

Notes on Predatory Behaviour in *Rhinacloa forticornis* (Hemiptera: Miridae)

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ABSTRACT

Predatory behaviour in the phyline mirid, *Rhinacloa forticornis* Reuter, was observed in the laboratory. Jasmine flowers and bean pods infested with larval and adult thrips were exposed in petri dishes to nymphs and adults of the bug. Only thrips larvae were successfully attacked. The manner in which *R. forticornis* handled prey, particularly the mirid's use of its fore tarsi to position and manipulate prey and its probing in different body regions, and the feeding process, involving the ingestion and egestion of fluids, and thus a potential role for extra-oral digestion of prey tissues, were suggestive of similar behaviours in predaceous Heteroptera. However, observations of apparently preferential feeding on vegetable matter in the presence of available prey suggested that phytophagy is an important, perhaps predominant, feeding mode in this plant bug, with predation occurring in nature in the absence of acceptable plant food.

Key words: Facultative predation, Heteroptera, Nutritional ecology, Plant bugs, Thrips.

INTRODUCTION

Rhinacloa forticornis Reuter is a polyphagous phyline mirid known originally from the Nearctic and Neotropical regions.¹ One of the "black fleahopper" complex, it is common in the western United States² and is considered a major pest of cotton there^{3,4} and in the West Indies.⁵

Despite its status as a crop pest, confusion exists concerning feeding patterns in the species, and there has been speculation and anecdotal suggestion that *R. forticornis* is primarily a predator. For example, Beingolea⁶ considered the mirid a predator of eggs and young larvae of tobacco budworm, *Heliothis virescens* (F.), in Peruvian cotton fields, and Johnson and Nafus⁷ regarded it as a predator of melon thrips, *Thrips palmi* Karny, in various crops in Hawaii, but in neither case was any observation of predatory behaviour reported. On the

basis of its lack of host plant specificity, Knight⁸ and Gagné⁹ speculated that it was probably predaceous on other arthropods. Some clearer indications of predatory behaviour have been reported. McGregor and McDonough¹⁰ observed *R. forticornis* to feed on spider mites, *Tetranychus* sp., in cotton fields and in the laboratory. Butler¹¹ provided circumstantial evidence for at least some facultative predation, reporting that laboratory colonies of the mirid could not be maintained on a diet of green beans alone, but required supplements of *Heliothis* sp. eggs. Stoner and Bottger¹² reported that adult *R. forticornis* reduced populations of 2nd-instar *Lygus* nymphs 72% in laboratory tests. However, these authors gave no details of their experimental methods. In a laboratory study of the life cycle, Herrera¹³ reported that, after taking plant sap for the first two instars, 3rd-instar nymphs fed on lepidopteran eggs, aphids, and larvae of *H. virescens* and cecidomyiids; the mirid was considered potentially effective in controlling *H.*

virescens populations in cotton. However, Ingram⁵ was unable to confirm any predatory behaviour in the bug.

After its discovery in Hawaii in 1962¹⁴ *R. forticornis* soon became one of the more common mirids on vegetation from sea level to tree line.⁹ Observed behaviour of the mirid on star jasmine, *Jasminum multiflorum* (Burm.f.) Andr., suggested that it might be preying on thrips infesting the flowers. This paper details laboratory observations made to determine the possibility of thrips predation by *R. forticornis* and, thereby, to assess further the prevalence of predatory behaviour in this mirid species.

MATERIALS AND METHODS

Activity of both adult and nymphal *R. forticornis* initially was observed within a jasmine hedge located on the Manoa campus of the University of Hawaii. Bugs were observed only on inflorescences harboring *Thrips orientalis* (Bagnall) and *T. hawaiiensis* (Morgan). On occasion, an adult mirid would enter the corolla tube of an individual flower. These observations prompted a desire for more detailed study under controlled conditions.

Thrips-infested flowers were cut at their bases with fine dissecting scissors and held in covered plastic petri dishes lined with moistened filter paper. Preliminary tests showed that jasmine flowers would remain fresh (indicated by absence of browning) for at least four days under these conditions. Adult bugs were aspirated from inflorescences. Aspirator vials were lined with a cotton ball to insure that bugs were not injured during collection. Flower and insect specimens were returned to the laboratory.

In the laboratory, two bugs were added to each of five petri dishes containing two thrips-infested flowers. The flowers contained only adult thrips, which generally restricted their activity to within corolla tubes and petal surfaces. Observations were made under a dissecting microscope during periods over the next 24 hours.

In a second experiment, 10 *R. forticornis* (two 3rd-instar nymphs and eight adults) were collected (two per aspirator vial) from jasmine

inflorescences. In the laboratory, they were introduced in pairs into each of five petri dishes containing two bean pods (*Phaseolus vulgaris* L.) infested with adults and larvae of western flower thrips, *Frankliniella occidentalis* (Pergande). Bugs were allowed one-half hour to become familiar with their new surroundings. Observations on all petri dishes were made continuously for a total period of more than three hours.

RESULTS

Results of the first experiment were inconclusive. Bugs initially wandered throughout the dishes, but generally reduced their restlessness within one-half hour, and were often found, thereafter, on the flowers. They were not observed to probe flowers with their rostra. The mirids also showed no interest in the thrips even when a thrips ventured close. When contacted by a thrips, however, the bugs would immediately retreat, often resuming a brief roaming around the dish. After 24 hours, there was no evidence that any thrips had been consumed (i.e., no thrips cadavers were found in flowers or elsewhere in the petri dishes).

By contrast, within 20 minutes of commencing observations in the second experiment, the first attack was seen. A *Rhinacloa* nymph, previously observed feeding on a bean pod, moved rapidly into the field of vision and came upon a 2nd-instar¹⁵ thrips larva cannibalizing a conspecific of similar age. The larva was immediately pierced with the rostrum (as evidenced by flexing of the labial sheath) through the dorsum of the abdomen and pulled away from the cannibalized victim. Feeding by the bug continued for more than eight minutes, during which time the thrips, its antennae in feeble motion the entire time, became progressively deflated and curled ventrally. The attack ceased abruptly when the nymph was disturbed by an adult thrips. (This nymph was later observed feeding on a 1st-instar thrips.)

In a second observed attack, by an adult bug, the body of a 1st-instar larva was alternately drained of fluid almost completely, then re-expanded (presumably with saliva) six times over a period of about eight minutes. The victim was finally abandoned as a dried, wrinkled, and flattened husk.

This inflation-deflation action was observed in a number of subsequent attacks on other thrips.

In addition to attacking active prey, *R. forticornis* adults were observed to feed upon moribund larvae and the partially desiccated cadavers of larvae. Prey of all instars were commonly held in position by adult bugs with the fore tarsi, and probed with the rostrum through various areas of the head, thorax, and abdomen until drained of fluid.

Adult thrips were not successfully attacked. However, the *R. forticornis* nymph, on which first observations were made, was observed twice in brief, apparent attacks on adult thrips. These were aborted immediately as the thrips moved rapidly away.

Both nymphal and adult bugs were often observed feeding at the freshly cut ends of bean pods. While engaged in such feeding, bugs would often ignore nearby thrips larvae, showing no aggressive response even to contact by larvae.

DISCUSSION

This study clearly demonstrated predation on thrips by *R. forticornis*. More than 10 separate attacks, by several individuals of different stages, were carefully observed, suggesting that the behaviour is not uncommon for the bug and that thrips are acceptable prey. Other mirids have been reported as occasionally taking thrips prey in the laboratory (e.g., Rajasekhara *et al.*¹⁶). In the present circumstances, successful attacks were made only on thrips larvae. The rostra of phytophagous Heteroptera are more limited in their freedom of movement and penetrability than are those of predatory forms,¹⁷ and thrips larvae may have been preferred as prey by *R. forticornis* over adult thrips because their less sclerotized cuticle could be more easily pierced. Also, thrips larvae are smaller and slower in their movements than adults and probably represent an easier target of

opportunity with a higher probability of successful capture. Prey of *R. forticornis* reported by Herrera¹³ were similarly sedentary and soft-bodied. Under such circumstances, given a choice of prey stage, bugs of predaceous groups (e.g., Anthocoridae¹⁸) similarly opt to attack thrips larvae over adults.

The manner in which *R. forticornis* handled prey was suggestive of similar repertoires of predaceous Heteroptera. In particular, the mirid's use of its fore tarsi to position and manipulate prey and its probing in different body regions also are common behaviours in anthocorids.^{4, 19, 20} Moreover, the rather lengthy duration of feeding, accompanied by the apparent alternation between egestion and re-ingestion of saliva, employed typically by predaceous types to liquefy and further digest prey tissues,^{21, 22} suggested a tendency in *R. forticornis* towards some predation. This mode of feeding, characterized by extra-oral digestion, is suggested as one factor contributing to the high incidence of omnivory in Heteroptera.²³

The opportunistic taking of animal food is known in a number of mirid species, some of which are notorious crop pests (e.g., *Lygus*²⁴), and may be an important factor in their nutritional ecology.²⁵ Although predatory behaviour in *R. forticornis* was plainly evident in the present study, its prevalence and importance to the species remain in doubt. Observations of apparently preferential feeding on freshly exposed bean pod tissue, while ignoring easy prey nearby and even in contact, suggest that phytophagy is an important, perhaps predominant, feeding mode in this plant bug, with predation occurring in nature in the absence of acceptable plant food.

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