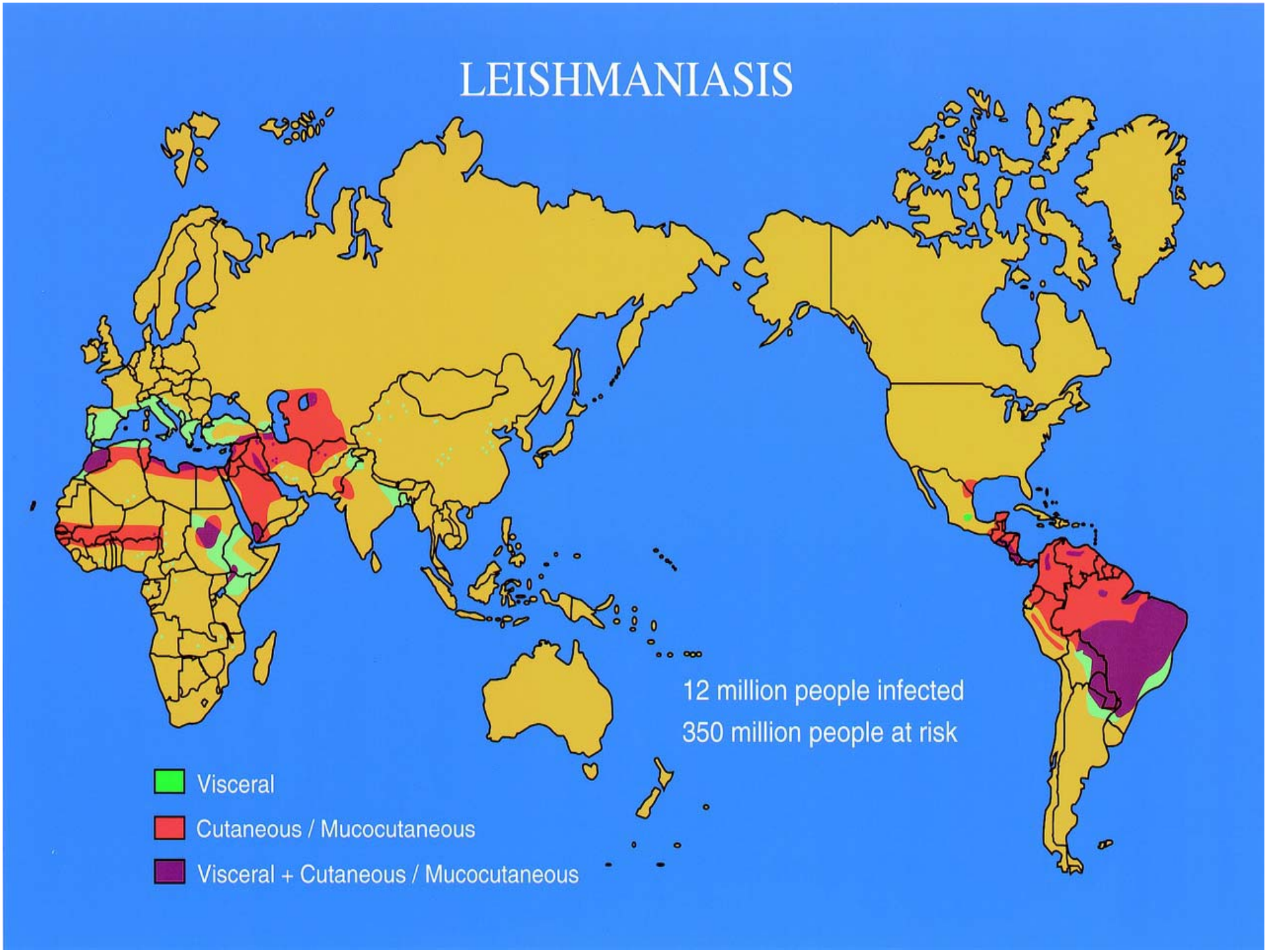
Trypanosomes and Biosecurity

Andrew Thompson

Murdoch
UNIVERSITY

- *Leishmania* and *Trypanosoma*
- Complacency and Dogma


LEISHMANIASIS
12 million people infected
350 million people at risk
Visceral
Cutaneous / Mucocutaneous
Visceral + Cutaneous / Mucocutaneous

Am. J. Trop. Med. Hyg., 96(3), 2017, pp. 534–542
doi:10.4269/ajtmh.16-0604

Review Article

Leishmaniasis in Thailand: A Review of Causative Agents and Situations

Saovanee Leelayoova,[1]* Suradej Siripattanapipong,[2] Jipada Manomat,[2] Phunlerd Piyaraj,[1] Peerapan Tan-ariya,[2] Lertwut Bualert,[3] and Mathirut Mungthin[1]

[1]*Department of Parasitology, Phramongkutklao College of Medicine, Bangkok, Thailand;* [2]*Department of Microbiology, Faculty of Science, Mahidol University, Bangkok, Thailand;* [3]*Department of Medicine, Trang Hospital, Trang Province, Thailand*

Abstract. Before 1999, leishmaniasis was considered an imported disease in Thailand. Since then, autochthonous leishmaniasis was reported in both immmunocompetent and immmunocompromised patients especially in human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS). A new species was identified and named as *Leishmania siamensis* consisting of two lineages, that is, lineages TR and PG. Analysis of isoenzymes has clarified the more commonly detected *L. siamensis* lineage PG as *Leishmania martiniquensis* (MON-229), a species originally reported from the Martinique Island, whereas the *L. siamensis* lineage TR has been identified as the true novel species, *L. siamensis* (MON-324). Both cutaneous leishmaniasis (CL) and visceral leishmaniasis (VL) have been found among Thai patients. Disseminated CL and VL could be presented in some reported patients who had HIV/AIDS coinfection. So far, only sporadic cases have been reported; thus, the true prevalence of leishmaniasis should be determined in Thailand among the high-risk populations such as people with HIV/AIDS. A recent survey among animals identified *L. martiniquensis* DNA in black rats (*Rattus rattus*) suggesting a potential animal reservoir. In addition, *L. martiniquensis* DNA was identified in *Sergentomyia gemmea* and *Sergentomyia barraudi*, the predominant sandfly species in the affected areas. However, further studies are needed to prove that these sandflies could serve as the vector of leishmaniasis in Thailand.

Leishmania spp. in Kangaroos

"Australia's first known outbreak of a hideous flesh eating disease has medical authorities scrambling for an explanation…" Bob Beale The Bulletin Newsweek

The Facts:

- **Reported to OIE in June 2003**
- **4 Red Kangaroos (*Macropus rufus*) at a wildlife Park in Northern Territory**
- **Rose *et al. IJP* 2004**

ELSEVIER

International Journal for Parasitology 34 (2004) 655–664

www.parasitology-online.com

Rapid communication

Cutaneous leishmaniasis in red kangaroos: isolation and characterisation of the causative organisms☆

K. Rose[a,*], J. Curtis[b], T. Baldwin[b], A. Mathis[c], B. Kumar[b], A. Sakthianandeswaren[b], T. Spurck[d], J. Low Choy[e], E. Handman[b]

NO SAND FLY VECTORS IN AUSTRALIA

International Journal for Parasitology 41 (2011) 571–579

Contents lists available at ScienceDirect

International Journal for Parasitology

journal homepage: www.elsevier.com/locate/ijpara

Evidence incriminating midges (Diptera: Ceratopogonidae) as potential vectors of *Leishmania* in Australia ☆

Annette M. Dougall [a,*], Bruce Alexander [b], Deborah C. Holt [a], Tegan Harris [a], Amal H. Sultan [c], Paul A. Bates [d], Karrie Rose [e], Shelley F. Walton [a,f]

[a] Menzies School of Health Research, Charles Darwin University, Darwin, NT 0810, Austr
[b] Xerashield Ltd., Roslin Biocentre, Roslin, Midlothian EH25 9PP, United Kingdom
[c] Liverpool School of Tropical Medicine, Liverpool L3 5QA, United Kingdom

Day-feeding midge:
subgenus *Forcipomyia* (*Lasiohelea*) sp. 1)

Parasites & Vectors

SHORT REPORT Open Access

First detection of *Leishmania infantum* (Kinetoplastida: Trypanosomatidae) in *Culicoides* spp. (Diptera: Ceratopogonidae)

Darine Slama[1], Najoua Haouas[1], Latifa Remadi[1], Habib Mezhoud[1]

Abstract

Background: *Culicoides* (Diptera: Ceratopogonidae) species are kr
African Horses Sickness virus (AHSV) in different areas of the worlc
hypothesized that these arthropods could be involved in the tran
Schmallenberg virus, *Plasmodium* and *Leishmania* parasites. Identifi
competence is crucial in understanding the worldwide *Culicoides/*

PLOS | NEGLECTED TROPICAL DISEASES

RESEARCH ARTICLE

The Biting Midge *Culicoides sonorensis* (Diptera: Ceratopogonidae) Is Capable of Developing Late Stage Infections of *Leishmania enriettii*

Veronika Seblova[1]*, Jovana Sadlova[1], Barbora Vojtkova[1], Jan Votypka[1], Simon Carpenter[2], Paul Andrew Bates[3], Petr Volf[1]

1 Department of Parasitology, Faculty of Science, Charles University, Prague, Czech Republic, **2** Vector-borne Viral Diseases Programme, The Pirbright Institute, Pirbright, Surrey, United Kingdom, **3** Division of Biomedical and Life Sciences, School of Health and Medicine, Lancaster University, Lancaster, United Kingdom

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OPEN ACCESS

Citation: Seblova V, Sadlova J, Vojtkova B, Votypka J, Carpenter S, Bates PA, et al. (2015) The Biting Midge *Culicoides sonorensis* (Diptera: Ceratopogonidae) Is Capable of Developing Late Stage Infections of *Leishmania enriettii*. PLoS Negl Trop Dis 9(9): e0004060. doi:10.1371/journal.pntd.0004060

Editor: Alvaro Acosta-Serrano, Liverpool School of Tropical Medicine, UNITED KINGDOM

Received: April 29, 2015

Accepted: August 15, 2015

Published: September 14, 2015

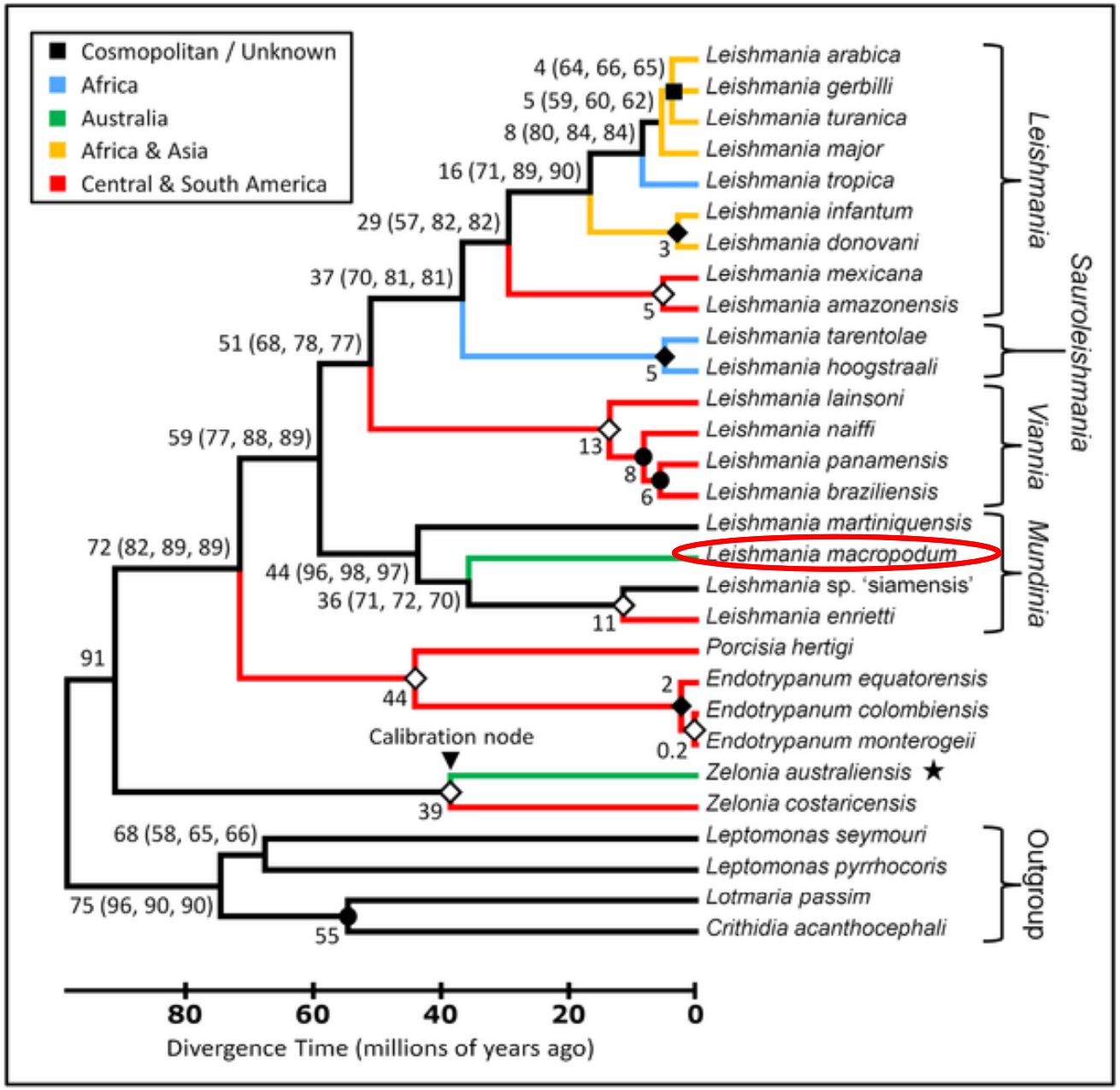
Abstract

Background

Despite their importance in animal and human health, the epidemiology of species of the *Leishmania enriettii* complex remains poorly understood, including the identity of their biological vectors. Biting midges of the genus *Forcipomyia (Lasiohelea)* have been implicated in the transmission of a member of the *L. enriettii* complex in Australia, but the far larger and more widespread genus *Culicoides* has not been investigated for the potential to include vectors to date.

Methodology/Principal Findings

Females from colonies of the midges *Culicoides nubeculosus* Meigen and *C. sonorensis* Wirth & Jones and the sand fly *Lutzomyia longipalpis* Lutz & Nevia (Diptera: Psychodidae) were experimentally infected with two different species of *Leishmania*, originating from Aus-



Barratt *et al*. 2017

Could the midge vector of *Leishmania macropodum* in Australia transmit other exotic pathogenic species of *Leishmania*?

Recent Human Cases in Australia

Patient	Age	Sex	Risk Factor	Country	Clinical presentation	*Leishmania* species (identified by RFLP)
1	67	M	Travel	Peru	CL (plaques on chest)	*L. mexicana*
2	39	M	Travel	Mexico	CL (elbow)	*L. mexicana*
3	28	F	Travel	Costa Rica	CL	*L. braziliensis* complex
4	61	F	Travel	Peru	CL (cheek)	*L. braziliensis* complex
5	30	F	Travel	Colombia	CL	*L. braziliensis* complex
6	29	F	Travel	French Guyana	CL (elbow)	*L. braziliensis* complex
7	52	M	Travel	Colombia	CL (calf)	*L. braziliensis* complex
8	2	M	Trans placental	Australia (Sudan)	VL	*L. donovanii* complex
9	69	F	Travel	Asia, Africa, South America	VL	*L. donovanii* complex
10	48	M	Travel	Southern Spain	VL	*L. donovanii* complex
11	60	M	Travel	Malta	CL (buttock)	*L. donovanii* complex
12	54	M	Travel	Asia, Africa, South America	CL (leg)	*L. donovanii complex*
13	40	M	Travel	Southern Spain	CL (calf)	*L. donovanii* complex
14	76	M	Immigrant	Italy (lived in Australia for 30 yrs)	CL	*L. donovanii* complex
15	42	M	Immigrant	Middle East	CL (elbow)	*L. major*
16	24	M	Immigrant	Afghanistan	CL (foot)	*L. major*
17	36	M	Travel	Afghanistan	CL (arm)	*L. major*
18	31	M	Army	Iraq	CL	*L. major*
19	21	M	Army	Iraq	CL	*L. major*
20	31	M	Army	Syria	CL (back)	*L. major*
21	33	M	Army	Afghanistan	CL	*L. tropica*
22	23	M	Army	Afghanistan	CL	*L. tropica*
23	18	M	Travel	Syria, Iraq	CL (arm)	*L. tropica*
24	36	M	Travel	Middle East	CL	*L. tropica*
25	43	F	Travel	Middle East	CL (elbow)	*L. tropica*
26	5	M	Travel	Middle East	CL (foot)	*L. tropica*
27	49	F	Travel	Middle East	CL (foot)	*L. tropica*
28	5	M	Travel	Middle East	CL	*L. tropica*
29	22	M	Travel	Middle East	CL	*L. tropica*
30	66	F	Travel	Iran	CL (face)	*L. tropica*
31	8	F	Travel	Afghanistan	CL	*L. tropica*
32	26	F	Travel	Afghanistan	CL	*L. tropica*
33	12	M	Travel	Afghanistan	CL (cheek)	*L. tropica*
34	20	M	Immigrant	Afghanistan	CL	*L. tropica*
35	23	M	Immigrant	Afghanistan	CL	*L. tropica*
36	69	F	Immigrant	Afghanistan	CL	*L. tropica*
37	2	M	Immigrant	Afghanistan	CL	*L. tropica*
38	2	M	Immigrant	Afghanistan	CL (cheek)	*L. tropica*
39	45	M	Immigrant	Afghanistan	CL (hand)	*L. tropica*
40	26	M	Immigrant	Afghanistan	CL (arm)	*L. tropica*
41	16	M	Immigrant	Afghanistan	CL	*L. tropica*
42	27	M	Immigrant	Afghanistan	CL (leg)	*L. tropica*
43	18	M	Immigrant	Afghanistan	CL (ankle)	*L. tropica*
44	30	M	Immigrant	Afghanistan	CL (thumb)	*L. tropica*
45	30	M	Immigrant	Afghanistan	CL (finger)	*L. tropica*
46	36	M	Immigrant	Afghanistan	CL (groin)	*L. tropica*
47	16	M	Immigrant	Afghanistan	CL (ear)	*L. tropica*
48	36	F	Immigrant	Afghanistan	CL (arm)	*L. tropica*
49	18	M	Immigrant	Afghanistan	CL (arm)	*L. tropica*
50	1	M	Immigrant	Afghanistan	CL (ankle)	*L. tropica*
51	28	M	Travel	Pakistan	CL (nose)	No ID*
52	36	F	Travel	Panama	CL	No ID*
53	26	F	Travel	Peru	CL (arm)	No ID*
54	34	M	Travel	-	CL (calf)	No ID*
55	26	M	Immigrant	-	CL	No ID*

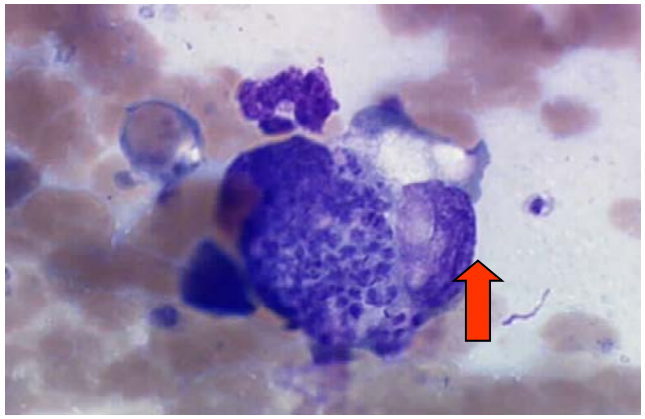
"Scruffy" from Portugal

- 5 Yr.o. Male Miniature Poodle
- Progressive weight loss
- Travel history:
  - Imported from Portugal 3 years previously with 2 other dogs

- Clinical Findings:
  - Pale mucous membranes
  - Scaly skin
  - Splenomegaly

Courtesy, Peter Irwin, Murdoch University

"Scruffy" Diagnosis



- Splenic & bone marrow aspirates revealed numerous amastigotes
- Positive IFAT serology
  - Both in-contact dogs negative
- PCR confirmation:
  - *L. infantum*
- Diagnosis: Visceral Leishmaniasis

Veterinary Parasitology 202 (2014) 292–295

Contents lists available at ScienceDirect

Veterinary Parasitology

journal homepage: www.elsevier.com/locate/vetpar

Short Communication

The diagnosis and management of a case of leishmaniosis in a dog imported to Australia

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[b] School of Veterinary and Life Sciences, Murdoch University, South Street, Western Australia 6150, Australia
[c] Australian Animal Health Laboratory, CSIRO Animal, Food and Health Sciences, Private Bag 24, Geelong, Victoria 3220, Australia
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ARTICLE INFO

Article history:
Received 31 October 2013
Received in revised form 16 March 2014
Accepted 27 March 2014

Keywords:
Australia
Amphotericin B
Dog
Leishmania infantum
PCR

ABSTRACT

This case study discusses in detail for the first time the diagnosis and management of a case of leishmaniosis in a dog imported to Australia. The dog presented with epistaxis and a non-regenerative anaemia five years after being imported from Europe. Protozoa were identified within macrophages in bone marrow and splenic cytology. A *Leishmania* indirect fluorescent antibody test was performed and was positive while an *Ehrlichia canis* antibody test was negative. Polymerase chain reaction of the ITS-1 and ITS-2 regions of skin, lymph node, spleen and bone marrow were all positive for *Leishmania infantum*. The dog was treated with amphotericin B with a strong clinical response. The importance of thorough diagnostics in non-endemic areas, particularly Australia, is discussed. Treatment with amphotericin B is discussed. Vigilance, disease reporting and response frameworks are recommended for non-endemic areas.

CHAGAS DISEASE

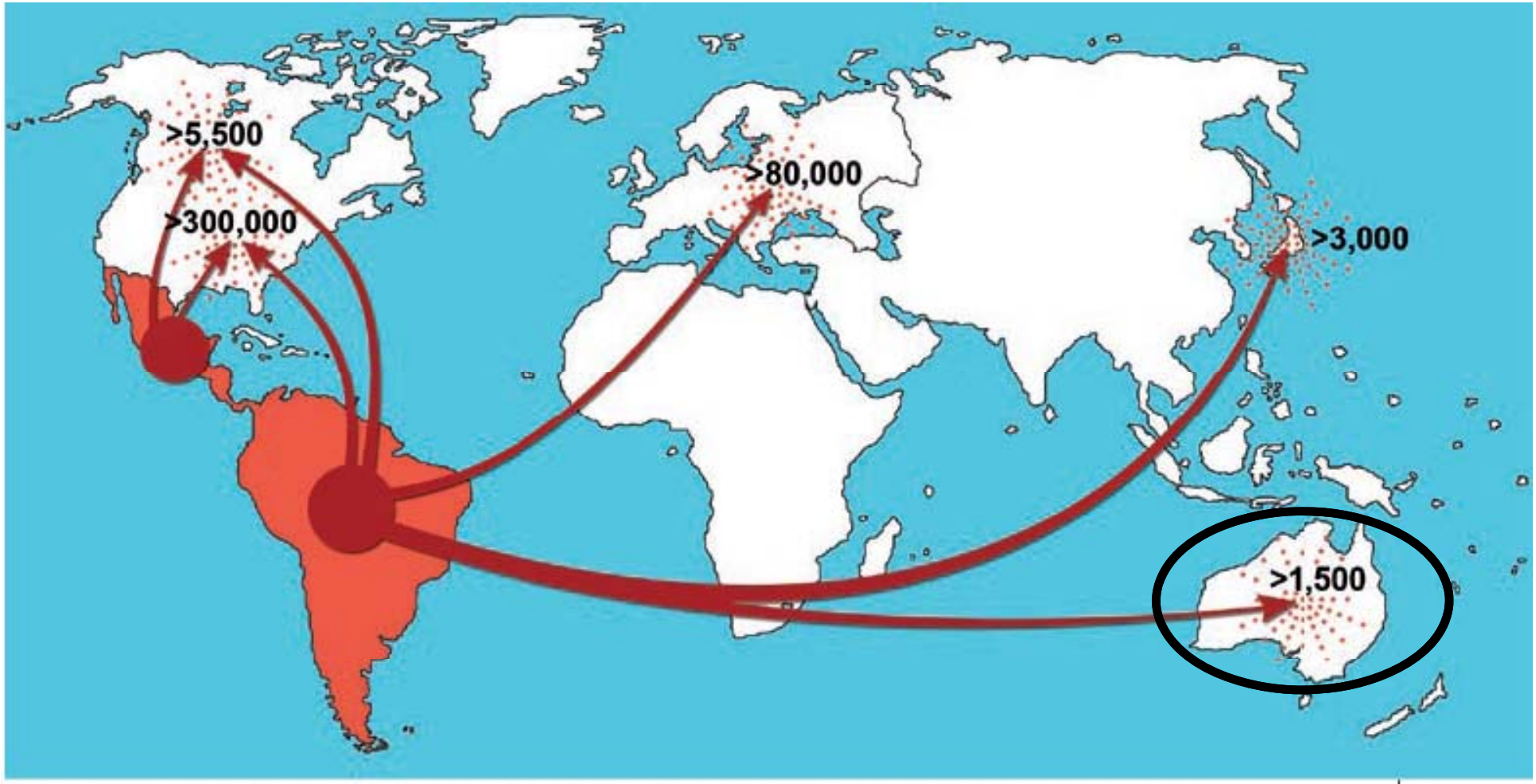
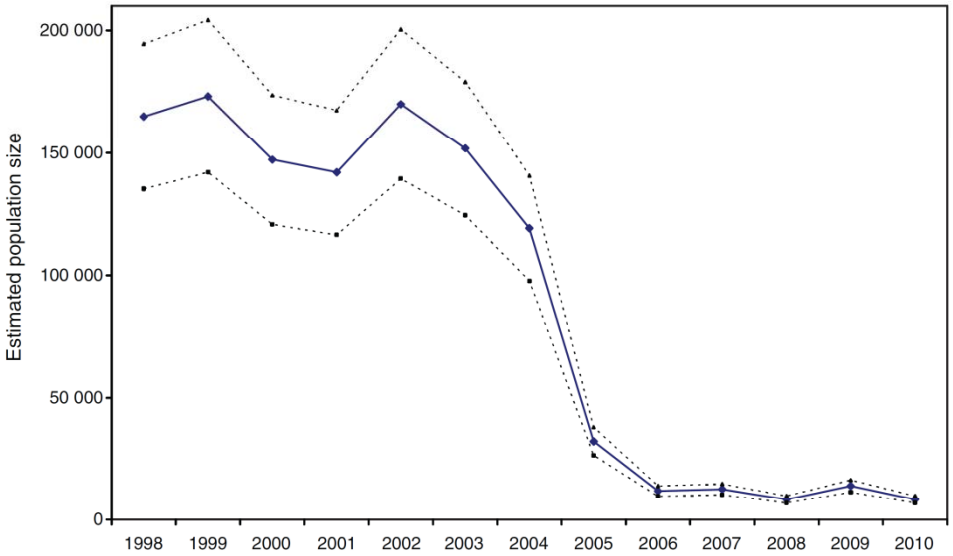


Fig. 2 | Migration routes from Latin America and estimation of the total number of infected individuals in non-endemic countries.

RA

Woylie declines in Western Australia

- Declined by **over 90%** in the last 15 years
- **Predators** are important, but cannot entirely explain declines
- Declines are **density dependent** (begin at around ~1 woylie/ha)



- Distinct **spatio-temporal pattern of decline** (~4km/yr)

Wayne et al. 2013. *Wildlife Research* 40(3): 169-83;
Wayne et al. 2013. *Oryx* (DOI: http://dx.doi.org/10.1017/S0030605313000677)

IJP: Parasites and Wildlife 7 (2018) 221–227

Contents lists available at ScienceDirect

IJP: Parasites and Wildlife

journal homepage: www.elsevier.com/locate/ijppaw

Trypanosome co-infections increase in a declining marsupial population

Stephanie S. Godfrey[a,b,*], Sarah Keatley[a], Adriana Botero[a], Craig K. Thompson[a], Adrian F. Wayne[a,c], Alan J. Lymbery[a], Keith Morris[c], R.C. Andrew Thompson[a]

[a] School of Veterinary and Life Sciences, Murdoch University, Murdoch, Western Australia, Australia
[b] Department of Zoology, University of Otago, Dunedin, New Zealand
[c] Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions, Western Australia, Australia

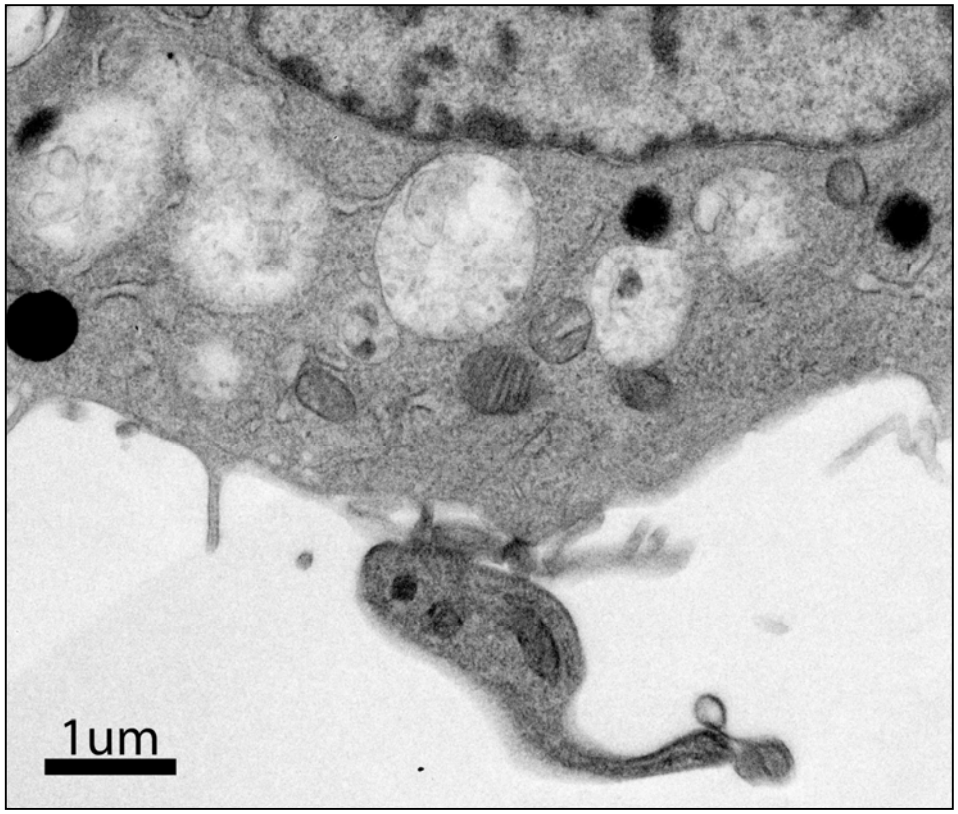
ARTICLE INFO

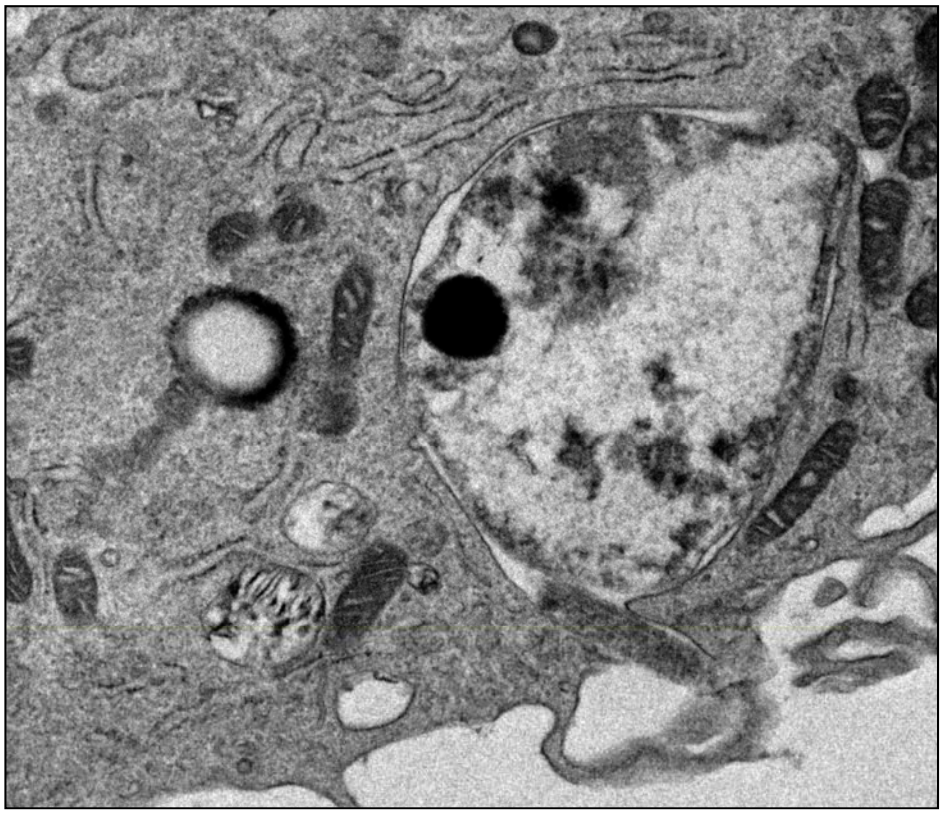
Keywords:
Wildlife disease ecology
Epidemiology
Parasite-induced declines
Polyparasitism
Conservation

ABSTRACT

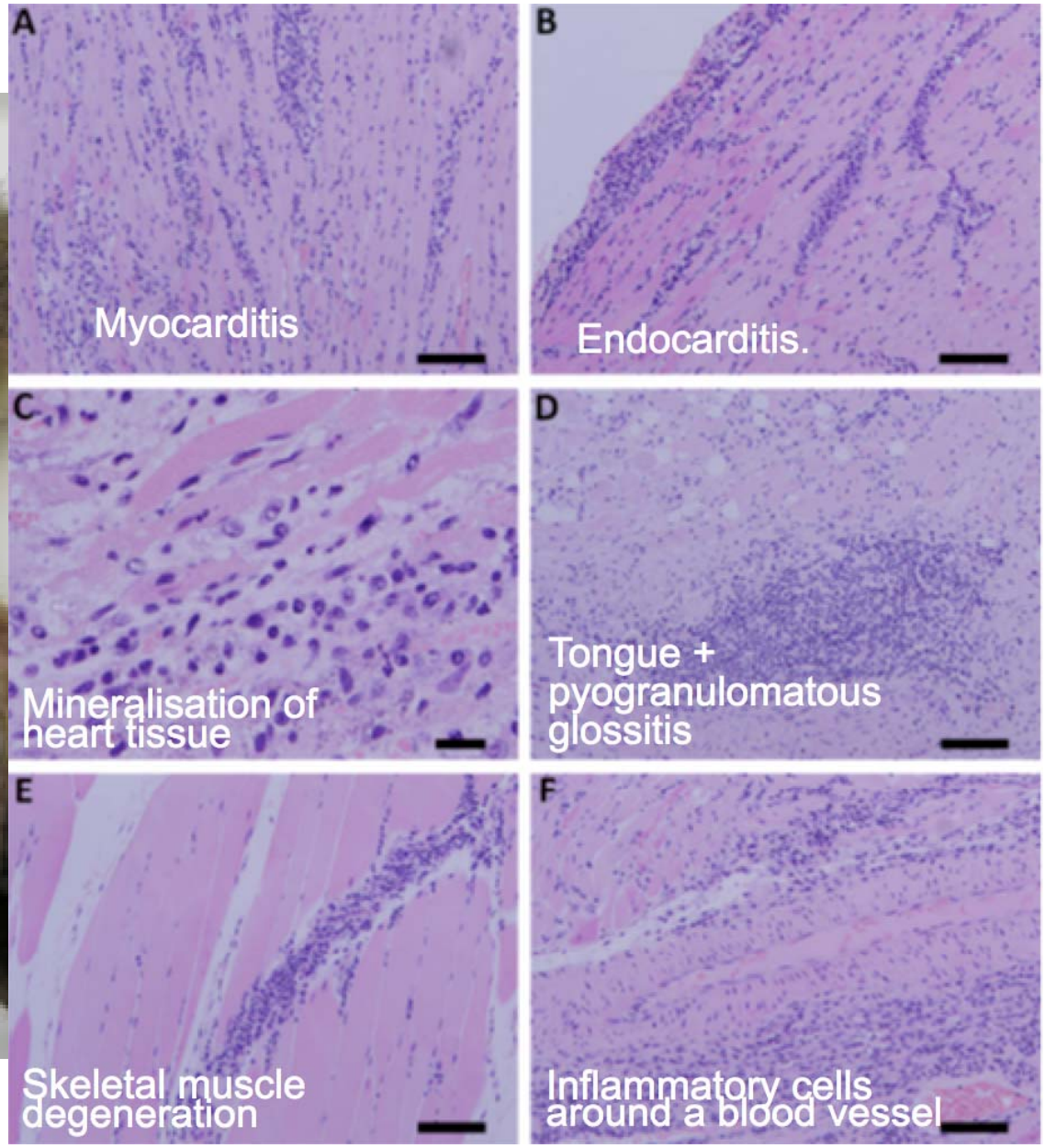
Understanding the impacts of parasites on wildlife is growing in importance as diseases pose a threat to wildlife populations. Woylie (syn. brush-tailed bettong, *Bettongia penicillata*) populations have undergone enigmatic declines in south-western Western Australia over the past decade. Trypanosomes have been suggested as a possible factor contributing towards these declines because of their high prevalence in the declining population. We asked whether temporal patterns of infection with *Trypanosoma* spp. were associated with the decline patterns of the host, or if other factors (host sex, body condition, co-infection or rainfall) were more influential in

TEM – *Trypanosoma copemani G2*

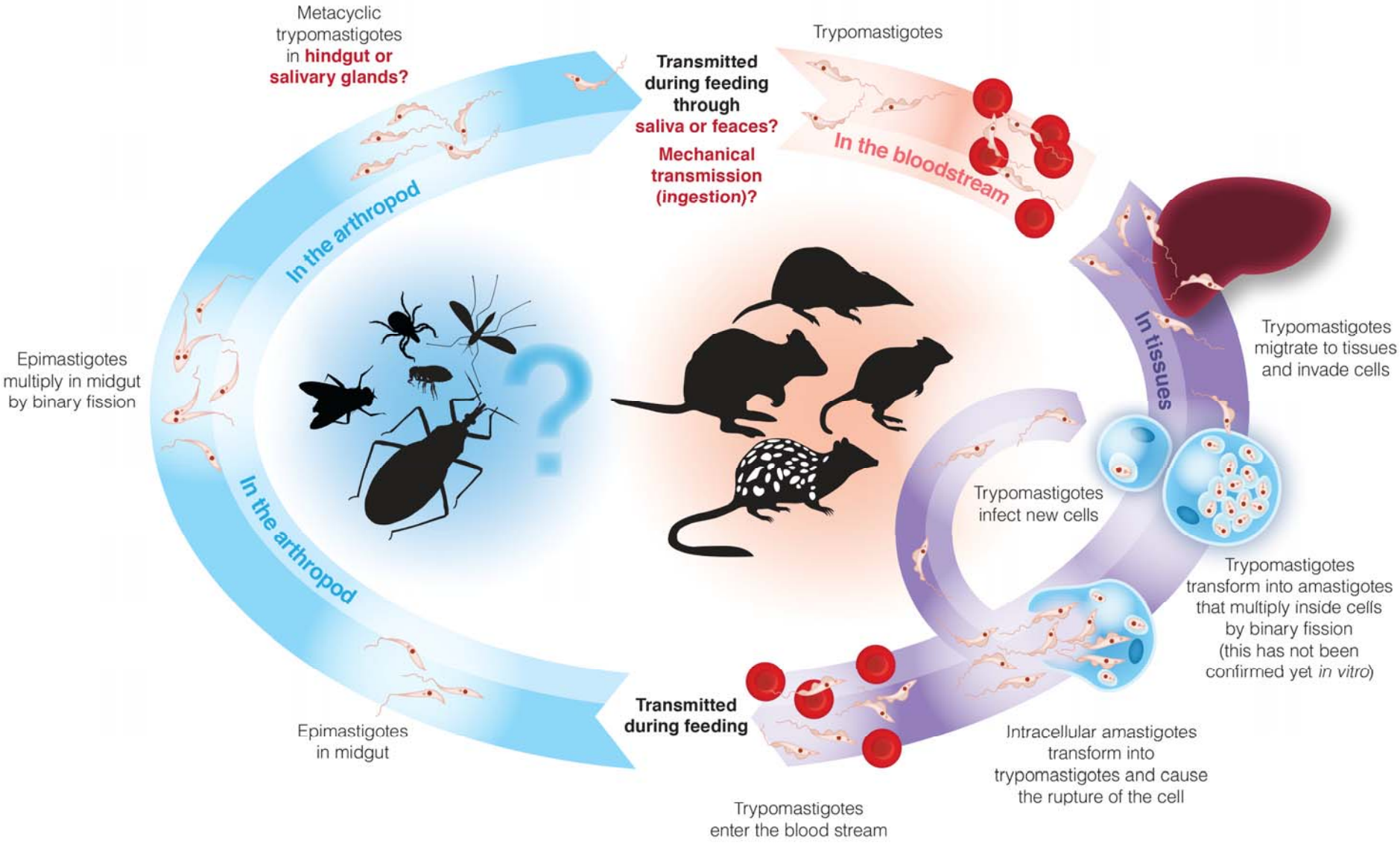


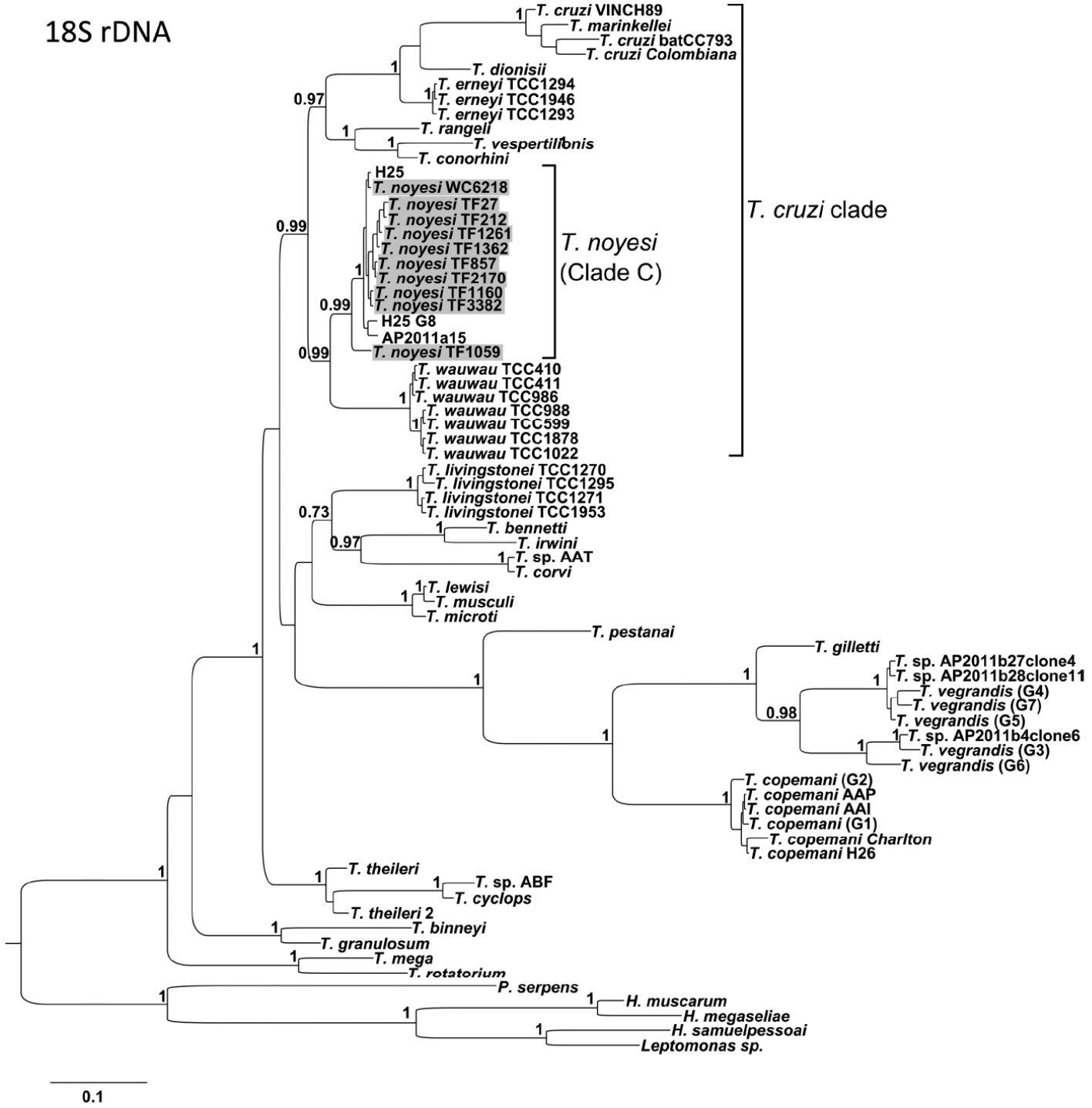



10/058


A
Myocarditis
B
Endocarditis.
C
Mineralisation of heart tissue
D
Tongue + pyogranulomatous glossitis
E
Skeletal muscle degeneration
F
Inflammatory cells around a blood vessel

Trypanosoma copemani is facultatively intracellular




18S rDNA
T. cruzi VINCH89
T. marinkellei
T. cruzi batCC793
T. cruzi Colombiana
T. dionisii
T. erneyi TCC1294
T. erneyi TCC1946
T. erneyi TCC1293
T. rangeli
T. vespertilionis
T. conorhini
H25
T. noyesi WC6218
T. noyesi TF27
T. noyesi TF212
T. noyesi TF1261
T. noyesi TF1362
T. noyesi TF857
T. noyesi TF2170
T. noyesi TF1160
T. noyesi TF3382
H25 G8
AP2011a15
T. noyesi TF1059
T. noyesi (Clade C)
T. wauwau TCC410
T. wauwau TCC411
T. wauwau TCC986
T. wauwau TCC988
T. wauwau TCC599
T. wauwau TCC1878
T. wauwau TCC1022
T. cruzi clade
T. livingstonei TCC1270
T. livingstonei TCC1295
T. livingstonei TCC1271
T. livingstonei TCC1953
T. bennetti
T. irwini
T. sp. AAT
T. corvi
T. lewisi
T. musculi
T. microti
T. pestanai
T. gilletti
T. sp. AP2011b27clone4
T. sp. AP2011b28clone11
T. vegrandis (G4)
T. vegrandis (G7)
T. vegrandis (G5)
T. sp. AP2011b4clone6
T. vegrandis (G3)
T. vegrandis (G6)
T. copemani (G2)
T. copemani AAP
T. copemani AAI
T. copemani (G1)
T. copemani Charlton
T. copemani H26
T. theileri
T. sp. ABF
T. cyclops
T. theileri 2
T. binneyi
T. granulosum
T. mega
T. rotatorium
P. serpens
H. muscarum
H. megaseliae
H. samuelpessoai
Leptomonas sp.
0.1

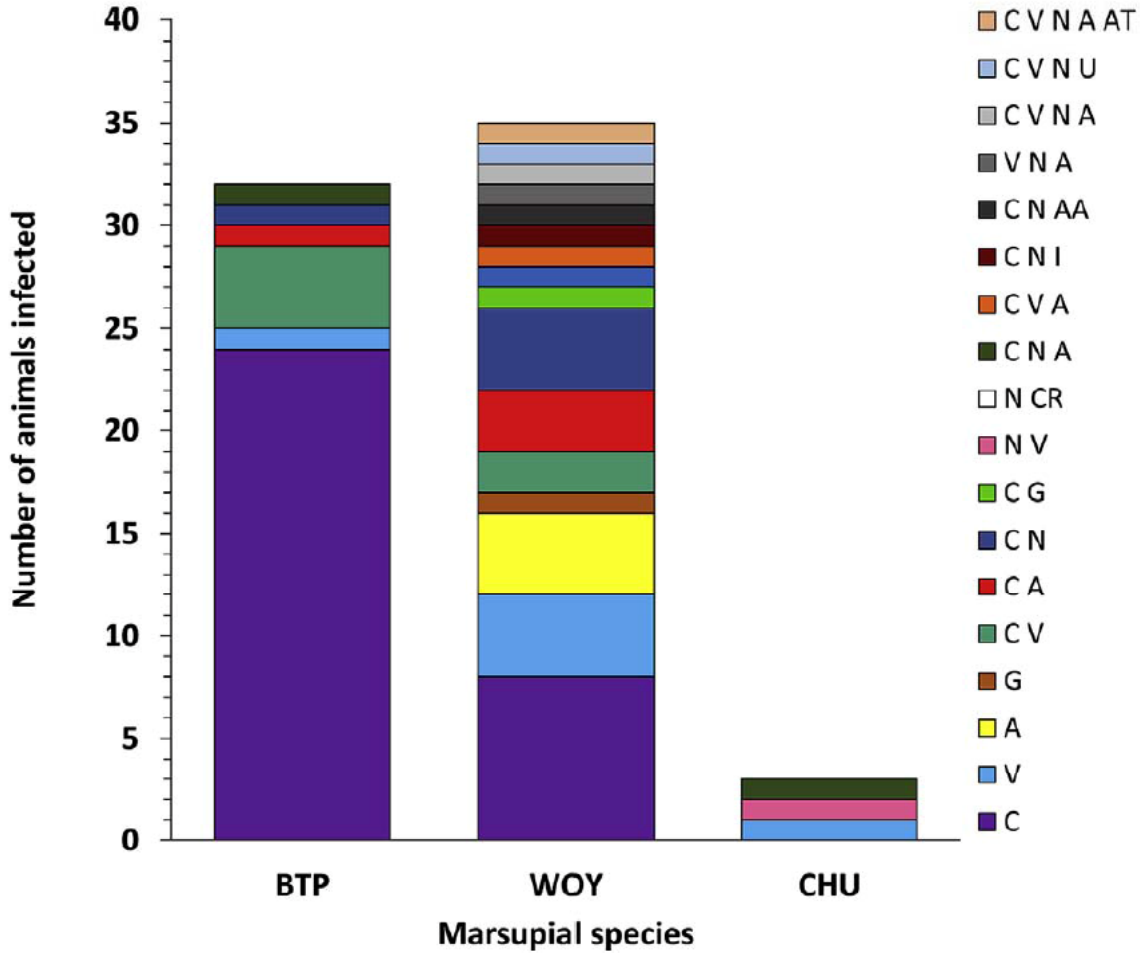


Fig. 5. *Trypanosoma* spp. polyparasitism in 70 blood samples taken from marsupials in the Upper Warren Region. Marsupial species include: woylie (WOY), brushtail possum (BTP) and chuditch (CHU). *Trypanosoma* spp. include; C = *Trypanosoma copemani*, V = *T. vegrandis*, N = *T. noyesi*, G = *T. gilletti*, A = *T.* sp. ANU2, I = *T. irwini*, AT = *T.* sp. AAT, U = unknown, AA = *T. avium*, and CR = *Crithidia* spp.

Cooper *et al.* 2018

WHAT ARE THE VECTORS OF MARSUPIAL TRYPANOSOMES IN AUSTRALIA???

Biosecurity Issues

Biosecurity Issues

Extinction Countdown

News and research about endangered species from around the world

Extinction Countdown Home

Parasites that Cause Chagas Disease in Humans May Also Be Killing Tiny Australian Marsupials

By John R. Platt | December 18, 2013 |

The views expressed are those of the author and are not necessarily those of Scientific American.

Email Print

Why are the woylies all dying? Since 2001 the populations of these tiny Australian marsupials have mysteriously crashed by as much as 90 percent. The species, which had already been driven to near-extinction in the early 20th century, had been on the path to recovery after successful conservation efforts protected them from foxes and other introduced predators. The rebound in population was enough to see the woylies removed from Australia's threatened species list in 1996, but five years later their numbers once again began to precipitously decline.

Contents lists available at ScienceDirect

Acta Tropica

journal homepage: www.elsevier.com/locate/actatropica

Chagas disease: A Latin American health problem becoming a world health

Gabriel A. Schmu

Health Surveillance, Disease
525 23th Street N.W., Washt

ization,

Chagas disease: a new worldwide challenge

Endemic Chagas disease began as a neglected disease of poor, rural and forgotten populations. Its spread from Latin America to non-endemic countries is a new worldwide challenge, say **José Rodrigues Coura** and **Pedro Albajar Viñas**.

ica

Chagas disease in Spain, the United States and other non-endemic countries

Joaquim Gascon[a,*], Caryn Bern[b], María-Jesús Pinazo[a]

[a] *Centre de Salut Internacional, CRESIB, Hospital Clínic, IDIBAPS, c/ Villarroel, 170, 08036, Barcelona, Spain*
[b] *Division of Parasitic Diseases, National Center for Zoonotic, Vector-borne and Enteric Diseases, Centers for Disease Control and Prevention, 4770 Buford Highway NE, Atlanta, GA 30341, USA*

WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTÉ

REGIONAL OFFICE FOR THE WESTERN PACIFIC
BUREAU RÉGIONAL DU PACIFIQUE OCCIDENTAL

INFORMAL CONSULTATION ON CHAGAS DISEASE IN THE WESTERN PACIFIC

Nagasaki, Japan
29-30 June 2011

WPR/DCC/MVP(4)/2011/IB//2
21 June 2011

ENGLISH ONLY

DO COUNTRIES LIKE AUSTRALIA HAVE THE VECTORS FOR CHAGAS DISEASE?

afp
Australian Family Physician
Genetics
July 2014

Clinical

Identifying Chagas disease in Australia: an emerging challenge for general practitioners

Volume 43, No.7, July 2014 Pages 440-442

J. Aust. ent. Soc., 1974, **13**: 89-94

CONFIRMATION OF THE PRESENCE OF TRIATOMINAE (HEMIPTERA: REDUVIIDAE) IN AUSTRALIA, WITH NOTES ON INDO-PACIFIC SPECIES

G. B. MONTEITH

Department of Entomology, University of Queensland, St Lucia, Queensland 4067.

Abstract

An annotated list is given of the Triatominae described from the Indo-Pacific region. *Triatoma novaeguineae* Miller, previously known only from New Guinea, is recorded from north Queensland, this being the first authentic record of Triatominae from Australia. Earlier Australi *migrans* Breddin and *T. amicitiae* Lent are excluded and it is shown that the latter

Triatoma leopoldi

Other Potential Vectors???

THANK YOU

Andy Smith, Craig Thompson, Adriana Botero, Adrian Wayne, Susana Averis, Stephanie Godfrey, Alan Lymbery, Aileen Elliot, Russ Hobbs, Crystal Cooper, Sarah Keatley, Peta Clode, Amanda Ash, Keith Morris, Amy Northover, Hamish McCallum, Stephanie Hing

Australian Government
Australian Research Council

PARKS AND WILDLIFE