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A note on body size parameters and some life history data of *Pisaura mirabilis* (Araneae, Pisauridae)

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INTRODUCTION

Morphological parameters and phenological data of the spider *Pisaura mirabilis* were studied in the past in various parts of Europe. Bonaric (1974, 1975) studied the relationship between morphological parameters and the developmental stage of *P. mirabilis,* while life history data of this spider were investigated by Dondale & Legendre (1970), Bonaric (1987), Penicaud (1979), Nitzsche (1987, 1988) and Buchar et al. (1989). This paper contributes to the present knowledge by presenting data of populations in South Germany. The following parameters were determined for males and females of *P. mirabilis*: duration of the subadult instar, duration of the adult stage, length of the 4th tibia of subadult and adult spiders, and cephalothorax width of adult spiders.

MATERIAL AND METHODS

Immature *P. mirabilis* (133 males and 76 females) were collected from two populations near Munich, Germany, in early spring and autumn 1991. These spiders (which belonged to various instars) were raised to adulthood in the laboratory. They were kept singly in plastic boxes (8 cm x 11 cm x 4 cm). Juveniles were fed in excess with flies of various species of *Drosophila, Musca* and *Lucilia.* Adult spiders were fed one *Calliphora* sp. every seven days. The spiders had a constant supply of water from a moistened cotton pad. Temperature in the laboratory was about 22 °C, relative humidity 70% and the day-night cycle 16 : 8 hours.

RESULTS

The distributions of the determined data are shown in Figs 1 and 2, and the means and standard deviations in Table 1. Male and female spiders differed significantly only in the duration of the adult stage (Mann-Whitney U-Test, $p < 0.001$) (Fig. 1, Table 1).

Spiders were collected in the field as juveniles and raised to adulthood in the laboratory. The spiders collected in autumn had in some of the measured parameters higher values than spiders collected in spring (Table 1): "autumn males" had a longer 4th tibia as subadults and a larger cephalothorax width as adults, and "autumn females" had a longer duration of the subadult instars and a longer 4th tibia as subadults.

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All body size parameters (length of 4th tibia of subadults and of adults, and width of cephalothorax) were positively correlated with each other (Pearson's correlation coefficient, correlation coefficients in the range between 0.40 and 0.64, $p < 0.001$). However, there was no correlation between these body size parameters and the gained life history data.

CONCLUSIONS

There was no difference in the measured body size parameters between males and females, whereas in most other spider species the males are smaller. Concerning these body size parameters Nitzsche (1987) also found no difference between males and females. The evolution of a relatively large male body size in *P. mirabilis* was perhaps influenced by the special mating behaviour of this species. Male *P. mirabilis* pass prey

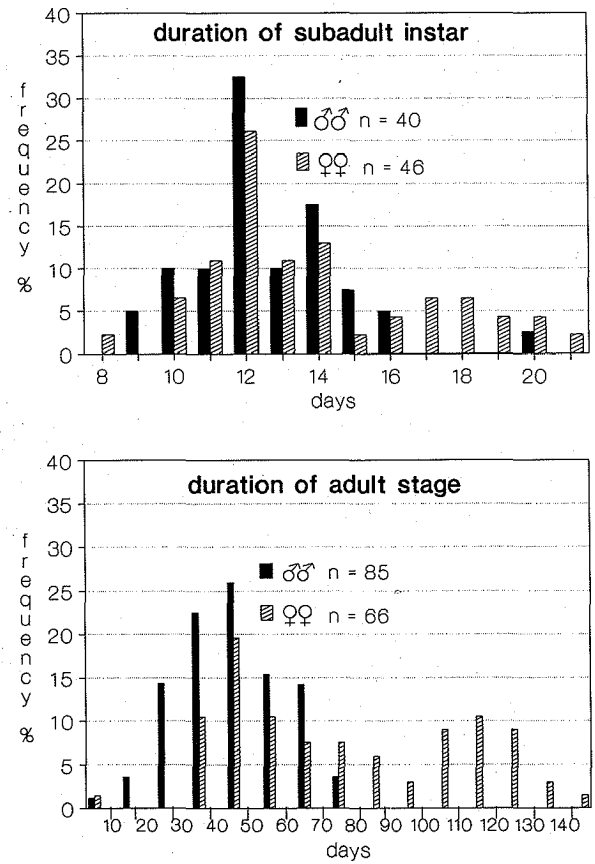

Fig. 1. Distributions of the duration of the subadult instar and the adult stage of *Pisaura mirabilis*. See Table 1 for mean values.

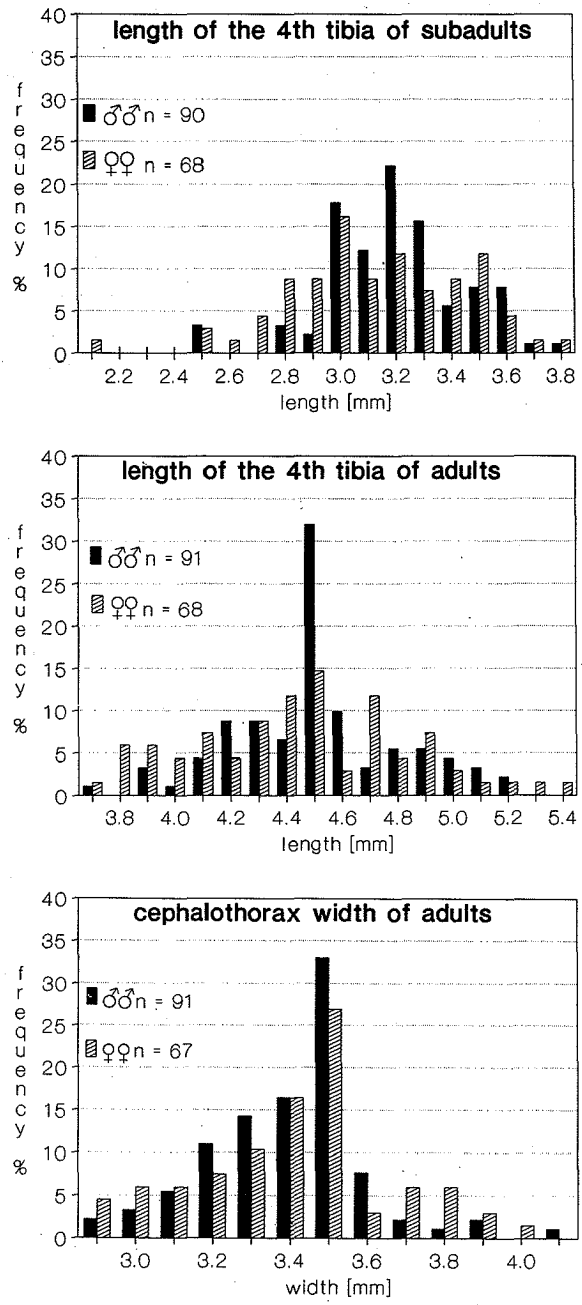

Fig. 2. Distributions of body size parameters of *Pisaura mirabilis*. See Table 1 for mean values.

Table 1. Mean values of the determined parameters, and a comparison between spiders collected in spring and spiders collected in autumn. subdur—duration of subadult instar, addur—duration of adult stage, subt4—length of 4th tibia of subadult spiders, adt4—length of 4th tibia of adult spiders, cv—cephalotohorax width of adult spiders. Values are means and standard deviations. Sample size in parenthess. Mann-Whitney R-Test: n.s.— not significant, * $p < 0.05$, ** $p < 0.01$.

	subdur [days]	addur [days]	subt4 [mm]	adt4 [mm]	cw [mm]
all males	12.7 ± 2.2 (40)	44.2 ± 15.3 (85)	3.2 ± 0.3 (90)	4.5 ± 0.3 (91)	3.4 ± 0.2 (91)
males collected in spring	14 (2) n.s.	45.9 ± 15.1 (62) n.s.	3.2 ± 0.2 (65) **	4.5 ± 0.3 (67) n.s.	3.4 ± 0.2 (67) **
males collected in autumn	12.6 ± 2.7 (38)	39.7 ± 15.1 (23)	3.3 ± 0.3 (25)	4.5 ± 0.3 (24)	3.5 ± 0.2 (24)
all females	13.9 ± 3.3 (46)	77.6 ± 34.5 (66)	3.1 ± 0.3 (68)	4.5 ± 0.4 (68)	3.4 ± 0.3 (67)
females collected in spring	12.6 ± 2.7 (16) *	77.4 ± 35.3 (40) n.s.	3.1 ± 0.3 (40) *	4.5 ± 0.4 (41) n.s.	3.3 ± 0.3 (40) n.s.
females collected in autumn	14.6 ± 3.4 (30)	77.9 ± 33.9 (26)	3.2 ± 0.3 (28)	4.4 ± 0.3 (27)	3.5 ± 0.3 (27)

items as nuptial gifts to females for mating. Females allow males with larger gifts to mate longer (Austad & Thornhill, 1986), and a longer copulation duration can be positively associated with reproductive success of the males (e.g. Austad, 1984). Larger males can cope with larger prey (personal observation) and might therefore have an advantage in reproductive succes compared to smaller males. This may have caused a positive selection of male body size in *P. mirabilis.*

Spiders collected in autumn were greater in some subadult and adult body size parameters compared to spiders collected in spring. Juvenile spiders of both these groups received food in excess. But spiders collected in autumn belonged to earlier instars, and therefore might have received a greater amount of food during their development to adulthood, which can lead to larger adult spiders (Vollrath, 1987). Also differences in food intake, temperature and the light-dark regime can have an effect on number and duration of instars and therefore on body size (e.g. Jakob & Dingle, 1990; Miyashita, 1992). So, for the explanation of the detected differences in our data further studies are required.

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