Survival of trapdoor spiders during and after fire

BARBARA YORK MAIN[1]

[1] Zoology Department, University of Western Australia, Nedlands 6009, Western Australia.

Abstract

The response to fire by two myglamorph 'trapdoor' spiders with very different life histories was studied. The study site was in sandplain heath/shrubland in Durokoppin Nature Reserve in the central Wheatbelt of Western Australia. The fire, in March 1989, was part of several experimental fires undertaken by CSIRO and CALM to study the effects of fire on the biota as part of a program to assess the role of fire in management of small reserves.

The two trapdoor species studied were *Anidiops villosus* (Rainbow) and an unnamed *Cethegus* species.

Cethegus spiders are web weavers which catch prey in a flocculent, curtain-like web over a shallow retreat burrow (Main 1960, 1964; Raven 1984). Webs are sited against the base of small shrubs, logs or fallen branches. The species studied here matures rapidly (in about a year) but females continue to live for at least several years. Spiders may move nest sites a short distance if webs are damaged by heavy rain. Juveniles disperse aerially (Main 1991, and personal observation).

In contrast, *Anidiops villosus* digs a deep (70 cm), permanent burrow closed by a trapdoor and with a radiating fan of twiglines attached to the burrow rim (Main 1978). These twiglines are used for foraging. Nests are sited in litter under the the shade of shrubs and low trees. Spiders have a long developmental period (at least eight years for males and longer for females). Females reproduce iteroparously and may live for upwards of 25 years (Main 1987, and unpublished data). Spiders are dependent on both shade and permanent litter. Juvenile dispersion is ambulatory and restricted to a short distance, often to the litter mat of the maternal shade tree.

Webs and burrows were marked individually with numbered steel tags on wire pegs along two transects (625 m and 100 m long) in the site to be burnt and along a parallel transect (625 m) in an adjacent control (non-burn) site. Nests along all transects were marked progressively when found on census dates between 5 September 1987 and 17 December 1988. Nests viable at the last day of census marking were censused again on 18 March 1989 one week after the fire.

Response of *Cethegus*

All active nests at the last pre-burn census (17 and 1) along the burnt transects (625 m and 100 m respectively) were destroyed and the spiders presumed killed by the fire. Of the the 11 active nests at last pre-fire census in the unburnt control 10 were still active on the post-burn census date. By June and July 1989 and 2 February 1990 (eleven months post-fire), none of the burn site nests had recovered nor were there any webs rebuilt nearby. In the control non-burnt site, of the 11 nests active on the pre-burn census date, 10 were still active at the post-fire census date. During the autumn following the fire (1990), aerially dispersed spiderlings from adjacent unburnt bush recolonized the regenerating bush on the burnt site.

Response of *Anidiops villosus*

Most adult nests (11 of 14 on the long transect, 5 (all nests) on the short transect) survived the fire; 17 of 24 along the unburnt transect persisted (of these one had been preyed upon). On the burnt site four (of 11) and one (of 5) became defunct within three months following the fire. Several of these nests were vigorously attacked by birds, i.e. by pecking off rebuilt doors and twiglines thereby disrupting the spiders' foraging capabilities. There was no recruitment of juveniles in the burnt site during the autumn-winter following the burn.

Conclusions

From survival and recruitment data of *Cethegus* and *Anidiops* following an induced burn it seems that *Cethegus* although destroyed outright by fire is able to recolonize a regenerating post-burn site provided there is adjacent unburnt habitat with a reservoir population.

Conversely, although adult spiders of *Anidiops* survive fire, spiders are disadvantaged in a post-burn habitat due to inadequate shade, litter and possibly reduced prey and exposure to predation - all factors which lead to a progressive mortality following fire. Main (1978) suggested that the behaviour and deep burrows of the spiders (adaptations to aridity and drought) 'fits them to survive through a bushfire' and also that fire would probably not be deleterious to a population. However, although the observations reported here show that adult spiders can survive a fire, the post-fire mortality combined with lack of juvenile recruitment means that in a population sense *Anidiops* is indeed vulnerable to fire.

These contrasting responses by two mygalomorph spiders demonstate that a knowledge of invertebrate species' life history particularities is desirable in order to adequately manage small reserves for maintenance of their species diversity.

Acknowledgements

This study was partly assisted by the World Wildlife Fund for Nature (Australia). The Division of Wildlife and Ecology (CSIRO) provided some on-site facilities and the Zoology Department, University of Western Australia provided some field work materials.

References

Main, B. Y. (1960). The genus *Cethegus* Thorell (Mygalomorphae: Macrothelinae). *Journal of the Royal Society of Western Australia* **43**, 30-34.

Main, B. Y. (1964). *Spiders of Australia.* Jacaranda Press, Brisbane.

Main, B. Y. (1978). Biology of the arid-adapted Australain trapdoor spider *Anidiops villosus* (Rainbow). *Bulletin of the British Arachnological Society* **4**, 161-175.

Main, B. Y. (1987). Persistence of invertebrates in small areas: case studies of trapdoor spiders in Western Australia. In: Saunders, D. A., Arnold, G. W., Burbidge, A. A. and Hopkins, A. J. M. (Eds.) *Nature conservation: the role of remnants of native vegetation.* Surrey Beatty and Sons, Sydney.

Main, B. Y. (1991). Trapdoor spiders in remnant vegetation of the Western Australian wheatbelt. *Web, Bulletin of National Threatened Species Network*, No. 2, 8-9.

Raven, R. J. (1984). Systematics of the Australian curtain-web spiders (Ischnothelinae: Dipluridae: Chelicerata). *Australian Journal of Zoology Supplementary Series,* No. 93, 1-102.