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LIFE CYCLE, HABITAT CHOICE AND DISTRIBUTION OF *PARDOSA AMENTATA* (CLERCK, 1757) IN BELGIUM (ARANEAE, LYCOSIDAE)

by

Mark ALDERWEIRELDT (1) and Jean-Pierre MAELFAIT (2)

(1) Laboratorium voor Ecologie der Dieren, Zoögeografie en Natuurbehoud
K.L. Ledeganckstraat 35, B - 9000 GENT, BELGIUM
(2) Instituut voor Natuurbehoud
Kiewitdreef 3, B - 3500 HASSELT, BELGIUM

SUMMARY. - In Belgium the Lycosid spider *Pardosa amentata* (CLERCK, 1757) is widely distributed and can be found in all kinds of open, rather humid places with a well developed litter layer. By means of a biometrical analysis we could infer the life cycle pattern of this species. Two broods are produced during spring and summer. The offspring of the first brood gets adult in the next spring. A part of the offspring of the second brood also becomes adult in their second year. The other part of that offspring however, only reaches the adult instar in their third year.

RESUME. - Pardosa amentata *(CLERCK, 1757)* Lycosidae, Araneae) *est une espèce très répandue en Belgique. Elle préfère des habitats ouverts et relativement humides avec une strate de litière bien développée. A partir de données biométriques, nous avons reconstitué le cycle vital de cette espèce. Deux cocons sont produits au printemps/été. Les descendants du premier et une partie des descendants du deuxième cocon deviennent adultes au printemps suivant, donc dans leur deuxième année. Le restant des juvéniles du deuxième cocon ne devient adulte que dans la troisième année.*

Index entries : *Pardosa amentata*, distribution, habitat choice, life cycle pattern.

Mots-clés : Pardosa amentata, distribution, choix d'habitat, cycle vital.

INTRODUCTION

The distribution, habitat choice and life cycle pattern of Lycosid spiders in Belgium is not yet very well known. For some European species the life cycle has been studied in detail (for instance *Pardosa lugubris*, EDGAR, 1971; *Trochosa* spp., ENGELHARDT, 1964; *Pirata piraticus*, TOFT, 1979; *Pardosa amentata*, VLIJM et al., 1963; *Pardosa monticola*, *P. nigriceps* and *P. pullata*, VLIJM & KESSLER-GESCHIERE, 1967).

Since 1985 we are studying the distribution and ecology of the Belgian Lycosidae. A publication in which all species occurring in our country are treated is in preparation. Hereafter, we present results obtained for the most common species of the family. This gives us the opportunity to illustrate the use of a statistical technique which was, to our knowledge, never used before to analyze the life cycle of spiders.

DISTRIBUTION AND HABITAT CHOICE

The Belgian distribution of *Pardosa amentata* is depicted in FIGURES 1 and 2. FIGURE 1 gives the distribution according to BECKER (1882). FIGURE 2 shows the geografical distribution of the captures made during the last decades. It can be seen that the species is widely distributed all over the country and has been recorded from all nine provinces. The maps of such a common species also indicate that the real distribution patterns of Lycosid spiders are still incompletely known. Many squares have never been investigated for what concerns their spider fauna.

Pardosa amentata is also very common in other European countries. It has a wide distribution from Western Europe to Siberia and also occurs in North-Africa (TONGIORGI, 1966). As a consequence it can be called a palearctic species.

High pitfall catches are registrated in a lot of different habitats : e.g. open woodlands, alder carr, marshes, wet meadows. In TABLE 1 some high pitfall catches of *Pardosa amentata* at different sites in Belgium are listed. For each month, the percentage of the total catch is indicated. The species seems to be rather tolerant and therefore occurs in all kinds of situations. It avoids too dry and too shady places. Possibilities for the hibernation of the juvenile instars also seem to limit the species in its occurrence. It is absent from intensively managed pastures and hayfields. This is probably due to the absence of a well developed litter layer.

	J	F	M	A	M	J	J	A	S	O	N	D
GALMAARDEN, 1982												
1099 males	-	0	0	51	43	6	0	0	0	0	0	0
552 females	-	0	0	41	33	21	2	2	1	0	0	0
SMEEREBBE, 1982												
440 males	-	0	0	33	64	3	0	0	0	0	0	0
148 females	-	0	0	28	32	17	18	3	2	0	0	0
XHORIS Station 1, 1983												
48 males	-	0	0	0	14	84	2	0	0	0	0	0
53 females	-	0	0	0	19	77	4	0	0	0	0	0
XHORIS Station 3, 1983												
106 males	-	0	0	34	34	32	0	0	0	0	0	0
33 females	-	0	0	21	36	26	11	6	0	0	0	0

TABLE 1 : High pitfall catches of *Pardosa amentata* at different localities in Belgium. Numbers expressed as percentages of the total catch. J, F, M, ... are the months of the year.

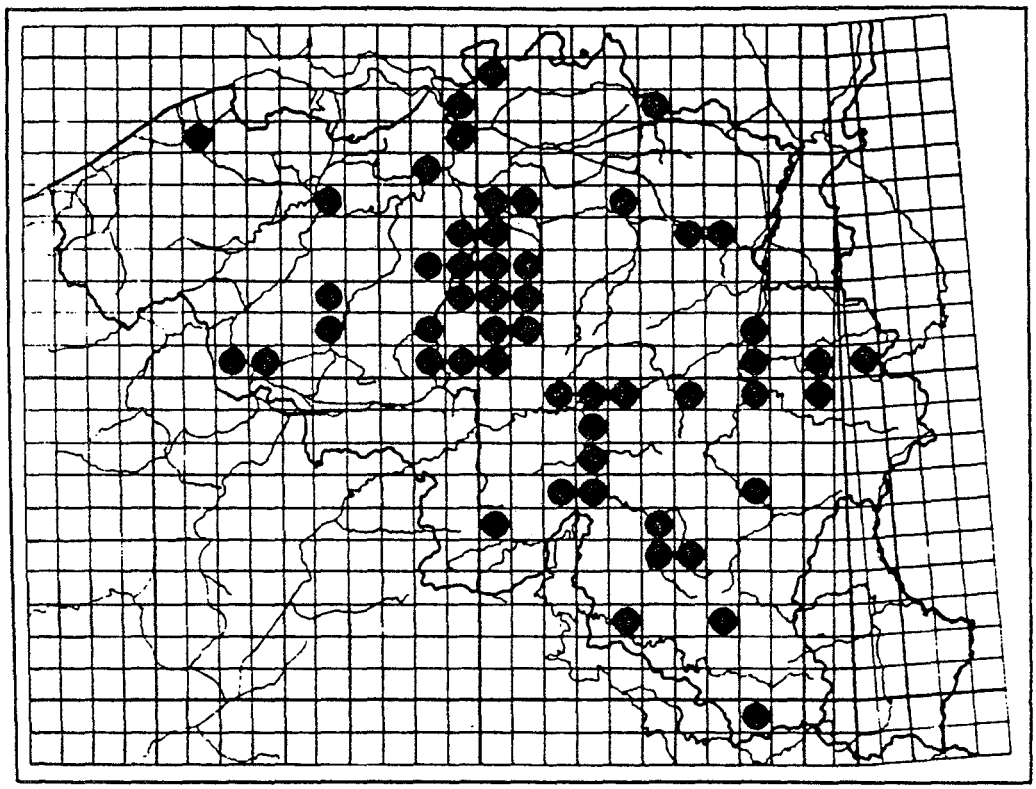

FIGURE 1 : Distribution of *Pardosa amentata* in Belgium according to BECKER (1882).

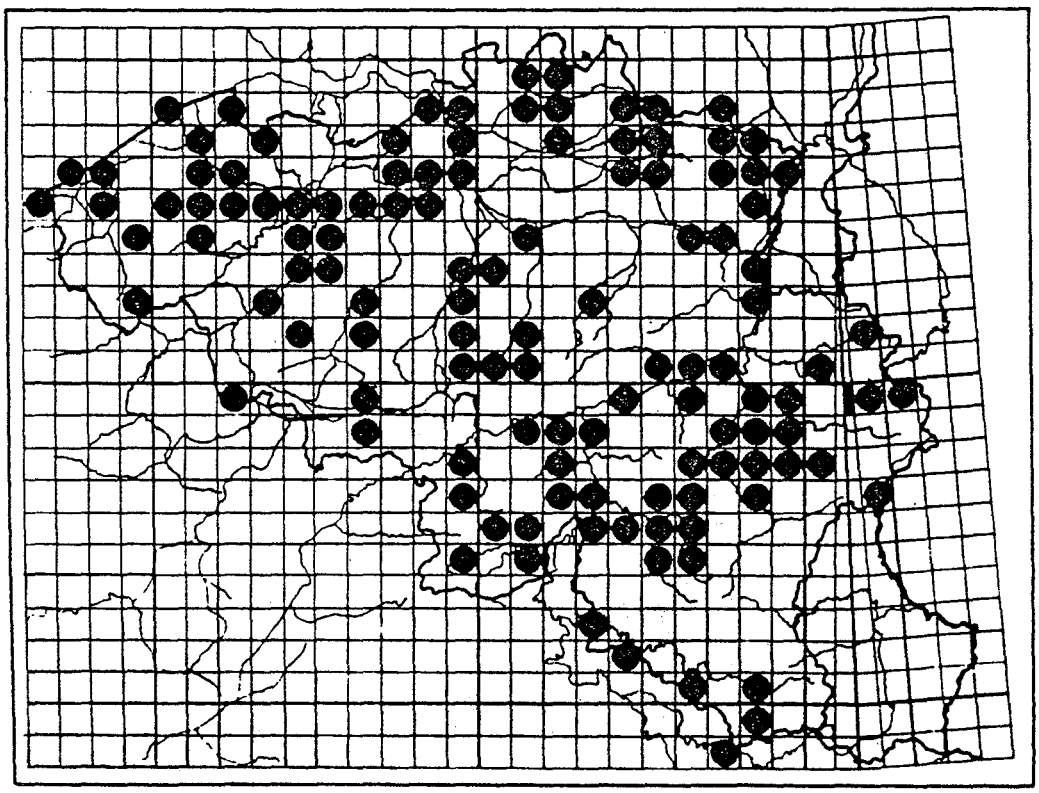

FIGURE 2 : Recent distribution data of *Pardosa amentata* in Belgium.

ANALYSIS OF THE LIFE CYLCE PATTERN

To infer the life cycle pattern of *Pardosa amentata* we effectuated a biometrical study of material gathered by means of pitfall traps. The samples were obtained from a dense population occurring in a wet hayfield during 1982 at Galmaarden (Brabant).

In FIGURE 3 the numbers caught per fortnightly interval are shown. As is usually the case for Lycosid spiders, much more males than females were caught in the pitfall traps. Male activity starts at the beginning of April, reaches a peak at the beginning of May and lasts till the end of June. The female activity shows two distinct peaks : the first at the beginning of May, the second mid-June. Females are present in the traps till September. They probably live longer than males.

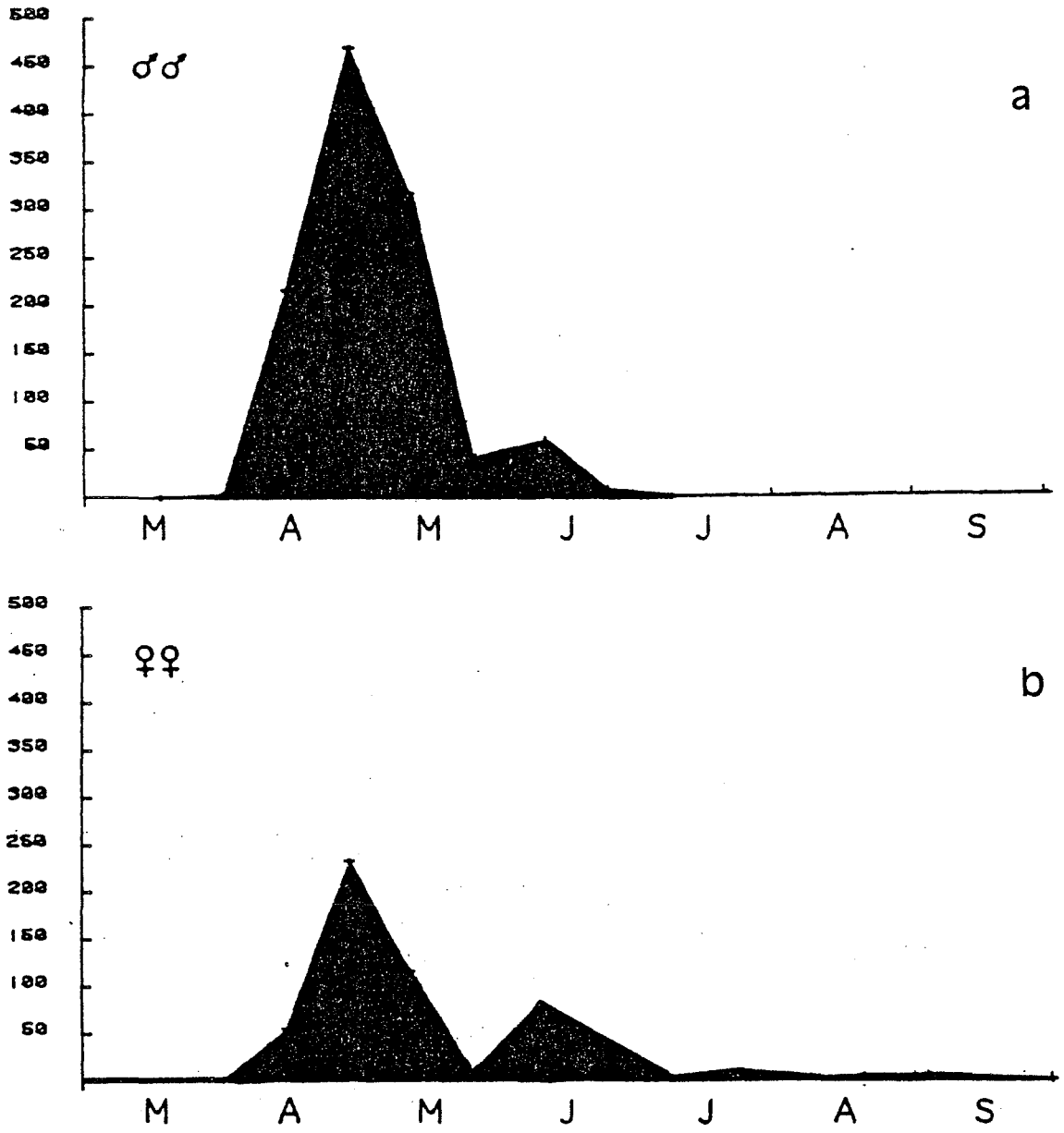

FIGURE 3 : Activity distribution pattern for males (a) and females (a) of *Pardosa amentata*.

From every period in which adults were caught we determined the sizes of abdomen and carapace of 10 individuals taken out at random. If fewer individuals were present they were all used. In total 100 males and 100 females were measured. The measure for size of abdomen and carapace is obtained as follows. By using a stereomicroscope we make enlarged drawings of the circumference in a horizontal plane of each body part. By means of the suited computer hard- and software the surface of that drawing is determined.

FIGURE 4 shows the variation during the breeding season of the size of the carapace and abdomen of the captured males. No clear pattern can be discerned.

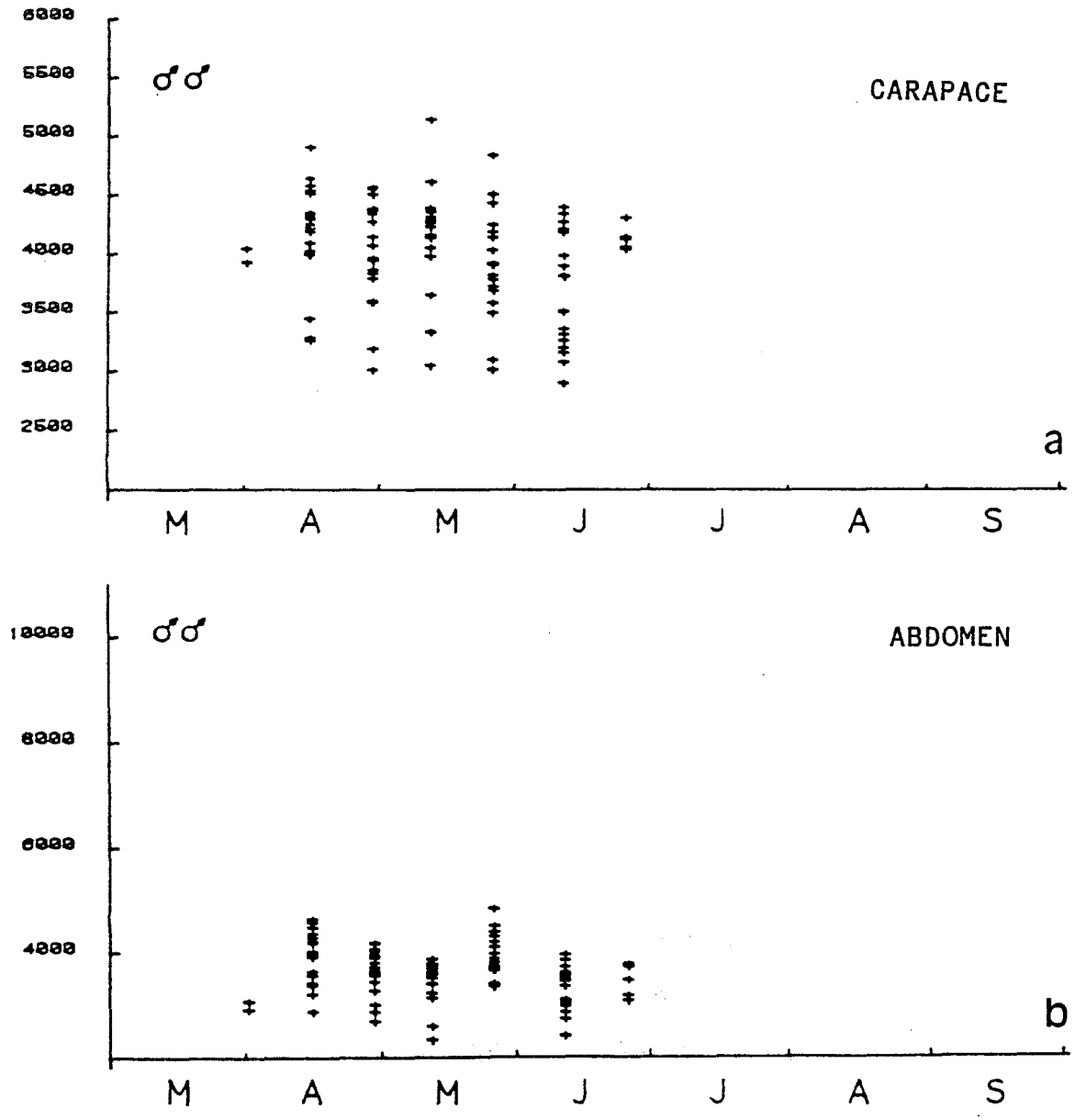

FIGURE 4 : Size variation of male carapace (a) and male abdomen (b) during the breeding season of *Pardosa amentata*.

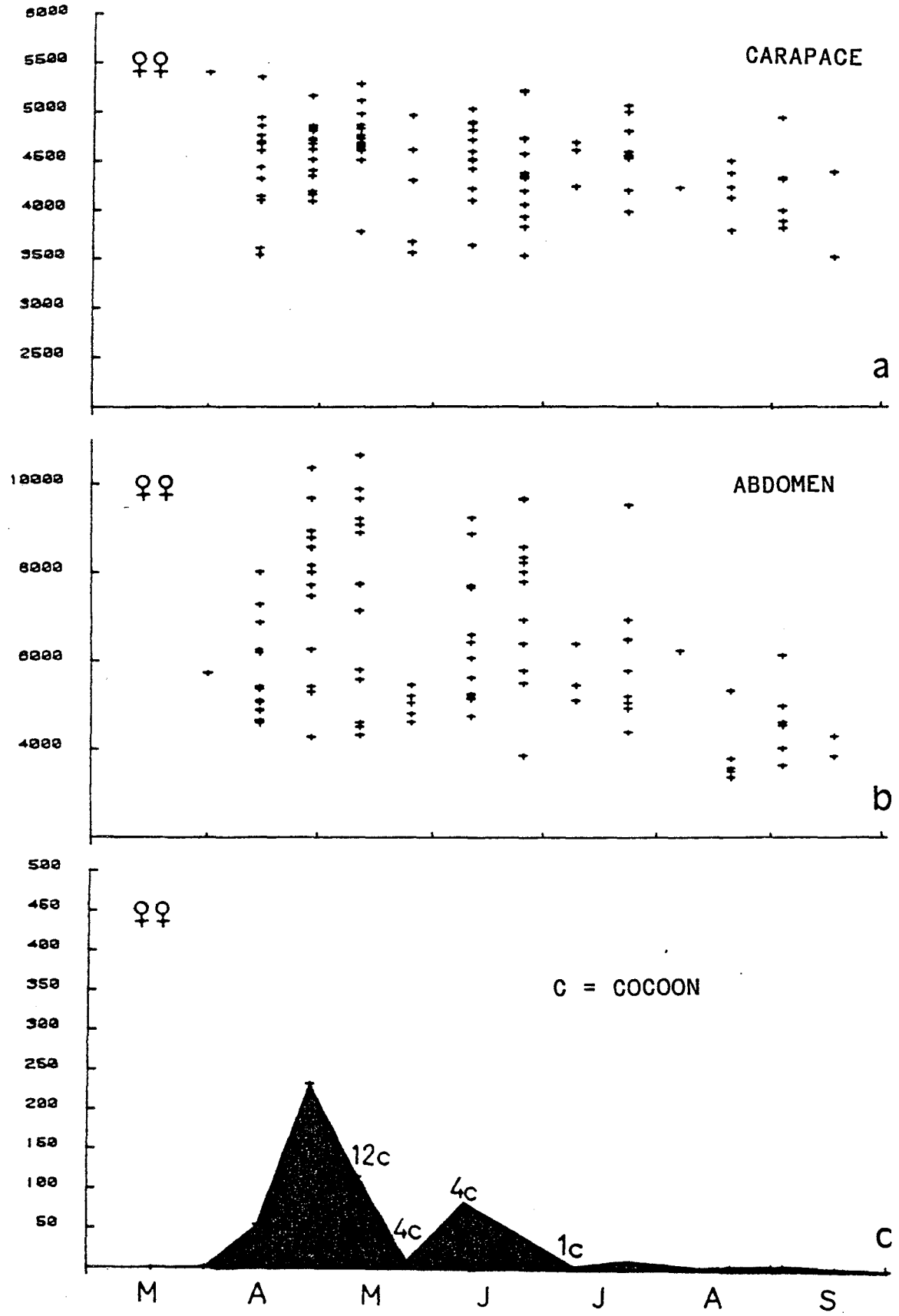

FIGURE 5 : Size variation of female carapace (a) and female abdomen (b) during the breeding season and activity distribution of the females (c) of *Pardosa amentata*.

Female carapace and abdomen sizes during the breeding season are depicted in FIGURE 5a and 5b. For the carapace size we again see no interpretable variation. It is for instance not so that larger females are active earlier in the season than smaller ones. We get a completely different picture for the abdominal size of the females. Females with large abdomina were caught by the end of April - beginning of May and also around mid-June. There is thus a close relation between the increase of the female activity (FIGURE 5c) and the increase in abdominal size. This would mean that female spiders are more active during the maturation of their eggs. This is probably due to a more intensive search for food needed for egg development.

The two peaks also suggest that most females produce two broods. In agreement with this, we notice that most cocoons are found after the first peak in activity and abdominal size (FIGURE 5c). Another cocoon was found after the second peak.

For both males and females we plotted the frequency distribution of the measurements of carapace size (FIGURE 6). Especially for the males it is clear that we are not dealing here with a unimodal distribution.

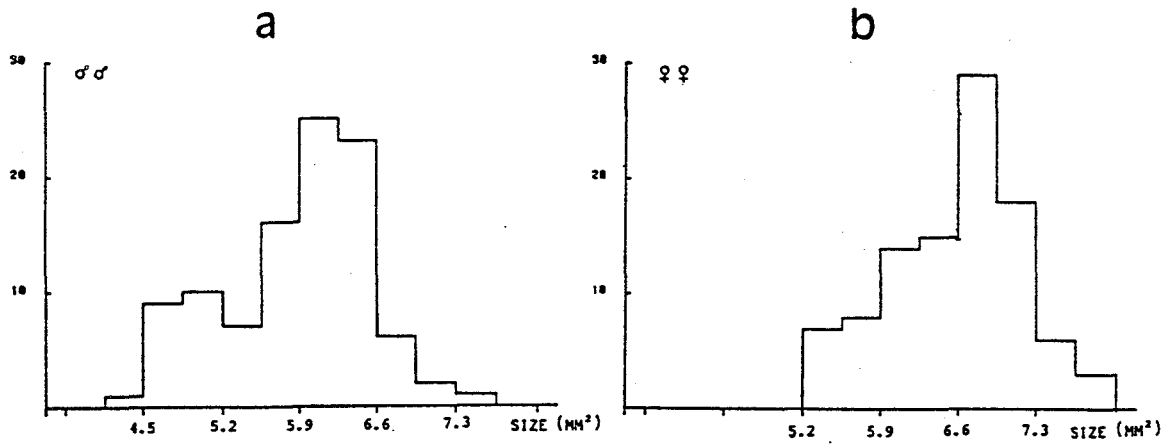

FIGURE 6 : Frequency distribution of the male (a) and female (b) carapace size of *Pardosa amentata*.

We therefore plotted the cumulative frequency distribution of these measurements on normal probability paper. For both sexes we obtained a curve with two inflexion points. This is illustrated in FIGURE 7 for the males. Following the method proposed by BHATTACHARYA (1967) we find three groups comprising respectively 27, 54 and 19 per cent of the total. For the females those percentages are 22, 70 and 8. The sum of these three distributions agrees very well with the emperical frequency distribution. This was confirmed by a G - test (SOKAL & ROHLF, 1981).

These three size groups can be interpreted as follows (FIGUUR 8). Knowing that there are two broods, we assume that the descendants of the first brood reach adulthood in one year. They make up the bulk of the adults, consisting of medium sized individuals. The descendants of the second brood would split up in two. A first group would also get adult after one year, just like the descendants of the first brood. Due to a

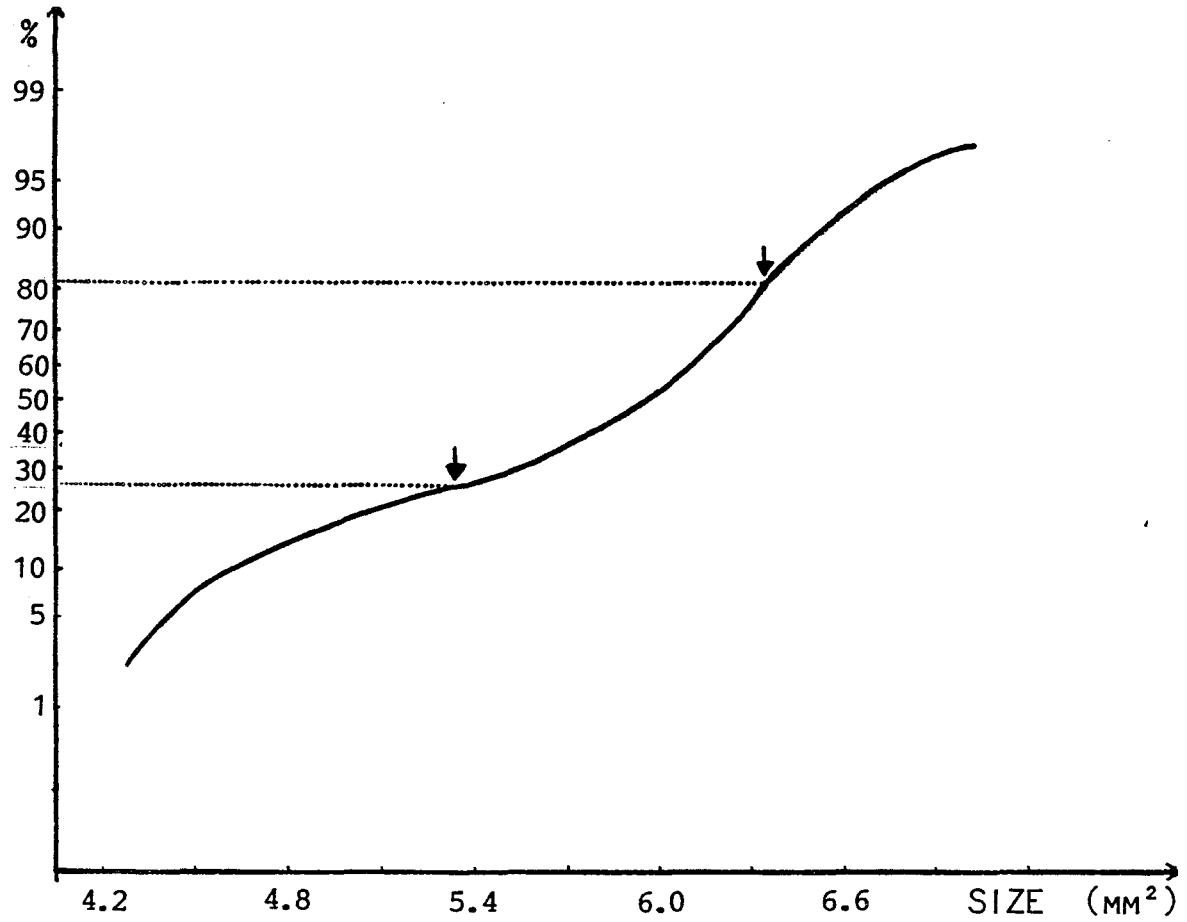

FIGURE 7 : Cumulative frequency distribution of the male carapace sizes plotted on a normal probability scale with indication of the two inflexion points (explanation see text).

shorter growing period they are however smaller. They build up the group of small sized adults. A second part of the descendants of the second brood would not have reached the minimal size to get adult by the beginning of the breeding season of the next year. Instead they keep on growing for another summer. If they survive winter they reach adulthood two years after their year of birth. Because of their longer growing period they make up the group of large sized adults.

Also in agreement with the proposed life cycle pattern is that subadult animals can be found during the breeding season. Those are thus descendants of the second brood which will only get adult the next year, this means two years after their year of birth.

CONCLUSION

The above mentioned results are important because they show that it is possible to get an idea of the life cycle pattern of a Lycosid spider only by considering the frequency distribution of the sizes of the adult individuals caught by pitfall traps. By doing this for *Pardosa amentata* we indeed obtained interpretable results which are in good agreement with the findings of the detailed investigations cited in the introduction.

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