Conserving the midas tree-weaver (*Midia midas*): an endangered spider of ancient trees

2012 Report to the Garfield Weston Foundation

A. Russell-Smith

Registered Charity Number 260346

Executive summary.
During 2012 surveying for *Midia* was carried out at six sites in five counties in England, at two of which it had been previously recorded prior to 1980. A completely new population of this extremely rare money spider was discovered at Burnham Beeches (Bucks.) where it was found in a limited area, coexisting with wood ants. This is the first new population of *Midia* to be discovered in Britain for over 30 years which is important for its conservation as only in Epping Forest (Essex) is another viable population thought to exist. The spider was also rediscovered in Hainault Forest (Essex) where it was last seen in 1980.

The efficacy of aerial pitfall traps for surveying *Midia* has been confirmed. However, there are limitations to the use of this method, especially for routine monitoring work, and alternative methods will be needed in future. The problems of surveying for *Midia* are outlined and recommendations for future survey are advanced. Although the results do not allow us to provide specific practical conservation recommendations for *Midia*, some general considerations regarding continuity of its habitat are discussed.

1. Background and previous work

The midas tree weaver, *Midia midas* is one of Britain's rarest spiders. A money spider associated with ancient trees, it is listed as nationally endangered and is identified as a Priority Species for conservation action under the UK Biodiversity Action Plan (UKBAP). Recent work in Epping Forest by the British Arachnological Society (BAS), supported by the invertebrate conservation charity Buglife, has shown that the spider survives there at very low densities in ancient pollards. At the remaining four known localities, there have been no records for at least 25 years and there has been no systematic survey of other potential sites in the UK with high densities of ancient trees. Thus, despite the fact that the UK has one of the largest populations of ancient trees in Europe, our knowledge of the status of *Midia* is hopelessly inadequate.

During the first year of the current project, surveys were carried out at a total of 10 potentially suitable sites in five counties between May and July 2011, the results of which were provided in an earlier report. Survey methods included sorting litter, bird nests and squirrel dreys, aerial pitfall traps placed in the crowns of trees and the use of a suction sampler to collect from trunks of trees and witches brooms. Despite surveying across southern England, no *Midia* were found in over 130 individual samples. While the reasons for this were not clear, it was suggested that the extreme drought conditions from March to May 2011 may have played a significant part.

2. Sites and method used in 2012

Because none of the sites surveyed in 2011 had previous records of *Midia*, it was unclear whether its absence was genuine or reflected other factors such as under-sampling. In 2012, it was decided to include two sites, Hainault Forest and Windsor Forest, where the species had been previously recorded, in both cases between 30 and 40 years ago. Initially, it was hoped that sampling would have been undertaken at a total of nine sites across southern England. Owing to the logistical difficulties of multiple visits to the sites and in one case difficulties of access, only six could be included in the final selection.

Prior to this project, spiders from aerial pitfall traps collected in Epping Forest in 2003 were sorted and identified. A reasonable proportion of traps contained *Midia* specimens and it was therefore decided to use pitfall traps as the standard sampling method in 2012. It was also decided to carry out continuous sampling over at least May and June, the peak period for adults of this species.

During 2012, surveys were carried out at six sites in five counties between May and July 2012 (Table 1). All surveying was by aerial pitfall traps placed either in the crowns of trees or, in a few cases, at ground level inside hollow trees.

County	Site	Historic land-use	Visits	Traps.
Kent	Bockhanger Wood, Merton Hatch	Wood pasture?	3	22
Essex	Hatfield Forest	Park	2	19
Essex	Hainault Forest	Wood pasture	3	20
Berkshire	Windsor Great Park	Park	3	19
Buckinghamshire	Burnham Beeches	Wood pasture	4	21
Oxfordshire	Wytham Wood	Woodland	2	15

Table 1. Number of sites, number of visits and number of traps used in *Midia midas* survey work, 2012

Figure 1. Placing a pitfall trap in an ancient oak in Windsor Great Park, June 2012. © Chris Woolley.

3. Results and discussion

By contrast with 2011, *Midia* was recorded from two of the six sites sampled in 2012. The first, Burnham Beeches in Buckinghamshire, is a completely new location for this species, only the sixth in Britain and the first new site for over 30 years. Here, a total of eight specimens were trapped, five in May and three in June, all from ancient pollard beeches. All specimens were collected from a very few trees in the section of the SSSI known as Crabtree Heath. The fact that a series of specimens were collected over two months suggests that here, as in Epping Forest 31 miles to the East, there may be a viable if small population of *Midia*.

At the second site, Hainault Forest in Essex, a single female was captured in a pollard hornbeam near the North-West boundary of the forest. It was originally discovered here in 1980 by the author when a sub-adult male was collected from a thrush nest, also in a pollard hornbeam, and subsequently reared to adulthood. This therefore represents the first record of the species from this site in over 30 years and provides a welcome confirmation that it survives there.

As in 2011, the number of individual spiders and the number of spider species recorded at each site were extremely low (Table 2). The number of spiders per sample ranged from 0.89 to 4.19, only slightly higher than in the previous year. Between 5 and 10 species were recorded from each site during any individual sampling period. Since, April to June 2012 were the wettest on record since 1910 while the same period in 2011 was one of the driest on record, it seems that weather *per se* is unlikely to have been a causal factor for these low

numbers. However, many of the pitfall traps were flooded in 2012 and this may have reduced the numbers of spiders recorded.

Figure 2. Female *Midia* in its web, viewed from below. Note the greatly enlarged blade-like epigynal scape. © Jurgen Greeling.

Site	Period	Samples	With spiders	Individuals	Species	spiders/trap
Bockhanger Wood, Kent	14.v. - 9.vi.2012	21	16	46	9	2.19
Bockhanger Wood, Kent	9.vi. - 5.vii.2012	21	17	68	8	3.20
Hatfield Forest, Essex	22.v. - 15.vi.2012	19	18	54	10	2.84
Hainault Forest, Essex	9.v. - 11.vi.2012	20	14	52	10	3.25
Hainault Forest, Essex	11.vi. - 10.vii.2012	20	15	67	9	4.19
Windsor Great Park, Berks.	16.v. - 22.vi.2012	15	13	33	6	2.20
Windsor Great Park, Berks.	22.vi. - 13.vii.2012	20	11	17	8	0.89
Burnham Beeches, Bucks.	2 - 31.v.2012	21	19	80	9	3.80
Burnham Beeches, Bucks.	31.v.- 28.vi.2012	18	12	20	5	1.11
Wytham Wood, Oxford.	5.v. - 7.vi.2012	15	13	38	8	2.53

Table 2. Summary of samples taken, numbers of individual spiders and numbers of spider species during the *Midia* survey in 2012.

Taking all sites together, a total of 31 spider species were identified. As in previous surveys, the three commonest species in trees across all sites were the hunting spider *Harpactea hombergi* (Fam. Dysderidae) and the money spiders *Tenuiphantes zimmermani* and *T. flavipes* (Fam. Linyphiidae) which respectively represented approximately 20%, 8% and 10% of all spiders captured. Among the remaining 28 species collected, the most interesting was a single male of the small comb-footed spider *Dipoena inornata* (Fam. Theridiidae) which was taken in a trap at least 10 feet above ground in an ancient oak at Windsor Great Park. Although quite widely distributed in southern Britain, it is also a BAP listed species, principally because it has declined significantly in the last 20 years. This habitat is extremely unusual for *D. inornata* which is normally found either in heathland, sandy coastal grassland or sand dunes.

A number of other species from the traps were unexpected as they are generally regarded as ground-active species rather than occurring in trees. They included, *Coelotes terrestris,* (Wytham Wood) which produces silk-lined burrows with a sheet-web at the entrance, *Cicurina cicur* (Wytham Wood), *Ceratinella brevis* (Bockhanger Wood), *Microneta viaria* (Bockhanger Wood), *Monocephalus fuscipes* (Bockhanger Wood), *Panamops sulcifrons* (Hatfield Forest), *Peponocranium ludicrum* (Bockhanger Wood) and *Walckenaeria acuminata* (Burnham Beeches). All but the first two of these species are small money spiders (Fam. Linyphiidae) which may have found their way into trees following dispersal by "ballooning" on silk threads as juveniles, subsequently finding themselves marooned in this unfamiliar habitat.

4. Achievements

The most important achievement has been the discovery of a completely new location for *Midia* at Burnham Beeches in Buckinghamshire, the first new site in the UK for over 30 years. The fact that a number of specimens were found in several trees at this site suggests that there is likely to be a viable population among the ca. 450 ancient beech and oak pollards surviving on this site. Although numbers were small, less than 5% of all pollards were sampled, and it is hoped that the real population size might be larger than is currently apparent. A notable feature of Burnham Beeches is the presence of a large population of the wood ant (*Formica rufa*), often a top invertebrate predator where it occurs. There were numerous wood ants in all the traps in which *Midia* was found, suggesting that it is perfectly able to coexist with the ants.

A second achievement has been the rediscovery of this species in Hainault Forest, Essex, after a gap of 32 years. The fact that only two specimens have ever been taken here suggests that the *Midia* population may be at very low densities. It is possible that this forms a meta-population with that in Epping Forest (once continuous with Hainault and only 4 miles to the north-west), and is reliant on chance recolonisation for its continued survival at Hainault. However, it is estimated that there are over 12,000 hornbeam pollards in Hainault so the number of trees sampled here represents a tiny proportion of the potential habitat for *Midia*. Further sampling could well reveal a much more substantial population.

Finally, the studies in 2012 have confirmed the efficacy of aerial pitfall traps for both discovery of new populations of *Midia* and surveillance of existing populations. There are, however, certain problems with using pitfall traps which are discussed in the next section and the search for alternative methods, particularly for routine monitoring of known populations, will form part of the future strategy for the conservation of this species.

5. Problems encountered

As in previous surveys, there have been problems with disturbance and loss of pitfall traps. Some of this is probably due to the activities of grey squirrels and thus largely unavoidable but in other cases there is evidence of deliberate human interference with the traps, even when they are placed well above head height in the trees. A second more serious problem has been the difficulty of finding suitable niches for trap placement. It is estimated that perhaps only one in every 7-8 trees investigated proved to have rot holes or similar niches which allowed the workers to embed a pitfall trap so that it would operate efficiently. This means a considerable amount of time is wasted in searching for and climbing trees when setting up the traps. As a consequence, at most sites, the maximum number of traps that could be set out in a single working day was in the region of 20, hardly sufficient where there are very large numbers of ancient trees.

Despite the successes mentioned above, there is a very low return to effort when using pitfall traps to sample *Midia*. During the 2012 survey, 215 traps were set out but *Midia* was recorded from a total of only five, approximately 2% of the total. While this might partially reflect low population densities in at least some sites, it is also possible that pitfall traps are not very efficient at catching web-building spiders such as *Midia*. This is particularly the case for females which tend to spend a large part of their adult life in the web, thus avoiding being caught by passive trapping methods such as pitfalls. The other problem with pitfall traps is that the catch is killed, not particularly desirable in the case of rare species even if they are unlikely to have a significant impact on the total population when only a small fraction of the available habitat is sampled. Alternative methods to pitfall traps are needed, particularly for

routine monitoring of populations where live-trapping and subsequent release of specimens are preferable.

Recommendations

1. Future survey work. The survey work undertaken during this project only covers a proportion of potential sites for *Midia* in southern England and needs to be extended to other sites and other areas of the country. Existing sites with reasonable populations should be monitored on a regular basis, perhaps at five yearly intervals. Since all known sites for the species have historic land use either as royal forests, deer parks or wood pasture, such sites should be prioritized for future survey work. However, if fuller coverage of potential sites and routine monitoring of existing ones are to be achieved, more reliable non-destructive survey techniques which require less time and effort will be needed. One possibility that might be considered is the development of either a pheromone lure or at least the use of natural products as a lure to trap the spider. Developing a pheremone lure is expensive and a long-term undertaking and has rarely been used for spiders. However, recently a female sex pheromone for the wasp spider (*Argiope bruennichi*) has been characterized and used to lure male spiders in a meadow in Germany (Chinta *et. al*., 2010). If a female sex pheromone for *Midia* were to be isolated and characterized, a natural product rich in the chemical concerned might provide a cheap and easily obtainable alternative as a lure. This approach has recently been used for trapping European stag beetles (*Lucanus cervus*) which are attracted to ginger, a spice rich in alpha copaene, which is known to attract a range of insect species (Harvey *et. al*., 2011).

2. Conservation implications. *Midia* remains an extremely elusive spider and one that, on present evidence, appears to exist at very low population densities wherever it is found. Currently, there are no known sites in Britain (or elsewhere) where the species appears to exist at densities sufficient to allow either routine population monitoring or studies of micro-habitat preferences that might inform future conservation measures. Epping Forest and possibly Burnham Beeches might have sufficiently large populations to allow such studies but they would almost certainly be dependent on developing new and more reliable survey and monitoring techniques as suggested above.

Although the results of this project do not allow us to provide specific practical conservation recommendations for *Midia*, there are some general habitat considerations that need emphasizing. The species is always associated with ancient trees and its continued survival in the future is entirely dependent on survival of this habitat. Most of the sites where it occurs have a history of tree pollarding as part of a wood pasture tradition. Pollarding is known to both slow down the growth and extend the life of trees helping to ensure the survival of the ancient tree habitat. At the majority of sites surveyed this year, pollarding has been resumed as a method of management which, although the results have been variable, at least increases the chances of survival of the existing ancient pollards into the future. Nevertheless, all trees (pollarded or otherwise) have a finite lifetime, and in order to ensure future generations of ancient trees at a given site, new pollards need to be created. While this is happening at some sites, there are several where the current generation of ancient trees will be the last unless action to replace them is taken.

Acknowledgements

We are particularly grateful to the Garfield Weston Foundation for generously providing funding to support this project. The survey work would have been impossible without the determined efforts of the BAS and other volunteers: Chris Woolley and Daniel West (Berks.); Helen Read and Martin Albertini (Bucks.); Ian Dawson, David Nellist and Vicky Knight (Essex); Michèle Russell-Smith and Richard Price (Kent); Lawrence Bee and Russell Payne (Oxon.). Our thanks go to them all for their dedication under extremely difficult weather conditions.

We would also like to thank all those who helped arrange access to the sites in their care: Graham Boulden (Merton Hatch, Estate Manager) Helen Read (Corporation of London, Burnham Beeches), Geoff Sinclair (Woodland Trust, Hainault Forest), Henry Bexley (National

Trust, Hatfield Forest), Ted Green & Dan West (Crown Estates, Windsor) and Nigel Fisher (Oxford University, Wytham Woods).

References

Chinta, S.P., Goller, S., Lux, J. Funke, S., Uhl, G. & Schulz, S. 2010. The Sex Pheromone of the Wasp Spider *Argiope bruennichi*. *Angewandte Chemie* **49:** 2033–2036.

Harvey, D.J. Hawes, C.J. Gange, A.C., Finch, P., Chesmore, D. & Farr, I. 2011. Development of non-invasive monitoring methods for larvae and adults of the stag beetle, *Lucanus cervus*. *Insect Conservation and Diversity* **4:** 4–14.