Pardosa wagleri (Hahn 1822) and *Pardosa saturatior* Simon 1937, a pair of sibling species (Araneae, Lycosidae)

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Pardosa wagleri was described by HAHN in 1822 (sub *Lycosa wagleri)* from the pebbly banks of the river Isar near Munich. According to his drawing this is a grey wolf spider with annulated legs. DAHL (1908) observed a very dark, nearly black variety of *Pardosa wagleri* from the screes of summer-dry streams at higher altitudes in the Alps. He denominated this form "*Lycosa wagleri var. nigra*" because he assumed (as discussed in detail and substantiated in DAHL 1908, p.469) that C.L.KOCH (1834) referred to this form and not to the species which DAHL named *Lycosa ludovici* and which was regarded to be *Pardosa nigra* by other authors. SIMON (1937) did not follow DAHL in this respect and gave the new name *Pardosa wagleri saturatior* to this form. TONGIORGI (1966) separated *wagleri* and *saturatior* despite their very similar genitalia on the basis of the differences in ecology, phenology, colour and size and considered them to be two different species.

Courtship behaviour

Males of many species of the genus *Pardosa* show a complex visual courtship display, which is species specific and may act as a reproductive isolating mechanism (BRISTOWE & LOCKET 1926). Therefore, evidence for courtship behaviours can contribute to the solution of the problem, whether two forms are biospecies or only different varieties of the same species. For this reason we studied courtship display of *Pardosa wagleri* and *Pardosa saturatior* by a frame by frame video analysis. This study revealed distinct differences in the courtship display of the two forms (BARTHEL & v.HELVERSEN in prep.). Furthermore, crossing experiments with virgin females were carried out for establishing whether females are

able to distinguish between the two male types. Females of *Pardosa wagleri* never accepted heterospecific males (N=15). *Pardosa saturatior* females generally refused heterospecific males (N=15), but in three cases *Pardosa saturatior* females accepted *Pardosa wagleri* males for copulation. So investigating the courtship display of males and testing acception by females allowed the classification even of individuals from syntopic locations.

Morphology

Generally *Pardosa saturatior* is larger than *Pardosa wagleri*, and the colouring of body and legs is substantially darker. Therefore, the annulation of the legs in *Pardosa saturatior* is less conspicuous. In males of *Pardosa wagleri* the frontal region of the prosoma and femur and patella of the palps are covered with light pubescence. Normally, these light patterns are absent in *Pardosa saturatior* males. In alcohol preserved specimen, unfortunately, the light pubescence of *Pardosa wagleri* males is no longer visible.

The form of the sclerotized structures of the male palp as well as the form of the epigyne are very similar in both species (TONGIORGI 1966, p.303 and Figs. 128-134). In order to investigate differences in size we measured the length and width of prosoma and sternum and the length of tarsus, metatarsus, tibia and femur of the first front leg. In the male palp the length and width of the tegular apophysis and terminal apophysis and the length of the femur, tibia, bulbus and the distal part of the cymbium were measured. In addition measurements were taken of the length and width of the epigyne, of the anterior epigynal pocket and the posterior epigynal pocket (Fig. 1).

In all measurements *Pardosa saturatior* is larger on average than *Pardosa wagleri*, but in most parameters a more or less prominent zone of overlap exists. As an example we give the measurements of prosoma width and length (Figs. 2a, 3a). In contrast to body size, measures of the length of the genitalia in males and females clearly differed and showed no

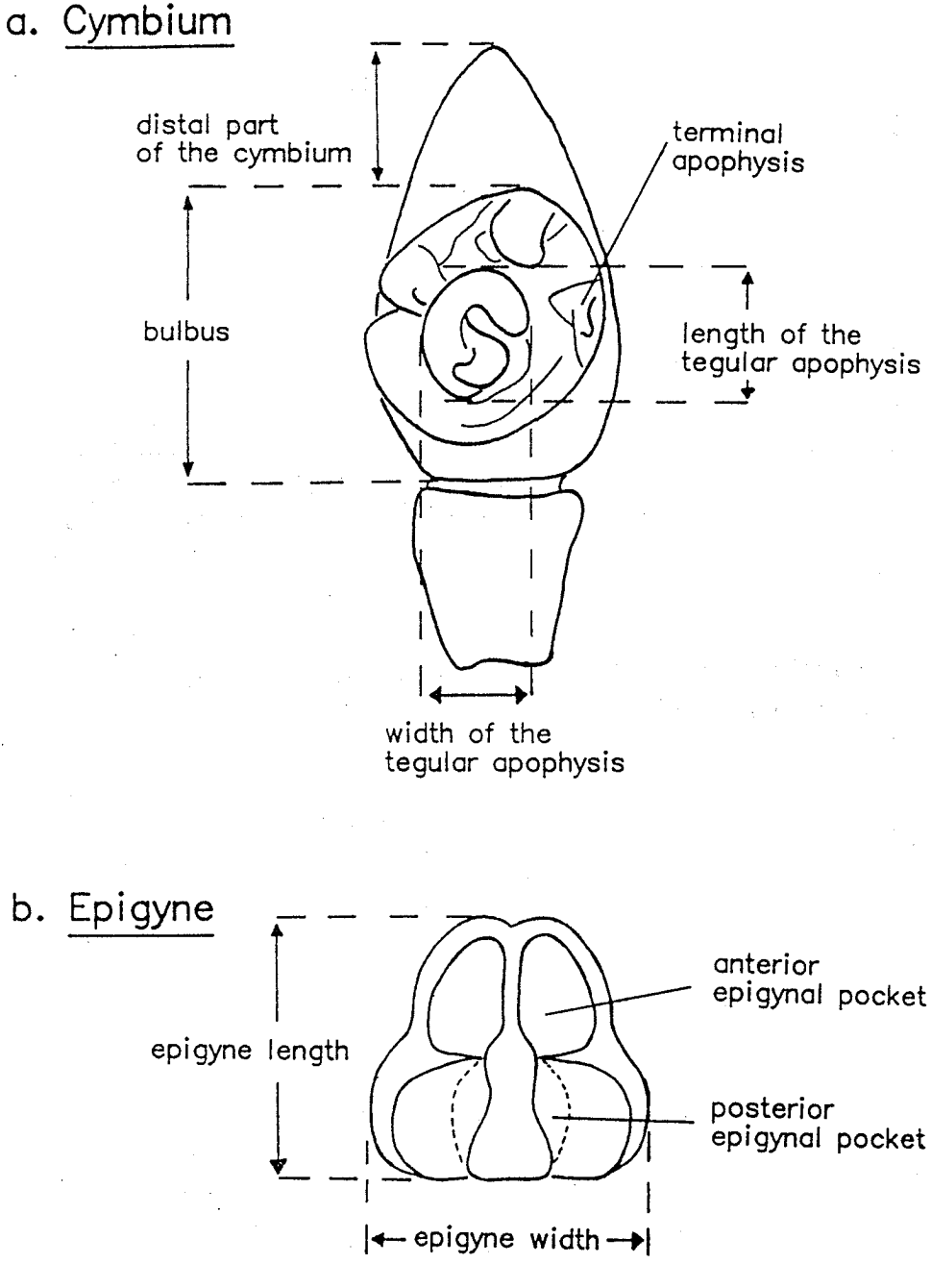
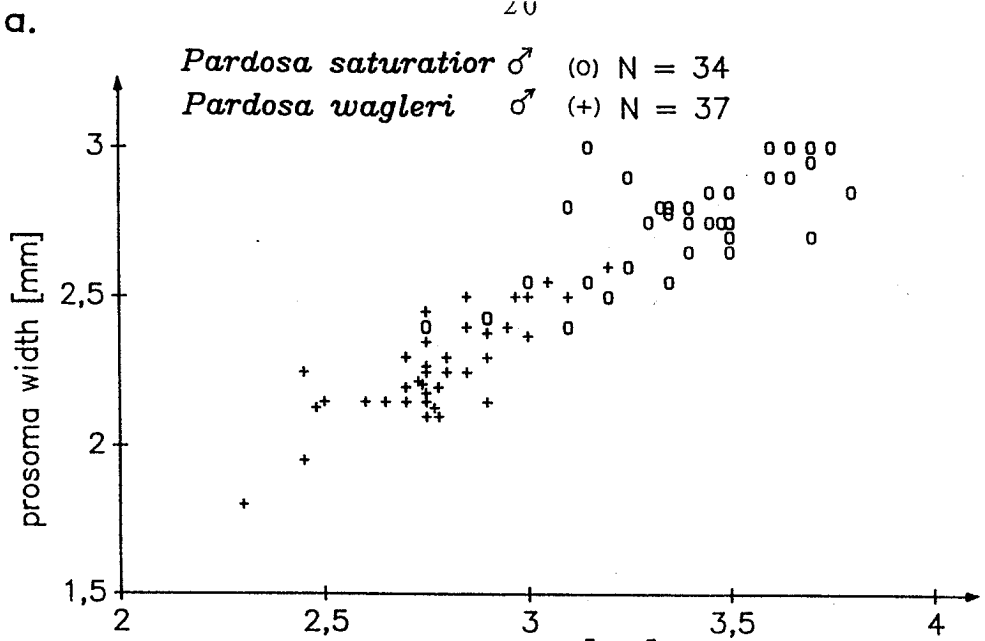


Fig. 1: Genital structures of a male (a) and female (b) of *Pardos saturatior*, which were measured for morphological studies.



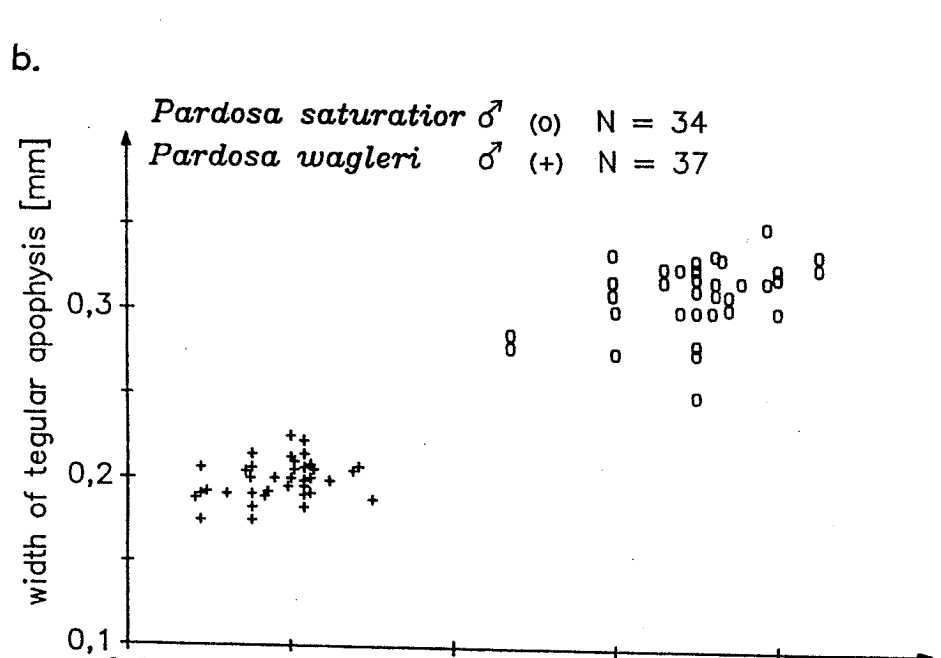
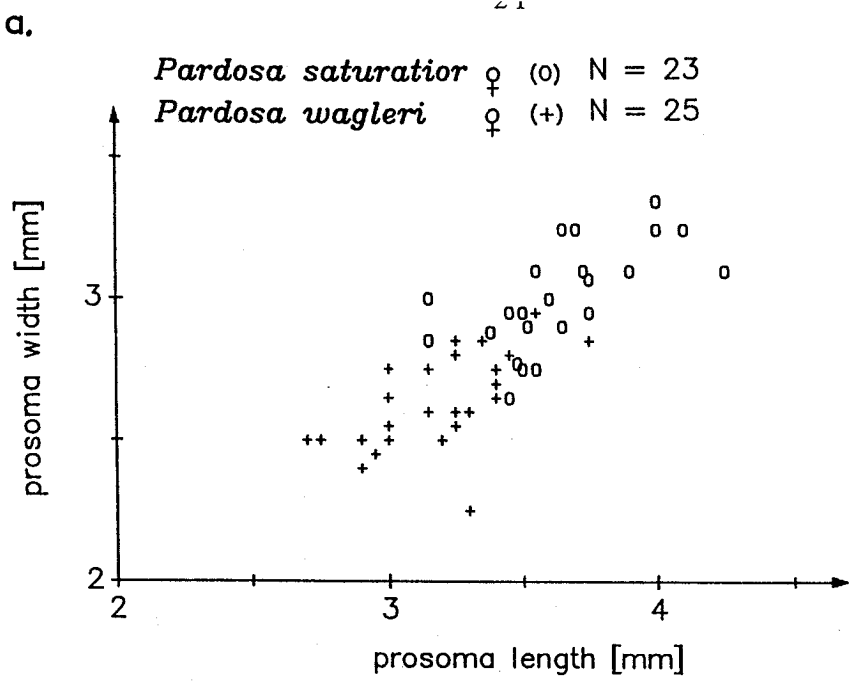


Fig. 2: (a) Prosoma length and prosoma width of *Pardosa wagleri* (+) and *Pardosa saturatior* (o) males.
(b) Length and width of the tegular apophysis of the males of both



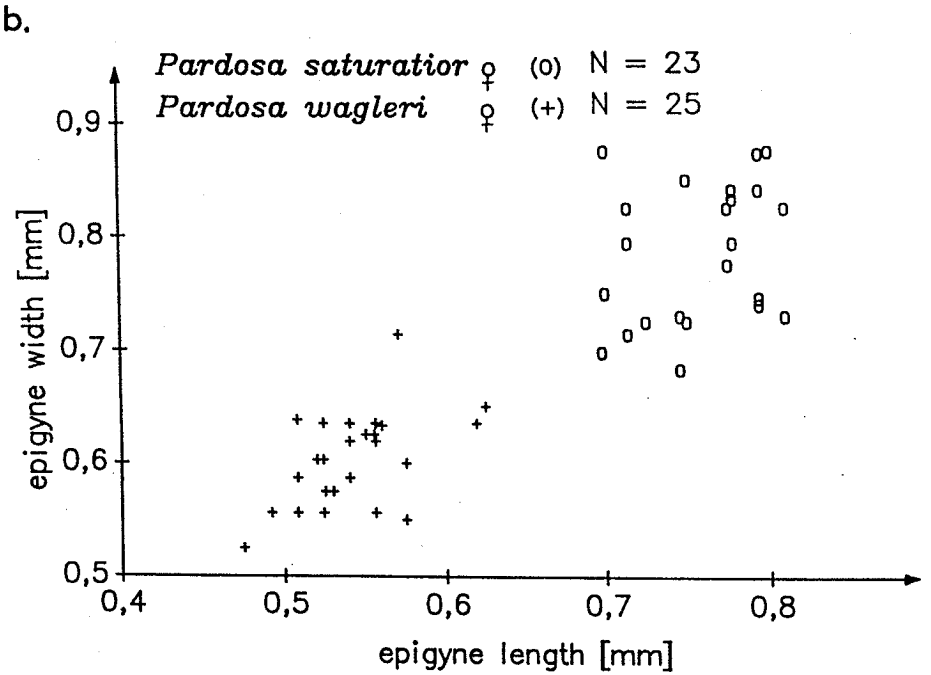


Fig. 3: (a) Prosoma length and prosoma width of *Pardosa wagleri* (+) and *Pardosa saturatior* (o) females.
(b) Length and width of the female epigyne of both species.

the length of tegular apophysis of the male and the length of epigyne can serve as a diagnostic feature to distinguish between both species.

	Pardosa wagleri	*Pardosa saturatior*
length of tegular apophysis [mm]	0.222 - 0.275 (min) (max) 0.246 ± 0.012 (mean ± SD) (N=37)	0.317 - 0.413 (min) (max) 0.374 ± 0.020 (mean ± SD) (N=34)
length of female epigyne [mm]	0.475 - 0.625 (min) (max) 0.541 ± 0.035 (mean ± SD) (N=25)	0.698 - 0.810 (min) (max) 0.758 ± 0.040 (mean ± SD) (N=23)

Table 1: Measured range, mean and standard deviation of the length of the tegular apophysis in the male palp and of the length of the female epigyne.

Ecology

Both forms live on pebbly river banks and block fields normally near running water. We confirm DAHL's and TONGIORGI's observation, that *Pardosa wagleri* occurs mainly at low altitudes while *Pardosa saturatior* is limited to the higher Alpine regions. During this study we also found two syntopic occurrences at about 1000m above sea level on the pebbly banks of the river Lech in Austria. At these two places both adult forms live side by side without any sign of interbreeding.

Conclusion

Pardosa wagleri (HAHN 1822) and *Pardosa saturatior* SIMON 1937 are separated by an ethological crossing barrier and do not seem to interbreed in syntopic locations. Furthermore the size of some genital structures does not overlap and can be used for identification. These findings support TONGIORGI's

view that *Pardosa wagleri* and *Pardosa saturatior* are two different species.

Literature

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