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The role of environment in the spreading of Visceral Leishmaniasis in western São Paulo, Brazil

Luiz Euribel Prestes Carneiro, MD, PhD

Oeste Paulista University, Immunology and Infectious Diseases Department, Presidente Prudente, São Paulo, Brazil

Immunodeficiencies/Infectious Diseases Ambulatory, Regional Hospital, Presidente Prudente, São Paulo, Brazil

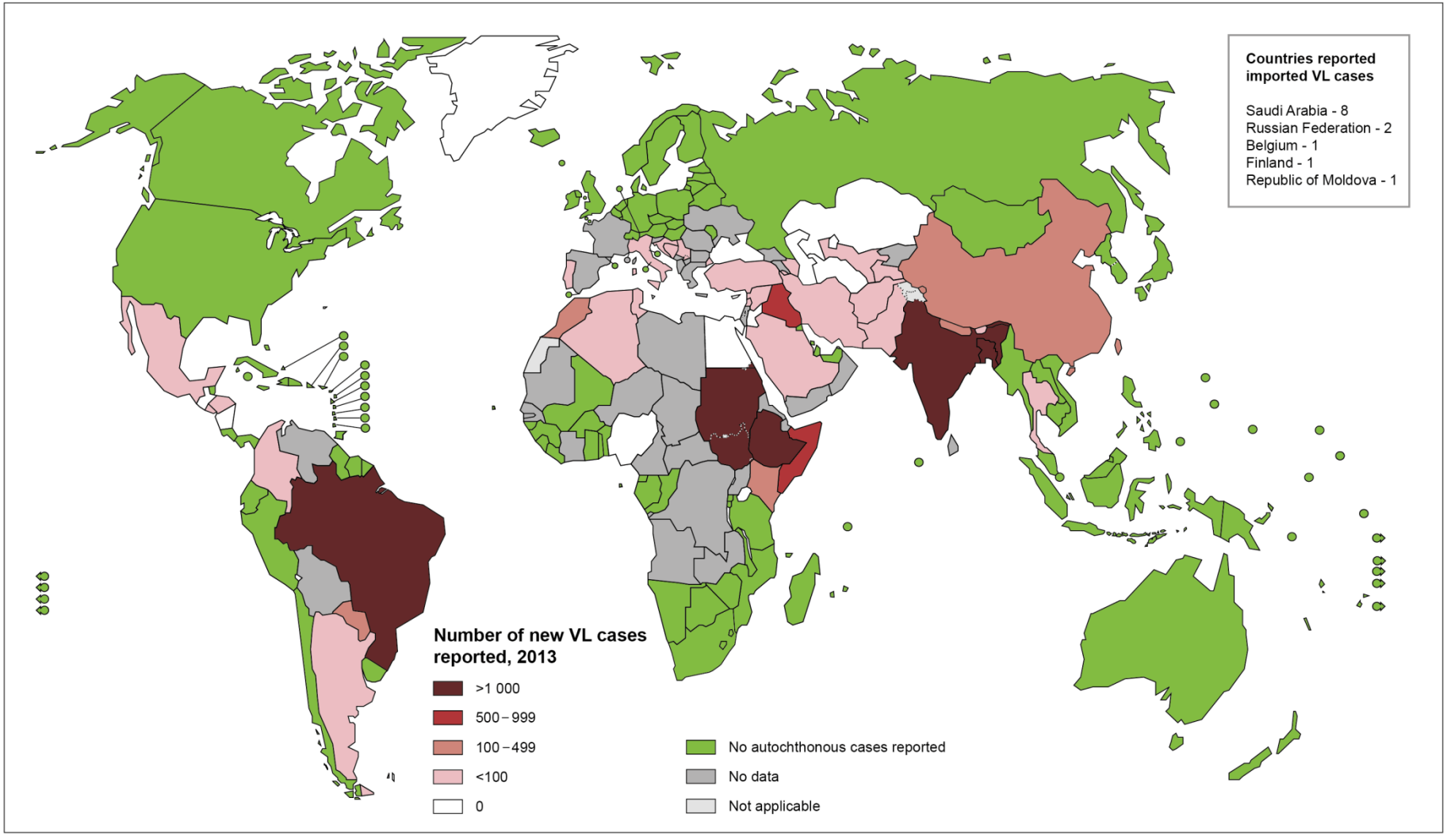
Background

- Visceral leishmaniasis (VL), emerging zoonosis
- Geographic distribution: tropical and temperate regions
- Five countries harbor > 90% of the cases
- In South America, sandflies *Lutzomyia longipalpis* (vector), *Leishmania chagasi* (parasite), dogs (reservoir) and humans (hosts) are involved in the biologic cycle.

Brazil: 90% of Visceral Leishmaniasis (VL) in Latin America

- ≠ Most: Northeast region
- ≠ Five regions and 21/26 states
- ≠ In 2015 reached the south region
- ≠ In São Paulo state, the first cases were described in 1999
- ≠ The vector, parasites and infected dogs came from Bolivia

Status of endemicity of visceral leishmaniasis, worldwide, 2013



Data Source: World Health Organization
Map Production: Control of Neglected Tropical Diseases (NTD)
World Health Organization

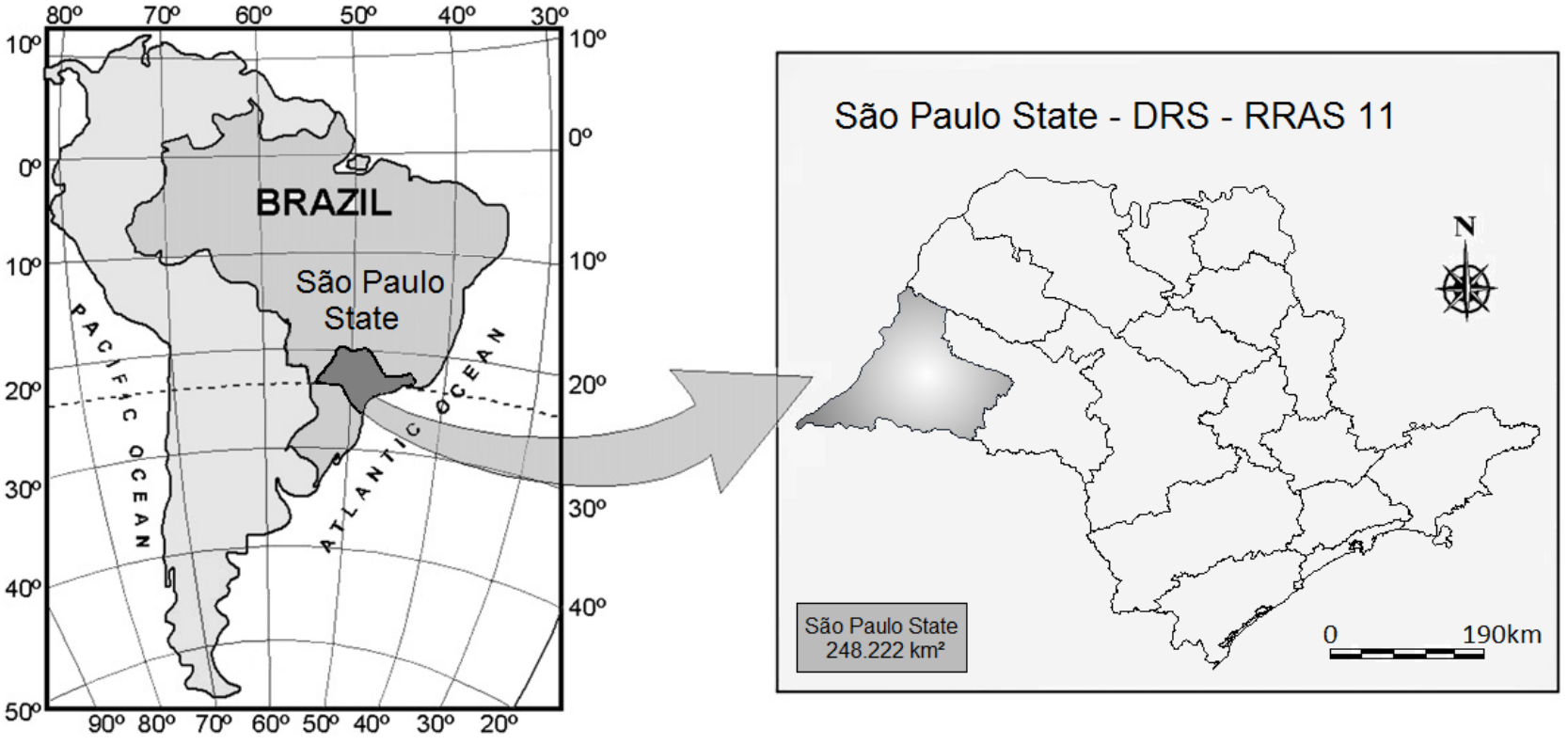
World Health Organization

The biggest country of LA

Route of disease:

Bolivia to Corumbá-Campo Grande-Tres Lagoas (Mato Grosso do Sul) - western region of São Paulo state

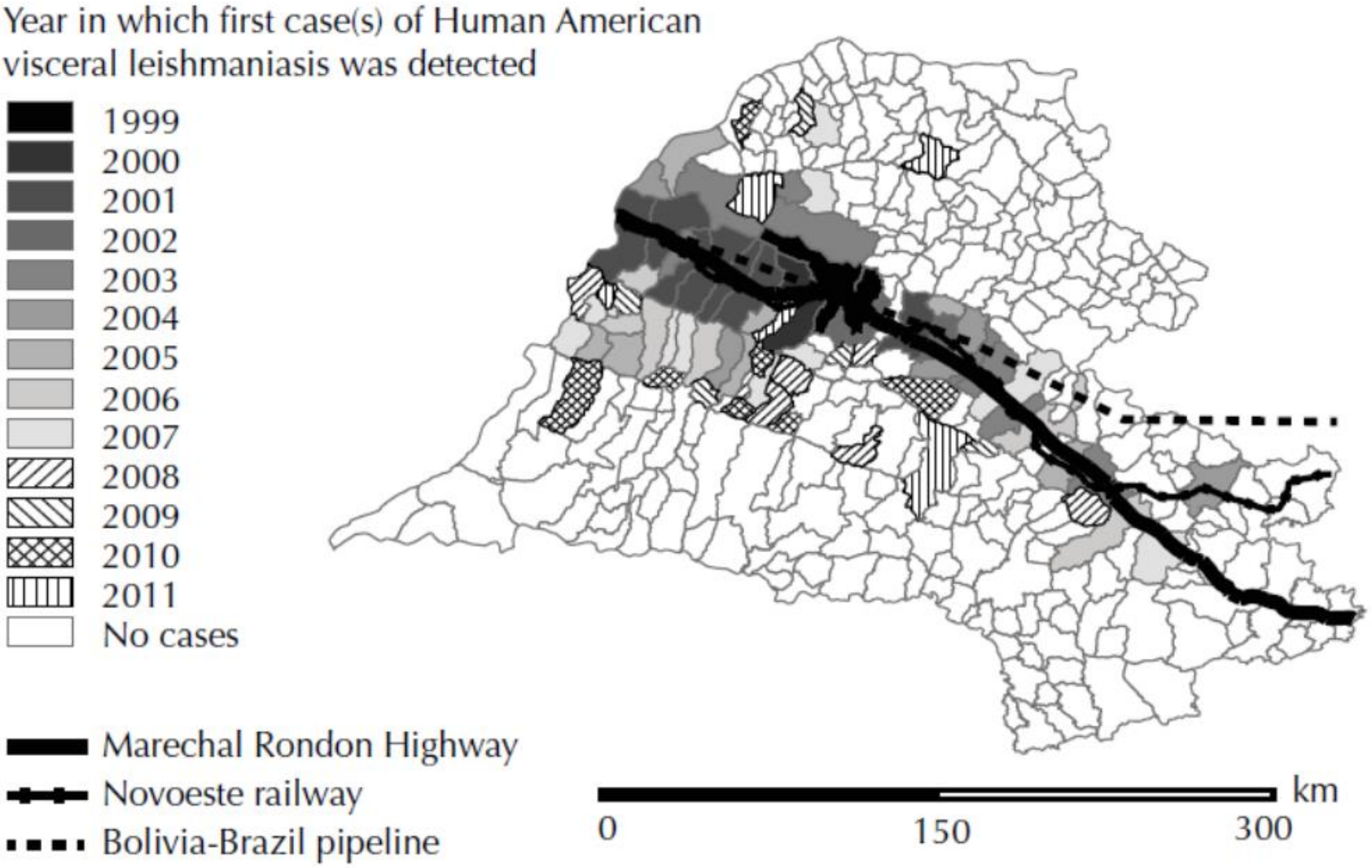
São Paulo State: the southeast region



VL route

- Coming to São Paulo from Bolivia
- 1952: Novoeste railway construction
- 1980: Marechal Rondon highway (SP-300) construction
- 1998: Bolivia-Brazil pipeline (GASBOL) construction
- 2005: west region of São Paulo state through Mato Grosso do Sul (MS) state

Primary axis of VL in São Paulo state



Cardin MFM, Rev. Saúde Pública, 2013

Objective

We described the role of environment in the fast and worrying spread of VL in western São Paulo state, Brazil.

Hypothesis: SP-563 highway

We hypothesize that the primary axis of VL dissemination through the western region was the SP-563 highway, coming from endemic areas of Mato Grosso do Sul state and throughout the whole region, crowded by small and middle cities and connected by a large number of highways (1,480 miles).

Health Care Regional11 (RRAS11)

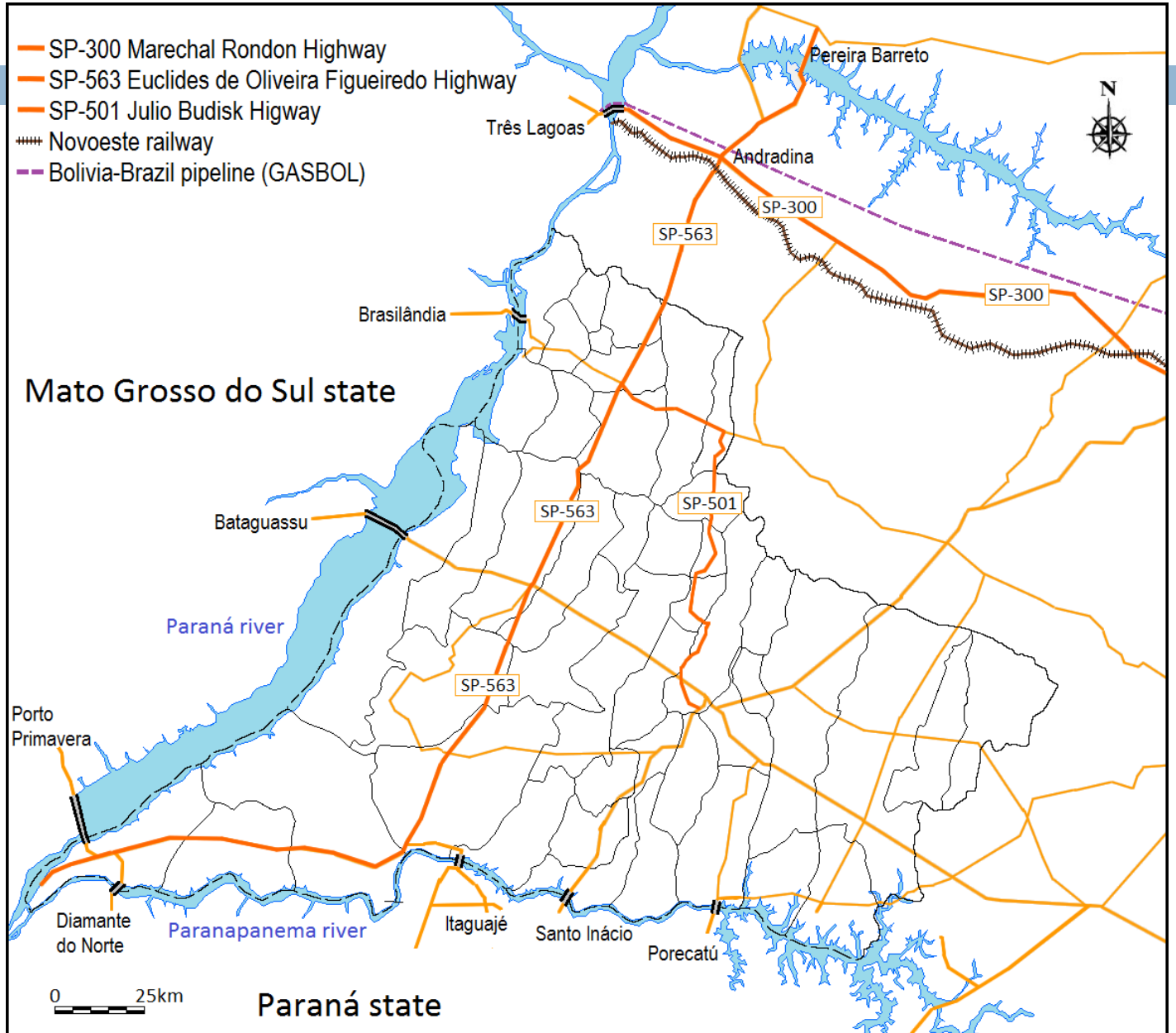
The West region: 5 sub-regions and 45 counties

Pontal of Paranapanema: the poorest region of São Paulo state

Environment risk factors

- Sandy/dry soil in the winter and rainy/wet soil in the summer
- Increasing temperatures in the last decades (average 23.5^{0}C)
- Extensive amount of watersheds flowing into Paraná, Paranapanema and Tietê rivers
- Three biggest rivers of Southwest and Southern Brazil
- Nine big lakes and a flooded area of 2,384 square miles
- Nine hydroelectric plants and bridges

The western region and SP-563 highway

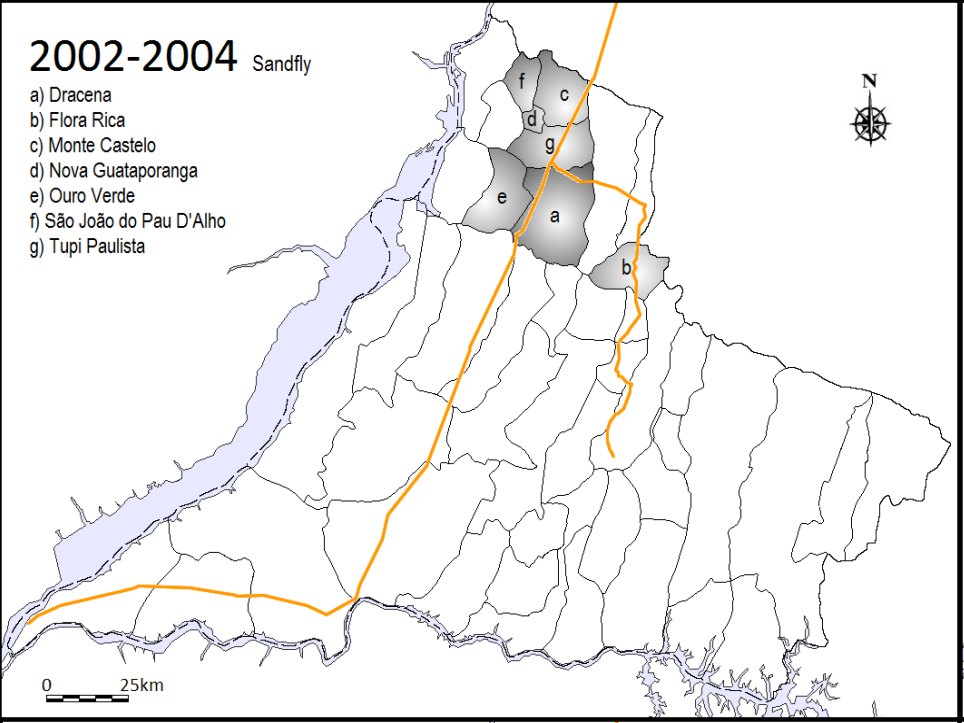


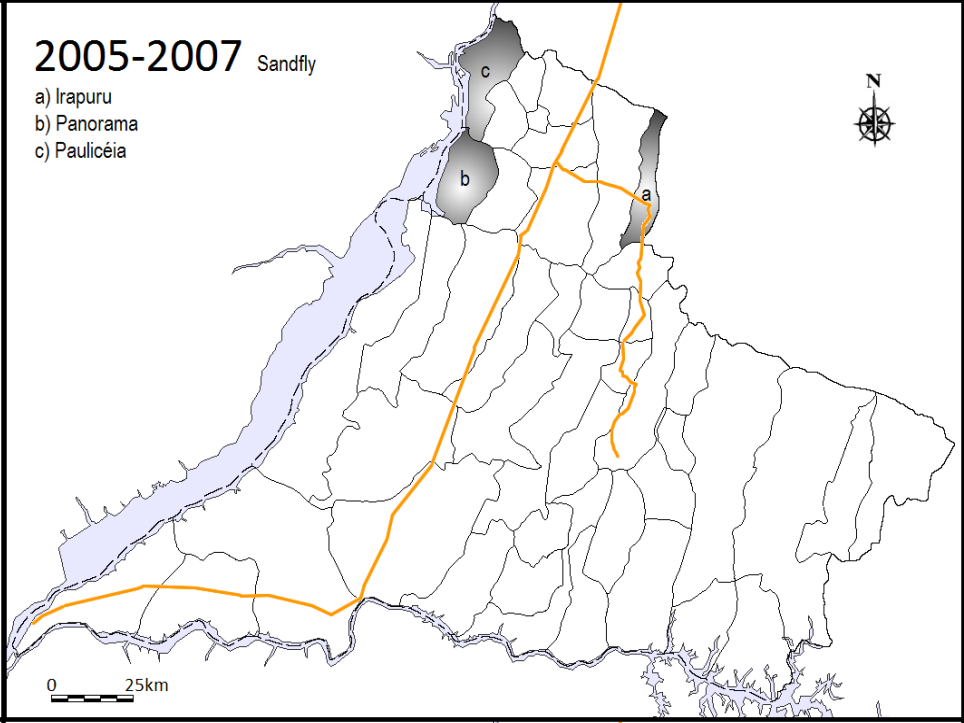
The route of the sandflies

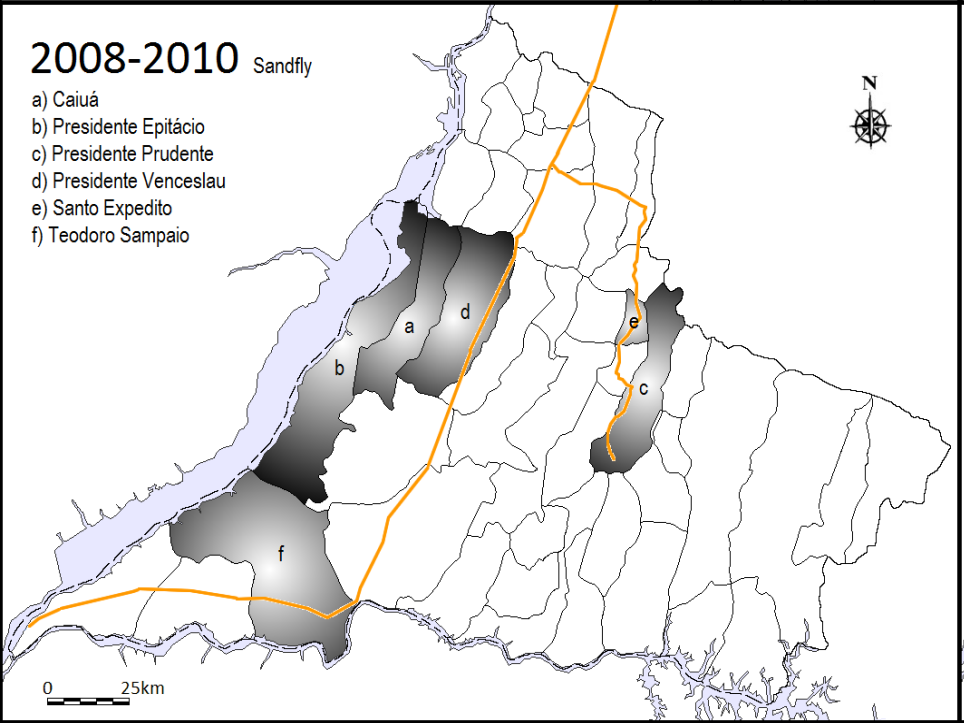
≠ Vector: *Lutzomyia longipalpis*

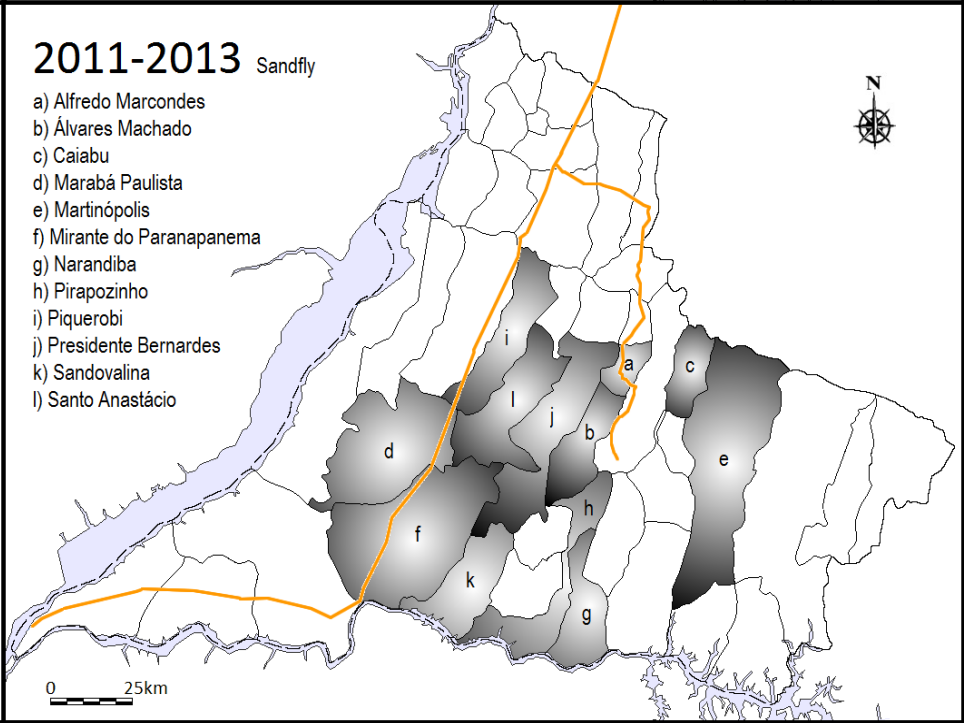
≠ Transmission occurs by contiguity

≠ Presence determined in three years interval


2002-2004 Sandfly
a) Dracena
b) Flora Rica
c) Monte Castelo
d) Nova Guataporanga
e) Ouro Verde
f) São João do Pau D'Alho
g) Tupi Paulista
N
0 25km

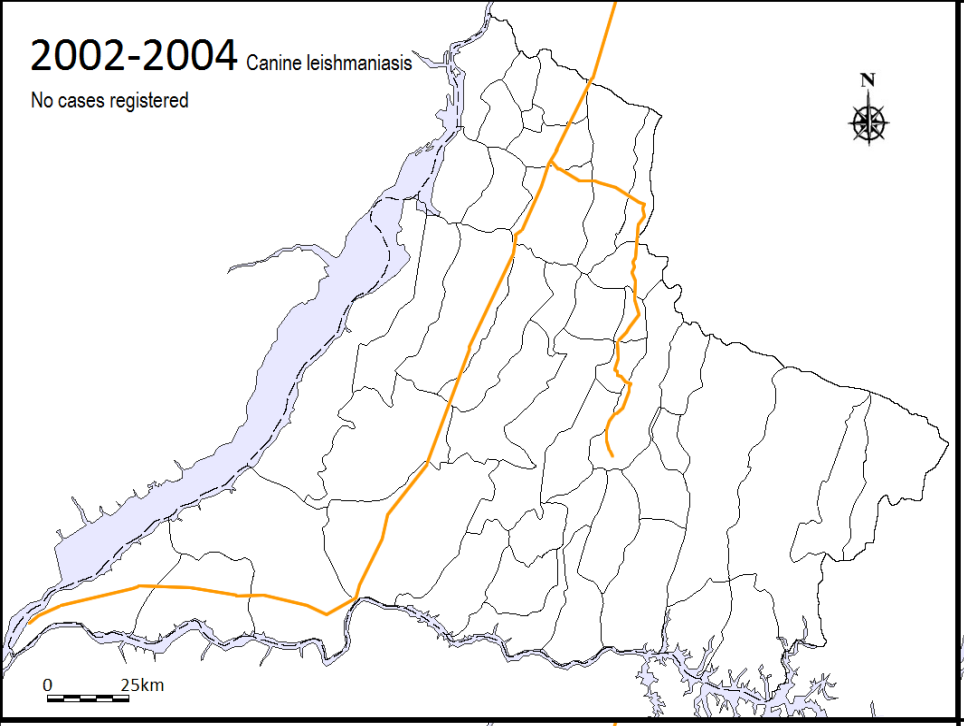

2005-2007 Sandfly
a) Irapuru
b) Panorama
c) Paulicéia
N
0 25km

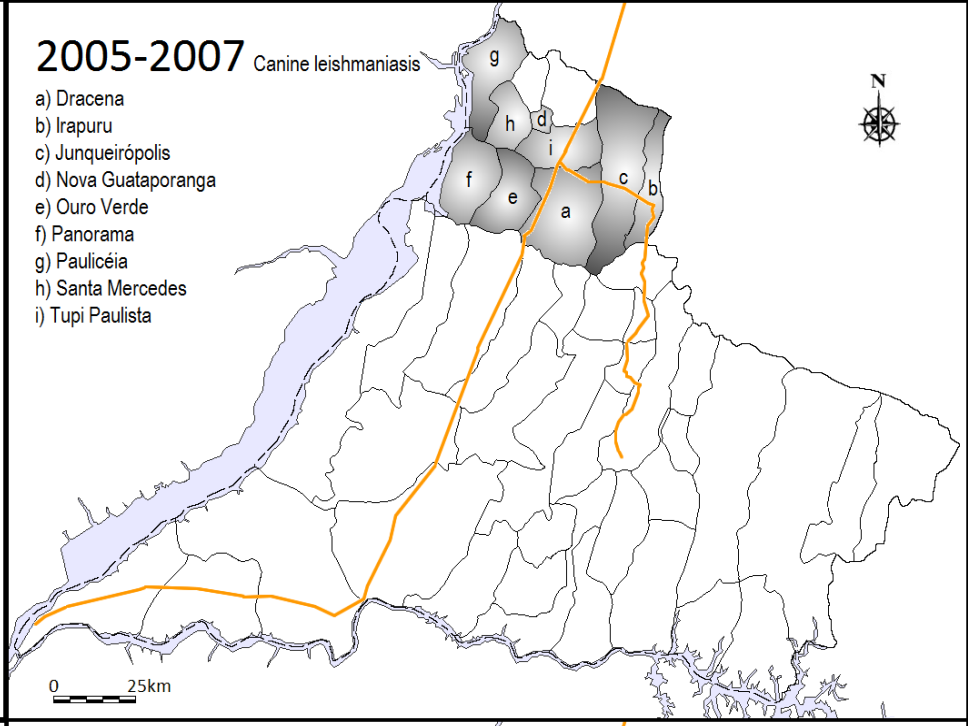

2008-2010 Sandfly
a) Caiuá
b) Presidente Epitácio
c) Presidente Prudente
d) Presidente Venceslau
e) Santo Expedito
f) Teodoro Sampaio
N
0 25km

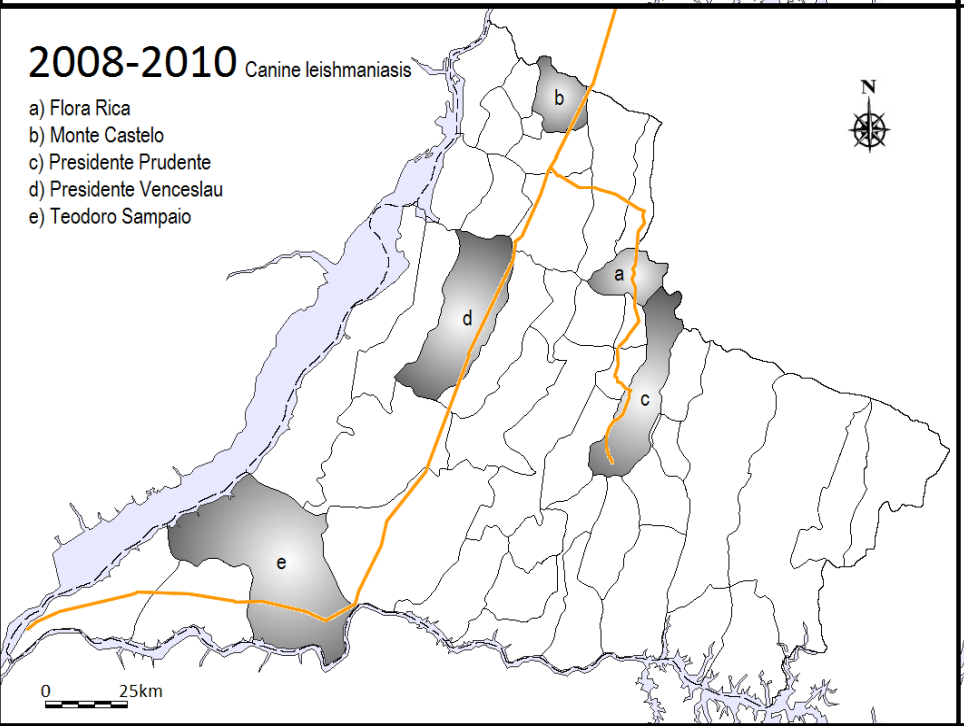

2011-2013 Sandfly
a) Alfredo Marcondes
b) Álvares Machado
c) Caiabu
d) Marabá Paulista
e) Martinópolis
f) Mirante do Paranapanema
g) Narandiba
h) Pirapozinho
i) Piquerobi
j) Presidente Bernardes
k) Sandovalina
l) Santo Anastácio
N
0 25km

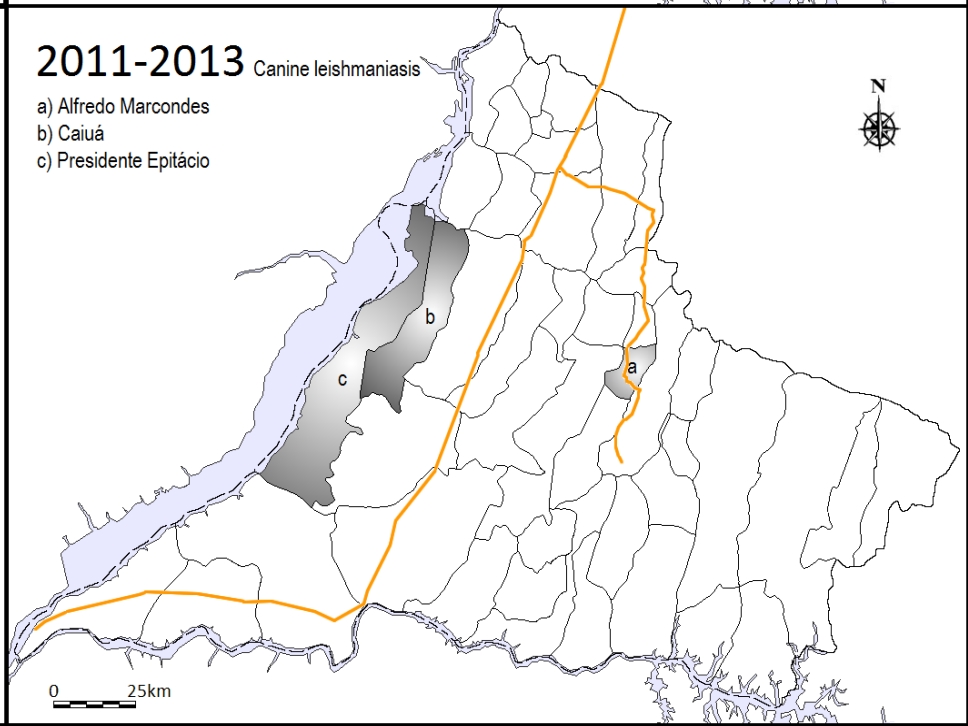
The canine VL footprints

- Canine visceral leishmaniasis
- Transmission occurs by contiguity
- Presence determined in three years interval


2002-2004 Canine leishmaniasis
No cases registered
N
0
25km

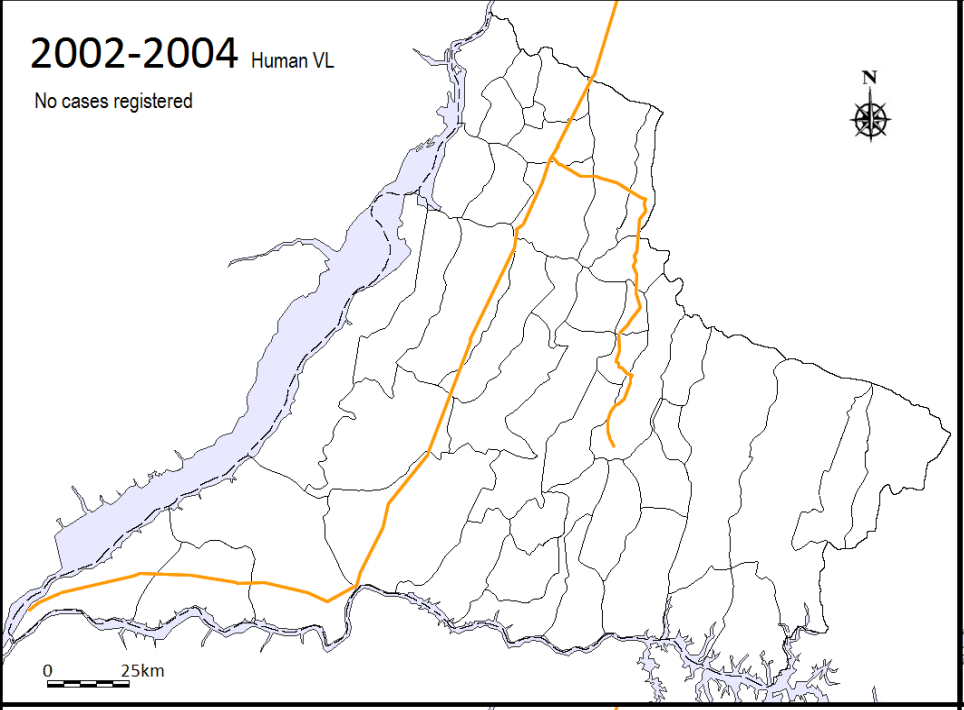

2005-2007 Canine leishmaniasis
a) Dracena
b) Irapuru
c) Junqueirópolis
d) Nova Guataporanga
e) Ouro Verde
f) Panorama
g) Paulicéia
h) Santa Mercedes
i) Tupi Paulista
N
0
25km

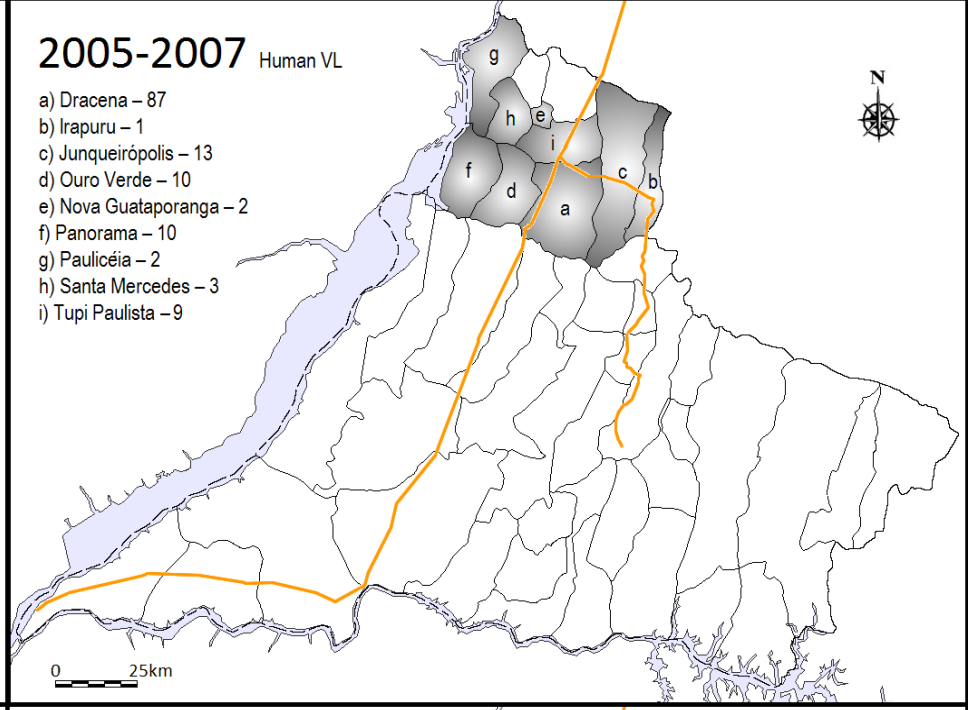

2008-2010 Canine leishmaniasis
a) Flora Rica
b) Monte Castelo
c) Presidente Prudente
d) Presidente Venceslau
e) Teodoro Sampaio
N
0
25km

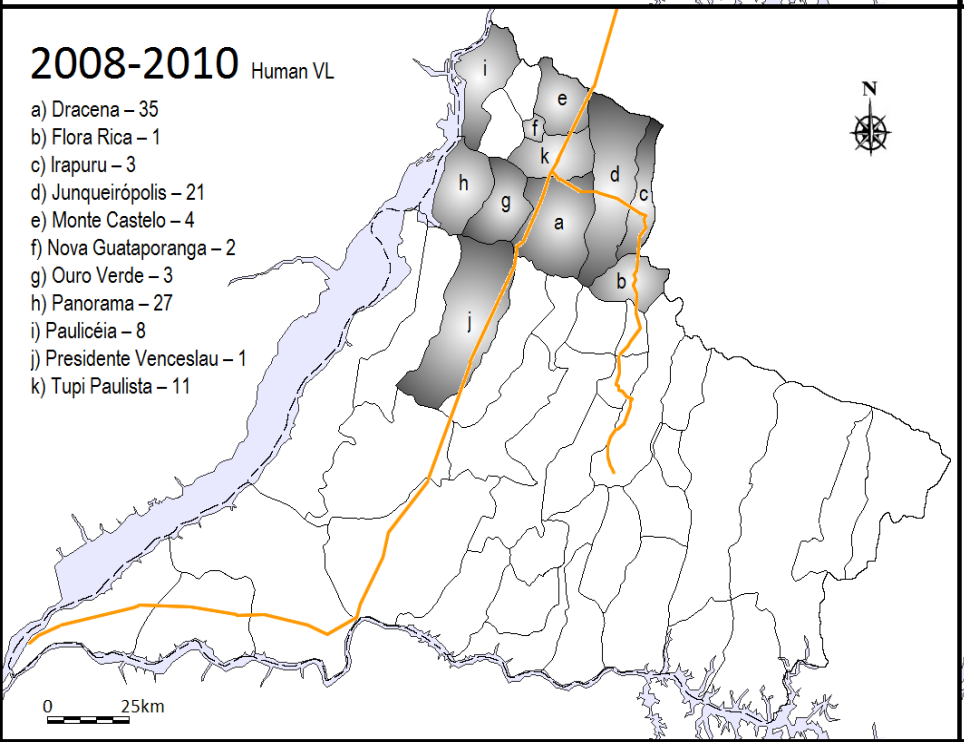

2011-2013 Canine leishmaniasis
a) Alfredo Marcondes
b) Caiuá
c) Presidente Epitácio
N
0
25km

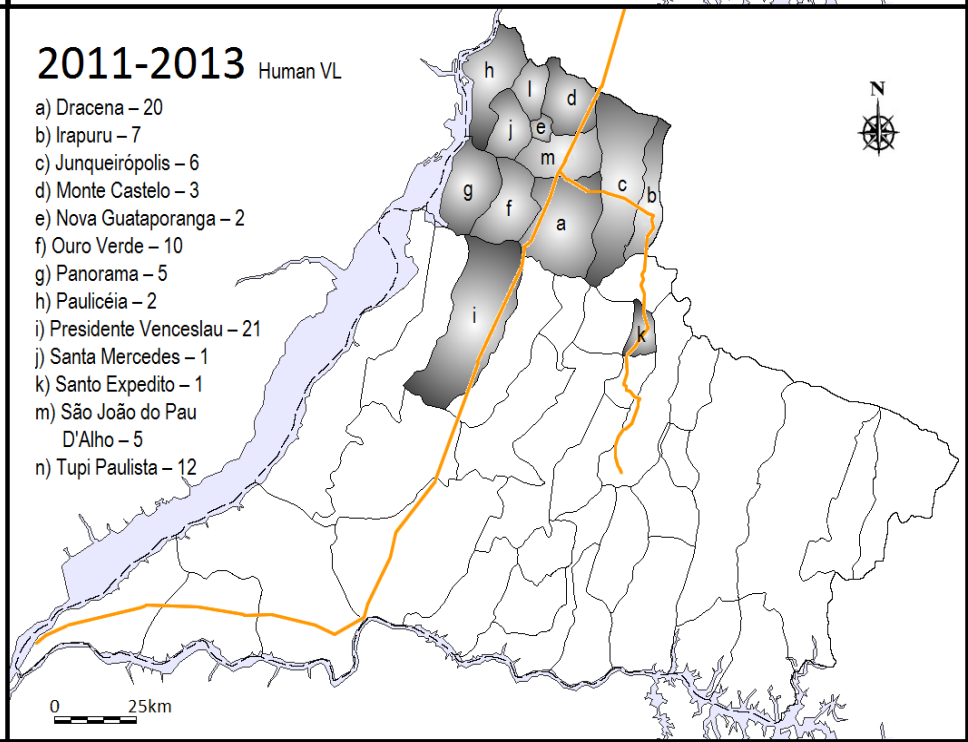
Human VL

- Human visceral leishmaniasis
- Transmission occurs by contiguity
- Presence determined in three years interval

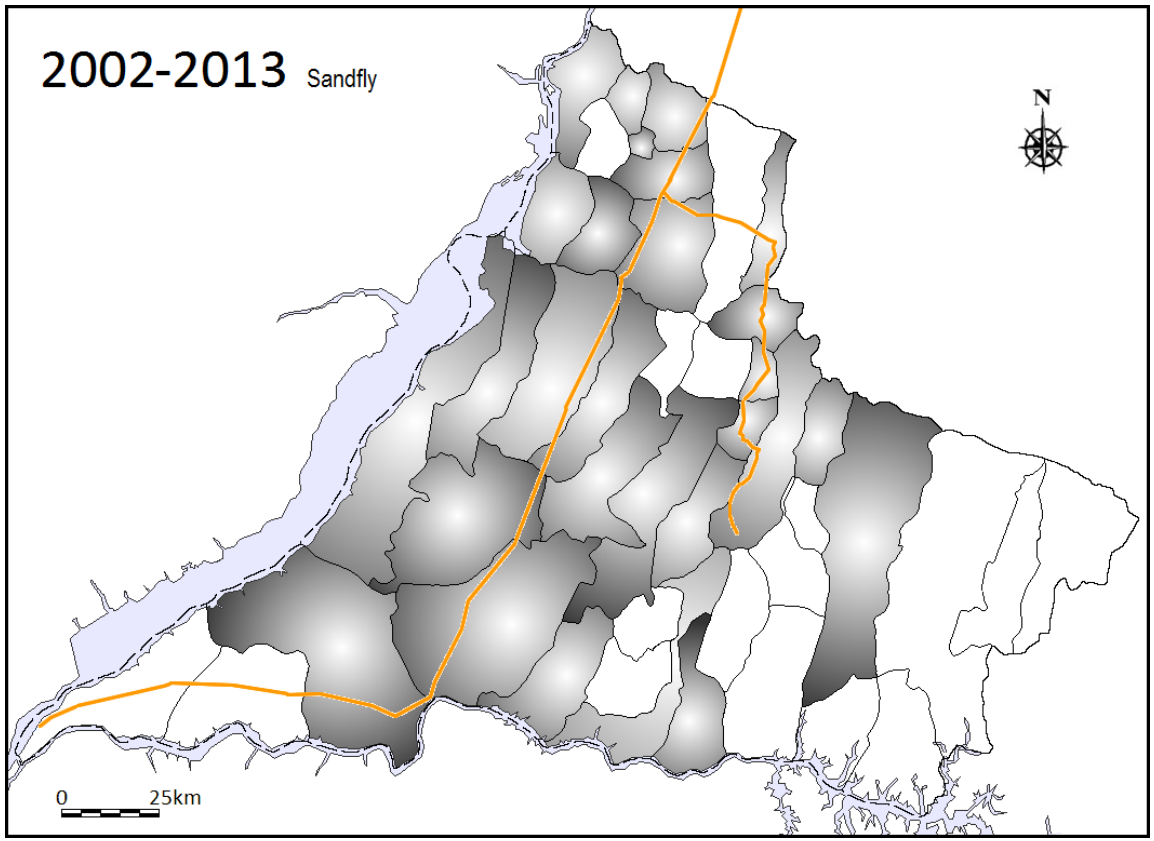

2002-2004 Human VL
No cases registered
N
0 25km


2005-2007 Human VL
a) Dracena – 87
b) Irapuru – 1
c) Junqueirópolis – 13
d) Ouro Verde – 10
e) Nova Guataporanga – 2
f) Panorama – 10
g) Paulicéia – 2
h) Santa Mercedes – 3
i) Tupi Paulista – 9
N
0 25km


2008-2010 Human VL
a) Dracena – 35
b) Flora Rica – 1
c) Irapuru – 3
d) Junqueirópolis – 21
e) Monte Castelo – 4
f) Nova Guataporanga – 2
g) Ouro Verde – 3
h) Panorama – 27
i) Paulicéia – 8
j) Presidente Venceslau – 1
k) Tupi Paulista – 11
N
0 25km

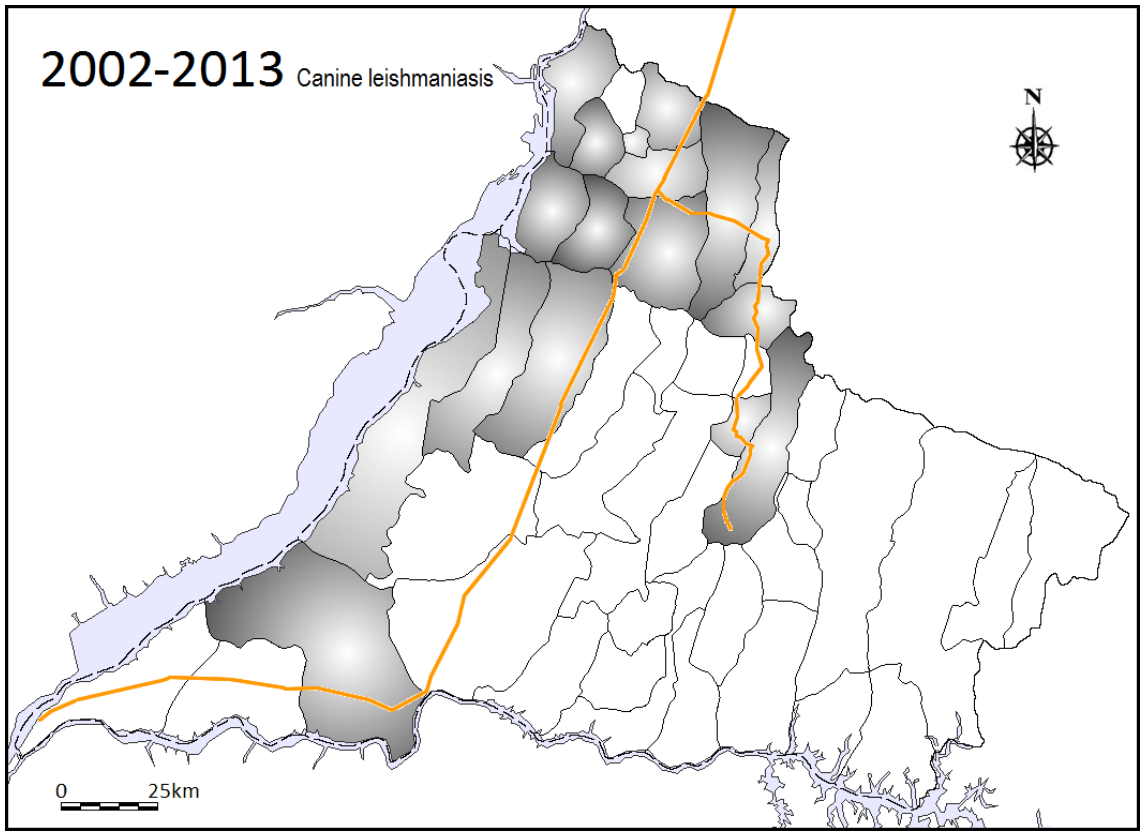

2011-2013 Human VL
a) Dracena – 20
b) Irapuru – 7
c) Junqueirópolis – 6
d) Monte Castelo – 3
e) Nova Guataporanga – 2
f) Ouro Verde – 10
g) Panorama – 5
h) Paulicéia – 2
i) Presidente Venceslau – 21
j) Santa Mercedes – 1
k) Santo Expedito – 1
m) São João do Pau D'Alho – 5
n) Tupi Paulista – 12
N
0 25km

And now, an endemic area for VL sandflies



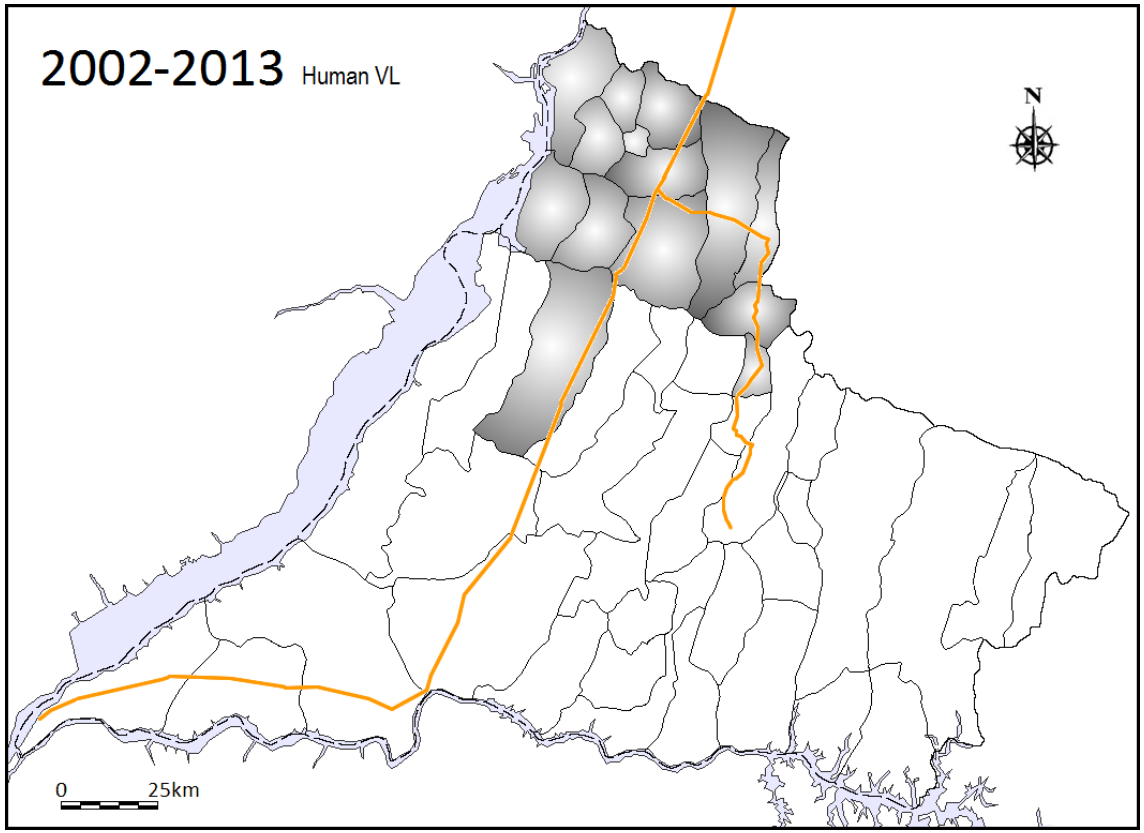
By 2013, 30 (66.7%) of the counties of RRAS11 reported the sandflies

...Canine leishmaniasis



By 2013, 18 (40%) of the counties of RRAS11 reported canine VL

...Human VL



By 2013, 14 (31.1%) counties of RRAS11 reported human VL, 348 cases and 19 deaths (2005-2013).

In conclusion

Poverty, tropical climate, extensive highway network, artificial big lakes linking endemic regions may endorse environment factors related to the spreading of VL in western São Paulo state.

Presidente Prudente, VL team

Team-mates
Dewton Moraes Vasconcelos: LIM-56, USP, SP, Brazil
Elivelton da Silva Fonseca: UNESP, SP/Louisiana State University, LA, US.
Ivete da Rocha Anjolete, SUCEN, SP, Brazil

Regional Hospital of Presidente Prudente Oeste Paulista University

Presidente Prudente, São Paulo, Brazil

Oeste Paulista University

Faculty of Medicine

Infectious Diseases Department

Infectious Diseases and Immunodeficiencies Ambulatory

e-mail: luiz@unoeste.br

Phone number: (0XX18) 32228848 Fax: (0XX18) 3229-2007 ...