Chapter 18
Broad-Headed Bugs (Alydidae)

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Abstract The broad-headed bugs (Alydidae) are divided into two subfamilies, Alydinae and Micrelytrinae, each divided into two tribes, Daclerini and Alydini, and Micrelytrini and Leptocorisini, respectively. The family has 53 genera and about 250 species; in the Neotropics, there are 21 genera. Alydids are small (8–20 mm), slender, with a triangular head; nymphs of alydines mimic ants, the adults of some Micrelytrini also mimic ants. The most studied species in the Neotropics is the alydine *Neomegalotomus parvus* (Westwood), usually associated with legumes, and may be a pest on soybean. Other common genera include *Hyalymenus* Amyot & Serville, *Stenocoris* Burmeister, *Cydamus* Stål, and *Trachelium* Herrich-Schäffer. Studies on taxonomy and bioecology on alydids of the Neotropics are needed.

18.1 Introduction

Alydidae Amyot and Serville, 1843, were treated as a subfamily of the family Coreidae and even as a tribe (Schaffner 1964); now it has been treated as a family, together with Coreidae, Rhopalidae, Hyocephalidae, and Stenocephalidae, in the superfamily Coreoidea (Schaefer 1964).

This family contains 53 genera and approximately 250 species, mostly tropical or subtropical, in all regions of the world. There are only two genera that span both the Old and the New World, *Alydus* and *Megalotomus*. These genera are Holarctic, but *Alydus* extends from Alaska through Canada into Mexico (Brailovsky and Flores 1979; Froeschner 1988; Maw et al. 2000).

The genera of Alydinae have been revised by Schaffner (1964; 22 species worldwide); the world genera of the subfamily Micrelytrinae, tribe Leptocorisini, were

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revised by Ahmad (1965; seven species worldwide). There has been no list of the subfamily Micrelytrinae, tribe Micrelytrini; our data came from Dolling's "Catalogue of the Palaearctic Region" (2006) (eight genera, Palearctic), which may be undercounted, especially for tropical Asian and African genera. The Alydinae contains two tribes, the Alydini and the Daclerini, the latter with only one genus, *Daclera*; this latter tribe has not been accepted by some workers and is included in Schaffner (1964) as a genus. *Acestra* has also been considered a Micrelytrinae tribe (Li and Zheng 1993); both suggested tribes (Daclerini and Acestrini) are from the Old World.

Schaefer (1999) worked out the higher classification of the family Alydidae. It now has two subfamilies (Alydinae and Micrelytrinae). The Alydinae contains two tribes (Daclerini and Alydini); Micrelytrinae also has two tribes, the Micrelytrini and the Leptocorisini, both distributed worldwide.

Within the Neotropics, there are eight genera of Alydinae and 13 genera of Micrelytrinae in the tribes Micrelytrini (11 species) and Leptocorisini (2 species). These genera have been keyed in Schaefer (2004), as well as the subfamilies, tribes, and subtribes (of Leptocorisini).

18.2 General Characteristics and Diagnosis

Species of Alydidae are fairly small, ranging from 8 to 20 mm. Alydids are narrow, i.e., they are much longer than wide, especially in many of the Leptocorisini and some of the Micrelytrini. The dorsa of the head and thorax lack ridges or bumps (except for spines on some Micrelytrini) and are flattened. The head is triangular and resembles the heads of ants. Some of the adults of Micrelytrini (genera *Cydamus* and *Trachelium*), as well as the nymphs of Alydinae, are antlike, presumably to ward off predators. This ant mimicry (myrmecomorphy) has been reported for several species of Alydidae by several authors for the past 80+ years (Nicholson 1927; Mathew 1935; Costa Lima 1940; Kormilev 1953; Kumar 1966; Schaefer 1972; Elzinga 1978; Sisson 1980; Oliveira 1985). The family's common name, broad-headed bugs, actually refers only to the Alydinae: their "heads are indeed broader between the eyes than are those of other coreoids" (Schaefer 2004).

Additional diagnostic characters include bucculae very short, antennae dorsally inserted with segment 1 not constricted at base, ocelli not placed on elevations, corium elongated on costal margin, metathoracic scent glands auricles well developed, and tibia nonsulcate (Schuh and Slater 1995).

18.3 Classification and Diversity

The family Alydidae was divided into three subfamilies [Leptocorisinae, Alydinae, and Micrelytrinae (Ahmad 1965)]. More recently, the family was divided into two subfamilies (Alydinae and Micrelytrinae), this last containing two tribes, Leptocorisini (a former subfamily of Ahmad's classification) and Micrelytrini

(Schaefer 1999). A key for the two subfamilies, including the tribes for the last, is presented below according to Schaefer (2004), with slight modifications.

1. Hind femur bearing spines; trichobothria of abdominal sternum five arranged in a row lateral or anterior to spiracle ..... Alydinae
- Hind femur without spines; trichobothria of abdominal sternum five arranged in a triangle posterior to spiracle..... Micrelytrinae (2)
2. Second rostral segment shorter than 3rd and 4th together; 3rd rostral segment more than half long as 4th; evaporative area of metathoracic scent gland smooth..... Leptocorisini
- Second rostral segment longer than 3rd and 4th together; 3rd rostral segment less than half long as 4th; evaporative area of metathoracic scent gland ridged ..... Micrelytrini

The complete higher classification of Alydidae based on Schaefer (1999) is shown below:

Family Alydidae Amyot and Serville

Subfamily Alydinae Amyot and Serville

Tribe Alydini (New and Old World)
Tribe Daclerini (Old World)

Subfamily Micrelytrinae Stål

Tribe Micrelytrini Stål (New and Old World)
Tribe Leptocorisini Stål

Subtribe Leptocorisidi Stål (New and Old World)
Subtribe Noliphidi Ahmad (Old World)

The most comprehensive taxonomic study of the Alydidae family is by Schaffner (1964), Ahmad's revision of the Leptocorisini (1965), and Kormilev's (1953) revision of part of the Micrelytrini: these are the only family-group taxonomic revisions. Much work needs to be done on revisions of other family groups and genera and also on alydids' biology. For the Neotropics (South America), Froeschner (1981) keyed the subfamilies and genera.

18.3.1 Alydinae

This subfamily contains individuals in all major zoogeographic zones. The best-known genera include *Alydus* F., *Hyalymenus* Amyot and Serville, *Megalotomus* Fieber, *Neomegalotomus* Schaffner and Schaefer, and *Riptortus* Stål. In the Neotropics, *Hyalymenus* and *Neomegalotomus* include the most common and known species (Grazia et al. 2012).

The Alydinae prefer legumes (Schaefer 1972, 1980; Schaefer and Mitchell 1983; Panizzi 1988; Santos and Panizzi 1998a, b), and some species are considered pests on leguminous crops (see section 4 on main species). There are also several references to different species of alydines being attracted to and feeding on carrion, vertebrate fecal matter, and cow urine and ammonia (Schaefer 1980; Adler and Wheeler 1984; Ventura and Panizzi 2000; Silva et al. 2010). These nitrogen-rich materials attract alydines, and it has been speculated that these bugs might require higher concentration of nitrogen than do other bugs, based on this behavior and their association with nitrogen-rich plants (i.e., legumes) (Panizzi et al. 2000).

18.3.2 Micrelytrinae

In this subfamily, several genera (*Cydamus*, *Darmistus*, *Esperanza*) reach the southwestern states of the USA. *Protenor* occurs throughout the USA and into Canada (Froeschner 1988). *Esperanza texana* Barber occurs farther north and its range may be expanding (Johnston 1927; Hussey 1948; Froeschner 1980). With global warming, *Esperanza*'s distribution is expanding, not only to the north but to the south. It now occurs as far south as Costa Rica (Schaefer 2003).

In the Neotropics, the main genera in Micrelytrinae (Micrelytrini) are *Stenocoris* Burmeister, *Cydamus* Stål, and *Trachelium* Herrich-Schäffer (Grazia et al. 2012). We do not know what Micrelytrini feed on. Leptocorisini feed on grasses; in the Orient, some species may become pests on rice.

18.4 General Biology

Data on the biology of alydids are available for those species with major or minor economic importance, such as species of *Leptocorisa* [*L. acuta* (Thunberg) and *L. oratorius* (F.)], associated with rice throughout Asia; species of *Riptortus* [*R. dentipes* (F.), *R. linearis* (F.), *R. pedestris* (F.), and *R. serripes* (F.)] associated with legume crops in Asia, Africa, and Australia; and *Alydus pilosulus* Herrich-Schäffer and *Megalotomus quinquespinosus* Say, associated with legumes in the Nearctic region (Canada and USA) (references in Panizzi et al. 2000).

For the Neotropical alydids, not much data is available on their biology. Most information has been published on the species which have some economic importance, such as *Neomegalotomus parvus* (Westwood), pest of legume crops, particularly in Brazil (section 5.1); other species studied in greater detail are those on the genus *Hyalymenus* which show mimetic association with ants (Oliveira 1985).

18.5 Main Species

Most members of Alydidae in the world are not pests, and in general their biology, ecology, and host plants are largely unknown. There is only one species which is considered common and is of somewhat economic importance in the Neotropics. The second species in this genus is less common, and they are presented below.

18.5.1 Neomegalotomus parvus (Westwood)

The new genus *Neomegalotomus* Schaffner & Schaefer was erected to accommodate the Neotropical species formerly included in the genus *Megalotomus* (Schaffner & Schaefer 1998; Schaefer & Panizzi 1998). *N. simplex* (Westwood), *N. latifascia* (Berg), and *N. pallescens* Stål were all synonymized with *N. parvus* (Schaefer & Ahmad 2008).

N. parvus (Westwood) occurs in the Neotropics between 24° N and 30° S longitude; the northernmost are from central Mexico on the west and St. Vincent and Barbados on the east; the southernmost distribution is northern Argentina, southern Brazilian states, and Uruguay (Schaefer and Ahmad 2008); these authors do not include Rio Grande do Sul, the southernmost state of Brazil, where specimens of *N. parvus* have been collected recently (in Passo Fundo, 28 ° S, AR Panizzi, unpublished).

N. parvus is, by far, the most studied species of alydid in the Neotropics, particularly in Brazil. It was first reported on *Crotalaria* sp. in Rio de Janeiro state (Costa Lima 1919), and other hosts include common bean, soybean, cotton, tomato, lupin, pigeon pea, and lablab (Panizzi 1988; Chandler 1989; Santos and Panizzi 1998a).

Eggs (Fig. 18.1) are laid singly or in groups. On soybean, eggs are laid on the upper third of the plant, preferably on the lower side of leaves, close to the midrib (Panizzi et al. 1996). On pigeon pea, *Cajanus cajan* (L.), eggs are laid preferably in-between seeds (crevices) of mature pods (Ventura and Panizzi 2000, 2003). Interesting to mention that during maintenance of *N. parvus* colony in the laboratory, in seven occasions, females laid eggs on the body of conspecifics, and on three events, eggs remained on the insect body until they hatched (Panizzi and Santos 2001).

Nymphs mimic ants (Fig. 18.2) and are darkish. Adult males are pale brown, with a whitish band along both sides of the thorax; females are entirely darkish brown (Fig. 18.3). Body length is ca. 10 mm (Costa Lima 1919, Paradela Fo et al. 1972).

Several studies on the nymphal and adult biology, population dynamics, oviposition, and feeding preferences of *N. parvus* on selected cultivated and noncultivated legumes (e.g., soybean, pigeon pea, lablab, green bean, indigo, lupin, and cowpea) have been published (Panizzi 1988; Ventura and Panizzi 1997; Santos and Panizzi 1998a; Ventura et al. 2000a, b; Ventura and Panizzi 2003, 2004, 2005). In general,

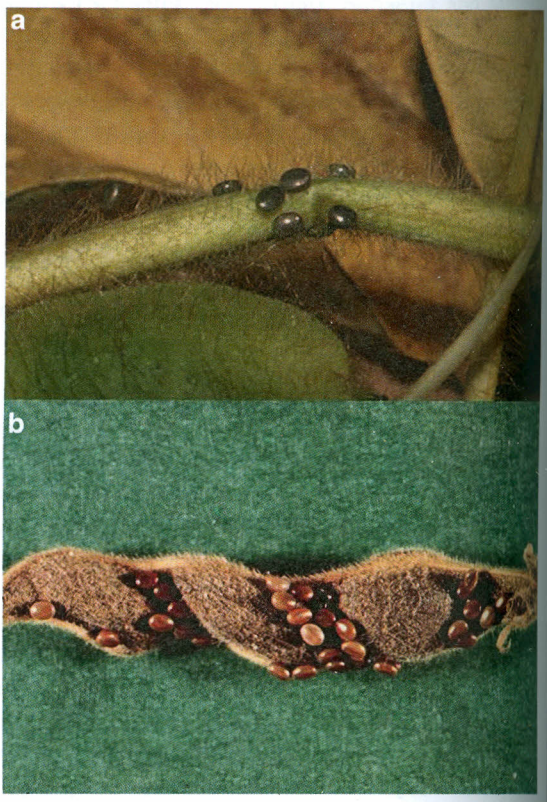

Fig. 18.1 Eggs of *Neomegalotomus parvus* on a soybean stem (**a**) and on crevices of a pigeon pea pod mature (**b**) (Courtesy of JJ Silva)

Fig. 18.2 Ant-mimic nymph of *Neomegalotomus parvus* on a soybean pod (Courtesy of JJ Silva)

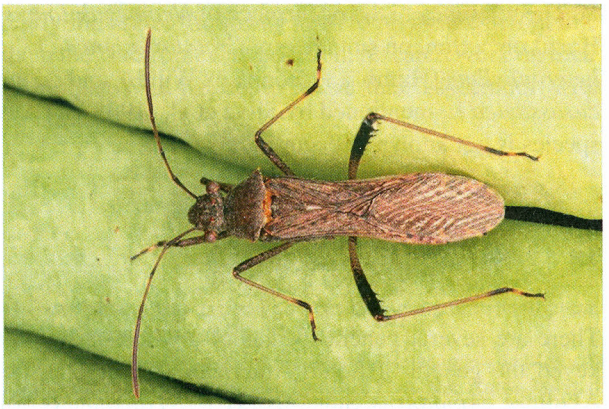

Fig. 18.3 Adult (female) of *Neomegalotomus parvus* on green bean pods (Courtesy of JJ Silva)

this alydid is most associated with mature soybean and pigeon pea plants. In the laboratory, colonies of *N. parvus* are easily kept using mature seeds of pigeon pea, to allow the use of this bug for research and teaching purposes (Ventura and Panizzi 1997).

Although considered a minor pest, this alydid damages common beans by transmitting the yeast spot disease caused by *Nematospora coryli* Peglion and by causing seedling mortality (Paradela Fo et al. 1972; Chandler 1984, 1989). It also can cause reduction in seed vigor and viability in soybean (Santos and Panizzi 1998b). In Brazil, *N. parvus* adults are parasitized by at least three species of tachinids (Santos and Panizzi 1997).

18.5.2 *Neomegalotomus rufipes (Westwood)*

This second species in the genus *Neomegalotomus*, *N. rufipes*, occurs from southeastern Florida south to Central America and the West Indies islands in the Caribbean, including Antigua, Bahamas, Cuba, Dominican Republic, Grand Cayman, Grenada, Guadeloupe, Jamaica, Martinique, Puerto Rico, St. Lucia, and St. Martin; despite its affinity to legumes, apparently it is not a pest in these islands (Schaefer and Ahmad 2008). These authors provide a key to species of *Neomegalotomus*, shown below:

1a. Metathoracic scent gland auricle usually somewhat flattened and separation between anterior and posterior parts of auricle shallow; median protuberance of ventral rim of male's genital capsule pointing medially ..... *Neomegalotomus parvus* (Westwood)

1b. Metathoracic scent gland auricle rounded, convex, separation between anterior and posterior parts deep; median protuberance of male's genital capsule pointing ..... *Neomegalotomus rufipes* (Westwood)

The reference to the occurrence of *Neomegalotomus rufipes* in São Paulo state in Brazil on cotton, on sunn hemp, *Crotalaria juncea* L., on the legume *Macroptilium heterophyllum* (Humb. and Bonpl. ex Willd.), and on the ornamental plant *Asclepias curassavica* L. mentioned by Silva et al. (1968) is probably a mistake, because this species is not known to occur in this area.

18.6 Secondary Species

There are several genera/species of alydids in the Neotropics. Froeschner (1981) keyed the genera of South American alydids, and he included the following: in Alydinae, *Apidaurus* Stål, *Alydus* F., *Hyalymenus* Amyot and Serville, *Burtinus* Stål, and *Megalotomus* Fieber (now *Neomegalotomus* Schaffner and Schaefer); in Micrelytrinae (Leptocorisini), *Stenocoris* Burmeister and *Lyrnessus* Stål; and in Micrelytrinae (Micrelytrini), *Calamocoris* Breddin, *Cydamus* Stål, *Trachelium* Herrich-Schäffer, *Bactrophya* Breddin, and *Bactrocoris* Kormilev.

Among these genera, species worth of mention are *Hyalymenus pulcher* (Stål), *Stenocoris americanus* Ahmad, *S. fabricii* Ahmad, *S. tipuloides* (De Geer), *Bactrophya aequatoriana* Breddin, *Calamocoris erubescens* Breddin, *C. nigrolimbatus* Breddin, and *Cydamus inauratus* Distant. *Cydamus pictipes* (Stål) is reported on grasses and on castor bean, *Ricinus communis* L. in São Paulo state, Brazil (Silva et al. 1968).

In Brazil, two species of *Hyalymenus* have been studied in detail regarding myrmecomorphy (ant mimicry): *Hyalymenus limbativentris* Stål, which is usually associated with solanaceous plants, feeding on fruits, and *Hyalymenus tarsatus* (F.), which is found on plants of several (five) families, feeding on flower and/or fruits (Oliveira 1985). This last species is reported on the legume *Cassia occidentalis* in Brazil (Silva et al. 1968).

18.7 Concluding Remarks

Alydids in the Neotropical region are largely unknown, and their biology, except for *Neomegalotomus parvus* (Westwood), which has occasional a pest status, is little studied. Data in the literature are scant, and most information in the literature is restrained to lists of species (catalog type of publication) and taxonomic keys for subfamilies and genera (e.g., Schaffner 1964; Froeschner 1981; Schaefer 2004; Schaefer and Ahmad 2008). Moreover, information (published and not) seems to be confused, such as the reference to *Leptocorisa filiformis* (F.) occurring in coffee plantations in São Paulo state, Brazil (Silva et al. 1968), and *Leptocorisa* sp. occasionally infesting soybean and rubber plant, *Hevea brasiliensis* (Willd. ex Adr. de Juss.) also in São Paulo, Brazil (AM Faria, pers comm to ARP). The genus *Leptocorisa* is distributed in the Orient and Australia (Ahmad 1965, Livermore

et al. http://Coreoidea.SpeciesFile.org) and is not supposed to occur in the Neotropics. This example, clearly illustrates the strong need to revise the taxonomic status of the species of alydids in the Neotropics. In addition, research work on their biology, particularly on their life history in nature, to reveal their association with host plants either cultivated or not is needed.

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