



General Entomology

Host plants and distribution records of lance flies (Diptera: Lonchaeidae) in São Paulo State, Brazil

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Abstract. The knowledge of host plants, distribution and economic importance of Lonchaeidae is scarce in Latin America. We have recovered specimens of Lonchaeidae from most fruit samples containing specimens of Tephritidae. The compilation of information is essential to determine the diversity of species and the relationship with their hosts. In addition to the list of records based on early publications, we add unpublished data of Lonchaeids recovered from plant samples collected in the Instituto Biológico, São Paulo, Brazil. In total, 18 species of Lonchaeidae, belonging to the genera *Dasiops*, *Lonchaea* and *Neosilba* were registered in São Paulo, and associated with 111 host plant species and 27 botanical families. New records are listed and geographical distribution is available by specific maps.

Keywords: Insecta; Tephritoidea; *Neosilba*; *Dasiops*; fruit hosts.

The Lonchaeidae family (lance flies) comprises an important group of fruit flies. Several species are associated with the decomposition of organic matter of plant origin. However, some species are considered of economic importance because they attack fruits and flower buds (McALPINE & STEYSKAL 1982). Species of the genera *Neosilba* and *Dasiops* are reported as primary invaders of certain fruit trees, obtaining pest status for some plant species of Euphorbiaceae, Myrtaceae, Rutaceae, Sapotaceae and Passifloraceae (UCHÔA & NICÁCIO 2010; RAGA *et al.* 2011; GISLOTI *et al.* 2017; ADAIME *et al.* 2017). Some lance fly species are polyphagous, and few species are known to be monophagous or oligophagous (STRIKIS 2011).

In around the State of São Paulo, Brazil, the distribution, infestation rate and infestation period of fruit flies (Tephritoidea) vary due to different agroecosystems, climatic diversity, peculiar phytophysiognomy and, the origin of the fruit sample (rural or urban region) (RAGA *et al.* 2011).

Regional research is crucial to provide basic information for the management of insect pest populations (UCHÔA *et al.* 2002). Therefore, it is important to examine historical and current research data on lance flies (Lonchaeidae), their distribution and host plants to help understanding the population dynamics of this insect group insects and developing management strategies.

The first reports of Lonchaeidae associated with fruits in São Paulo occurred when HEMPEL (1901) associated *Lonchaea glaberrima* Wiedemann [*Neosilba glaberrima* (Wiedemann)] with passion fruit *Passiflora* sp. However, the main reports of association of lance flies with host fruits, occurred in the 1980s, when dozens of species of host fruits were listed for several Brazilian states, including São Paulo (MALAVASI *et al.*

1980; MALAVASI & MORGANTE 1980).

Here, after 30 years of random fruit collections in different regions of São Paulo, we compile the state records of lonchaeids, based on all available publications of plant hosts, monitoring, distribution, species descriptions, and unpublished records. The present study reinforces the biological diversity and the economic importance of Lonchaeidae species within superfamily Tephritoidea.

MATERIAL AND METHODS

An extensive search of available printed or digital publications on field-collected lance flies was carried out from 1980 to 2020. This search period was considered the resumption of scientific works on Lonchaeidae in São Paulo, after the taxon redefinition and description of many species.

For each publication, we provide the complete references on lance flies and their geographical distribution. Each study was categorized into two insect collection categories: fruit or trapping. This approach was used to relate the Lonchaeidae species with plant hosts. Data from traps helping to create specific maps. With the analysis of the data of all publications, a table of relation of lance fly/hosts and distribution maps were available.

We removed duplicate records from abstracts, conference proceedings and thesis. In addition to the list of records based on early publications, we add unpublished data of Lonchaeids recovered from fruits and flower buds collected in the Instituto Biológico, São Paulo, Brazil.

RESULTS

Eighteen species of Lonchaeidae are known to São Paulo,

belonging to the genera *Dasiops*, *Lonchaea* and *Neosilba*. Currently, 111 host species of Lonchaeids are identified, belonging to 27 botanical families (Table 1), from which 47 are introduced species (Table 1). Species of *Neosilba* are the most commonly lance flies found in São Paulo, where 15 species are reported: *N. glaberrima*, *Neosilba pendula* (Bezzi), *Neosilba zadolicha* McAlpine & Steyskal, *Neosilba certa* (Walker), *Neosilba dimidiata* (Curran), *Neosilba inesperata* Strikis & Prado, *Neosilba perezii* (Romero & Ruppel), *Neosilba laura* Strikis, *Neosilba bifida* Strikis & Prado, *Neosilba cornophallus* Strikis, *Neosilba pradoi* Strikis & Lorena, *Neosilba parva* Hennig, *Neosilba bella* Strikis & Prado, *Neosilba delvechioi* Strikis and *Neosilba paramerolatus* Strikis. Only two *Dasiops* species were registered: *Dasiops inedulis* Steyskal and *Dasiops friesenii* Norrbom & McAlpine. Both species of *Dasiops* are associated with *Passiflora edulis* Sims. *Lonchaea* was exhibited only at the

genus level according to the record of original paper.

Myrtaceae has the largest number of host plants of Lonchaeidae, followed by Rosaceae, Rutaceae, Fabaceae and Rubiaceae (Table 1). The botanical species with the greatest diversity of lance flies is *Eriobotrya japonica* (Thunb.) (Rosaceae), with 10 associated species (nine species of *Neosilba* and one *Lonchaea* sp.), followed by *Coffea* spp. with 9 species. *Neosilba zadolicha* is highly polyphagous species among Lonchaeids in São Paulo, where is associated with 75 hosts and 22 families.

The distribution of lonchaeids in São Paulo is represented in Figure 1. There are reports of lonchaeids in 99 municipalities of São Paulo. *Neosilba pendula*, *N. zadolicha*, *N. certa*, *N. inesperata* and *N. glaberrima* are the most widely distributed

Table 1. Lonchaeidae (Diptera: Tephritoidea) host plants (N = Native; I = Introduced) in São Paulo, Brazil.

Botanical Family (number of Lonchaeidae species) Botanical species	Native Introduced	Lonchaeidae species	Reference
Anacardiaceae (4)			
<i>Lithraea molleoides</i> (Vell.) Engl.	N	<i>N. glaberrima</i> ; <i>N. pendula</i>	RAGA et al. 2015
<i>Mangifera indica</i> L.	I	<i>N. zadolicha</i>	RAGA et al. 2015
<i>Spondias dulcis</i> Parkinson	I	<i>N. pendula</i>	RAGA et al. 2015
<i>Spondias mombin</i> L.	N	<i>N. certa</i> ; <i>N. pendula</i> ; <i>N. zadolicha</i>	GISLOTI et al. 2017
<i>Spondias purpurea</i> L.	I	<i>N. pendula</i> ; <i>N. zadolicha</i>	RAGA et al. 2015; GISLOTI et al. 2017
<i>Spondias tuberosa</i> Arruda	N	<i>N. zadolicha</i>	GISLOTI et al. 2017
<i>Spondias venulosa</i> (Engl.) Engl.	N	<i>N. zadolicha</i>	GISLOTI et al. 2017
Annonaceae (4)			
<i>Annona coriacea</i> Mart.	N	<i>N. zadolicha</i> ; <i>N. certa</i>	RAGA et al. 2015
<i>Annona emarginata</i> (Schltdl.) H. Rainer	N	<i>N. certa</i>	RAGA et al. 2015
<i>Annona mucosa</i> Jacq.	N	<i>N. zadolicha</i> ; <i>N. certa</i>	RAGA et al. 2015
<i>Annona reticulata</i> L.	I	<i>N. zadolicha</i>	RAGA et al. 2015
<i>Annona neoserica</i> H. Rainer	N	<i>N. dimidiata</i> ; <i>N. zadolicha</i> ; <i>N. glaberrima</i>	RAGA et al. 2015
<i>Annona squamosa</i> L. x <i>A. cherimola</i> Mill.	I	<i>N. zadolicha</i> ; <i>N. pendula</i>	RAGA et al. 2015
<i>Annona sylvatica</i> A. St.-Hil	N	<i>N. zadolicha</i>	RAGA et al. 2015
<i>Annona sylvatica</i> A. St.-Hil	N	<i>N. zadolicha</i> ; <i>N. glaberrima</i>	GISLOTI et al. 2017
Apocynaceae (1)			
<i>Hancornia speciosa</i> Gomes	N	<i>N. zadolicha</i>	GISLOTI et al. 2017
Areaceae (2)			
<i>Bactris gasipaes</i> Kunth	N	<i>N. zadolicha</i> ; <i>N. glaberrima</i>	GISLOTI et al. 2017
Cactaceae (2)			
<i>Pereskia aculeata</i> Mill.	I	<i>N. glaberrima</i>	New record
<i>Hylocereus setaceus</i> (Salm-Dyck ex DC.) Ralf Bauer	N	<i>N. zadolicha</i> ; <i>N. glaberrima</i>	GISLOTI et al. 2017
Caricaceae (1)			
<i>Carica papaya</i> L.	I	<i>Lonchaea</i> sp.	RAGA et al. 2015
Caryocaraceae (2)			
<i>Caryocar brasiliensis</i> A. St.-Hil	N	<i>N. zadolicha</i> ; <i>N. pendula</i>	GISLOTI et al. 2017
Combretaceae (4)			
<i>Terminalia catappa</i> L.	I	<i>N. zadolicha</i> ; <i>N. inesperata</i> ; <i>N. certa</i> ; <i>N. glaberrima</i>	RAGA et al. 2015
Cucurbitaceae (1)			
<i>Cucurbita maxima</i> Duchesne	N	<i>N. zadolicha</i>	RAGA et al. 2015
<i>Cucurbita moschata</i> Duchesne	I	<i>N. zadolicha</i>	RAGA et al. 2015

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Table 1. Continue...

Botanical Family (number of Lonchaeidae species) Botanical species	Native Introduced	Lonchaeidae species	Reference
<i>C. moschata</i> Duchesne x <i>C. maxima</i> Duchesne	I	<i>N. zadolicha</i>	RAGA <i>et al.</i> 2015
Ebenaceae (1)			
<i>Diospyros kaki</i> L.f.	I	<i>N. zadolicha</i>	RAGA <i>et al.</i> 2015
Euphorbiaceae (1)			
<i>Manihot esculenta</i> Crantz	N	<i>N. perezii</i>	LOURENÇÃO 1996; GISLOTI & PRADO 2011; RAGA <i>et al.</i> 2015
Fabaceae (9)			
<i>Dalbergia brasiliensis</i> Vogel	N	<i>N. laura</i>	STRIKIS 2011
<i>Inga</i> spp.	N	<i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. glaberrima</i> ; <i>N. pendula</i> ; <i>N. laura</i> ; <i>N. bifida</i> ; <i>N. inesperata</i> ; <i>N. cornuphallow</i>	STRIKIS 2011; RAGA <i>et al.</i> 2015
<i>Inga vera</i> Willd.	N	<i>N. certa</i> ; <i>N. pendula</i> ; <i>N. pradoi</i> ; <i>N. zadolicha</i>	GISLOTI <i>et al.</i> 2017
<i>Leucaena leucocephala</i> (Lam.) de Wit	I	<i>N. certa</i> ; <i>N. pendula</i>	RAGA <i>et al.</i> 2015
<i>Swartzia langsdorffii</i> Raddi	N	<i>N. zadolicha</i> ; <i>N. glaberrima</i> ; <i>N. certa</i>	RAGA <i>et al.</i> 2015
Ginkgoaceae (1)			
<i>Ginkgo biloba</i> L.	I	<i>N. zadolicha</i>	New record
Lauraceae (5)			
<i>Persea americana</i> Mill.	I	<i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. glaberrima</i> ; <i>N. pendula</i> ; <i>N. parva</i>	RAGA <i>et al.</i> 2015
Malpighiaceae (8)			
<i>Bunchosia armeniaca</i> (Cav.) DC.	I	<i>N. pendula</i>	RAGA <i>et al.</i> 2015
<i>Byrsonima crassifolia</i> (L.) Kunth	N	<i>N. bella</i> ; <i>N. glaberrima</i> ; <i>N. inesperata</i> ; <i>N. pendula</i> ; <i>N. pradoi</i> ; <i>N. zadolicha</i>	GISLOTI <i>et al.</i> 2017
<i>Malpighia emarginata</i> DC.	I	<i>N. pendula</i> ; <i>N. inesperata</i> ; <i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. cornuphallow</i> ; <i>N. glaberrima</i> ; <i>N. perezii</i>	STRIKIS & Lerena 2009; RAGA <i>et al.</i> 2015; GISLOTI <i>et al.</i> 2017
Malvaceae (1)			
<i>Gossypium hirsutum</i> L.	I	<i>N. zadolicha</i>	RAGA <i>et al.</i> 2015
Moraceae (6)			
<i>Ficus carica</i> L.	I	<i>N. certa</i> ; <i>N. zadolicha</i> ; <i>N. glaberrima</i> ; <i>N. bifida</i> ; <i>N. cornuphallow</i>	RAGA <i>et al.</i> 2015
<i>Ficus</i> sp.	N	<i>N. certa</i> ; <i>N. pendula</i> ; <i>N. zadolicha</i>	RAGA <i>et al.</i> 2015
<i>Morus nigra</i> L.	I	<i>N. zadolicha</i>	RAGA <i>et al.</i> 2015
Musaceae (1)			
<i>Musa x paradisiaca</i> L. (cv. Nanica)	I	<i>N. zadolicha</i>	RAGA <i>et al.</i> 2015
Myrtaceae (11)			
<i>Acca sellowiana</i> (O. Berg) Burret	N	<i>N. zadolicha</i>	GISLOTI <i>et al.</i> 2017
<i>Campomanesia auera</i> O. Berg	N	<i>N. pradoi</i>	GISLOTI <i>et al.</i> 2017
<i>Campomanesia guazumifolia</i> (Cambess.) O. Berg	N	<i>N. pradoi</i> ; <i>N. zadolicha</i>	GISLOTI <i>et al.</i> 2017
<i>Campomanesia phaea</i> (O. Berg.) Landrum	N	<i>N. pradoi</i> ; <i>N. zadolicha</i>	GISLOTI <i>et al.</i> 2017
<i>Eugenia brasiliensis</i> Lam.	N	<i>Neosilba</i> sp.; <i>N. pradoi</i> ; <i>N. zadolicha</i>	RAGA <i>et al.</i> 2015; GISLOTI <i>et al.</i> 2017
<i>Eugenia dysenterica</i> DC.	N	<i>N. inesperata</i> ; <i>N. pendula</i> ; <i>N. zadolicha</i>	GISLOTI <i>et al.</i> 2017
<i>Eugenia involucrata</i> DC.	N	<i>N. certa</i> ; <i>N. pradoi</i> ; <i>N. laura</i> ; <i>N. pendula</i> ; <i>N. zadolicha</i>	RAGA <i>et al.</i> 2015; GISLOTI <i>et al.</i> 2017
<i>Eugenia selloi</i> B. D. Jacks.	N	<i>N. pendula</i> ; <i>N. zadolicha</i>	GISLOTI <i>et al.</i> 2017
<i>Eugenia leitonii</i> D. Legrand	N	<i>N. glaberrima</i> ; <i>N. zadolicha</i>	RAGA <i>et al.</i> 2015
<i>Eugenia pitanga</i> (O. Berg) Nied.	N	<i>N. zadolicha</i>	GISLOTI <i>et al.</i> 2017
<i>Eugenia pyriformis</i> Cambess.	N	<i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. pendula</i> ; <i>N. pradoi</i> ; <i>N. inesperata</i> ; <i>N. laura</i>	RAGA <i>et al.</i> 2015; GISLOTI <i>et al.</i> 2017
<i>Eugenia lambertiana</i> DC.	N	<i>N. pendula</i> ; <i>N. inesperata</i> ; <i>N. zadolicha</i> ; <i>N. bella</i>	RAGA <i>et al.</i> 2015
<i>Eugenia stipitata</i> McVaugh	N	<i>N. bella</i> ; <i>N. pendula</i>	GISLOTI <i>et al.</i> 2017

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Table 1. Continue...

Botanical Family (number of Lonchaeidae species) Botanical species	Native Introduced	Lonchaeidae species	Reference
<i>Eugenia uniflora</i> L.	N	<i>N. bella</i> ; <i>N. pendula</i> ; <i>N. inesperata</i> ; <i>N. zadolicha</i>	RAGA et al. 2015; GISLOTI et al. 2017
<i>Myrciaria dubia</i> (Kunth) McVaugh	N	<i>N. zadolicha</i>	GISLOTI et al. 2017
<i>Plinia cauliflora</i> (Mart.) Kausel	N	<i>N. certa</i>	RAGA et al. 2015
<i>Myrciaria glazioviana</i> (Kiaersk.) G. M. Barroso ex Sobral	N	<i>N. inesperata</i> ; <i>N. pendula</i> ; <i>N. certa</i>	RAGA et al. 2015
<i>Plinia edulis</i> (Vell.) Sobral	N	<i>N. bifida</i>	RAGA et al. 2015
<i>Psidium cattleianum</i> Afzel. ex Sabine	N	<i>N. certa</i> ; <i>N. inesperata</i> ; <i>N. pendula</i> ; <i>N. pradoi</i> ; <i>N. bifida</i> ; <i>N. dimidiata</i> ; <i>N. zadolicha</i>	RAGA et al. 2015; GISLOTI et al. 2017
<i>Psidium guajava</i> L.	N	<i>N. zadolicha</i> ; <i>N. pendula</i> ; <i>N. certa</i> ; <i>N. glaberrima</i> ; <i>N. bifida</i> ; <i>N. cornuphallus</i> ; <i>N. inesperata</i> ; <i>N. bella</i> ; <i>N. dimidiata</i>	RAGA et al. 2015; GISLOTI et al. 2017
<i>Psidium guineense</i> Sw.	N	<i>N. pendula</i> ; <i>N. zadolicha</i>	GISLOTI et al. 2017
<i>Syzygium jambos</i> (L.) Alston	I	<i>N. pendula</i> ; <i>N. zadolicha</i>	RAGA et al. 2015
<i>Syzygium samarangense</i> (Blume) Merr. & L. M. Perry	I	<i>N. pendula</i> ; <i>N. certa</i>	RAGA et al. 2015
Oxalidaceae (6)			
<i>Averrhoa carambola</i> L.	I	<i>N. certa</i> ; <i>N. inesperata</i> ; <i>N. pendula</i> ; <i>N. glaberrima</i> ; <i>N. bella</i>	RAGA et al. 2015
Passifloraceae (7)			
<i>Passiflora alata</i> Curtis	N	<i>N. zadolicha</i> ; <i>N. glaberrima</i> ; <i>N. certa</i> ; <i>Lonchaea</i> sp.; <i>Dasiops inedulis</i>	RAGA et al. 2015
<i>Passiflora edulis</i> Sims	N	<i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. inesperata</i> ; <i>Lonchaea</i> sp.; <i>Dasiops inedulis</i> ; <i>D. friesenii</i>	RAGA et al. 2015
Rhamnaceae			
<i>Ziziphus joazeiro</i> Mart.	N	<i>N. pendula</i>	RAGA et al. 2015; GISLOTI et al. 2017
Rosaceae (10)			
<i>Eriobotrya japonica</i> (Thunb.) Lindl.	I	<i>N. pendula</i> ; <i>N. certa</i> ; <i>N. zadolicha</i> ; <i>N. glaberrima</i> ; <i>N. inesperata</i> ; <i>N. bella</i> ; <i>N. bifida</i> ; <i>N. pradoi</i> ; <i>N. cornuphallus</i> ; <i>Lonchaea</i> sp.	STRIKIS & PRADO 2005; STRIKIS & PRADO 2009; RAGA et al. 2015
<i>Malus domestica</i> Borkh.	I	<i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. pendula</i>	RAGA et al. 2015
<i>Prunus mume</i> (Siebold) Siebold & Zucc.	I	<i>N. certa</i>	RAGA et al. 2015
<i>Prunus persica</i> (L.) Batsch.	I	<i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. pendula</i> ; <i>N. inesperata</i> ; <i>N. glaberrima</i> ; <i>N. bifida</i> ; <i>Lonchaea</i> sp.	RAGA et al. 2015
<i>Prunus salicina</i> Lindl.	I	<i>N. certa</i> ; <i>N. pendula</i> ; <i>N. inesperata</i>	RAGA et al. 2015
<i>Pyrus communis</i> L.	I	<i>N. certa</i>	RAGA et al. 2015
<i>Rubus urticifolius</i> Poir.	N	<i>N. inesperata</i> ; <i>N. pendula</i>	GISLOTI et al. 2017
<i>Rubus</i> sp.	N	<i>N. zadolicha</i> ; <i>N. pendula</i> ; <i>N. certa</i>	RAGA et al. 2015
Rubiaceae (9)			
<i>Coffea</i> spp.	I	<i>N. pendula</i> ; <i>N. zadolicha</i> ; <i>N. inesperata</i> ; <i>N. bella</i> ; <i>N. certa</i> ; <i>N. bifida</i> ; <i>N. laura</i> ; <i>N. delvechio</i> ; <i>Lonchaea</i> sp.	RAGA et al. 1997; STRIKIS 2011; RAGA et al. 2015
Rutaceae (9)			
<i>Citrus x aurantium</i> L.	I	<i>N. zadolicha</i> ; <i>N. glaberrima</i>	RAGA et al. 2015
<i>Citrus x microcarpa</i> Bunge		<i>N. delvechio</i>	STRIKIS 2011
<i>Citrus limon</i> (L.) Osbeck	I	<i>N. zadolicha</i> ; <i>N. glaberrima</i> ; <i>N. pendula</i> ; <i>N. certa</i>	RAGA et al. 2015
<i>Citrus mitis</i> Blanco	I	<i>N. pendula</i> ; <i>N. glaberrima</i> ; <i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. laura</i> ; <i>N. inesperata</i>	RAGA et al. 2015
<i>Citrus reticulata</i> Blanco cv. Ponkan	I	<i>N. zadolicha</i> ; <i>N. pendula</i> ; <i>N. inesperata</i>	RAGA et al. 2015
<i>Citrus reticulata</i> Blanco cv. Cravo	I	<i>N. zadolicha</i> ; <i>N. glaberrima</i> ; <i>N. pradoi</i> ; <i>N. parva</i>	RAGA et al. 2015
<i>C. reticulata</i> Blanco x <i>C. sinensis</i> (L.) Osbeck	I	<i>N. zadolicha</i> ; <i>N. certa</i>	RAGA et al. 2015
<i>Citrus sinensis</i> (L.) Osbeck	I	<i>N. zadolicha</i> ; <i>N. glaberrima</i> ; <i>N. certa</i> ; <i>N. pendula</i> ; <i>N. inesperata</i> ; <i>N. bifida</i>	RAGA et al. 1997; RAGA et al. 2015

to be continued...

Table 1. Continue...

Botanical Family (number of Lonchaeidae species) Botanical species	Native Introduced	Lonchaeidae species	Reference
<i>Fortunella</i> sp.	I	<i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. pendula</i>	RAGA <i>et al.</i> 2015
Salicaceae (2)			
<i>Dovyalis abyssinica</i> (A. Rich) Warb. X <i>Dovyalis hebecarpa</i> (Gardner) Warb.	I	<i>N. zadolicha</i> ; <i>N. pendula</i>	New records
Sapotaceae (7)			
<i>Chrysophyllum cainito</i> L.	I	<i>N. zadolicha</i> ; <i>N. pendula</i>	RAGA <i>et al.</i> 2015
<i>Chrysophyllum mexicanum</i> Brandegee	I	<i>N. zadolicha</i>	RAGA <i>et al.</i> 2015
<i>Manilkara zapota</i> (L.) P. Royen	I	<i>N. zadolicha</i>	RAGA <i>et al.</i> 2015
<i>Mimusops balata</i> (Aubl.) C. F. Gaertn.	I	<i>N. glaberrima</i> ; <i>N. certa</i>	RAGA <i>et al.</i> 2015
<i>Pouteria caimito</i> (Ruiz & Pav.) Radlk.	N	<i>N. zadolicha</i> ; <i>N. glaberrima</i> ; <i>N. pendula</i> ; <i>N. bella</i> ; <i>N. certa</i>	RAGA <i>et al.</i> 2015; GISLOTI <i>et al.</i> 2017
<i>Pouteria torta</i> (Mart.) Radlk.	N	<i>N. dimidiata</i> ; <i>N. zadolicha</i> ; <i>N. glaberrima</i> ; <i>N. paramerolatus</i>	RAGA <i>et al.</i> 2015
Solanaceae (8)			
<i>Capsicum</i> sp.	I	<i>N. glaberrima</i> ; <i>N. certa</i> ; <i>N. zadolicha</i> ; <i>N. pendula</i> ; <i>N. inesperata</i> ; <i>N. laura</i>	RAGA <i>et al.</i> 2015
<i>Capsicum annuum</i> L.	I	<i>N. parva</i> ; <i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. glaberrima</i> ; <i>N. pendula</i>	RAGA <i>et al.</i> 2015
<i>Mandragora officinarum</i> L.	I	<i>Neosilba</i> sp.	RAGA <i>et al.</i> 2015
<i>Solanum aethiopicum</i> L.	I	<i>N. zadolicha</i> ; <i>N. parva</i> ; <i>N. certa</i> ; <i>N. pendula</i> ; <i>N. glaberrima</i> ; <i>N. pradoi</i> ; <i>N. inesperata</i>	STRIKIS & PRADO 2005; RAGA <i>et al.</i> 2015
<i>Solanum lycopersicum</i> L.	I	<i>N. zadolicha</i> ; <i>N. certa</i>	RAGA <i>et al.</i> 2015
<i>Solanum lycopersicum</i> var. <i>cerasiforme</i>	I	<i>N. certa</i> ; <i>N. parva</i>	New records
<i>Solanum mammosum</i> L.	N	<i>N. zadolicha</i> ; <i>N. certa</i> ; <i>N. parva</i>	RAGA <i>et al.</i> 2015
<i>Solanum melongena</i> L.	N	<i>N. zadolicha</i> ; <i>N. parva</i> ; <i>N. glaberrima</i>	STRIKIS & PRADO 2005; RAGA <i>et al.</i> 2015
<i>Solanum variabile</i> Mart.	N	<i>N. inesperata</i>	RAGA <i>et al.</i> 2015
Verbenaceae (4)			
<i>Citharexylum myrianthum</i> Cham.	N	<i>N. pendula</i> ; <i>N. cornuphalus</i> ; <i>N. bifida</i> ; <i>N. bella</i> .	STRIKIS 2011; RAGA <i>et al.</i> 2015

in the state, where they were registered on 64, 59, 40, 32 and 26 municipalities, respectively.

DISCUSSION

Until the 1980s, lance flies were neglected and often discarded in surveys of frugivorous flies in Brazil, due to a lack of taxonomic knowledge and, mainly because they were not considered fruit pests (GATELLI *et al.* 2008). There has been a significant increase in the number of studies related to the Lonchaeidae family since the 1990s.

RAGA *et al.* (2011) recovered Lonchaeidae from the majority of Tephritidae host plants collected in São Paulo, and concluded that it is not an opportunistic group, although fruits with previous infestation by tephritids showed physical-chemistry changes and facilitate further lonchaeid infestation.

An extensive survey of fruit samples in 94 municipalities of São Paulo was performed by RAGA *et al.* (2015), totalling 113 botanical species related to 31 plant families. Lonchaeidae species were found in 77 plant species, corresponding to 68% of the plant species collected. GISLOTI *et al.* (2017) sampled fruits from 35 species and found that almost 90% of the sampled plants were colonized by *Neosilba* species. Although most of the bibliography mentioned in the present study recorded the occurrence of species of lonchaeids in plants of economic importance, some native botanical species were sampled in places bordering the conservation areas.

Neosilba zadolicha, *N. pendula*, *N. inesperata* and, *N. glaberrima* are frequently recovered in fruit samples (UCHÔA *et al.* 2012; LEMOS *et al.* 2015; RAGA *et al.* 2015). All mentioned species occur in São Paulo all year long (RAGA *et al.* 2015). *Neosilba perezi* occurs in cassava sprouts (LOURENÇO *et al.* 1996; GISLOTI & PRADO 2011). Polyphagous species have a wider geographic distribution than species considered to be specialists, in many cases exhibit niche overlap, and many species can infest the same host (MALAVASI & MORGANTE 1980; RAGA *et al.* 2011). The polyphagia of *Neosilba pendula* and *N. zadolicha* represents high adaptation to introduced plant species, being responsible for their wide geographic distribution in the state of São Paulo (Figure 1). Twenty-four plant species reported here are both hosts of *N. zadolicha* and *Ceratitis capitata* (Wied.) (Tephritidae) in São Paulo. *Neosilba zadolicha* exhibits dominance similar to *C. capitata* in urban areas (RAGA *et al.* 2011).

Lonchaeidae's knowledge in São Paulo is not yet consolidated. It is necessary to continue efforts to learn about the diversity of Lonchaeidae species, their host plants, and specially the economic losses in horticulture crops, as well as an increase in studies on biology and behaviour. The data from the present study emphasize the relevance of Lonchaeidae species to the main crops of economic importance in São Paulo.

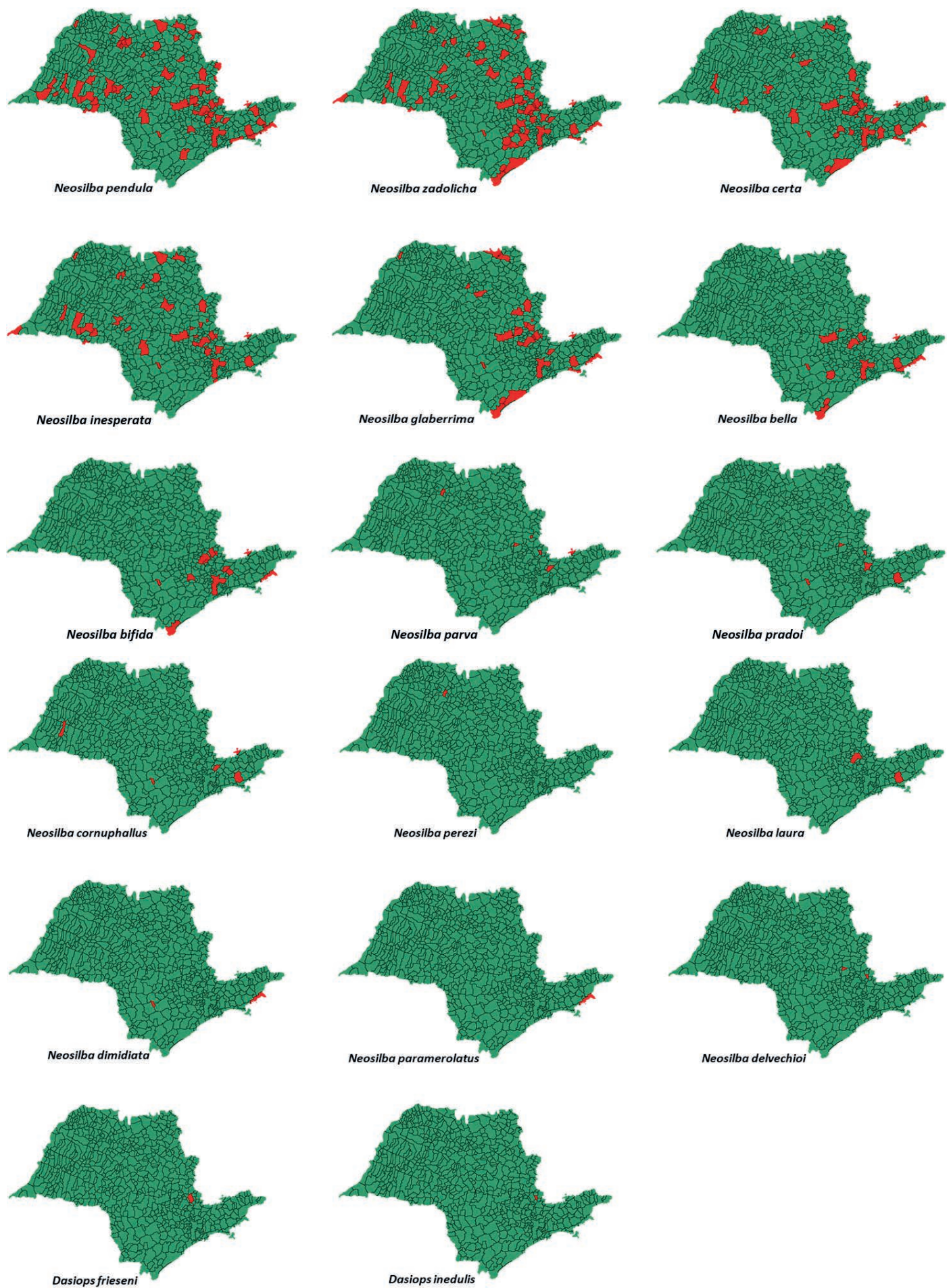


Figure 1. The known distribution of *Neosilba* and *Dasiops* species (Lonchaeidae) in São Paulo, Brazil.

REFERENCES

- Adaime, R, MDSM Sousa, CR Jesus-Barros, EDGD Deus, JF Pereira, PC Strikis & MF Souza-Filho, 2017. Frugivorous flies (Diptera: Tephritidae, Lonchaeidae), their host plants, and associated parasitoids in the extreme north of Amapá State, Brazil. *Florida Entomologist*, 100: 316-324. DOI: <https://doi.org/10.1653/024.100.0229>
- Gattelli, T, FF Silva, RNMLR Redaelli & FKD Soglio, 2008. Moscas frugívoras associadas a mirtáceas e laranjeira "Céu" na região do Vale do Rio Caí, Rio Grande do Sul, Brasil. *Ciência Rural*, 38: 236-239. DOI: <https://doi.org/10.1590/S0103-84782008000100038>
- Gislotti, LJ, MA Uchoa & A Prado, 2017. New records of fruit trees as host for *Neosilba* species (Diptera, Lonchaeidae) in southeast Brazil. *Biota Neotropica*, 17: 1-6. DOI: <https://doi.org/10.1590/1676-0611-bn-2016-0213>
- Gislotti, LJ & AP Prado, 2011. Cassava shoot infestation by larvae of *Neosilba perezii* (Romero & Ruppel) (Diptera: Lonchaeidae) in São Paulo State, Brazil. *Neotropical Entomology*, 40: 312-315. DOI: <https://doi.org/10.1590/S1519-566X2011000300004>
- Hempel, A, 1901. Notas sobre moscas das fructas. *Boletim de Agricultura*, 2: 162-167.
- Lemos, LN, R Adaime, SV Costa-Neto, EG Deus, CR Jesus-Barros & PC Strikis, 2015. New findings on Lonchaeidae (Diptera: Tephritoidea) in the Brazilian Amazon. *Florida Entomologist*, 98: 1227-1237. DOI: <https://doi.org/10.1653/024.098.0433>
- Lourenção, AL, JO Lorenzi & GMB Ambrosano, 1996. Comportamento de clones de mandioca em relação a infestação por *Neosilba perezii* (Romero & Ruppel) (Diptera: Lonchaeidae). *Scientia Agricola*, 53: 304-308. DOI: <https://doi.org/10.1590/S0103-90161996000200019>
- Malavasi, A & JS Morgante, 1980. Biologia de "moscas-das-frutas" (Diptera, Tephritidae). II: Índices de infestação em diferentes hospedeiros e localidades. *Revista Brasileira de Biologia*, 40: 17-24.
- Malavasi, A, JS Morgante & RA Zucchi, 1980. Biologia de "moscas-das-frutas" (Diptera: Tephritidae). I. Lista de hospedeiros e ocorrência. *Revista Brasileira de Biologia*, 40: 9-16.
- McAlpine, JF & GC Steyskal, 1982. A revision of *Neosilba* McAlpine with a key to the world genera of Lonchaeidae (Diptera). *Canadian Entomologist*, 114: 105-137. DOI: <https://doi.org/10.4039/Ent114105-2>
- Raga, A, MF Souza Filho, V Arthur, ME Sato, LA Machado, A Batista Filho, 1997. Observações sobre a incidência de moscas-das-frutas (Diptera: Tephritidae) em frutos de laranja (*Citrus sinensis*). *Arquivos do Instituto Biológico*, 64: 125-129.
- Raga, A, MF Souza-Filho, PC Strikis & SMNM Montes, 2015. Lance fly (Diptera: Lonchaeidae) host plants in the State of São Paulo, Southeast Brazil. *Entomotropica*, 30: 57-68.
- Raga, A, MF Souza-Filho, RA Machado, ME Sato & RC Siloto, 2011. Host ranges and infestation indices of fruit flies (Tephritidae) and lance flies (Lonchaeidae) in São Paulo State, Brazil. *Florida Entomologist*, 94: 787-794. DOI: <https://doi.org/10.1653/024.094.0409>
- Strikis, PC, 2011. Description of 11 new species of genus *Neosilba* (Diptera: Lonchaeidae) from Brazil, its hosts and geographical distribution. *Trends in Entomology*, 7: 67-79.
- Strikis, PC & AP Prado, 2005. A new species of genus *Neosilba* (Diptera: Lonchaeidae). *Zootaxa*, 828: 1-5.
- Strikis, PC & AP Prado, 2009. Lonchaeidae associados a frutos de nêspera, *Eriobotrya japonica* (Thunb.). Lindley (Rosaceae), com descrição de uma nova espécie de *Neosilba* (Diptera: Tephritoidea). *Arquivos do Instituto Biológico*, 76: 49-54.
- Strikis, PC & ML Lerena, 2009. A new species of *Neosilba* (Diptera: Lonchaeidae) from Brazil. *Iheringia Série Zoológica*, 99: 273-275. DOI: <https://doi.org/10.1590/S0073-47212009000300006>
- Uchôa, MA & J Nicácio, 2010. New records of neotropical fruit flies (Tephritidae), lance flies (Lonchaeidae) (Diptera: Tephritoidea), and their host plants in the South Pantanal and adjacent areas, Brazil. *Annals of the Entomological Society of America*, 103: 723-733. DOI: <https://doi.org/10.1603/AN09179>
- Uchôa, MA, I Oliveira, RMS Molina & RA Zucchi, 2002. Species diversity of frugivorous flies (Diptera: Tephritoidea) from hosts in the cerrado of the state of Mato Grosso do Sul, Brazil. *Neotropical Entomology*, 31: 515-524. DOI: <https://doi.org/10.1590/S1519-566X2002000400002>
- Uchôa, MA, CS Caires, JN Nicácio, M Duarte, 2012. Frugivory of *Neosilba* species (Diptera: Lonchaeidae) and *Thepytus echelta* (Lepidoptera: Lycaenidae) on *Psittacanthus* (Santalales: Loranthaceae) In Ecotonal Cerrado-South Pantanal, Brazil. *Florida Entomologist*, 95: 630-640. DOI: <https://doi.org/10.1653/024.095.0314>

