

Atopozelus opsimus (Hemiptera: Reduviidae) preying on *Mastigimas anjosi* (Hemiptera: Calophyidae), a pest of tropical cedar, *Cedrela fissilis* (Meliaceae)

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Tropical cedar, *Cedrela fissilis* Vell. (Meliaceae), is widely distributed in Central and South America (IUCN 2018), and produces wood used in the aerospace, furniture, and naval industries (Gandara et al. 2014). Deforestation and habitat loss threaten this plant (Sakuragui et al. 2013; IUCN 2018), and damage by pests limits commercial production on plantations in Brazil by reducing its growth, and modifying the shape of the tree (Pereira et al. 2016). The main pests of *C. fissilis* include the mahogany shoot borer, *Hypsipyla grandella* Zeller (Lepidoptera: Pyralidae), and *Antaeotricha bicolor* Zeller (Lepidoptera: Oecophoridae), *Eacles imperialis magnifica* Walker (Lepidoptera: Saturniidae), *Megalopyge chrysocoma* Herrich-Schäffer (Lepidoptera: Megalopygidae) (Kowalczyk et al. 2012), and *Mastigimas anjosi* Burckhardt (Hemiptera: Calophyidae) (De Queiroz et al. 2013).

Outbreaks of *M. anjosi* have been reported in *Cedrela* spp. and other Meliaceae plantations, such as *Toona ciliata* M. Roem., since 2010 (Burckhardt et al. 2011). Damage by this insect may cause chlorosis, deformation, curling, spotting, necrosis, abscission, and production of sooty mold on the leaves (Costa et al. 2015). Chemical control of this insect has been conducted in *T. ciliata* plantations (De Queiroz et al. 2013), but sustainable alternatives, such as biological control strategies, should be developed and used.

Syrphid predators (De Queiroz et al. 2013) and the parasitoid *Psyllaephagus trioziaphagus* (Howard) (Hymenoptera: Encyrtidae) (Costa et al. 2015) are known to be natural enemies of *M. anjosi*. The objective of this work was to report, for the first time, *Atopozelus opsimus* Elkins (Hemiptera: Reduviidae) preying on *M. anjosi* nymphs and adults on *C. fissilis* trees in Minas Gerais State, Brazil.

Three *C. fissilis* trees (A1, A2, and A3) were surveyed between Apr and May 2018 on the campus of the Federal University of Minas Gerais in Montes Claros, Minas Gerais State, Brazil. These trees were of different ages and heights, and were planted among other vegetation. The height and diam at breast height of the trees were measured with clinometer and millimeter tape, respectively. The height and diam at breast height of trees A1, A2, and A3 were 6.5 m and 29.4 cm, 2.8 m and 6.0 cm, and 3.4 m and 13.6 cm, respectively.

Damage and behavior of *M. anjosi* on *C. fissilis* trees were observed. Leaves of this plant that were infested by *M. anjosi* and with *A. opsimus* were collected, taken to the Laboratory of Applied

Forest Entomology, and placed in 3 wooden cages coated with clear plastic and a cover.

Mastigimas anjosi was found in colonies on the trees, mainly on the rachis and base of petioles. This insect caused leaflet deformation and curling, and sooty mold was observed on tree A1, even with the predator (*A. opsimus*) present. The leaves of this plant, a deciduous species, fell in May of that year, eliminating the insects. Trees A2 and A3 were younger, and suffered no injuries.

Atopozelus opsimus was observed on all 3 trees. Its eggs were deposited on the primary veins (Fig. 1a) on the abaxial face of the *C. fissilis* leaflets. Nymphs and adults were present primarily between the veins. Adults of *A. opsimus* preyed on *M. anjosi* nymphs and adults (Fig. 2). Adults of this predator exhibited parental care, and were observed standing over their eggs and nymphs (Fig. 1b). Immature predators preyed on nymphs of the psyllid and supplemented their diet by feeding on their honeydew. *Musca domestica* L. (Muscidae: Muscinae) adults also consumed *M. anjosi* honeydew on the leaves, and chrysopid eggs were observed on the *C. fissilis* leaflets.

The presence of *M. anjosi* apparently attracted *A. opsimus* to the *C. fissilis* trees, but this plant is deciduous, preventing the continuing presence of this predator. *Atopozelus opsimus* did not reduce *M. anjosi* damage on *C. fissilis* trees, which may be related to the high populations of this pest, and also to the temperatures of the region. Reproduction and development of the predator may have been inhibited, resulting in a lower number of individuals to control the pest. Temperatures above 36.36 °C for females and 31.57 °C for males can increase the development period and reduce *A. opsimus* predation and reproduction rates (Dias 2013). However, this predator assists in the management of *Glycaspis brimblecombei* Moore (Hemiptera: Psyllidae) in eucalyptus plantations (Dias et al. 2012), so it may contribute to *M. anjosi* population regulation following augmentative releases.

Atopozelus opsimus oviposition, which occurred mainly on the primary leaflet veins, may be related to proximity to the food source because *M. anjosi* was found principally on the base of the petiole and rachis. In addition, sugary substances such as honeydew and nectar produced by extrafloral nectaries (Guillermo-Ferreira et al. 2012), may complement the diet of *A. opsimus* in situations of prey scarcity, such as during the dry season, and could be used to rear this predator in the laboratory for augmentative releases (D'Ávila et

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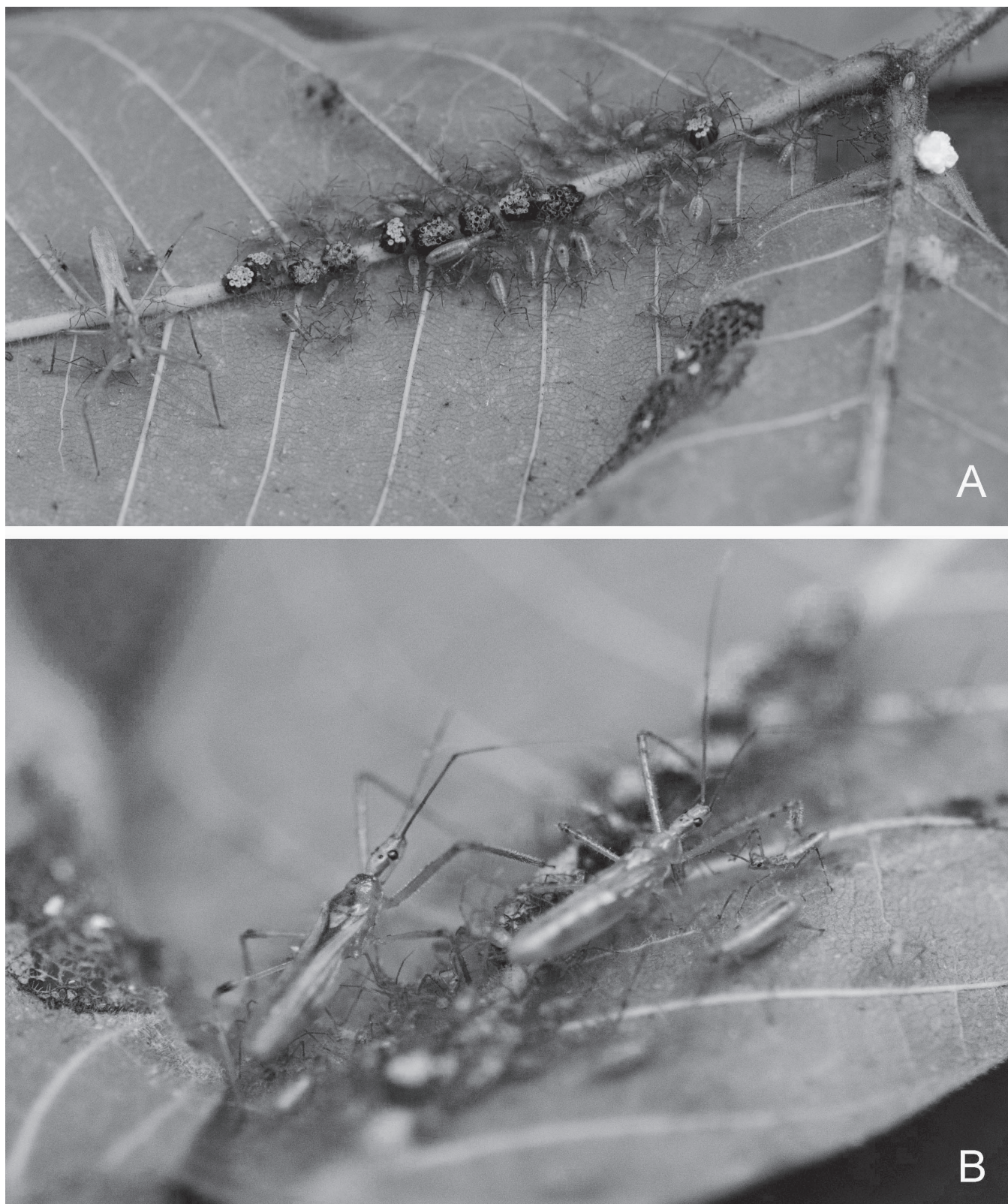


Fig. 1. Eggs deposited on the primary leaflet vein (A); *Atopozelus opsimus* (Hemiptera: Reduviidae) protecting their eggs and nymphs (B).

al. 2017). *Atopozelus opsimus* feeds on *M. domestica* adults in the laboratory (M. F. Matos, personal observation), and such hosts may complement the predator diet in case of *M. anjosi* scarcity. Parental care is a common behavior for species of this genus, as reported

for *Atopozelus pallens* (Herrich-Schäffer) (Heteroptera: Reduviidae) adults, which protect their eggs and nymphs against natural enemies on *Pithecellobium dulce* (Roxb.) Benth. (Fabaceae) plants in Santiago de Cali, Colombia (Tallamy et al. 2004).



Fig. 2. *Atopozelus opsimus* (Hemiptera: Reduviidae) immature preying on *Mastigimas anjosi* (Hemiptera: Calophyidae) nymphs.

Atopozelus opsimus preyed on *M. anjosi* and, therefore, has potential to be used in the management of this pest.

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Summary

Insects pests such as *Mastigimas anjosi* Burckhardt (Hemiptera: Calophyidae), native to Brazil, limit the establishment of commercial plantations of the tropical cedar *Cedrela fissilis* Vell. (Meliaceae), reducing growth and affecting tree shape. Insecticides have been used to suppress *M. anjosi* outbreaks, but sustainable alternatives should be developed to manage this pest. The objective of this work was to report, for the first time, the predator *Atopozelus opsimus* Elkins (Hemiptera: Reduviidae) preying on *M. anjosi* attacking *C. fissilis* trees in Minas Gerais State, Brazil. Trees of this plant were observed between Apr and May 2018 in Montes Claros, Minas Gerais State, Brazil. *Atopozelus opsimus* adults preyed on *M. anjosi* nymphs and adults, and fed on their honeydew. This predator did not eliminate the damage to *C. fissilis*, which may be related to the temperatures of the region, and which may have affected reproduction and increased its development period.

Key Words: biological control; bug; honeydew; predation, tropical cedar

Sumário

Insetos pragas, como *Mastigimas anjosi* Burckhardt (Hemiptera: Calophyidae), nativo do Brasil, limitam o estabelecimento de plantios comerciais de *Cedrela fissilis* Vell. (Meliaceae), reduzindo o crescimento e afetando a forma das árvores. Inseticidas tem sido usados para suprimir surtos de *M. anjosi*, mas alternativas sustentáveis devem ser desenvolvidas para manejar essa praga. O objetivo desse trabalho foi relatar, pela primeira vez, o predador *Atopozelus opsimus* Elkins (Hemiptera: Reduviidae) predando *M. anjosi* atacando árvores de *C. fissilis* no estado de Minas Gerais, Brasil. Árvores dessa planta foram observadas entre abril e maio de 2018 em Montes Claros, estado de Minas Gerais, Brasil. Adultos de *A. opsimus* predaram ninfas e adultos de *M. anjosi*, e se alimentaram de honeydew. Esse predador não eliminou os danos em *C. fissilis*, o que pode estar relacionado às temperaturas da região, que podem ter afetado sua reprodução e aumentado seu período de desenvolvimento.

Palavras Chave: controle biológico; honeydew; percevejo; predação

References Cited

- Burckhardt D, Queiroz DL, Queiroz EC, Andrade DP, Zanol K, Rezende MQ, Kotrba M. 2011. The jumping plant-louse *Mastigimas anjosi* spec. nov., a new pest of *Toona ciliata* (Meliaceae) in Brazil. *Spixiana* 34: 109–120.
- Costa VA, De Queiroz DL, Anjos N. 2015. *Psyllaephagus triocephalus* (Hymenoptera: Encyrtidae), parasitoide de *Mastigimas anjosi* (Hemiptera: Calophyidae). *Pesquisa Florestal Brasileira* 35: 339–342.
- D'Ávila VA, Aguiar-Menezes EL, Pereira RN, Gonçalves-Esteves V, Mendonça CBF, Melo SJ, Santos TM. 2017. Effect of provision of apiaceous flowers associated to foods on the biology of *Coleomegilla maculata*. *Phytoparasitica* 45: 471–484.
- De Queiroz D, Burckhardt D, Anjos ND. 2013. Psilídeos no Brasil: 8-*Mastigimas anjosi* (Hemiptera, Psylloidea), nova praga da *Toona ciliata* no Brasil. *Embrapa Florestas-Comunicado Técnico* (INFOTECA-E). Colombo, Paraná, Brazil.
- Dias TKR. 2013. *Atopozelus opsimus* (Hemiptera: Reduviidae): presas alternativas, comportamento parental e predação sobre pragas exóticas. xiv, 101 f. Tese de doutorado: Universidade Estadual Paulista, Júlio de Mesquita Filho, Faculdade de Ciências Agrônômicas de Botucatu, Botucatu, São Paulo, Brazil. (online) <http://hdl.handle.net/11449/105476> (last accessed 3 Feb 2019).
- Dias TKR, Wilcken CF, Soliman EP, Gil-Santana HR, Zaché B. 2012. Occurrence of *Atopozelus opsimus* preying on nymphs and adults of *Glycaspis brimblecombei*. *Phytoparasitica* 40: 137–141.
- Gandara FB, Tambarussi EV, Sebbenn AM, Ferraz EM, Moreno MA, Ciampi AY, Vianello RP, Grattapaglia D, Kageyama PY. 2014. Development and characterization of microsatellite loci for *Cedrela fissilis* Vell. (Meliaceae), an endangered tropical tree species. *Silvae Genetica* 63: 240–243.
- Guillermo-Ferreira R, Cardoso-Leite R, Gandolfo R. 2012. First observation of alternative food usage (extrafloral nectar) by the assassin bug *Atopozelus opsimus* (Hemiptera, Reduviidae). *Revista Brasileira de Entomologia* 56: 489–491.
- IUCN. 2018. The IUCN Red List of Threatened Species. Version 2017-3. (online) <http://dx.doi.org/10.2305/IUCN.UK.2018-1.RLTS.T33928A68080477.en> (last accessed 3 Feb 2019).
- Kowalczyk M, Carneiro E, Casagrande MM, Mielke OHH. 2012. The Lepidoptera associated with forestry crop species in Brazil: a historical approach. *Neotropical Entomology* 41: 345–354.
- Pereira LD, Fleig FD, Meyer EA, Lanzarin K, Wolf K. 2016. Susceptibility of cedar to pest attack in seasonally deciduous forest. *Pesquisa Agropecuária Brasileira* 51: 607–614.
- Sakuragui CM, Calazans LSB, Stéfano MV, Valente ASM, Maurenza D, Kutschenko DC, Prieto PV, Penado TSA. 2013. Meliaceae, pp. 697–701 *In* Martinelli G, Moraes MA [eds.], Livro Vermelho da Flora do Brasil. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Brazil.
- Tallamy DW, Walsh E, Peck DC. 2004. Revisiting paternal care in the assassin bug, *Atopozelus pallens* (Heteroptera: Reduviidae). *Journal of Insect Behavior* 17: 431–436.