trapdoor spiders are among the most cryptic spiders, and in many parts of the world knowledge about their biology lags well behind that of more conspicuous spider families. Nevertheless, in Australia a number of species have been described which can easily be detected in the field, because they add various objects to the entrance of the burrow (Main, 1957, 1982), which improve the probability of catching prey. From the Northern Hemisphere reports on twig-lining are scarce (Coyle, 1986), although it occurs locally, even in the Mediterranean region (Decae, pers. comm.). As twig-lining is often confined to distinct populations of certain species, it would be interesting to know whether it is fixed genetically or may be triggered by environmental factors.

Material and Methods

During field studies on the Ryukyu Islands, at Chibana (Okinawa), a population of *Latouchia swinhoei* Pocock, 1901 (Ctenizidae) was found, in which twig-lining occurred on a very large scale. *L. swinhoei* was described on the basis of a single male from a forest close to Motobu (Okinawa). For the determination of the species palpal organs were compared to the type material and found identical. Female receptacula are depicted in Fig. 1.

Some specimens were taken to the laboratory and kept in plastic boxes on the indigenous soil in order to study the construction of new burrows and trapdoors. They were offered grass blades and various twigs at a distance of 20 to 40 mm from the burrow mouth, which the spiders normally do not visit when collecting material for construction purposes.

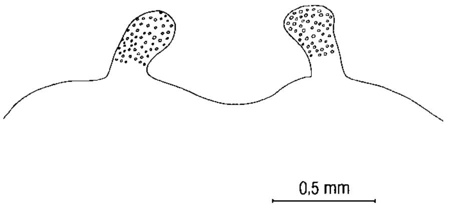

Fig. 1. Receptacula of a female *Latouchia swinhoei* from the twig-lining population at Chibana.

Observations and Discussion

The Chibana population of *Latouchia swinhoei* was rather dense, and specimens were also competing for prey with numerous *Ryuthela nishihirai* (Haupt, 1979) (Mesothelae) living in the same habitat. While a few specimens had attached pine needles, most individuals used grass blades (Figs 2, 3).

Specimens taken to the laboratory readily used twigs and grass-blades offered in the neighbourhood of the new burrow for attachment to the rim of the burrow (Fig. 4).

At present, one can only speculate on the origin and evolution of this behavioural capacity.

From ethological studies on nemesiid spiders, it is well known that different species may have differing ranges around the burrow for catching prey. Consequently, one can assume that they also obtain a different amount of information about their surrounding area. Specimens of *Nemesia caementaria* (Latreille, 1798) never leave their burrow when catching prey, their last pair of legs always maintains contact with the rim of the burrow. In this case only 5–10% of attempted catches are successful (Buchli, 1965). *Nemesia corsica* Simon, 1914 and *N. arenicola* Simon, 1902 may pursue their prey (Buchli, 1969), and a Portuguese *Nemesia* species [presumably *N. meridionalis* (Costa, 1835)] even spins silk lines radiating from the mouth of the burrow, forming a kind of funnel (Bacelar, 1933). These spiders may leave the burrow completely, even during daytime.

During the construction of the trapdoor, spiders commonly grasp soil particles at random from the close neighbourhood of the burrow, chew them with their chelicerae and fix them to the rim or utilize them for the construction of the trapdoor by the use of silk, as shown by Coyle et al. (1992) for a mygalomorph (idiopid) trapdoor spider, and Haupt (1994) in the case of *Ryuthela nishihirai*. This habit results in the extraordinary camouflage of the trapdoor surface. Unlike *Ryuthela*, specimens of *Latouchia swinhoei* moisten the soil particles and press them for attachment, consequently the surface structure of the trap door is more even than in trapdoors of Mesothelae.

In the same way as with soil particles, other materials may be added to the rim of the burrow. This type of construction process has been observed closely in an aganippine spider (Ctenizidae) by Main (1957).

In order to explain the occurrence of twig-lining at all, one may suppose that twigs or grass-blades have first been gripped by accident. This could easily happen in habitats with low surface inclination and much litter available. The attachment of twigs to the burrow rim must have provided a considerable evolutionary advantage to the owners of such burrows, as vibration signals caused by walking prey are more readily transmitted by twigs than by soil particles, as is also true for other vibrational signals (Michelsen et al., 1982). Thus, the range over which the spider can detect prey is increased considerably. At the same time, the twigs serve as guiding structures for direct return to the safety of the burrow, decreasing the risk of danger. More use of twig-lining certainly increases the probability of catching prey, even in unfavourable habitats. In Australia, corresponding populations have been traced, especially in desert areas and in habitats densely populated by trap door spiders (Main, 1957). In this way certain populations manage to become more successful.

The occurrence of twig-lining in distinct populations of certain species (Main, 1957, 1982) makes it likely that this behaviour could be genetically determined. This would also explain the fact of twig-lining by *L. swinhoei* in the laboratory, without the effects of high population density and lack of prey.

Trapdoor spiders have a considerable life span of several years, and at least in some species spiderlings may stay a fairly long time in their mother's burrow. In such cases a learning process cannot be entirely excluded.

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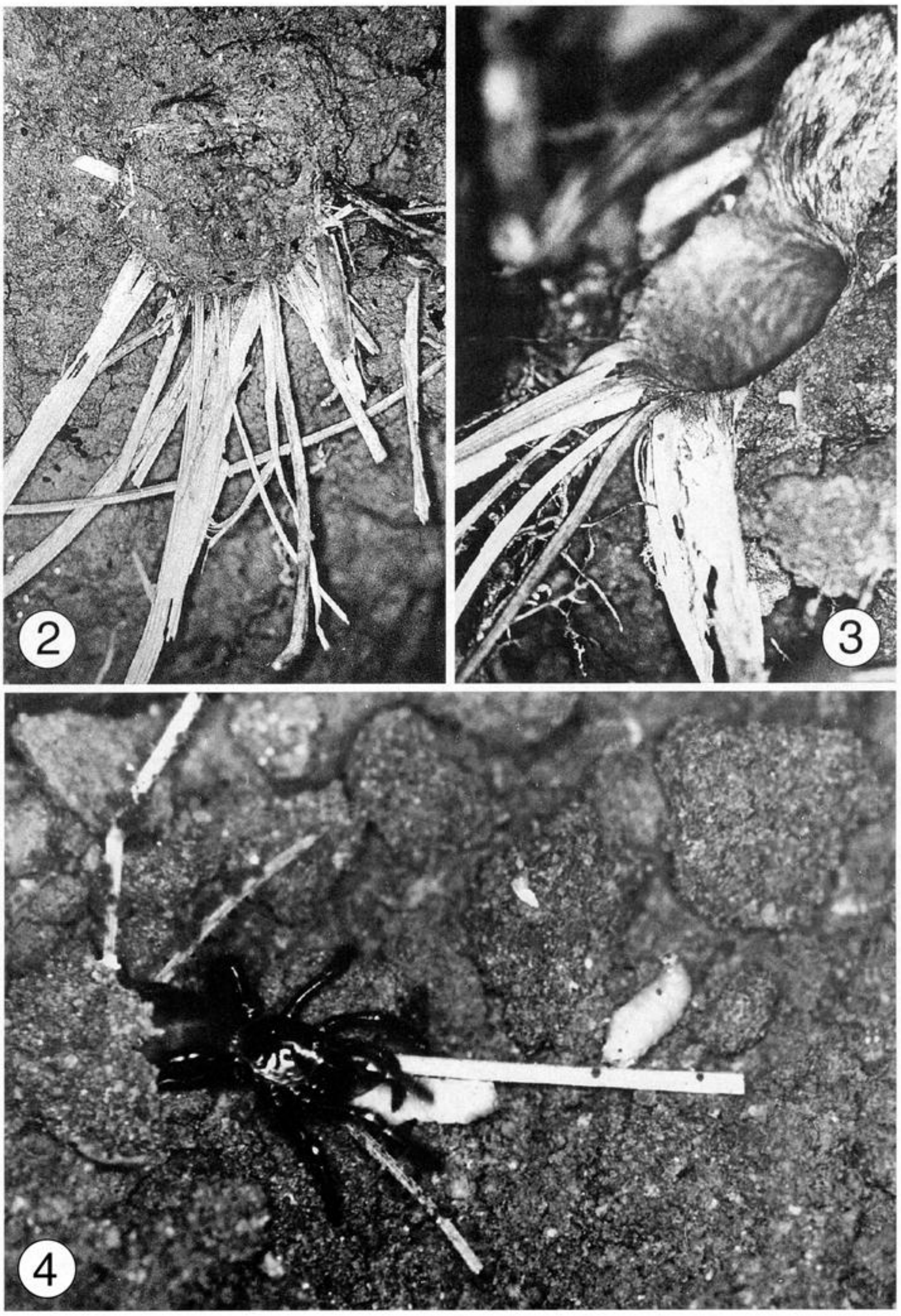
* Contra Raven (1985: 15), the name *Ryuthela* has been used here on grounds explained earlier (Haupt, 1983, 1984, 1990).



Figs 2–4. 2 – closed trapdoor of *Latouchia swinhoei* with attached grass-blades; 3 – trapdoor opened; 4 – *Latouchia swinhoei* catching prey at twig line from blades offered in the laboratory.

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