OBSERVATIONS ON PREY CAPTURE BY A REDBACK (*LATRODECTUS HASSELTI* THORELL, 1870) (ARANEAE, THERIDIIDAE)

Peter J. van Helsdingen
Naturalis Biodiversity Centre, Leiden, Netherlands (Peter.vanhelsdingen@naturalis.nl)

ABSTRACT
Observations on prey capture behaviour under laboratory conditions for the Redback *Latrodectus hasselti* are recorded. A general pattern is described. Reactions on different types of prey, such as wasps, bees, flies, crickets, and spiders were tested. The behaviour of the redback is distinctly influenced by that of the prey.

Key words: *Latrodectus hasselti*, prey capture, prey behaviour, retention time

INTRODUCTION

I here describe some observations made on a single female specimen of *Latrodectus hasselti* which I held in captivity during the second half of 2018. I had the specimen on loan from the owner of a pet shop who is fascinated by venomous spiders.

The specimen was an adult female. I assume it had not mated, at least it did not lay eggs during the half year it was my guest. Neither were any eggs laid when with the owner. The history before that is unknown. The spider is now back with its owner.

The specimen was kept in a plastic container (10 X 20 X 30 cm) where it built an irregular and unstructured mass of threads – the more or less standard cobweb of a theridiid spider – spreading from a retreat in one upper corner of the cage, its regular hiding place. The prey, after consumption of the digestible parts, were stored around the hiding place, providing cover for the spider or at least hiding it a bit from view (fig. x).

My interest focused on the prey capture of this species, especially the use of the venom and the effect on the prey. My experience with prey capture and the use of venom in Theridiidae was restricted to just a few species such as *Steatoda albomaculata* (De Geer, 1778), a predator of ants, and *Parasteatoda tepidariorum* (C.L. Koch, 1841) which eats practically anything that comes along. Since I did not have a supply of food from the regions where *L. hasselti* naturally occurs or regions where it has settled after introduction I offered her a variety of

Fig. 1. *Latrodectus hasselti*, seen from above and surrounded by its preys.

insect species from garden and park, at the same time testing her preferences and abilities to capture specimens of different taxa.

GENERAL BEHAVIOUR PATTERN

When a prey item is introduced into the cage the spider starts with a standard pattern with only slight variation: it remains in its hiding place for about 10 to 20 seconds even when the prey has landed on the threads or is flying around and hits threads of the spider web. I have called this time lapse “retention time”. Apparently this section of the behaviour pattern is independent of the type of prey, its size, or the distance from the spider’s retreat, but appears to be influenced by the behaviour of the prey. Differences in the pattern are shown after this period of seemingly inertness. If the prey has successfully been located the spider directs its abdomen with the spinnerets towards the prey and starts throwing threads around and over the prey with its 4th pair of legs, remaining at a safe distance of 1-2 cm. In about one minute the prey is completely immobilized by the sticky silk which it is wrapped in. Only then the spider approaches its victim and bites it during a few seconds. The effect of the venom is invisible since the prey is unable to move because it is already completely immobilized by its silk casing.

Once handled this way the spider cuts the threads around the prey enabling it to bring the package towards its hiding place. Remains of the earlier preys are kept there until they fall down (or are removed by the spider?) (fig. 1).

DIFFERENT TYPES OF PREY

Wasps

The common wasp (*Vespula vulgaris* (Linnaeus, 1758)) was regularly offered as prey because it was abundantly present during most of the warm summer of 2018. Wasps after being released in the cage always flew around hitting the threads of the cobweb. Wasps kept flying around and hitting the threads of the web, probably trying to get away of the threads or out of the cage. They never were successful because there were too many threads and the retention time was too short. A wasp appeared to be an easily traceable prey and was always quickly located, immobilized and bitten. I head expected some caution by the spider with this noisy type of prey with imminent weaponry, its sting. However, I did not notice any difference in the sequence of behaviour elements although the victim was more tightly and securely packed than a fly. There was obviously more silk around the wasp than most other victims, with the exception of bumblebees.

The behaviour of the wasp was as to be expected. From the first moment the spider started to wrap up the wasp the victim tried to defend itself by using its only weapon left, its sting, thrusting it fruitlessly in the air hoping to hit the attacker, the predator but not encountering any object to jab its sting in and release its venom. The spider, however, remained at safe distance while it continued to throw threads over the prey. All other possibilities for the wasp to escape from its predator by wings or legs were already made impossible because of immobilization of the appendages. In fact the pumping movements of the sting were the last visible activities of the wasp. They stopped after the bite of the spider in the harmless, wrapped prey.

Quite the opposite to this was the disabled fly with functionless wings which could only walk through the cage and never was caught. It ended its life after half a day of drawing the attention of the spider by touching threads but it never got entangled in the threads at the bottom of the cage and was found dead on the bottom with its feet in the air in the end. I come back to this observation later.

Honeybees and Bumblebees

Since wasps were so abundant last summer I made only few exceptions by using other Hymenoptera and only with the purpose to observe other species for comparison. It is less nice to use bumblebees and honeybees for such an experiment. Even a researcher can become aware of the higher degree of cuddliness of a bumblebee compared with a yellowjacket!

Both bumblebee – any species – and honeybee proved to be handled in the same way as the wasp with the spider following the general behaviour pattern as described above. As with the wasps, specimens remained active, flying around in order to find a way out from the tangle of threads they unexpectedly were confronted with, trying to find their way out towards the light but touching threads all the time. Specimens of either taxon defended themselves without any success: they were, after the standard retention time, wrapped quickly and had no chance in either escaping or hitting the predator with their sting.

Flies

Due to the general insect crisis – low numbers of individuals – the availability of flies was very restricted during most of the summer and early autumn in the surroundings of the laboratory. Individuals of *Sarcophaga* of the flesh-fly family (Sarcophagidae) were so scarce that I did not use them for an experimental test and so were blue bottle flies or blowfies, such as *Lucillia* species (Calliphoridae). Instead I used hoverflies (Syrphidae) which were present in low numbers. The dronefly *Eristalis tenax* (Linnaeus, 1758) and its relative *Eristalis pertinax* (Scopoli, 1763) were mostly used. Hoverflies, though expert fliers appeared to be quite clumsy when released in the cage and soon ended on the threads and were not successful in restarting their flight, landing over and again on the web. One of the reasons for this unexpected behaviour – a thought which occurred to me afterwards – may have been the failing light in the cage. Hoverflies normally fly in open and sunny areas or half-shade and most likely depend for their orientation on good flying conditions which may have been much less favourable in the experimental room. At the end of the retention time the spider easily located the fly and wrapped it up.

As already mentioned above a muscid fly with deformed wings and unable to fly dropped to the bottom of the cage and remained there walking around, sometimes also a short way up the sides of the cage, attracted the attention of the spider when it touched one of the many criss-cross threads attached to the floor. The spider clearly oriented itself towards the fly which, however, walked on and therefore did not send any consistent signal towards the spider until it hit another thread, sending a new signal, leading to a repetiton of the behaviour: new orientation of the spider, the fly walking on and hitting another thread etcetera. The spider never went down to the last place of encounter of fly with thread and apparently needed more signals from one place to be triggered to investigate the possibilities of an interesting prey. The next day the fly was found dead on the floor of the cage. It had not been found or consumed.

Other food supplies

The summer and autumn season having come to an end and thus the possibility to collect flying insects I had to fall back on other sources. Woodlice and spiders can always be found and garden centers usually have some live invertebrates on sale as food for pet animals (lizards, mygalomorph spiders and possibly other animals). I tested these taxa on the interest of the redback and its strategy to catch them..

House crickets

House crickets (*Acheta domesticus* Linnaeus, 1758)) usually are available at some garden centres in different size classes and I selected the size which I thought to be a proper one for the redback. A cricket was placed individually on the upper threads of the web. Sometimes the cricket fell through the tangle to the bottom of the cage and started to walk around, inevitably hitting threads of the spiders web. The redback, though showing interest and descending to the place where the cricket moved, never caught the animal because it had walked on and not even ever started to throw threads into the direction of where he suspected his prey to be located.

A cricket which did not slip through but remained on the threads where it was put showed a typical behaviour of freezing its movements and stay put motionless, sometimes moving its antennae. The spider, having found its way to the prey when it had landed or moved a bit waited at some distance. Even a cricket will not stay motionless forever and by eventually starting to move signed its own death warrant, was located by the spider and wrapped.

Woodlice

Woodlice (Isopods) were dropped into the cage just to test the limits of the redback's interest and ability to catch them. Woodlice are easy to collect and handle but difficult to present to the spider in an exciting way. Woodlice curl up and even when place carefully on the tangle of threads of the spider's "web" tended to curl up and fall to the bottom of the cage through the mass of threads. Woodlice have a smooth surface and thus tend to slip away among the threads instead of getting caught. After a while a woodlouse will start walking around on the bottom of the cage following the margins and hitting a snare of the spider's web from time to time but the spider showed no interest and remained in its retreat. The woodlouse always died at the floor within a day, most likely because of the dry air which is lethal for these land-living crustaceans.

Spiders

Spiders showed the same behaviour as the crickets: they froze to absolute inertness. The redback came out after the usual retention time but did not proceed. I recognized this behaviour from earlier (unpubl.) research with Linyphiidae and I know a spider released in a strange spider's web of another species can stay in that inert position for a very long time: a test of the patience and endurance of the observer. I didn't deem it necessary to observe the present feeding experiments to the end but always found the spider wrapped up in the web the next day. In the present experiments I used spiders that walked along in the house, such as *Amaurobius similis*, a *Steatoda* bipunctata, and a subadult *Tegenaria* (probably *atrica*).

Since I had promised to return the redback alive to its owner I did not take the risk to put a *Pholcus phalangioides* in the cage. Earlier experiments had shown me that this species masters about any live invertebrate that happens to get entangled in its domestic tangle of threads. It is a sneaky predator which always draws the longest straw. Admittedly this is true for the *Pholcus* in its own web and the outcome may be different when it is released in the web of another spider. I may test this with a *Steatoda grossa* or *S. albomaculata* one day.

DISCUSSION AND CONCLUSIONS

I stress again that the above observations were made under artificial laboratory conditions and may have been influenced by unnatural light and temperature regime.

Even though I had put some carton at the bottom of the cage, expecting that the spider would prefer a hideout of that kind the specimen built its web in an upper corner of the gage. The cage was situated in a darker corner of my office which may have made the difference. At a few occasions I have noticed that during the night the spider had left its hiding place and was hanging in the middle of its web. These were chance observations but I feel I can generalize it as typical behaviour of the spider. Maybe it is a night-active species while I carried out my feeding experiments in the daytime! The spider reacted with enough flexibility anyway and collected the daytime prey.

My observations confirm the general knowledge that the redback, like other Theridiidae, has poor eyesight, does not locate its prey in the web by sight and is unable to locate an errant prey walking on the floor of the cage even when regularly touching the lower threads of the web (as described, for instance, for the disabled fly). The eyes serve to register day and night and not the surroundings or details like a prey in the web. It completely depends on vibrations.

I did not study consumption of the preys after they were transported to the retreat and fastened to the web there.

Earlier descriptions of the behaviour of Latrodectus hasselti

The outcome of my observations on *L. hasselti* is compared with the best available study of this species by Lyn Forster (1995). She describes most of the biology of this spider such as the mating behaviour, the natural habitat of the species and its prey. In fact it is a superb monograph on the history of the species in Australia – solving the question whether it was indigenous or introduced (it proved to be indigenous) – , courtship, the summersaulting behaviour of the male, dispersal of the young, and the degree of tolerance of heat and frost in their natural habitats within its distribution range. There is only one chapter devoted to “predatory behaviour”. Her observations partly agree with mine and I will discuss the agreements and disagreements here.

In contrast to what I noticed (with this single specimen!) my spider did not “rush to the site” (where the prey was in the web) but showed what I called a “retention time” of 10-20 secs. After that time lapse it was a quick descent to the prey indeed and not a calm walk towards the prey. Turning its spinnerets towards the prey and “squirting a swathe of viscous silk over the target” is what I observed and tried to describe above. Lyn Forster more precisely describes the way the viscous silk (“super glue”) “passes via short ducts to the posterior spinnerets from which it disgorges through extra wide spigots”, allowing very swift action, citing Kovoor (1987) and Coddington (1989).

Lyn Forster writes that “Once restrained, the spider bites its prey repeatedly on the head, body and leg joints”, intensive behaviour which I have not seen. To the contrary I was surprised about the very short time spent in biting.

If I summarize my observations and impressions I see the redback as an impressive looking spider which contrary to my expectations operated rather calmly (“retention time”) with subdued aggression which was only released when a prey was sufficiently located. Only then the spider approached the prey and started to “squirting a swathe of viscous silk over the target” as Lyn Forster described it, action which was carried out at full speed, call it aggressiveness.

ACKNOWLEDGEMENTS
I thank my colleague Jeremy A. Miller for suggesting linguistic corrections.

REFERENCES

Coddington, J.A. 1989. Spinneret Silk Spigot Morphology: Evidence for the Monophyly of Orbweaving Spiders, Cyrtophorinae (Araneidae), and the Group Theridiidae plus Nesticidae. – *Journal of Arachnology* 17:71–95.

Forster, L. 1995. The behavioural ecology of *Latrodectus hasselti* (Thorell), the Australian redback spider (Araneae: Theridiidae): a review. – Records of the Western Australian Museum, Supplement 52: 13-24.

Kovoor, J. 1987. Comparative structure and histchemistry of silk-producing organs in arachnids. In: Nentwig, W. (edit.), Ecophysiology of Arachnids, pp. 160-168. – Springer Verlag, Berlin.