

Triatominae

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The members of **Triatominae** /traɪ.əˈtɒminiː/, a subfamily of Reduviidae, are also known as **conenose bugs**, **kissing bugs**, **assassin bugs**, or **vampire bugs**. Other local names for them used in the Latin Americas include **barbeiros**, **vinchucas**, **pitos** and **chinchés**. Most of the 130 or more species of this subfamily are haematophagous, i.e. feeds on vertebrate blood; a very few species feed on other invertebrates (Sandoval *et al.* 2000, 2004). They are mainly found and widespread in the Americas, with a few species present in Asia, Africa, and Australia. These bugs usually share shelter with nesting vertebrates, from which they suck blood. In areas where Chagas disease occurs (from the southern United States to northern Argentina), all triatomine species are potential vectors of the Chagas disease parasite *Trypanosoma cruzi*, but only those species (such as *Triatoma infestans* and *Rhodnius prolixus*) that are well adapted to living with humans are considered important vectors.

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History

At the beginning of the 19th century Charles Darwin made one of the first reports of the existence of triatomines in America in his *Journal and Remarks*, published in 1839 and commonly known as *The Voyage of the Beagle*. The following is an extract which he based on his journal entry dated 26 March 1835:^{[1]:315}

Triatominae



Scientific classification

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Hemiptera
Family:	Reduviidae
Subfamily:	Triatominae Jeannel, 1919

Tribes

Alberproseniini
 Bolboderini
 Cavernicolini
 Linshcosteusini
 Rhodniini
 Triatomini

"We crossed the Luxan, which is a river of considerable size, though its course towards the sea-coast is very imperfectly known. It is even doubtful whether, in passing over the plains, it is evaporated, or whether it forms a tributary of the Sauce or Colorado. We slept in the village, which is a small place surrounded by gardens, and forms the most southern part, that is cultivated, of the province of Mendoza; it is five leagues south of the capital. At night I experienced an attack (for it deserves no less a name) of the *Benchuca* (a species of *Reduvius*) the great black bug of the Pampas. It is most disgusting to feel soft wingless insects, about an inch long, crawling over one's body. Before sucking they are quite thin, but afterwards they become round and bloated with blood, and in this state are easily crushed. They are also found in the northern parts of Chile and in Peru. One which I caught at Iquique, was very empty. When placed on the table, and though surrounded by people, if a finger was presented, the bold insect would immediately draw its sucker, make a charge, and if allowed, draw blood. No pain was caused by the wound. It was curious to watch its body during the act of sucking, as it changed in less than ten minutes, from being as flat as a wafer to a globular form. This one feast, for which the *benchuca* was indebted to one of the officers, kept it fat during four whole months; but, after the first fortnight, the insect was quite ready to have another suck."^{[1]:315}

Note: Luxan is a reference to the town/district of *Luján de Cuyo*, though there is no longer a river named after the town in its vicinity (the only Luján River in present-day Argentina empties into the Rio de la Plata and is basically a minor branch of the Rio Parana); the *Benchuca* is identified by Richard Keynes as *Triatoma infestans* which is commonly called the "Vinchuca" bug.^[1]

There has been considerable medical speculation as to whether or not Darwin's contact with triatomines in Argentina was related to his later bouts of long term illness, though it is unlikely to have been caused on this specific occasion as he made no mention of the fever that usually follows the first infection.^[1]

Discovery of triatominae's relation with Chagas disease

In 1909 the Brazilian doctor Carlos Chagas discovered that these insects were responsible for the transmission of *T. cruzi* to many of his patients in Lassance, a village located on the banks of the São Francisco River in Minas Gerais (Brazil). Poor people living there complained of some insects they called *barbeiros* that bite during the night. Carlos Chagas put his first observations in words:

"Knowing the domiciliary habits of the insect, and its abundance in all the human habitations of the region, we immediately stayed on, interested in finding out the exact biology of the *barbeiro*, and the transmission of some parasite to man or to another vertebrate".

Another Brazilian, Herman Lent, former student of Carlos Chagas, became devoted to the research of the triatomines and together with Peter Wygodzinsky made a revision of the Triatominae, a summary of 40 years of studies on the triatomines up to 1989.^[2]

Biological aspects

Life cycle

Triatomines undergo incomplete



metamorphosis. A wingless first instar nymph hatches from an egg, and may be small as 2mm. It passes successively through 2nd, 3rd, 4th, and 5th instars. Finally, the fifth instar turns into an adult, acquiring two pairs of wings.^[3]

Ecology

All triatomine nymph instars and adults are haematophagous and require the stability of a sheltered environment where they aggregate. Most species are associated with wild nesting vertebrates and are named "sylvatic" triatomines. These live in ground burrows with rodents or armadillos,^[4] or in tree-dwellings with bats, birds, sloths, or opossums. Few species (5%) live in human dwellings or in the surroundings of human houses (peridomicile) in the shelters of domestic animals, these are named "domestic" species. Many sylvatic species are in process of domiciliation (i.e. "semidomestic").

Behavior

Most triatomines aggregate in refuges during day and search for blood during night when the host is asleep and the air is cooler. Odors as well as heat guide these insects to the host. Carbon dioxide emanating from breath, as well as ammonia, short chain amines and carboxylic acids from skin, hair, and exocrine glands from vertebrate animals, are among the volatiles that attract triatomines. Vision also serves triatomines for orientation. During night, adults of diverse species fly to houses attracted by light.

Adults produce a pungent odor (isobutyric acid) when disturbed, and are also capable of producing a particular sound by rubbing the rostrum over a stridulatory sulcus under its head (stridulation).

Epidemiology

Domestic and sylvatic species can carry the Chagas parasite to humans and wild mammals; birds are immune to the parasite. *T. cruzi* transmission is carried mainly from human to human by domestic kissing bugs; from the vertebrate to the bug by blood, and from the bug to the vertebrate by the insect's feces, and not by its saliva as occurs in most bloodsucking arthropod vectors such as Malaria mosquitoes.

Triatomine infestation especially affects older dwellings. One can recognize the presence of triatomines in a house by its feces, exuviae, eggs, and individuals themselves. Triatomines characteristically leave 2 kinds of feces like strikes on walls of infected houses; one is white with uric acid, the other is dark (black) containing heme. Whitish or pinkish eggs can be seen in wall crevices. After having had a blood meal the insects sometimes show a limited mobility and can be identified easily.

Controlling triatomine infestations

If bitten by a triatominae, do not rub or scratch the bite area or touch your eyes until any traces of triatominae faeces have been washed off.

Insecticide treatment

Synthetic pyrethroids are the main class of insecticides used to control triatominae infestations. Insecticide treatment is more effective on non-porous surfaces, such as hardwood timber, fired bricks and plastered walls, than on porous surfaces such as mud. A single treatment with insecticide will typically protect against triatomine infestation for a year or more on timber walls vs 2-3 months on adobe walls. Wettable powders, suspension concentrates and insecticide paints can improve treatment effectiveness on porous surfaces.

Rates of insecticide resistance among triatominae are fairly low due to their long life cycle and low genetic variability, but there are some reports of resistance, particularly among *Triatoma infestans* populations in Bolivia and Argentina. ^[5]

Tribes, genera and numbers of described species

The monophyletic nature of the Triatominae subfamily is strongly supported by molecular data, indicating that their blood-sucking character has occurred only this once within the Reduviidae.^[6]

- Alberproseniini
 - *Alberprosenia* 2
- Bolboderini
 - *Belminus* 9
 - *Bolbodera* 1
 - *Microtriatoma* 2
 - *Parabelminus* 2
- Cavernicolini
 - *Cavernicola* 2
- Linshcosteini
 - *Linshcosteus* 6
- Rhodniini
 - *Psammolestes* 3
 - *Rhodnius* 16
- Triatomini
 - *Dipetalogaster* 1
 - *Eratyrus* 2
 - *Hermanlenticia* 1
 - *Meccus* 6
 - *Mepraia* 2
 - *Nesotriatoma* 3
 - *Panstrongylus* 13
 - *Paratriatoma* 1
 - *Triatoma* 67

Note: For a complete list of species see *A checklist of the current valid species of the subfamily Triatominae Jeannel, 1919 (Hemiptera, Reduviidae) and their geographical distribution, with nomenclatural and taxonomic notes*^[7]

Most important vectors

All 138 Triatominae species are potentially able to transmit *T. cruzi* to humans but the following five species are the most epidemiologically important vectors of Chagas disease.

- *Triatoma infestans*
- *Rhodnius prolixus*
- *Triatoma dimidiata*
- *Triatoma brasiliensis*
- *Panstrongylus megistus*

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External links

- Triatominae on BugGuide.net (<http://bugguide.net/node/view/381676>)
- Triatominae or Kissing Bugs in California (<http://www.heteroptera.ucr.edu/index.php/research/reduviidae/triatominae>)
- Parasitology University Würzburg: *Life cycle stages of the wingless Cimicidae and the Reduviidae* (<http://parasitology.informatik.uni-wuerzburg.de/login/n/h/0185.html>)
- Information on Triatominae (<http://triatominae.tripod.com/iin.htm>) (under construction), by Fernando Otálora-Luna
- LABORATORIO DE FISIOLÓGÍA DE INSECTOS, Argentina (<http://www.dbbe.fcen.uba.ar/labs/lab-t/lab-t.htm>)
- The Kiss of Death: Chagas' Disease in the Americas (<http://www.uta.edu/chagas/>)
- Entomological Laboratory "Herman Lent" University of Los Andes (http://www.ciens.ula.ve/~labenthl/pagina_nueva_1.htm)
- University of Neuchâtel (<http://www2.unine.ch/Jahia/site/lap/op/edit/lang/en/pid/14759>)
- ECLAT = European Community Latin American Network for Research on the Biology and Control of Triatominae (<http://eclat.fcien.edu.uy/>)
- Taxonomy and general information on Triatominae bugs from metapathogen.com (<http://www.metapathogen.com/kissing-bugs/>)
- World Health Organisation guide to Triatominae (http://www.who.int/water_sanitation_health/resources/vector210to222.pdf)

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