NESTING BEHAVIOUR OF A *LYRODA* PREDATOR (HYMENOPTERA: SPHECIDAE) ON *TRIDACTYLUS* (ORTHOPERA: TRIDACTYLIDAE)

By Howard E. Evans and Allan W. Hook

Department of Zoology and Entomology, Colorado State University, Fort Collins, Colorado, 80523, U.S.A.

Abstract

Lyroda species near *minima* Turner has been found preying upon *Tridactylus mutus* Tindale in south-eastern Queensland. Nests are dug either in firm clay or in sandy soil not far from the muddy margins of pools where the prey occur.

Introduction

Lyroda is a genus of nearly worldwide distribution, regarded by Bohart and Menke (1976) as perhaps the most primitive genus in the large subfamily Larrinae. There is considerable morphological diversity in the genus as well as a certain amount of ethological diversity. The North American *L. subita* (Say) preys on Gryllidae and nests are initiated from the walls of pre-existing cavities in the soil; Kurczewski and Peckham (1982) have recently reviewed what is known of this species. The Asiatic *L. japonica* Iwata uses grouse locusts (Tetrigidae) and also nests in pre-existing holes (Iwata, 1976) or evidently sometimes in burrows dug from the soil surface (Tsuneki and Iida, 1969). *L. formosa* (Smith) and *L. madecassa* Arnold are also reported to prey on Tetrigidae (Bohart and Menke, 1976).

Lyroda is well represented in Australia, although only five or six of the numerous species have been described. We report here on the behaviour of several individuals observed at Blunder Creek, in the southern part of the city of Brisbane, during the summer of 1979-80. This small species (about 6 mm long) cannot be identified with certainty, but is very similar to *minima* Turner, though possibly specifically distinct (A. S. Menke, pers. comm.). Voucher specimens have been placed in the Australian National Insect Collection, Canberra, and at the U.S. National Museum, Washington, U.S.A., in the hope that the species name can be clarified when the genus receives the revisionary studies it deserves.

Results

On 30 December 1979, several *Lyroda* females were seen along a clay bank overlooking a small, stagnant pool. They walked rapidly with the abdomen in constant up and down movement. In mid-morning one female began to dig in slightly sloping soil. The firm clay was loosened with the mandibles, then dragged out in small lumps as she backed from the burrow 3-4 cm, leaving the pellets in a small circle about the entrance. At 1055 h (E.S.T.) she was spending 8-12 seconds in the burrow each time, only 2-3 s outside as she deposited the pellets. At 1150 h she stayed in 15 s, at 1215 h about 18 s, reflecting the increasing depth of the burrow. At 1230 h she made a quick, partial closure of the entrance and walked in irregular circles

about the nest and then walked off towards the nearby pool. At 1240 h she returned over the ground with her first prey and entered the nest directly, without putting the prey down. Another prey was brought in at 1315 h, again from the muddy edge of the pool. This time she made short, hopping flights as well as carrying the prey over the ground, holding the prey with her mandibles, slung beneath her body.

At 1400 h this female was seen digging again at the same spot; at 1407 h she stopped, closed the entrance, and walked off. This nest was excavated at 1430 h and found to contain two cells. The burrow was oblique, 8 cm long, reaching a newly prepared cell containing one prey and no egg at a vertical depth of 6 cm. Just beyond, at 7 cm, was a cell that had been closed off, containing three prey, one of them bearing the wasp's egg attached behind the left fore coxa and lying across the sternum, its other end wedged under the right fore coxa. Burrow diameter was 1.5 mm; cells measured about 3 x 3 mm.

This female returned with another prey while the nest was being excavated and was collected. All prey in this nest and in a second similar nest dug the same day proved to be adult *Tridactylus mutus* Tindale (pygmy mole crickets, Tridactylidae). Without exception they were very lightly paralyzed, and in fact several escaped by jumping away when the cell was opened.

On 9-16 March these wasps once again appeared in abundance, evidently members of a second generation. We had recently excavated a *Sphex* nest nearby, and left a flat heap of sand about a meter in diameter. This was adopted as a nesting site by at least ten *Lyroda* females, which made slightly deeper nests in this more friable substrate. These wasps scraped soil from the burrow with their fore legs and left it outside the entrance in a small tumulus measuring about 2 x 3 cm, about 0.2 cm deep in the center. Burrows measured 9-14 cm in length ($\bar{x}$ = 10.6, n = 5), cells 6-9 cm deep ($\bar{x}$ = 7.6, n = 5). All prey (n = 19) were *Tridactylus mutus*, but at this season all were immature and 4 to 6 were used per cell. Some nests appeared to have more than one cell, but the nests were so close together that it was difficult to be sure which cells belonged with each nest. It appeared that each female made a fresh nest each day, as two nests marked as fresh on 15 March had received final closures the following day. In both cases only the lower third of the burrow had been packed with sand, the upper part being more or less open

Discussion

This species of *Lyroda* is the first of its genus to have been found to use Tridactylidae as prey, although other Larrinae (some of the smaller species of *Tachytes*) use tridactylids. The very light paralysis of the prey has been noted by others who have studied species of *Lyroda* (Iwata, 1976; Kurczewski and Peckham, 1982), and placement of the egg is consistent with what is known of other species. All of the nests we observed were started from the surface of flat or slightly sloping soil. It is interesting to note that this species is able to dig in firm clay or in much more friable sand, employing

a different method of removing soil from the burrow in each case. Both nesting sites were within 3 meters of the muddy edge of a pool where pygmy mole crickets occurred in abundance. The mode of prey transport, on foot or in short, hopping flights, doubtless placed restrictions on the distance that could be traversed from the source of prey.

Acknowledgements

These studies were conducted while the senior author held a research fellowship in the Department of Entomology, University of Queensland, and the junior author a grant for dissertation research from the National Science Foundation, U.S.A.

References

Bohart, R. M. and Menke, A. S., 1976. *Sphecid wasps of the World. A generic revision.* University of California Press. 695 pp.

Iwata, K., 1976. *Evolution of instinct. Comparative Ethology of Hymenoptera.* Amarind Publ. Co. 529 pp.

Kurczewski, F. E. and Peckham, D. F., 1982. Nesting behaviour of *Lyroda subita* Say (Hymenoptera: Sphecidae). *Proc. ent. Soc. Wash.* 84: 149-156.

Tsuneki, K. and Iida, T., 1969. The biology of some species of the Formosan Sphecidae, with descriptions of their larvae (Hymenoptera). *Etizenia, Occ. Publ. Biol. Lab. Fukui Univ.* No. 37: 21 pp.

BOOK REVIEW

Natural History of the South East. Eds M. J. Tyler, C. R. Twidale, J. K. Ling and J. W. Holmes. Published November, 1983. Royal Society of South Australia, Adelaide. Occasional Publication No. 3. xiii, 237 pages, illustr. Price $15, plus $2.50 posted. Available direct from the Society, State Library Blg, North Terrace, Adelaide, S.A. 5000.

This is a text outstanding both for its content and value for money. It is the third in a series that the Society has produced and the most ambitious. The book is an authoritative account of the natural history of the south-eastern portion of South Australia. Thirty-two authors have combined to produce 22 chapters concerning subjects such as geology, climate, vegetation, tribal man, mammals, birds, reptiles, fishes and invertebrates. The invertebrate chapters are: "Spiders, scorpions and other arachnids" by D. C. Lee (3 pp.); "Freshwater and some terrestrial invertebrates" by W. Zeidler (18 pp.); "Myriopods, insects and allied forms" by G. F. Gross (9 pp.); and "Butterflies" by R. H. Fisher (8 pp.). Primary references are provided at the conclusion of each chapter.

Obviously the depth of detail is restricted in a work of this kind but the authors have all achieved a remarkable degree of specificness. For example Lee's chapter mentions over 40 species by name, Zeidler over 60 species and illustrates over 50, Gross over 70 and Fisher over 40 with 29 figs of eggs, larvae, adults and food plants.

I have no hesitation in recommending this book; for those who live in South Australia I consider it a must on the natural history shelf.

M. S. MOULDS