The microhabitat of *Tuberta maerens* (Araneae, Agelenidae)

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Summary

The relative abundance of *Tuberta maerens* (O. P.-Cambridge) on woodland tree trunks was examined in relation to compass bearing, years since coppicing, vegetation cover on the trunk, and bark parameters. In the site studied, there was a bias to the south and west of tree trunks, and the species peaked in abundance in intermediate stages of the coppice cycle (declining sharply 14 years after coppicing). The species is also common on exposed trees on woodland rides. These data suggest a thermophilous (i.e. warmth dependent) nature, or higher survival in warm environments.

Introduction

Tuberta maerens (O. P.-Cambridge) has been recorded rarely in Europe (Hambler, 1995; Bonnet, 1959). The restricted distribution in England (south of the Thames/Severn) led Bristowe (1939) to suggest that temperature may limit the species' distribution.

The largest known population occurs on the oaks (*Quercus robur*) in a coppice-with-standards woodland (Brasenose Wood, Oxfordshire). This presents an opportunity to examine habitat preferences, since a relatively homogeneous woodland is being manipulated (cut) in rotating patches, creating a range of "year-classes". The pattern of a species' abundance within the coppice cycle may indicate its microhabitat requirements. Thermophilous species and those of woodland clearings thrive in the early year-classes, where undergrowth surrounding the "standard" trees has been cleared. Conversely, species favouring sheltered, moist environments become more common as the undergrowth regrows in later year-classes and when coppice is neglected (Sterling & Hambler, 1988; Hambler & Speight, 1995).

A thermophilous nature would also be suggested by a greater abundance on sunlit, warm, dry parts of tree trunks (the south-west sector in Britain). However, light itself may influence abundance directly or through prey behaviour, creating a similar pattern.

This study examines how the abundance of *T. maerens* varies with compass orientation on the trunk, with year-class and with measurements of vegetation cover and bark texture on the trunks.

Study site and methods

Brasenose Wood, Oxfordshire (Grid ref. SP 560055) has been coppiced with a predominantly hazel (*Corylus avellana*) understorey and oak (*Quercus robur*) standards since the Middle Ages, with an interruption of some 40 years in recent times. Since 1975 sections have been

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brought back into a coppice cycle, and most of the wood now has less than 15 years of regrowth. Standard trees are up to about 1 m in diameter at breast height (d.b.h.), and average about 65 cm d.b.h.

The study was performed in late June and early July 1993, when webs are relatively easy to find.

T. maerens populations on trunks were assessed in a 1 m-wide belt around the trunk, 1–2 m above the ground. Every web encountered was noted, and assigned to one of 12 sectors based on compass bearings at 30° intervals from north. To standardise search-effort between times, sectors and year-classes, the 19 year-classes were examined in a random order. Sectors were examined for a minimum of five minutes, and a "giving-up time" of one minute was employed (if no webs were found within this period, the next sector was examined).

The year-classes examined were the first to eighteenth year of regrowth after coppicing (inclusive), plus areas uncoppiced for 48 years. Three replicate trees of each year-class were sampled. Trees within 10 m of a woodland edge or path were not used, since *T. maerens* is common by paths.

Measurements of bark roughness were taken using a "pro-form template", which when pressed on to the bark retains the texture of a 14 cm horizontal line, at a height of 1.5 m on the trunk. The intervals between successive peaks and troughs on the template, and the depth of each trough, were measured to the nearest mm.

Estimates of the percentage cover of epiphytic non-vascular plants and vascular plant cover (mostly ivy *Hedera helix*, honeysuckle *Lonicera periclymenum*, and bramble *Rubus* sp.) were made by eye for each sector.

The d.b.h. of each tree was taken with a forestry diameter tape, to check if this parameter (and hence trunk area sampled) was biased with respect to year-class.

Results

Homogeneity of sample area

Although the sample was too small for full statistical analysis, visual examination of the mean d.b.h. in each year class suggests there is no bias in d.b.h., and hence sample area, with year-class.

Compass orientation

There was a highly significant bias in the abundance of *T. maerens* towards the south and west of tree trunks, using the Rayleigh test (Mardia, 1972). The mean vector of webs was 243.43°, and the angular deviation $S=121°$ ($p<0.001$, $n=12$). A means square difference test (Zar, 1984) confirmed that abundance varied with orientation ($p<0.05$, $n=12$). This bias in orientation is shown in Fig. 1. The sample size is insufficient to determine whether the abundance for the mean (south-westerly) vector is slightly less than for due west or due south — which might indicate an avoidance of the most extremely sunlit sectors.
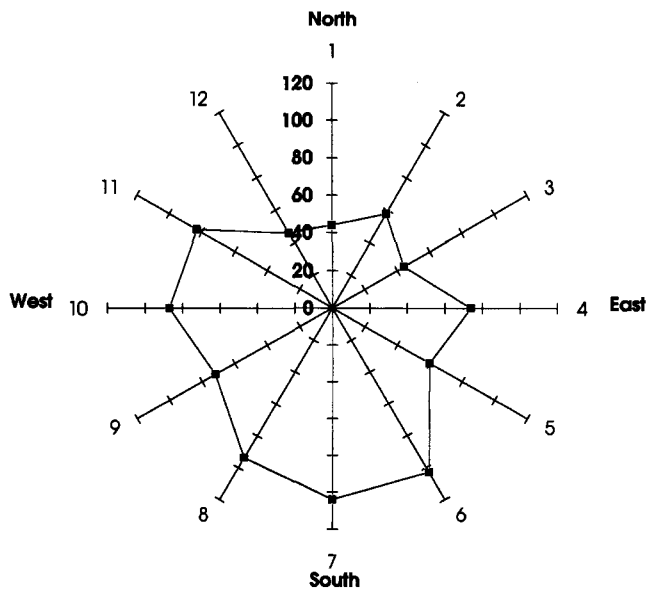
Fig. 1: Total number of webs in samples from twelve compass sectors (each 30°) of tree trunks in Brasenose Woods, Oxford, showing bias in orientation to the south and west.

Years since coppicing

There was a highly significant inequality in abundance across year-class (runs test, $p<0.02$, $n=19$). Figure 2 shows that this reflects a low abundance in recently coppiced areas, and in areas uncut for 15 years or more.

Bark roughness

A small sample suggested that roughness was not strongly biased with compass bearing ($p>0.6$, $n=12$).

In four of the 11 year-classes which were testable, there was a negative correlation between web abundance and roughness, but for other year-classes this was not the case, and thus no clear pattern emerges.

Epiphytic plant cover

Vascular plant cover was biased with respect to orientation ($p<0.05$, $n=12$), being most dense on the south-west of trunks.

Non-vascular plants were biased to the northern face ($p<0.0005$, $n=12$); the mean vector is 15.66° ($p<0.001$, $n=12$).

There was no correlation between the web count and the vascular plant cover in 11 year-classes tested.

Discussion

T. maerens appears most abundant in this site on the less shaded aspects of tree trunks. It is not clear if this bias indicates preference, or if mortality is higher elsewhere. However, this bias is in accord with the hypothesis that temperature is important to the species. Compass orientation is used by other arachnids in thermoregulation (Lahoz-Beltra & Ortega, 1989).

The non-vascular epiphytic plant cover is most pronounced on the opposite compass bearing to *T. maerens*, although causality cannot be determined from this

pattern. Psocoptera (a likely food for *T. maerens*) feed on such plants and might be more abundant on the northern face, suggesting other benefits on the opposite face outweigh their importance. Vascular plant cover is relatively rare, but is biased to the same aspect of the trunk as *T. maerens*.

The pattern of abundance after coppicing (Fig. 2) suggests a peak in numbers after 12 years and that shaded trunks in late year-classes are not favourable for this spider. However, the most favourable year-classes are not yet clear, since the coppice cycle has not been completely re-established at Brasenose Wood, and populations on trunks might continue to rise if vegetation surrounding the trunks were re-cut within 12 years. Under rotations of less than 12 years, populations might peak in earlier year-classes or reach saturation and become insensitive to year-class. Indeed, permanently exposed trees on the woodland paths probably support the highest populations (pers. obs.).

Recently coppiced areas support few spiders at the height sampled, yet appear from the orientation study to have the most suitable microclimate. This may be explained if there is slow colonisation due to slow reproduction and dispersal (Hambler, 1995).

A higher abundance of *T. maerens* at the height sampled does not prove unequivocally that the total abundance on the tree is greater. However, the species was found at the tops of tree trunks felled during coppicing, and it is simplest to assume that a greater population will occur if the animals are able to use a greater proportion of the trunk.

The roughness of bark on which the species has been found is most often moderate to high (Merrett & Hambler, 1991). Very smooth (usually young) trunks present few opportunities for web and retreat construction; very highly textured, old trees seldom occur in the known sites, and webs appear rarer on them than on intermediate ages (pers. obs.), which fits the few correlations observed in this study.

Coppicing is a traditional woodland exploitation technique, and its use is therefore controversial on nature reserves (Sterling & Hambler, 1988; Hambler,
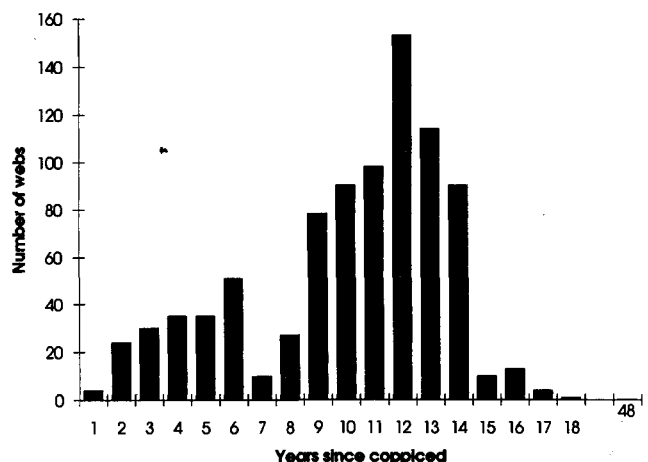

Fig. 2: Total number of webs in samples from three trees within areas of Brasenose Woods, Oxford, in relation to years since each area was last coppiced (year-class).

1990; Goldsmith & Warren, 1993; Hambler & Speight, 1995). The implications for management are that *T. maerens* might benefit from coppicing rotations of less than 15 years in sites similar to Brasenose Wood. The density at which standard trees are maintained will also presumably influence the abundance of the species.

However, the species survived at Brasenose Wood whilst coppicing was interrupted for 40 years, presumably at the tops of trees, and on trees along the rides. Moreover, the species occurs in uncoppiced sites such as Savernake Forest, Wiltshire (Hambler, 1995). The species is not dependent on coppicing, and has alternative habitats — as do other beneficiaries of this management (Hambler & Speight, 1995). The needs of other species must be considered before advocating this management.

It is predicted from these results that the species will be encountered near the canopy of trees in new sites, and its abundance will prove greatest in southern Europe.

Acknowledgements

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